CERCARBONO
Certified Carbon Standard

METHODOLOGY M/LU/F-A02

For the Implementation GHG Removal Projects Through Reforestation, Forest Restoration and the Woody Agricultural Crops Establishment

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Version 2.1

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Acronyms and abbreviations

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
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 activity(s) is implemented) and the non-eligible area.
- **Cropland:** includes cultivated lands, including rice paddies, and agroforestry systems where the vegetation structure is below the thresholds used for the forest land category.
- **Establishment of woody agricultural crops:** a set of actions that lead to the establishment of shrub or tree species of the woody type in non-forest areas, which due to this establishment, may meet the country's definition of a forest.
- **Forest:** an area of land permanently covered by trees normally, according to the parameters of area, tree cover, and minimum height of adult trees established by each country before the United Nations Framework Convention on Climate Change.
  For climate change mitigation programs or forest restoration-focused projects, areas that are part of a forest area (non-stable forest), which 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 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 aims to reestablish and conserve forest cover and ecosystem services that previously existed in a given area, without intentions of future forest exploitation.
- **Natural forest:** a forest ecosystem characterized by the presence of native woody species with varying vegetation structures and high diversity of fauna and flora. Natural forests can be classified as primary forests (without human internvention) and secondary forests (disturbed by humans and undergoing regeneration).
- **Non-eligible area:** geographic area that does not meet the characteristics to implement program or project activities according to the methodology used. CCMP only identifies it but does not intervene in it.

[1] Some terms are adapted from the del 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 right to use and own the area where the project and/or management of GHG emissions and removals is established.

- **Non-forest:** corresponds to surfaces not having forest coverage. It shall be demonstrated they have not had forest coverage for at least ten years prior to the CCMP start date. Their changes shall be recorded in the projection and in the monitoring periods. It includes areas implemented in areas with agricultural activities (tree plantations in agricultural production systems, e.g., in fruit plantations and agroforestry systems), grasslands, settlements, among others.
- **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 included in some category of forest territorial ordinance according to the country's regulation. It shall be demonstrated they have not been stable forests 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 through planting, seeding, and/or the human-induced promotion of natural seed sources.
- **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:** an area or portions of areas that make up a segment (program or project activities) within the areas categorized as strata (non-stable forest and non-forest), present in the project or program, allowing them to be considered as a unit for analysis, calculations, inventories, monitoring, or management purposes, among others.
- **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), for example ploughing, ripping, scarification, digging of pits and trenches, stump removal, among others.
- **Stable forest:** corresponds to the surface covered by natural forest (primary type) from start (t1) to end (t2) of the historical, projection and monitoring period. It shall be demonstrated it has been a natural forest for at least ten years prior to CCMP start date.
- **Stratum:** in climate change mitigation programs or projects in the land use sector, a stratum is a set of areas that share certain common features, allowing for area classification within the CCMP.
- **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 very 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. Although these categories may vary from country to country, for climate change mitigation sakes, those established by the IPCC are used, which correspond with those reported in each country's national GHG inventory.

Internationally, it has been repeatedly pointed out that land use contributes directly 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 modes of production, fertilizer use and land use change, which in many cases generate degradation and desertification.

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.

There are currently numerous initiatives to promote climate change mitigation actions in these sectors and generate GHG removals and reductions of GHG emissions leading to carbon credits.

In such direction, Cercarbono developed the present methodology, focused on GHG removing through reforestation and forest restoration activities and the establishment of woody agricultural crops.

2 Principles

The principles set the basis for the generation of robust carbon credits, from initiatives that meet the ultimate objective of climate change mitigation by CCMPs focused on GHG removal through reforestation or forest restoration processes or the establishment of woody agricultural crops.

CCMPs applying this methodology shall 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 that integrate 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 during its lifetime, GHG emission sources and carbon pools relevant to the program or project, as well as quantification of net GHG removals, monitoring and necessary documentation.

Innovatively, it includes the reassessment of baseline and project scenarios to recalculate the potential for total long-term mitigation. Reassessment of baseline (especially for grouped projects) and project scenarios shall be performed when changes in net GHG removal due to the CCMP implementation occur, improving the accuracy of the estimate of such removal.

The land-use categories to be used at the CCMP level should 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 processes, or the woody agricultural crops establishment, 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, such reforestation must be established 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 agricultural woody crops, whether the lands continue to be classified as agricultural lands or they become forest lands will depend on the guidelines established at the national level.

[6] This type of species must be established in a minimum of 30 % 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 established if the rate of reforestation at the subnational or national level is greater than 5 %.

At least 30 % of the CCMP area established due to this activity must be dedicated to forest conservation throughout its useful life.

b) **Forest restoration:** corresponds to GHG removal due to the establishment of native woody species of tree and/or shrub type (including artificial or natural regeneration practices, 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.

At least 30% of the CCMP area established with this activity and during its useful life must remain with forest cover because of its implementation.

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.

GHG removal achieved by the program or project activities result from 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 the 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 woody, tree-type species, under conditions that meet the forest definition established by the country where the CCMP is implemented, aimed at conservation, production, or forestry utilization (timber).
Forest restoration	Optional	A set of actions leading to the establishment of woody tree and shrub species without future forestry utilization, 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 exploitation of one or more perennial species for scientific, economic or industrial purposes other than wood production.

*Its inclusion is dependent on the operational, technical and administrative ability of the project to manage it.

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.*
- *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.*

[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 taken into account so that their results are considered in the national accounting either as forest land, or as cropland.

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

[11] Available at https://cdm.unfccc.int.

- *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 is based on 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 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), in line with international efforts of Measurement/Monitoring, Reporting, and Verification of climate change mitigation initiatives.

4 Eligibility and inclusion requirement

4.1 Area eligibility

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

Conditions CCMP must meet are as follows:

- 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 areas where the CCMP is implemented, soil alterations (maximum 10 %), attributable to conventional soil preparation (tillage) only, are allowed. Soil inversion practice to a depth greater than 25 cm (vertical tillage) is allowed. CCMP must include zero tillage and friendly and sustainable practices in at least 90 % of the area intended for the establishment of woody species.

[12] This classification represents the minimum stratification criterion of the CCMP total area, supported by the analysis of satellite images and other guidelines contemplated in the following sections.

[13] It corresponds to other land uses having this denomination to develop reforestation or the establishment of woody agricultural crops activities.

[14] It 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.

- This methodology does not apply to wetlands or floodplains. Drainage of wet areas and flood irrigation are not permitted.
- CCMP shall not be implemented in environmental protection areas.
- Overlaps (either temporary, or geographical) with another initiative with similar scope are not allowed.
- CCMP must demonstrate ownership of the areas where it implements its activities.

All items listed above must have supporting documentation.

The retroactivity period accepted for CCMP's operations start date, is as defined in the ***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 established in ***Cercarbono's Protocol***.

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 discriminates such covers.

Eligible areas (non-forest and/or non-stable forest areas) must be determined according to the cross-referencing of information presented in a traceable manner.

Non-eligible areas, correspond to stable forest areas or non-forest areas (not considered), which must be taken out from the eligible area.

Table 2 shows the structure of how the CCMP can present information regarding eligible and non-eligible areas.

Table 2. Presentation of CCMP total area.

Item	Baseline (ha)	Project (ha)	Total
Eligible area			
Non-stable forest			
Non-forest			
Non-eligible area			
Stable forest			
Non-forest*			
CCMP total area			

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

To support area eligibility, CCMP must perform:

4.1.1 Eligibility analysis based on mapping instruments

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 from remote sensors, orthophotos, coverage maps, or land-use planning tools developed by official cartographic institutions in the country where the CCMP is implemented

are allowed. These sources must provide spatially explicit information, precise locations, and tree cover change patterns within the CCMP area. To determine coverage changes (stable forest, non-stable forest, and non-forest); implementation of methodologies, spatial scale, and minimum area measurement units generated by the forest monitoring entities of the country where the CCMP is located is considered.

CCMP must present the cartography and provide evidence of the mapping using reliable information sources such as satellites, drones, or the Global Positioning System (GPS)[15], proportional to the CCMP's scale. The use of images captured by drones to estimate coverage changes during the project period is also allowed.

The collection and analysis of mapping information must follow the guidelines defined by Standard ISO 19157:2023 or by the official mapping institution of the country where the CCMP is implemented.

The CCMP's 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 according to the size of the discrete areas included and the total area of the CCMP must be considered.

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

The unit for the management of agricultural activities is the lot (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, which may be separated by a characteristic of the terrain (power line, forest road, water network, protection zones, among others), provided such separation is not greater than 20 meters between the 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 ha).

4.1.1.2 Raster Data

Raster data information 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

The sources of vector data used must be identified, described, and supported. If image vectorization is required, the procedure used must be documented.

[15] 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.

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

4.1.2 Identification and classification of areas

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

The first step in project area classification is the preliminary analysis, which establishes a region where stable forest cover and its changes (non-stable forest or non-forest) are analyzed over a period of ten years or more. This region serves as a transitional instrument to confirm stable forest areas, non-stable forest, and non-forest areas, as well as the project activities a CCMP can include.

The documentation used for the analysis shall consider the entire area to be included in the CCMP, and the existing covers at the analysis date must be substantiated. The mapping interpretation should be supplemented to support the covers at the CCMP start date and those at the time of legal support.

If coverage information for the project area is unavailable, it is recommended to quantify activity data according to the steps 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 as long as they are technically justified and supported.

Therefore, a methodology that allows for clear classification of the areas present in the CCMP must be applied. Some key elements to consider in the classification of the areas present in the CCMP, as established by Galindo *et al*. (2014), are described in ***Annex 1***.

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

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

CCMP should conduct a comparative analysis of the land use guidelines resulting from land use or territorial planning, the formulated programs, and the project activities. This comparison should be descriptive and demonstrate the geographical compatibility of the activities. For each CCMP action, it should be reported under which land use or planning framework it is developed and describe how it aligns with official institutional efforts.

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

4.3 Ownership

CCMP must demonstrate the capacity to act on the CCMP areas or obtain express authorization from the current holder or legal representative (both in the preparation of the PDD, and during the monitoring periods that generate mitigation results), individually, publicly, or

collectively, of the property or boundary(ies) in which the CCMP is intended to be carried out[16].

For privately owned properties, explicit authorization from the holder, possessor, or 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.

Ownership of GHG removals between interested parties must be evidenced; that is, participation, claim, or transfer of rights over GHG removals must be supported by a signed document between the parties.

In areas where farmers, indigenous people or other groups are established, the property must comply with the current regulatory legal framework or the one that this or Cercarbono incorporates in the future.

4.4 CCMP general objective

CCMP objective shall be described in the PDD, focusing on the main positive impact expected from the implementation of its activities and the expected mitigation potential.

It shall also include, at a minimum, the main activity, geographical location of the project activities' implementation, actors involved, and the period of performance of the project activities.

5 Additionality

Additionality in this methodology shall be demonstrated by applying the current version of ***Cercarbono's Tool to Demonstrate Additionality of Climate Change Mitigation Initiatives***.

6 CCMP delimitation

CCMP delimitation requires the definition of the different elements specifying its geographical and temporal scope, activities, emission sources and carbon pools. Some of these elements are definitely established for the CCMP validation and cannot be modified (start date and duration, activities (segments), emission sources and carbon pools considered), although others can be modified due to implementation changes (addition of areas or participants, spatial limits of the segments).

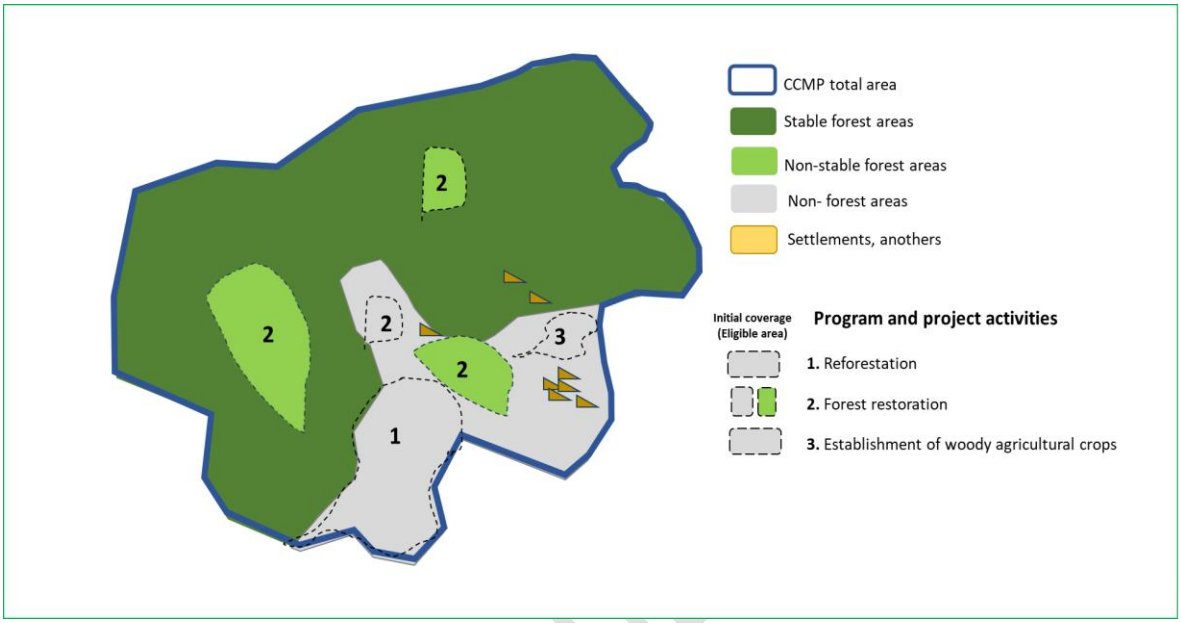
6.1 Spatial boundaries - Initial definition

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

[16] 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.

- **CCMP total area:** the area in which the CCMP can be implemented. This area is where the initial classification takes place to identify the strata that make up the eligible areas (non-stable forest and non-forest) and the non-eligible areas (stable forest and non-forest).

Figure 1. Example spatial delimitation of the CCMP total area, which integrates all the strata of 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 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 should contain the following three spatial typologies: strata, segments, and segment components:

– **Strata** represent the eligible areas in which the CCMP can be implemented, i.e. the areas of non-stable forest and non-forest, obtained 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 restoration or establishment of woody agricultural crops) will be carried out. Each segment must be in the eligible area of the CCMP and in turn can be 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.

– **Segment components** are portions of area that make up 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 that can be restored (in the forest restoration segment), grouped by 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.

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 re-validated. 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 have been identified (see ***Table 3***), the different segments that will be considered by the CCMP must be selected.

Table 3. Strata combinations representing the CCMP eligible area.

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)		
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 interacts with other methodologies 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 limits of the CCMP are presented in the following table:

Table 4. Variables related to the definition of CCMP spatial limits.

Variable	Description	Units	Segment		
			R*	FR*	WAC*
TSA	Total segment area ***s*** in the baseline and project scenarios or their reassessment.	ha	X	X	X

ASC_f	Area of segment component ***f*** of segment ***s*** in the baseline and project scenarios or their reassessment.	ha	X	X	X
NSCS	Number of segment components of segment ***s*** in the baseline and project scenarios or their reassessment.	Number	X	X	X

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

6.2 Program or project activities considered - Segments

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 called: reforestation, forest restoration and woody agricultural crops. A CCMP may include one or various types of segments, based on the initial classification of areas and according to their 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.

6.3 Temporary limits

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:

- **CMP start date (day.month.year):** date on which the first direct action is implemented in the program or project area leading to mitigation results, i.e., the date on which GHG removals from on-the-ground actions are initiated.
- **Historical period**[17]: period (in years) not less than ten years prior to the start date of the CCMP, in which the covers (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 that of the start date of the CCMP, covering its total duration. The baseline must be assessed by the CCMP's holder every 5 years, verifying its initial consistency.
- **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

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

removals are carried out. The duration of this period is equal to the duration of the CCMP accreditation period**.**

- **CCMP duration or useful life:** period (in years) between the start of project actions in the territory and the expected effect of these on reforestation, restoration or implementation of woody agricultural crops activities. CCMP duration must be equal to or greater than 30 years (day.month.year to day.month.year).
- **Verification times:** periods 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. 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 will be the same for the baseline and project scenarios and the reassessment of said scenarios.

6.4 Carbon pools

Carbon pools included in a CCMP are those significant ones that may be 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 the baseline scenario and that are likely to significantly change due to the CCMP implementation, as presented in the following table:

Table 5. Carbon pools.

Activity / Carbon pool	Reforestation	Forest restoration	Woody agricultural crops	Justification
Aboveground tree biomass (***Atree***)	Yes	Yes	Yes	Main carbon pool.
Belowground tree biomass (***Btree***)	Yes	Yes	Yes	Main carbon pool.
Aboveground shrub biomass (***AShrub***)*	No	Optional	Optional	They may be conservatively excluded.
Deadwood (***Dw***)	No	Optional	No	
Litter (***L***)	No	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. Aboveground shrub biomass is optional in the forest restoration and woody agricultural crops segments, if considered, should be included in both the baseline and project scenarios. Deadwood and litter can only optionally be included in the forest restoration segment, but if considered, must be included in this segment in both baseline and project scenarios. Soil organic carbon is optional for all segments, but if considered, it must be included in all segments of baseline and project scenarios.

If the estimate for carbon stock in carbon pools changes 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***.

6.5 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 6. GHG emission sources considered.

Emission source		Baseline scenario	Project scenario	Justification
Reforestation and forest restoration				
Fires				
	CO_2	No	No	Considered in carbon stock calculations.
	Non-CO_2	No	Yes	Conservatively excluded in the baseline scenario. 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.
Use of synthetic and organic fertilizers				
	N_2O	No	No	Nitrification/denitrification of fertilizers and organic supplements applied to soils. Conservatively excluded.
	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. 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. In the project scenario, only if permitted by law.
Use of synthetic and organic fertilizers				
	N_2O	No	Yes	Nitrification/denitrification of fertilizers and organic supplements applied to soils. 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	No	Yes	Main GHG of this emission source.
	Non-CO_2	No	Yes	Potentially very low emission.

Emission source		Baseline scenario	Project scenario	Justification
				Conservatively excluded in the baseline scenario. In the project scenario it must be included.

Fires are conservatively excluded from the baseline scenario and its reassessments but are included in **all** segments of the project scenario and its reassessments.

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 woody agricultural crops or the type of plantation to be implemented. In the project scenario, burning can only be used if permitted by law, in which case they must be estimated according to the guidelines explained in ***Section 7.2.2***.

Fertilizer use is conservatively excluded from the baseline scenario and its reassessments but is included in **all** segments (when applicable) of the project scenario and its reassessments.

6.5.1 GHG emissions from biomass burning and fires

In reforestation and forest restoration processes, burning for soil preparation or crop harvesting is not permitted. Although burning could occur in the baseline scenario, it is conservatively excluded for these segments.

In the case of woody agricultural crops, it is possible to consider controlled burns for site preparation and crop harvesting, if allowed by law; otherwise, these activities should not be considered, even if they occur in the baseline scenario.

Estimate for this emission source may undergo changes due to a different CCMP implementation than that presented during validation, in which case a reassessment of the baseline or project scenario is required. This estimate is presented in ***Sections 7.2.1***, ***7.2.2***, ***8.2.1*** and ***8.2.2***.

6.5.2 GHG emissions from fertilizer use

GHG emissions associated with fertilizer use are contemplated only in the woody agricultural crops segment.

Estimate of this emission source may undergo changes due to a different CCMP implementation than that presented during validation, in which case a reassessment of the baseline or project scenario is required. This estimate is presented in ***Section 7.2.3***.

6.5.3 GHG emissions from consumption of fossil fuels in agricultural machinery

GHG emissions from fossil fuel consumption in agricultural machinery are considered only in the segment of woody agricultural crops, for the project scenario.

Estimate of this emission source may undergo changes due to a different CCMP implementation than the one presented during validation, in which case reassessment of the project scenario is required. This estimate is presented in ***Section 7.2.4***.

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

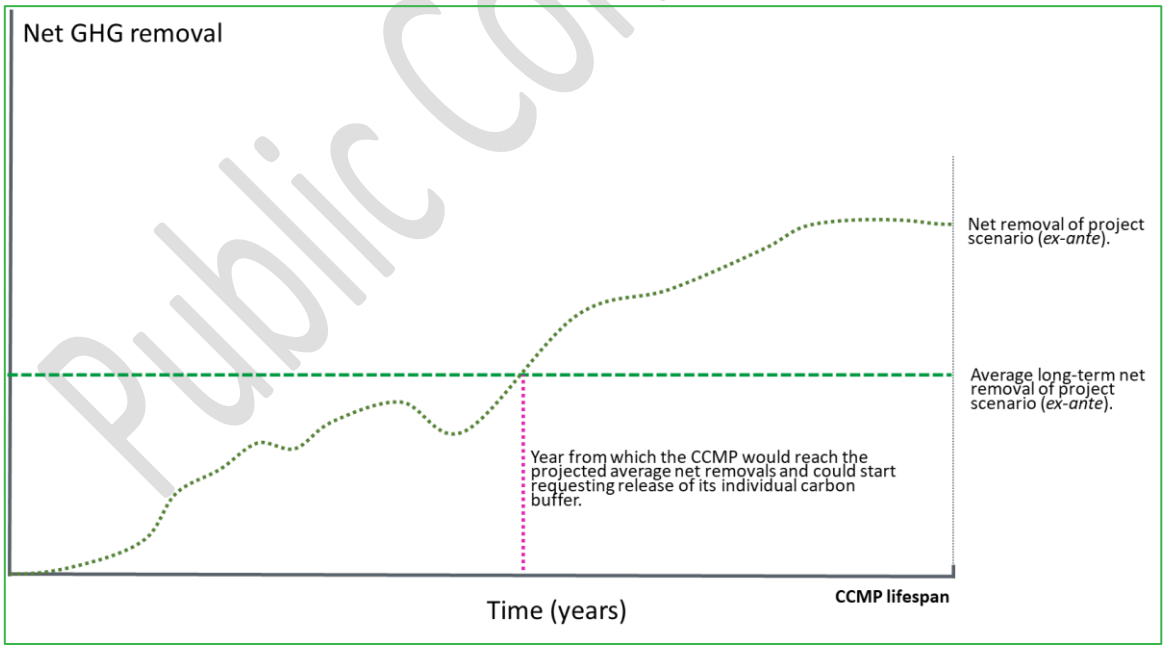
As mentioned, the segments represent the different activities that are eligible in this methodology. They should be projected in the project scenario and implemented in the field. The segments, their initial specific areas or the initial corresponding segment units should be defined from the CCMP design.

For each CCMP segment, it is necessary to estimate the net GHG removals that would occur in the baseline and project scenarios during its lifetime and to re-evaluate these scenarios (when required), 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 presents a generic project scenario with its corresponding estimate of net carbon accumulated over the CCMP implementation period, 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***.

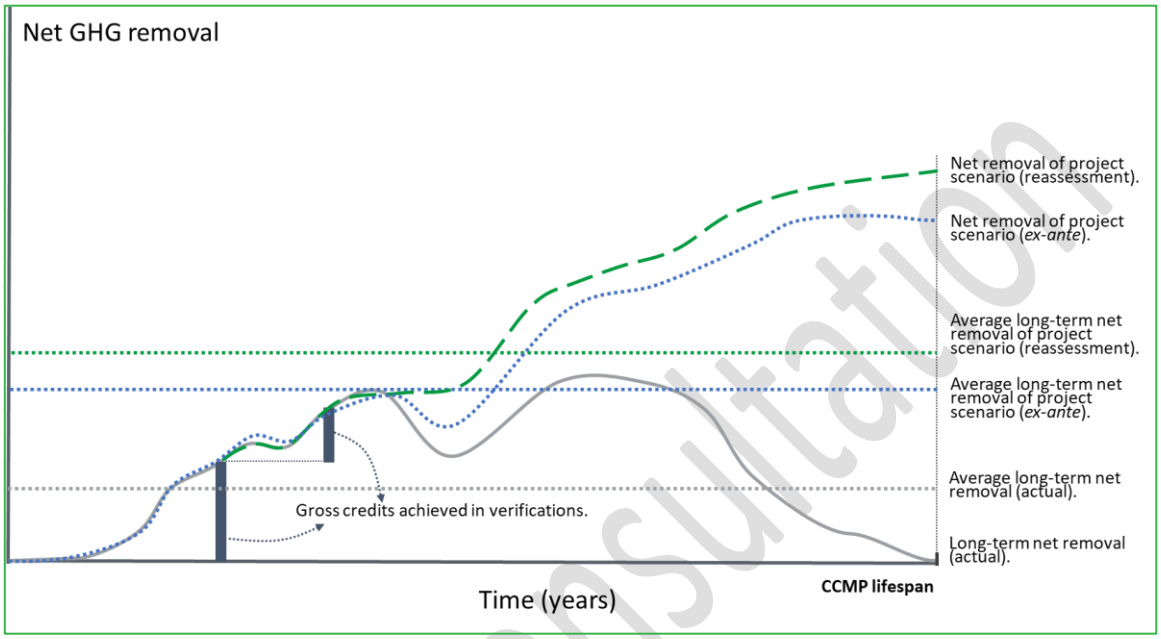
Figure 2. Representation of a generic project scenario and its long-term average net removal.



However, 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 average 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 lines in ***Figure 3*** in the case of the project scenario), or it could decrease with respect to what was initially planned, and even to what was reprojected during a previous verification, as shown by the green lines in the same figure[18].

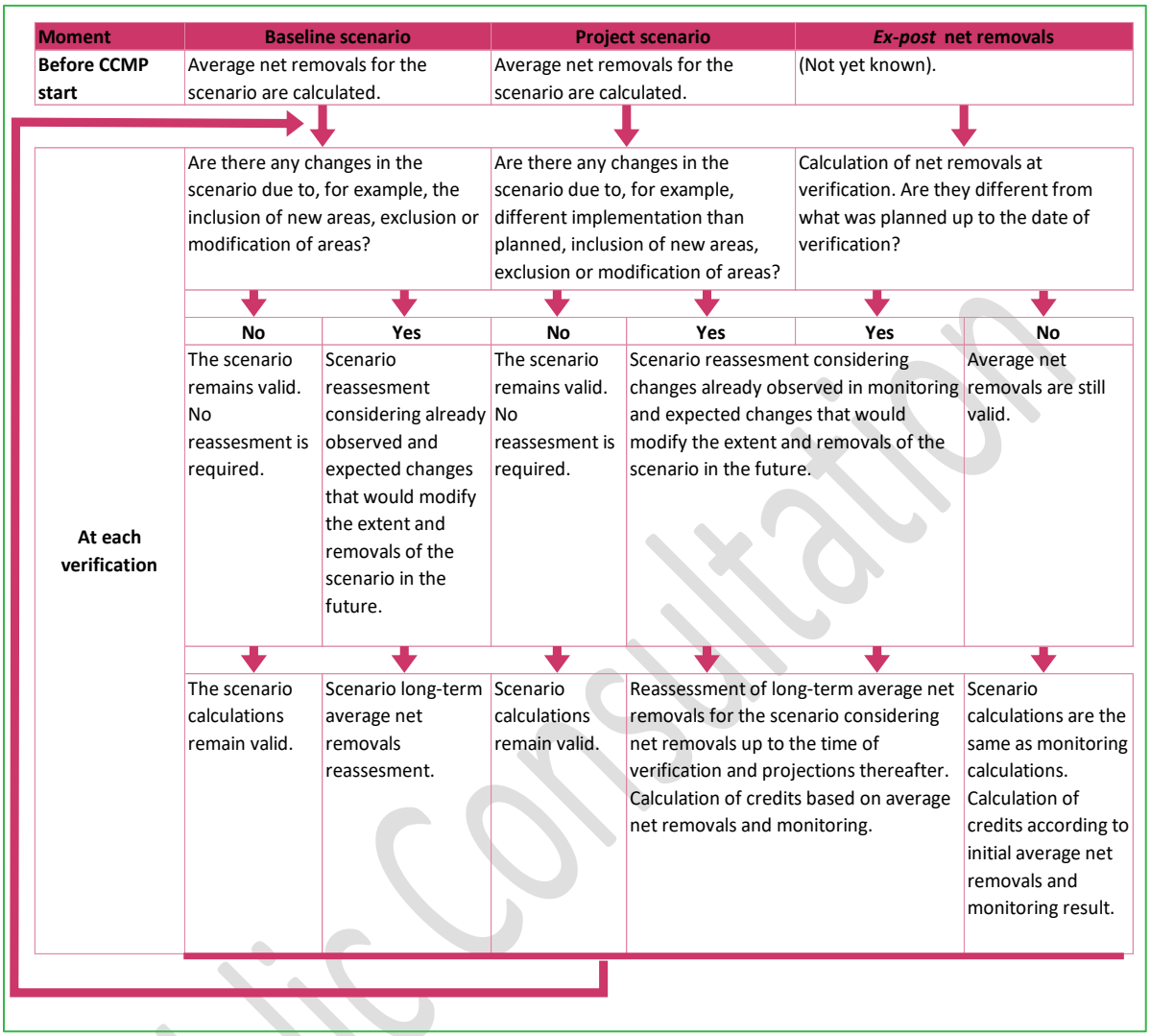
Figure 3. Representation of two possible reassessments of the CCMP project scenario with the inclusion of additional areas from the first verification and subsequent decline of the CCMP in the long term.



If the expected net removals from the CCMP change from those initially projected in the PDD, a reassessment of the baseline or project scenarios will be necessary, since it is the project's net removals that determine the point at which the release of the individual CCMP carbon pool is 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 4***.

[18] The average percent decrease in net carbon in the baseline scenario must not exceed 20 % of the total initially established, nor can the increase in average net carbon exceed 20 % of the total established in the project scenario.

Figure 4. Calculation cycle of baseline and project scenarios and their reassessment due to differences in implementation from that planned.



7 Baseline scenario

CCMP must realistically and credibly identify land use scenarios that would have occurred in the areas in the absence of the program or project activity within the proposed project boundary (eligible areas), considering relevant national and/or sectoral policies and circumstances regarding land use or land use change or socio-economic trends over the areas in which the CCMP will be implemented.

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

The stratification criterion used for the baseline scenario is land cover, and additional stratification criteria (either higher or lower hierarchy) such as region, climate, among others, may be used, provided their use is justified.

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

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 5*** and ***Table 6***, accordingly.

Eligible coverages of the baseline scenario of the areas to be intervened are presented in ***Table 7***. The biomass and carbon contents of these coverages can be taken from the IPCC or from national forest inventories applicable to the country where the CCMP is to be developed, considering the most recent versions and the most conservative and least uncertain values. CCMP can determine its own parameters and data, provided they are consistent with the methodologies reported by these sources.

Following, eligible and non-eligible land coverages where each program or project activity (segment) may or may not be implemented are presented. Additionally, coverage as defined in the country in which the CCMP is implemented shall be considered.

Table 7. Eligible and non-eligible coverages in the baseline scenario.

Eligible coverages	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 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 crops	Woody agricultural crops
Short cycle crops	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.

7.1 Carbon stock estimation

Carbon stocks in carbon pools are estimated separately for each of the segments.

Calculations are required for the baseline scenario.

When required, especially when established in legal regulations, sectoral technical documentation or international carbon market guidelines, a reassessment of this scenario must be carried out. The reassessment of the baseline scenario must tend towards determining conservative baselines.

The sum of the three segments will constitute the total carbon stocks in carbon pools in the baseline scenario or its reassessment, as shown in the following equation:

$$Rcp_{BL,t} = \sum_{s=1}^{Ns\_BL} Rcp_{BL,s,t} \qquad \textit{Equation 1}$$

Variable	Description	Units	Segment		
			R	FR	WAC
$Rcp_{BL,t}$	Total removals by carbon pools in all segments in year ***t***, in the baseline scenario or its corresponding reassessment.	tCO_2e/ha	X	X	X
$Rcp_{BL,s,t}$	Removals by carbon pools in the segment ***s,*** in year ***t***, in the baseline scenario or its corresponding reassessment.	tCO_2e/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		
t	CCMP year index.	NA	X		
Ns_BL	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	X		

NA: Not applicable.

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

For a ***s*** segment and given ***t*** year, the carbon stocks in the carbon pools of a segment component in the baseline scenario and its reassessment are calculated according to the following equation (considering that the deadwood and litter can only be included in the restoration segment):

$$Rcp_{BL,s,t} = \sum_{f=1}^{NSCS\_BL} (\Delta CAtree_{BL,f,s,t} + \Delta CBtree_{BL,f,s,t} + \Delta CAshrub_{BL,f,s,t} + \Delta CDw_{BL,f,s,t} + \Delta CL_{BL,f,s,t} + \Delta CSoc_{BL,f,s,t}) \qquad \textit{Equation 2}$$

In baseline scenario reassessments, the values of the different carbon pools (***Atree***, ***Btree***, ***Ashrub***, ***Dw***, ***L***, and ***Cos***) come from models, national data, study data, or extrapolations.

Variable	Description	Units	Segment		
			R	FR	WAC
$Rcp_{BL,s,t}$	Carbon pool removals in segment ***s***, in year ***t***, in the baseline scenario or its corresponding reassessment.	tCO_2e/ha	X	X	X
$\Delta C_{Atree_{BL,f,s,t}}$	Change in carbon stock in aboveground tree biomass from segment component ***f***, of segment ***s***, in year ***t***, in the baseline or its corresponding reassessment.	tCO_2e/ha	X	X	X
$\Delta C_{Btree_{BL,f,s,t}}$	Change in carbon stock in belowground tree biomass from ***f*** segment component of ***s*** segment in year ***t***, in the baseline or its corresponding reassessment.	tCO_2e/ha	X	X	X
$\Delta C_{Ashrub_{BL,f,s,t}}$	Change in carbon stock in aboveground shrub biomass from segment component ***f*** of segment ***s***, in year ***t***, in the baseline or its corresponding reassessment.	tCO_2e/ha	NA	X	X
$\Delta C_{Dw_{BL,f,s,t}}$	Change in carbon stock in deadwood from segment component ***f*** of segment ***s***, in year ***t***, in the baseline or its corresponding reassessment.	tCO_2e/ha	NA	X	NA
$\Delta C_{L_{BL,f,s,t}}$	Change in carbon stock in litter from segment component ***f*** of segment ***s***, in year ***t***, in the baseline scenario or its corresponding reassessment.	tCO_2e/ha	NA	X	NA
$\Delta C_{Soc_{BL,f,s,t}}$	Change in carbon stock in Soil organic carbon from segment component ***f***, of segment ***s***, in year ***t***, in the baseline scenario or its corresponding reassessment.	tCO_2e/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		
f	Index of the component segment of segment ***s*** in the baseline scenario or its reassessment.	NA	X	X	X
t	CCMP year index.	NA	X		
NSCS_BL	Total number of segment components of segment ***s*** in the baseline scenario its corresponding reassessment.	Segment components count	X	X	X

NA: Not applicable.

Equation 2 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 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 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 estimated according to the following equation:

$$E_{BL} = \sum_{s=1}^{Ns} EB_{BL,s,t} \qquad \textit{Equation 3}$$

Variable	Description	Units	Segment		
			R	FR	WAC
E_{BL}	Total GHG emissions by sources in the baseline scenario or its corresponding reassessment.	tCO_2e	NA	NA	X
$EB_{BL,s,t}$	Non-CO_2 GHG emissions from burning of segment ***s***, in year ***t***, in the baseline scenario or its corresponding reassessment.	tCO_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

NA: Not applicable.

7.2.1 GHG emissions from fires

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

7.2.2 GHG emissions from burning

GHG emissions calculation from burning (for site preparation or for disposal of crop residues) in the baseline scenario is carried out if they are permitted by law; In this case, a

reassessment of said scenario may be necessary, if it differs from what is established in the PDD.

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

For the baseline scenario:

$$EB_{BL,s,t} = \sum_{t=1}^{T} \sum_{f=1}^{NSCS\_BL} EB_{BL,f,s,t} \qquad \textit{Equation 4}$$

For its reassessments:

$$EB_{BL,s,t} = \sum_{t=tvx+1}^{T} \sum_{f=1}^{NSCS\_BL} EB_{BL,f,s,t} \qquad \textit{Equation 5}$$

In the reassessments of the baseline scenario, $EB_{BL,f,s,t}$ 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.	tCO_2e	NA	NA	X
$EB_{BL,f,s,t}$	Non-CO_2 GHG emissions from component segment ***f*** of segment ***s***, in year ***t*** in the baseline scenario or its corresponding reassessment.	tCO_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	Ordinal of verification year, counted from the CCMP start date.	Year	NA	NA	X
T	CCMP total duration.	Years	NA	NA	X
NSCS_BL	Total number of segment components of ***s*** segment in the corresponding baseline scenario or its reassessment.	Segment components count	NA	NA	X

NA: Not applicable.

7.2.3 GHG emissions from fertilizer use

GHG emissions from fertilizer use are conservatively excluded from the woody agricultural crops segment in the baseline scenario and its reassessments. In other segments it is not applicable.

7.2.4 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.

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

If ***Equation 2*** 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:

$$Rag_{BL} = \sum_{t=1}^{T} \frac{Rcp_{BL,t}}{T} \qquad \textit{Equation 6}$$

Variable	Description	Units	Segment		
			R	FR	WAC
Rag_{BL}	Long-term average gross removals by carbon pools in all segments, in the baseline scenario or its corresponding reassessment.	tCO_2e	X		
$Rcp_{BL,t}$	Total removals by carbon pools in all segments in year ***t***, in the baseline scenario or its corresponding reassessment.	tCO_2e	X	X	X
t	CCMP year index.	NA	X		
T	CCMP total duration.	Years	X		

NA: Not applicable.

$Rcp_{BL,t}$ 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 come 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:

$$Ran_{BL} = Rag_{BL} - E_{BL} \qquad \textit{Equation 7}$$

Variable	Description	Units	Segment		
			R	FR	WAC
Ran_{BL}	Long-term average net removals by carbon pools in all segments, in the baseline scenario.	tCO_2e	X		
Rag_{BL}	Long-term average gross removals by carbon pools in all segments, in the baseline scenario.	tCO_2e	X		

Variable	Description	Units	Segment		
			R	FR	WAC
E_{BL}	Total emissions of all segments (as applicable), in the baseline scenario.	tCO_2e	X		

For its reassessments:

$$Ran_{BL,vx} = Rag_{BL,vx} - E_{BL,vx} \quad \textit{Equation 8}$$

Variable	Description	Units	Segment		
			R	FR	WAC
$Ran_{BL,vx}$	Long-term average net removals by carbon pools in all segments, in the reassessment ***vx*** of the baseline scenario, considering the initial one referred Ran_{BL}.	tCO_2e	X		
$Rag_{BL,vx}$	Long-term average gross removals by carbon pools in all segments, in the reassessment ***vx*** of the baseline scenario, considering the initial one referred Rag_{BL}.	tCO_2e	X		
$E_{BL,vx}$	Total emissions of all segments (as applicable), in the reassessment ***vx*** of the baseline scenario.	tCO_2e	X		

8 Project scenario

8.1 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 re-evaluated 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 of the project scenario or its reassessment, as shown in the following equation:

$$Rcp_{P,t} = \sum_{s=1}^{Ns\_P} Rcp_{P,s,t} \quad \textit{Equation 9}$$

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 or its corresponding reassessment.	tCO_2e/ha	X	X	X
$Rcp_{P,s,t}$	Removals by carbon pools in the segment ***s,*** in year ***t***, in the project scenario or its corresponding reassessment.	tCO_2e/ha	X	X	X

Variable	Description	Units	Segment		
			R	FR	WAC
s	Index of the segments to be implemented in the CCMP (maximum 3: reforestation, forest restoration, and woody agricultural crops).	NA	X		
t	CCMP year index.	NA	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.	Segments count	X		

NA: Not applicable.

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

For a ***s*** segment and given ***t*** year, the carbon stocks in the carbon pools of a segment component in the project scenario and its reassessment are calculated according to the following equation (considering that dead wood and litter can only be included in the restoration segment):

$$Rcp_{P,s,t} = \sum_{f=1}^{NSCS\_P} (\Delta CAtree_{P,f,s,t} + \Delta CBtree_{P,f,s,t} + \Delta CAshrub_{P,f,s,t} + \Delta CDw_{P,f,s,t} + \Delta CL_{P,f,s,t} + \Delta CSoc_{P,f,s,t}) \quad \textit{Equation 10}$$

In project scenario reassessments, the values of the different carbon pools (***Atree***, ***Btree***, ***Ashrub***, ***Dw***, ***L***, and ***Cos***) beetwen ***t*** = ***tvx+1*** up to ***T***, which come from *ex-ante* estimates.

Variable	Description	Units	Segment		
			R	FR	WAC
$Rcp_{P,s,t}$	Removals by carbon pools in the segment ***s***, in year ***t***, in the project scenario or its corresponding reassessment.	tCO_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***, in year ***t***, in the project scenario or its corresponding reassessment.	tCO_2e/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***, in year ***t***, in the project scenario or its corresponding reassessment.	tCO_2e/ha	X	X	X
$\Delta CAshrub_{P,f,s,t}$	Change in carbon stock in aboveground shrub biomass from segment component ***f*** of segment ***s***, in year ***t***, in the project scenario or its corresponding reassessment.	tCO_2e/ha	X	X	X
$\Delta CDw_{P,f,s,t}$	Change in carbon stock in deadwood from segment component ***f*** of segment ***s***, in year ***t***, in the project scenario or its corresponding reassessment.	tCO_2e/ha	NA	X	NA
$\Delta CL_{P,f,s,t}$	Change in carbon stock in litter from segment component ***f*** of segment ***s***, in year ***t***, in the project scenario or its corresponding reassessment.	tCO_2e/ha	NA	X	NA

Variable	Description	Units	Segment		
			R	FR	WAC
$\Delta CSoc_{P,f,s,t}$	Change in carbon stock in Soil organic carbon from segment component ***f*** of segment ***s***, in year ***t***, in the project scenario or its corresponding reassessment.	tCO_2e/ha	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 or its reassessment.	NA	X		
f	Index of the component segment of segment ***s*** in the project scenario or its reassessment.	NA	X	X	X
t	CCMP year index.	NA	X		
NSCS_P	Total number of segment components of segment ***s*** in the project scenario its corresponding reassessment.	Segment components count	X	X	X

NA: Not applicable.

Equation 10 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*.

8.2 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 7.3***.

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

$$ET_P = \sum_{s=1}^{Ns} EF_{P,s,t} + EB_{P,s,t} + EFer_{P,s,t} + EFF_{P,s,t} \qquad \textit{Equation 11}$$

Variable	Description	Units	Segment		
			R	FR	WAC
ET_P	Total GHG emissions by sources in the project scenario or its corresponding reassessment.	tCO_2e	X	X	X
$EF_{P,s,t}$	Non-CO_2 GHG emissions from fires of segment ***s***, in year ***t***, in the project scenario or its corresponding reassessment.	tCO_2e	X	X	X

Variable	Description	Units	Segment		
			R	FR	WAC
$EB_{P,s,t}$	Non-CO_2 GHG emissions from burning of segment ***s***, in year ***t***, in the project scenario or its corresponding reassessment.	tCO_2e	X	X	X
$EFer_{P,s,t}$	Non-CO_2 GHG emissions from fertilizer use of the woody agricultural crops segment in year ***t***, in the project scenario or its corresponding reassessment.	tCO_2e	NA	NA	X
$EFF_{P,s,t}$	Non-CO_2 GHG emissions from consumption of all types of fossil fuel in agricultural machinery of the woody agricultural crops segment in year ***t***, in the project scenario or its corresponding reassessment.	tCO_2e	NA	NA	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 or its corresponding reassessment.	NA	X		
t	CCMP year index.	NA	X		
Ns	Total number of segments to implement in the CCMP (maximum 3: reforestation, forest restoration, and woody agricultural crops) in the project scenario or its corresponding reassessment.	Segment count	X		

NA: Not applicable.

8.2.1 GHG emissions from fires

Due to their incidental nature, fires are not calculated in the project scenario and its reassessments, but they should be monitored and reported when they are generated during project implementation and reported in the verification event covering the period they occurred in. These emissions can be estimated according to the guidelines established in the current version of the CDM's methodological *AR-Tool 08*.

8.2.2 GHG emissions from burning

GHG emissions calculation from burning (for site preparation or for disposal of harvest residues) is performed for the project scenario only if these are allowed by law; in this case, a reassessment of this scenario may be necessary if it differs from what is established in the PDD. These only occur in the segment of woody agricultural crops.

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:

$$EB_{P,s,t} = \sum_{t=1}^{T} \sum_{f=1}^{NSCS\_P} EB_{P,f,s,t} \qquad \textit{Equation 12}$$

For its reassessments:

$$EB_{P,s,t} = \sum_{t=tvx+1}^{T} \sum_{f=1}^{NSCS\_P} EB_{P,f,s,t} \qquad \textit{Equation 13}$$

In the reassessments of the project scenario, $EB_{P,f,s,t}$ between t = $tvx+1$ to T values come from *ex-ante* estimations.

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.	tCO_2e	NA	NA	X
$EB_{P,f,s,t}$	Non-CO_2 GHG emissions from burning from segment component ***f*** of segment ***s***, in year ***t***, in the project scenario or its corresponding reassessment.	tCO_2e	NA	NA	X
f	Index of the component segment of segment ***s*** in the project scenario or its reassessment.	NA	X	X	X
t	CCMP year index.	NA	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 or its corresponding reassessment.	NA	X		
tvx	Ordinal of verification year, counted from the CCMP start date.	NA	X		
T	CCMP total duration.	Years	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

NA: Not applicable.

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.

8.2.3 GHG emissions from fertilizer use

To calculate the direct GHG emissions associated with fertilizer use, first calculate the GHG emissions from fertilization of the segment units of the woody crops segment, according to ***Equation 14***, and then estimate the GHG emissions from fertilizer use using ***Equation 15*** or ***Equation 16***, as appropriate.

This estimation is performed only in the woody agricultural crops segment, in the project scenario, as well as for reassessment when required.

For the project scenario:

$$EFer_{P,s,t} = \sum_{t=1}^{T} \sum_{f=1}^{NSCS\_P} EFer_{P,f,s,t} \qquad \textit{Equation 14}$$

For its reassessments:

$$EFer_{P,s,t} = \sum_{t=tvx+1}^{T} \sum_{f=1}^{NSCS\_P} EFer_{P,f,s,t} \qquad \textit{Equation 15}$$

Variable	Description	Units	Segment		
			R	FR	WAC
$EFer_{P,s,t}$	Non-CO_2 GHG emissions from fertilizer use of the woody agricultural crops segment, in year ***t***, in the project scenario or its corresponding reassessment.	tCO_2e	NA	NA	X
$EFer_{P,f,s,t}$	Non-CO_2 GHG emissions from fertilizers use in segment component ***f*** of the woody agricultural crops segment, in year ***t***, in the project scenario or its corresponding reassessment.	tCO_2e	NA	NA	X
f	Index of the segment component of the woody agricultural crops segment in the project scenario or its reassessment.	NA	NA	NA	X
s	Index of the segment (woody agricultural crops) to be implemented in the CCMP, in the project scenario or its corresponding reassessment.	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	CCMP total duration.	Years	NA	NA	X
NSCS_P	Total number of segment components of segment ***s*** (woody agricultural crops) in the project scenario or its corresponding reassessment.	Segment components count	NA	NA	X

NA: Not applicable.

In the reassessments of the project scenario, $EFer_{P,f,s,t}$ between ***t*** = ***tvx+1*** to ***T*** values come from *ex-ante* estimations.

$$EFer_{P,f,s,t} = \left(FNS_{P,f,s,t} + FNO_{P,f,s,t}\right) * FEN \qquad \textit{Equation 16}$$

Variable	Description	Units	Segment		
			R	FR	WAC
$EFer_{P,f,s,t}$	Non-CO_2 GHG emissions from fertilizers use in segment component ***f*** of the woody agricultural crops segment, in year ***t***, in the project scenario or its corresponding reassessment.	tCO_2e	NA	NA	X
$FNS_{P,f,s,t}$	Annual amount of nitrogen from the synthetic fertilizer applied in the component segment ***f*** of the woody agricultural crops segment, in year ***t***, adjusted to reflect volatilization in the form of NH_3 and NOx in the corresponding project scenario or its reassessment.	tN	NA	NA	X
$FNO_{P,f,s,t}$	Annual amount of nitrogen from the organic fertilizer applied in the component segment ***f*** of the woody agricultural crops segment, in year ***t***, adjusted to reflect volatilization in the form of NH_3 and NOx in the corresponding project scenario or its reassessment.	tN	NA	NA	X

Variable	Description	Units	Segment		
			R	FR	WAC
FEN	N_2O emission factor per N contribution.	kg CO_2e / kg N	NA	NA	X
f	Index of the component segment (woody agricultural crops), 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 project scenario or its reassessment.	NA	NA	NA	X
t	CCMP year index.	NA	NA	NA	X

NA: Not applicable.

8.2.4 GHG emissions from consumption of fossil fuels by agricultural machinery

Emissions from consumption of fossil fuels in agricultural machinery in the woody agricultural crops segment are estimated based on the annual consumption of the different types of fuels used in all segment components of the corresponding scenario for each one of the CCMP years and multiplying each quantity by the CO_2 emission factor.

For the project scenario:

$$EFF_{P,s,t} = \sum_{t=1}^{T} \sum_{m=1}^{TC} \sum_{f=1}^{NSCS\_P} EFF_{P,m,f,s,t} \qquad \textit{Equation 17}$$

For its reassessment:

$$EFF_{P,s,t} = \sum_{t=tvx+1}^{T} \sum_{m=1}^{TC} \sum_{f=1}^{NSCS\_P} EFF_{P,m,f,s,t} \qquad \textit{Equation 18}$$

In the reassessments of the baseline scenario, $EFF_{P,m,f,s,t}$ between ***t*** = ***tvx+1*** to ***T*** values come from *ex-ante* estimations.

Variable	Description	Units	Segment		
			R	FR	WAC
$EFF_{P,s,t}$	Total GHG emissions from consumption of all types of fossil fuel by agricultural machinery of the woody agricultural crops segment in year ***t***, in the project scenario or its corresponding reassessment.	tCO_2e	NA	NA	X
$EFF_{P,m,f,s,t}$	GHG emissions from consumption of ***m*** type fossil fuel in the component segment ***f*** of the woody agricultural crops segment in year ***t***, in the project scenario or its corresponding reassessment.	tCO_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 project scenario or its reassessment.	NA	NA	NA	X

Variable	Description	Units	Segment		
			R	FR	WAC
s	Index of the segment 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
tvx	Ordinal of 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 the woody agricultural crops segment, in the project scenario or its corresponding reassessment.	Fossil fuel types count	NA	NA	X
NSCS_P	Total number of segment components of segment ***s*** in the project scenario its corresponding reassessment.	Segment compo-nents count	NA	NA	X

NA: Not applicable.

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

$$EFF_{P,m,f,s,t} = CC_{m,f,s,t} * KCC_{m,f,s,t} \qquad \textit{Equation 19}$$

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 woody agricultural crops segment in year ***t***, in the project scenario or its corre-sponding reassessment.	tCO_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 woody agricul-tural crops segment in year ***t***, in the project scenario or its corresponding reassessment.	l or gal	NA	NA	X
$KCC_{m,f,s,t}$	Emission factor for combustion of fossil fuel ***m*** consumed by agricultural machinery in component segment ***f*** of the woody agricultural crops segment in year ***t***, in the project scenario or its corresponding reassessment.	tCO_2e/unit of fossil fuel	NA	NA	X
m	Index of type fossil fuel consumed by agricultural machin-ery.	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

NA: Not applicable.

8.3 Leakages

This methodology only considers leakages due to the displacement of agricultural activities (livestock and crops), estimated using the guidelines established in the current version of the CDM's methodological *AR-Tool 15*.

The estimated leaks are named 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 no leaks occur after five years from the start of CCMP implementation, this will only be the case if the areas of project implementation are not increased. If the areas increase, it will be necessary to perform a leakages calculation for the new areas and monitor their leaks for the next three years.

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

For the project scenario:

$$LK_{P,t} = \sum_{t=1}^{T} LK_{Ag,t} + \sum_{t=1}^{T} LK_{Livestock,t} \qquad \textit{Equation 20}$$

For monitoring:

$$LK_{P,t} = \sum_{t=1}^{tvx} LK_{Ag,t} + \sum_{t=1}^{tvx} LK_{Livestock,t} \qquad \textit{Equation 21}$$

For reassessment of the project scenario:

$$LK_{P,t} = \sum_{t=tvx+1}^{T} LK_{Ag,t} + \sum_{t=tvx+1}^{T} LK_{Livestock,t} \qquad \textit{Equation 22}$$

Variable	Description	Units	Segment		
			R	FR	WAC
$LK_{P,t}$	Total Leakages due to displacement of agricultural or livestock activities attributed to the implementation of the CCMP in ***t*** year, in the project scenario or its reassessment.	tCO_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 or its reassessment.	tCO_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 or its reassessment.	tCO_2e	X	X	X
t	CCMP year index.	NA	X		
tvx	Ordinal of verification year, counted from the CCMP start date.	NA	X		

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

NA: Not applicable.

8.4 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:

$$Rag_P = \sum_{t=1}^{T} \frac{Rcp_{P,t}}{T} \qquad \textit{Equation 23}$$

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.	tCO_2e	X		
$Rcp_{P,t}$	Total removals by carbon pools in all segments in year ***t***, in the project scenario or its corresponding reassessment.	$t\text{-}CO_2e$	X	X	X
t	CCMP year index.	NA	X		
T	CCMP total duration.	Years	X		

NA: Not applicable.

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 come 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 what was 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 annually monitor carbon stocks in carbon pools 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 **RanP** (for CCMP validation) and as $Ran_{P,v1}$, $Ran_{P,v2}$... $Ran_{P,vx}$ for the 1,2... x verifications that require reassessments.

The net average removals from the project scenario or its reassessment represent the maximum potential credits that the CCMP can receive in its verifications. However, this maximum potential may vary if the actual implementation is different from the planned one. To do this, consider the following equations:

For project scenario:

$$Ran_P = (Rag_P - Ran_{BL}) - (ET_P + E_{BL} + LK_P) \qquad \textit{Equation 1}$$

Variable	Description	Units	Segment		
			R	FR	WAC
Ran_P	Long-term average net removals by carbon pools in all segments, in the project scenario.	tCO_2e		X	
Rag_P	Long-term average gross removals by carbon pools in all segments, in the project scenario.	tCO_2e		X	
Ran_{BL}	Long-term average net removals by carbon pools in all segments, in the baseline scenario.	tCO_2e		X	
ET_P	Total GHG emissions by sources in the project scenario.	tCO_2e		X	
E_{BL}	Total GHG emissions by sources in the baseline scenario.	tCO_2e		X	
$LK_{P,t}$	Total Leakages due to displacement of agricultural or livestock activities attributed to the implementation of the CCMP in year ***t***, in the project scenario.	tCO_2e		X	

For its reassessments:

$$Ran_{P,vx} = (Rag_{P,vx} - Ran_{BL,vx}) - (ET_{P,t,vx} + E_{BL,t,vx} + LK_{P,t,vx}) \qquad \textit{Equation 25}$$

Variable	Description	Units	Segment		
			R	FR	WAC
$Ran_{P,vx}$	Long-term average net removals by carbon pools in all segments, in the reassessment of the project scenario, considering the initial Ran_P referred to.	tCO_2e		X	
$Rag_{P,vx}$	Long-term average gross removals by carbon pools in all segments for verification or reassessment ***vx*** of the project scenario, considering the initial Rag_P referred to.	tCO_2e		X	
$Ran_{BL,vx}$	Long-term average net removals by carbon pools in all segments, in the reassessment of the baseline scenario, considering the initial Ran_{BL} referred to.	tCO_2e		X	
$ET_{P,t,vx}$	Total GHG emissions by sources for verification or reassessment ***vx*** of the project scenario, considering the initial $ET_{P,t}$ referred to.	tCO_2e		X	
$E_{BL,t,vx}$	Total GHG emissions by sources for verification or reassessment ***vx*** of the baseline scenario, considering the initial $E_{BL,t}$ referred to.	tCO_2e		X	
$LK_{P,t,vx}$	Total leakages due to the displacement of agricultural or livestock activities for verification or reassessment ***vx*** of the project scenario, considering the initial $LK_{P,t}$ referred to.	tCO_2e		X	

The net average removals from the project scenario or its reassessment represent the maximum potential credits that the CCMP can receive in its verifications. However, this maximum potential may vary if the actual implementation is different from the planned one.

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, those of the ***Cercarbono's Protocol*** and those of this methodology to be eligible to carry out such addition and, if applicable, generate GHG removal credits subject to trading. The monitoring requirements must be met 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 a whole, as well as the ownership of the associated GHG emissions, 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 entities.

In addition to the guidelines described above, in any case, the requirements on grouped projects described in the current version of the ***Cercarbono's Protocol*** must be met.

9.1 Addition and exclusion of grouped CCMP areas

The addition of instances can be done during verifications, complying with all the requirements foreseen for this type of CCMP considered in the ***Cercarbono's Protocol***. The addition or subtraction of areas from a CCMP may be done during verifications and will require the reassessment of scenarios, as explained in ***Section 6.6***.

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

If during a reporting period a participant withdraws from the CCMP, an update to the PDD is required, explaining that the calculation of previously issued credits corresponding to the area belonging to the withdrawing landowner must be revalidated. This area cannot be considered in the calculations for the next verification and an amount equal to the corresponding credits that were previously issued is deducted from the total mitigation to be reported at the next verification.

The withdrawal of areas from an holder or participant in the CCMP must be total, partial area withdrawals are not allowed. To formalize the withdrawal, CCMP must update the PDD,

explicitly stating the areas and participants being withdrawn and indicating how many credits have been issued in previous verifications. An amount equal to these credits must be subtracted from the credits to be certified in the next verification.

9.2 Update of spatial boundaries of grouped CCMPs

If the spatial boundaries of the activities included in the CCMP change during the implementation of the CCMP, 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. The total area of each activity should be the same for the baseline and project scenarios.

10 Risks and non-permanence

The requirements of this methodology seek that in every component of the quantification, precise and accurate CCMP results are obtained, as a result of the rigorous application of the principles.

However, by the very nature of the GHG removals, these are considered non-permanent. This is because they come from planting and harvesting cycles, which can be affected by internal and external events (such as disasters, land use changes, infrastructure developments). In this methodology, this non-permanence is controlled by setting aside a percentage of credits earned by CCMPs, in proportion to their identified 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.

11 Uncertainty

CCMP shall perform an uncertainty assessment during the planning and implementation phase, consistent with the guidelines in Annexes A.3.5, A.3.6 and A.3.8 of the Standard ISO 14064-2:2019. CCMP holder shall pursue minimizing the uncertainty of the initiative-related information and data.

12 Contributions to UN's Sustainable Development Goals

In the framework of Cercarbono programme, CCMPs shall report their contributions to (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 application of such tool will be part of the verification process. The **Rubric of the SDG Tool** shall be duly signed by the VVB in charge of the verification event.

CCMPs adequately implementing Cercarbono's SDGs tool will be awarded a differentiation seal, shown on the retirement certificate and in the EcoRegistry platform.

13 Safeguards

The CCMP must be checked for no-net harm, in accordance with the ***Safeguarding Principles and Procedures of Cercarbono's Certification Programme***.

14 Monitoring and quantification of results

The CCMP shall be monitored during its implementation, both in its area and in terms of leakages, as a basis for quantifying the results and credits obtained at each verification. All information and data related to the CCMP shall be subject for validation and verification, under the guidelines of ISO 14064-3:2019 and ***Cercarbono's Protocol***.

GHG removals and associated GHG emissions must be monitored continuously throughout the implementation period. GHG removals may be monitored annually or less frequently, while GHG emissions should be monitored more regularly, depending on the identified sources of GHG emissions. For verification events, carbon stock estimates need to be based on field measurements. For intermediate years between verification events, monitoring can be done by direct field measurements or by projections of recent field measurements using conservative and well-supported models.

14.1 Description of the monitoring plan

CCMP shall establish and maintain a monitoring and quality management plan that includes procedures for measuring or otherwise obtaining, recording, collecting, and analyzing relevant data and information to quantify and report relevant GHG emissions and removals. 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 communicated, including units of measurement.
- Data origin.
- Monitoring methodologies, including estimation, modelling, measurement, calculation approaches, and uncertainty.
- Frequency of monitoring, considering the needs of the CCMP.
- 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, and procedures for corrective actions.
- GHG information management systems, including the location and keeping of recorded data and data management, including a procedure for transferring data between different forms of systems or documentation.

[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, it is necessary to periodically verify that the CCMP has been implemented in the initially validated areas or, in the case of clustered projects, added to at later stages during validations. Boundary monitoring includes checking that the different areas remain under the control of the participants and that the reported areas of each polygon remain valid.

14.3 Monitoring of GHG removals

CCMP shall 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 should be conducted annually, as annual stock data are required for the calculation of long-term average net removals and the calculation of the maximum amount of credits that can be achieved by the CCMP. In the absence of annual monitoring of carbon stocks, it will be necessary at a minimum, perform a monitoring 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 only for periods no longer than five years.

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

As explained in ***Section 8***, particularly in ***Figure 2***, the maximum possible net removals achieved by the CCMP is calculated as the average of net removals over its duration. At each verification, the net removals achieved during the period are obtained by calculating the net removals in the verification period and subtracting those already achieved and certified in previous verification periods (including the corresponding credit buffers), as shown in this equation:

$$RE_x = (Rcp_{P,tvx} - Rcp_{BL,tvx}) - (E_{BL,x} + ET_{P,x} + LK_{P,x}) - RE_{x-1} \qquad \textit{Equation 26}$$

$Rcp_{P,tvx}$ and $Rcp_{BL,tvx}$ are calculated based on ***Equations 9*** and ***1***. $E_{BL,x}$, $ET_{P,x}$ and $LK_{P,x}$ based on ***Equations 3***, ***11*** and ***20***, respectively.

Variable	Description	Units	Segment		
			R	FR	WAC
RE_x	Net effective removal achieved by the CCMP in reporting period ***x***.	tCO_2e	X		
$Rcp_{P,tvx}$	Total removals by carbon pools in all segments of the project scenario in the year ***tvx*** verification.	tCO_2e	X		
$Rcp_{BL,tvx}$	Total removals by carbon pools in all segments of the baseline scenario in the year ***tvx*** verification.	tCO_2e	X		
$E_{BL,x}$	Total emissions of all segments of the baseline scenario in verification period ***x***.	tCO_2e	X		
$ET_{P,x}$	Total emissions of all segments of the project scenario in verification period ***x***.	tCO_2e	X		
$LK_{P,x}$	Total leakages due to displacement of agricultural or livestock activities attributed to the implementation of the CCMP in the verification period ***x***.	tCO_2e	X		
RE_{x-1}	Net effective removal achieved by the CCMP in the previous reporting period (***x-1***).	tCO_2e	X		
tvx	Ordinal of verification year, counted from the CCMP start date.	NA	X		
x	Ordinal of the reporting or verification period.	NA	X		

NA: Not applicable.

14.4 Emissions monitoring

CCMP must monitor the GHG emissions identified in the project scenario that occur during its implementation.

Emission sources in CCMP area must be permanently monitored during the period of results to be verified.

14.4.1 Monitoring of GHG emissions from burning and fires

The CCMP shall keep a log of burning and fire occurrences, where the information shown in ***Table 8*** shall be reported. Based on this table, and according to guidelines as per in current version of CDM's methodological *A/R-Tool 08*, GHG emissions shall be estimated for each occurrence and then the annual sum and for the corresponding verification periods.

Table 8. 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 fertilizers use should also be done through a fertilizer consumption log, where the information shown in ***Table 9*** should be reported. It is acceptable to use data linked to its automated recording or accounting systems or warehouse inventories for this table.

Based on this table, and according to the procedures set out in ***Section 8.2.3***, GHG emissions shall be estimated for each occurrence and then summed annually and for the corresponding verification periods.

Table 9. 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 in the case of burns 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, which allows the calculation of the annual consumption of each type of fuel used, as shown in ***Table 10***.

Based on this table, and according to guidelines as per in current version of CDM's methodological *AR-Tool 15*, GHG emissions will be estimated for each occurrence, the annual sum, and the corresponding verification periods.

Table 10. 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 CCMP that do not undergo area expansions during their lifetime, leakage monitoring should be conducted during the first five years of implementation. In the case of additions or changes in areas of implementation, monitoring shall be performed during the following three years in which such expansions or changes in areas occur. In the case of area reductions, these will not imply the need for monitoring.

14.5 Monitoring of contributions to the Sustainable Development Goals

The monitoring of contributions to the Sustainable Development Goals 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 variables that must be monitored are presented in ***Table 11***.

Table 11. Monitoring variables.

Variable/parameter/data		Units	Segment			Data origin and measurement procedure	Frequency
			R	FR	WAC		
A (Non-stable Forest, Non-Forest)	CCMP eligible area.	ha	X	X	X	Measurement in the field or through remote sensing.	At every verification.
A (Stable Forest, Non-Forest)	CCMP non-eligible area.	ha	NA	NA	NA	Measurement in the field or through remote sensing.	CCMP design or when it is revalidated.
$AB_{f,s,t}$	Area burnt by fires in segment component ***f*** of the segment ***s,*** in year ***t*** in the corresponding project, or reassessment scenario.	ha	X	X	X	Field measurement of affected areas or by remote sensors. Estimation of biomass burned and GHG emissions according to pre-established factors.	Continuous, depending on the occurrence of fires.
$ABC_{f,s,t}$	Area burnt by controlled burn in segment component ***f*** of the segment ***s***, in year ***t*** in the corresponding baseline, project, or reassessment scenario.	ha	X	X	X	Field measurement of affected areas or by remote sensors. Estimation of biomass burned and GHG emissions according to pre-established factors.	Continuous, depending on the occurrence of burns.
$Abtree_{i,t}$	Average biomass per hectare in eligible stratum ***i*** at the start of the CCMP in year ***t***.	tCO_2e/ha	X	X	X	Estimated using CDM tool: A/R Methodological Tool: Estimation of non-CO_2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity. Where pre-project living trees are not burned during site preparation, $btree_i$ shall be set equal to zero.	During CCMP design.
ADA_t	Area of land from which displacement of agricultural activities attributed to CCMP implementation in year ***t*** occurs.	ha	X	X	X	Field measurements.	At every verification.
$Ashrub_{f,s,t}$	Aboveground shrub biomass of segment component ***f*** of the segment ***s***, in year ***t*** in the corresponding baseline, project, or reassessment scenario.	tCO_2e/ha	NA	X	X	Field measurements or properly supported estimates, where ***s*** represents each of the implemented segments.	At every verification.

Variable/parameter/data		Units	Segment			Data origin and measurement procedure	Frequency
			R	FR	WAC		
$Atree_{f,s,t}$	Aboveground tree biomass of segment component ***f*** of the segment ***s***, in year **t** in the corresponding baseline, project, or reassessment scenario.	tCO_2e/ha	X	X	X	Field measurements or properly supported estimates, where ***s*** represents each of the implemented segments.	At every verification.
Bag_{Forest}	Default above ground biomass in the forest in the region or country where the CCMP is located.	t-d.m./ha	X	X	X	Field measurements or properly supported estimates.	At every verification.
$Bshrub_{f,s,t}$	Above-ground shrub biomass of segment component ***f*** of the segment ***s***, in year ***t*** in the corresponding baseline, project or reassessment scenario.	tCO_2e/ha	X	X	X	Field measurements or properly supported estimates, where ***s*** represents each of the implemented segments.	At every verification.
$Btree_{f,s,t}$	Belowground tree biomass of segment component ***f*** of the segment ***s***, in year ***t*** in the corresponding baseline, project, or reassessment scenario.	tCO_2e/ha	X	X	X	Field measurements or properly supported estimates, where ***s*** represents each of the implemented segments.	At every verification.
$B_{Harvest,t}$	Harvested biomass that will be burned to clear the area of harvest residues before planting in year ***t***.	t-d.m.	X	X	X	Field data corresponding to the CCMP.	Continuous, according to occurrence.
$CC_{m,t}$	Amount of fossil fuel type ***m*** consumed in agricultural machinery of the woody agricultural crops segment, in year ***t*** in the corresponding baseline, project, or reassessment scenario.	l or gal	NA	NA	X	Fuel consumption logbook or equivalent record linked to the company's accounting.	At every verification (annual registration).
$CC_{Shrub,f,s,t}$	Crown cover in shrub biomass of segment component ***f*** of segment ***s***, in year ***t*** in the corresponding baseline, project, or reassessment scenario.	Dimensionless	NA	X	X	Field measurement or properly supported estimates.	At every verification.
$CC_{Tree,f,s,t}$	Crown cover in trees biomass of segment component ***f*** of segment ***s***, in year ***t*** in the corresponding baseline, project, or reassessment scenario.	Dimensionless	X	X	X	Field measurement or properly supported estimates.	At every verification.

Variable/parameter/data		Units	Segment			Data origin and measurement procedure	Frequency
			R	FR	WAC		
$CCB_{Shrub,t}$	Proportion of shrub canopy cover of the area that is burnt or set on fire of segment component ***f*** of segment ***s***, in year ***t*** in the corresponding baseline, project, or reassessment scenario.	Dimensionless	NA	X	X	Field measurements or properly supported estimates.	Continuous, according to occurrence.
CF_{Shrub}	Carbon fraction of shrub biomass in the corresponding baseline, project, or reassessment scenario.	Tc/t-d.m.	NA	X	X	Estimated using default values or specific studies.	At every verification.
CF_{Tree}	Carbon fraction of tree biomass in the corresponding baseline, project, or reassessment scenario.	Tc/t-d.m.	X	X	X	Estimated using default values or specific studies.	At every verification.
$Dw_{f,s,t}$	Deadwood of segment component ***f*** of segment ***s***, in year ***t*** in the corresponding baseline, project, or reassessment scenario.	tCO_2e/ha	NA	X	NA	Field measurements or properly supported estimates.	At every verification.
$FBR_{f,t}$	Fraction of biomass left as residues after harvesting of segment component ***f*** of woody agricultural crops segment, in year ***t*** in the baseline, project, or reassessment scenario considered.	Tc/t-d.m.	NA	NA	X	Field measurements or properly supported estimates.	Continuous, according to occurrence.
$FNO_{f,t}$	Annual amount of nitrogen from organic fertilizer applied in segment component ***f*** of the woody agricultural crops segment, in year ***t*** adjusted to reflect volatilization in the form of NH_3 and NO_x in the corresponding baseline, project or reassessment scenario.	t-N	NA	NA	X	Monitoring of inventories, purchase orders or activity planning.	Annual.
$FNS_{f,t}$	Annual amount of nitrogen from synthetic fertilizer applied in segment component ***f*** of the woody agricultural crops segment, in year ***t*** adjusted to reflect volatilization in the form of NH_3 and NO_x in the corresponding baseline, project or reassessment scenario.	t-N	NA	NA	X	Monitoring of inventories, purchase orders or activity planning.	Annual.

Variable/parameter/data		Units	Segment			Data origin and measurement procedure	Frequency
			R	FR	WAC		
$L_{f,s,t}$	Litter of segment component ***f*** of segment ***s***, in year ***t***, in the corresponding baseline, project, or reassessment scenario.	tCO_2e/ha	NA	X	NA	Field measurements or properly supported estimates.	At every verification.
$LK_{AG,t}$	Leakages due to displacement of agricultural activities attributed to CCMP implementation in year ***t*** of the project scenario or its reassessment.	tCO_2e	X	X	X	Calculation according to CDM's methodological Tool.	During the first five years of implementation and three years of adding areas.
$LK_{Livestock,t}$	Leakages due to displacement of livestock attributed to CCMP implementation in year ***t*** of the project scenario or its reassessment.	tCO_2e	X	X	X	Calculation according to CDM's methodological Tool.	During the first five years of implementation and three years of adding areas.
NSCS	Total number of segment components of the segment in the corresponding baseline, project, or reassessment scenario.	Segment components count	X	X	X	Field measurements, monitoring of CCMP implementation. Updating map layers using field measurements or remote sensors.	Whenever there is any modification of ***TSA*** and each of the elements that compose it.
$RASB_{f,s,t}$	Ratio of average shrub biomass per hectare of segment component ***f*** of the segment ***s***, in year ***t*** in the corresponding baseline, project or reassessment scenario to tree biomass.	Dimensionless	NA	X	X	Field measurements or properly supported estimates.	During CCMP design.
$Soc_{f,s,t}$	Soil organic carbon of segment component ***f*** of segment ***s***, in year ***t*** in the corresponding baseline, project, or reassessment scenario.	tCO_2e/ha	X	X	X	Field measurements or properly supported estimates, where ***s*** represents each of the implemented segments.	At every verification.
TC	Total number of fossil fuels used in agricultural machinery in woody agricultural crops segment, in the corresponding project, or reassessment scenario.	Fossil fuel types count	NA	NA	X	Monitoring of fuel consumption in the CCMP.	Continued.
TSA	Total area of the segment in the corresponding baseline, project, or reassessment scenario.	ha	X	X	X	Updating map layers through field measurements or remote sensing.	Whenever there is any modification of ***TSA*** and each of the elements that compose it.

Variable/parameter/data		Units	Segment			Data origin and measurement procedure	Frequency
			R	FR	WAC		
$TSAC_f$	Total area of segment component ***f*** in the corresponding baseline, project, or reassessment scenario.	ha	X	X	X	Updating map layers through field measurements or remote sensing.	Whenever there is any modification of ***TSA*** and each of the elements that compose it.

NA: Not applicable.

15 Stakeholder consultation

Stakeholder consultation on 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.

16 Effective participation

CCMP must identify local communities or ethnic groups present in the proyecto area or which can be directly affected by the implementation of the CCMP and guarantee full and effective participation with the mandates from which these procedures operate online. with the losses of ethnic minorities.

CCMP must contain an effective participation protocol that includes:

- A map of actors, an institutional map of the other governance structures or institutions and leaders associated with decision-making in the territory, associated with the activities of the CCMP.
- Decisions agreed upon with local governance structures.
- Traceability of consensus processes.
- Management of requests, complaints, claims and requests and their traceability.
- A schedule of meetings for CCMP decision-making.
- A protocol for conflict management.
- An agreement document, signed by the representative parties of the local communities for the development of the CCMP. In this case, community representativeness occurs, at a minimum, through explicit agreement with local governance structures and represented in their designated leader(s).

17 Information management

CCMP operator shall 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[19].

CCMP holder should reduce, to the extent possible, uncertainties related to the quantification of GHG emission reductions. Thus, errors or omissions detected should be identified and duly addressed, and documentary evidence should be generated and maintained.

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

CCMP holder must apply monitoring criteria and procedures, in which coherent reviews or audits are carried out 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 operator should ensure that calibrated or verified monitoring and measuring equipment is used and maintained as appropriate.

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

17.1 Data, model and parameter quality management

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

- **Academic and scientific support:** use parameters and models supported by own developments duly substantiated and based on recognized academic or scientific procedures, or from recognized academic or scientific sources. Data and parameters from the Intergovernmental Panel on Climate Change (IPCC) Good Practice Guidance (GPG) in its most current version or previous versions can be used if technically justified or following its recommendations.
- **Accuracy of data:** ensure accurate measurements using calibrated instruments and trained personnel.
- **Representativeness:** ensure that the sampled plots are representative of the total area.
- **Updating:** keep relevant data up to date and revise them periodically.
- **Validation:** use field data to validate the models and parameters used.
- **Statistics:** apply appropriate statistical techniques to estimate errors and confidence.
- **Scale:** ensure that models are applied at the appropriate 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

For the presentation of the cartographic information to guarantee traceability in the eligible areas that make up the geographic limits of the CCMP, the information of each management unit (year of establishment, species, area in hectares, planting density, holder) can be included, considering what is established in the ***Guidelines for Mapping Presentation and Analysis***.

18 CCMP documentation

All documentation and records generated must be retained to demonstrate that the CCMP activity has been implemented as designed. Any deviation of the implementation from the design must be technically justified and demonstrated to be following the guidelines, conditions and procedures of this methodology.

CCMP holder must have documentation demonstrating compliance of the GHG project 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 between the methodology or guideline initially used and the current methodology must be considered. For this purpose, the level of progress of the CCMP throughout the project cycle defined by Cercarbono, composed of five stages (as referenced in the current version of the Protocol), will be considered. Depending 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 should 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 selected methodology (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 set out in the current version of the ***Cercarbono's Protocol*** and in the ***Procedures*** document.

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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.
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.

Annex 1

Summary of measurement techniques related to visualization methods.

1. Digital preprocessing of satellite images

To reduce atmospheric effects and generate reliable records, radiometric corrections, calibrations, and normalizations must be performed, producing comparable images and allowing at the same time forest cover changes to be verified. The preprocessing steps include:

A. Image selection and download

For each year considered in the historical period, the image catalog 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 do not provide sufficient cloud-free coverage, images from sensors such as CBERS, RapidEye, ASTER, Sentinel 2, among others, are used.

B. Band stacking

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

C. Geometric correction

For constructing annual image composites, exact co-registration at the pixel level between all images acquired for each scene is required. The L1T products (surface reflectance) provided by the *Earth Resources Observation and Science Center* (EROS) usually have precise pixel correspondence; 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 in 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 metrics generated is the annual median of 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[20] 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.

[20] 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.

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).