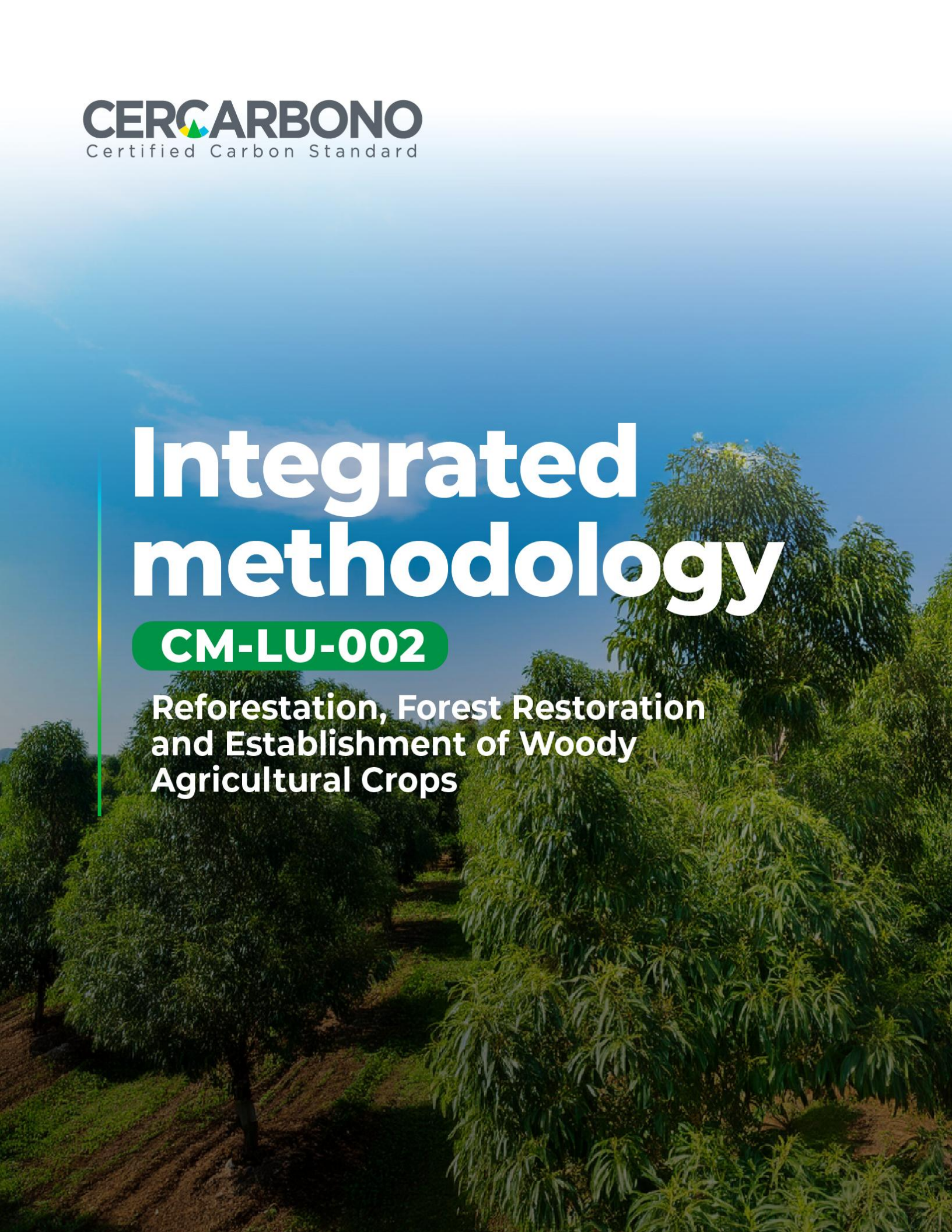
CERCARBONO
Certified Carbon Standard

# Integrated methodology

## CM-LU-002

### Reforestation, Forest Restoration and Establishment of Woody Agricultural Crops



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# CM-LU-002 Integrated methodology Reforestation, Forest Restoration and Establishment of Woody Agricultural Crops

**Version 2.2**

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## Acronyms and abbreviations

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| **CCMP** | Climate Change Mitigation Program or Project |
| **CDM** | Clean Development Mechanism |
| **EROS** | Earth Resources Observation and Science Center |
| **FR** | Forest Restoration |
| **GHG** | Greenhouse gas |
| **GPG** | Good Practice Guidelines |
| **GPS** | Global Positioning System |
| **IPCC** | Intergovernmental Panel on Climate Change |
| **ISO** | International Organization of Standardization |
| **MRV** | Monitoring, Reporting, and Verification |
| **NDC** | Nationally Determined Contributions |
| **ODS** | Sustainable Development Goals |
| **PDD** | Project Description Document |
| **R** | Reforestation |
| **REDD+** | Reducing Emissions from Deforestation and Forest Degradation |
| **WAC** | Woody Agricultural Crops. |

## Terms and definitions

The terms and definitions contained in the document ***Terms and Definitions of the Voluntary Certification Programme of Cercarbono***, available in www.cercarbono.com, section: Documentation, shall apply.

For the purposes of this methodology, the following terms[1] apply:

- **CCMP eligible area:** the geographic extent in which the program or project activity (GHG removal) is implemented, where the CCMP directly intervenes in the land and the resources associated with it.
- **CCMP total area:** a geographic area that has legal ownership[2], encompassing both the eligible area (in which the program or project activities are implemented) and the non-eligible area.
- **Cropland:** includes cultivated lands, including rice fields, and agroforestry systems where the vegetation structure is below the thresholds used for the forest land category.
- **Establishment of Woody Agricultural Crops:** set of actions leading to the establishment of woody shrub or tree species in non-forest areas (i.e., part of a land-use planning category other than forests). Due to their establishment, these areas could later meet the definition of forest as defined by national regulations. Includes palm and bamboo species under eco-friendly practices that do not negatively affect natural resources (especially water and soil) in the area where they are established.
- **Forest:** land area typically covered permanently by trees, as defined by each country under the United Nations Framework Convention on Climate Change (UNFCCC) parameters for area, tree cover, and minimum tree height at maturity.
  For Climate Change Mitigation Programs or Projects (CCMP) focused on forest restoration, this includes areas that are part of a forest area (non-stable forest) that may be temporarily without standing timber due to human intervention, such as harvesting, or natural causes, but are expected to regain tree cover, are included.
- **Forest conservation:** Actions aimed at preserving the vegetation cover in a specific area, ensuring that the area is not subject to management or removal, thereby directly contributing to its ecological stability or function.
- **Forest cover:** area covered by vegetation that meets the forest definition.
- **Forest land:** includes all lands with woody vegetation consistent with thresholds used to define a forest.
- **Forest restoration:** a set of actions leading to the establishment of native woody species in non-forest or non-stable forest areas, resulting in these areas meeting the country's definition of forest through the planting of trees and shrubs. This activity is aimed at restoring and conserving forest cover and/or the ecosystem services that previously existed in a given area, with no future timber exploitation intended.
- **GHG removal:** results of the processes by which greenhouse gases are removed from the atmosphere and stored permanently as a result of human activities.

[1] Some terms were adapted from the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4: Agriculture, Forestry and Other Land Use.

[2] CCMP holder must demonstrate that they have the legal right to use and own the area where the project and/or management of GHG emissions and removals is established.

- **Native species**: Any plant species (in the context of this methodology) that is native to a specific geographic area.
- **Natural forest:** a forest ecosystem characterized by the presence of woody species with varying vegetation structures and high diversity of fauna and flora. Natural forests can be further classified as primary forests (without human intervention) and secondary forests (disturbed by humans and undergoing regeneration).
- **Non-eligible area:** geographic area that does not meet the characteristics to implement the program or project activities according to the methodology used. The CCMP only identifies this area but does not intervene in it.
- **Non-forest:** refers to areas that do not have forest cover under any national land-use category. It must be demonstrated they have not had forest coverage for at least ten years prior to the CCMP start date. Changes in these areas must be recorded during the projection and monitoring periods. This category includes areas used for agricultural activities (such as tree planting in agricultural production systems, e.g., fruit plantations and agroforestry systems), pastures, settlements, and more.
- **Non-stable forest:** corresponds to the surface featuring a coverage, different from a stable forest from start (t1) to end (t2) of the historical period. It must be part of a land-use planning category for forests according to the country's regulations. It shall also be demonstrated that the area has not been a stable forest for at least ten years prior to the CCMP start date.
- **Overlap:** intersection of areas included in a program or project registered with Cercarbono with those registered either in Cercarbono, other standards, or national programs.
- **Reforestation:** the direct human-induced conversion of non-forest areas into areas that meet the country's definition of forest. This is achieved through tree planting, seeding, and/or human-induced promotion of natural seed sources or species approved under the national regulatory framework where the CCMP is implemented.
- **Reassessment:** a process inherent to the project activities that must be carried out by the CCMP holder or developer to verify whether implementation and expected results—which shall be justified in the monitoring report and reviewed by the VVB in verification and/or revalidation events—are consistent with reality. Reassessment may lead to a revalidation under certain circumstances, depending on the magnitude of differences between the implementation/results and the originally projected or expected outcomes.
- **Revalidation:** A process in which a VVB conducts an audit to revalidate aspects related to implementation, design, baseline, activity modality, additionality, or other characteristics that have been modified in the CCMP due to internal or external conditions (changes in legal or regulatory frameworks, accreditation period renewal, methodology updates, etc.). The VVB issues an opinion and declaration to ensure the integrity of the CCMP design, considering the modifications that led to such revalidation.
- **Segment:** in the context of climate change mitigation programs or projects, a segment is an area or set of areas dedicated to the same type of mitigation activity.
- **Segment component:** areas or portions of areas (with the same activity) that form a segment (program or project activities) within categorized land strata (non-stable forest and non-forest) present in the project or program. These allow them to be treated as a unit for analysis, calculations, inventories, monitoring, management, and other purposes.
- **Settlements:** includes all urbanized land, including transportation infrastructure and human settlements of any size, unless already included in other categories.

- **Soil disturbance:** refers to any activity that results in a decrease in soil organic carbon (SOC), such as conventional plowing or tillage, well and trench digging, stump removal, among others.
- **Stable forest:** refers to areas that remain covered by natural forest (primary type) from start (t1) to the end (t2) of the historical, projection, and monitoring period. It shall be demonstrated that the area has been a natural forest for at least ten years prior to the CCMP start date.
- **Stratum:** in climate change mitigation programs or projects in the land use sector, this refers to areas that share common characteristics, allowing for classification of eligible areas within the CCMP.
- **Tree vegetation:** vegetation characterized by having plants with wide, lignified trunks and a height greater than two meters.
- **Wetlands:** includes areas of peat extraction and lands covered or saturated with water, either throughout the year or during part of the year (peatlands and other types of wetlands), that do not fall into the categories of Forest Land, Cropland, Grassland, or Settlements.

# 1 Introduction

The land use sector is highly relevant to human survival. It is the primary basis for their livelihoods, including food supply and other services provided by their constituent ecosystems. According to the Intergovernmental Panel on Climate Change (IPCC), this sector comprises six categories: Forest Land, Cropland, Grassland, Wetlands, Settlements, and Other Land. While these categories may vary from country to country, for climate change mitigation purposes, the IPCC-defined categories are used, as they are reported in each country's National Greenhouse Gas (GHG) Inventory.

At the international level, it has been repeatedly stated that land use directly contributes to climate change, as it has been attributed between 21 % and 37 % of the total net anthropogenic GHG emissions present in the atmosphere (IPCC, 2019), mainly due to deforestation, oxidation of timber products, soil cultivation or poor production practices, fertilizer use and land use changes, which often result in land degradation and desertification.

Moreover, it is also well known that land use has a dual role, not only as a source, but also as a sink, of GHG emissions (due to both anthropogenic, and natural factors), by storing GHG in carbon pools such as living biomass, mainly woody biomass.

Therefore, land use categories such as forest and agricultural land can play a significant role in mitigation actions to reverse the adverse impacts of climate change through activities that encourage the planting, growth or maintenance of tree and shrub vegetation through reforestation or forest restoration and the establishment of sustainably managed woody agricultural crops.

Currently, numerous initiatives aim to promote climate change mitigation actions in these sectors to generate GHG removals that lead to carbon credits. In this regard, Cercarbono has updated this methodology, focusing on GHG removal through reforestation and forest restoration activities and the establishment of Woody Agricultural Crops. This methodology aligns with the goals set out in the Paris Agreement and the requirements of the voluntary carbon market.

# 2 Principles

The principles set the basis for the generation of high integrity carbon credits, from initiatives that meet the ultimate objective of climate change mitigation via CCMPs focused on GHG removal through reforestation or forest restoration processes or the establishment of Woody Agricultural Crops.

CCMPs applying this methodology must comply with and refer to the relevant principles and how they have been applied according to the current version of the ***Cercarbono's Protocol for Voluntary Carbon Certification*** (hereinafter ***Cercarbono's Protocol***, available at www.cercarbono.com, section: Documentation).

# 3 Objective and application field

This methodology is applicable to CCMPs integrating activities that increase woody vegetation cover through reforestation processes, forest restoration, and the establishment of woody agricultural crops.

It includes the identification of baseline and project scenarios throughout its implementation, GHG emission sources and carbon pools relevant to the program or project, as well as quantification of net GHG removals, monitoring and necessary documentation.

It includes the reassessment of baseline and project scenarios to dynamically recalculate the total long-term mitigation potential. The reassessment of baseline scenarios (especially in the case of grouped projects) and project scenarios must be conducted when changes in the average net GHG removal due to the CCMP implementation are recorded, improving the accuracy of the removal estimation.

The land-use categories to be used at the CCMP level shall be consistent with those adopted at the national GHG emissions inventory level, as well as with those reported in the Nationally Determined Contributions (NDCs)[3], if available.

## 3.1 Scope

This methodology is specific and applicable to Cercarbono's certification programme. It can be used by any natural or legal person, public or private, that intends to establish a CCMP focused on the GHG removal through reforestation[4], forest restoration, and the establishment of Woody Agricultural Crops to qualify for payments-for-results or similar compensations, as a result of GHG removal actions that generate in turn, the increase of carbon content in the related carbon pools and that may result in a change in land use[5]. CCMPs may include agroforestry systems within the activity of woody agricultural crops, if said systems do not include a livestock component.

This methodology applies to CCMPs that meet the standards described in this section.

***The program or project activities covered by this methodology are:***

a) **Reforestation:** corresponds to the GHG removal due to the establishment or planting of woody tree species (native[6] or approved in the regulatory framework of the country

[3] A program or project activity that is not accounted for in the NDC may be implemented, provided it complies with the guidelines established in this methodology.

[4] This methodology does not distinguish between the concepts of "afforestation" and "reforestation" since the difference between them does not affect the applicability conditions. Nevertheless, reforestation activities must be implemented in non-forest areas.

[5] As in reforestation or restoration, the transition from non-forest lands (such as agricultural lands, grasslands, settlements, or other types of lands) to forest lands can occur. With the establishment of woody agricultural crops, whether the lands continue to be classified as agricultural lands, or they become forest lands will depend on CCMP activities implemented and/or the guidelines established at the national level.

[6] This type of species must be established on at least 20 % of the CCMP area.

where the project is developed[7]). This activity can only occur in areas with a non-forest surface.

This activity cannot be implemented if the project areas are part of national or subnational reforestation plans or receive private support.

b) **Forest Restoration:** corresponds to GHG removal due to the establishment of native woody species of tree and/or shrub type (including artificial regeneration practices -replanting by transplanting plants generated in nurseries- or natural regeneration, the latter through the growth of sprouts when the species allows it). This activity can occur in areas with non-forest and/or non-stable forest surface.

CCMP holder or developer must ensure that the areas allocated to this activity are not considered as results in the REDD+[8] mechanism (through the activity of forest carbon stocks enhancement), thus avoiding double counting.

c) **Establishment of Woody Agricultural Crops**: corresponds to GHG removal due to the establishment or exploitation of perennial woody species of tree and/or shrub type, as long as the species are native, naturalized or approved in the country where the CCMP is implemented. This activity can only occur in areas with non-forest surface.

The GHG removal achieved by the program or project activities mentioned above is calculated as the sum of the differences between the gross annual removals and the gross annual emissions during the results period compared to the baseline scenario.

Accordingly, CCMPs may be formulated by considering the selection of activities that will be monitored, as shown in the table below:

**Table 1.** Program or project activities likely to be included by the CCMP holder or developer.

| Activity* | Included | Explanation |
|---|---|---|
| **Reforestation** | Optional | A set of actions leading to the establishment or planting of native or legally permitted woody species of an arboreal type, with conditions to meet the forest definition established by the country where the CCMP is implemented, intended for conservation, production, or forest (timber) use. |
| **Forest restoration** | Optional | A set of actions leading to the establishment of native woody species, either arboreal and/or shrub-like, without future forest exploitation purposes (intended for conservation), meeting the forest definition established by the country where the CCMP is implemented. |

[7] In charge of the official institution supporting production and commercialization of plant genetic material in the country where the CCMP is implemented.

[8] If this activity is contemplated in the REDD+ mechanism, it must comply with all the requirements established in the REDD+ methodology. Therefore, the present methodology does not support this activity for said mechanism.

| Activity* | Included | Explanation |
|---|---|---|
| **Woody agricultural crops**[9] | Optional | A set of actions leading to the planting and utilization of one or more native, naturalized, or legally approved perennial species, either arboreal and/or shrub-like, for scientific, economic, or industrial purposes other than timber production. |

*Its inclusion will depend on the project's operational, technical, and administrative capacity to address it. In each program or project activity when "set of actions" is mentioned, these include direct actions (such as planting, management, among others) and indirect actions (such as planning, socialization, monitoring, among others), through which its establishment is achieved.

## 3.2 Technical and program compliance

The following Cercarbono's regulatory framework documents[10], in their current versions, are complementary and essential for the application of this methodology:

- Cercarbono's Protocol for Voluntary Carbon Certification.
- Procedures of Cercarbono's Certification Programme.
- Terms and Definitions of the Voluntary Certification Programme of Cercarbono.
- Cercarbono's Tool to Demonstrate Additionality of Climate Change Mitigation Initiatives.
- Cercarbono's Tool to Estimate the Carbon Buffer in Climate Change Mitigation Initiatives in the Land Use Sector.
- Cercarbono's Tool to Report Contributions from Climate Change Mitigation Initiatives to the Sustainable Development Goals.
- Guidelines for Mapping Presentation and Analysis.
- Safeguarding Principles and Procedures of Cercarbono's Certification Programme.

As well as the following Clean Development Mechanism (CDM)[11] methodological Tools:

- *AR- Tool 03 - Methodological tool: Tool to calculate project or leakage $CO_2$ emissions from fossil fuel combustion.*
- *AR-Tool 08 - Methodological tool: Estimation of non-$CO_2$ GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity.*
- *AR-Tool 12 - Methodological tool: Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities.*
- *AR-Tool 13 - Calculation of the number of sample plots for measurements within A/R CDM project activities*.
- *AR-Tool 14 - Methodological tool: Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities.*

[9] This type of cultivation will be established in non-forest areas, predominantly on croplands. However, when this activity is established by the CCMP, the areas could meet the definition of forest adopted by the country. Therefore, the guidelines established for such crops must be considered so that their results are considered in the national accounting either as forest land, cropland or other land.

[10] Available at www.cercarbono.com, section: Documentation. In addition, CCMP must incorporate applicable technical tools developed by Cercarbono in the land use sector. not listed previously, available for new CCMP verification events.

[11] Or those substituting them under Article 6.4 mechanism, or complementing them under Cercarbono's regulatory framework. This comment applies to any mention related to any CDM methodological documents referred throughout this document.

- *AR-Tool 15 - Methodological tool: Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity.*
- *AR-Tool 16 - Methodological tool: Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities.*
- *AR-Tool 17 - Methodological tool: Demonstrating appropriateness of allometric equations for estimation of aboveground tree biomass in A/R CDM project activities.*
- *AR-Tool 18 - Methodological tool: Demonstrating appropriateness of volume equations for estimation of aboveground tree biomass in A/R CDM project activities.*

This methodology includes common elements in relation to the CDM methodology:

- *AR-ACM0003 A/R Large-scale Consolidated Methodology: Afforestation and Reforestation of Lands Except Wetlands, version 2.0.*

### 3.3 Compliance with applicable legal provisions

Within the framework of this methodology, the CCMP must fully consider and comply with the applicable regulations, measures, and circumstances (national, regional or jurisdictional, local, social, environmental, technological, among others) for the implementation of its activities, ensuring robust and verifiable supporting documentation.

The CCMP holder must demonstrate that the areas where the CCMP is implemented comply with licenses, permits or environmental management plans, as well as with all applicable regulations in accordance with the technology used in the competent jurisdiction, prior to the start of validation and verification activities.

GHG removals obtained by the CCMP, as applicable, must be registered in the national registry of the country they are implemented in (if they correspond to the GHG removal commitments assumed by said country), aligned with international efforts of Measurement/Monitoring, Reporting, and Verification of climate change mitigation initiatives.

## 4 Eligibility and inclusion requirement

### 4.1 Area eligibility

The eligibility of the CCMP area of this type is supported by the initial classification analysis[12] of the areas (stable forest, non-stable forest, and non-forest), which determines the eligible areas (non-stable forest and non-forest) and non-eligible areas (stable forest and non-forest).

The conditions CCMP must meet are as follows:

[12] This classification represents the minimum recognition criterion for the CCMP total area, supported by the analysis of satellite imagery (using reliable and verifiable data) and other guidelines outlined in the following sections.

- The areas in which the CCMP is implemented must correspond to areas with non-forest surfaces[13] (In which there is no woody cover) and/or non-stable forest surfaces[14].
- The areas in which the CCMP is implemented must not have been covered by stable forest for at least ten years prior to the start date of the CCMP implementation. CCMP implementation must not cause disturbances on stable forests surfaces.
- In the areas where the CCMP is implemented, soil disturbances are permitted (only up to 10% of the eligible area of the CCMP), attributable to conventional soil preparation (tillage). Soil inversion practice to a depth greater than 25 cm (vertical tillage using chisel or subsoiler) is allowed. CCMP must include zero tillage and friendly and sustainable practices (such as the use of mulch, organic fertilizers, integrated pest control, among others) in at least 90 % of the area intended for the establishment of woody species.
- This methodology does not apply to wetlands or floodplains.
- Drainage or irrigation of organic soils is not permitted, except for irrigation for sowing.
- CCMP shall not be implemented in environmental protection areas[15].
- Overlaps (either temporary, or geographical) with another initiative with similar scope and during the same timespan are not allowed.
- CCMP must demonstrate legal ownership or rights over the areas where it implements its activities.

All items listed above must present documented evidence.

The retroactivity period accepted for CCMP's operations start date, is as per ***Cercarbono's Protocol***.

The eligible mitigation results have an established validity in accordance with the regulations and with the date of performance of the verification process as per ***Cercarbono's Protocol***.

The CCMP holder must provide evidence that areas within the planned project boundaries are eligible for at least one program or project activity, demonstrating that at the beginning of the activity they contain areas with non-stable forest and/or non-forest covers, providing information that reliably identify such covers.

Eligible areas (non-forest and/or non-stable forest areas) must be determined based on cross-referenced, traceable information.

Non-eligible areas (when applicable[16]) correspond to stable forest areas or non-forest areas (that were not considered eligible), which are part of the spatial boundaries of the project but must be excluded from the eligible areas. These areas must also be presented in a traceable manner.

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[13] Corresponds to other land uses, considering this designation for the development of reforestation, forest restoration, or establishment of woody agricultural crops activities, which may be subclassified according to the type of vegetation present (herbaceous, shrub-like, or arboreal).

[14] Corresponds to forest lands (or that are part of some category of forest territorial planning according to the country's regulations) taking this denomination into account to develop forest restoration activities.

[15] Geographically defined areas that have been designated, regulated and managed by public entities to achieve specific conservation objectives. CCMP may only be implemented in such areas when the competent authority determines that there is compatibility with such land use and authorizes such implementation.

[16] Since a CCMP may not identify non-eligible areas within its total area.

*Table 2* presents the structure for reporting the total areas that make up the CCMP, which must include both eligible and non-eligible areas (as applicable).

**Table 2.** Presentation of CCMP total area.

| **Eligible area** ($A_{Eligible}$) | **Hectares (ha)** | |
|---|---|---|
| | Baseline | Project |
| Non-stable forest | Non-stable forest areas. | Forest Restoration Segment. |
| Non-forest | Non-forest areas. | -Reforestation Segment.<br>-Forest Restoration Segment.<br>-Establishment of Woody Agricultural Crops Segment. |
| **Non-eligible area** ($A_{Non-eligible}$) | **Hectares (ha)** (When applicable) | |
| Stable forest | | |
| Non-forest* | | |
| **CCMP total area** | **Hectares (ha)** | |
| Eligible area | | |
| Non-eligible area (when applicable) | | |
| **Total** | | |

*Where population, access roads, among others are established.

To support area eligibility, the CCMP must perform:

### 4.1.1 Eligibility analysis based on mapping software

The eligibility analysis based on coverage includes the following stages:

#### 4.1.1.1 Collection of mapping information

To determine the status of coverage during the historical and project periods, information sources such as remote sensors, orthophotos, coverage maps, or land-use planning tools developed by official mapping institutions in the country where the CCMP is implemented are allowed. The information sources must provide explicit spatial data, exact locations, and patterns of tree cover change within the CCMP area. To determine changes in coverage (stable forest, non-stable forest, and non-forest); the use of methodologies, spatial scales, and minimum area measurement units generated by the forest monitoring entities of the country where the CCMP is located is considered.

The CCMP shall present the cartography and provide evidence of the mapping based on reliable and verifiable sources of information, such as satellite data, drones, or the Global Positioning System (GPS)[17], which must be proportional to the scale of the CCMP. The use of images captured by drones to estimate coverage changes during the project period is also allowed, provided used methods and equipment are consistent with best practices applicable.

[17] The use of free cartographic viewers as a source of complementary information is permitted. In any case, the dates of the images or maps used must be within the range of the evaluated period.

The collection and analysis of mapping information must follow the guidelines defined by the ISO 19157:2023 standard (or its replacement) or the institution responsible for official mapping in the country where the CCMP is implemented.

The CCMP mapping presentation must comply with the guidelines established in the ***Guidelines for Mapping Presentation and Analysis***. The final scale of the products and the relevance of the information sources must be considered, according to the size of the discrete areas included and the total area of the CCMP.

To generate an adequate and accurate collection of mapping information, it shall be considered that the minimum mappable area - defined as the smallest unit of interpretation of cartographic sources and corresponding to the working scale - must be equal to the minimum size established in the country's forest definition where the CCMP is implemented.

The management unit of agricultural activities is the plot (woody agricultural crop activity) or stand (reforestation or forest restoration activity), which can be a continuous unit or made up by several polygons that may be smaller than the minimum forest area defined by the country where the CCMP is located. These polygons may be separated by terrain characteristics (e.g., power lines, forest roads, water networks, protection zones), as long as the separation is not greater than 20 meters between their closest points (identification and monitoring images must have a spatial resolution of at least 10 cm per pixel and cover a minimum area of 0.25 hectares).

#### 4.1.1.2 Raster Data

Raster data must be used with specialized software for image interpretation. Each process must be documented: preprocessing, corrections, enhancements, classification, assignment, and final interpretation of images.

#### 4.1.1.3 Vector data

Sources of vector data used must be identified, described, and substantiated. If image vectorization is required, the procedure used must be documented.

Whether raster or vector data is used, the procedure to generate land cover maps for each analysis date must be substantiated.

### 4.1.2 Identification and classification of areas

The CCMP shall classify its area according to coverage into stable forest, non-stable forest, and non-forest areas. If the total project area includes stable forest areas, these must be identified and designated as non-eligible areas.

The first step in classifying the project area is the preliminary analysis, which defines a region where the stable forest coverage and its changes (to non-stable forest or non-forest, if applicable, as the latter may correspond to other categories of land use) are analyzed over a period of ten years or more. This region serves as a transitional tool to confirm the stable forest, non-stable forest, and non-forest areas, as well as the project activities that the CCMP can include.

The documentation used for the analysis must consider the entire area to be included in the CCMP and must substantiate the existing covers at the time of the analysis. Cartographic

interpretation should be supplemented to verify the covers (and its classification) at the CCMP start date and those at the time of legal support.

If no coverage information is available for the project area, it is recommended to quantify activity data according to the method established by the national forest monitoring system of each country. Alternatively, other methodological proposals related to area classification (stable forest, non-stable forest, and non-forest) will be accepted, provided they are technically sound, justified and supported.

Therefore, a methodology that allows for clear classification of the areas within the CCMP must be applied. ***Annex 1*** outlines and highlights some key elements to consider in the classification of the areas within the CCMP, as established by Galindo *et al*. (2014).

## 4.2 Compatibility with land use categories, land use planning, and applicable environmental legislation

The CCMP must demonstrate the compatibility of the actions developed with the land use categories defined in the country where it is implemented, if such categories exist.

The CCMP shall perform a comparative analysis of the land use guidelines resulting from land use planning or zoning, formulated programs, and project activities. This comparison shall be descriptive and demonstrate the geographic compatibility of the activities. For each CCMP action, it must report the planning or zoning frameworks under which it is developed and describe how it aligns with official institutional efforts.

The CCMP must specify all applicable laws, statutes, and regulatory frameworks (local, regional, national, etc.) regarding land use categorization or zoning and must identify, implement, and periodically evaluate their compliance.

## 4.3 Ownership

The CCMP must demonstrate the capacity to act over the CCMP areas [18] or obtain explicit authorization from the current CCMP holder or legal representative (both during the preparation of the Project Description Document (PDD) and in the monitoring periods that generate mitigation results), whether on an individual, public, or collective basis.

For privately owned properties, explicit authorization from the owner or legal holder of the property(ies) must be provided, authorizing the implementation of the CCMP. The delimitation of the possession area corresponds to a declaration of ownership or administration.

Evidence must be provided regarding the ownership of GHG removals among the interested parties. This means that participation, claims, or transfer of rights over GHG removals must be supported by a legally binding signed document between the parties.

[18] Including cases of areas where farmers populations, indigenous communities or other groups are established, in which in addition to the ownership demonstrated as established here, the validity and legality of the representation held by the signatories of the respective contracts or agreements must be demonstrated, of such populations, communities or groups, including full verification and legal identity documents of such representatives, as well as the certifications or endorsements of the government authorities involved and their representatives, in accordance with the legal framework applicable in the jurisdiction where CCMP is implemented.

In addition to this, the CCMP must consider provisions on this subject as per current version of ***Safeguarding Principles and Procedures of Cercarbono's Certification Programme*** document.

### 4.4 CCMP general objective

The objective of the CCMP shall be described in the PDD, outlining the primary positive impact expected from the implementation of its activities and the anticipated mitigation potential.

It shall also include, at a minimum: The main activity, the geographic location where the project activities will be implemented, the stakeholders involved, and the timeline for the execution of the project activities.

## 5 Additionality

In this methodology, additionality must be demonstrated by applying the latest version of ***Cercarbono's Tool to Demonstrate Additionality of Climate Change Mitigation Initiatives***.

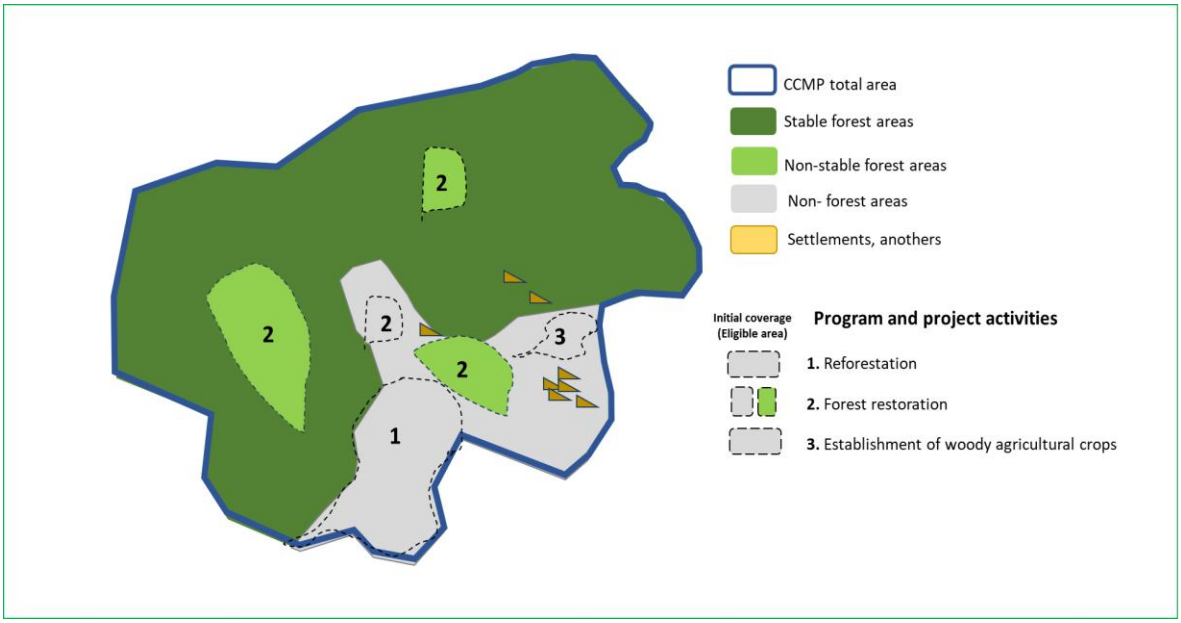
## 6 CCMP delimitation

The delimitation of the CCMP requires defining various elements that specify its geographic, scope, temporal, activity, emission source and carbon pools. Some of these elements are definitely established during the CCMP validation and cannot be modified (start date and duration, activities (segments), emission sources and carbon pools considered), while others can be modified due to implementation changes (e.g. addition of areas or participants or spatial limits of the segments).

### 6.1 Spatial boundaries - Initial definition

The CCMP must identify and delimit the following areas in the context in which it is implemented, as exemplified in ***Figure 1***.

**Figure 1.** Example spatial delimitation of the CCMP total area, integrating all land covers from the initial classification, and the program or project activities covered by the methodology.




**Note:** Some areas by type of activity may or may not be contiguous. Areas framed in dashed lines with a number inside represent the fragments.

- **CCMP total area:** area where the CCMP can be implemented. In this area, the initial classification is conducted to identify the land covers that make up the eligible areas (non-stable forest and non-forest) and the non-eligible areas (stable forest and non-forest[19]).
- **CCMP eligible area:** area in which the estimation of GHG removals that would have occurred both in the absence of the project (baseline scenario) and those that will occur due to the implementation of the project (project scenario) is carried out. It corresponds to the eligible strata (non-stable forest and non-forest), in which the segments will be established.

CCMP spatial boundaries must be explicitly defined in the PDD.

For baseline and project scenarios, a CCMP shall contain the following three spatial typologies: strata, segments, and segment components:

– **Strata** represent the eligible areas where the CCMP can be implemented, meaning non-stable forest and non-forest areas, as identified in the initial classification of the areas. They allow the macro division of the CCMP, to separate and identify the areas subject to monitoring (segments). They must be identified in the baseline and project scenarios. ***Table 3*** presents the possible combinations of strata, with which a CCMP can establish the program or project activities covered by this methodology.
– **Segments** are the explicitly delimited areas (superimposed on the strata identified and considered by the CCMP), where the program or project activities (reforestation, forest

[19] It corresponds to non-forest areas where populations, access roads, and other infrastructure may be established, where project activities will not be implemented.

restoration or establishment of woody agricultural crops) will be carried out. Each segment must be within the eligible area of the CCMP and in turn can be included in one or both strata identified as eligible (as is the case with the forest restoration activity). In addition, a segment may encompass part, or all the area of a stratum identified as eligible.

- **Program or project activities** as mentioned in ***Section 3.1***, this methodology can be used for the implementation of CCMPs focused on GHG removal through reforestation activities, forest restoration and establishment of woody agricultural crops. An activity may comprise a set of areas with similar characteristics called components, which in turn make up the segments that the CCMP can consider.
  This methodology defines three types of segments, namely: reforestation, forest restoration and woody agricultural crops. A CCMP may include one or all three types of segments, based on the initial classification, area eligibility, and its administrative or technical capacity. Segment areas should be identified in the baseline and project scenarios to avoid double counting in results. Segments will only be monitored once the CCMP is implemented.
  Program or project activities of the segments can be implemented independently or together in the same CCMP, as long as the conditions established in ***Sections 3*** and ***4***, are complied with.

– **Segment components** are portions of an area with the same activity that make up the segments. They integrate the potential types of stands or lots that can be established (in the reforestation segment and in the woody agricultural crops segment) and restored (in the forest restoration segment), grouped according to their common characteristics for calculation purposes, at different stages of the implementation of the CCMP (e.g. based on planting plans, restoration or planting, or species used). ***This classification is only required*** when the segment is made up of more than one portion of area, usually distant from each other, otherwise only segments are established.

The spatial boundaries of the segments considered in the CCMP may only change during its implementation, when areas are added or removed, in which case, the CCMP must be revalidated. The rules and calculations referred to them are presented in ***Sections 7*** and ***8***.

Once the strata (areas of stable and non-forest forest) that will be part of the CCMP are identified (see ***Table 3***), the different segments that will be considered by the CCMP shall be selected.

**Table 3.** Example strata combinations representing the CCMP eligible area for both the baseline scenario and the project scenario (including the activities it may contain), in accordance with ***Section 4***.

| Non-forest areas | | Non-stable forest areas |
|---|---|---|
| **Option 1: Activities (segments)** | | |
| Reforestation | Woody agricultural crops | Forest restoration |
| **Option 2: Activities (segments)** | | |
| Reforestation | NA | Forest restoration |
| **Option 3: Activities (segments)** | | |
| Reforestation | Woody agricultural crops | NA |
| **Option 4: Activities (segments)** | | |

| Non-forest areas | | Non-stable forest areas |
|---|---|---|
| Reforestation | NA | NA |
| **Option 5: Activities (segments)** | | |
| NA | Woody agricultural crops | Forest restoration |
| **Option 6: Activities (segments)** | | |
| NA | NA | Forest restoration |
| **Option 7: Activities (segments)** | | |
| NA | Woody agricultural crops | NA |

NA: Not applicable.

When the CCMP requires the application of other methodologies developed or approved by Cercarbono (such as REDD+) to implement the forest restoration segment, for the formation of forest landscapes, it must identify and exclude the segments where these activities are carried out, avoiding double counting situations.

The variables related to the definition of the spatial boundaries of the CCMP are presented in the following equations:

$$A_{Eligible} = \left(A_{Non\ Stable\ forest} + A_{Non\ forest}\right) \qquad \textit{Equation 1}$$

$$A_{Non\ Stable\ forest} = TSAs_{FR1} \qquad \textit{Equation 2}$$

$$A_{Non\ forest} = TSAs_{R} + TSAs_{FR2} + TSAs_{WAC} \qquad \textit{Equation 3}$$

$$TSAs_{(R,FR1,FR2,WAC)} = \sum_{f=1}^{NSCS\_Sc} A_{SC,f,s\_R}, \sum_{f=1}^{NSCS\_Sc} A_{SC,f,s\_FR1}, \sum_{f=1}^{NSCS\_Sc} A_{SC,f,s\_FR2}, \sum_{f=1}^{NSCS\_Sc} A_{SC,f,s\_WAC} \qquad \textit{Equation 4}$$

| Variable | Description | Units | Segment* | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| $A_{eligible}$ | Total area where the program or project activity is implemented. | ha | X | X | X |
| $A_{Non\ Stable\ Forest}$ | Total area of Non-Stable Forest (eligible stratum) where the forest restoration segment is established. | ha | NA | X | NA |
| $A_{Non\ Forest}$ | Total area of Non-Forest (eligible stratum) where the reforestation, forest restoration, and/or establishment of Woody Agricultural Crops segments are established. | ha | X | X | X |
| $TSAs_{(R,FR1,FR2,WAC)}$ | Total area of segment ***s*** (reforestation "R", forest restoration "FR1 and/or FR2"[20], and/or establishment of Woody Agricultural Crops "WAC") in the | ha | X | X | X |

[20] As referred throughout this document, forest restoration (FR) can take place in both eligible strata (Non-Stable Forest - FR1 and/or Non-Forest - FR2), which will be determined by the selection of activities that the CCMP holder or developer supports within the CCMP.

| Variable | Description | Units | Segment* | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| | baseline scenario (***Sc***), project scenario, monitoring, or reassessment. | | | | |
| $s$ | Index of the segments to be implemented in the CCMP (maximum 3: reforestation, restoration, and establishment of Woody Agricultural Crops). | NA | X | X | X |
| $A_{Sc,f,s\_R}$ | Area of segment component ***f*** of segment ***s*** (reforestation "R") in the baseline scenario (***Sc***), project scenario, monitoring, or reassessment. | ha | X | X | X |
| $A_{Sc,f,s\_FR1}$ | Area of segment component ***f*** of segment ***s*** (forest restoration "FR1") in the baseline scenario (***Sc***), project scenario, monitoring, or reassessment. | ha | X | X | X |
| $A_{Sc,f,s\_FR2}$ | Area of segment component ***f*** of segment ***s*** (forest restoration "FR2") in the baseline scenario (***Sc***), project scenario, monitoring, or reassessment. | ha | X | X | X |
| $A_{Sc,f,s\_WAC}$ | Area of segment component ***f*** of segment ***s*** (establishment of Woody Agricultural Crops "WAC") in the baseline scenario (***Sc***), project scenario, monitoring, or reassessment. | ha | X | X | X |
| $NSCS\_Sc$ | Total number of segment components within segment ***s*** in the baseline scenario (***Sc***), project scenario, monitoring, or reassessment. | Number of segment components | X | X | X |

*R: Reforestation; FR: Forest Restoration; WAC: Woody Agricultural Crops.
NA: Not applicable.

$$A_{Non\_eligible} = (A_{Stable\ forest} + A_{Non\_forestNE}) \qquad \textit{Equation 5}$$

| Variable | Description | Units | Segment | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| $A_{Non\_eligible}$ | Total non-eligible area for the program or project activity. | ha | NA | NA | NA |
| $A_{Stable\ forest}$ | Stable Forest Area. | ha | NA | NA | NA |
| $A_{Non\_forestNE}$ | Non-Forest Area (not part of the eligible area), where populations, access roads, and other infrastructure may be established. | ha | NA | NA | NA |

*R: Reforestation; FR: Forest Restoration; WAC: Woody Agricultural Crops.
NA: does not apply.

## 6.2 Temporary limits

The CCMP temporary limits must be explicitly defined in the PDD. Credits may only be earned for GHG removals during the period determined within these limits. These must be defined as described below:

– **CCMP start date** (day.month.year)**:** date on which the first direct action is implemented in the program or project area leading to mitigation results; that is, the date when GHG removals resulting from on-site actions begin.

- **Historical period**: period (in years) not less than ten years prior to the start date of the CCMP, in which the land covers[21] (stable forest, non-stable forest and non-forest) present in the CCMP area are determined.
- **Projection period:** is the time range (in years) for which projections are made in the baseline scenario and in the project scenario based on the historical period. The initial year of this period must coincide with the CCMP start date, covering the accreditation period and may exted to the total duration of the CCMP.
- **Results period:** range of time (in years) during which CCMP activities and the results of said actions are monitored in terms of GHG removal due to carbon increases in the carbon pools. The results period includes the verification times in which monitoring of GHG removals are carried out. The total duration of this period is equal to the duration of the CCMP accreditation period**.**
- **CCMP duration:** period (in years) between the start of project actions and their conclusion in a given territory. CCMP duration must be equal to or greater than 30 years (day.month.year to day.month.year). There is no maximum limit, as this will depend on the legal, technical, and operational capacity of the CCMP holder or developer to sustain the activities. However, the holder or developer may extend this period under the crediting period renewal.
- **Verification times:** periods (months or years) within the results period in which the GHG removal results are verified by an independent third party. A CCMP shall have a maximum interval of three years between successive verifications. Please review considerations on this aspect in the current version of the ***Cercarbono's Protocol***.
- **Crediting period:** this period is defined in accordance with the provisions of the current version of the ***Cercarbono's Protocol***. It shall be the same for the baseline and project scenarios and reassessment of said scenarios.

## 6.3 Carbon pools

Carbon pools included in a CCMP are the significant ones that may be estimated/measured to assess carbon stock in the baseline scenario and whose changes are evaluated in the project scenario associated with the implemented activities.

Carbon pools considered in the baseline scenario correspond, at a minimum, to those significant carbon pools that contain carbon in the land covers of this scenario and are likely to change due to the CCMP implementation, as presented in the following table:

**Table 4.** Carbon pools.

| Carbon pool | Activity | | | Justification | |
|---|---|---|---|---|---|
| | Reforestation | Forest restoration | Woody agricultural crops | Baseline (BL) | Project (P) |
| Aboveground tree biomass (***Atree***) | Yes | Yes | Yes | Main carbon pool. | |
| Belowground tree biomass (***Btree***) | Yes | Yes | Yes | Main carbon pool. | |

[21] It should be aligned (if available) with the forest or agricultural inventory established at the subnational or national level.

| Carbon pool | Activity | | | Justification | |
|---|---|---|---|---|---|
| | Reforestation | Forest restoration | Woody agricultural crops | Baseline (BL) | Project (P) |
| Aboveground shrub biomass (***AShrub***)* | No | Optional | Optional | They may be considered or conservatively excluded. | |
| Belowground shrub biomass (***AHerb***) | No | Optional | Optional | | |
| Aboveground herbaceous biomass (***AHerb***) | Yes (BL) No (P) | Yes (BL) No (P) | Yes (BL) No (P) | Carbon pool considered in all segments of this scenario. | Conservatively excluded. |
| Belowground herbaceous biomass (***BHerb***) | Yes (BL) No (P) | Yes (BL) No (P) | Yes (BL) No (P) | | |
| Deadwood (***Dw***) | Optional | Optional | No | They may be considered or conservatively excluded. | |
| Litter (***L***) | Optional | Optional | No | | |
| Soil organic carbon (***Soc***) | Optional** | Optional | Optional | | |

*"Aboveground shrub biomass" refers to the biomass of all vegetative components (leaves, branches, stems) of shrubs that are above the soil surface in a given area. This includes stems, branches, leaves, flowers, and fruits.

Aboveground and belowground tree biomass must be included in all considered segments, both in baseline and project scenarios. Shrub biomass (Aboveground and belowground) is optional in the forest restoration and woody agricultural crops segments, if considered, it should be included in both the baseline and project scenarios. Herbaceous biomass must be considered in all segments in the baseline scenario and conservatively excluded from the project scenario. Deadwood and litter may be optionally included in the reforestation and/or forest restoration segments, but if considered, it must be included in these segments in both baseline and project scenarios. Soil organic carbon is optional for all segments, but if considered, it must be included in all segments both in baseline, and project scenarios.

If the estimates for carbon stock in carbon pools change due to CCMP implementation different from that assessed during validation, a reassessment of the baseline or project scenario is required, as explained in ***Section 6.6***.

## 6.4 GHG emissions sources

GHG emissions sources considered in this methodology are those that occur from burning, fires, fertilizer use and fossil fuel consumption in agricultural machinery, as shown in the following table:

**Table 5.** GHG emission sources considered[22]**.**

| Emission source | | Baseline scenario | Project scenario | Justification |
|---|---|---|---|---|
| **Reforestation and forest restoration** | | | | |
| **Fires** | | | | |
| | $CO_2$ | No | No | Considered in carbon stock calculations. |

[22] These emission sources must be directly associated with the project activity.

| Emission source | | Baseline scenario | Project scenario | Justification |
|---|---|---|---|---|
| | Non-$CO_2$ | No | Yes | Conservatively excluded in the baseline scenario.<br>It is included in the project scenario when the event is generated fortuitously (natural or anthropogenic). |
| **Biomass burning** | | | | |
| | $CO_2$ | No | No | Considered in carbon stock calculations. |
| | Non-$CO_2$ | No | No | Conservatively excluded in Baseline project. Burning is not permitted in the project scenario. |
| **Use of synthetic and organic fertilizers** | | | | |
| | $N_2O$ | No | Optional | Nitrification/denitrification of fertilizers and organic supplements applied to soils.<br>Conservatively excluded in the baseline scenario. In the project scenario it may be a significant source to consider. |
| | $CH_4$ | No | No | Excluded. |
| **Woody agricultural crops** | | | | |
| **Fires** | | | | |
| | $CO_2$ | No | No | Considered in carbon stock calculations. |
| | Non-$CO_2$ | No | Yes | Conservatively excluded in the baseline scenario.<br>It is included in the project scenario when the event is generated fortuitously (natural or anthropogenic). |
| **Biomass burning** | | | | |
| | $CO_2$ | No | No | Considered in carbon stock calculations. |
| | Non-$CO_2$ | Optional | Optional | In the baseline scenario, only if it is common practice in the region and only if it is included in the project scenario only if permitted by law. |
| **Use of synthetic and organic fertilizers** | | | | |
| | $N_2O$ | Optional | Yes | Nitrification/denitrification of fertilizers and organic supplements applied to soils.<br>It can be considered or conservatively excluded in the baseline scenario. It is included in the project scenario because this activity is common in crop management. |
| | $CH_4$ | No | No | Emissions of this gas from this source are not expected to occur in this type of activity. |
| **Fossil fuel consumption in agricultural machinery** | | | | |
| | $CO_2$ | Optional | Yes | Main GHG of this emission source.<br>It can be considered or conservatively excluded in the baseline scenario. It is included in the project scenario because this activity is common in crop management. |
| | Non-$CO_2$ | No | Yes | Potentially very low emission.<br>Conservatively excluded in the baseline scenario.<br>In the project scenario it must be included. |

The estimation of these emission sources may be subject to changes due to a CCMP implementation, different from that presented during the validation, in which case a reassessment of the baseline or project scenario may be required.

## 6.5 Long-term average GHG mitigation potential

The long-term mitigation potential (long-term average net removal) of a CCMP represents the total amount of net removals, expressed as the difference between the GHG removal

achieved by the selected carbon pools in the project scenario and that in the baseline scenario, including GHG emission sources (and also potential leakages during the implementation of the CCMP).

To determine the long-term mitigation potential, **Equation 6** must be used. This potential should be established according to the type of program or project activity to be implemented. The maximum number of GHG credits that can be obtained by the CCMP must not exceed its long-term mitigation potential.

$$R_{LA} = \frac{\sum_{t=1}^{T} Ran_{P,t} - Ran_{BL,t}}{T} \qquad \textit{Equation 6}$$

| Variable | Description | Units | Segment* | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| $R_{LA}$ | Long-term average GHG mitigation potential. | t $CO_2e$ / year | X | X | X |
| $Ran_{P,t}$ | Long-term average net removals by carbon pools across all segments in year $t$, in the project scenario. | t $CO_2e$ | X | X | X |
| $Ran_{BL,t}$ | Long-term average net removals by carbon pools across all segments in year $t$, in the baseline scenario. | t $CO_2e$ | X | X | X |
| $t$ | CCMP year index. | NA | X | X | X |
| $T$ | CCMP total duration | years | X | X | X |

*R: Reforestation; FR: Forest restoration and WAC: Woody agricultural crops.
NA: does not apply.

When forest utilization activities (harvesting) are integrated, such as in reforestation, or woody biomass renewal activities, as occurs in the establishment of Woody Agricultural Crops activity (see ***Figure 2***), the long-term average mitigation potential is defined as the value corresponding to the total net removal of woody biomass for the area of each segment or its segment components throughout the CCMP duration, divided by the CCMP duration (expressed in years). As a result, the CCMP must establish the timeframe in which this average will be reached, based on the type of woody species implemented in its planting plan or harvest cycles that the CCMP will consider, ensuring that it incorporates GHG emissions caused by such harvests or potential leakages that may result[23].

For CCMPs that include forest restoration activities (***Figure 3***), the long-term average net removal will be determined from the point at which tree biomass reaches equilibrium ($CO_2$ fixation) in this segment or its segment components over its duration. If this equilibrium occurs beyond the CCMP duration, the long-term average net removal will be set according to the CCMP end date.

As explained in the following paragraph, the average mitigation potential does not represent a limit on the **credits that can be obtained in a given year** (as long as it does not exceed the long-term mitigation potential) but serves only as a reference, as the GHG removal achieved

[23] The carbon loss due to harvesting must be included in the quantification of project emissions and affects the average removal of the biomass component, thereby shifting the mitigation potential over time.

may be higher or lower than this average, depending on the growth of species, intrinsic management factors, or unexpected external events.

Thus, the long-term mitigation potential of the CCMP, and therefore the maximum number of credits that can be obtained during its implementation, will be determined by the product of its average mitigation potential times the years of CCMP implementation, appropriately considering any harvesting events at the end of implementation, if applicable[24].

## 6.6 Generic process for estimation and reassessment of baseline and project scenarios

As referred above, segments represent the different activities that are eligible under this methodology. They should be projected in the project scenario and implemented in the field. The initial segments, their specific areas or the corresponding components that make them up must be defined in CCMP design.

For each CCMP segment, it is necessary to estimate the long-term net average GHG removals (mitigation potential, ***Section 6.5***) that would occur in the baseline and project scenarios during its duration and to reassessment these scenarios (when required or at most every 5 years), according to the sequence described in the following sections.

Reassessment is necessary to recalculate the total long-term mitigation potential, which varies if implementation of the CCMP results in a different baseline scenario (e.g., if areas are expanded or changed) or in a net GHG removal, different than those presented in the initial project scenario (e.g., due to inclusion or exclusion of new areas, areas, growth rates, or years of implementation rectifications against those planned, among others).

***Figure 2*** and ***Figure 3*** presents two generic project scenarios of net carbon that is removed during the CCMP implementation period with its corresponding estimates of long-term average mitigation potential, which is the basis for the calculation of the point at which the CCMP may request the release of its credit pool, as established in ***Cercarbono's Tool to Estimate the Carbon Buffer in Climate Change Mitigation Initiatives in the Land Use Sector***.

[24] In these cases, the year in which the harvest takes place must be added to the implementation period, solely for the purpose of calculating the long-term average annual mitigation potential.

**Figure 2.** Representation of the long-term net removal GHG of a generic project scenario that implements a reforestation activity or the establishment of woody agricultural crops.

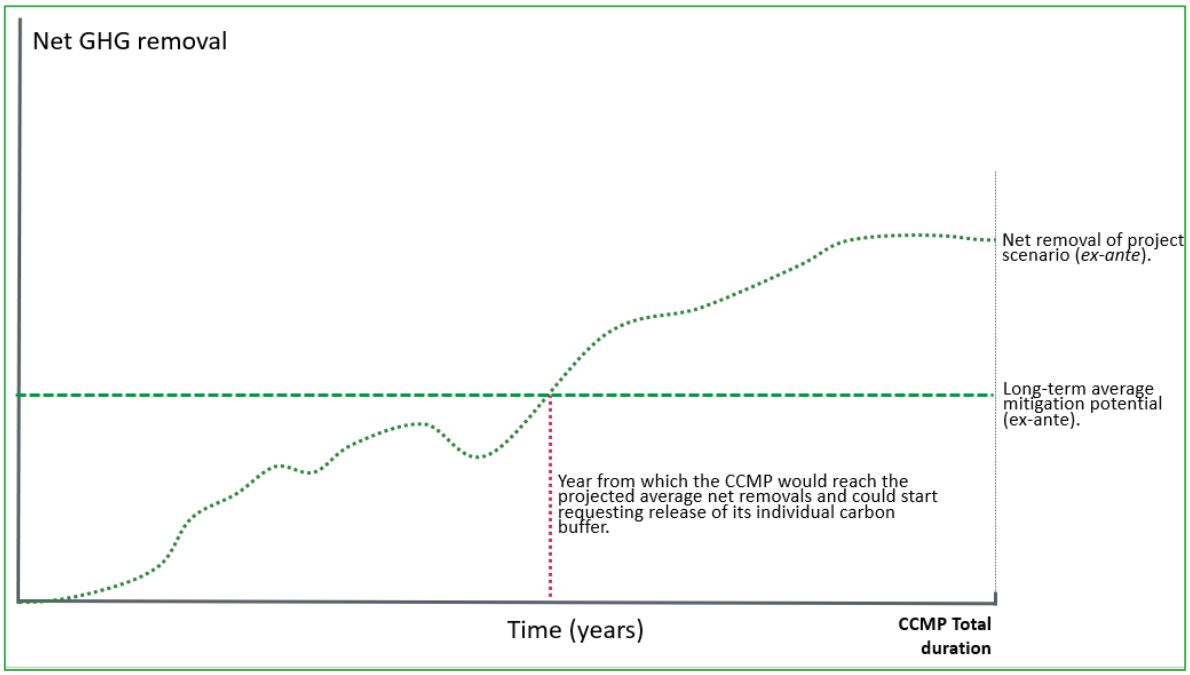
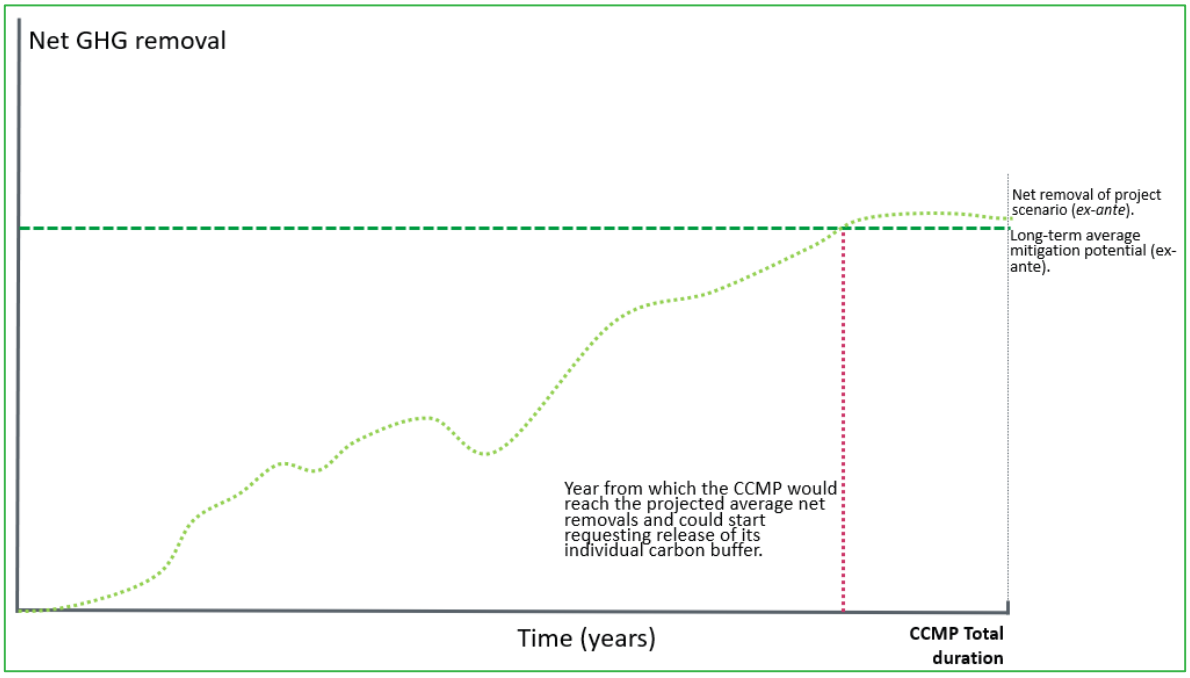



**Figure 3.** Representation of the long-term average mitigation potential of a generic project scenario that implements a forest restoration activity.




It is likely, especially in CCMPs related to land use, that the implementation of a project will differ from what was planned, either due to technological changes, external events or the inclusion of new areas in the segments. In this case, the net carbon could increase with respect to the initially proposed scenario, either for the baseline or for the project scenario (as shown by the green diagonal lines in ***Figure 4*** and ***Figure 5*** in the case of the project

scenario), or it could be lower than initially planned, and even to what has been reprojected during a previous verification, as shown by the yellow diagonal lines in the same figures[25].

**Figure 4.** Representation of two possible reassessments of the project scenario (illustrating reforestation or establishment of Woody Agricultural Crops activities) in a CCMP, including the addition of new areas from the first verification and subsequent long-term decline.

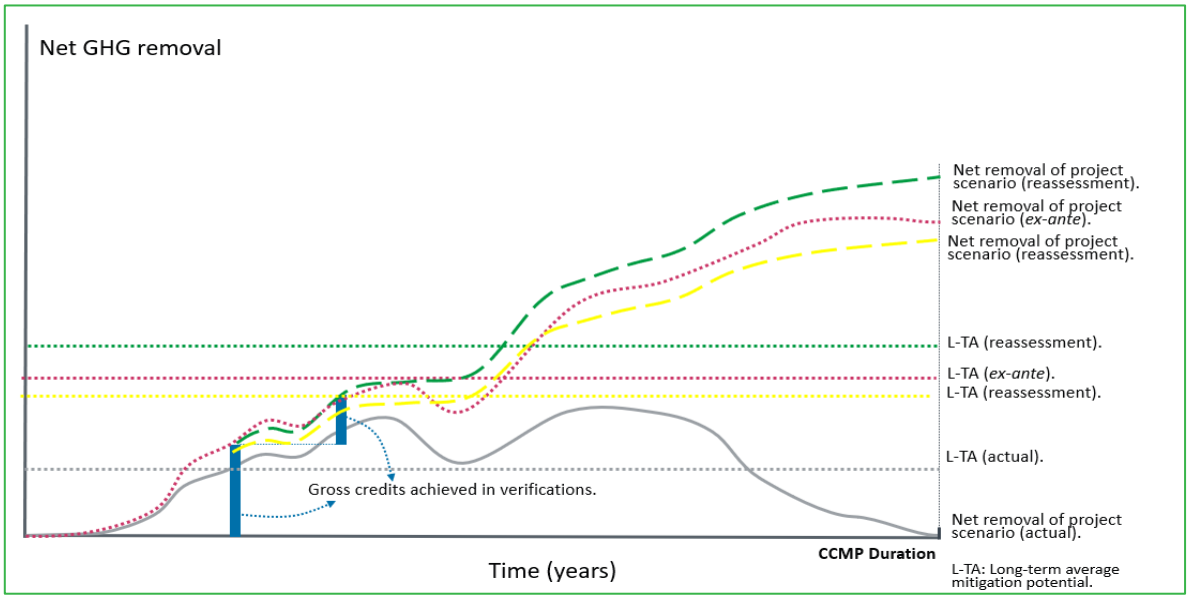
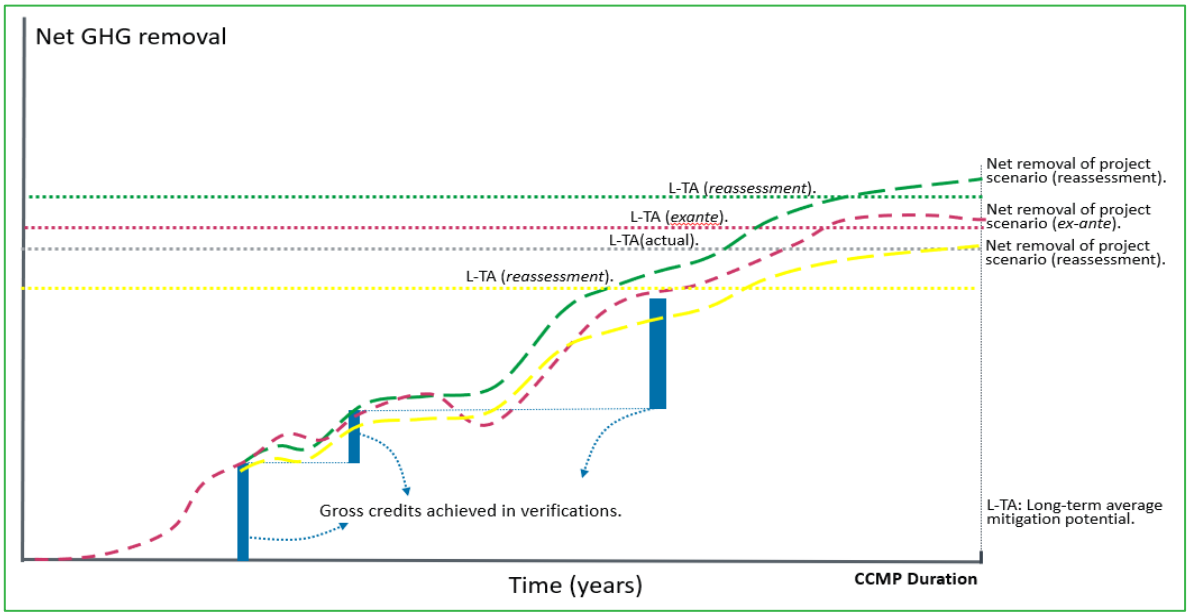


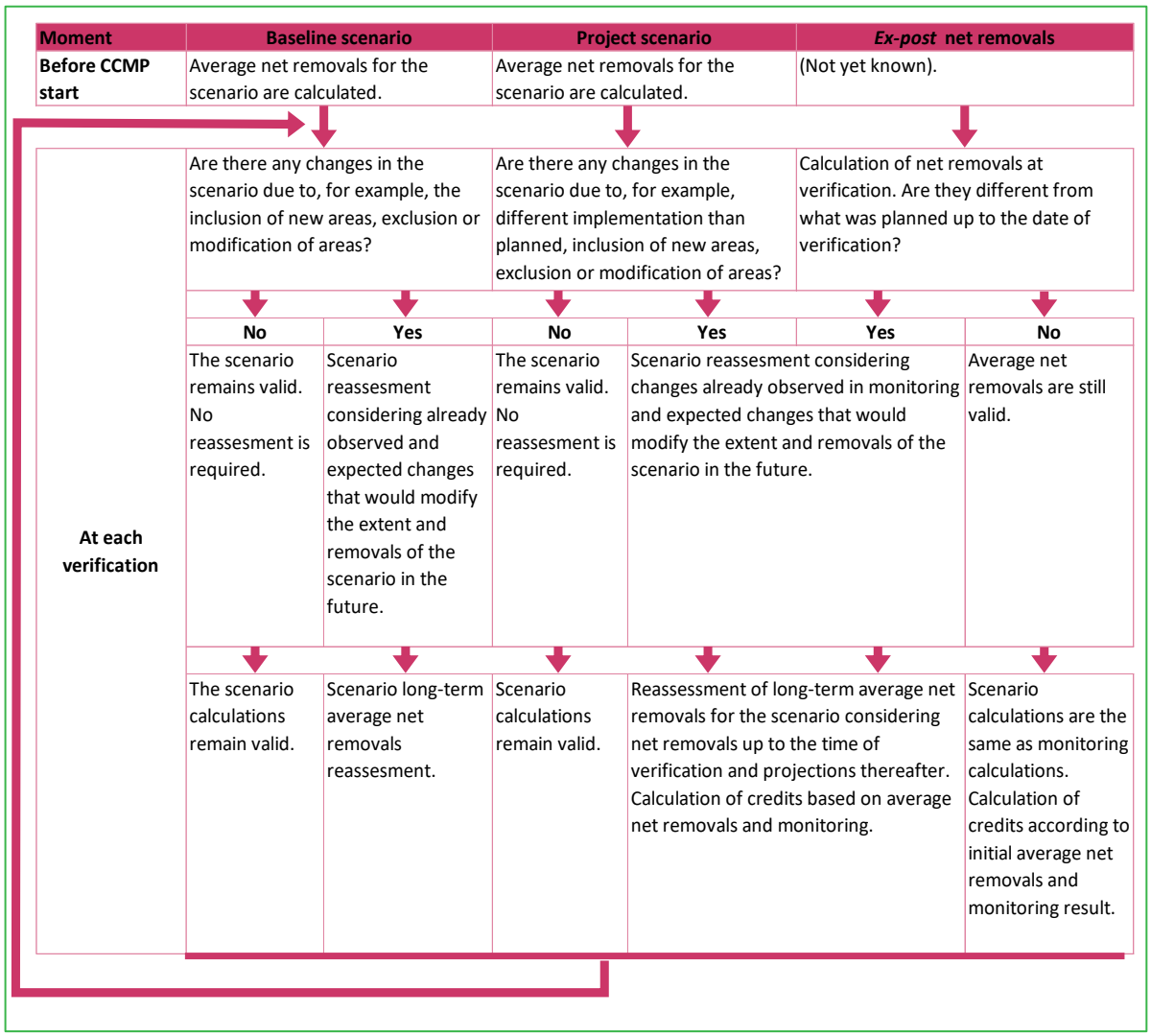

**Figure 5.** Representation of two possible reassessments of the project scenario (illustrating the forest restoration activity) in a CCMP, including the addition of new areas from the first verification.




[25] The percentage increase in average net carbon in the baseline scenario after a reassessment shall not exceed 20% of the initially established total for the validated areas without a revalidation. In the case a decrease greater than 20% is assessed, then the driver(s) for such decrease shall be documented and communicated to Cercarbono and the VVB.

If the net removals projected for the CCMP change compared to those initially estimated in the PDD, a reassessment of the baseline or project scenario is required. This is because the point at which the CCMP reaches the project's average net removals determines the moment from which the release of the CCMP's individual carbon reserve becomes possible. Since a project's modification of areas also affects its baseline scenario calculations, it is likely that a project will have to perform reassessments of its baseline and project scenarios at each verification to update the average net removals from the CCMP and determine the buffer to be retained or released at each verification. This reassessment sequence is schematized in ***Figure 6***.

**Figure 6.** Calculation cycle of baseline and project scenarios and their reassessment due to differences in implementation from that planned.



# 7 Baseline scenario

## 7.1 Identification of the Baseline Scenario

If standardized baselines are available and approved by the country in the sector in which the CCMP is implemented, their use must be integrated. Otherwise, the guidelines set out here must be followed.

The CCMP must identify realistic and credible land-use scenarios that would have occurred in the areas in the absence of the program or project activity, within the boundaries of the project's eligible areas. This should take into account relevant national and/or sectoral policies on land use or land-use change, as well as socioeconomic trends affecting the areas where the CCMP will be implemented[26].

Based on this analysis, the most realistic baseline scenario should be selected, quantifying its considered characteristics, ensuring that:

- It includes the best available technologies that represent an economically viable and environmentally sound course of action, where appropriate.
- A reference approach where the baseline is set at least at the average emissions level of comparable best-performing activities that provide similar outcomes and services in a defined scope under similar social, economic, environmental and technological circumstances.
- Based on existing actual or historical emissions, adjusted downwards[27] to ensure consistency with the principle of conservatism.

In addition to the above, to select the baseline scenario, CCMP must comply with provisions as per in ***Sections 3*** and ***4***.

The baseline must be assessed by the CCMP's holder every 5 years, verifying its initial consistency. If significant changes are recorded in said evaluation, due to changes in the CCMP design, it may be subject to revalidation.

The stratification criterion used for the baseline scenario is land cover. However, additional stratification criteria (either higher or lower in hierarchy) such as region, climate, among others, may be used if properly justified. If the stratification criterion changes after the CCMP implementation, it must undergo revalidation.

## 7.2 Quantification of the Baseline Scenario

Baseline scenario in this methodology consists of estimating the amount of carbon in the carbon pools and significant source emissions (as applicable to the eligible strata identified

[26] The analysis must include at least the cases of continuation of the pre-project situation, as well as the scenario of project implementation without considering carbon credits, justifying the selection of the baseline scenario ultimately determined as the most realistic.

[27] Considering the economic viability of the critical mitigation activities, practices or technologies used. Quantitative factors or methods for the downward adjustment of the baseline will be updated at each renewal of the accreditation period or CCMP revalidation.

and considered) that would have occurred within the CCMP eligible boundaries in the absence of the activities planned to be implemented. The GHG emission sources and carbon pools to include are detailed in ***Table 4*** and ***Table 5***, accordingly.

The eligible land coverage (non-stable forest areas and non-forest areas) in the baseline scenario and the project scenario for the areas to be intervened by the CCMP are presented in ***Table 6***. Additionally, the land coverage defined by the country where the CCMP is implemented must also be considered.

**Table 6.** Eligible and Non-Eligible Coverage in the Baseline Scenario, Considering the Activities to Be Implemented in the Project Scenario.

| **Eligible coverages** (for the baseline and project scenarios) | **Non-eligible coverages** |
|---|---|
| **Reforestation** | |
| Heterogeneous agricultural areas without woody agricultural crops* | Shrubs |
| Areas with no- or scarce vegetation | Forests (primary and secondary) |
| Non-woody permanent crops | Woody agricultural crops |
| Short cycle crops | Forest plantations |
| Grasslands | Peatlands |
| Low secondary vegetation | High secondary vegetation |
| | Swampy areas |
| **Forest restoration** | |
| Heterogeneous agricultural areas with woody agricultural crops** | Primary forests |
| Areas with no- or scarce vegetation | Peatlands |
| Non-woody permanent crops | Swampy areas |
| Short cycle crops | |
| Grasslands | |
| Low and high secondary vegetation | |
| **Woody agricultural crops** | |
| Heterogeneous agricultural areas without woody agricultural crops* | Shrubs |
| Areas with no- or scarce vegetation | Forests (primary and secondary) |
| Non-woody permanent agricultural crops | Woody agricultural crops |
| Short cycle crops (vegetables, some fruits, flowers and medicinal plants) | Forest plantations |
| Grasslands | Peatlands |
| Low secondary vegetation | High secondary vegetation |
| | Swampy areas |

*Areas **transitorily** not covered by woody agricultural crops at the time of their inclusion in the CCMP and areas with woody agricultural crops in the process of renewal (e.g. coffee or cocoa crops), are not eligible.

**Areas **transitorily** not covered by woody agricultural crops at the time of their inclusion in the CCMP and areas with woody agricultural crops in the process of renewal (e.g. coffee or cocoa crops), are eligible if the **average** carbon stocks representative of those previous coverages are included in the baseline scenario.

### 7.2.1 Carbon stock estimation

The carbon stock in carbon pools is estimated separately for each eligible stratum (non-stable forest or non-forest) where the segments to be implemented by the CCMP overlap. It is necessary to perform calculations for the baseline scenario.

The different data, factors, or parameters used to calculate the carbon stock or changes in carbon stock in the carbon pools (across different vegetation types) may be sourced from national inventories (such as forest inventories) or subnational inventories applicable to the country where the CCMP will be developed. If these data are unavailable, parameters from the Good Practice Guidance (GPG) of the Intergovernmental Panel on Climate Change (IPCC), in its most updated version or previous versions, if technically justified, may be used. In both cases, the values used must be the most conservative and have the lowest uncertainty. The CCMP may determine its own parameters and data using methods or technologies that are consistent, conservative, and aligned with the methodologies and results reported by these sources.

When required—especially when established in legal regulations, sectoral technical documentation, or international carbon market guidelines—these elements must be considered in setting this scenario. The reassessment of the baseline scenario, when applicable, should aim for the establishment of conservative baseline scenarios.

The sum of the three segments (when applicable, as the project may contain only one or two segments) will constitute the total carbon stock in carbon pools in the baseline scenario or its reassessment. They must be recorded in the PDD and validation calculations, as shown in the following equation:

$$Rcp_{BL,t} = \sum_{s=1}^{Ns_{BL}} Rcp_{BL,s(R,FR1,FR2,WAC),t} * TSAs_{(R,FR1,FR2,WAC)} \qquad \textit{Equation 7}$$

| Variable | Description | Units | Segment* | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| $Rcp_{BL,t}$ | Total removal of the carbon pools in all segments in year ***t***, in the baseline scenario or its corresponding reassessment. | t $CO_2e$ | X | X | X |
| $Rcp_{BL,s(R,FR1,FR2,WAC),t}$ | Total removal by selected carbon pools in segment ***s*** (reforestation "R", forest restoration "FR1 and/or FR2", and/or establishment of Woody Agricultural Crops "WAC") in scenario (***Sc***) in year *t*, in the baseline scenario or its corresponding reassessment. | t $CO_2e$ / ha | X | X | X |
| $TSAs_{(R,FR1,FR2,WAC)}$ | Total area of segment **s** (reforestation "R", forest restoration "FR1 and/or FR2", and/or establishment of Woody Agricultural Crops "WAC") in scenario (***Sc***) in the baseline scenario, project scenario, monitoring, or corresponding reassessment. | ha | X | X | X |
| ***s*** | Index of the segments to be implemented in the CCMP (maximum 3: reforestation, forest restoration, and woody agricultural crops). | NA | X | X | X |
| ***t*** | CCMP year index. | NA | X | X | X |
| ***Ns_BL*** | Total number of segments to be implemented in the CCMP (maximum 3: reforestation, forest res- | Number of segments | X | X | X |

| Variable | Description | Units | Segment* | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| | toration, and establishment of Woody Agricultural Crops) in the baseline scenario or its corresponding reassessment. | | | | |

*R: Reforestation; FR: Forest restoration and WAC: Woody agricultural crops. NA: does not apply.

For a ***s*** segment and given ***t*** year, the change in carbon stocks in the carbon pools of a segment component (where applicable, as the CCMP can only integrate segments) is calculated following:

For the baseline scenario:

$$Rcp_{BL,s(R,FR1,FR2,WAC),t} = \sum_{t=1}^{T} \sum_{f=1}^{NSCS\_BL} (\Delta CAtree_{BL,f,s,t} + \Delta CBtree_{BL,f,s,t} + \Delta CAshrub_{BL,f,s,t} + \Delta CBshrub_{BL,f,s,t} + \Delta CAherb_{BL,f,s,t} + \Delta CBherb_{BL,f,s,t} + \Delta CDw_{BL,f,s,t} + \Delta CL_{BL,f,s,t} + \Delta CSoc_{BL,f,s,t}) * 44/12 \quad \textit{Equation 8}$$

For its reassessment:

$$Rcp_{BL,s(R,FR1,FR2,WA),tvx} = \sum_{t=tvx+1}^{T} \sum_{f=1}^{NSCS\_BL} (\Delta CAtree_{BL,f,s,t} + \Delta CBtree_{BL,f,s,t} + \Delta CAshrub_{BL,f,s,t} + \Delta CBshrub_{BL,f,s,t} + \Delta CAherb_{BL,f,s,t} + \Delta CBherb_{BL,f,s,t} + \Delta CDw_{BL,f,s,t} + \Delta CL_{BL,f,s,t} + \Delta CSoc_{BL,f,s,t}) * 44/12 \quad \textit{Equation 9}$$

| Variable | Description | Units | Segment* | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| $Rcp_{BL,s(R,FR1,FR2,WAC),t}$ | Total removal by selected carbon pools in segment ***s*** (reforestation "R", forest restoration "FR1 and/or FR2", and/or establishment of Woody Agricultural Crops "WAC") in year ***t***, in the baseline scenario. | t $CO_2e$ / ha | X | X | X |
| $Rcp_{BL,s(R,FR1,FR2,WAC),tvx}$ | Total removal by selected carbon pools in segment ***s*** (reforestation "R", forest restoration "FR1 and/or FR2", and/or establishment of Woody Agricultural Crops "WAC") in year ***tvx***, in the reassessment of the baseline scenario. | t $CO_2e$ / ha | X | X | X |
| $\Delta CAtree_{BL,f,s,t}$ | Change in carbon content of aboveground arboreal biomass in segment component ***f*** of segment ***s*** (reforestation "R", forest restoration "FR1 and/or FR2", and/or establishment of Woody Agricultural Crops "WAC") in year ***t***, in the baseline scenario or its reassessment. | t C / ha | X | X | X |
| $\Delta CBtree_{BL,f,s,t}$ | Change in carbon content of belowground arboreal biomass in segment component ***f*** of | t C / ha | X | X | X |

| Variable | Description | Units | Segment* | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| | segment ***s*** (reforestation "R", forest restoration "FR1 and/or FR2", and/or establishment of Woody Agricultural Crops "WAC") in year ***t***, in the baseline scenario or its reassessment. | | | | |
| $\Delta C Ashrub_{BL,f,s,t}$ | Change in carbon content of aboveground shrub biomass in segment component ***f*** of segment ***s*** (reforestation "R", forest restoration "FR1 and/or FR2", and/or establishment of Woody Agricultural Crops "WAC") in year ***t***, in the baseline scenario or its reassessment. | t C / ha | NA | X | X |
| $\Delta C Bshrub_{BL,f,s,t}$ | Change in carbon content of belowground shrub biomass in segment component ***f*** of segment ***s*** (reforestation "R", forest restoration "FR1 and/or FR2", and/or establishment of Woody Agricultural Crops "WAC") in year ***t***, in the baseline scenario or its reassessment. | t C / ha | NA | X | X |
| $\Delta CAherb_{BL,f,s,t}$ | Change in carbon content of aboveground herbaceous biomass in segment component ***f*** of segment ***s*** (reforestation "R", forest restoration "FR1 and/or FR2", and/or establishment of Woody Agricultural Crops "WAC") in year ***t***, in the baseline scenario or its reassessment. | t C / ha | X | X | X |
| $\Delta CBherb_{BL,f,s,t}$ | Change in carbon content of belowground herbaceous biomass in segment component ***f*** of segment ***s*** (reforestation "R", forest restoration "FR1 and/or FR2", and/or establishment of Woody Agricultural Crops "WAC") in year ***t***, in the baseline scenario or its reassessment. | t C / ha | X | X | X |
| $\Delta CDw_{BL,f,s,t}$ | Change in carbon content of deadwood in segment component ***f*** of segment ***s*** (reforestation "R", forest restoration "FR1 and/or FR2", and/or establishment of Woody Agricultural Crops "WAC") in year ***t***, in the baseline scenario or its reassessment. | t C / ha | X | X | NA |
| $\Delta CL_{BL,f,s,t}$ | Change in carbon content of litter in segment component ***f*** of segment ***s*** (reforestation "R", forest restoration "FR1 and/or FR2", and/or establishment of Woody Agricultural Crops "WAC") in year ***t***, in the baseline scenario or its reassessment. | t C /ha | X | X | NA |
| $\Delta CSoc_{BL,f,s,t}$ | Change in carbon content of soil organic carbon (SOC) in segment component ***f*** of segment ***s*** (reforestation "R", forest restoration "FR1 and/or FR2", and/or establishment of Woody Agricultural Crops "WAC") in year ***t***, in the baseline scenario or its reassessment. | t C /ha | X | X | X |
| ***44/12*** | Molecular weight ratio of carbon dioxide ($CO_2$) to carbon (C). | NA | X | X | X |
| ***f*** | Index of the segment component of segment ***s*** in the baseline scenario or its reassessment. | NA | X | X | X |

| Variable | Description | Units | Segment* | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| ***s*** | Index of segments to be implemented in the CCMP (maximum 3: reforestation, forest restoration, and establishment of Woody Agricultural Crops). | NA | X | X | X |
| ***t*** | Index of the CCMP year. | NA | X | X | X |
| ***T*** | Total duration of the CCMP (and for reassessments). | Years | X | X | X |
| ***tvx*** | Index of the verification year, counted from the CCMP start date. | NA | X | X | X |

*R: Reforestation; FR: Forest restoration and WAC: Woody agricultural crops. NA: does not apply.

For the reassessments of the baseline scenario, the values of the different carbon pools (***Atree***, ***Btree***, ***Ashrub***, ***Bshrub***, ***Aherb***, ***Bherb***, ***Dw***, ***L***, and ***Soc***) are derived either from models, national or subnational data, study data, or extrapolations.

***Equations 8 and 9*** must be calculated for each of the segments considered in the CCMP.

Changes in carbon stocks in tree and shrub biomass for these segments can be estimated according to the guidelines established in the current version of CDM's methodological *AR-Tool 14*. For this, the current version of CDM's methodological Tools *AR-Tool 17* and *AR-Tool 18* should also be considered.

Changes in carbon stocks in aboveground herbaceous biomass in the baseline scenario in these segments can be estimated according to the following equation:

$$\Delta CAherb_{BL,f,s,t} = CAherb_{BL,f,s,t2} - CAherb_{BL,f,s,t1} / T \qquad \textit{Equation 10}$$

$$CAherb_{BL,f,s\,t} = DM_{Aherb_{BL,t}} * CF \qquad \textit{Equation 11}$$

| Variable | Description | Units | Segment* | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| $\Delta CAherb_{BL,f,s,t}$ | Change in carbon stock in aboveground herbaceous biomass from segment component ***f*** of segment ***s***, in year ***t***, in the baseline or its corresponding reassessment. | t C / ha | X | X | X |
| $CAherb_{BL,f,s,t2}$ | Average carbon stock in the aboveground herbaceous biomass from segment component ***f,*** of segment ***s***, in year ***t2***, in the baseline or its corresponding reassessment. | t C / ha | X | X | X |
| $CAherb_{BL,f,s,t1}$ | Average carbon stock in the aboveground herbaceous biomass from segment component ***f,*** of segment ***s***, in year ***t1***, in the baseline or its corresponding reassessment. | t C / ha | X | X | X |
| $f$ | Index of the component segment of segment ***s*** in the baseline scenario or its reassessment. | NA | X | X | X |
| $s$ | Index of the segments to be implemented in the CCMP (maximum 3: reforestation, forest restoration, and woody agricultural crops). | NA | X | X | X |
| $t$ | CCMP year index. | NA | X | X | X |
| $T$ | Total Duration of the CCMP | Years | X | X | X |

| Variable | Description | Units | Segment* | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| $CAherb_{BL,t}$ | Average carbon stock in the aboveground herbaceous biomass from segment component ***f,*** of segment ***s,*** in year ***t***, in the baseline or its corresponding reassessment. | t C / ha | X | X | X |
| $DM_{Aherb_{BL,t}}$ | Dry matter of aboveground herbaceous biomass in year ***t***, in the baseline scenario or its reassessment. | t d.m./ ha | X | X | X |
| $CF$ | Carbon fraction of dry biomass. | t C/t d.m. | X | X | X |

*R: Reforestation; FR: Forest restoration and WAC: Woody agricultural crops.

Changes in carbon stocks in belowground herbaceous biomass in these segments in the baseline scenario can be estimated according to the following equation:

$$\Delta CBherb_{BL,f,s,t} = CBherb_{BL,f,s,t2} - CBherb_{BL,f,s,t1} / T \qquad \textit{Equation 12}$$

$$CBherb_{BL,f,s,t} = CAherb_{BL,f.s,t} * R_n \qquad \textit{Equation 13}$$

| Variable | Description | Units | Segment* | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| $\Delta CBherb_{BL,f,s,t}$ | Change in carbon stock in belowground herbaceous biomass from segment component ***f*** of segment ***s***, in year ***t***, in the baseline or its corresponding reassessment. | t C / ha | X | X | X |
| $CBherb_{BL,f,s,t2}$ | Average carbon stock in the belowground herbaceous biomass from segment component ***f,*** of segment ***s***, in year ***t2***, in the baseline or its corresponding reassessment. | t C / ha | X | X | X |
| $CBherb_{BL,f,s,t1}$ | Average carbon stock in the belowground herbaceous biomass from segment component ***f,*** of segment ***s***, in year ***t1***, in the baseline or its corresponding reassessment. | t C / ha | X | X | X |
| $f$ | Index of the component segment of segment ***s*** in the baseline scenario or its reassessment. | NA | X | X | X |
| $s$ | Index of the segments to be implemented in the CCMP (maximum 3: reforestation, forest restoration, and woody agricultural crops). | NA | X | X | X |
| $t$ | CCMP year index. | NA | X | X | X |
| $T$ | Total Duration CCMP. | Years | X | X | X |
| $CBherb_{BL,f,s,t}$ | Average carbon stock in the belowground herbaceous biomass from segment component ***f,*** of segment ***s,*** in year ***t***, in the baseline or its corresponding reassessment. | t C / ha | X | X | X |
| $CAherb_{BL,t}$ | Average carbon stock in the aboveground herbaceous biomass from segment component ***f,*** of segment ***s,*** in year ***t***, in the baseline or its corresponding reassessment. | t C / ha | X | X | X |
| $R_n$ | Root to shoot ratio of herbaceous species ***n***. | (t root d.m. / t shoot d.m.) | X | X | X |

*R: Reforestation; FR: Forest restoration and WAC: Woody agricultural crops.

Changes in carbon stocks in dead wood and litter for these segments can be estimated according to the guidelines established in the current version of the CDM's methodological Tool *AR-Tool 12*.

Changes in carbon stocks in Soil Organic Carbon for these segments can be estimated according to the guidelines established in the current version of the CDM's methodological Tool *AR-Tool 16*.

### 7.2.2 GHG emissions sources estimation

For the determination of the baseline scenario, the values of the different parameters used in the emission sources shall integrate data generated at the national or subnational level; if these data are not available, data and parameters from the Good Practice Guidelines (GPG) of the Intergovernmental Panel on Climate Change (IPCC) in its most updated version or previous versions may be used if their use is technically justified. Academic articles published in indexed journals, approved academic works subjected to peer review from accredited programs, or technical publications from R&D institutions specialized in related subjects, may be also considered as valid.

Total GHG emissions by sources in the baseline scenario or in a corresponding reassessment are calculated according to the following equation:

$$E_{BL,t} = \sum_{s=1}^{Ns} (EB_{BL,s,t} + EFer_{BL,s,t} + EFF_{BL,s,t}) \qquad \textit{Equation 14}$$

| Variable | Description | Units | Segment* | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| $E_{BL,t}$ | Total GHG emissions by sources in year ***t***, in the baseline scenario or its corresponding reassessment. | t $CO_2e$ | NA | NA | X |
| $EB_{BL,s,t}$ | Non-$CO_2$ GHG emissions from burning of segment ***s*** (woody agricultural crops), in year ***t***, in the baseline scenario or its corresponding reassessment. | t $CO_2e$ | NA | NA | X |
| $EFer_{BL,s,t}$ | Non-$CO_2$ GHG emissions from fertilizer use of the segment ***s*** (woody agricultural crops) in year ***t***, in the baseline scenario or its corresponding reassessment. | t $CO_2e$ | NA | NA | X |
| $EFF_{BLs,t}$ | GHG emissions from consumption of all types of fossil fuel in segment ***s*** (by agricultural machinery of the woody agricultural crops) in year ***t***, in the baseline scenario or its corresponding reassessment. | t $CO_2e$ | NA | NA | X |
| ***s*** | Index of the segments to be implemented in the CCMP (maximum 3: reforestation, forest restoration, and woody agricultural crops). | NA | NA | NA | X |
| ***t*** | CCMP year index. | NA | NA | NA | X |
| ***Ns*** | Total number of segments to be implemented in the CCMP (maximum 3: reforestation, forest restoration, and woody agricultural crops) in the baseline scenario or its corresponding reassessment. | Segments count | NA | NA | X |

*R: Reforestation; FR: Forest restoration and WAC: Woody agricultural crops. NA: does not apply.

#### 7.2.2.1 GHG emissions from fires

GHG emissions from fires are conservatively excluded in all segments of the baseline scenario and its reassessment.

##### 7.2.2.1.1 GHG Emissions from Burning

GHG emissions from burning can only be considered in the baseline scenario and its reassessment if it is common practice in the region where the CCMP is implemented for the woody agricultural crops segment. In the project scenario, burning can only be used if it is permitted by law, in which case it must be estimated according to the guidelines explained in ***Section 7.2.2***.

Emissions from biomass burning are estimated using the CDM's methodological *AR-Tool 08*. Total emissions from burning are calculated using the following equations, as appropriate:

For the baseline scenario:

$$EB_{BL,s,t} = \sum_{t=1}^{T} \sum_{f=1}^{NSCS\_BL} EB_{BL,f,s,t} \qquad \textit{Equation 15}$$

For its reassessments:

$$EB_{BL,s,t} = \sum_{t=tvx+1}^{T} \sum_{f=1}^{NSCS\_BL} EB_{BL,f,s,t} \qquad \textit{Equation 16}$$

In the reassessments of the baseline scenario, $EB_{BL,f,s,tvx}$ values come from models, survey data or extrapolations.

| Variable | Description | Units | Segment* | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| $EB_{BL,s,t}$ | Non-$CO_2$ GHG emissions from burning from segment ***s***, in year ***t***, in the baseline scenario or its corresponding reassessment. | t $CO_2e$ | NA | NA | X |
| $EB_{BL,s,tvx}$ | Non-$CO_2$ GHG emissions from burning in segment **s** during year **tvx**, in the baseline scenario reassessment. | t $CO_2e$ | NA | NA | X |
| $EB_{BL,f,s,t}$ | Non-$CO_2$ GHG emissions from component segment ***f*** of segment ***s*** (woody agricultural crops), in year ***t*** in the baseline scenario or its corresponding reassessment. | t $CO_2e$ | NA | NA | X |
| ***s*** | Index of the segment to be implemented in the CCMP (maximum 3: reforestation, forest restoration, and woody agricultural crops). | NA | NA | NA | X |
| ***f*** | Index of the component segment of segment ***s*** in the baseline or its corresponding reassessment. | NA | NA | NA | X |
| ***t*** | CCMP year index. | NA | NA | NA | X |
| ***tvx*** | Index of the verification year, counted from the start date of the CCMP. | NA | NA | NA | X |
| ***T*** | CCMP total duration. | Years | NA | NA | X |

| Variable | Description | Units | Segment* | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| ***NSCS_BL*** | Total number of segment components of segment ***s*** in the corresponding baseline scenario or its reassessment. | Segment components count | NA | NA | X |

*R: Reforestation; FR: Forest restoration and WAC: Woody agricultural crops. NA: does not apply.

#### 7.2.2.1.2 GHG emissions from fertilizer use

GHG emissions from fertilizer use are optional in the woody agricultural crops segment in the baseline scenario and its reassessments; they may be included if they are significant and to demonstrate changes in their use with respect to the project scenario. In the other segments, these emissions do not apply.

Non-GHG Emissions from the use of fertilizers in baseline scenario are calculated using the following equations, as appropriate:

For the baseline scenario:

$$EFer_{BL,s,t} = \sum_{t=1}^{T} \sum_{f=1}^{NSCS\_BL} EFer_{BL,f,s,t} \qquad \textit{Equation 17}$$

For its reassessments:

$$EFer_{BL,s,tvx} = \sum_{t=tvx+1}^{T} \sum_{f=1}^{NSCS\_BL} EFer_{LB,f,s,t} \qquad \textit{Equation 18}$$

| Variable | Description | Units | Segment* | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| $EFer_{BL,s,t}$ | Non-$CO_2$ GHG emissions from fertilizer used in segment ***s***, in year ***t***, in the baseline scenario or its corresponding reassessment. | t $CO_2e$ | NA | NA | X |
| $EFer_{BL,s,tvx}$ | Non-$CO_2$ GHG emissions from fertilizer use in segment **s** (woody agricultural crops) during year **tvx**, in the baseline scenario reassessment. | t $CO_2e$ | NA | NA | X |
| $EFer_{BL,f,s,t}$ | Non-$CO_2$ GHG emissions from fertilizers use in segment component ***f*** of the segment ***s*** (woody agricultural crops), in year ***t***, in the baseline scenario or its corresponding reassessment. | t $CO_2e$ | NA | NA | X |
| ***f*** | Index of the segment component of segment in the baseline scenario or its reassessment. | NA | NA | NA | X |
| ***s*** | Index of the segment to be implemented in the CCMP, in the baseline scenario or its corresponding reassessment. | NA | NA | NA | X |
| ***t*** | CCMP year index. | NA | NA | NA | X |
| ***tvx*** | Index of the verification year, counted from the CCMP start date. | NA | NA | NA | X |
| ***T*** | CCMP total duration. | Years | NA | NA | X |
| ***NSCS_BL*** | Total number of segment components of segment ***s*** in the baseline scenario or its corresponding reassessment. | Segment components count | NA | NA | X |

*R: Reforestation; FR: Forest restoration and WAC: Woody agricultural crops. NA: does not apply.

$$EFer_{BL,f,s,t} = [(FNS_{BL,f,s,t} + FNO_{BL,f,s,t}) * FEN)] * 44/28 * GWP_{N2O}$$ *Equation 19*

| Variable | Description | Units | Segment | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| $EFer_{BL,fs,t}$ | Non-CO2 GHG emissions from fertilization of segment component ***f*** of segment ***s***, in year ***t***, in the baseline scenario or its corresponding reassessment. | t $CO_2e$ | NA | NA | X |
| $FNS_{BL,f,s,t}$ | Annual amount of nitrogen from the synthetic fertilizer applied in segment component ***f*** of the segment ***s***, in year ***t***, adjusted to reflect volatilization in the form of $NH_3$ and NOx in the corresponding baseline scenario or its reassessment. | t N | NA | NA | X |
| $FNO_{BL,f,s,t}$ | Annual amount of nitrogen from the organic fertilizer applied in segment component ***f*** of the segment ***s,*** in year ***t***, adjusted to reflect volatilization in the form of $NH_3$ and NOx in the corresponding baseline scenario or its reassessment. | t N | NA | NA | X |
| ***FEN*** | $N_2O$ emission factor per N contribution. | t $CO_2e$ / t N | NA | NA | X |
| ***f*** | Index of the component segment ***s***, in the project scenario or its reassessment. | NA | NA | NA | X |
| ***s*** | Index of the segments to be implemented in the CCMP (woody agricultural crops) in the baseline scenario or its reassessment. | NA | NA | NA | X |
| ***t*** | CCMP year index. | NA | NA | NA | X |
| **44/28** | Ratio of molecular weight of $N_2O$ to N. | NA | NA | NA | X |
| $GWP_{N2O}$ | $N_2O$ Global potential Warming | Dimensionless | NA | NA | X |

*R: Reforestation; FR: Forest restoration and WAC: Woody agricultural crops.
NA: does not apply.

#### 7.2.2.1.3 GHG emissions from consumption of fossil fuels in agricultural machinery

GHG emissions from the consumption of fossil fuels used in agricultural machinery are conservatively excluded from the woody agricultural crops segment in the baseline scenario and its reassessments. In the other segments these emissions do not apply.

GHG Emissions from the use of fossil fuel in baseline scenario are calculated using the following equations, as appropriate, considering the guidelines established in the current version of the *CDM AR-Tool 03* methodological tool:

For the baseline scenario:

$$EFF_{BL,s,t} = \sum_{t=1}^{T} \sum_{m=1}^{TC} \sum_{f=1}^{NSCS\_BL} EFF_{BL,m,f,s,t}$$ *Equation 20*

For its reassessment:

$$EFF_{BL,s,tvx} = \sum_{t=tvx+1}^{T} \sum_{m=1}^{TC} \sum_{f=1}^{NSCS\_BL} EFF_{BL,m,f,s,t} \qquad \textit{Equation 21}$$

| Variable | Description | Units | Segment* | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| $EFF_{BL,s,t}$ | Total GHG emissions from consumption of all types of fossil fuel in segment ***s***, in year ***t***, in the baseline scenario or its corresponding reassessment. | t $CO_2e$ | NA | NA | X |
| $EFF_{BL,s,tvx}$ | Non-$CO_2$ GHG emissions consumption of all types of fossil fuel in segment **s** during year **tvx**, in the baseline scenario reassessment. | t $CO_2e$ | NA | NA | X |
| $EFF_{BL,m,f,s,t}$ | GHG emissions from consumption of ***m*** type fossil fuel in the component segment ***f*** of the segment ***s*** (by agricultural machinery in woody agricultural crops), in year ***t***, in the baseline scenario or its corresponding reassessment. | t $CO_2e$ | NA | NA | X |
| ***m*** | Index of type fossil fuel consumed by agricultural machinery. | NA | NA | NA | X |
| ***f*** | Index of the component segment in the baseline scenario or its reassessment. | NA | NA | NA | X |
| ***s*** | Index of the segment to be implemented in the CCMP, in the baseline scenario or its corresponding reassessment. | NA | NA | NA | X |
| ***t*** | CCMP year index. | NA | NA | NA | X |
| ***tvx*** | Index of the verification year, counted from the CCMP start date. | NA | NA | NA | X |
| ***T*** | CCMP total duration. | Years | NA | NA | X |
| ***TC*** | Total number of fossil fuels used in agricultural machinery in segment ***s***, in the baseline scenario or its corresponding reassessment. | Fossil fuel types count | NA | NA | X |
| ***NSCS_BL*** | Total number of segment components of segment ***s*** in the baseline scenario its corresponding reassessment. | Segment components count | NA | NA | X |

*R: Reforestation; FR: Forest restoration and WAC: Woody agricultural crops. NA: does not apply.

For a type of fuel ***m***, used in the implementation of the CCMP, the annual GHG emissions are estimated using the following equation:

$$EFF_{BL,m,f,s,t} = CC_{m,f,s,t} * KCC_{BL,m,f,s,t} \qquad \textit{Equation 22}$$

$$KCC_{BL,m,f,s,t} = W_{m,f,s,t} * 44/12 \qquad \textit{Equation 23}$$

| Variable | Description | Units | Segment* | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| $EFF_{P,m,f,s,t}$ | GHG emissions from consumption of ***m*** type fossil fuel in the component segment ***f*** of the segment ***s***, in year ***t***, in the project scenario or its corresponding reassessment. | t $CO_2e$ | NA | NA | X |
| $CC_{m,f,s,t}$ | Amount of type ***m*** fossil fuel consumed by agricultural machinery in the component segment ***f*** of the segment ***s***, in year ***t***, in the project scenario or its corresponding re-assessment. | l or gal | NA | NA | X |
| $KCC_{BL,m,f,s,t}$ | Emission factor for combustion of fossil fuel ***m*** consumed by agricultural machinery in the component segment ***f*** of the segment ***s***, in year ***t***, in the project scenario or its corresponding reassessment. | t $CO_2e$ / unit of fossil fuel | NA | NA | X |
| ***m*** | Index of type fossil fuel consumed by agricultural machinery. | NA | NA | NA | X |
| ***f*** | Index of the component segment in the project scenario or its corresponding reassessment. | NA | NA | NA | X |
| ***s*** | Index of the segments to be implemented in the CCMP (woody agricultural crops) in the project scenario or its corresponding reassessment. | NA | NA | NA | X |
| ***t*** | CCMP year index. | NA | NA | NA | X |
| $W_{m,f,s,t}$ | Weighted average mass fraction of carbon in fuel type ***m*** in component segment ***f*** of the segment ***s***, in year ***t***, in the project scenario or its corresponding reassessment. | t C / mass unit of the fuel | NA | NA | X |
| ***44/12*** | Ratio of molecular weight of carbon dioxide ($CO_2$) to carbon (C). | NA | NA | NA | X |

*R: Reforestation; FR: Forest restoration and WAC: Woody agricultural crops.
NA: does not apply.

### 7.2.3 Estimation of average gross and net removals from the baseline scenario or its corresponding reassessment

If ***Equation 7*** is repeated for each of the CCMP years, either in the baseline scenario or for its reassessment, the average gross removals for the baseline scenario or its reassessment can be estimated using the following equation:

$$Rag_{BL} = \sum_{t=1}^{T} Rcp_{BL,t} \qquad \textit{Equation 24}$$

| Variable | Description | Units | Segment* | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| $Rag_{BL}$ | Long-term gross removals by carbon pools in all segments, in the baseline scenario or its corresponding reassessment. | t $CO_2e$ | X | X | X |
| $Rcp_{BL,t}$ | Total removals by carbon pools in all segments in year ***t***, in the baseline scenario or its corresponding reassessment. | t $CO_2e$ | X | X | X |
| ***t*** | CCMP year index. | NA | X | X | X |

| Variable | Description | Units | Segment* | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| ***T*** | CCMP total duration. | Years | X | X | X |

*R: Reforestation; FR: Forest restoration and WAC: Woody agricultural crops.

The values of $Rcp_{BL,t}$ for all years from the start of the CCMP to the total duration ***T*** will result from estimates based on field data or from applicable models. In the case of reassessments, the data will result from official sources on which said reassessment is based.

Baseline scenario reassessment is mandatory when additional areas are included in the verifications against the *ex-ante* baseline.

Regarding the average **net** removals in the baseline scenario or its corresponding reassessment, they will be calculated as $Ran_{BL}$ if it is an *ex-ante* estimate for CCMP validation, or as $Ran_{BLv1}$, $Ran_{BLv2}$… $Ran_{BLvx}$ for verifications 1, 2… x that require reassessments. If these variables are generically represented as $Ran_{BL}$, the average net removals are calculated using the following equation:

For the baseline scenario:

$$Ran_{BL,t} = Rag_{BL,t} - E_{BL,t} \qquad \textit{Equation 25}$$

| Variable | Description | Units | Segment* | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| $Ran_{BL,t}$ | Long-term net removals by carbon pools in all segments, in the year ***t*** in the baseline scenario. | t $CO_2e$ | X | X | X |
| $Rag_{BL,t}$ | Long-term gross removals by carbon pools in all segments, in the year ***t*** in the baseline scenario. | t $CO_2e$ | X | X | X |
| $E_{BL,t}$ | Total GHG emissions by all sources in the year ***t*** in the baseline scenario. | t $CO_2e$ | X | X | X |
| ***t*** | CCMP year index. | NA | X | X | X |

*R: Reforestation; FR: Forest restoration and WAC: Woody agricultural crops.

For its reassessments:

$$Ran_{BL,tvx} = Rag_{BL,tvx} - E_{BL,tvx} \qquad \textit{Equation 26}$$

| Variable | Description | Units | Segment* | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| $Ran_{BL,tvx}$ | Long-term net removals by carbon pools in all segments, in the reassessment **tvx** of the baseline scenario, considering the initial one referred $Ran_{BL}$. | t $CO_2e$ | X | X | X |
| $Rag_{BL,vtx}$ | Long-term gross removals by carbon pools in all segments, in the reassessment **tvx** of the baseline scenario, considering the initial one referred $Rag_{BL}$. | t $CO_2e$ | X | X | X |
| $E_{BL,tvx}$ | Total emissions of all segments (as applicable), in the reassessment ***tvx*** of the baseline scenario. | t $CO_2e$ | X | X | X |
| **tvx** | Index of the verification year, counted from the CCMP start date. | NA | X | X | X |

*R: Reforestation; FR: Forest restoration and WAC: Woody agricultural crops.

# 8 Project scenario

## 8.1 Quantification of the Project Scenario

### 8.1.1 Carbon stock estimation

As in the baseline scenario, carbon stocks in carbon pools are estimated separately for each of the segments.

It will be necessary to perform the calculations for the project scenario, as well as monitoring and calculating them for the verification events.

When it is necessary to reassess the baseline scenario, the project scenario must be reassessed as well to recalculate the total long-term mitigation potential. Reassessment of the project scenario may be due to modification of areas or variations in the implementation of the CCMP with respect to what was established in the PDD. Only an increase in GHG removal by activity of a maximum of 20 % with respect to the original project scenario is allowed.

The sum of the three segments will constitute the total carbon stocks in carbon pools in the project scenario or its reassessment, which must be recorded in the PDD and in the validation calculations. For monitoring, it should be summarized in the monitoring report and detailed in the verification calculations, as shown in the following equation:

$$Rcp_{P,t} = \sum_{s=1}^{Ns\_P} Rcp_{P,s(R,FR1,FR2,WAC),t} * TSAs_{(R,FR1,RF2,WAC)} \qquad \textit{Equation 27}$$

| Variable | Description | Units | Segment* | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| $Rcp_{P,t}$ | Total removals by carbon pools in all segments in year ***t***, in the project scenario, its reassessment or corresponding monitoring. | t $CO_2$e | X | X | X |
| $Rcp_{P,s(R,FR1,FR2,WAC),t}$ | Removals from carbon pools in segment ***s*** (Reforestation "R", Forest Restoration "FR1 and/or FR2", and/or Establishment of Woody Agricultural Crops "WAC") in year ***t***, in the project scenario, its reassessment, or corresponding monitoring. | t $CO_2$e / ha | X | X | X |
| $TSAs_{(R,FR1,FR2,WAC)}$ | Total area of segment ***s*** (Reforestation "R", Forest Restoration "FR1 and/or FR2", and/or Establishment of Woody Agricultural Crops "WAC") in the baseline scenario (***Sc***), project scenario, monitoring, or corresponding reassessment. | ha | X | X | X |
| ***s*** | Index of the segments to be implemented in the CCMP (maximum 3: reforestation, forest restoration, and woody agricultural crops). | NA | X | X | X |
| ***t*** | CCMP year index. | NA | X | X | X |
| ***Ns_P*** | Total number of segments to be implemented in the CCMP (maximum 3: reforestation, forest restoration, and Woody Agricultural Crops) in the project scenario or its corresponding reassessment. | Number of segments | X | X | X |

*R: Reforestation; FR: Forest restoration and WAC: Woody agricultural crops.
NA: does not apply.

The accumulated carbon stocks in carbon pools up to a specific year $t_x$, are calculated as the sum of all carbon pools to be considered in each segment.

For a given segment ***s*** and year ***t***, the carbon stocks in the carbon pools of its segment components in the project scenario are calculated as follows:

For the project scenario:

$$Rcp_{P,s(R,FR1,FR2,WAC),t} = \sum_{t=1}^{T} \sum_{f=1}^{NSCS\_P} (\Delta CAtree_{P,f,s,t} + \Delta CBtree_{P,f,s,t} + \Delta CAshrub_{P,f,s,t} + \Delta CBshrub_{P,f,s,t} + \Delta CDw_{P,f,s,t} + \Delta CL_{P,f,s,t} + \Delta CSoc_{P,f,s,t}) * 44/12 \quad \textit{Equation 28}$$

For its reassessments or monitoring:

$$Rcp_{P,s(R,FR1,FR2,WAC),tvx} = \sum_{t=tvx+1}^{T\ or\ X} \sum_{f=1}^{NSCS\_P} (\Delta CAtree_{P,f,s,t} + \Delta CBtree_{P,f,s,t} + \Delta CAshrub_{P,f,s,t} + \Delta CBshrub_{P,f,s,t} + \Delta CDw_{P,f,s,t} + \Delta CL_{P,f,s,t} + \Delta CSoc_{P,f,s,t}) * 44/12 \quad \textit{Equation 29}$$

| Variable | Description | Units | Segment | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| $Rcp_{P,s,(R,FR1,FR2,WAC),t}$ | Total carbon pool removal for the selected carbon pools in segment ***s*** (Reforestation "R", Forest Restoration "FR1 and/or FR2", and/or Establishment of Woody Agricultural Crops "WAC") in year ***t***, in the project scenario. | t $CO_2e$ / ha | X | X | X |
| $Rcp_{P,s(R,FR1,FR2,WAC),tvx}$ | Total carbon pool removal for the selected carbon pools in segment ***s*** (Reforestation "R", Forest Restoration "FR1 and/or FR2", and/or Establishment of Woody Agricultural Crops "WAC") in year **tvx**, in the reassessment of the project scenario or corresponding monitoring. | t $CO_2e$ / ha | X | X | X |
| $\Delta CAtree_{P,f,s,t}$ | Change in carbon stock in aboveground tree Biomass from segment component ***f*** of segment ***s*** (Reforestation "R", Forest Restoration "FR1 and/or FR2", and/or Establishment of Woody Agricultural Crops "WAC"), in year ***t***, in the project scenario, its reassessment or its corresponding monitoring. | t C / ha | X | X | X |
| $\Delta CBtree_{P,f,s,t}$ | Change in carbon stock in belowground tree Biomass from segment component ***f*** of segment ***s*** (Reforestation "R", Forest Restoration "FR1 and/or FR2", and/or Establishment of Woody Agricultural Crops "WAC"), in year ***t***, in the project | t C / ha | X | X | X |

| Variable | Description | Units | Segment | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| | scenario, its reassessment or its corresponding monitoring. | | | | |
| $\Delta C_{Ashrub_{P,f,s,t}}$ | Change in carbon stock in aboveground shrub Biomass from segment component ***f*** of segment ***s*** (Reforestation "R", Forest Restoration "FR1 and/or FR2", and/or Establishment of Woody Agricultural Crops "WAC"), in year ***t***, in the project scenario, its reassessment or its corresponding monitoring. | t C / ha | X | X | X |
| $\Delta C_{Bshrub_{P,f,s,t}}$ | Change in carbon stock in aboveground shrub Biomass from segment component ***f*** of segment ***s*** (Reforestation "R", Forest Restoration "FR1 and/or FR2", and/or Establishment of Woody Agricultural Crops "WAC"), in year ***t***, in the project scenario or its corresponding reassessment. | t C / ha | X | X | X |
| $\Delta C_{Dw_{P,f,s,t}}$ | Change in carbon stock in Deadwood from segment component ***f*** of segment ***s*** (Reforestation "R", Forest Restoration "FR1 and/or FR2", and/or Establishment of Woody Agricultural Crops "WAC"), in year ***t***, in the project scenario, its reassessment or its corresponding monitoring. | t C / ha | NA | X | NA |
| $\Delta CL_{P,f,s,t}$ | Change in carbon stock in litter from segment component ***f*** of segment ***s*** (Reforestation "R", Forest Restoration "FR1 and/or FR2", and/or Establishment of Woody Agricultural Crops "WAC"), in year ***t***, in the project scenario, its reassessment or its corresponding monitoring. | t C / ha | NA | X | NA |
| $\Delta C_{Soc_{P,f,s,t}}$ | Change in carbon stock in Soil Organic Carbon from segment component ***f*** of segment ***s*** (Reforestation "R", Forest Restoration "FR1 and/or FR2", and/or Establishment of Woody Agricultural Crops "WAC"), in year ***t***, in the project scenario, its reassessment or its corresponding monitoring. | t C / ha | X | X | X |
| $44/12$ | Ratio of molecular weight of carbon dioxide (CO2) to carbon (C). | NA | X | X | X |
| ***f*** | Index of the component segment of segment ***s*** in the project scenario, its reassessment or its corresponding monitoring. | NA | X | X | X |
| ***s*** | Index of the segments to be implemented in the CCMP (maximum 3: reforestation, forest restoration, and woody agricultural crops) in the project scenario, its reassessment or its corresponding monitoring. | NA | X | X | X |
| ***t*** | CCMP year index. | NA | X | X | X |
| ***T*** | Total Duration of the CCMP (and for Reassessments). | Years | X | X | X |
| ***tvx*** | Index of the verification year, counted from the start date of the CCMP. | NA | X | X | X |
| ***X*** | Reporting or Verification Period (For Monitoring) | Years | X | X | X |

*R: Reforestation; FR: Forest restoration and WAC: Woody agricultural crops. NA: does not apply.

In project scenario reassessments, the values of the different carbon pools (***Atree***, ***Btree***, ***Ashrub***, ***Dw***, ***L***, and ***Cos***) between ***t*** = ***tvx+1*** up to ***T***, which result from *ex-ante* estimates. The CCMP may determine its own parameters and data using methods or technologies, provided they are consistent and conservative.

***Equations 28*** and ***29*** must be calculated for each of the segments considered by CCMP.

Changes in carbon stocks in tree and shrub biomass for these segments can be estimated according to the guidelines established in the current version of CDM's methodological *AR-Tool 14*. For this, the current version of CDM's methodological Tool *AR-Tool 17* and *AR-Tool 18* should also be considered.

Changes in carbon stocks in dead wood and litter for these segments can be estimated according to the guidelines established in the current version of the CDM's methodological *AR-Tool 12*. Changes in carbon stocks in soil organic carbon for these segments can be estimated according to the guidelines established in the current version of the CDM's methodological *AR-Tool 16*.

### 8.1.2 GHG emission sources estimation

For the determination of the project scenario, the values of the different parameters used in the emission sources should be integrated in the same way as mentioned in ***Section 7.2.3***.

The total GHG emissions from sources in the project scenario, during a reassessment or corresponding monitoring, are estimated using the following equation:

$$E_{P,t} = \left( \sum_{s=1}^{Ns} EFi_{P,s,t} + EB_{P,s,t} + EFer_{P,s,t} + EFF_{P,s,t} \right) + LK_{P,t} \quad \textit{Equation 30}$$

| Variable | Description | Units | Segment* | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| $E_{P,t}$ | Total GHG emissions from sources in year ***t***, in the project scenario, its reassessment, or corresponding monitoring. | t $CO_2e$ | X | X | X |
| $EFi_{P,s,t}$ | Non-$CO_2$ GHG emissions from fires of segment ***s***, in year ***t***, in the project scenario or its corresponding reassessment. | t $CO_2e$ | X | X | X |
| $EB_{P,s,t}$ | Non-$CO_2$ GHG emissions from burning of segment ***s***, in year ***t***, in the project scenario or its corresponding reassessment. | t $CO_2e$ | X | X | X |
| $EFer_{P,s,t}$ | Non-$CO_2$ GHG emissions from fertilizer in segment ***s***, in year ***t***, in the project scenario or its corresponding reassessment. | t $CO_2e$ | NA | NA | X |
| $EFF_{P,s,t}$ | GHG emissions from consumption of all types of fossil fuel in agricultural machinery in segment ***s***, in year ***t***, in the project scenario or its corresponding reassessment. | t $CO_2e$ | NA | NA | X |
| $LK_{P,t}$ | Total leakage from the displacement of agricultural or livestock activities (outside the CCMP boundaries) attributed to the CCMP implementation in year ***t*** in the project scenario. | t $CO_2e$ | NA | NA | NA |
| ***s*** | Index of the segments to be implemented in the CCMP in the project scenario or its corresponding reassessment. | NA | X | X | X |
| ***t*** | CCMP year index. | NA | X | X | X |

| Variable | Description | Units | Segment* | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| ***Ns*** | Total number of segments to implement in the CCMP in the project scenario or its corresponding reassessment. | Segment count | X | X | X |

*R: Reforestation; FR: Forest restoration and WAC: Woody agricultural crops.
NA: does not apply.

#### 8.1.2.1 GHG emissions from fires

Due to their incidental nature, fires are not calculated in the project scenario and its reassessments. They are only included (reported and monitored) when a natural or anthropogenic fortuitous event occurs during the project implementation, affecting the eligible area, and are reflected in the verification event covering the period in which they occurred. These emissions can be estimated following the guidelines established in the current version of the CDM Methodological Tool *AR-Tool 08*.

#### 8.1.2.2 GHG emissions from burning

In reforestation and forest restoration activities, burning is not permitted for site preparation or crop residue collection. Although burning may occur in the baseline scenario, it is conservatively excluded for these segments.

The calculation of GHG emissions from burning (for site preparation or disposal of crop residues) is considered in the project scenario for the woody agricultural crops segment only if such practices are legally permitted. In this case, a reassessment of this scenario may be necessary if it differs from what is established in the PDD. Otherwise, burning must not be considered, even if it occurs in the baseline scenario.

These biomass burning emissions for a particular occurrence are estimated using the CDM's methodological *AR-Tool 08* referenced in the previous section. Total emissions from burning are estimated using the following equations, as appropriate:

For the project scenario:

$$EB_{P,s,t} = \sum_{t=1}^{T} \sum_{f=1}^{NSCS\_P} EB_{P,f,s,t} \qquad \textit{Equation 31}$$

For its reassessments or monitoring:

$$EB_{P,s,tvx} = \sum_{t=tvx+1}^{T\ or\ X} \sum_{f=1}^{NSCS\_P} EB_{P,f,s,t} \qquad \textit{Equation 32}$$

| Variable | Description | Units | Segment* | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| $EB_{P,s,t}$ | Non-$CO_2$ GHG emissions from burning from segment ***s***, in year ***t***, in the project scenario or its corresponding reassessment. | t $CO_2e$ | NA | NA | X |
| $EB_{P,f,s,t}$ | Non-$CO_2$ GHG emissions from burning in segment component ***f*** of segment ***s***, during year ***t***, in the project scenario, its reassessment, or corresponding monitoring. | t $CO_2e$ | NA | NA | X |

| Variable | Description | Units | Segment* | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| $EB_{P,s,tvx}$ | Non-$CO_2$ GHG emissions from burning in segment s during year ***tvx***, in the reassessment of the project scenario or corresponding monitoring. | t $CO_2e$ | NA | NA | X |
| ***s*** | Index of the segments to be implemented in the CCMP in the project scenario, its reassessment, or corresponding monitoring. | NA | NA | NA | X |
| ***f*** | Index of the component segment of segment ***s*** in the project scenario, its reassessment or corresponding monitoring. | NA | NA | NA | X |
| ***t*** | CCMP year index. | NA | NA | NA | X |
| ***tvx*** | Ordinal of verification year, counted from the CCMP start date. | NA | NA | NA | X |
| ***T*** | Total Duration of the CCMP (For Reassessments) | Years | NA | NA | X |
| ***X*** | Reporting or Verification Period (For Verification Events) | Years | NA | NA | X |
| ***NSCS_P*** | Total number of segment components of segment ***s*** in the project scenario or its corresponding reassessment. | Segment-components count | X | X | X |

*R: Reforestation; FR: Forest restoration and WAC: Woody agricultural crops. NA: does not apply.

In the reassessments of the project scenario or monitoring, the values of $EB_{P,f,s,t}$ between entre ***t*** = ***tvx+1*** and ***T*** or $EB_{P,f,s,t}$ between ***t*** = ***tvx+1*** and ***X*** are derived from **ex-ante** and **ex-post** calculations, respectively.

Although the calculation of GHG emissions from fires and burning could be done jointly, in a single procedure, it is separated because it is possible that the latter is done based on the biomass to be burned and not based on the affected area.

#### 8.1.2.3 GHG emissions from fertilizer use

To calculate direct GHG emissions and those associated with fertilizer use, the GHG emissions from fertilization must first be calculated using ***Equations 33*** and ***34***. Subsequently, the GHG emissions from fertilizer use are estimated with ***Equation 35***, as applicable.

In this scenario, the calculation of emissions from fertilizer use is mandatory for the woody agricultural crops segment and optional (if they represent a significant emission source) for the reforestation and forest restoration segments. For these segments, justification must be provided if such emissions are not considered.

For the project scenario:

$$EFer_{P,s,t} = \sum_{t=1}^{T} \sum_{f=1}^{NSCS\_P} EFer_{P,f,s,t} \qquad \textit{Equation 33}$$

For its reassessments or monitoring:

$$EFer_{P,s,tvx} = \sum_{t=tvx+1}^{T\ or\ X} \sum_{f=1}^{NSCS\_P} EFer_{P,f,s,t} \qquad \textit{Equation 34}$$

| Variable | Description | Units | Segment* | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| $EFer_{P,s,t}$ | Non-$CO_2$ GHG emissions from fertilizer use in segment **s** during year **t** in the project scenario. | t $CO_2e$ | X | X | X |
| $EFer_{P,s,tvx}$ | Non-$CO_2$ GHG emissions from fertilizer use in segment **s** during year **tvx** in the reassessment of the project scenario or corresponding monitoring. | t $CO_2e$ | X | X | X |
| $EFer_{P,f,s,t}$ | Non-$CO_2$ GHG emissions from fertilization in segment component **f** of segment ***s*** during year **t** in the project scenario, its reassessment, or corresponding monitoring. | t $CO_2e$ | X | X | X |
| ***f*** | Index of the segment component in segment **s** in the project scenario, its reassessment, or corresponding monitoring. | NA | X | X | X |
| ***s*** | Index of the segment to be implemented in the CCMP in the project scenario, its reassessment, or corresponding monitoring. | NA | X | X | X |
| ***t*** | Index of the CCMP year. | NA | X | X | X |
| ***tvx*** | Index of the verification year, counted from the start date of the CCMP. | NA | X | X | X |
| ***T*** | Total duration of the CCMP (For reassessments). | Years | X | X | X |
| ***X*** | Reporting or verification period (For monitoring). | Years | X | X | X |
| ***NSCS_P*** | Total number of segment components in segment ***s*** in the project scenario, its reassessment, or corresponding monitoring. | Segment components count | X | X | X |

*R: Reforestation; FR: Forest restoration and WAC: Woody agricultural crops. NA: does not apply.

$$EFer_{P,f,s,t} = [(FNS_{P,f,s,t} + FNO_{P,f,s,t}) * FEN] * 44/28 * GWP_{N2O}$$

*Equation 35*

| Variable | Description | Units | Segment* | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| $EFer_{P,fs,t}$ | Non-$CO_2$ GHG emissions from fertilization in segment component **f** of segment **s**, during year **t**, in the project scenario, its reassessment, or corresponding monitoring. | t $CO_2e$ | X | X | X |
| $FNS_{P,f,s,t}$ | Annual amount of nitrogen from synthetic fertilizer applied in segment component **f** of segment **s**, during year **t**, adjusted to reflect volatilization as $NH_3$ and NOx in the project scenario, its reassessment, or corresponding monitoring. | t N | X | X | X |
| $FNO_{P,f,s,t}$ | Annual amount of nitrogen from organic fertilizer applied in segment component **f** of segment **s**, during year **t**, adjusted to reflect volatilization as $NH_3$ and NOx in the project scenario, its reassessment, or corresponding monitoring. | t N | X | X | X |
| ***FEN*** | Emission factor for $N_2O$ from nitrogen input. | t $CO_2e$ / t N | X | X | X |
| ***f*** | Index of the segment component in segment ***s*** in the project scenario or considered reassessment. | NA | X | X | X |

| Variable | Description | Units | Segment* | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| ***s*** | Index of the segment to be implemented in the CCMP in the project scenario or corresponding re-assessment. | NA | X | X | X |
| ***t*** | Index of the CCMP year. | NA | X | X | X |
| **44/28** | Ratio between the molecular weight of Nitrous Oxide ($N_2O$) and Nitrogen (N). | NA | X | X | X |
| $GWP_{N2O}$ | Global warming potential of Nitrous Oxide ($N_2O$). | Dimension-less | X | X | X |

*R: Reforestation; FR: Forest restoration and WAC: Woody agricultural crops. NA: does not apply.

In the reassessments of the project scenario or monitoring, only $EFer_{P,f,s,t}$ between $t = tvx+1$ to $T$ or o $EFer_{P,f,s,tvx}$ between $t = tvx+1$ to $X$ values are considered, which are derived from *ex-ante* and *ex-post* estimates, respectively.

#### 8.1.2.4 GHG emissions from consumption of fossil fuels by agricultural machinery

GHG emissions from fossil fuel consumption by agricultural machinery in the woody agricultural crops segment are estimated based on the annual consumption of different types of fuels used across all segment components in the project scenario, its reassessment, or corresponding monitoring, for each year of the CCMP. Each quantity is multiplied by the $CO_2$ emission factor, following the guidelines established in the current version of the CDM Methodological Tool AR-Tool 03**.**

For the project scenario:

$$EFF_{P,s,t} = \sum_{t=1}^{T} \sum_{m=1}^{TC} \sum_{f=1}^{NSCS\_P} EFF_{P,m,f,s,t} \qquad \textit{Equation 36}$$

For its reassessment or monitoring:

$$EFF_{P,s,t} = \sum_{t=tvx+1}^{T} \sum_{m=1}^{TC} \sum_{f=1}^{NSCS\_P} EFF_{P,m,f,s,t} \qquad \textit{Equation 37}$$

| Variable | Description | Units | Segment* | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| $EFF_{P,s,t}$ | Total GHG emissions from the consumption of all types of fossil fuels by agricultural machinery in segment ***s*** (woody agricultural crops) during year ***t,*** in the project scenario. | t $CO_2e$ | NA | NA | X |
| $EFF_{P,s,tvx}$ | Total GHG emissions from the consumption of all types of fossil fuels by agricultural machinery in segment **s** (woody agricultural crops) during year ***tvx***, in the reassessment of the project scenario or corresponding monitoring. | t $CO_2e$ | NA | NA | X |

| Variable | Description | Units | Segment* | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| $EFF_{P,m,f,s,t}$ | GHG emissions from the consumption of fossil fuel type ***m*** in year t by agricultural machinery in segment component ***f*** of segment **s** (woody agricultural crops) during year ***t***, in the project scenario, its reassessment, or corresponding monitoring. | t $CO_2e$ | NA | NA | X |
| ***m*** | Index of fossil fuel type consumed by agricultural machinery. | NA | NA | NA | X |
| ***f*** | Index of the segment component in the project scenario or considered reassessment. | NA | NA | NA | X |
| ***s*** | Index of the segment to be implemented in the CCMP in the project scenario or corresponding reassessment. | NA | NA | NA | X |
| ***t*** | Index of the CCMP year. | NA | NA | NA | X |
| ***tvx*** | Index of the verification year, counted from the start date of the CCMP. | NA | NA | NA | X |
| ***T*** | Total duration of the CCMP (For reassessments). | Years | NA | NA | X |
| ***X*** | Reporting or verification period (For verification events). | Years | NA | NA | X |
| ***TC*** | Total number of fossil fuel types used in agricultural machinery in the woody agricultural crops segment, in the project scenario or corresponding reassessment. | Fossil fuel types count | NA | NA | X |
| ***NSCS_P*** | Total number of segment components in segment ***s*** in the project scenario or corresponding reassessment. | Segment components count | NA | NA | X |

*R: Reforestation; FR: Forest restoration and WAC: Woody agricultural crops. NA: does not apply.

In the reassessments of the project scenario or monitoring, only $EFF_{P,f,s,t}$ between ***t*** = ***tvx+1*** and ***T*** or $EFF_{P,f,s,tvx}$ between ***t*** = ***tvx+1*** and ***X*** values are considered, which are derived from ex-ante and ex-post calculations, respectively.

For a type of fuel ***m*** used in the implementation of the CCMP, the annual GHG emissions are estimated using the following equation:

$$EFF_{P,m,f,s,t} = CC_{m,f,s,t} * KCC_{P,m,f,s,t} \qquad \textit{Equation 38}$$

$$KCC_{p,m,f,s,t} = W_{m,f,s,t} * 44/12 \qquad \textit{Equation 39}$$

| Variable | Description | Units | Segment* | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| $EFF_{P,m,f,s,t}$ | GHG emissions from consumption of ***m*** type fossil fuel in the component segment ***f***, of the segment ***s***, in year ***t***, in the project scenario or its corresponding reassessment or monitoring. | t $CO_2e$ | NA | NA | X |
| $CC_{m,f,s,t}$ | Amount of type ***m*** fossil fuel consumed by agricultural machinery in component segment ***f*** of the segment ***s***, in year ***t***, in the project scenario or its corresponding reassessment or monitoring. | l or gal | NA | NA | X |
| $KCC_{p.m,f,s,t}$ | Emission factor for combustion of fossil fuel ***m*** consumed by agricultural machinery in component segment ***f*** of the segment ***s***, in year ***t***, in the project scenario or its corresponding reassessment. | t $CO_2e$/unit of mass of fossil fuel | NA | NA | X |

| Variable | Description | Units | Segment* | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| $m$ | Index of type fossil fuel consumed by agricultural machinery. | NA | NA | NA | X |
| $f$ | Index of the component segment in the project scenario or its corresponding reassessment. | NA | NA | NA | X |
| $s$ | Index of the segments to be implemented in the CCMP (woody agricultural crops) in the project scenario or its corresponding reassessment. | NA | NA | NA | X |
| $t$ | CCMP year index. | NA | NA | NA | X |
| $W_{m,f,s,t}$ | Weighted average mass fraction of carbon in fuel type $m$ in segment component $f$ of segment $s$ during year $t$, in the project scenario, its reassessment, or corresponding monitoring. | t C / unit of fuel mass | NA | NA | X |
| $44/12$ | Ratio between the molecular weight of $CO_2$ and Carbon. | NA | NA | NA | X |

*R: Reforestation; FR: Forest restoration and WAC: Woody agricultural crops. NA: does not apply.

#### 8.1.2.5 Emissions from leakage

The CCMP must identify, avoid, or address emission sources resulting from leakage, when applicable, considering the use of standardized baselines if available. This methodology considers leakage caused by the displacement of agricultural activities (livestock and crops), estimated using the guidelines established in the current version of the CDM Methodological Tool AR-Tool 15.

The CCMP must take into account available information on leakage emissions as established in the NDC.

The estimated leakage sources are designated as $LK_{Ag}$ (leakage due to displacement of agricultural activities associated with crops) and $Lk_{Livestock}$ (leakage due to displacement of agricultural activities associated with livestock).

Although these tools consider that leakage does not occur after five years from the start of CCMP implementation, under this methodology, leakage monitoring must be conducted from the beginning to the end of CCMP implementation. If areas are expanded, it will be necessary to calculate leakage for the new areas and carry out the corresponding leakage monitoring.

Total leakages due to displacement of agricultural or livestock activities attributed to the implementation of the CCMP are calculated as:

For the project scenario:

$$LK_{P,t} = \sum_{t=1}^{T} LK_{Ag,t} + \sum_{t=1}^{T} LK_{Livestock,t} \qquad \textit{Equation 40}$$

For reassessment or monitoring:

$$LK_{P,tvx} = \sum_{t=tvx+1}^{T\ or\ X} LK_{Ag,t} + \sum_{t=tvx+1}^{T} LK_{Livestock,t} \qquad \textit{Equation 41}$$

| Variable | Description | Units | Segment* | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| $LK_{P,t}$ | Total leakages from the displacement of agricultural or livestock activities attributed to the implementation of the CCMP in year ***t*** in the project scenario. | t $CO_2e$ | X | X | X |
| $LK_{P,tvx}$ | Total leakages from the displacement of agricultural or livestock activities attributed to the implementation of the CCMP in year **tvx** in the reassessment of the project scenario or corresponding monitoring. | t $CO_2e$ | X | X | X |
| $LK_{Ag,t}$ | Leakages due to the displacement of agricultural activities attributed to the implementation of the CCMP in year ***t*** of the project scenario, its reassessment, or corresponding monitoring. | t $CO_2e$ | X | X | X |
| $LK_{Livestock,t}$ | Leakages due to the displacement of livestock activities attributed to the implementation of the CCMP in year ***t*** of the project scenario, its reassessment, or corresponding monitoring. | t $CO_2e$ | X | X | X |
| ***t*** | Index of the CCMP year. | NA | X | X | X |
| ***tvx*** | Index of the verification year, counted from the start date of the CCMP. | NA | X | X | X |
| ***T*** | Total duration of the CCMP (For reassessments). | Years | X | X | X |
| ***X*** | Reporting or verification period (For verification events). | Years | X | X | X |

*R: Reforestation; FR: Forest restoration and WAC: Woody agricultural crops. NA: does not apply. Leakage occurs outside the boundaries of the CCMP but is attributed to its implementation.

### 8.1.3 Average gross estimate and net removals from the project scenario or its corresponding reassessment

Average gross removals from the project scenario or its reassessment can be estimated using the following equation:

$$Rag_P = \sum_{t=1}^{T} Rcp_{P,t} \qquad \textit{Equation 42}$$

| Variable | Description | Units | Segment* | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| $Rag_P$ | Long-term average gross removals by carbon pools in all segments, in the project scenario or its corresponding reassessment. | t $CO_2e$ | X | X | X |
| $Rcp_{P,t}$ | Total removals by carbon pools in all segments in year ***t***, in the project scenario or its corresponding reassessment. | t $CO_2e$ | X | X | X |
| ***t*** | CCMP year index. | NA | X | X | X |

*R: Reforestation; FR: Forest restoration and WAC: Woody agricultural crops. NA: does not apply.

The $Rcp_{P,t}$ values for all years from the start of the CCMP to the total duration ***T*** will come from estimates based on field data or from applicable models. In the case of reassessments,

the data will be derived from a combination of data **monitored** from the beginning of the CCMP until the verification year ***tvx*** and estimates or models from said verification year.

Project scenario reassessment is mandatory when additional areas are included, or areas are eliminated in the verifications with respect to that previously established or with respect to the previous verification. Reassessment of the CCMP (combining the results monitored **annually** until the time of verification and an *ex-ante* scenario from the time of verification to the end of the CCMP) is necessary at each verification, unless the implementation of the CCMP is the same to that foreseen in the *ex-ante* scenario or to the previous reassessment.

If the CCMP does not monitor carbon stocks in carbon pools annually in the years prior to verifications, **conservative** models may be used to estimate these stocks. However, CCMP GHG emissions must be continuously monitored to be duly considered in reassessments and verifications.

Regarding the average **net** removals of the project scenario or its corresponding reassessment, they will be calculated as $Ran_P$ (for CCMP validation) and as $Ran_{P,v1}$, $Ran_{P,v2}$… $Ran_{P,vx}$ for the 1,2… x verifications that require reassessments.

For project scenario:

$$Ran_{P,t} = [(Rag_{P,t} - E_{P,t}) - (Ran_{BL,t})] - LK_{P,t} \qquad \textit{Equation 43}$$

| Variable | Description | Units | Segment* | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| $Ran_{P,t}$ | Net long-term removals from carbon pools in all segments during year ***t***, in the project scenario. | t $CO_2e$ | X | X | X |
| $Rag_{P,t}$ | Gross long-term removals from carbon pools in all segments during year ***t***, in the project scenario. | t $CO_2e$ | X | X | X |
| $Ran_{BL,t}$ | Net long-term removals from carbon pools in all segments during year ***t***, in the baseline scenario. | t $CO_2e$ | X | X | X |
| $E_{P,t}$ | Total GHG emissions from sources during year ***t***, in the project scenario. | t $CO_2e$ | X | X | X |
| $LK_{P,t}$ | Total leakages from the displacement of agricultural or livestock activities attributed to the implementation of the CCMP during year ***t***, in the project scenario. | t $CO_2e$ | NA | NA | NA |
| ***t*** | Index of the CCMP year. | NA | X | X | X |

*R: Reforestation; FR: Forest restoration and WAC: Woody agricultural crops. NA: does not apply.

For its reassessments:

$$Ran_{P,tvx} = (Rag_{P,tvx} - ET_{P,tvx}) - (Ran_{BL,tvx}) - LK_{P,tvx} \qquad \textit{Equation 44}$$

| Variable | Description | Units | Segments* | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| $Ran_{P,tvx}$ | Net long-term removals from carbon pools in all segments during year **tvx**, in the reassessment of the project scenario, considering the initial value referred to as $Ran_P$. | t $CO_2e$ | X | X | X |
| $Rag_{P,tvx}$ | Gross long-term removals from carbon pools in all segments during year **tvx**, in the reassessment of | t $CO_2e$ | X | X | X |

| Variable | Description | Units | Segments* | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| | the project scenario, considering the initial value referred to as $Rag_P$. | | | | |
| $Ran_{BL,tvx}$ | Net long-term removals from carbon pools in all segments during year **tvx**, in the reassessment of the baseline scenario, considering the initial value referred to as $Ran_{BL}$. | t $CO_2e$ | X | X | X |
| $ET_{P,tvx}$ | Total GHG emissions from sources during year **tvx**, in the reassessment of the project scenario, considering the initial value referred to as $ET_{P,t}$. | t $CO_2e$ | X | X | X |
| $LK_{P,tvx}$ | Total leakages from the displacement of agricultural or livestock activities for verification or reassessment **tvx** of the project scenario, considering the initial value referred to as $LK_{P,t}$. | t $CO_2e$ | NA | NA | NA |
| ***tvx*** | Index of the verification year, counted from the start date of the CCMP. | NA | X | X | X |

*R: Reforestation; FR: Forest restoration and WAC: Woody agricultural crops.
NA: does not apply.

# 9 Grouped projects

Grouped projects are those that, in a Monitoring, Reporting and Verification (MRV) process, unify instances (participants or operational units) to achieve environmental impact mitigation through the registration of a single CCMP. It must be demonstrated that each of these instances meets all the criteria established in the regulations of the country where they are implemented, the ***Cercarbono's Protocol***, and this methodology to be eligible for inclusion. If eligible, these instances can generate GHG removal credits subject to commercialization. The monitoring requirements must be fulfilled by all grouped instances.

For several instances to be unified into a single CCMP, additionality must be evaluated individually for each instance.

The responsible party or parties (natural or legal persons), the spatial and temporal extent of each instance that makes up the grouped project, as well as the ownership of the associated GHG removals, must be clearly described separately in the PDD.

Additionally, the GHG removals achieved and projected throughout the accreditation period must be broken down individually by instance, and the accumulated sum must also be reported.

The monitoring requirements associated with these initiatives must be met by all grouped instances.

In addition to the guidelines described above, the requirements for grouped projects described in the current version of the ***Cercarbono's Protocol*** must also be followed.

## 9.1 Addition and exclusion of grouped CCMP areas

The addition of instances can be done during verifications, provided all requirements foreseen for this type of CCMP outlined in the ***Cercarbono's Protocol*** are met. Adding or removing areas from a CCMP will require a reassessment of scenarios, as explained in ***Section 6.6***.

If new instances are added to the CCMP, a new assessment of risks, non-permanence, and uncertainty is required, following the procedures described in ***Sections 10*** and ***11***.

If, during a reporting period a participant withdraws from the CCMP, it is necessary to update the PDD, explaining that the calculation of previously issued credits corresponding to the area belonging to the holder who has withdrawn from the project must be submitted for revalidation. The withdrawn area cannot be included in calculations for the subsequent verification and an equivalent amount of the previously issued credits must be deducted from the total mitigation to be reported in the next verification.

The withdrawal of areas from a holder or participant in the CCMP must be total; partial area withdrawals are not allowed. To formalize the withdrawal, CCMP must update the PDD (creating a new version), explicitly identifying the withdrawn areas and participants and indicating how many credits have been issued in previous verifications. An equivalent amount of these credits must be subtracted from the credits to be certified in the subsequent verification.

### 9.2 Update of spatial boundaries of grouped CCMPs

If the spatial boundaries of the activities included in the CCMP change during its implementation, either due to the inclusion of new instances or the withdrawal of participants, it is necessary to update the spatial boundaries of each modified activity and the total CCMP. This must be done in accordance with the ***Guidelines for Mapping Presentation and Analysis***. The total area of each activity must remain the same for both the baseline and project scenarios.

## 10 Risks and non-permanence

The requirements of this methodology aim to ensure that every component of quantification yields precise and accurate CCMP results, achieved through the rigorous application of its principles.

Cercarbono has established various mechanisms to enable the CCMP to identify potential risks related to the implementation of its activity (and, when involving social groups, to ensure their full, free, and informed participation through consensus). These mechanisms are backed by compliance with the current ***Safeguarding Principles and Procedures of Cercarbono's Certification Programme*** document of the Cercarbono certification program.

However, due to the inherent nature of the GHG removals, these are considered as non-permanent (as they result from planting and harvesting cycles or other anthropogenic actions such as restoration) and are susceptible to internal and external events (such as disasters, land use changes, infrastructure development). This methodology addresses non-permanence by requiring a percentage of the credits generated by CCMPs to be held in reserve, proportional to their identified reversal risks. This percentage is calculated using the ***Cercarbono's Tool to Estimate the Carbon Buffer in Climate Change Mitigation Initiatives in the Land Use Sector***. The rules for its calculation and subsequent return are detailed in the **Guidelines** of this tool.

The CCMP must also justify, support, and demonstrate compliance with the safeguard ***Measures for Risk Prevention and Management of Reversals***, as established in the ***Safeguarding Principles and Procedures of Cercarbono's Certification Programme*** document of

the Cercarbono certification program. This includes implementing management plans for prevention and monitoring to avoid creating negative environmental and social impacts.

Any reversal event must be fully addressed and identified in the field by the CCMP based on cartographic and temporal evidence. The reversal must be accounted for in subsequent verification events, with its occurrence deducted from the removals reported in the monitoring event. The risk of reversal must be analyzed every five years from the start of the CCMP, in line with the reassessment of baseline and project scenarios.

To ensure the permanence of GHG removals, the CCMP must obtain and maintain sufficient coverage under an insurance policy or comparable guarantee products to reasonably cover[28] the risk of reversals.

## 11 Uncertainty

The CCMP must include all data sources, parameters, and factors used to estimate/calculate carbon pools and emission sources. The CCMP must perform an uncertainty assessment during the planning and implementation phase, in accordance with the guidelines in Annexes A.3.5, A.3.6 and A.3.8 of ISO 14064-2:2019. The CCMP holder must aim to reduce the uncertainty associated with the information related to the initiative and must report the results conservatively, considering the magnitude of such uncertainty. This should be reflected in both the baseline establishment and the project outcome assessment, as applicable.

## 12 Contributions to UN's Sustainable Development Goals

Under the Cercarbono program, CCMPs must report their contributions to the Sustainable Development Goals (SDGs) by means of ***Cercarbono's Tool to Report Contributions from Climate Change Mitigation Initiatives to the Sustainable Development Goals***. Assessment of the application of this tool will be part of the verification process. The **Rubric of the SDG Tool** must be duly signed by the VVB in charge of the verification event.

Certified CCMPs are distinguished by a differentiation seal available on the retirement certificate and in the EcoRegistry platform, indicating compliance with the SDGs.

## 13 Safeguards

The activities of the program or project considered by the CCMP must not cause net harm to the social, environmental, economic, or legal aspects of the surrounding areas and/or communities where it is implemented. Therefore, the CCMP must ensure compliance with the ***Safeguarding Principles and Procedures of Cercarbono's Certification Programme***.

## 14 Monitoring and quantification of results

The CCMP must be monitored during its implementation, both within its area and regarding leakages, as a basis for quantifying the results and credits obtained at each verification. All

[28] Facilitating the purchase of credits with the same year of issuance and type of activity.

information and data related to the CCMP must be subject to validation and verification, in accordance with the guidelines of ISO 14064-3:2019 and ***Cercarbono's Protocol***.

GHG removals and emissions must be continuously reviewed and evaluated throughout the implementation period. GHG removals can be monitored annually or less frequently, while GHG emissions should be recorded and monitored more frequently, depending on the identified sources of GHG emissions. For verification events, the CCMP holder or developer must generate a monitoring report based on the plan established in the PDD. For intermediate years between verification events, monitoring can be conducted through direct field measurements or through projections of recent field measurements using conservative calculations or statistically reliable and well-supported models.

The monitoring report must include, but is not limited to [29]:

- A description of the CCMP activities monitored and the methods used;
- It is necessary that the data collected on carbon stock estimates, stock change in carbon pools and net removals generated in the monitoring period be based on field measurements, using statistically representative sampling, reliable and accurate remote sensing tools, third party sources and/or robust published literature, whose results are conservative and consider the associated uncertainties.
- A summary of the dataset if the collected data is too large, indicating how access to the full dataset can be obtained;
- Records and logs (where applicable) of GHG removal reversal events;
- Information on how reversal risks were assessed and addressed, in accordance with the risk mitigation measures described in the PDD;
- Information on how negative environmental and social impacts were assessed, mitigated, and managed, in line with the measures described in the PDD.

Although Cercarbono provides standard monitoring report templates (available on its website at (www.cercarbono.com, section: Documentation), CCMPs applying this methodology must consider all the guidelines established here when preparing the report.

## 14.1 Description of the monitoring plan

The CCMP must establish and maintain a monitoring and quality management plan that includes procedures for measuring or otherwise obtaining, recording, collecting, analyzing and presenting data using conservative values (based on justified and appropriate sources). It must also include all relevant information to quantify and report GHG emissions and removals, ensuring that they are real, transparent, and credible. The monitoring plan should include the following aspects, as applicable:

- Purpose.
- List of parameters to be measured and monitored.
- Types of data and information to be reported, including units of measurement.
- Data sources.
- Monitoring methodologies, including estimation, modelling, measurement, calculation approaches, and uncertainty. When appropriate, the use of remote sensing and digital

[29] Adapted from UNFCCC, 2004[a]

technologies should be incorporated to enable a transparent, reliable, conservative, and credible calculation and estimation of GHG removal.
- Frequency of monitoring, considering the needs of the CCMP.
- Calculation document, detailing each step of its development and results, ensuring that the calculated GHG removals are achieved solely through the activity and are attributable to it.
- Monitoring roles and responsibilities, including authorizing, approving, and documenting changes to recorded data.
- Controls that include an internal check of data in terms of input, transformation and output elements, as well as procedures for corrective actions.
- GHG information management systems, including the location and storage of recorded data and data management, including a procedure for transferring information between different systems or documentation formats.

[Some items taken from ISO 14064-2:2019 Standard].

The following sections outline the elements that should be subject to monitoring.

## 14.2 Boundaries monitoring

As part of monitoring process, it is necessary to periodically verify that the CCMP has been implemented in the areas initially validated or, in the case of grouped projects, in instances subsequently added during validations. Monitoring of the boundaries includes checking that the different areas remain under the control of the participants and that the reported areas of each polygon remain valid, in accordance with the ***Guidelines for Mapping Presentation and Analysis.***

## 14.3 Monitoring of GHG removals

The CCMP must monitor the carbon pools identified in the project scenario in the CCMP area during the results period to be verified.

### 14.3.1 Carbon stock monitoring

Monitoring of carbon stocks in carbon pools must be conducted annually, as annual stock data is required for calculating the net removals achieved by the CCMP. In the absence of annual monitoring of carbon stocks, it is mandatory to conduct monitoring at least prior to each verification event and estimate annual stocks conservatively and based on transparent and technically sound procedures. Average annual increments can only be used if they do not lead to overestimation and are applied for periods no longer than five years.

### 14.3.2 Calculation of the net removals achieved by the CCMP during the verification period

The net GHG removals achieved by the CCMP during the verification period must be recorded in the monitoring report and in the verification calculations using the following equation:

$$RE_{P,x} = (Rcp_{P,tx} - E_{P,tx}) - (Rcp_{BL,tx} - E_{BL,tx}) - LK_{P,tx} - Buffer_{P,tx}$$ *Equation 45*

$Rcp_{P,s,tx}$ and $Rcp_{BL,s,tx}$ are calculated based on ***Equations 27*** y ***7*** respectively. $E_{P,tx}$; $E_{BL,tx}$; $LK_{P,tx}$ based on ***equations 14***, ***30*** and ***40***, respectively. $Buffer_{P,tx}$ is obtained from the **Cercarbono Tool to Estimate Carbon Buffer in Initiatives to Mitigate Climate Change in the Land Use Sector**.

| Variable | Description | Units | Segment* | | |
|---|---|---|---|---|---|
| | | | R | FR | WAC |
| $RE_x$ | Net effective removal achieved by the CCMP in reporting period ***x***. | t $CO_2e$ | X | X | X |
| $Rcp_{P,tx}$ | Total carbon pool removal in all segments in year ***tx***, by the CCMP. | t $CO_2e$ | X | X | X |
| $Rcp_{BL,s,tvx}$ | Total carbon pool removal in all segments in year ***tx***, in the baseline scenario. | t $CO_2e$ | X | X | X |
| $E_{BL,t}$ | Total GHG emissions from GHG sources in year ***tx***, in the baseline scenario. | t $CO_2e$ | X | X | X |
| $E_{P,t}$ | Total GHG emissions from sources in year ***tx***, generated by the CCMP. | t $CO_2e$ | X | X | X |
| $LK_{P,tx}$ | Total leakages from the displacement of agricultural or livestock activities during year ***tx***, attributed to the implementation of the CCMP. | t $CO_2e$ | X | X | X |
| $Buffer_{P,tx}$ | GHG removal by the CCMP designated as a reserve (individual and collective) during year ***tx***. | t $CO_2e$ | X | X | X |
| ***tx*** | Index of the verification year, counted from the start date of the CCMP or from the completion date of the previous verification event (the latter in cases involving consecutive events). | NA | X | X | X |
| ***x*** | Ordinal of the reporting or verification period. | NA | X | X | X |

*R: Reforestation; FR: Forest restoration and WAC: Woody agricultural crops.
NA: does not apply.

## 14.4 Emissions monitoring

The CCMP must monitor the GHG emissions identified in the project scenario that occur during its implementation. Emission sources within the CCMP area must be monitored continuously throughout the period of results to be verified.

### 14.4.1 Monitoring of GHG emissions from burning and fires

The CCMP must keep a log of the occurrences of burnings and fires, where the information shown in ***Table 7*** should be reported. Based on this table, and according to guidelines established in the current version of CDM's methodological *A/R-Tool 08*, GHG emissions shall be estimated for each occurrence, followed by the annual total and for the corresponding verification periods.

**Table 7.** Possible structure of the fire and burnings occurrence reporting table.

| Date | Segment component | Area affected (ha) | Biomass burned (%) | Comments |
|---|---|---|---|---|
| | | | | |

### 14.4.2 Monitoring GHG emissions from use of fertilizers

The estimation of GHG emissions from fertilizer use must also be done using a fertilizer consumption reporting table, where the information shown in ***Table 8*** should be reported. It is acceptable to use data from automated registration systems, accounting systems, or warehouse inventories of the company for this table.

Based on this table, and according to the procedures set out in ***Section 8.1.2.3***, GHG emissions will be estimated for each occurrence, followed by the annual total and for the corresponding verification periods.

**Table 8.** Possible structure of fertilizer consumption reporting table.

| Date | Fertilizer | Composition | Applied quantity (t) | Place of application (lot or stand) | Comments |
|---|---|---|---|---|---|
| | | | | | |

### 14.4.3 Monitoring of GHG emissions from fuel consumption

As with the case of burnings and fires, the CCMP must keep a logbook to record the consumption of fossil fuels in agricultural machinery or an equivalent record linked to the company's accounting system, which allows the calculation of the annual consumption of each type of fuel used, as shown in ***Table 9***.

Based on this table, and in accordance with the guidelines established in the current version of CDM's methodological *AR-Tool 15*, GHG emissions will be estimated for each occurrence, followed by the annual sum, and the corresponding verification periods.

**Table 9.** Fossil fuel consumption report log in agricultural machinery.

| Date/month | Type of fuel | Total consumption | Units | Comments |
|---|---|---|---|---|
| | | | | |

### 14.4.4 Leakage monitoring

In the case of CCMPs not experiencing area expansions during their implementation, leakage monitoring must be conducted during the first five years of implementation. In the case of additions or changes in areas of implementation, monitoring must be performed during the following three years following such expansions or area changes. In the case of area reductions, monitoring is not required.

## 14.5 Monitoring of contributions to the Sustainable Development Goals

The monitoring of contributions to the Sustainable Development Goals (SDGs) of the United Nations is carried out according to the ***Cercarbono's Tool to Report Contributions from Climate Change Mitigation Initiatives to the Sustainable Development Goals***.

## 14.6 Variables to be monitored

The values, sources, and data requirements for parameters not subject to monitoring are provided alongside the equations in which they are used. The variables, parameters, or data that must be monitored during the CCMP's accreditation period are presented in ***Table 10*** which specified the accumulated data or measurements at the segment level.

**Table 10.** Variables to record and/or for monitoring.

| Variable/parameter/data | | Unit | Segment* | | | Data origin and measurement procedure | Frequency | Equation number |
|---|---|---|---|---|---|---|---|---|
| | | | R | FR | WAC | | | |
| $A_{eligible}$ | Total area where the program or project activity is implemented (Non-Stable Forest and/or Non-Forest). | ha | X | X | X | Field measurement or remote sensing.<br><br>Based on land covers supported by the national forest monitoring system or other official sources from the country where the CCMP is implemented. If unavailable, those supported by the IPCC in the GPG LULUCF 2003 or robustly generated based on the guidelines described in the methodology. | When the CCMP is revalidated.<br><br>In each verification event. | Equation 1. |
| $A_{Non\_eligible}$ | Total non-eligible area for the program or project activity (Stable Forest or Non-Forest). | ha | X | X | X | Field measurement or remote sensing. | When the CCMP is validated and revalidated. | Equation 5. |
| $TSAs_{(R,FR1,FR2,WAC)}$ | Total area of segment ***s*** (for Reforestation "R", Forest Restoration "FR1 and/or FR2"[30], and/or Establishment of Woody Agricultural Crops "WAC") in the baseline scenario (***Sc***), project scenario, monitoring, or corresponding reassessment. | ha | X | X | X | Generation of cartographic layers through field measurements or remote sensing. | When the CCMP is validated and revalidated.<br><br>Review at each verification event. | Equation 4.<br><br>Implicit in equations 7 and 27. |
| $A_{Sc,f,s\_(R;FR1;FR2;WAC)}$ | Area of segment component ***f*** in segment ***s*** (for Reforestation "R", Forest | ha | X | X | X | Field measurement or remote sensing. | When the CCMP is validated and revalidated. | Equation 4. |

[30] As mentioned throughout the document, forest restoration can occur in both eligible strata (Non-stable Forest and Non-Forest), which will be determined by the selection of activities that the CCMP holder or developer supports within the CCMP.

| Variable/parameter/data | | Unit | Segment* | | | Data origin and measurement procedure | Frequency | Equation number |
|---|---|---|---|---|---|---|---|---|
| | | | R | FR | WAC | | | |
| | Restoration "FR1 and/or FR2"[31], and/or Establishment of Woody Agricultural Crops "WAC") in the baseline scenario (***Sc***), project scenario, reassessment, or corresponding monitoring. | | | | | | Review at each verification event. | |
| $R_{LA}$ | Average long-term GHG mitigation potential. | t $CO_2e$ / year | X | X | X | Calculation of GHG removal eligible for generating credits, obtained from CCMP results. | When the CCMP is validated and revalidated. | Equation 6. |
| ***CAtree*** | Average carbon stock in aboveground tree biomass. | t C / ha | X | X | X | Based on the Tool CDM *AR-Tool 14.*<br><br>Field measurements or well-supported estimates. | When the CCMP is validated and revalidated.<br><br>Review at each verification event. | Implicit in equations 8, 9, 28, and 29. |
| ***CBtree*** | Average carbon stock in belowground tree biomass. | t C / ha | X | X | X | Based on the Tool CDM *AR-Tool 14.*<br><br>Field measurements or well-supported estimates. | When the CCMP is validated and revalidated.<br><br>Review at each verification event. | Implicit in equations 8, 9, 28, and 29. |
| $CF_{Tree}$ | Carbon fraction of tree biomass. | t C / t d.m. | X | X | X | Based on the Tool CDM *AR-Tool 14.*<br><br>Default value supported by the IPCC (0,47). However, it may come from field measurements, scientific literature, or well-supported estimates. | When the CCMP is validated and revalidated.<br><br>Review at each verification event. | Implicit in equations 8, 9, 28, and 29. |

[31] As mentioned throughout the document, forest restoration can occur in both eligible strata (Non-stable Forest and Non-Forest), which will be determined by the selection of activities that the CCMP holder or developer supports within the CCMP.

| Variable/parameter/data | | Unit | Segment* | | | Data origin and measurement procedure | Frequency | Equation number |
|---|---|---|---|---|---|---|---|---|
| | | | R | FR | WAC | | | |
| $R_{Tree}$ | Root-to-shoot ratio of tree species. | (t root d.m. / t stem d.m.) | X | X | X | Based on the Tool CDM AR-*Tool 14.*<br><br>Default value supported by the IPCC (0,25). However, it may come from field measurements, scientific literature, or well-supported estimates. | When the CCMP is validated and revalidated.<br><br>Review at each verification event. | Implicit in equations 8, 9, 28, and 29. |
| $CAshrub$ | Average carbon stock in aboveground shrub biomass. | t C / ha | NA | X | X | Based on the Tool CDM *AR-Tool 14.*<br><br>Derived from field measurements or well-supported estimates. | When the CCMP is validated and revalidated.<br><br>Review at each verification event. | Implicit in equations 8, 9, 28, and 29. |
| $CBshrub$ | Average carbon stock in belowground shrub biomass. | t C / ha | NA | X | X | Derived from field measurements or well-supported estimates. | When the CCMP is validated and revalidated.<br><br>Review at each verification event. | Implicit in equations 8, 9, 28, and 27. |
| $CF_{Shrub}$ | Carbon fraction of shrub biomass. | t C / t d.m. | X | X | X | Based on the Tool CDM *AR-Tool 14.*<br><br>Default value supported by the IPCC (0.47). However, it may come from field measurements, scientific literature, or well-supported estimates. | When the CCMP is validated and revalidated.<br><br>Review at each verification event. | Implicit in equations 8, 9, 28, and 29. |
| $R_{Shrub}$ | Root-to-shoot ratio of shrub species. | (t root d.m. / t shoot d.m.) | X | X | X | Based on the Tool CDM *AR-Tool 14.*<br><br>Default value supported by the IPCC (0.40). However, it may come from field measurements, scientific literature, or well-supported estimates. | When the CCMP is validated and revalidated.<br><br>Review at each verification event. | Implicit in equations 8, 9, 28, and 29. |

| Variable/parameter/data | | Unit | Segment* | | | Data origin and measurement procedure | Frequency | Equation number |
|---|---|---|---|---|---|---|---|---|
| | | | R | FR | WAC | | | |
| $CDW$ | Average carbon stock in deadwood. | t C / ha | X | X | NA | Based on the Tool CDM *AR-Tool 12.*<br><br>Obtained from field measurements, national inventories, or IPCC sources such as the GPG LULUCF 2003. | When the CCMP is validated and revalidated.<br><br>Review at each verification event. | Implicit in equations 8, 9, 28, and 29. |
| $CL$ | Average carbon stock in litter. | t C | X | X | NA | Based on the Tool CDM *AR-Tool 12.*<br><br>Obtained from field measurements, national inventories, or IPCC sources. | When the CCMP is validated and revalidated.<br><br>Review at each verification event. | Implicit in equations 8, 9, 28, and 29. |
| $CF_{Litter}$ | Carbon fraction of shrub biomass. | t C / t d.m. | X | X | X | Based on the Tool CDM *AR-Tool 12.*<br><br>Default value supported by the IPCC (0.37). However, it may come from field measurements, scientific literature, or well-supported estimates. | When the CCMP is validated and revalidated.<br><br>Review at each verification event. | Implicit in equations 8, 9, 28, and 29. |
| $BEF$ | Biomass Expansion Factor. | Dimensionless | X | X | X | Obtained from field measurements, national inventories, or IPCC sources. | When the CCMP is validated and revalidated.<br><br>Review at each verification event. | Implicit in equations 8, 9, 28, and 29. |
| $DBH_n$ | Diameter at breast height of a given tree species. | Meters | X | X | X | Obtained from field measurements, national inventories, or IPCC sources such as the GPG LULUCF 2003. | When the CCMP is validated and revalidated.<br><br>Review at each verification event. | Implicit in equations 8, 9, 28, and 29. |
| $D_n$ | Basic wood density of a given species. | t d.m. $m^{-3}$ | X | X | X | Obtained from field measurements, national inventories, or | When the CCMP is validated and revalidated. | Implicit in equations 8, 9, 28, and 29. |

| Variable/parameter/data | | Unit | Segment* | | | Data origin and measurement procedure | Frequency | Equation number |
|---|---|---|---|---|---|---|---|---|
| | | | R | FR | WAC | | | |
| | | | | | | IPCC sources such as the GPG LULUCF 2003. | Review at each verification event. In each verification event. | |
| $SOC$ | Soil Organic Carbon stock. | t C / ha | X | X | X | Based on the Tool CDM *AR-Tool 16.*<br><br>Default values from the IPCC or obtained from field measurements, laboratory analysis, or high-precision technological tools. | When the CCMP is validated and revalidated.<br><br>Review at each verification event. | Implicit in equations 8, 9, 28, and 29. |
| $A_{Burn,s,t}$ | Burned or fire-affected area in segment ***s*** during year ***t***. | ha | X | X | X | Based on the Tool CDM *AR-Tool 08.*<br><br>Field data corresponding to the CCMP. Obtained from field measurements using remote sensing. | When the CCMP is validated and revalidated.<br><br>In each verification event, depending on the occurrence and project activity generating the source. | Implicit in equations 15, 16, 31 and 32. |
| $EF_{CH4}$ | $CH_4$ emission factor in segment ***s*** (burned or fire-affected) during year ***t***. | g $CH_4$ / k d.m. | X | X | X | Based on the Tool CDM *AR-Tool 08.*<br><br>Field data corresponding to the CCMP. Obtained from field measurements, national or subnational inventories, or IPCC default values. | When the CCMP is validated and revalidated.<br><br>In each verification event, depending on the occurrence and project activity generating the source. | Implicit in equations 15, 16, 31, and 32. |

| Variable/parameter/data | | Unit | Segment* | | | Data origin and measurement procedure | Frequency | Equation number |
|---|---|---|---|---|---|---|---|---|
| | | | R | FR | WAC | | | |
| $EF_{N2O}$ | $N_2O$ emission factor in segment ***s*** (burned or fire-affected) during year ***t***. | g $N_2O$ / k d.m. | X | X | X | Based on the Tool CDM *AR-Tool 08.*<br><br>Field data corresponding to the CCMP. Obtained from field measurements, national or sub-national inventories, or IPCC default values. | When the CCMP is validated and revalidated.<br><br>In each verification event, depending on the occurrence and project activity generating the source. | Implicit in equations 15, 16, 31, and 32. |
| $GWP_{CH4}$ | Global Warming Potential of $CH_4$. | Dimensionless | X | X | X | Based on the Tool CDM *AR-Tool 08.*<br><br>Field data corresponding to the CCMP. Default value to be used as per the latest IPCC report or Cercarbono guidelines. | When the CCMP is validated and revalidated.<br><br>In each verification event, depending on the occurrence and project activity generating the source. | Implicit in equations 15, 16, 31, and 32. |
| $GWP_{N2O}$ | Global Warming Potential of $N_2O$. | Dimensionless | X | X | X | Based on the Tool CDM *AR-Tool 08.*<br><br>Field data corresponding to the CCMP. Default value to be used as per the latest IPCC report or Cercarbono guidelines. | When the CCMP is validated and revalidated.<br><br>In each verification event, depending on the occurrence and project activity generating the source. | Implicit in equations 15, 16, 19, 31, 32 and 35. |
| $COMF_S$ | Combustion factor for segment ***s***. | Dimensionless | X | X | X | Based on the Tool CDM *AR-Tool 08.* | When the CCMP is validated and revalidated. | Implicit in equations 15, |

| Variable/parameter/data | | Unit | Segment* | | | Data origin and measurement procedure | Frequency | Equation number |
|---|---|---|---|---|---|---|---|---|
| | | | R | FR | WAC | | | |
| | | | | | | Field data corresponding to the CCMP. Default value to be used as per the latest IPCC report or Cercarbono guidelines. | In each verification event, depending on the occurrence and project activity generating the source. | 16, 31, and 32. |
| $B_{Harvest,t}$ | Harvested biomass that will be burned to clear crop residues before planting in year ***t***. | t d.m. | NA | NA | X | Based on the Tool CDM *AR-Tool 08.*<br><br>Field data corresponding to the CCMP. Obtained from field measurements, national or subnational inventories, or IPCC default values. | Continuous monitoring, reporting as it occurs. | Implicit in equations 15, 16, 31, and 32. |
| $FNS_{s,t}$ | Annual amount of nitrogen from synthetic fertilizers applied in segment ***s*** during year ***t***. | t N | NA | NA | X | Monitoring of inventories, purchase orders, or CCMP activity planning. | Annual monitoring, reporting in each verification event. | Equations 19 and 35. |
| $FNO_{f,t}$ | Annual amount of nitrogen from organic fertilizers applied in segment *s* during year ***t***. | t N | NA | NA | X | Monitoring of inventories, purchase orders, or CCMP activity planning. | Annual monitoring, reporting in each verification event. | Equations 19 and 35. |
| $FEN$ | $N_2O$ emission factor for nitrogen input. | kg $CO_2e$ / kg N | NA | NA | X | Monitoring of inventories, purchase orders, or CCMP activity planning.<br><br>Default values to be used according to the latest IPCC report or officially available national data. | Annual monitoring, reporting in each verification event. | Equations 19 and 35. |
| $TC$ | Total number of fossil fuels used in agricultural machinery in the woody agricultural crops segment, in | Number of fossil fuel types | NA | NA | X | Monitoring of fuel consumption in the CCMP. Obtained from field measurements or national or subnational inventories. | Continuous monitoring, reporting in each verification event. | Equations 20, 21, 36, and 37. |

| Variable/parameter/data | | Unit | Segment* | | | Data origin and measurement procedure | Frequency | Equation number |
|---|---|---|---|---|---|---|---|---|
| | | | R | FR | WAC | | | |
| | the corresponding project or reassessment scenario. | | | | | | | |
| $KCC_{p,m,s,t}$ | Emission factor for the combustion of fossil fuel type ***m*** consumed in segment **s** during year ***t***. | t $CO_2e$ / unit of fuel mass or volume | NA | NA | X | Based on the Tool CDM *AR-Tool 03.*<br><br>Monitoring of fuel consumption in the CCMP. Obtained from field measurements or national or subnational inventories. | Continuous monitoring, reporting in each verification event. | Equations 20, 21, 36, and 37. |
| $CC_{m,s,t}$ | Quantity of fossil fuel type ***m*** consumed in segment ***s*** during year ***t***. | l or gal | NA | NA | X | Based on the Tool CDM *AR-Tool 03.*<br><br>Monitoring of fuel consumption in the CCMP. Obtained from fuel consumption logs or equivalent records linked to company accounting. | Continuous monitoring, reporting in each verification event. | Equations 20, 21, 36 and 37. |
| $W_{m,s,t}$ | Weighted average mass fraction of carbon in fuel type ***m*** during year ***t***. | t C / unit of fuel mass | NA | NA | X | Based on the Tool CDM *AR-Tool 03.*<br><br>Monitoring of fuel consumption in the CCMP. Obtained from field measurements, provided in fuel invoices or national or subnational inventories. | Continuous monitoring, reporting in each verification event. | Equations 20, 21, 36 and 37. |
| $W_{m,s,t}$ | Weighted average density of fuel type ***m*** during year ***t***. | Unit of mass / unit of fuel volume | NA | NA | X | Based on the Tool CDM *AR-Tool 03.*<br><br>Monitoring of fuel consumption in the CCMP. Obtained from field measurements, provided in fuel invoices or national or subnational inventories. | Continuous monitoring, reporting in each verification event. | Implicit in equations 20, 21, 36 and 37. |
| $ADA_t$ | Land area to which agricultural activities are dis- | ha | X | X | X | Field measurements through remote sensing. | When the CCMP is validated and revalidated. | Implicit in equations 40 and 41. |

| Variable/parameter/data | | Unit | Segment* | | | Data origin and measurement procedure | Frequency | Equation number |
|---|---|---|---|---|---|---|---|---|
| | | | R | FR | WAC | | | |
| | placed due to the implementation of the CCMP in year ***t***. | | | | | | In each verification event, as it occurs. | |
| $LK_{Livestock,t}$ | Leakages from livestock displacement attributed to the implementation of the CCMP in year ***t*** in the project scenario or its reassessment. | t $CO_2e$ | X | X | X | Based on the Tool CDM *AR-Tool 15.*<br><br>Obtained from field measurements or national or subnational inventories.<br>Based on the Tool CDM AR-Tool 15. | In each verification event, as it occurs.<br><br>From the first five years of implementation and three years after area incorporation. | Implicit in equations 40 and 41. |
| $LK_{AG,t}$ | Leakages from the displacement of agricultural activities attributed to the implementation of the CCMP in year ***t*** in the project scenario or its reassessment. | t $CO_2e$ | X | X | X | Obtained from field measurements or national or subnational inventories. | In each verification event, as it occurs.<br><br>From the first five years of implementation and three years after area incorporation. | Implicit in equations 40 and 41. |

R: Reforestation; FR: Forest Restoration; and WAC: Woody Agricultural Crops.
NA: does not apply.

## 15 Stakeholder consultation

Stakeholder consultation in this methodology must be carried out in accordance with the guidelines described in the section: ***Public consultation of CCMPs*** of the ***Cercarbono's Protocol*** and in the applicable reference documents.

All records and results of the public consultation process must be uploaded to the EcoRegistry platform, where they will be duly stored.

Additionally, the requirements on this matter outlined in the current ***Safeguarding Principles and Procedures of Cercarbono's Certification Programme*** document of the Cercarbono certification program must be observed.

## 16 Effective participation

CCMP must identify local or ethnic communities present in the project area or those that may be directly affected by the implementation of the CCMP and guarantee full and effective participation with the legal mandates governing such procedures and in alignment with the rights of ethnic minorities.

CCMP must comply with the provisions on effective participation outlined in the current ***Safeguarding Principles and Procedures of Cercarbono's Certification Programme*** document of the Cercarbono certification program.

## 17 Information management

The CCMP holder must establish and apply quality management procedures in accordance with the principles of this methodology to receive, manage and control data, databases and information, including uncertainty assessment, relevant to baseline and project scenarios and monitoring activities[32].

The CCMP holder should reduce, as much as possible, uncertainties related to the quantification of GHG removals. Detected errors or omissions must be identified and addressed appropriately, with documentary evidence should be generated and maintained.

The CCMP holder must apply tracking criteria and procedures to conduct consistent reviews or audits to ensure the accuracy of the quantification of GHG removals, in accordance with the monitoring plan.

When monitoring and measuring equipment is used, the CCMP holder must ensure that calibrated or verified equipment is used and maintained as appropriate.

All data and information related to CCMP monitoring must be recorded and documented.

[32] CCMP holder can apply the principles of ISO 9001 and ISO 14033 for data quality management.

### 17.1 Data, model and parameter quality management

To ensure the quality of baseline and project scenario estimates, as well as monitoring calculations, the CCMP must consider the following guidelines:

- **Academic and scientific support:** Use parameters and models supported by properly substantiated developments based on recognized academic or scientific procedures, or from acknowledged academic or scientific sources. Data and parameters from the latest version of the Good Practice Guidance (GPG) of the Intergovernmental Panel on Climate Change (IPCC), or earlier versions if their use is technically justified, may be used, following its recommendations.
- **Data accuracy:** Ensure reliable measurements using calibrated technological tools or instruments and trained personnel.
- **Representativeness:** Ensure that the sampled plots are representative of the total area.
- **Up-to-date:** Keep relevant data up to date and revise it periodically.
- **Validation:** Use field data to validate the models and parameters applied.
- **Statistics:** Apply appropriate statistical techniques to estimate errors and confidence levels.
- **Scale:** Ensure models are applied to the correct spatial and temporal scale.
- **Consistency:** Maintain consistency in methodologies and definitions used over time.
- **Transparency:** Document all phases of the inventory to allow for future audits and improvements.

### 17.2 Mapping quality management

To ensure traceability of the eligible areas within the geographic boundaries of the CCMP, cartographic information can include details for each management unit (such as the year of establishment, species, area in hectares, planting density, holder), considering what is established in the ***Guidelines for Mapping Presentation and Analysis***.

## 18 CCMP documentation

All documentation and records generated to demonstrate that the CCMP activity has been implemented as designed or reassessed (supported by the PDD and relevant updates) or as implemented (supported by the monitoring report) must be retained. Any deviation of the implementation relative to the design must be technically justified, ensuring compliance with the guidelines, conditions and procedures of this methodology.

The CCMP holder shall maintain documentation demonstrating the GHG project's conformity with the requirements of this document. This documentation must be consistent with the validation and verification needs of Cercarbono's carbon programme.

## 19 Transition regime for the use of other methodologies

Since the Cercarbono certification program allows the use of methodologies available from other carbon programs or standards, a transition regime must be considered between the methodology or guideline initially used and the current methodology. This regime will take

into account the progress of the CCMP within the project cycle defined by Cercarbono, composed of five stages (as referenced in the current version of the Protocol). Based on the stage of the CCMP, the following should be considered:

- If the CCMP is at Stages 1 and 2 (formulation and public comment), the CCMP must fully integrate the present methodology.
- If the CCMP is in Stages 3, 4, and 5 (validation, verification, and certification), the CCMP may implement the methodology it initially chose from the non-Cercarbono program if it is current and authorized by Cercarbono; otherwise, it must use the present methodology. In these stages, credits will be issued based on the methodology initially selected (from the non-Cercarbono program).

## 20 CCMP validation and verification

The requirements for validation and verification processes, in addition to the technical guidelines of this methodology, are outlined in the current version of the ***Cercarbono's Protocol*** and in the ***Procedures*** document or other applicable supporting documents.

## 21 References

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## 22 Document history

| Version | Date | Comments or changes |
|---|---|---|
| 1.0 | 01.10.2021 | Initial version of the document open for public consultation from 01.10.2021 to 31.10.2021. |
| 1.1 | 25.11.2021 | Final version after public consultation. This version was developed jointly by Forest Consulting Group. |
| 2.0 | 16.01.2023 | Updated version in which all its content has been reviewed and modified and is subject to evaluation by an independent third party. |
| 2.1 | 26.07.2024 | Updated version with comments from the third-party evaluation and which is put up for public consultation. |
| 2.2 | 04.03.2025 | Final version after public consultation and final review by an independent third party.<br>Change the title Methodology M/UT/F-A02 For the Implementation of GHG Removal Projects through Reforestation, Forest Restoration, and Woody Agricultural Crops Establishment, to: CC-CM-LU -002 Integrated methodology Reforestation, Forest Restoration and Establishment of Woody Agricultural Crops. |

# Annex 1

Summary of measurement techniques related to area visualization methods.

***1. Digital preprocessing of satellite images***

To reduce atmospheric effects and generate reliable records, radiometric corrections, calibrations, and radiometric normalizations must be performed to produce comparable images and verify of forest cover changes. The preprocessing steps include:

**A. Image selection and download**

For each year in the historical period, the image catalogue of the satellite program used in each country is downloaded, selecting all images with less than 90 % cloud cover and a time window between January 1 and December 31 of the reference year, ensuring that all images from the last quarter of the year are downloaded and processed. By generating annual temporal composites of images, all "cloud" and "cloud shadow" pixels are excluded from each image. These composites allow for identifying forest surface and its changes in the reference year. When satellite data does not provide sufficient cloud-free coverage, images from sensors such as CBERS, RapidEye, ASTER, Sentinel 2, are used.

**B. Band stacking**

Each image is reconstructed by merging all bands, except those corresponding to the thermal infrared wavelength. Optionally, algorithms related to manipulation and processing may be used.

**C. Geometric correction**

For annual image composites, pixie-level co-registration is required for all images in each scene. The L1T products (surface reflectance) provided by the *Earth Resources Observation and Science Center* (EROS) usually have exact pixel alignment; however, before interpretation, each image is reviewed, and adjustments are made for those that do not meet this condition.

**D. Cloud and shadow masking**

This step masks and eliminates areas with clouds, banding, shadows, or haze. A semi-automated procedure combining results from masks produced with different tools is executed before analyzing changes.

**E. Radiometric normalization**

A process of relative radiometric normalization is performed on the images, adjusting radiometric values to reduce variability between images due to atmospheric differences, illumination, sensor calibration, geometric distortions, etc. This ensures that images from different years are comparable and that detected changes are not due to these factors.

**F. Image composite generation**

All available images for the CCMP area during each year of the historical period are used. For each observation unit (pixel), an annual time series with all valid surface reflectance data for that year is created. The main metric generated is the annual median for each spectral band, a statistic that has shown good results for change detection. Thus, each observation

unit obtains a single annual surface reflectance radiometric value in each of the radiometric bands used (Red, NIR, SWIR-1, and SWIR-2).

***2. Digital processing of satellite images***

This involves automated detection of changes in forest surface, enabling direct detection of changes in spectral response corresponding to forest cover loss or gain. Technicians then perform visual verification of the changes on the images to minimize potential errors and false detections. The result of this phase is the identification of forest cover change classes. The following steps are recommended in this process:

**A. Change detection**

A legend (following reclassification) must be assigned where the definitions of each category[33] align with those defined in the national GHG or forest inventory of the country where the project is implemented. It should include at least the following categories: 1. Stable Forest, 2. Non-stable Forest, 3. Non-Forest, and 4. No Information (corresponding to masked data due to clouds and cloud shadows).

To adjust areas without information detected for each reporting period, a time series analysis is applied to verify temporal consistency. This process considers information from the most recent reporting period to retrospectively adjust areas without information for other reporting periods.

**B. Visual verification of detected changes by the interpreter**

After processing each scene or set of scenes, each unit must be coded, resulting in a preliminary change map including the categories: 1. Stable Forest, 2. Non-stable Forest, 3. Non-Forest, and 4. No Information.

**C. Quality control and in-process adjustments**

Quality control involves tracking all execution activities, from downloading satellite images to intermediate products and final forest change maps and forest surface maps.

***3. Thematic accuracy assessment***

Evaluating the thematic accuracy of the forest surface change map generates reliability metrics for the figures produced and makes the corresponding adjustments. The steps for thematic accuracy assessment are summarized as follows:

a) Sampling design.
b) Interpretation of sampling points.
c) Error matrix and confidence intervals.
d) Calculations and reports.

Forest losses detected after one or several dates without information shall not be included in the calculation to avoid overestimated rates during periods when areas without information increase due to various factors (e.g., high cloud cover).

[33] As long as the country where the project is implemented has these definitions. Otherwise, take into account what is defined in the national GHG inventory.