CultivO2 Project 1

Document prepared by Fundación Cataruben

Project Document Template (Versión 4.1)	
Name of the project	Climate change mitigation project CultivO2 P1
Project proponent	Fundación Cataruben
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Project participants	Casa Luker S.A.S. Partners of the Americas (POA) 69 propietarios de predios privados
Version	4.1
Date	27/12/2022
Project type	AFOLU (Joint REDD+ and AR Document)
Grouped project	Yes
Applied Methodology	For the area of removals, the methodological document Sector AFOLU / BCR0001 Quantification of GHG Emission Reductions, Removal Activities of BIOCARBON REGISTRY will be used as a reference. Version 3.0. For the forest area, the AFOLU Sector Methodological Document / Quantification of GHG Emission Reduction REDD+ Projects BCR0002 of BIOCARBON REGISTRY will be used as a reference. Version 3.1.

Project Document Template (Versión 4.1)	
Project location	Colombia - Andina and Orinoquia Region 7 departments: Arauca, Caldas, Casanare, Cordoba, Huila, Meta and Vichada.
Starting date	09/06/2017
Quantification Period of GHG emissions reductions	09/06/2017 - 09/06/2037
Estimated total and average annual GHG emission reduction amount	Removals (AR Activities) - Total amount: 109.292 tCO2e - Estimated annual average: 5.465 tCO2e Emission reductions (REDD+ Activities) - Total amount: 38.189 tCO2e - Estimated annual average: 1.819 tCO2e
Sustainable Development Goals	SDG 6: Water and sanitation SDG 13: Climate action SDG 15: Life of Terrestrial Ecosystems

Table of Contents

Index of Tables

Index of Images

Index of Graphs.

Index of figures

Term and definitions

• **GHG Removal Activities:** These are GHG mitigation actions in the AFOLU sector based on agricultural and forestry activities. These may include: silvopastoral systems (pastures and planted trees), agroforestry systems (agroforestry crops), commercial plantations (forest plantations), and other landscape management tools, as well as oil palm and other crops, as long as they are developed in areas other than natural forest or natural vegetation cover other than forest. GHG removal activities may also include actions leading to the restoration of degraded ecosystems, such as: (a) ecological restoration, (b) ecological rehabilitation and, (c) ecological recovery. (Biocarbon Registry, 2023)

• **Additionality:** Characteristic that allows demonstrating that GHG emission reductions or removals, derived from the implementation of a GHG mitigation initiative, generate a net benefit to the atmosphere in terms of reduced or removed GHG emissions.

• **AFOLU (Agriculture, Forestry and Other Land Use Sector):** The sector comprising GHG emissions and/or removals attributable to project activities in agriculture, forestry and other land uses.

• **Eligible Areas:** Areas that meet the condition of no forest or natural cover other than forest, at the reference dates established by the BCR Standard. (Biocarbon Registry, 2023)

• **Project area:** Area on which project activities that demonstrate net climate benefits are implemented.

• **Forest:** Land occupied primarily by trees, which may contain shrubs, palms, guaduas, grasses and lianas, in which tree cover predominates with a minimum canopy density of 30%, a minimum canopy height (in situ) of 5 m at the time of identification, and a minimum area of 1.0 ha.

• **Agroforestry Crops:** Areas occupied by arrangements or combinations of crops of different species, with others of herbaceous, shrub and tree habits, where the main characteristic of the cover is that the increase in detail does not imply subdivision into pure units, because these are combined in the same area, alternated by furrows or rows of trees with crops or trees with grasses.

Carbon pools: A compartments in which carbon stock changes occur in terrestrial ecosystems (aboveground biomass, belowground biomass, deadwood, litter, soil organic matter), as defined in the Guidelines of the Intergovernmental Group of Experts on Climate Change (IPCC) for national Greenhouse gas inventories.

• **GHG emission:** Release to the atmosphere of the mass of GHG.

• **Leakages:** Those are the potential emissions that would occur outside the project boundaries due to the GHG project's activities. Leakage means the net change in anthropogenic emissions by sources of greenhouse gases (GHG) that occurs outside the project boundary and is measurable and attributable to the project activity.

• **Greenhouse Gases (GHGs)**: Those gaseous components of the atmosphere, both natural and anthropogenic, that absorb and reflect infrared radiation, as defined by the UNFCCC.

• **Permanence:** The condition resulting from activities whereby the system implemented within its limits extends continuously and over time, removing GHG from the atmosphere.

• **Forest Plantation:** These are coverages constituted by plantations of arboreal vegetation, carried out by the direct intervention of man for the purpose of forest management.

• **REDD+ Project:** These are GHG projects that implement activities aimed at reducing emissions due to deforestation and forest degradation, as well as promoting conservation, sustainable forest management and increasing forest carbon stocks. (Biocarbon Registry, 2023).

• **SMByC:** Forest and Carbon Monitoring System (SMByC), is an official scientific tool for continuous and frequent monitoring of forest area and deforestation in Colombia.

SECTION 1.
PROJECT OVERVIEW

1. PROJECT ELIGIBILITY

1.1. Scope

The project is eligible under the scope of the BCR Standard by meeting one or more of the following conditions (Mark with an X).

Table 1. Scope of the BCR Standard

The scope of the BCR Standard is limited to:	
The following greenhouse gases, included in the Kyoto Protocol: Carbon Dioxide (CO2), Methane (CH4) and Nitrous Oxide (N2O).	x
GHG projects using a methodology developed or approved by BioCarbon Registry, applicable to GHG removal activities and REDD+ activities (AFOLU Sector).	x
Quantifiable GHG emission reductions and/or removals generated by the implementation of GHG removal activities and/or REDD+ activities (AFOLU Sector).	x
GHG projects using a methodology developed or approved by BioCarbon Registry, applicable to activities in the energy, transportation and waste sectors.	-
Quantifiable GHG emission reductions generated by the implementation of activities in the energy, transportation and waste sectors.	-

Source: BiocarbonRegistry.

The CultivO₂ project proves to be eligible under the scope of the BCR standard for several key reasons that align with the criteria stipulated therein. First, it addresses the removal and reduction of greenhouse gases (GHGs) included in the Kyoto Protocol: carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O), which is a fundamental requirement for eligibility under this standard.

Additionally, the project has been structured following two methodologies approved by BioCarbon Registry (BCR), specifically BCR0001 and BCR0002, which are applicable to GHG Removal Activities and REDD+ projects respectively. This methodological approach allows for the quantification of emission reductions and/or increases in GHG removals, which is in line with the criteria established in the scope of the BCR standard. Furthermore, CultivO₂ has initiated specific actions for GHG removals since 2017, with clear targets for CO2e reductions through forest conservation and sustainable agricultural practices.

The commitment to sustainability and the social and economic well-being of the communities involved is remarkable, providing a conservation and development model that benefits both the environment and local producer families, through the implementation of sustainable production

systems that promote biodiversity conservation and responsibly manage natural resources such as water and soil.

CultivO₂ has also established a detailed monitoring plan with a 20-year duration, ensuring continuous and reliable tracking of GHG reduction and removal activities. This long-term plan facilitates sustainable and effective emissions management, a crucial aspect of meeting the BCR standard criteria.

1.2. Project type

Select the type of project under which the project activities are developed (Mark with an X).

Table 2. Project type

Activities in the AFOLU sector, other than REDD+	**X**
REDD+ Activities	**X**
Activities in the energy sector	
Activities in the transportation sector	
Activities related to Handling and disposing of waste	

Source: BiocarbonRegistry.

1.3. Project scale

Not applicable for REDD+ projects, or GHG projects in the AFOLU sector.

2. GENERAL DESCRIPTION OF THE PROJECT

CultivO₂ is a climate change mitigation initiative focused on the reduction and removal of greenhouse gases (GHG). This initiative was born as a commitment to farming families throughout Colombia who implement sustainable production systems to contribute to biodiversity conservation, aboveground- and belowground carbon stocks, and clean water management. CultivO₂ supports the economic and social well-being of cacao and cashew producing families, generating economic incentives for farmers through the sale of carbon certificates on private properties in the Andes and Orinoquia regions.

CultivO₂ will be developed in the departments of Arauca, Caldas, Casanare, Córdoba, Huila, Meta, and Vichada. These will incorporate an area of 1,467 hectares of cacao, 543 hectares of cashew and 1,405 ha of forests distributed in a total of 69 properties. These properties represent small, medium, and large producers with crops ranging from 2 hectares to 617 hectares planted. The initiative contemplates the expansion of areas in the AR component during the 2 years following registration and after monitoring, demonstrating that both the eligibility condition of the areas and the conditions

expressed in Biocarbon Registry's BCR0001 methodology are met.

The initiative uses two methodologies that incorporate both crop and forest areas, a condition that allows the quantification of emission reductions and/or increased GHG removals. The requirements of the BCR standard (Biocarbon Registry, 2023) and the methodologies described in the documents were followed:

- Methodological Document AFOLU Sector / BCR0001 Quantification of GHG Emission Reductions - Removal Activities. Version 3.0, April 13, 2022.
- Methodological Document AFOLU Sector / BCR0002 Quantification of GHG Emission Reductions - REDD+ Projects. Version 3.1, September 15, 2022.

In accordance with the guidelines of the aforementioned documents, the initiative was structured through the implementation of activities that demonstrate the reduction and/or removal of GHGs, across a 20-year monitoring plan. Project activities began on 09 June 2017, in this sense, it is projected to achieve a reduction of 38,189 tons of CO2 equivalent (tCO2e) through forest conservation and a removal of 109,292 tCO2e through sustainable practices in cashew and cacao crops.

The CultivO2 P1 project proposes several strategies to reduce greenhouse gas (GHG) emissions during its 20-year implementation period. These strategies involve planting cashew and cacao crops and implementing REDD+ activities. A key strategy is the planting of 2,500 hectares of crops, monitored annually by satellite or field visits. The project also proposes a series of trainings over the years to strengthen silvicultural practices and promote farm planning and biodiversity conservation, including long-term monitoring of the impacts of these practices on the farms involved. In addition, it is planned to monitor and report disturbance events and terrestrial hot spots to prevent forest deforestation. The major commitment is to implement practices that protect threatened ecosystems and endangered wildlife in the project area, thus ensuring effective and sustained reduction of GHG emissions.

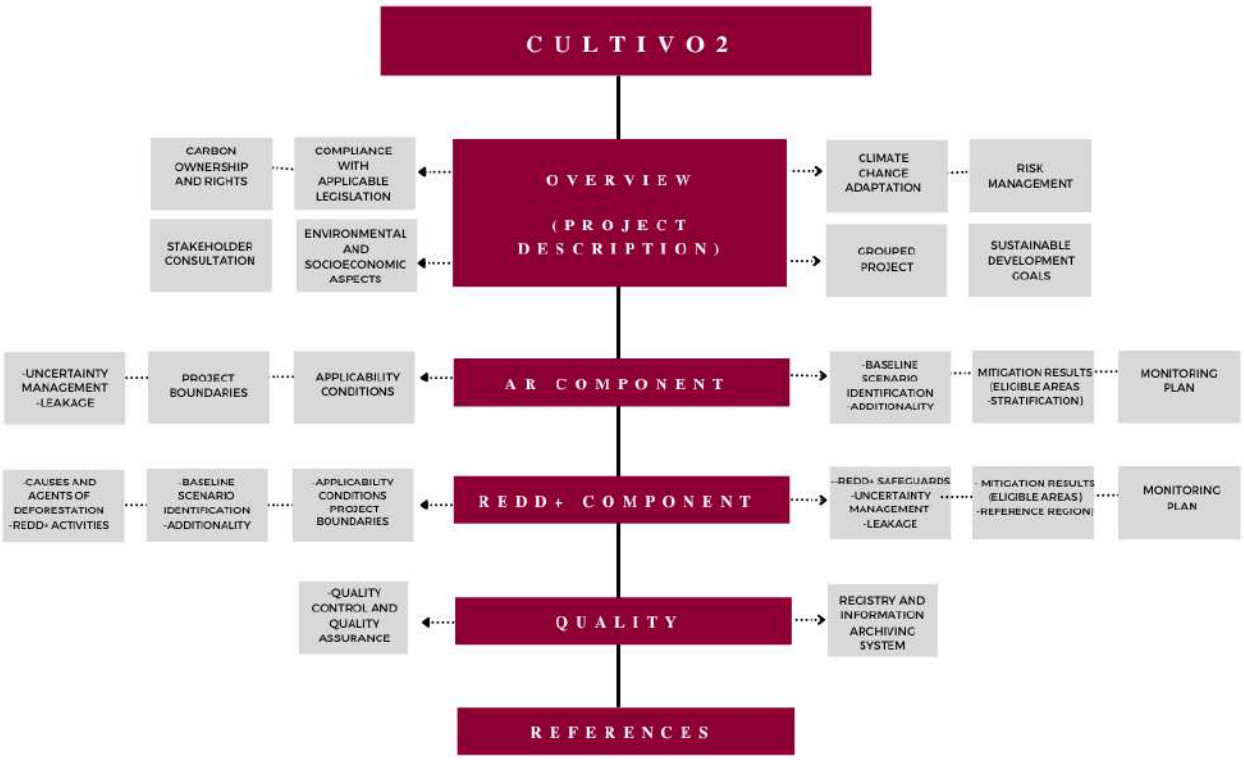
The project methodically addresses the reduction of greenhouse gas (GHG) emissions through REDD+ strategies and removal activities (A/R), clearly stating the differences between the two approaches and avoiding double counting of CO_2eq reductions. Although the CultivO2 initiative involves the implementation of crops, it does not conform to a REDD+ activity as the designated areas are not categorized as forests according to the BCR001 methodology criteria and, furthermore, these areas do not offer a harvestable forest component that would reduce pressure on existing forests. Therefore, it is guaranteed that there is no overestimation of benefits in terms of emission reductions, ensuring that a ton of CO_2eq is not used more than once to obtain benefits, thus avoiding overcompensation. To the above, clear traceability of activities is maintained to ensure rigorous monitoring, reporting, and verification (MRV) to support transparency and project effectiveness in the long term.

On the other hand, the CultivO2 initiative does not apply to special categories; however, it is aimed at strengthening the fulfillment of several Sustainable Development Goals (SDGs). For SDG 6, it plans to

implement a plan for efficient water use through three structured phases, in order to increase efficiency in the use of water resources, following indicator 6.4.1. In relation to SDG 13, the project seeks to insert strategies to address climate change in national policies, focusing on the reduction of greenhouse gas emissions, in line with indicator 13. With regard to SDG 15, CultivO2 focuses on the conservation and sustainable use of terrestrial ecosystems, aiming to preserve areas vital for biodiversity, along the lines of indicators 15.1.1 and 15.1.2. Overall, the project is aligned with these SDGs, promoting sustainable water management, climate change mitigation and the conservation of essential ecosystems.

The development of the project document (PDO) was divided into four sections. The first section covers generalities, listing ten aspects related to project eligibility, legal compliance, ownership and rights, climate change adaptation, risk management, environmental and socioeconomic aspects, among others. The second and third sections focus on Removal Activities and the REDD+ component, where the quantification of emissions, the monitoring plan and other relevant aspects are detailed. The last section refers to the control and quality procedures applied to the project, addressing information management and data recording. This is evidenced in the following figure

Figure 1. General structure of the document.



Source: Fundación Cataruben, 2023

2.1. GHG Project name

CultivO$_2$ P1, is an initiative that aims to break the cycle of deforestation caused by the expansion of the agricultural frontier. In addition, it seeks to improve the economic and social welfare of cacao and cashew growing families by implementing economic incentives for the reduction and/or removal of greenhouse gas emissions (GHG). This initiative impacts changes in the coverage of natural areas and agricultural territories in private properties in the departments of Arauca, Caldas, Casanare, Córdoba, Huila, Meta, and Vichada.

2.2. Objectives

Develop actions to mitigate climate change in the project's area of influence.

- Reduce CO2 emissions resulting from the conversion of natural ecosystems to alternative land uses due to anthropic interventions.
- Contribute to national climate change mitigation goals.
- Develop actions that lead to GHG removals from the atmosphere expressed as tCO_2eq, through the establishment of cacao and cashew plantations.

2.3. Project activities

The project activities of the cultivO2 P1 initiative are developed over a 20-year time horizon and are divided into two main components: Removal Activities and REDD+ activities.

In the Removal Activities, the main objective is the net removal of greenhouse gases (GHG) through the implementation of sustainable production systems, based on a structured set of activities described below:

A) **Establishment of Crops and Restoration Zones:** The first activity involves the delimitation of the areas earmarked for the project through satellite images or field inspections, with a planting target of 2,500 hectares during the stipulated project period. This crop establishment will contribute significantly to carbon sequestration, thus helping to reduce GHG emissions.

B) **Training and Accompaniment Processes:** A cycle of 20 trainings will be carried out throughout the project period, aimed at strengthening the silvicultural practices of local farmers. Continued training will enable the adoption of more sustainable and efficient techniques, resulting in cleaner production and lower GHG emissions.

C) **Characterization and Implementation of Silvicultural Practices:** In this stage, 57 properties will be monitored to characterize and improve existing production systems. The implementation of better silvicultural management practices will not only improve productivity but, crucially, will help reduce GHG emissions through cleaner and more sustainable techniques.

D) **Monitoring of Disturbance Event Impacts:** The project includes continuous monitoring of affects by various events such as fires, floods, pests, among others, facilitating quick and effective responses to these disturbances, mitigating potential GHG emissions associated with these events.
E) **Evaluation of the Growth of Planted Plots:** Through periodic evaluation every four years, we seek to ensure adequate biomass growth and crop permanence, a key indicator for the removal of CO2 from the environment.
F) **Monitoring and Quantification of Net Removals:** Finally, the project includes the detailed measurement and quantification of net GHG removals, thus ensuring an accurate estimate of the project's contribution to reducing GHG emissions.

In summary, through the integration of advanced technologies such as remote sensing and the application of scientifically validated methodologies, together with improved silvicultural management practices, the CultivO2 P1 project seeks to achieve a significant reduction in GHG emissions, promoting sustainable and resilient production systems in the face of climate change.

On the other hand, REDD+ activities are strategically designed to mitigate emissions generated by deforestation through a combination of prevention, mitigation, and constant monitoring. The description of each activity and how they will contribute to the reduction of greenhouse gas (GHG) emissions are described below:

a. Implement training and accompaniment processes through trainings that strengthen land planning, biodiversity conservation, and sustainable forest management: Twenty trainings will be carried out covering land planning, biodiversity conservation and sustainable forest management, aiming to eradicate the lack of knowledge that drives deforestation. Strengthening the knowledge of property owners about sustainable management will favor forest conservation and, therefore, the reduction of GHG emissions.

b. Identify and adopt the principles of forest governance for sustainable forest management: The implementation of this principle will be carried out in three phases: land characterization, creation of land planning documents and monitoring the implementation of the plan. By promoting sustainable forest management, indiscriminate deforestation is prevented, resulting in the preservation of carbon sinks and the reduction of GHG emissions.

c. Monitoring of terrestrial hot spots: Constant monitoring of hot spots to identify and report the presence of forest fires and take appropriate measures. By detecting hot spots early, large-scale fires that result in significant carbon emissions to the atmosphere can be avoided.

d. Generating alerts on changes due to deforestation, or transformation of ecosystems: Permanent monitoring through the analysis of satellite images to detect adverse changes in the ecosystem and act in a timely manner. By actively preventing and mitigating the effects of deforestation, we contribute significantly to reducing GHG emissions.

e. Monitoring of threatened ecosystems: Monitoring will be carried out based on existing data on threatened ecosystems in the project area. By monitoring threatened ecosystems, it is possible to work towards their conservation, contributing to maintaining existing levels of carbon stocks and avoiding additional GHG emissions.

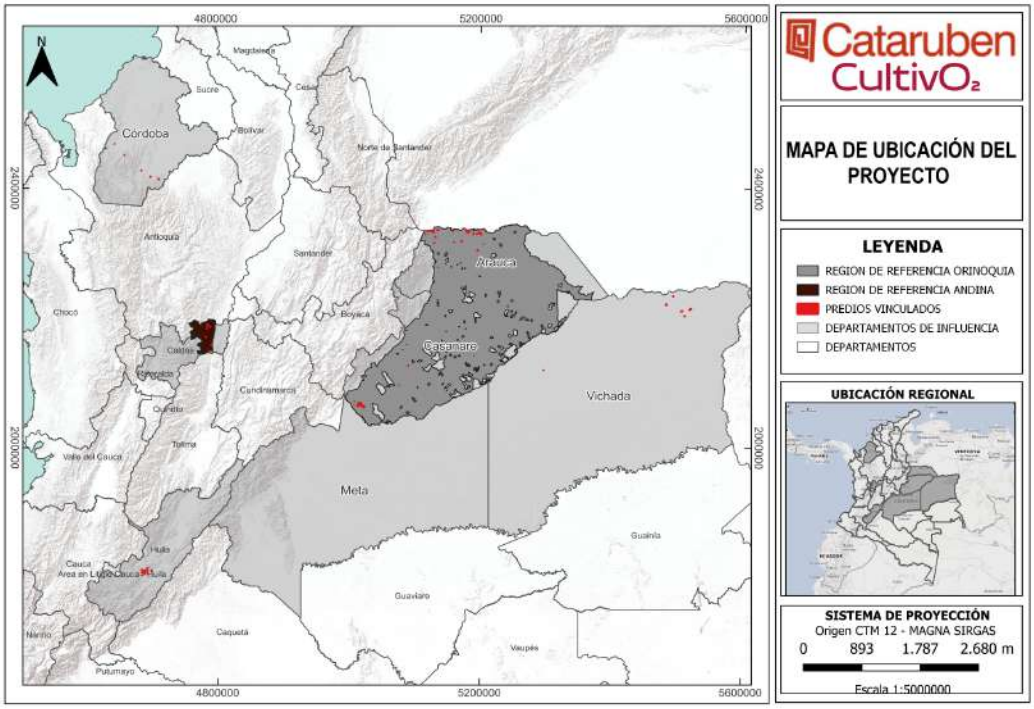
f. Participatory monitoring of threatened species: Participatory monitoring with the involvement of local communities for the reporting and monitoring of threatened species. Preserving biodiversity and preventing the extinction of local species protects ecosystems that act as carbon sinks, thus reducing GHG emissions.

In summary, the planned activities seek a sustainable and conscious management of forest resources, focusing both on the prevention of deforestation and on the monitoring and conservation of the ecosystems and biodiversity present. By encouraging education and active monitoring, REDD+ activities are expected to lead to a notable decrease in GHG emissions in the region, promoting the health of forest ecosystems and, therefore, contributing positively to the balance of global climate change.

2.4. Project location

The project is located in the Orinoco and Andes biomes, specifically in the departments of Arauca, Casanare, Vichada and Meta for the Orinoco biome, and Caldas, Cordoba and Huila for the Andes biome. Image 1 shows the spatial distribution of the project beneficiaries.

Image 1. Project location map



Source: Fundación Cataruben, 2023.

2.5. Additional information about the GHG Project

2.5.1. The Regional Autonomous Corporations that are present in the CultivO₂ project areas are:

Las Corporaciones Autónomas Regionales que hacen presencia en las áreas del proyecto CultivO₂ son:

Table 3: Environmental authorities with jurisdiction in the project area.

ACRONYMS	CORPORATION	HECTARES AR	HECTARES REDD
CAM	Corporación Autonoma Regional del Alto Magdalena	39,7	0
CORMACARENA	Corporación para el Desarrollo Sostenible del área Especial La Macarena	0	809,7

CORPORINOQUIA	Corporación Autónoma Regional de la Orinoquía	1939,78	551,4
CVS	Corporación Autónoma Regional de los Valles del Sinú y del San Jorge	13,42	0
CORPOCALDAS	Corporación Autónoma Regional de Caldas	18,0	44,2
TOTAL		**2.010,9**	**1.405**

Source: Fundación Cataruben, 2023.

Corporación Autónoma Regional del Alto Magdalena - CAM: The Corporación Autónoma Regional del Alto Magdalena (CAM) exercises its environmental authority in the department of Huila and in 37 municipalities; therefore, it has four offices, which guarantee greater effectiveness in the exercise of institutional management. CAM carries out its functions through Law 99 of December 22, 1993, which grants it the power to be the highest environmental authority in the department in question, in order to improve the centralized and sectoral scheme that previously predominated in environmental management. Taking into account the above, the jurisdiction of the corporation includes the municipalities in the department of Huila that are the focus of the Cataruben Foundation's CultivO2 P1, such as El Agrado and El Pital.

The Institutional Action Plan of the Corporación Autónoma Regional del Alto Magdalena (2020-2023) reports action strategies that revolve around three fundamental axes of Huila: Territory of Life (Protection of all forms of life, including human life in the context of the current crisis), Sustainability (to ensure the conservation of the natural resource base and environmental goods and services) and development (Natural base as a support for the economic and social development of the territory). Taking into account this premise, the activities of the CAM management plan are articulated with the initiative of the CultivO2 project, such as promoting a responsible and ethical culture with the environment, where it is understood that we are all responsible for its care and conservation, through environmental education and communication processes linked to the programs and projects carried out by the entity, with strengthening of the capacity for action, decision and citizen participation in the administration of renewable natural resources (CAM 2020).

The corporation has managed to identify different environmental problems since 2011 in the department, on which it has been implementing actions with a view to improving the environmental conditions of the department; among the solutions aimed at improvement, activities are articulated with the project initiative, such as: the protection of biodiversity and the growth of sustainable production and good practices (CAM 2020).

Corporación para el Desarrollo Sostenible del área Especial La Macarena - CORMACARENA: The Corporación para el Desarrollo Sostenible del Área de Manejo Especial de La Macarena (Cormacarena), exercises its functions in accordance with Article 31 of Law 99 of 1993, which establishes that it must execute national policies and plans consolidated by the law approving the National Investment Plan or by the Ministry of Environment, as well as exercise the function of maximum environmental authority in the area under its jurisdiction (Law 99, 1993). The territory of the Corporation's jurisdiction is focused on the department of Meta. Within the scope of the CultivO2 initiative, the municipalities included in this jurisdiction are: Fuente de Oro, Puerto Gaitán and San Martín (Cormacarena 2020).

As a corporation, Cormacarena is responsible for carrying out activities that promote scientific research and technology transfer. Subject to the special regime provided for in the aforementioned Law and in its bylaws, it is empowered primarily to promote the conservation and sustainable use of renewable natural resources.

Many of the activities of the cormacarena Action Plan (2020-2023) are aligned with several of the project's activities, such as: Provide accompaniment to sectors for the reconversion towards sustainable production systems; design and implement a strategy for the integrated management of post-consumer waste; Strengthen actions on issues of prevention and control of forest fires and burns in the department of Meta; Strengthen relief agencies and / or community for risk management for forest fires; Implement environmental education actions in the area of jurisdiction of the corporation; Areas under sustainable conservation systems (restoration, agroforestry systems and sustainable forest management); among other activities (Cormacarena 2020).

Corporación Autónoma Regional de la Orinoquía - CORPORINOQUIA: The territory under the jurisdiction of the Corporación Autónoma Regional de la Orinoquia (Corporinoquia) is focused on 4 departments: Casanare, Arauca, Vichada and part of the department of Cundinamarca. Under the initiative, the municipalities are the following: Maní, Orocué, Paz de ariporo, San Luis de Palenque, Trinidad, Yopal and Villanueva (Casanare); Cumaribo, Puerto Carreño and La Primavera (Vichada); Arauca, Arauquita, Saravena and Tame (Arauca).

Corporinoquia in its strategic planning process for the four-year period 2020-2023, advanced the present process of formulation of the Action Plan according to current regulations; for which it examined the state of progress of the Regional Environmental Management Plan 2013-2025 (PGAR) (instrument of higher hierarchy that was approved by Agreement 1100.02.2.13-005 of August 14, 2013), by the Board of Directors of the Regional Autonomous Corporation of the Orinoco. Corporinoquia, has a programmatic structure made up of six lines and twenty-four strategic components. In alignment with the project, goals enrolled in (Corporinoquia 2020) are defined:

- Construction of knowledge as a determinant for territorial environmental planning and management, with the objective of generating a continuous process of socio-environmental research to learn about the regional ecological structure and its relationships in the territory.

- Articulation of risk management and climate change management strategies to environmental planning and management, with the objective of guiding the appropriate use of the territory based on knowledge of its potential and limitations to reduce environmental risk factors.
- Conservation of the biocultural diversity of the Orinoco region as part of the heritage of humanity, with the objective of strengthening the social fabric around the conservation and sustainable management of environmental goods and services.

Corporación Autónoma Regional de los Valles del Sinú y del San Jorge - CVS: The Corporación Autónoma Regional de los Valles del Sinú y del San Jorge (CVS) is developing its projects in the department of Córdoba. For the CultivO₂ project, the municipalities that are routed in the initiative are: Tierralta, Puerto Libertador, Montelíbano, San José de Ure, and Valencia. The Corporation works in a timely and appropriate manner for the conservation, protection, and administration of natural resources and the environment, for sustainable development; this is achieved through environmental management and community participation.

CVS's Institutional Action Plan (2020-2023) indicates the following relevant problems in the terrestrial ecosystems within its jurisdiction: degradation of natural forests, loss of wildlife, and drainage erosion. Considering this and other problems visualized in the department of Córdoba, the goals and objectives related to the strategic lines present in the Regional Environmental Management Plan (PGAR CVS 2020-2031), are focused on:

- Strategic Line 1. Environmental management of the territory from the Main Ecological Structure, EEP.
- Strategic Line 2. Knowledge, conservation, use and management of biodiversity within the framework of sustainability.
- Integral management of climate change in the territory.
- Prevention and control of environmental degradation of the territory.
- Institutional strengthening and coordination in the regional SINA for sustainable environmental management.
- Environmental education and structural participation for territorial environmental governance and management.

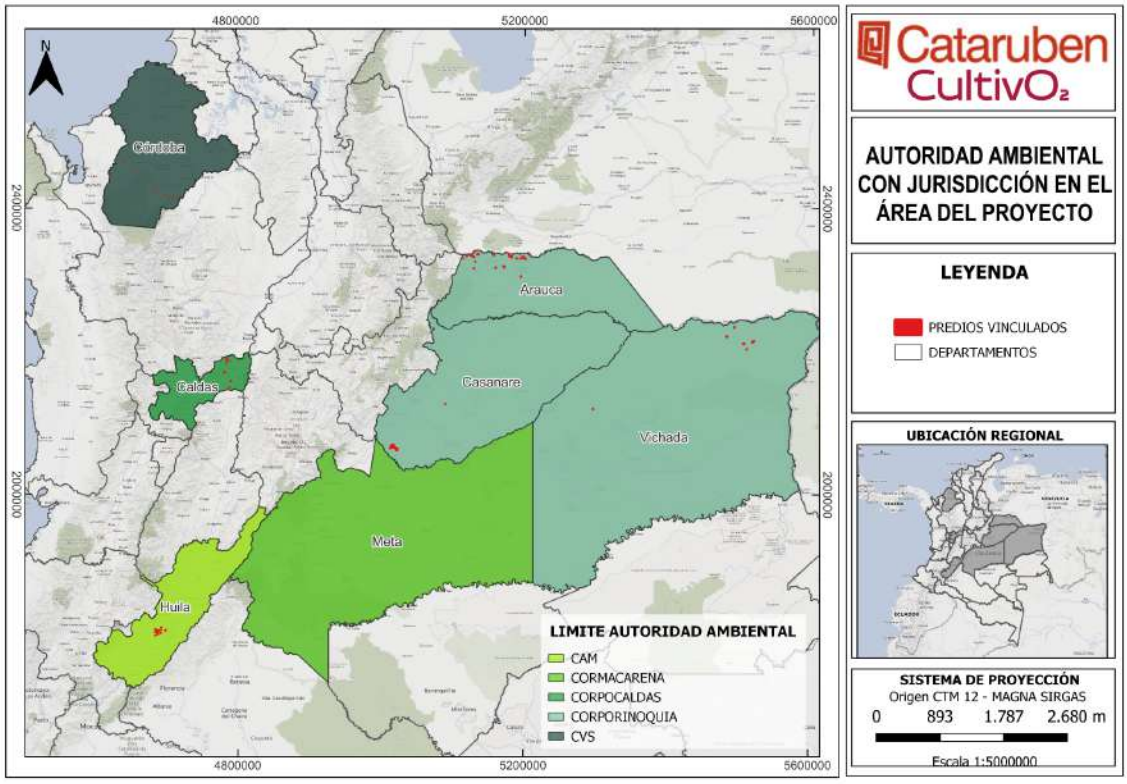
Said goals are articulated to the activities of the CultivO₂ project such as: conserve the Main Ecological Structure, EEP, which sustains and provides for all productive activities in the department of Córdoba; decrease the vulnerability of strategic ecosystems through actions aimed at climate adaptation, based on the conservation and management of ecosystems as a measure of socio-environmental adjustment; prevent and control the processes that lead to the degradation of ecosystems; generate structured and objective information for decision-making in favor of conservation; and generate inclusive, equitable and dynamic mechanisms and/or processes that lead to the recognition of the importance of conservation, care and appropriate use of the territory (CVS 2020).

Corporación Autónoma Regional de Caldas - CORPOCALDAS: The Corporación Autónoma Regional de Caldas (CORPOCALDAS) was created with the purpose of addressing the problem of erosion and its consequences in the deterioration of human settlements in the department of Caldas. By means of Law 40 of December 1971, the Regional Autonomous Corporation was created for the defense of three municipalities mainly at that time: Manizales, Salamina and Aranzazu (CRAMSA), standing out for its erosion control through strategic methodologies. Law 22 of March 1991, brings great changes for the corporation. Thus, Corpocaldas expands its jurisdiction to 22 municipalities and assumes the competencies in the area of renewable natural resources. The municipalities under CultivO2 P1 are: Samaná, Valledupar, Norcasia and Victoria.

In the case of Corpocaldas, this corporation's functions include promoting and developing community participation in activities and programs for environmental protection, sustainable development and adequate management of renewable natural resources; advising territorial entities in the formulation of formal environmental education plans and executing non-formal environmental education programs, in accordance with national policy guidelines; to exercise the functions of evaluation, control and environmental monitoring of the uses of land and other renewable natural resources, which will include the emission that may cause damage or endanger the normal sustainable development of renewable natural resources or prevent or hinder their use for other purposes.

According to Corpocaldas' Environmental Management Plan, its goals are focused on the restoration of protected areas and the main ecological structure of the department, as well as the implementation of incentives for conservation, the reduction of air pollution, the use of solid waste, the implementation of sectoral agreements, the incorporation of urban biodiversity, the strengthening of the green business strategy, the implementation of climate actions, environmental management, the strengthening of the POMCAs, the implementation of a collaborative platform for the Integral Management of Water Resources, and the strengthening of education, participation and environmental culture. Many of the aforementioned goals complement and align with conservation and reduction activities of the CultivO2 project (Corpocaldas 2020).

Image 2. Environmental authorities with jurisdiction in the project area.



Source: Fundación Cataruben, 2023.

2.5.2. Biotic, Meteorological and Water Resource Characteristics of the Project.

2.5.2.1. General Ecosystems.

In the project's reference region there is a great diversity of ecosystems that are characteristic of the Andean region and the Orinoco region, mainly those related to the eastern (foothills, mainly piedmont plains) and central mountain ranges where the project is located. For the central mountain range, the reference region is mainly determined by the Magdalena hydrographic zone (Upper and Middle Magdalena) dominated by agroecosystems (coffee agroecosystem, crop mosaics and natural spaces, permanent crops, livestock "applied to the eastern mountain range"), natural vegetation cover such as sub-Andean and Andean shrublands, humid gallery forest, artificialized territories, secondary vegetation, among others.

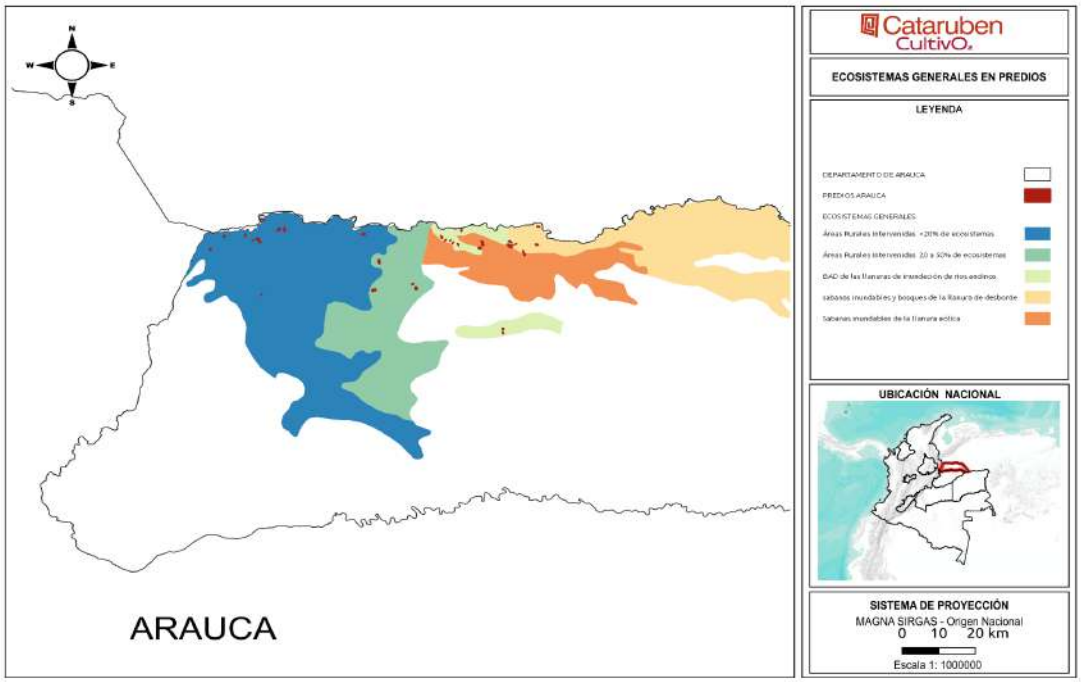
While for the foothills of the eastern cordillera, precisely the plains foothills are influenced by the Orinoco hydrographic zone, dominated by an amalgam of ecosystems including gallery forest, flooded savannas, fragmented forest, secondary vegetation, swampy areas and agroecosystems (rice, forest, palm, livestock, crop agroecosystems, pastures and natural spaces).

The following maps show the distribution of the general ecosystems present in the properties of the

CultivO2 project by department: Arauca, Caldas, Casanare, Córdoba, Huila, Meta and Vichada.

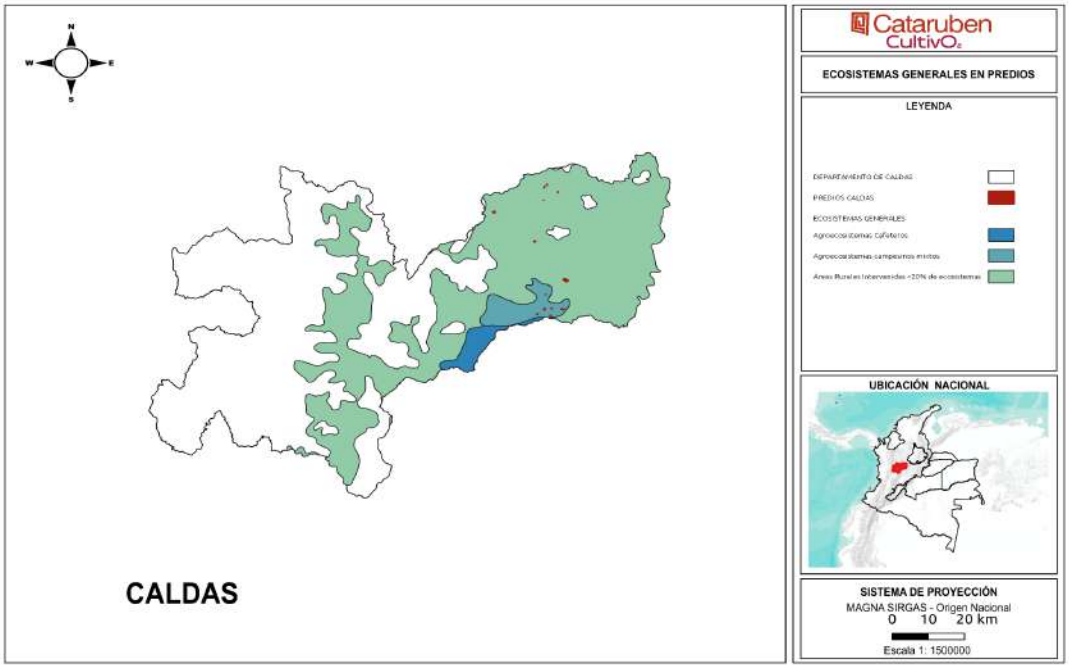
1. On the properties in the department of Arauca, there are ecosystems in rural areas with ecosystems intervened by human activity, high dense forest of the flood plains of the Andean rivers, floodable savannas and floodplain forests, as well as floodable savannas of the eolian plain.
2. The Properties in the Department of Caldas include rural areas of ecosystems intervened by human activity, coffee agroecosystems and mixed peasant agroecosystems.
3. The properties in the department of Casanare include ecosystems such as dense high forests in the flood plains of Andean rivers, floodable savannas and overflow forests, floodable savannas of the Aeolian plain, non-floodable savannas of the piedmont, and entrepreneurial agroecosystems.
4. The properties in the Department of Córdoba include rural areas with ecosystems that have been severely affected by human activity and have areas of less than 20% of the original ecosystems of this territory.
5. The Properties in the department of Huila include rural areas with ecosystems that have been severely affected by human activity and have areas of less than 20% of the original ecosystems of this territory.
6. In the Properties of the department of Meta, there are ecosystems such as medium-dense gallery forests and Morichales, as well as very dissected highland savannahs and flooded savannahs of the eolian plain.
7. The properties in the Department of Santander include rural areas with ecosystems that have been severely affected by human activity and have areas of less than 20% of the original ecosystems of this territory.
8. In the properties of the department of Vichada, there are ecosystems such as medium dense gallery forests and Morichales, as well as very dissected highland savannahs and flat highland savannahs.

Image 3. General ecosystems in the properties of the department of Arauca.



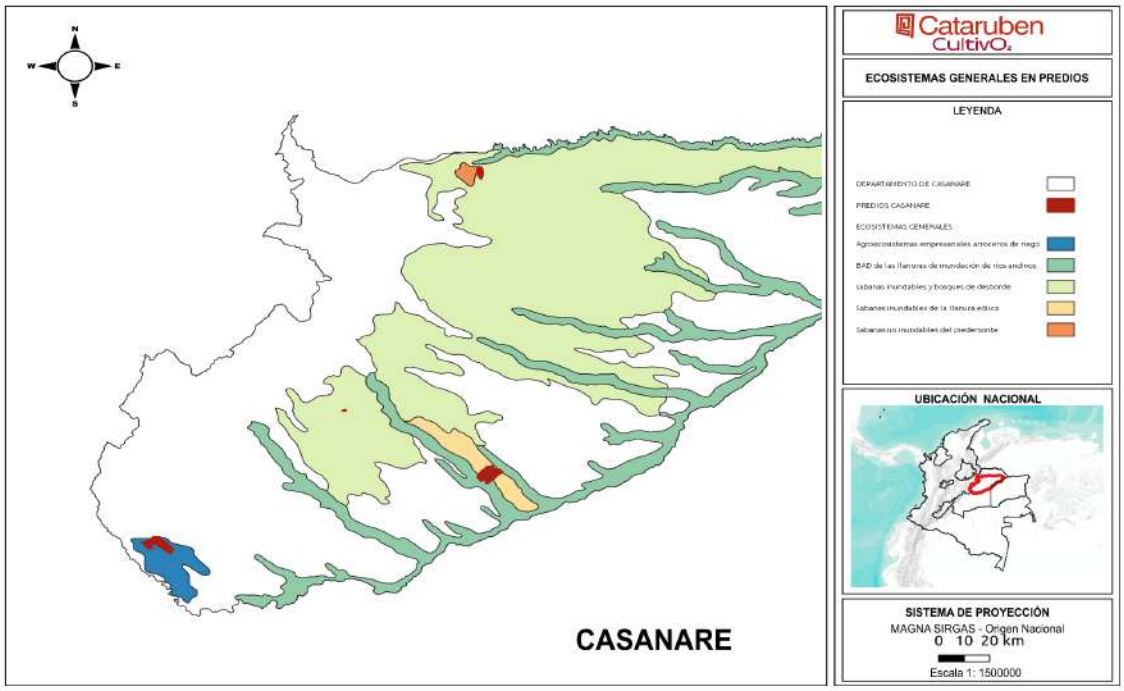
Source:. (SIAC, 2022). **Prepared by:** Fundación Cataruben.

Image 4. General ecosystems in the properties of the department of Caldas



Source:. (SIAC, 2022). **Prepared by:** Fundación Cataruben.

Image 5. General ecosystems in the properties of the department of Casanare

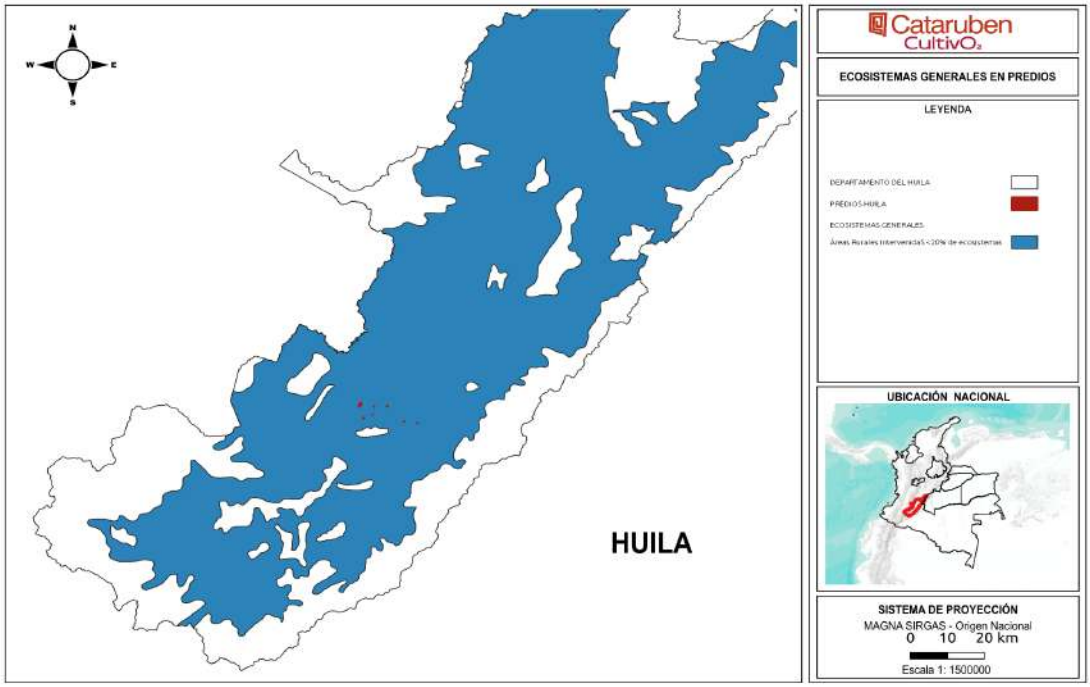


Source:. (SIAC, 2022). **Prepared by:** Fundación Cataruben.

Image 6. General ecosystems in the properties of the department of Córdoba

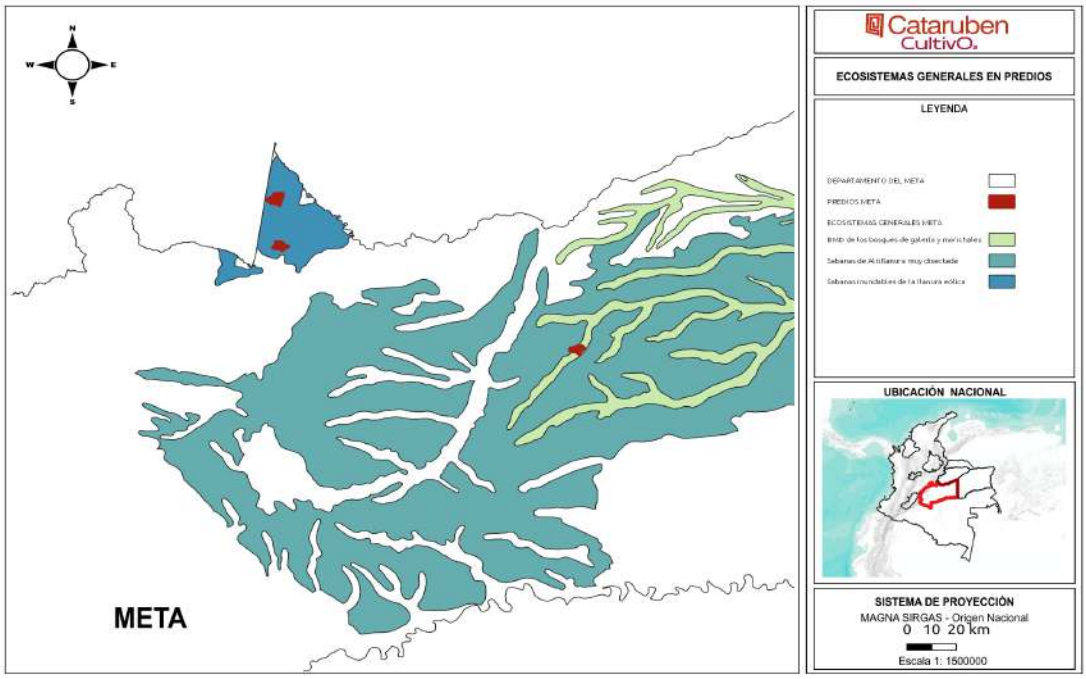
Source:. (SIAC, 2022). **Prepared by:** Fundación Cataruben.

Image 7. General ecosystems in the properties of the department of Huila



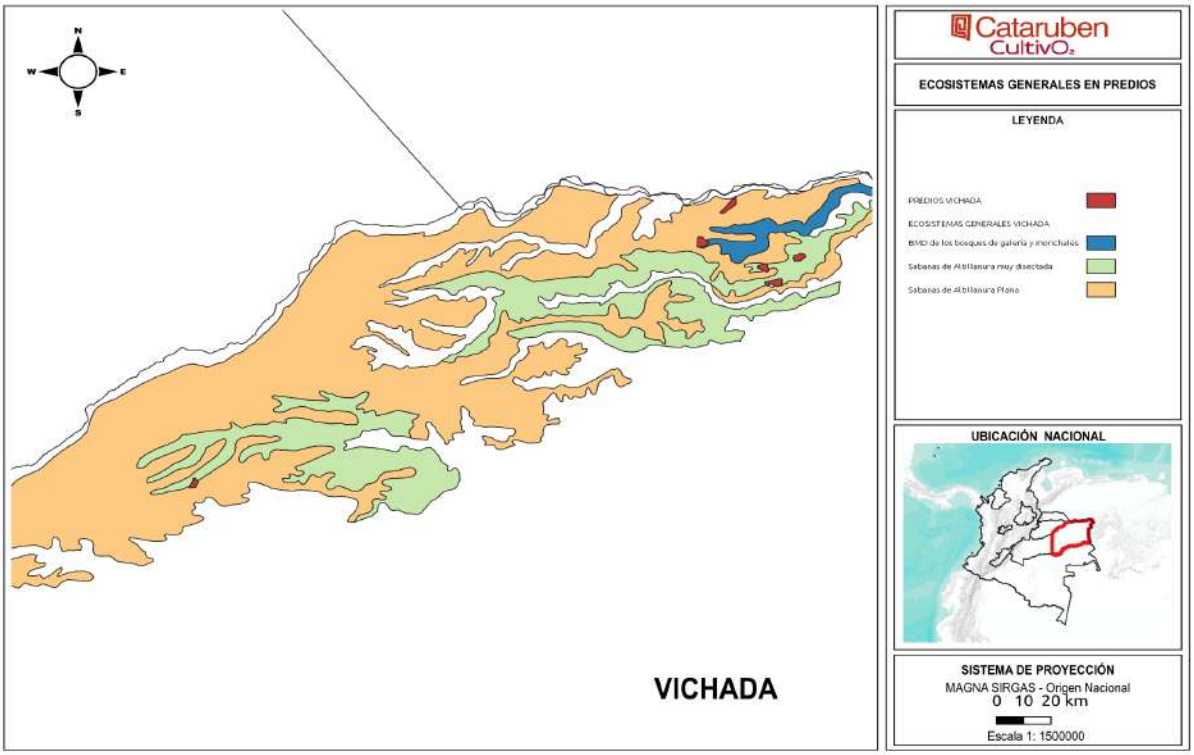
Source:. (SIAC, 2022). **Prepared by:** Fundación Cataruben.

Image 8. General ecosystems in the properties of the department of Meta



Source:. (SIAC, 2022). **Prepared by:** Fundación Cataruben.

Image 9. General ecosystems in the properties of the department of Vichada.

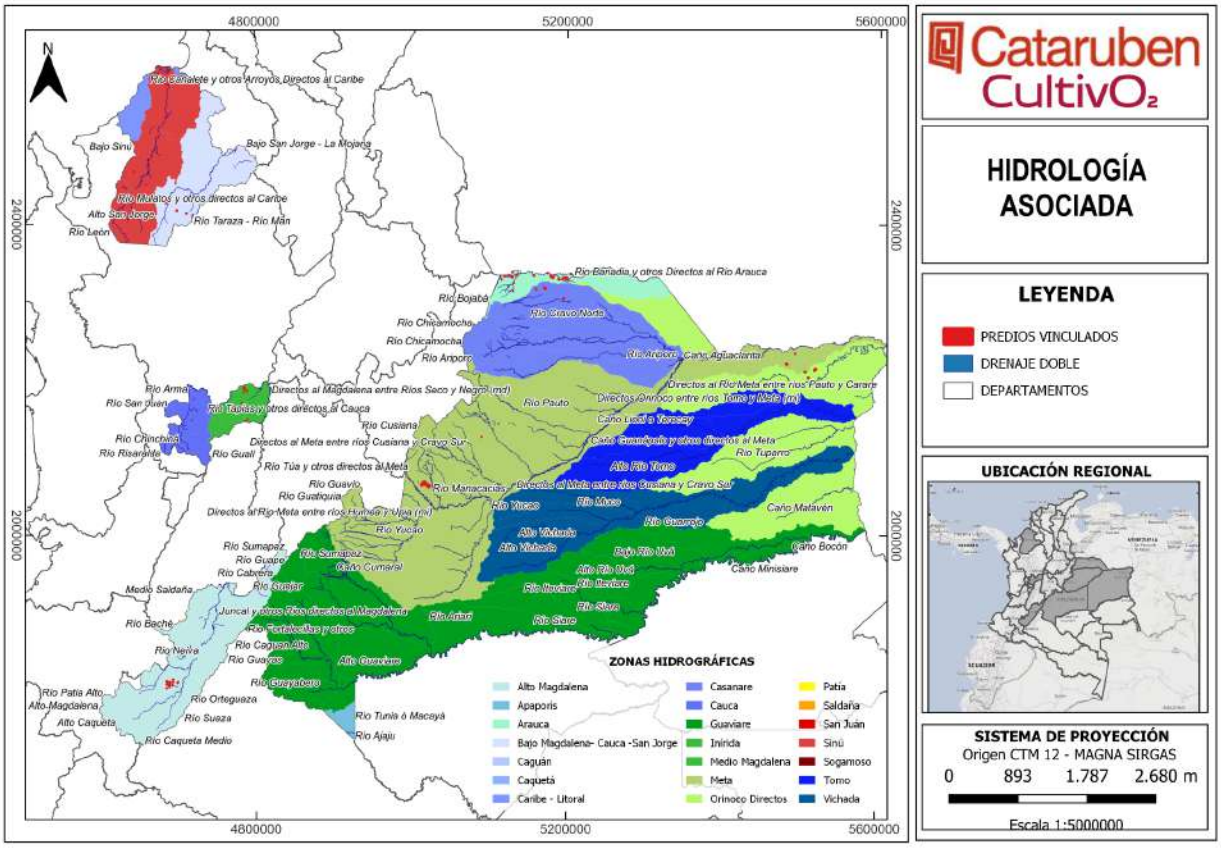


Source:. (SIAC, 2022). **Elaboration::** Fundación Cataruben.

2.5.2.2. Hydrology of the Project.

The project area encompasses a total of 8 departments, including the following rivers associated with the drainage of the properties that are part of the project: Sinú River, San Jorge River, Sogamoso River, La Miel River, Upper, Middle and Lower Magdalena River, Upía River, Cabuyarito River, Meta River, Cravo Sur River, Tua River, Casanare River, Banadía River, Arauca River, Bita River, Tomo River, Elvita River, Planas River, and Vichada River. There is a diversity of tributaries associated with these watersheds.

Image 10. Hydrology present in the Project.



Source: (SIAC, 2022). **Prepared by:** Fundación Cataruben.

There are also 11 hydrographic zones in the project's area of influence: Alto Magdalena, Arauca, Bajo Magdalena, Casanare, Medio Magdalena, Meta, Orinoco, Sinú, Sogamoso, Tomo, Vichada. Additionally, there are 4 aquifers identified in the area of influence in the departments of Meta, Casanare, Arauca, Caldas and Huila.

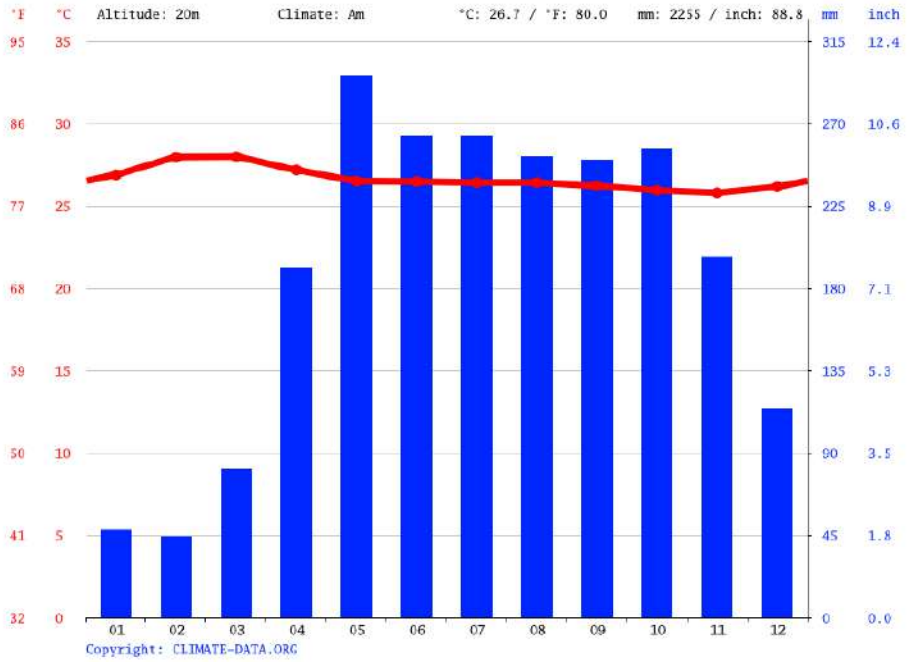
2.5.2.3. Meteorological factors.

The meteorological factors in the different regions where there are properties are very varied due to the country's orographic conditions; the three mountain ranges generate drastic changes in terms of vegetation, species distribution and climates in the areas, as well as the intertropical convergence zone, which generates changes in the climatic patterns of the areas; the general climograms of the 8 departments that have properties in the CultivO2 project are described below.

a. Córdoba.

The department of Córdoba has an average annual temperature of 26.7 °C and an average annual precipitation of 2,255 mm of water, as shown in the following climogram, which shows that precipitation has a monomodal regime with an extended rainy period from April to November and a dry period from December to March.

Graph 1. Annual climogram of the department of Córdoba.

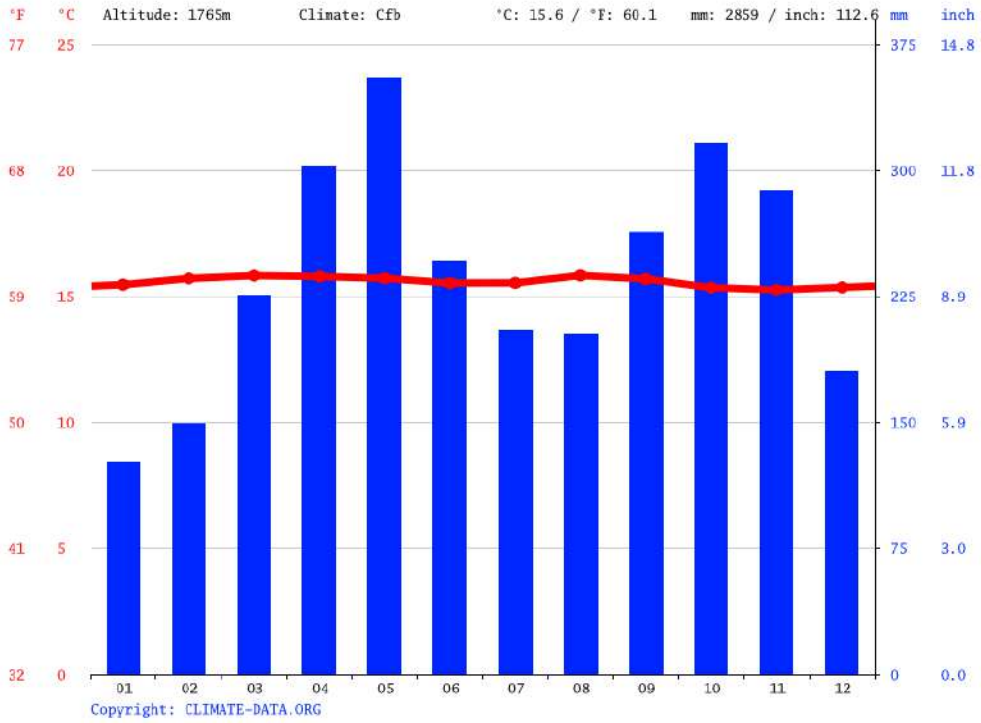


Source: (Climate-data, 2022) . **Prepared by:** Fundación Cataruben.

b. Caldas.

The department of Caldas has an average annual temperature of 15.6 °C and an average annual precipitation of 2859 mm of water, as shown in the following climogram. It is observed that precipitation has a bimodal regime with 2 periods of low water and 2 periods of rain, the first period of low water goes from December to March, followed by a period of rain from April to June, followed by a period of low water from July to August and finally a period of rain from September to November.

Graph 2. Annual climogram of the department of Caldas.

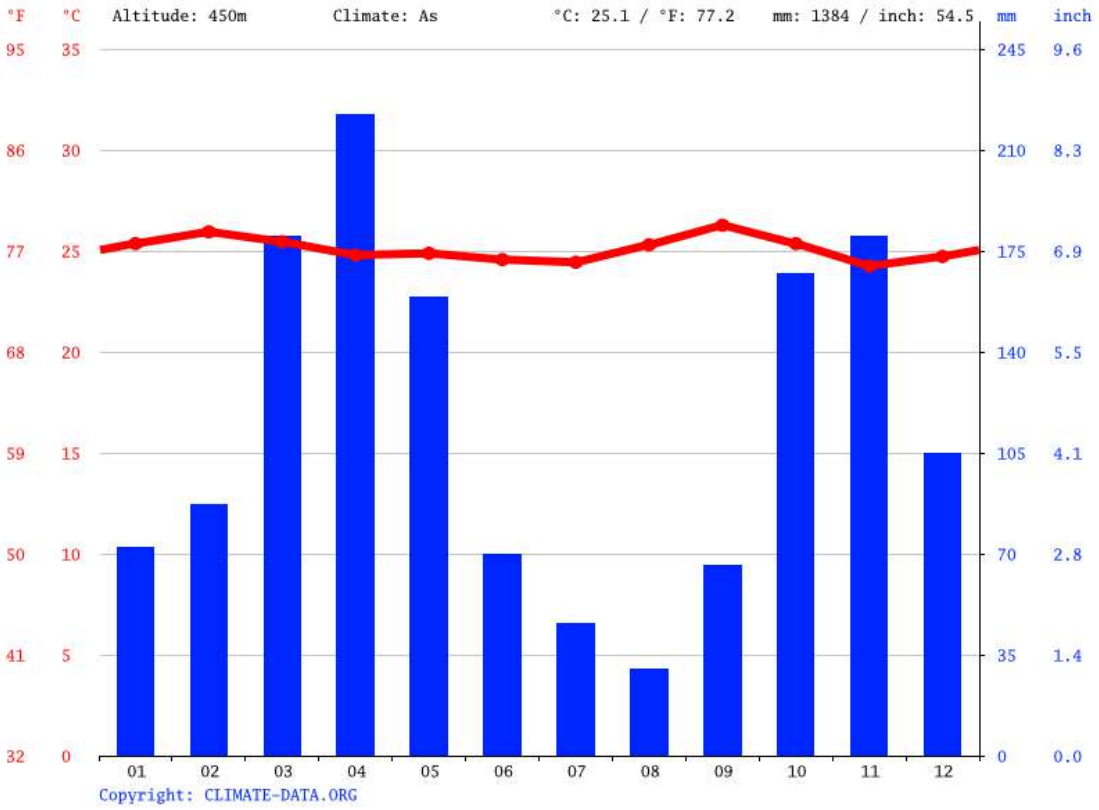


Source: (Climate-data, 2022) . **Prepared by:** Fundación Cataruben.

c. Huila.

The department of Huila has an average annual temperature of 25.1 °C and an average annual precipitation of 1,384 mm of water, as shown in the following climogram. It is observed that precipitation has a bimodal regime with 2 periods of low water and 2 periods of rain, the first period of low water goes from December to February, followed by a period of rain from March to May, followed by a period of low water from June to September and finally a period of rain from October to November.

Graph 3. Annual climogram of the department of Huila

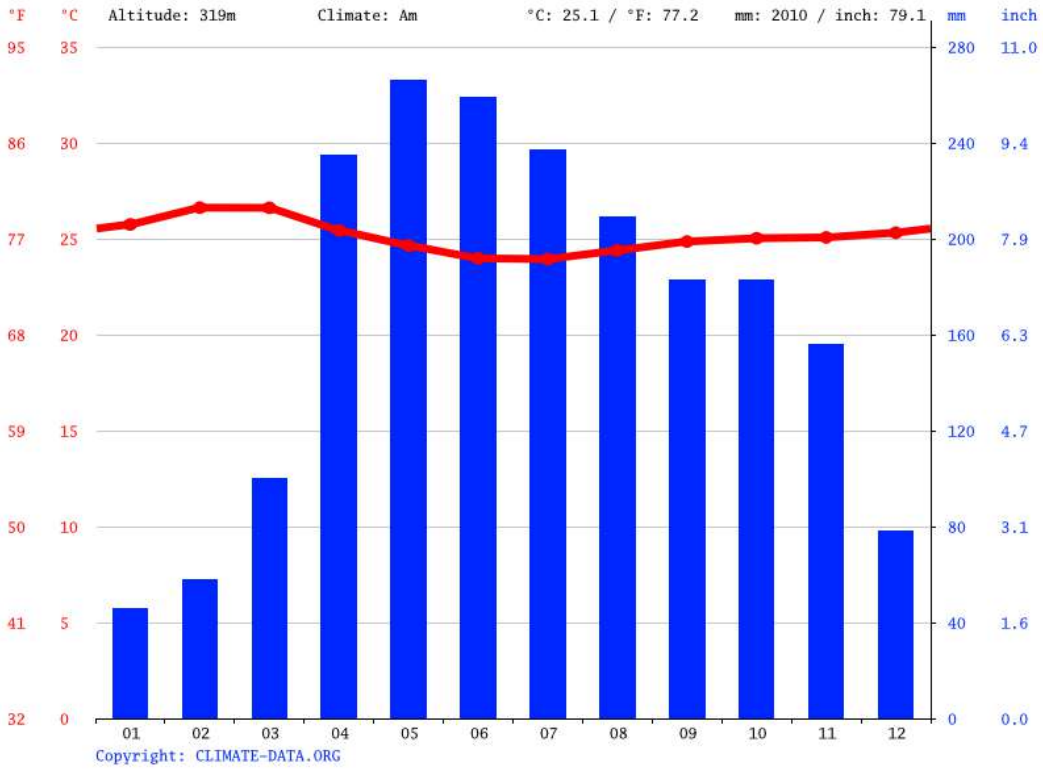


Source: (Climate-data, 2022) . **Prepared by:** Fundación Cataruben.

d. Arauca.

The department of Arauca has an average annual temperature of 25.1 °C and an average annual precipitation of 2010 mm of water, as shown in the following climogram. This indicates that precipitation has a monomodal regime with an extended rainy season from April to November and a dry season from December to March.

Graph 4. Annual climogram of the department of Arauca

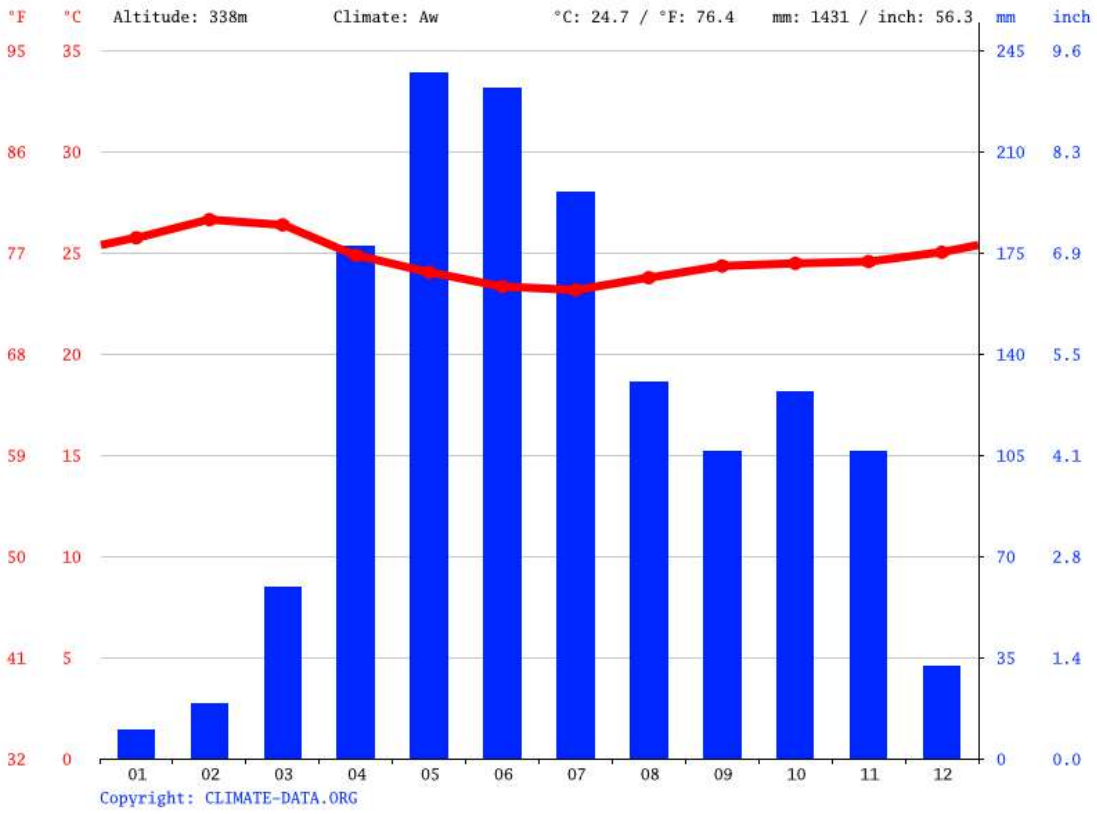


Source: (Climate-data, 2022) . **Prepared by:** Fundación Cataruben.

e. Casanare.

The department of Casanare has an average annual temperature of 24.1 °C and an average annual precipitation of 1431 mm of water, as shown in the following climogram. This indicates that precipitation has a monomodal regime with a rainy period from April to November and a dry period from December to March.

Graph 5. Annual climogram of the department of Casanare.

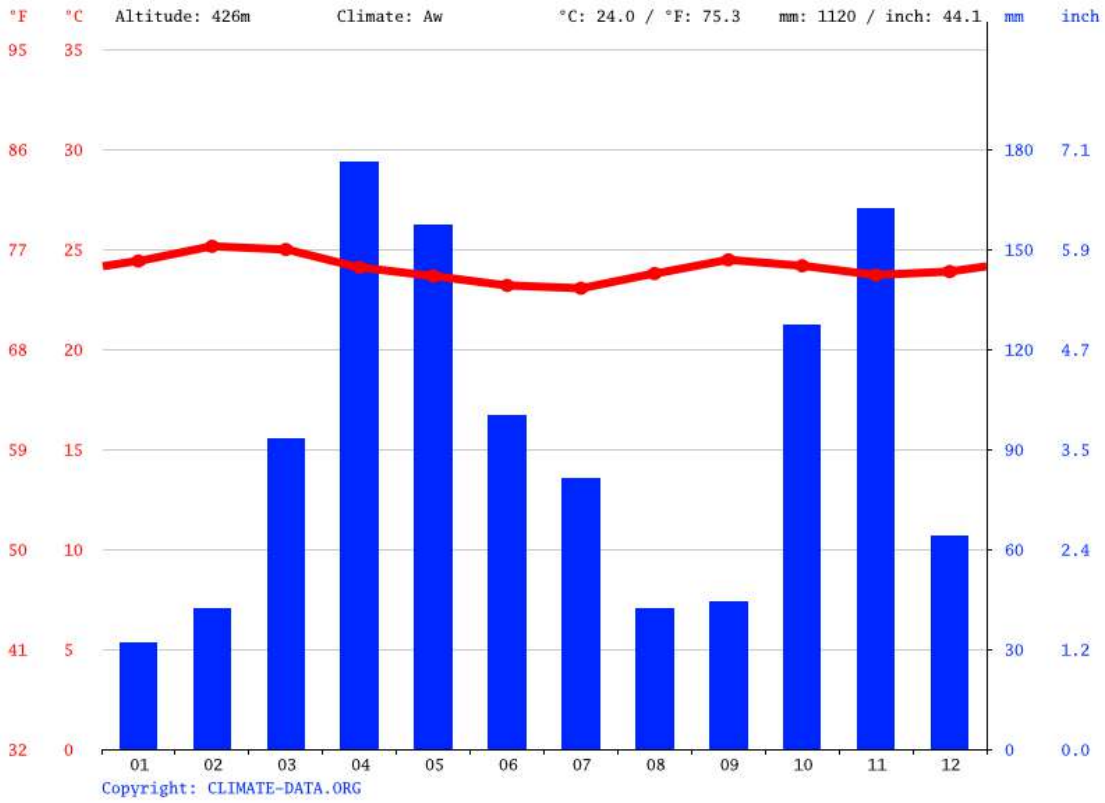


Source: (Climate-data, 2022) . **Prepared by:** Fundación Cataruben.

f. Meta.

The department of Meta has an average annual temperature of 24 °C and an average annual precipitation of 1120 mm of water, as shown in the following climogram. It is observed that precipitation has a bimodal regime with 2 dry periods and 2 rainy periods, the first dry period goes from December to February, followed by a rainy period from March to June, followed by a dry period from July to September and finally a rainy period from October to November.

Graph 6. Annual climogram of the department of Meta.

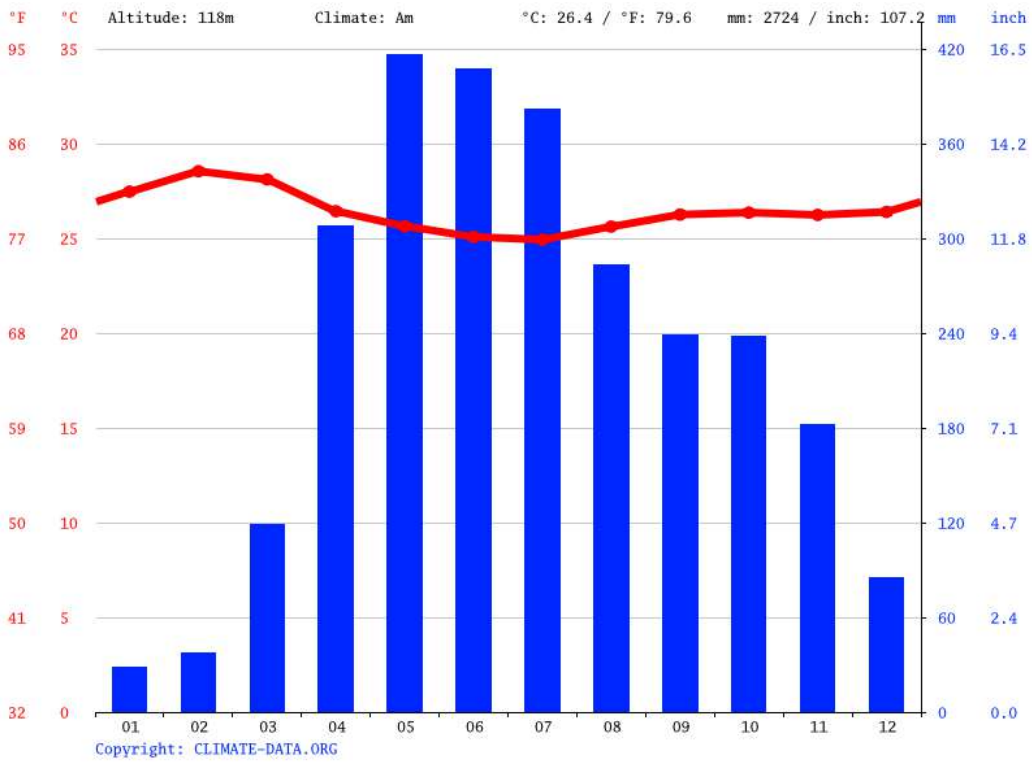


Source: (Climate-data, 2022) . **Prepared by:** Fundación Cataruben.

g. Vichada.

The department of Vichada has an average annual temperature of 26.4°C and an average annual precipitation of 2,724 mm of water, as shown in the following climogram. This indicates that precipitation has a monomodal regime with a rainy period from April to November and a dry period from December to March

Graph 7. Annual climogram of the department of Vichada



Source: (Climate-data, 2022) . **Prepared by:** Fundación Cataruben.

2.6. Economic Aspects

Given the relevance of the project, the Andina region is analyzed in a macroeconomic context. This encompasses the departments of Antioquia, Santander, Tolima, Norte de Santander, Huila and Caldas, with respect to the following indicators: participation in the national GDP with its main economic activities, GDP per capita at current prices, departmental representation in cacao planting based on hectareage as a unit of measurement, trade balance at prices of the representative market rate and unemployment rate. The above is studied over a period of five (5) years, from 2017-2021, the same period in which this climate change mitigation initiative is carried out.

Attached is the annex "cuadro de análisis macroeconómico para la región Andina" for the departments indicated, which was prepared in detail to be able to observe the behavior of the region in a country context and is summarized in the following table:

Table 4: Summary table, macroeconomic analysis for the Andina Region

YEAR	SOURCES: DANE, DIAN, INFORME OBSERVATORIO REGIONAL ODS, MINCIT, Camara de comercio Bucaramanga, MINISTRY OF AGRICULTURE,											
	GDP PER CAPITA COP (millions of current pesos) (AVERAGE)	**GDP % COUNTRY CURRENT PRICES**	**MOST REPRESENTATIVE ECONOMIC ACTIVITY BY DEPT. CONTRIBUTING TO GDP**	**HOW IS CACAO? HECTAREAGE**	**HOW IS CACAO? HECTAREAGE % COUNTRY LEVEL**	**EXPORTS THOUSANDS USD FOB (excluding oil and its derivatives)**	**MAIN EXPORT PRODUCTS**	**% EXPORT PARTICIPATION RATE**	**IMPORTACIONES MILES USD CIF**	**PARTICIPATION RATE % IMPORTS**	**TRADE BALANCE USD**	**UNEMPLOYMENT RATE (average)**
2017	$17,111,069.33 (The average per capita in Colombia was $18,828,100)	27,8	Wholesale and retail trade; repair of motor vehicles and motorcycles; transportation and storage; accommodation and food service activities; manufacturing industries; public administration and defense; compulsory social security schemes; education; human health care and social work activities.	109.534,00 (the hectares planted that year were 175.000)	62,59%	$6.424.842,00 (at national level was $24.753.113,00)	Textiles and apparel; Machinery; Tobacco ; Beverages	26,00%	$8.023.000,00 (at national level was $46.075.706,00)	17,30%	-$1.598.158,00 (at national level, there was a balance deficit of -$21.322.593,00)	9,6
2018	$17.952.265,50	27,7	trade, transportation, lodging and restaurants; manufacturing industries	96.193 (the hectares planted that year were 176.050)	54,64%	$6.385.731 (at national level was $25.062.090,00)	Textiles and apparel; Coffee derivatives; beverages	25,40%	$9.016.557,00 (at national level was $51.230.567,00)	17,50%	-$2.630.826,00 (at national level, there was a balance deficit of -$26.168.477,00)	10,6

2019	$18.991.746,50	27,9	Wholesale and retail trade; repair of motor vehicles and motorcycles; transportation and storage; accommodation and food service activities, Manufacturing industries, Public administration and defense; compulsory social security schemes; Education; Human health care and social work activities; Health care and social work activities.	97.565,00 (the hectares planted that year were 183.409,00)	53,20%	$6.780.815,00 (at national level was $23.527.214,00)		28,70%	$8.796.265 (at national level was $52.702.624)	16,80%	-$2.015.450,00 (a nivel nacional hubo un déficit en la balanza por -$29.175.410,00)	11,6
2020	$17.754.065,50	28,1	trade, hotels and repairs; Manufacturing industries; Duties and taxes; Public administration and defense; Agriculture, livestock and fishing;	100.599,00 (the hectares planted that year were 189.185,00)	53,17%	$7.931.973,00 (at national level was $22.301.043,00)	Mining and energy; Agriculture; Agroindustry;	32,60%	$7.528.748,00 (at national level was $43.488.662,00)	17,30%	$403.225,00 (t national level, there was a balance deficit of -$21.187.619,00)	17,2
2021	$20.746.009,83	28,3	Wholesale and retail trade; repair of motor vehicles and motorcycles; transportation and storage; accommodation and food service activities; Manufacturing industries; Agriculture, Livestock, hunting, forestry and fishing; Public administration and defense; Compulsory social security schemes; Education; Human health care and social work activities; Health care and social work activities.	100.599,00(2020**) (the hectares planted that year were 194.428,00**Projection)	53,17% (2020**)	$9.636.618,00 (at national level was $27.875.578,00)	Agricultural; energy mining; agroindustry	34,60%	$10.993.071,00 (at national level was $61.101.362,00)	17,90%	-$1.356.453,00 (t national level, there was a balance deficit of -$33.225.784,00)	14,6
AVERAGE	**$18.511.031**	**28,0**	**...**	**100.898,00**	**55,90%**	**$7.431.995,80**	**...**	**29,46%**	**$8.871.528,20**	**17,36%**	**-$1.439.532,40**	**12,7**

Source: Fundación Cataruben.

In the above table, it can be concluded that during the macroeconomic study period of the departments of Antioquia, Santander, Tolima, Norte de Santander, Huila and Caldas, the average GDP per capita of the region was $18,511. 031 (millions of current pesos), that is, a person residing in this region earns less than 2 SMMLV, which is below the national average for the year 2022 according to DANE statistics. Likewise, a 28% share of the national GDP is observed, highlighting economic activities such as retail trade, manufacturing industry and agriculture. On the other hand, the analysis of the behavior of the sowing of cacao crop hectares, determines that these departments contribute more than 50% of the cacao sowing at the national level, with an average of 100,898 ha. Likewise, there is a deficit in the trade balance on a regional scale, parallel to what happens in Colombia, without overlooking the contribution of 29% participation in the export rate. Finally, the table shows an unemployment rate of 12.7% above the country's average, according to the DANE technical bulletin on labor market indicators for the month of July/2022. Therefore, it is evaluated in a macro context, economic needs in a region with a high productive capacity in crops such as cacao, which allows to visualize in broad strokes the environment in which the project is located and how the results of the project would act for the benefit of the communities and the objective of breaking the cycle of deforestation through the implementation of economic income from reduction and/or removal of greenhouse gas emissions - GHG.

2.7. Social Aspects.

The main articulation of the Andean and Orinoco biomes in the configuration of the CultivO₂ initiative prompts the reflection on the social aspects several considerations of geographical, historical, economic and cultural character, since from the eastern Andina region, crossing the plains piedmont, there have been permanent migratory waves particularly initiated since the Spanish conquest, but with greater intensity since the beginning of the 20th century (Sánchez S., L.F. 2007). However, it was only until the enactment of the 1991 Constitution that Colombia recognized as departments and elevated to the same territorial category the entities previously called Intendencias and Commissariats known, for almost 150 years, as former National Territories (Revista Credencial Historia. 2002).

These regions of Colombia have a historical background that goes back to their indigenous origins, passing through the shock experiences of the Spanish conquest and colonization, then crossed by the independence and republican process and defined by the contemporary era. Thus, in CultivO₂ converge, on the one hand, the most densely populated region of the country, the Andina region, which occupies 12% of the national territory, and, on the other hand, the Orinoco region, with about 25% of the territory, with lower population density, although with greater demographic growth in recent decades. Thus, the reference area that contains Arauca, Casanare, Meta, Vichada, Santander, Huila, Caldas and Córdoba reaches about 7.5 million inhabitants, with 15% of the national population. (DANE. 2018).

Before the arrival of the Spaniards, there were, in the territory that is now known as the Colombian orinoquia, indigenous populations related, due to their geographic proximity, to the Venezuelan orinoquia, or to the Amazon or the Andean highlands. Some of these original groups were the Sikuani

and Cuibas, of the Guahibo family, the Piapoco and Achaguas, of the Arawak family, U'was of the Chibcha family, Sálibas of the Sáliba-Piaroa family, among others. (Bustamante, C. 2019) In the Andina region, the Muiscas of the Chibcha family were consolidated with various ramifications.

After the cultural impact produced by the European expeditions, new practices of family and territorial organization, land use and economic production were introduced. Thus, from the traditional native ways of life, the indigenous encomienda was introduced, which protected the different native communities in villages or towns, and around 1661 the first head of cattle arrived from the Jesuit Caribabare Hacienda, which would later be consolidated as "criollo de piedemonte llanero" cattle, precursor of the Casanareña cattle breed (Huertas Herrera, Alejandro & Ramírez, Hugoberto. 2015). These changes produced, over time, the socioeconomic leap from the indigenous encomienda to the cattle herd, consolidating the productive practices that built the cultural profile of contemporary llanero communities (Martínez Pérez, 2008). On the other hand, in the densely populated Andina region, commercial and industrial hubs were formed that demanded food from the provinces and national territories as a result of the agriculture and cattle raising that had been established there.

After 1991, royalties from the exploitation of hydrocarbons in each region were also created, which contributed to economic and social development, transferring knowledge, strengthening technological capabilities in the regions and boosting social mobility, fueled by communication between people from neighboring departmental provinces. At the same time, alongside the agro-industrial development in the Orinoco region, oil palm cultivation was extended as a long-term exploitation strategy, while in the Andina region coffee cultivation led to the consolidation of solid trade union structures with a deep territorial scope that began to diversify towards the tourism economy associated to coffee production.

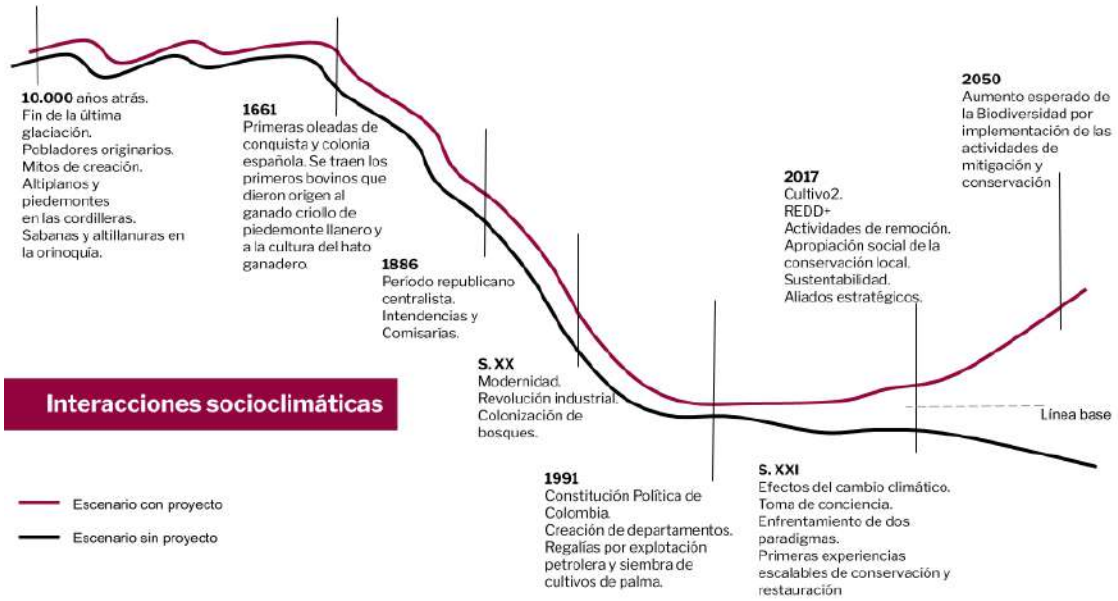
Additionally, the diverse social composition of the regions that make up the initiative is framed within the dynamics of the conflict accentuated in the twentieth century, with shades of illegality in some departments in which groups outside the law have settled, establishing the cultivation and trafficking of coca and illegal mining. It is here where climate change mitigation initiatives, especially this one focused on removal Activities, reach a significant dimension of socioeconomic impact by providing sustainable alternatives focused on the transition to licit economies of villagers and small landowners who find in the promising crops of cacao and cashew worthy options to substitution that can accompany the conservation of forests and natural resources in medium and long term productive bets. These villagers find in CultivO₂ that, in the strategy of horizontal dialogue of knowledge, their knowledge and participation are valued as definitive for the management of conservation and sustainable use of biodiversity in their territories.

This is precisely why the CultivO₂ initiative has environmental, cultural and productive diversity as its raison for being, since it understands that sustainability in climate change mitigation and conservation processes involves a close relationship with social and cultural aspects, recognizing that local communities live and organize their economy based on the environmental supply. These communities have acquired knowledge about the ecosystems from their ancestral origins as referred by the Casanareño writer Getulio Vargas Barón in Cuentos, Mitos y Leyendas del Llano (Vargas Barón, G. 1996), using interviews, conversations and compilations he relates in Amanecer Llanero, the

legend of the princess Pamoare and her lover Casanari, who through their love story reflect changes in the climate and landscape of the savannah and the altillanura that could coincide with the origins of the Casanareña windy plain some 10,000 years ago (Banco de Occidente. 2005. Ecological Collection. The Orinoco of Colombia.).

In short, the recognition of local cultures and knowledge, the presence of sustainable productive alternatives based on the environmental offering, the care of the forests and the promotion of promising cacao and cashew crops come to consolidate in CultivO₂ ecological and socio-climatic interactions that lead to the social appropriation of local conservation, turning participants from uninformed agents of land use change into conscious managers and conservationists of their own ecosystems.

Graph 8. Timeline of main socio-climatic interactions in the CultivO2 area.



Source: Fundación Cataruben.

3. COMPLIANCE WITH APPLICABLE LEGISLATION

The project proponents and beneficiaries conform to the standards and methodologies established for the planning and execution of environmental projects, additionally, a verification process is conducted which includes both national and international regulations that are applicable given the intention and need of each one, with the sole purpose of ensuring compliance with them and mitigate legal risks against barriers that may be found in all the analysis that are performed in each of the steps established for the parties to become allies with rights and obligations established equitably.

The applicable legislation regulates social, environmental, economic, cultural and other situations, rules that are modified according to the changes that are generated in the day to day and the need for

updating, therefore, this is why, for this control is carried in the matrix of regulations that is reviewed and adjusted as needed, monthly, quarterly or annually, takinging into consideration the management procedure of legal requirements and other GJP-14 of the document management system of the project owner. Annex Procedimiento GJP-14 Gestión de Requisitos Legales y otros.

The following is a list of the different environmental regulations related to the implementation of this project.

Table 5. Compliance with Applicable Legislation.

Compliance with Applicable Legislation			
Project activities	**Compliance**	**Compatibility with national policies, programs, strategies and plans**	**Compatibility with international agreements**
Strengthening processes based on training cycles.	Within the framework of the project operation, the purpose is to strengthen the knowledge, skills, aptitudes and competencies of project participants through virtual and face-to-face training on topics related to land-use planning, biodiversity conservation and sustainable forest management, forest governance, land-use planning, silvicultural practices (installation, establishment, growth and development, harvesting and post-harvesting). All of the above is compatible with national policies, programs, strategies and plans, as well as international agreements on climate change and combating deforestation, as listed in the following columns.	1. Política de Bosques. 2. Política Nacional de Biodiversidad. 3. Plan Nacional de Prevención y Control de Incendios Forestales y Restauración de Áreas Afectadas. 4. Política Nacional de Educación Ambiental. 5. Plan de Acción Nacional de la Lucha Contra la Desertificación y la Sequía en Colombia. 6. Ley General Forestal. 7. Política Nacional para la Gestión Integral del Recurso Hídrico. 8. Estrategia Nacional de Prevención, Control, Seguimiento y Vigilancia Forestal. 9. Política Nacional de Producción y Consumo Sostenible. 10. Estrategia Institucional para la Articulación de Políticas y Acciones en Materia de Cambio	1. Convenio Marco de las Naciones Unidas contra el Cambio Climático (UNFCCC). 2. Convenio para la Lucha contra la Desertificación y la Sequía (UNCCD) 3. Convenio de Diversidad Biológica.

Strengthening of governance structures	The conservation actions of the forest ecosystems outline a common horizon towards the Social appropriation of Local Conservation through the convergence and participation of the owners of the Properties, as managers of the ecosystems and the Fundacion Cataruben as owner of the CultivO2 initiative, To achieve this, this participatory, dialogic and inclusive governance strategy is designed and implemented, promoting respect for stakeholders and the focus on the Conservation of ecosystems. Governance is represented by people, policies and processes that provide the framework for making decisions and adopting measures to optimize project management. Therefore, the actions taken to strengthen governance structures are related to and compatible with national legislation, policies, programs, strategies and plans, as well as international agreements applicable to the implementation of the project.	Climático en Colombia. 11. Política Nacional para la Gestión Integral de la Biodiversidad y sus Servicios Ecosistémicos. 12. Política para la Gestión Sostenible del Suelo. 13. Política Nacional para la Gestión Integral de Residuos Sólidos. 14. Política Nacional de Cambio Climático. 15. Estrategia para la Implementación de los Objetivos de Desarrollo Sostenible (ODS) en Colombia. 16. Política de Crecimiento Verde. 17. Política Nacional para el Control de la Deforestación y la Gestión Sostenible de los Bosques. 18. Política Pública para Reducir las Condiciones de Riesgo de Desastres y Adaptarse a los Fenómenos de Variabilidad Climática. 19. Política Ambiental para la Gestión Integral de Residuos o Desechos Peligrosos. 20. Política para Impulsar la Competitividad Agropecuaria.	
Implementation of conservation actions and participatory land-use planning.	The accompaniment in the implementation of conservation actions is key in environmental terms for the project, in this sense, and based on land planning, the beneficiaries are accompanied in processes of declaration of private conservation figures (Natural Reserve of the Civil Society); identification, delimitation and marking of strategic ecosystems, and participatory monitoring of biodiversity; which implies a strengthening and vision of sustainable management of natural resources. The above is compatible and complies with national policies, programs, strategies and plans, as well as international agreements on climate change and combating deforestation, as listed in the following columns.		
Monitoring and mitigation of disturbance events and loss of eligible areas.	During the drought and flood seasons in the project area, disturbance events are monitored in order to mitigate the risks of deforestation, and/or transformation in land use, with the purpose of avoiding leakage and reversals that could compromise the loss of the areas. In this sense, it is compatible with national policies, programs, strategies and plans, as well as international agreements on climate change and		

	combating deforestation, as listed in the following columns.		
Follow-up on regulations that seek to balance the development of Cacao and Cashew crops and the environment.	In the context of the project's operation, the objective is to achieve the goal of understanding the regulations governing crop development, with the purpose of benefiting both farmers and the environment. This is achieved by promoting sustainable environmental management practices and strengthening the crop production chain. As a result of this initiative, producers of Cacao and Cashew crops will also receive economic incentives through the sale of carbon certificates, which will guarantee the implementation of actions aimed at preserving these crops over time.It is important to highlight that all these activities are carried out in full alignment with national policies, programs, strategies and plans related to climate change and the fight against deforestation. In addition, these actions are aligned with the commitments acquired in international agreements on climate change and forest conservation, as detailed in the following sections. This initiative is part of a broader effort to promote sustainability, protect the environment and contribute to climate change mitigation, while supporting local farmers in the cultivation of Cacao and Cashew.	21. Resolución 087 de 2022. 22. Plan Nacional de Extensión Agropecuaria 2020-2023 del Vichada. 23. Buenas Prácticas Agrícolas (BPA). 24. Decreto 1843 de 1991.	4. Organización Internacional del Cacao.

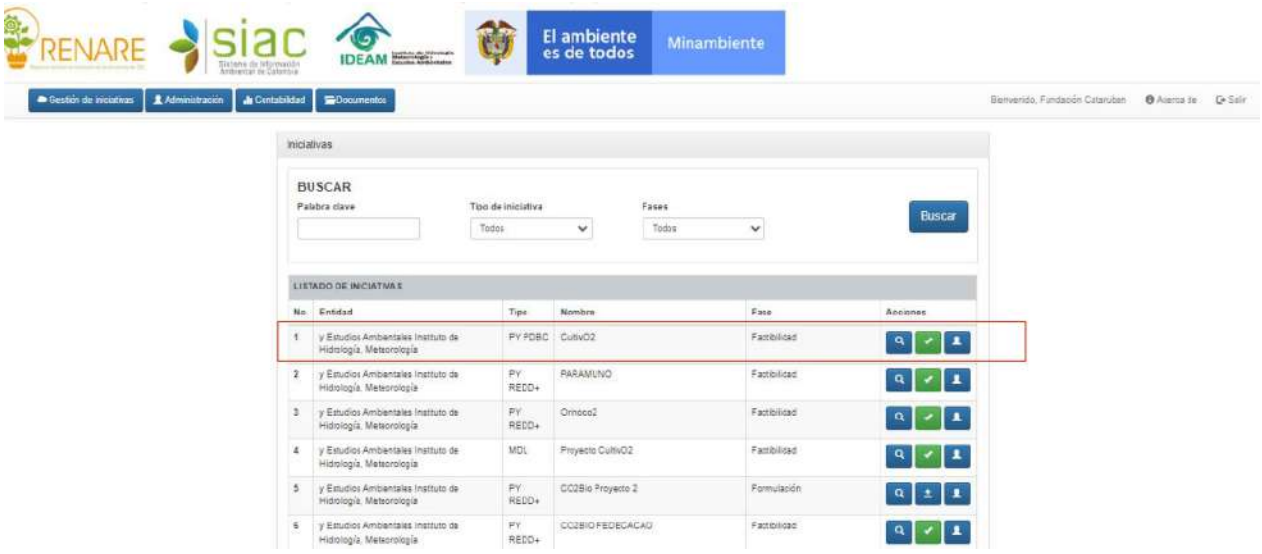
Source: Fundación Cataruben 2023.

In addition, a description and comparison with the regulations applicable to the National System of Protected Areas (SINAP), created to conserve and protect the country's biodiversity, is provided. This system is made up of various protected areas, including natural parks, nature reserves, and flora and fauna sanctuaries, among others.

3.1. National registry of greenhouse gas emission reductions - RENARE

CultivO2 P1 is currently registered in the National Registry of Greenhouse Gas Emissions Reduction (RENARE), a platform created by Resolution 1447 of 2018, for the management of GHG mitigation initiatives at the national level, that aim to qualify for payments for results or offsets, that contribute to the fulfillment of national climate change goals established under the United Nations Framework Convention on Climate Change (UNFCCC).

Image 11. Proyecto Cultivo2 P1 registered in the RENARE platform.



Source: Fundación Cataruben 2022

According to the Ministry of Environment, the RENARE platform integrates four registration phases (feasibility, formulation, implementation and closure). In each of these phases, the different types of GHG emission reduction and removal initiatives registered are duly monitored. It should be noted that RENARE allows for the generation of a certification with the initiative status report and the generation of an accounting report that evidences the traceability and transparency of the initiative's transactions.

The CultivO2 project is registered under the typology of "Low carbon development projects and programs-PDBC". The initial feasibility phase is currently being reported. The organization is waiting for the Ministry of the Environment to complete the maintenance of the application. Once this is done, they intend to proceed with the reporting of the relevant project information (see evidence Soporte_Renare.pdf)). To follow up on the above, Cataruben Foundation requested the Ministry of Environment and Sustainable Development information on the estimated date for the platform to be operational again, however, the official response is that the date has not yet been determined (see evidence 01/06/2023 Soporte información plataforma RENARE.pdf).

3.2. Double counting

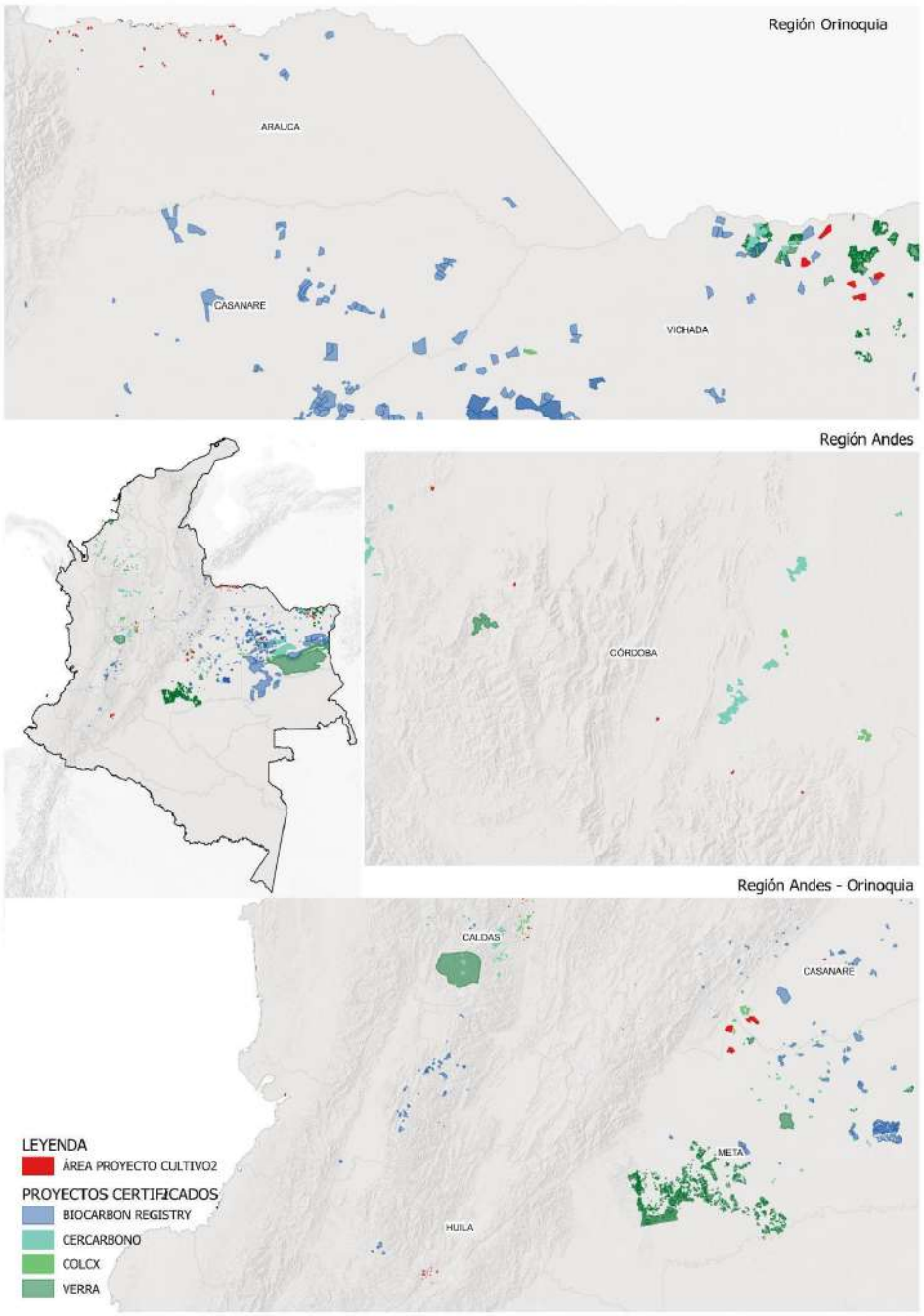
In accordance with international GHG emission reduction and climate change mitigation targets, the BCR Standard establishes the following scenarios as actions associated with the practice of "double counting":

A) A ton of CO2e is counted more than once to demonstrate compliance with the same GHG mitigation target.
B) A ton of CO2e is counted to demonstrate compliance with more than one GHG mitigation target.
C) A ton of CO2e is used more than once to obtain remuneration, benefits or incentives.
D) A ton of CO2e is verified, certified or accredited by assigning more than one serial to a single mitigation outcome.

Likewise, in relation to scenarios C and D, the registration and certification of the Project will be carried out under a single standard; counting, at the time of CCV issuance, with exclusive serials for each ton of CO_2 reduced, as provided by the standard.

Additionally, the Project holder has conducted an exhaustive Revisión estándares - CultivO2; among them, BioCarbon Registry, Colcx, Cercarbon and Verra. The objective of this review was to verify and validate the Shapes of the different registered Projects, and thus, compare them with the CultivO2 project areas. In this way, we sought to ensure that there is no double counting or overlapping of areas. During the review process, a total of 56 projects located in the departments where the project is present were identified. However, it was possible to obtain only 45 shapefiles available for these projects, which can be seen distributed nationwide in image 12 . As a result of this analysis, no cross-referencing with the CultivO2 project areas was found.

Image 12. Projects in the area of influence of the CultivO2 initiative



Source: Fundación Cataruben, 2023

4. CARBON OWNERSHIP AND RIGHTS

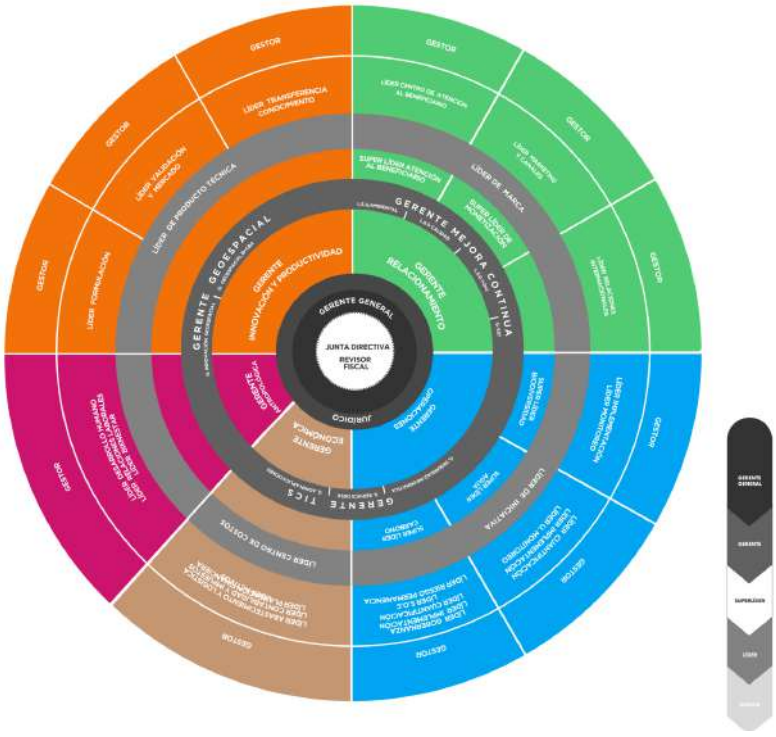
4.1. Project holder

The project holder is the Fundación Cataruben with strategic allies such as Luker Agrícola S.A.S., Partners of the Americas and the owners of the private properties.

4.1.1. Fundación Cataruben

Fundacion Cataruben is an environmental organization with over 10 years of experience in developing nature-based solutions through science, technology and innovation to avoid and remove GHG emissions in natural ecosystems (Forests, Wetlands, Paramo and Native Savannas) and Agrosystems (Cacao, Cashew), demonstrating net gains in Biodiversity and managing Clean Water in prioritized areas, promoting governance in the territory, social and economic impact to private properties in the national territory. Its molecular type organizational structure of self-directed groups, strategic alliances, scientific, technical and legal support, ensures the successful operation of the projects (2.1.1.1. Documentos Fundación Cataruben).

Figure 2. Organizational Structurel Fundación Cataruben. **Source:** Fundación Cataruben, 2023.



Finally, the contact details of the professionals responsible for the initiative are listed, as well as general information about the organization.

Table 6: Contact details of the professionals responsible for the Project

Organization	FUNDACIÓN CATARUBEN
NIT	900634522 - 9
Legal Representative	MARÍA FERNANDA WILCHES FONSECA
Contact person	JOHN FREDY MALDONADO COY SANDRA DUARTE CHAPARRO
Job position	*CULTIVO2 INITIATIVE LEADER* *SUPER CARBON LEADER*
Address	CRA 20 #36 04, YOPAL, CASANARE
Phone number	3107827681 / 3112166140
Email	cacao@cataruben.org operativa@cataruben.org

Source: Fundación Cataruben, 2023.

4.2. Other project participants

4.2.1. Casa Luker S.A.S.

Casa Luker SAS is a company that was born in 1906 with the dream of creating a product from the basic family basket that would be of excellent quality and available to everyone, its processes began in the city of Manizales with a mill and some molds to make chocolate by hand. Thanks to the high demand, they managed to expand and acquired two more factories located in Bogota and Medellin. Over the years they continued to expand and explore new products that diversified their portfolio.

In 2018 the strategic division of the company was created between two business units, Luker Colombia and Luker Chocolate. Luker Colombia focused on mass consumption at the country level and Luker Chocolate focused on fine aroma cacao globally, which currently has a presence in more than 40 countries.

For Luker Chocolate, environmental sustainability is a matter of coherence, which is why venture to the territories training and sensitizing communities to be allies of preserving ecosystems and biodiversity, as well as setting their own ambitious goals such as making Luker Chocolate a carbon neutral company by 2030.

In this context, the company decided in 2021 to demonstrate reduction of its emissions due to its operation, which is consolidated with the signing of the agreement with CATARUBEN, enrolled its

properties in production, as well as smallholders enrolled directly, in order to demonstrate additionality by implementing sustainable and conservation practices. (2.1.1.2. Documentos Luker Agricola).

Table 7. Luker Agricola S.A.S

Organization	LUKER AGRICOLA S.A.S.
NIT	900645768-0
Legal Representative	FRANCISCO GÓMEZ
Contact person	JULIA INES OCAMPO ANDREA CAMACHO
Job position	DIRECTOR OF SUSTAINABILITY REGIONAL SUSTAINABILITY COORDINATOR
Address	Carrera 23 No. 64B - 33 OF 601 BRR Laureles, MANIZALES, CALDAS.
Phone number	3148638600 / 3112287127
Email	jiocampo@lukerchocolate.com acamacho@lukerchocolate.com

Source: Fundación Cataruben, 2023.

4.2.2. Partners of the Americas (POA)

Partners Of The Americas (POA) es una Organización No Gubernamental (ONG) con sede en Washington D.C., Estados Unidos, fundada en 1964 con el objetivo de crear lazos de cooperación regional con los países de América, en términos de desarrollo social. En Colombia, específicamente, POA tiene presencia hace más de 50 años a través del trabajo en las siguientes áreas: programas de intercambio de educación, programas para combatir el trabajo infantil, programas para promover el liderazgo juvenil y programas para promover la agricultura y la seguridad alimentaria.

En septiembre de 2020, POA firmó un convenio de cooperación internacional con el Departamento de Agricultura de los Estados Unidos (United States Department of Agriculture, USDA) para implementar el proyecto “Colombian Cacao & Complementary Crops for Development (C4D)”, por un periodo de 5 años, iniciando el 1 de octubre de 2020, con el propósito de avanzar en la cadena de valor del cacao en Colombia y generar mayores ingresos para productores a través de la diversificación y comercialización de cultivos complementarios.

Dentro de los objetivos del convenio suscrito entre POA y USDA tienen contemplado realizar estudios especiales y a su vez, dentro de los estudios especiales, la Fundación Cataruben se encuentra desarrollando el "Estudio Inicial de Carbono para el proyecto C4D" el cual tiene como propósito evaluar el potencial de 5.455 cacaocultores distribuidos en 11 departamentos de Colombia para diseñar un proyecto de carbono. En ese sentido, se ha demostrado implementación de actividades de proyecto en predios priorizados para esta primera instancia de la iniciativa, las cuales se traducen en remociones de GEI (2.1.1.3. Documentos C4D).

Table 8. Partners of the Americas (POA)

Organization	PARTNERS OF THE AMERICAS (POA)
NIT	NIT: 901.251.613-1
Legal Representative	SARA LEIGH TAYLOR
Contact person	PABLO RAMIREZ
Job position	CHIEF OF PARTY - CACAO FOR DEVELOPMENT C4D
Address	CARRERA 12a ·78-40, BOGOTÁ
Phone number	NA
Email	pramirez@partners.net

Source: Fundación Cataruben

4.2.3. Private Property Owners

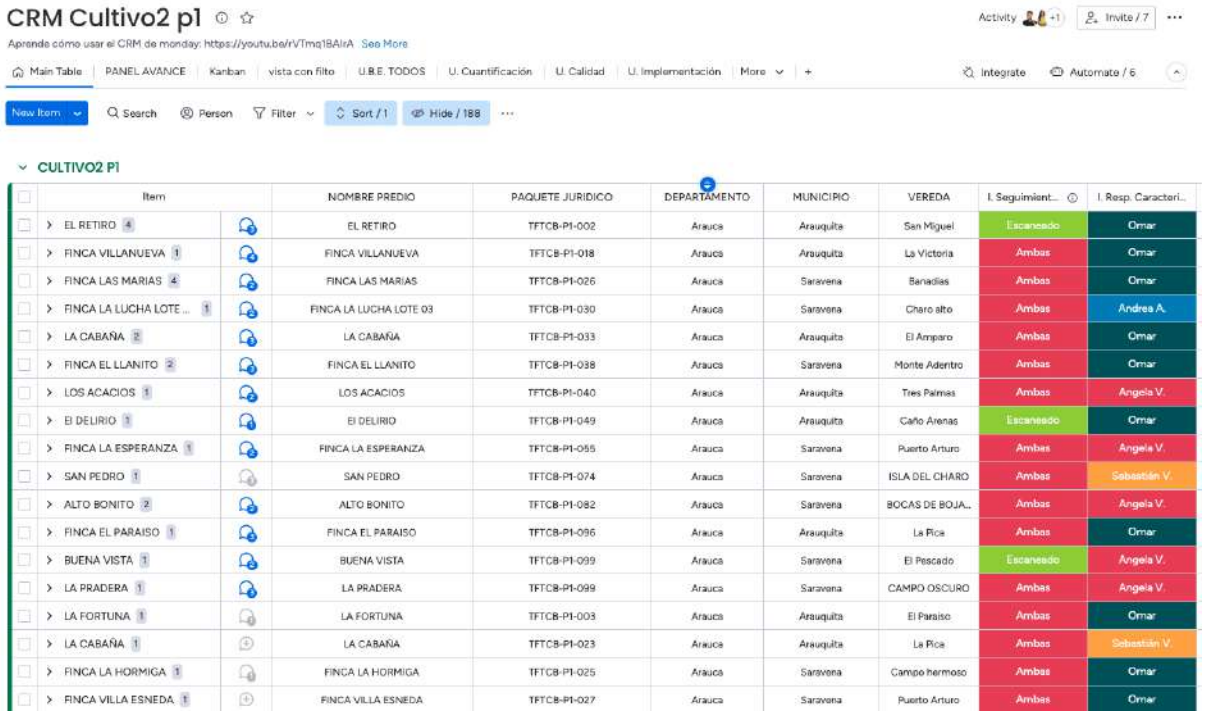
Group of people made up of owners, holders or possessors exercising tenure over private properties located in the Orinoquia Region and Colombian Andean Region, who have voluntarily decided to join efforts aiming to implement low-carbon production systems on their properties to ensure the conservation of carbon stocks and the permanence of biodiversity, incorporating sustainable practices that allow them to access alternative income over time. These ecosystem managers will be the main implementers of conservation commitments and project activities in the future, and will be the direct beneficiaries of the commercialization of carbon certificates by Fundación Cataruben.

To be part of the project, the ecosystem managers must comply with documentary and legal requirements, as well as a legal and technical analysis conducted by the Cataruben Foundation team. This allows the identification of the tenure of the property and the eligibility of the areas where the

project activities will be implemented, formalized upon completion of contractual agreements for the participation of the managers in the initiative.

The enrolled parties are enrolled through the MONDAY platform, where they are monitored and the information on the properties is managed (see image 13). The Cataruben Foundation's Care Unit is responsible for managing the private areas and providing support to the Ecosystem Managers to ensure effective management throughout the process and the life of the project.

Image 13. Monday Monday CultivO2 P1 Platform Dashboard



Item	NOMBRE PREDIO	PAQUETE JURIDICO	DEPARTAMENTO	MUNICIPIO	VEREDA	I. Seguimient...	I. Resp. Caracteri...
EL RETIRO 4	EL RETIRO	TFTCB-P1-002	Arauca	Arauquita	San Miguel	Escaneado	Omar
FINCA VILLANUEVA 1	FINCA VILLANUEVA	TFTCB-P1-018	Arauca	Arauquita	La Victoria	Ambas	Omar
FINCA LAS MARIAS 4	FINCA LAS MARIAS	TFTCB-P1-026	Arauca	Saravena	Baniadias	Ambas	Omar
FINCA LA LUCHA LOTE ... 1	FINCA LA LUCHA LOTE 03	TFTCB-P1-030	Arauca	Saravena	Charo alto	Ambas	Andrea A.
LA CABAÑA 2	LA CABAÑA	TFTCB-P1-033	Arauca	Arauquita	El Amparo	Ambas	Omar
FINCA EL LLANITO 2	FINCA EL LLANITO	TFTCB-P1-038	Arauca	Saravena	Monte Adentro	Ambas	Omar
LOS ACACIOS 1	LOS ACACIOS	TFTCB-P1-040	Arauca	Arauquita	Tres Palmas	Ambas	Angela V.
El DELIRIO 1	El DELIRIO	TFTCB-P1-049	Arauca	Arauquita	Caño Arenas	Escaneado	Omar
FINCA LA ESPERANZA 1	FINCA LA ESPERANZA	TFTCB-P1-055	Arauca	Saravena	Puerto Arturo	Ambas	Angela V.
SAN PEDRO 1	SAN PEDRO	TFTCB-P1-074	Arauca	Saravena	ISLA DEL CHARO	Ambas	Sebastián V.
ALTO BONITO 2	ALTO BONITO	TFTCB-P1-082	Arauca	Saravena	BOCAS DE BOJA...	Ambas	Angela V.
FINCA EL PARAISO 1	FINCA EL PARAISO	TFTCB-P1-096	Arauca	Arauquita	La Pica	Ambas	Omar
BUENA VISTA 1	BUENA VISTA	TFTCB-P1-099	Arauca	Saravena	El Pescado	Escaneado	Angela V.
LA PRADERA 1	LA PRADERA	TFTCB-P1-099	Arauca	Saravena	CAMPO OSCURO	Ambas	Angela V.
LA FORTUNA 1	LA FORTUNA	TFTCB-P1-003	Arauca	Arauquita	El Paraiso	Ambas	Omar
LA CABAÑA 1	LA CABAÑA	TFTCB-P1-023	Arauca	Arauquita	La Pica	Ambas	Sebastián V.
FINCA LA HORMIGA 1	FINCA LA HORMIGA	TFTCB-P1-025	Arauca	Saravena	Campo hermoso	Ambas	Omar
FINCA VILLA ESNEDA 1	FINCA VILLA ESNEDA	TFTCB-P1-027	Arauca	Saravena	Puerto Arturo	Ambas	Omar

Source: Fundación Cataruben.

4.3. Agreements related to carbon rights

Los beneficiarios manifestaron a través de cartas de intención su deseo de participar en el proyecto. Luego, tras la evaluación de su viabilidad jurídica y técnica, formalizaron su compromiso a través de la firma de un contrato de vinculación, adquiriendo obligaciones y beneficios, los cuales fueron socializados en la etapa precontractual.

En la carpeta 2.1.1.4. Documentos Vinculación Propietarios se relacionan los documentos que integran el paquete contractual para la vinculación a la iniciativa, tales como; la carta de intención, el contrato, el acuerdo de confidencialidad y el acta de veracidad de la información, junto con todos los soportes que demuestren la propiedad sobre el carbono, para las áreas ya validadas y el ingreso

de las nuevas áreas.

4.4. Land tenure

Fundacion Cataruben as owner of the initiative, verifies that the land tenure on the property is held, determining the quality of owner, possessor or holder, depending on the case, regarding the property to be enrolled in the project, in accordance with the provisions of Article 669, 673, 762 and 775 of the Colombian Civil Code, at least during the period of quantification of GHG reductions or removals.

Therefore, in the process of enrolled properties to the project, a title study is carried out as an exercise of legal analysis of documents such as Certificate of Tradition and freedom, Resolution of adjudication (issued by INCODER, now National Land Agency), Public Deed or judicial sentence, Cadastral Certificate, Purchase and Sale Contract, peace and safe property or payment of property tax, Plan or map, among others. Its objective is to determine the legal situation of the property with respect to information of the same, in which we identify:

a. The information of the property to determine the geographic location, size and boundaries.
b. The owner of the property to determine the quality of tenure and conclude the ownership, possession or tenancy of the property.
c. Encumbrances (lawsuits, registered liens, mortgages, antichresis, leases, resolutory condition and in general any limitation of ownership) in order to prove and guarantee the ownership of the carbon without any legal restriction.

Likewise, the Land Restitution Unit verified that none of the properties to be enrolled in the project are in the process of restitution; in the case of properties acquired through possession, a link to the National Land Agency (ANT) is attached, as shown in Table 9; We were able to determine that the properties do not present situations of dispossession or abandonment due to the armed conflict; likewise, we consulted VITAL (integral window for environmental procedures) to determine that the properties do not contemplate environmental sanctions or infractions and finally, we consulted the National Registry System of Corrective Measures RNMC, Disciplinary Record, Judicial and Criminal Record.

When legal certainty is established with respect to the quality of the applicant's land tenure, it is ultimately determined on whom the ownership of the carbon falls; thus, an enrolled contract is signed to incorporate the total eligible area of the real estate studied in the project and, in addition, the conditions to acquire the verified carbon certificates (VCC) and/or the rights to the benefits from the sale of the same. In this regard, the seventh clause of said instrument establishes the imperative obligation of the applicant (later beneficiary) to demonstrate ownership or tenure of the land on which the climate change mitigation and natural ecosystem conservation activity is being developed, for a period of time greater than or equal to the duration of the project. The above in accordance with the provisions of Article 45 of Resolution 1447 of 2018. In addition, the third clause determines the obligations of the beneficiary to be able to acquire the carbon certificates and the respective benefit for the sale of the same, which is regulated in the seventeenth clause of said contract.

For the properties that have a Certificate of Good Possession, we initially start from the good faith of the holder, and the information provided by the document issued by the mayor's office of the municipality where the property is located; in turn, we provide legal advice and support to carry out the respective process of adjudication before the National Land Agency (ANT), formerly INCODER or INCORA. Likewise, with the support of the Agustin Codazzi Institute (IGAC), the owner can initiate the cadastral registration process and generate the cadastral code, identifying the Property by means of the codes that are generated.

The above is established for the non-exclusion of properties that implement activities that reduce deforestation and promote the development of low-carbon production systems, in order to manage the removal and/or reduction of GHG emissions.

Finally, Table 9 shows the list of properties and their respective identification by means of the Real Estate Registration Folio designated in the Certificate of Tradition and Freedom or the cadastral identification of the property, determining that the property is registered with the Public Instruments Registry Office or registered with the Agustín Codazzi Geographic Institute (IGAC). The supports can be evidenced in the folder 2.1.3. Documentos de vinculación.

Table 9. Ownership and carbon rights of the properties enrolled in the CultivO2 Initiative.

No.	DDEPARTMENT	MUNICIPALITY	PROPERTY	FOREST	CROPS		REAL ESTATE REGISTRATION / CADASTRAL CERTIFICATE	BENEFICIARY	LAND RESTITUTION PROCESS
					CACAO	CASHEW			
1	ARAUCA	Arauquita	El Astillero		X		410-1572	Gerardo Peña Olave	https://drive.google.com/drive/folders/1Yv1-W5SCXMTN_fncv4jek_dbYwWRv-QC
2	ARAUCA	Arauquita	El Delirio		X		410-17379	Bertilda Caceres Parra	https://drive.google.com/drive/u/0/folders/1bZ7TNbMzcVEcdH8d_-a9vS4bcmBtB9lU
3	ARAUCA	Arauquita	El Retiro		X		410-8574	Luis Alvaro Jimenez Mosquera / Yerson Jimenez Mosquera / Sandra Inez Jimenez Mosquera / Mariela Mosquera Mosquera	https://drive.google.com/drive/u/0/folders/1pJY1H8YtDCHc5uGaf42q1PSN2WUUDgM1
4	ARAUCA	Arauquita	Finca Alto Viento	X	X		410-62045	Carlos Fonseca Gonzalez	https://drive.google.com/drive/u/0/folders/1sYfK5-Qt3FILNoTZbthFIpTOcDnCn5iX

5	ARAUCA	Arauquita	Finca El Jazmin		X		410-39160	William Higuera Rueda / Martha Cecilia Remolina Jerez	https://drive.google.com/drive/folders/1Q3R5BM_m4YJs9GlE5RkBlkilM7-aCXHg
6	ARAUCA	Arauquita	Finca El Porvenir	X	X		410-71715	Hilda Murillo Rojas	https://drive.google.com/drive/u/0/folders/1kjQfnL_kB4toD1Ag5_Z_KtSQTqOHKPDF
7	ARAUCA	Arauquita	Finca El Paraiso	X	X		410-30794	Wilmar Gustavo Parra Vanegas	https://drive.google.com/drive/u/0/folders/1SzbvF60Kkz6Dtr6N7qbB5dAisWlDS6zb
8	ARAUCA	Arauquita	Finca La Granja		X		410-44395	Hugo Efrain Castro Guerrero	https://drive.google.com/drive/u/0/folders/1Z4f6UwQnLBl7Nw82Zn6itupFoQnQgYHE
9	ARAUCA	Arauquita	Finca La Granja		X		410-44663	Hugo Efrain Castro Guerrero	https://drive.google.com/drive/u/0/folders/18qQWA81PmcTO1zmLQEKfa6hmFJ_SusU0
10	ARAUCA	Arauquita	Finca La Tigra		X		410-64865	Alexi de Jesus Moreno / Alcira Duran Pacheco	https://drive.google.com/drive/u/0/folders/1maoP-Wtd37QSCWM1Lkz8Sg7v

									bKl1I_xQ
11	ARAUCA	Arauquita	Finca Villanueva		X		410-15263	Carlos Daniel Angarita Álvarez	https://drive.google.com/drive/folders/1ICBcsJEhhE5_eKd2GCeyATUN0jKU2BrT
12	ARAUCA	Arauquita	La Azucena		X		410-17265	Jose Miguel Romero Rivas	https://drive.google.com/drive/u/0/folders/1F5JjVOpuLDTvi_NYeVVoxuN6P5gW8GPe
13	ARAUCA	Arauquita	La Cabaña	X	X		410-8531	Esneider Quintero Tellez / Yanesdy Quintero Tellez	https://drive.google.com/drive/folders/1YCym2T6NZXoCyB2raFKHPsaC_wluoyKJ
14	ARAUCA	Arauquita	La Cabaña		X		410-4	Euclides Castro Perez	https://drive.google.com/drive/u/0/folders/1I-HQANGEYgvHV_gwklhUiyt-qfbJQ6W6
15	ARAUCA	Arauquita	La Chipola		X		410-30277	Ciro Enrique Marin Jaimes	https://drive.google.com/drive/folders/1HyT3S4sLAuJSNu_eUDzMpnHhOIeBzJaC
16	ARAUCA	Arauquita	La Esmeralda	X	X		410-17170	Abimael Antonio Castillo Martinez	https://drive.google.com/drive/u/0/folders/18P

									jmOESTgcpbGOfisXo2bjxImoitUYgM
17	ARAUCA	Arauquita	La Fortuna		X		410-23620	Martha Cecilia Remolina Jerez	https://drive.google.com/drive/u/0/folders/1tFz4jG3KVZ64VdflhZ113v0hky2iKMpO
18	ARAUCA	Arauquita	Finca La Protección	X	X		410-72125	Florentina Higuera Suarez	https://drive.google.com/drive/u/0/folders/1OucuTEWo3WYyac__jbEB0RuPtn6Grce2
19	ARAUCA	Arauquita	Los Acacios		X		410-17171	Manuel Mejía Fuentes	https://drive.google.com/drive/u/0/folders/1BviCKbKtWt0cq_-zLpjLSxvPu5BaUEEd
20	ARAUCA	Arauquita	Vengala	X			410-30874	Gratiniano Baron Arias /Blanca Miriam Torres Lozano	https://drive.google.com/drive/u/0/folders/1t7YCGWyYKIIRtpJvu1D71PFDpxPjnAGd
21	ARAUCA	Saravena	Alto Bonito	X	X		410-1827	Mery Ariza Guerrero // Pablo Antonio Jiménez Galeano	https://drive.google.com/drive/u/0/folders/1PxOZVb5lx0pbGBb8Kst4K8JfeJqpCk4D
22	ARAUCA	Saravena	Buena Vista	X	X		410-10499	Gerardo Alfonso Archila Romero	https://drive.go

									ogle.com/drive/folders/1qNva_ebPfLhzltZ-Q3M8GTby-_wuExBH
23	ARAUCA	Saravena	Finca El Llanito	X	X		410-56162	Lorenzo Niño Rojas // Angela Amador Bravo	https://drive.google.com/drive/u/0/folders/1ZByuNlI0UjlF1UPk4Sha4YNZZpgnTNIw
24	ARAUCA	Saravena	Finca La Esperanza	X			410-47766	Silveria Oyola	https://drive.google.com/drive/u/0/folders/1hbtWPAKyYl3uV_izIJQbQuP4UUXFzOk0
25	ARAUCA	Saravena	Finca La Hormiga		X		410-69195	Carmen Cilia Leon Reyes	https://drive.google.com/drive/u/0/folders/1fxZI5OwfJS-POMiEa-lT-vcwuPReXc9-
26	ARAUCA	Saravena	Finca La Lucha Lote 3		X		410-70440	Andelfo Niño Blanco	https://drive.google.com/drive/u/0/folders/1WCZOv-Vj20ICdnKk9anEFXH6dxBrPGph
27	ARAUCA	Saravena	Finca Las Marías	X	X		410-14618	Maria Dueñez Prieto // Maryi Rocio Jaimes Dueñez // Jeiczon Elim Jaimes Dueñez // Juan David Jaimes Dueñez	https://drive.google.com/drive/folders/1tadCFwP5VOBq07_-3AYzsx2ILwt9XyvB

28	ARAUCA	Saravena	Finca Villa Esneda	X	X		410-43121	Elda Esneda Daza Piedrahita	https://drive.google.com/drive/u/0/folders/1JgcfdNOkWfHGGNy05hrG4ix0CTF_J0UD
29	ARAUCA	Saravena	La Pradera	X	X		410-11321	Gerardo Alfonso Archila Romero	https://drive.google.com/drive/folders/1RmvTkizfTN3pUkmUIFcA6cRuss3YTIjD
30	ARAUCA	Saravena	San Pedro	X	X		410-10978	Dagoberto Santis Cabarcas	https://drive.google.com/drive/folders/1prf-kjDO3ixLMwq8N2GT6akRm8nHw58r
31	CALDAS	Samaná	Anolaima		X		114-14729	Rosalba Garcia de Arroyave	https://drive.google.com/drive/folders/1L1jkci9g8Q_IEZoMi7ud0Ck2hyNWzY2P
32	CALDAS	Samaná	La Unión	X	X		N/A	Haison Alberto Idarraga Galviz	https://drive.google.com/drive/folders/1gkNWJz1SmHbASX6fJzEzjVsMX0Dn5Xjw
33	CALDAS	Samaná	Maracaibo	X	X		106-244	Gustavo Lopez Rios	https://drive.google.com/drive/folders/166ItWdk--0IT0DpsegLGlWxrbYYjHF-

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34	CALDAS	Samaná	El Brasil		X		N/A	Duvan Lopez Diaz	https://drive.google.com/drive/folders/1DrAWIkk97aGLXDcwV-7UcnEDO08Wz7g4
35	CALDAS	Samaná	El Pedregal	X	X		N/A	Cristian Aldemar Manrique Lopez	https://drive.google.com/drive/folders/1DjSnkKebG-bRjhgBQTfUEc7XiC6rx3re
36	CALDAS	Samaná	La María		X		N/A	Juan de Dios Marin Ramirez	https://drive.google.com/drive/folders/1btvhA7V8E2Z1J29Nq-gPmNGInhJPEZVD
37	CALDAS	Samaná	Piedras Lindas		X		N/A	Jose Elierto Martinez Buitrago	https://drive.google.com/drive/folders/141GwVpT_WUhzdXja_cwXrStevkjc9ruh
38	CALDAS	Samaná	Villa Real	X	X		N/A	Dain Blandon Quintero	https://drive.google.com/drive/folders/1OV0TQYUzzCrwZTuL26W_gTj83lV-VbBA
39	CALDAS	Victoria	El Retiro	X	X		106-16934	Jose Norberto Osorio Valencia	https://drive.google.com/drive/folders/1wFNax

									K8fOKjivIzt8nhTopka-2Kck9Zz
40	CALDAS	Victoria	Los Almendros	X	X		106-601	Gildardo Oviedo Jimenez	https://drive.google.com/drive/folders/1Fr28kwpBX-tL4mWq0ehA8oEZ3xoNwdpP
41	CALDAS	Victoria	Los Planos	X	X		106-24041	Berenice Bravo de Ramos	https://drive.google.com/drive/folders/1OCaOl9PIVg9PpBeu8qVrUfFisJ03HPv4
42	CALDAS	Victoria	Predio Numero Dos		X		106-31503	Amparo Giraldo Zuluaga	https://drive.google.com/drive/folders/1SkSJ3H2VNmxuZs0_xWGcXlYa6LDn7tOt
43	CASANARE	Villanueva	Villanueva	X	X		470-94892	Palmas del Casanare SAS - Casa Luker	https://drive.google.com/drive/u/0/folders/1EYrpysqiLoFoZcm8oWW4YUpvfLcbuaPa
44	CASANARE	Yopal	El Palmar	X	X		470-29109	Fernando Wilches Gonzalez	https://drive.google.com/drive/folders/1H-KeYftthRO-woM_pE0XMC64Bsk3KwRB
45	CÓRDOBA	Montelibano	La Isla		X		N/A	Emilio Bertulfo Guzman Fernandez	https://drive.google.com/drive/

									folders/19E5a6ZMelzkcsQsABkFG5rMGztg0Qnkr
46	CÓRDOBA	Puerto Libertador	El Bajo		X		N/A	Luis Manuel Rojas Zambrano	https://drive.google.com/drive/u/0/folders/10bUSrgihC5JSirlS_csPj02QHWxZCqGV
47	CÓRDOBA	Puerto Libertador	Vera Cruz		X		N/A	Cesar Amaris Arrieta	https://drive.google.com/drive/folders/1gmnK6IJGtjVbakNiC1v-r1mD1EKtbv1O
48	CÓRDOBA	San Jose de Ure	No Hay Como Dios		X		N/A	Jader Manuel Ortiz Padilla	https://drive.google.com/drive/folders/1IegLvw9mva16bxJ7bZRrk2ag0Gb4ISPw
49	CÓRDOBA	Tierralta	Finca La Bendición		X		N/A	Dulcenio Diamante Perez Atencia	https://drive.google.com/drive/folders/1TR5zmTnlywfNPlLNW2z5cnBY2igw5KZc
50	CÓRDOBA	Valencia	Finca San Miguel		X		N/A	Miguel Antonio Arteaga Avila	https://drive.google.com/drive/folders/10zk7v22IbgZ9-2ZoWVyA4-YNfTw9mCe9

51	*HUILA*	*El Agrado*	*La Estrella*		***X***		*202-16561*	*Reinaldo Sánchez Chavarro*	*https://drive.google.com/drive/folders/1lLhNOsF-7hBm4J06wVytqaOI9xifcrWg*
52	*HUILA*	*Pital*	*El Carrizal*		***X***		*204-4473*	*Alba Luz Ortiz Castro*	*https://drive.google.com/drive/folders/17aYAMZCT5vuYAMQRJuX5QSn935nFjphl*
53	*HUILA*	*Pital*	*El Mirador*		***X***		*204-13987*	*Rogelio Rojas Vitobis*	*https://drive.google.com/drive/folders/1bK5NZ5n5VlenpwH1luYDde0Gkb2bnpU4*
54	*HUILA*	*Pital*	*La Esperanza*		***X***		*204-25598*	*Ricardo Tovar Betancurt*	*https://drive.google.com/drive/folders/1AGngNzXP0orjbbe6zu3gdD00M64rA5o0*
55	*HUILA*	*Pital*	*La Laguna*		***X***		*204-7441*	*Guillermo Parra Fajardo*	*https://drive.google.com/drive/folders/1gYFDkvZl9nXi2BgAYMrp19n3p-cr44FJ*
56	*HUILA*	*Pital*	*Primavera*		***X***		*204-865*	*Jose Eustasio Vargas Borrero*	*https://drive.google.com/drive/folders/1EkQgk8Lir5FtQbkTnZipgvCLQyAICvg*

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57	META	Barranca de Upia	Bellacruz	X			230-9187	Bella cruz del Llano S.A.S.	https://drive.google.com/drive/folders/1BhiIYJmpi_t1_DzbtvAw4ntQY7aynlxu
58	META	Barranca de Upia	El Amparo	X			230-29277	Bella cruz del Llano S.A.S.	https://drive.google.com/drive/folders/1rb3wmtU5M8eNVbEhgJlvZz2UCzb3TjQP
59	META	Cabuyaro	El Diamante	X			234-1	Sandra Milena Puerto Fonseca	https://drive.google.com/drive/folders/12ktQqO1mii8czhLjg3EKLJj6rAp8lOKV
60	META	Cabuyaro	El Diamante	X			234-9786	Javier Reinaldo Puerto Puerto	https://drive.google.com/drive/folders/1q0-fwwWSq7hHMzOHYBY0wTAES95O3ZxS
61	META	Cabuyaro	La Gran Diana	X			234-3615	Ana Dulcelina Puerto Puerto	https://drive.google.com/drive/folders/1Qy8_ifUgQ_f6qlse2urrx2p-BIJXN7Qo
62	META	Cabuyaro	Lote 2	X			234-17912	Veigrasas S.A.S.	https://drive.google.com/drive/folders/18cib6ISMAjWL7MZaekFNQN9Jr4NE

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63	META	Cabuyaro	Oleocol	X			234-4311	Oleaginosas de Colombia SAS - Oleocol SAS	https://drive.google.com/drive/folders/1FQTsrRHIDUm-NQ8SaumOcP3RZk2TH65C
64	VICHADA	La Primavera	Bacari	X		X	540-2473	Nidia Genith Álvarez Téllez	https://drive.google.com/drive/folders/1OXPCJUsHIE22iYfs_4Bgb8WptW3BB4di
65	VICHADA	Puerto Carreño	Cantarrana	X		X	540-4463	Grupo TRS Sociedad por Acciones Simplificada	https://drive.google.com/drive/u/0/folders/1_YG8G7MH57T86T-Cmg_V-laS4wT_XkMq
66	VICHADA	Puerto Carreño	El Manantial	X		X	540-4748	Biocaucho SAS	https://drive.google.com/drive/u/0/folders/1Waa5IXjqFWEl7gqwawQbbP4PjO_h8lEj
67	VICHADA	Puerto Carreño	La Prosperidad	X		X	540-3514	Cauchobiz Colombia S.A.S.	https://drive.google.com/drive/u/0/folders/1oG2niXQ5rVyVhS8CytPbc7SDjEDJTeID
68	VICHADA	Puerto Carreño	Las Corocoras	X		X	540-4756	Grupo Caucol Sociedad por Acciones Simplificada	https://drive.google.com/drive/u/0/folders/1-ar

									vYjQ1UXVOYRcbgaGYvF1YkzinIJvV
69	VICHADA	Puerto Carreño	Mataguaro	X		X	540-6182	Grupo Vicau Sociedad por Acciones Simplificada	https://drive.google.com/drive/u/0/folders/1G6K5GmDH0ji_wxhGYYcT4OCzDIXhUiNK

Source: Fundación Cataruben, 2023.

5. CLIMATE CHANGE ADAPTATION

a. *Considers one or more of the strategic lines proposed in the National Climate Change Policy and/or focuses aspects outline in the regulations of the country where the project is implemented;*

The project takes into account and aligns with the guidelines established in the National Climate Change Policy, specifically with action line 4, which deals with the "Management and conservation of ecosystems and their ecosystem services for low carbon and climate resilient development". This is reflected in project activities such as the establishment of crops with verification of areas actually planted and the implementation of silvicultural practices aimed at reducing emissions generated by the implementation of unsustainable practices in crops.

b. *Improve conditions for the conservation of biodiversity and its ecosystem services, in the areas of influence, outside the project boundaries; i.e.,natural coveron environmental key areas,biological corridors, water management in watersheds, among others; ;*

In order to improve the conditions for the conservation of biodiversity and its ecosystem services, the project proposes to contribute to the conservation of areas and thus achieve the conservation of ecosystems, providing vital spaces for flora and fauna, as well as to conserve a diversity of plants and animals that support other ecosystem services. It is worth mentioning that some habitats have an exceptionally high number of species, which makes them more genetically diverse than others (Government of Mexico, 2021).

Among the regulating services provided by the ecosystem services in the project area are climate and air quality, carbon sequestration and storage, erosion prevention and soil fertility conservation, and pest control, which for many people these regulating services are invisible and taken for granted; however, when they are affected, such as air or soil quality, the consequences are significant and in some cases difficult to repair.

For this reason, the project's proposed activities include capacity building in the environmental management of the Properties, through the application of training processes and support through training to strengthen land planning, biodiversity conservation and sustainable forest management, as well as the implementation of monitoring and conservation measures for fauna and flora, which will be achieved through the monitoring of threatened ecosystems and participatory monitoring of endangered species.

c. *Implement activities that generate sustainable and low-carbon productive landscapes.*

Under the CultivO₂ project, the adoption of sustainable low-carbon productive systems is actively promoted in the AFOLU (Agriculture, Forestry and Land Use) sector, focusing mainly on cacao and cashew crops. These two crops, cacao and cashew, have proven to be fundamental in generating sustainable low-carbon landscapes due to their ability to intercrop with other crops and trees, contributing to soil conservation, biodiversity and carbon sequestration. To achieve this objective, specific training and technical assistance will be offered for these crops, seeking not only to transfer knowledge, but also to strengthen competencies adapted to the sustainable production of cacao and cashew.

Two scenarios will be addressed based on the needs of the beneficiaries:

- Beneficiaries interested in initiating sustainable low-carbon productive activities, focusing on cacao and cashew.
- Beneficiaries who already have production systems and are looking to transform their current practices towards more sustainable and low-carbon models, with a focus on cacao and cashew.

Within the fulfillment of the RA Activities, the project proposes to accompany the beneficiaries in the optimization of their land, specifically for the establishment of areas that will be effectively planted. It is essential to point out that the areas destined for planting do not come from or form part of forested areas, which underscores a commitment to the conservation of our forests. The central purpose is that the properties to be integrated into the project minimize the negative impacts that may arise from current agricultural practices. To achieve this, training will focus on improving soil preparation and management, optimized harvest and post-harvest techniques, proper use of organic fertilizers, and effective approaches to pest and disease management. In addition, training will be provided on various planting methods. Regarding areas designated for restoration, training will be offered in PES systems, with emphasis on the valorization of non-timber products and the importance of food security. In addition, to reinforce silvicultural systems, practices such as the creation of shade cores, the implementation of living barriers and the introduction of nectariferous species will be promoted. These interventions, in addition to improving the productivity and sustainability of the land, offer a wide range of environmental services. These range from the regulation of the hydrological cycle and local microclimate, to significant contributions to global biodiversity and carbon sequestration (Garcia, 2011).

e. Design and implement adaptation strategies based on an ecosystem approach;

To address climate challenges, particularly during the low rainfall seasons from December to March, when beneficiaries face the threat of fires and water shortages affecting their properties and crops, the project will adopt adaptation strategies with an ecosystem approach. Through satellite analysis, a warning system will be generated to detect changes in ecosystems due to fire, wind, floods and human activities such as deforestation and degradation (Gomez & Flores 2001). In addition, it will focus on knowledge transfer, training landowners in conservation practices, sustainable crop development and water management, promoting efficient use of natural resources and proper water management. Understanding that well-managed soil and water provide crucial ecosystem services, the beneficiaries will be better prepared to face the adversities of climate change (Shepherd G., 2006).

Compliance with such requirements is related in the monitoring report attached to this PDD.

f. Strengthens the local capacities of institutions and/or communities to take informed decisions to anticipate negative effects derived from climate change (recognition of vulnerability conditions); as well as to take advantage of opportunities derived from expected or evidenced changes.

The project has an essential focus on strengthening the capacities of local communities and institutions to respond proactively to the challenges and opportunities arising from climate change. Recognizing the critical relevance of forests to the country, especially at the current juncture of modernization, climate change and territorial reordering, the project seeks to amalgamate and validate various existing and developing forest governance inputs. These efforts are aligned with the vision of facing the country's contemporary and future challenges under a sustainable development paradigm, as highlighted in the guidelines of Minambiente (2015). Therefore, through this integration and strengthening, the aim is to empower communities and institutions to make informed decisions, recognize their vulnerability and anticipate possible adverse impacts of climate change, while capitalizing on emerging opportunities.

The fulfillment of these requirements is listed in the monitoring report attached to this PDD.

For activities in the AFOLU sector:

a. *Agricultural, forestry, and fisheries production systems better adapted to high temperatures, droughts, or floods, to improve competitiveness, income, and food security, especially in vulnerable areas.*

The project will promote the implementation of agricultural, livestock and forestry production systems that are better adapted to high temperatures, droughts or floods, to improve competitiveness, income and food security, especially in vulnerable areas. This will be done through the application of training and support processes through training cycles that strengthen silvicultural practices (establishment, growth and development, harvest and post-harvest of cacao and cashew crops), thus obtaining a record of the number of training sessions carried out and the number of properties with implemented silvicultural practices. The aim of this training is to strengthen the capacity to manage the crops of the properties enrolled in the project, obtaining crop management and monitoring plans.

b. *Integrated actions that assist in the efficient use of the soil, including, i.e. the conservation of existing natural cover, land use consistent with land vocation and agro-ecological conditions, family farming, and agricultural technology transfer to increases competitiveness by reducing vulnerability to climate change;*

The owner of the project contributes to ensure comprehensive actions that help the efficient use of the soil, and where, for example, the following are contemplated: conservation of existing natural cover, use consistent with the vocation and agro-ecological conditions of the territory, family farming and agricultural technology transfer to increase competitiveness and reduce vulnerability to climate change; This will be achieved through the contractual contract signed by the two interested parties, it is intended to achieve that the owners acquire responsibilities aimed at the conservation of the areas enrolled in the project, and by the Fundacion Cataruben acquire responsibilities that are focused on carrying out monitoring and monitoring activities to ensure the conservation of these areas, but also, The Cataruben Foundation is responsible for following up and monitoring activities to ensure the conservation of these areas, but also for accompanying the implementation of best practices in the crops established or to be established, such as training on topics of interest such as types of planting, pest and disease control, organic fertilizers, harvesting and post-harvesting, among others.

c. *Reduction of GHG emissions from agricultural activities, compared to the non-project scenario (i.e. replacement of pastures for livestock feed and use of planting methods that reduce emissions from crop management).*

Within the framework of the project managed by Fundacion Cataruben, the project actively seeks to reduce GHG emissions from agricultural activities. In a non-intervention scenario, i.e. without the implementation of the project, strategic measures are being taken. These include the identification and rigorous monitoring of crop establishment practices and restoration zones, with the main objective of ensuring that the areas are actually planted. By precisely delimiting these areas, the project not only seeks to have clearly identified zones, but also to focus on those that offer a significant contribution to reducing GHG emissions. In addition, the project aims to identify and promote production strategies that offer the greatest potential for mitigating GHG emissions. These sustainable production practices will be based on a baseline scenario designed specifically for the project's area of influence, allowing for a more precise and effective intervention in reducing emissions.

d. *Actions causally related to climate change adaptation measures, such as use and management of seeds resistant to temperature change, water management through rainwater harvesting, recycling, drainage and irrigation, reforestation of watersheds to prevent erosion, soil management with practices that reduce compaction, and techniques to fertilizer.*

The project holder will establish within its activities actions directly related to climate change adaptation measures, such as: use and management of seeds resistant to temperature change, water management through rainwater harvesting and/or recycling, drainage and irrigation, planting around watercourses to prevent erosion, soil management with practices that reduce compaction and techniques to reduce fertilizer use; The project will be carried out through the characterization and implementation of silvicultural practices, thus identifying the properties that have already implemented productive systems. To this end, a property characterization will be carried out and the owners will be surveyed to find out the current status of the properties, if their crops were established with certified seeds, if they know the origin of the seeds, if they know the origin of the seeds, if they know the origin of the seeds, if they know the origin of the seeds, if they know the origin of the seeds, if they know the origin of the seeds, and if they know the origin of the seeds, This will be done in order to apply training and accompaniment processes through training cycles to strengthen silvicultural practices (installation, establishment, growth and development, harvest and post-harvest), as established in the previous characterization

6. RISK MANAGEMENT

During the development of the initiative, the environmental, financial and social risks related to the implementation of the project were evaluated and categorized in order to mitigate them and ensure the long-term stability of the project. Preventive measures were identified and risks were classified

into low, medium and high levels. This facilitated more effective monitoring of the mitigation measures and actions implemented.

6.1. Reversal risk management

To mitigate the reversal risk management in the project areas, Fundacion Cataruben has established a legal framework, in which commitments are established around the implementation of activities, carbon property, limitation in the execution of anthropic intervention, distribution of economic benefits and monitoring in the accreditation period of the initiative, since there is a 20% reserve stipulated in the standard at each verification, in order to ensure the replacement of certificates placed in the market as a result of the occurrence of events that mean loss or decrease of the same.

According to the standard, it is established that the 10% discounted on the Verified Carbon Credits, in each period will be kept in a Reserve Account for the Project to which they belong and the remaining 10% will be placed in a general Reserve Account of *Biocarbon Registry*; the PROJECT HOLDER cannot use these for commercialization. Additionally, at the end of the quantification period of the project, the last reserve at the time of the last verification, the corresponding percentage will also go to the general reserve account called BCR Reserve, in this account, the CCVs are maintained to cover possible reversals in the future.

6.2. Permanence risk Management Monitoring Plan

The following is the monitoring plan for the three (3) risks identified, which are categorized at a low or medium level, and which will be monitored for the accreditation period of the initiative; this will allow us to demonstrate the permanence of project activities and their effectiveness in terms of GHG removals. See the annex "Plan de Monitoreo Riesgo de Permanencia."

For Risk Type 1, Environmental, the following risks are established:

Fire: This is classified as **High Risk Level** for the project area, taking into account the abundant presence of plant material in the area, which can facilitate and accelerate the spread of fire in the event of a fire. During the estimated monitoring period, there was no evidence of any fire reports that could affect the land cover associated with the project; monitoring was carried out through the hot spot monitoring system on the surface detected by satellite on the hot spot monitoring platform in Colombia - IDEAM.

Flooding: One of the main factors that currently affects the flood risk scenario, with a **low risk** classification, is generated by climate variability and change, as well as by unregulated river management for the different uses of water: agriculture and livestock. Monitoring was carried out using Google Earth Engine using radar image flood mapping.

Wind: Categorized as **low risk**. Wind, in excessive amounts, abruptly hits the plants and can cause fruit loss, leaf damage or total detachment of the roots. During the monitoring period, there were no reports of properties in areas reported as vulnerable to wind. This was done from the platform

https://giovanni.gsfc.nasa.gov/giovanni/ where wind speed data was taken since in the areas close to the project there are no hydrometeorological stations with anemometers to measure wind speed and direction.

The following risks are established for Risk Type 2, Financial:

Profitability: It is categorized as **Low risk.** Fundacion Cataruben financially models the project under a preliminary projection, that is, before the start-up of the project during its period of validity, which builds different financial indicators such as cash flow, income statement and financial evaluation indexes such as (IRR, NPV), making evident the financial status of the project allowing to know the economic viability of the initiative and the actions to be taken to avoid the profitability risk.

Market: The project is categorized as **medium risk,** considering that its main source of income, which supports ecosystem conservation, comes from the sale of carbon certificates. These certificates represent the verified reduction of greenhouse gas emissions. To anticipate these revenues, a financial analysis is carried out based on a price projection of these certificates. A market study is carried out to establish an appropriate selling price and to estimate the amount of annual sales, as well as their possible variability. In Colombia, the sale of carbon certificates has gained relevance as a tool that encourages companies and projects to adopt more environmentally friendly practices. The country, committed to international emission reduction goals, recognizes the importance of these certificates as a way to finance projects that promote sustainability and the conservation of ecosystems. Therefore, the correct projection and commercialization of these certificates is essential to guarantee the financial viability of projects such as the one mentioned.

Supply: It is categorized as **Low risk**, taking into account the prior planning and preparation of the project, which ensures a projection of certificates in the short, medium and long term and allows generating commitments with strategic allies. This low risk perception is the result of identifying the investment, implementation times, follow-up and projection of available resources and capacities. In summary, a low supply risk indicates that the project is well equipped and organized to fulfill its promises and deliver value to its strategic allies.

Country Risk: This risk is categorized as **Medium risk**. Any climate change mitigation initiative has macroeconomic risks due to the current globalized market. Therefore, the project owner analyzes both the macroeconomic conditions of the country where the project operates, as well as the location of the sales market. There, decisions are determined that directly affect the financial permanence risk of the project. Additionally, the project is financially modeled taking into account macroeconomic variables such as the TRM, inflation and UVT in order to foresee disruptive actions in important variables and mitigate significant effects on the initiative.

For Risk Type 3, Social, the following risks are established:

Land tenure dispute: is established as a **Low risk**. Taking into account that the project integrates two natural components, of the 69 properties enrolled in the project, title studies were conducted to

ensure ownership and carbon rights, as well as liens, precautionary measures, limitations to the domain or situations that may affect it.

Low stakeholder participation: During the monitoring period, the absence of reported conflicts highlights the effectiveness of the strategies adopted, such as the knowledge gathering, which facilitates a constructive exchange of information and perspectives. In addition, the implementation of the PQRS (Questions, Complaints, Claims and Suggestions) mechanism provides a channel for stakeholders to express their concerns and receive feedback, reinforcing their trust and commitment to the project. This set of actions ensures a harmonious relationship with project participants, minimizing any potential for discontent or disagreement, and demonstrating the positive impact of project activities on the community.

Assessing the levels of risk in a carbon project is essential to ensure its long-term viability and sustainability. These risks were classified into three levels: low, medium and high, based on the combination of the probability of occurrence and the magnitude of the consequences. A risk categorized as "low" indicates that it is unlikely to occur and, if it does, its effects would be minimal. On the other hand, a "high" risk means that it has a high probability of materializing and, if it does, its consequences would be significant.

7. ENVIRONMENTAL AND SOCIOECONOMIC ASPECTS

The study assessing the environmental and socioeconomic effects of the CultivO₂ project includes the detailed description of the physical, biotic and socioeconomic environment within its area of influence. This is carried out with the purpose of identifying potential impacts that may arise as a result of the project activities and ensuring alignment with the safeguards and applicable regulations of the initiative. In this context, it can be concluded that since no negative effects were detected, it is not necessary to implement environmental and socioeconomic management plans to prevent, reduce or eliminate such impacts.

The relationship between socioeconomic growth and environmental protection is of vital importance, as these aspects complement each other. The absence of adequate environmental protection could significantly distort the positive analysis of a project's activities. Consequently, increased economic revenues should be used to provide the necessary resources for more sound environmental planning.

In this context, both the Environmental Impact Assessment (EIA) and the Socioeconomic Impact Assessment (SEIA) emerge as preventive tools that, traditionally, had not been taken into account during project planning, design or implementation. These assessments strengthen the decision-making process at the project level, as they incorporate essential variables that define the management plans both at the predial level and in the area of influence of the project.

Two important aspects that must be defined from the beginning of the execution of a project, within the framework of the Environmental and Socioeconomic Impact Assessment, refers to the identification of actions of the project that may generate some type of impact on the components to

be analyzed, this is achieved by adequately understanding its characteristics and by identifying all environmental factors and elements that might be impacted in various ways.

To achieve the first point, it is necessary to obtain a high degree of understanding of the characteristics of the project for an environmental analysis, from the different phases (Feasibility, Formulation, Implementation, Verification and Certification), covering even the pre-operational to its total operation, for this, it is necessary to know all the documentation related to it, such as pre-feasibility studies, feasibility and others that have given technical support in its formulation stage; As well as everything related to technical, operational and operational aspects inherent to the project; from a socioeconomic perspective, compliance with project activities, adherence to safeguards, and related SDGs are analyzed.

Finally, for the second point, activities that have an impact on the environmental factors and elements being analyzed should be clearly differentiated and quantitatively determined, thus, each activity must be defined in the following terms; when (temporality of the action), where (location), and which (most representative magnitudes, importance of the impact) (Saenz, 1991).

7.1. Environmental Assessment

All organizations, regardless of their nature, private or public, have an impact on the environment as a result of their activities, generating an environmental impact to varying degrees.

The implementation of an Integrated Management System (IMS) allows the organization to identify those environmental aspects derived from its activity that may have an impact on the environment and, consequently, to establish the pertinent actions to act on them and minimize their impact, especially if they result in negative impacts on the environment. Fundacion Cataruben has an IMS, which, in compliance with regulations (ISO 9001;14001;45001), develops the Environmental Aspects and Impacts Matrix for the general activities carried out within the organization for the execution of projects (see Annex 2.1.6. Matriz de Aspectos e Impactos Ambientales Fundación Cataruben)

The environmental impacts can be considered as those parts that result after executing an activity, product or service, which can have repercussions on the natural conditions of the environment, leaving as a consequence specific alterations or modifications on the environment in which the activities were executed. The Environmental Impact has a clear connotation of human origin, since it is the activities, projects and plans developed by man that induce the mentioned alterations, which can be either positive, when they imply improvement of environmental quality, or negative when the opposite situation occurs.(Pelaez, 2019)

The EIA can also be considered as an instrument or tool of a preventive nature, aimed at identifying the environmental consequences of the execution and operation of a human activity, in order to establish preventive and control measures that make possible the development of the activity without harming the environment as little as possible. (Arboleda, 2008).

The main objective of the Environmental Assessment for the CultivO2 Project is to identify the environmental impacts that may arise from the interaction of the project activities and the elements

of the environment in the area of influence, in order to establish the environmental management measures to be developed during the construction and operation phases of the project.

7.1.1. Scope of the Environmental Assessment

The scope of this Environmental Assessment is related to all actions related to the execution and operation of the activities proposed for the CultivO2 Project of Fundacion Cataruben. This assessment primarily aims to establish a balance between the development of human activity and the environment, without pretending to be a negative or obstructionist figure, nor a brake to development, but rather an operative instrument to prevent overexploitation of the natural environment, nor negative effects on the social part of the area of influence of the project. Each project, work or activity will cause a disturbance on the environment in which it is located, which must be minimized based on the environmental impact studies (González, 2019).

7.1.2. Priority Environmental Impact Assessment for the Cultivo2 Project.

The environmental impact assessment is a very important tool to determine the impact of a project on its area of influence; it is a technical study that is carried out in order to forecast and process the environmental footprints that can be produced with the implementation of a project (Iso 14001, 2019), regardless of its place of development.

For the implementation of the CultivO2 project, the Environmental Impact Assessment was carried out taking into account all the activities or actions that are developed to achieve the execution of all the activities proposed for the project, and, the impact that these could have on the elements of the physical and biological environment of the area of influence of the project, taking into account, as mentioned above, that the impacts can be presented in a positive or negative way, for the case of this project it is evidenced that the impacts are positive.

7.1.3. Results of the Environmental Assessment.

The following link contains the Environmental Assessment Matrix for the CultivO2 project, with the results obtained after an exhaustive verification of the information and its weighting on the possible impacts that could be generated by the implementation of the project activities on the environment, social and economic impacts in the area of influence.

See Annex 2.1.12.2. Matriz de Evaluación de Impacto Ambiental CultivO2.

According to the matrix, it can be determined that the CultivO₂ project activities do not represent negative impacts within the project's area of influence, this because they are aimed at protecting the environment and reducing and removing greenhouse gases (GHG) within the areas established and enrolled in the CultivO₂ project.

The two (2) components in which a higher Importance (Positive) of the evaluated Impact was obtained are listed below.

7.1.3.1. Environmental Assessment Component 2 - Safeguards.

From the impact assessment carried out for component 2, which refers to Governance activities, specifically safeguard 5: "The compatibility of measures with the conservation of natural forests and biological diversity, ensuring that those indicated in paragraph 70 of this decision are not used for the conversion of natural forests, but instead serve to encourage the protection and conservation of these forests and the services derived from their ecosystems and to enhance other social and environmental benefits. "The conclusion is that the impact on environmental elements is positive, since the implementation of the project will improve the conservation conditions of the forests and biological diversity present in the properties enrolled in the project, promote the recovery of ecosystems, and for the areas that are already carrying out conservation measures, it will help to continue promoting conservation.

7.1.3.2. Environmental Assessment Component 4 - Project Activities.

Component 4 refers to the activities related to the implementation area, specifically the execution of project activities related to the "Establishment of crops and restoration zones", it is concluded that the impact generated on the environment and on the socioeconomic part of the area of influence is positive, this because, that by accompanying the beneficiaries of the project to achieve sustainable production systems, the conditions with respect to natural resources are improved, and by establishing the crop under ecological conditions from the nursery stage to planting and monitoring, preventive and mitigation measures can be established in the processes that may generate negative impacts on the social and economic environment of the sector.

The support for the application of the measures will be directly linked to the evaluation and the results of the initial characterization, which includes an analysis of the development stage of the crop, since the structural characteristics of the crop and the impact it may have on the environment will depend on its development over time, as well as the community's change of attitude towards natural resources and the need to maintain a good relationship between man and his environment.

In this same component, a high score was obtained in relation to the project activity focused on "Characterization and support for the implementation of silvicultural practices", it is concluded that the impact generated on the elements of the environment and in the socioeconomic part of the area of influence is positive, because, with the activities of characterization of properties with productive systems, it is possible to identify and strengthen capacities for the management of the crop, The silvicultural treatments seek to induce variations in the structure of the forest, with a view to strengthening the establishment of natural regeneration and increasing the growth of individuals of commercial species, which are largely responsible for the application of the treatments (Monge, 2003), and, in this way, contribute to the reduction of the negative environmental and socioeconomic impacts that may be generated as a result of the bad practices implemented in the different crops of the properties enrolled in the CultivO2 initiative.

From the activities of characterization and accompaniment to the beneficiaries of the project, a monitoring system is generated, with which it is intended to follow up the suggestions made by the professionals of Fundacion Cataruben to the beneficiaries of the project, from that it is possible to

obtain a series of evidences of the execution of the established activities, these evidences refer to the Predial Characterization Forms, Visit Logs and Photographic Record, which allows to have a traceability of the execution of the project and the impact that it achieves in each of the identified crops.

7.2. Socioeconomic Assessment

As in the analysis of environmental impacts, socioeconomic impacts can be considered as those resulting after the execution of an activity, product or service, which may have repercussions on the conditions of the socioeconomic components, resulting in specific alterations or modifications in the aspects evaluated.

The SEIA can also be considered as an instrument or tool of a preventive nature, aimed at identifying the socioeconomic consequences of the implementation and operation of greenhouse gas projects, in order to establish preventive and control measures that make possible the development of the components to be evaluated without prejudice to the implementation of the climate change mitigation initiative, or even as a taxonomy to evaluate social and economic benefits. For instance, Olsen and Fenhann attempted to standardize such an approach in 2008, aiming to define criteria for evaluating CDM projects based on their contribution to sustainability, managing to generate important contributions that highlight the social aspects and economic growth at a priority level above 55% in the global valuation of GHG projects[1]..

The main objective of the Socioeconomic Assessment for the CultivO2 Project is to identify the socioeconomic impacts that may arise between the interaction of project activities, the assurance of safeguards and SDGs, allowing the establishment of management measures to mitigate negative impacts if any.

7.2.1. Scope of the Socioeconomic Assessment

The scope of this Socioeconomic Assessment is related to the interaction of project activities, the assurance of safeguards, SDGs and project activities proposed for the CultivO2 initiative, this assessment matrix aims to determine the negative or positive impact taking into account the main components from the perspective of the social and economic scope of the initiative, This assessment does not aim to hinder the project's development but serves as an operational instrument to mitigate potential negative effects through the implementation of corrective and/or improvement actions within the project's area of influence.

[1] Evaluación de los proyectos de mecanismo de desarrollo limpio presentados a la UNFCCC: Los criterios de sostenibilidad 2044 y 2008.

http://www.scielo.org.co/scielo.php?script=sci_arttext&pid=S0121-68052010000100014

7.2.2. Evaluation of Priority Socioeconomic Impacts for the CultivO2 Project.

For the implementation of CultivO2 P1, the Economic Impact assessment considered the interaction of project activities, safeguards, SDGs, and their potential impacts on social elements of study, including: gender equity, education and training, communication with stakeholders and forest governance in the territories; and the economic elements of study such as: generation of economic benefits from the project, formalization of environmental services as an economic activity and implementation of sustainable productive practices. The above, taking into account that although the impacts can be positive or negative, in the case of the valuation of this project it is evident that the impacts are positive.

7.2.3. Socioeconomic Evaluation Results.

The following link contains the Socioeconomic Evaluation Matrix for the CultivO2 initiative, with the results obtained after an exhaustive verification of the project input information, bibliographic review, expertise of those performing the analysis, and weighting of this data on the possible impacts that could be generated by the implementation of the project activities on the social and economic assumptions in the project area.

See Annex Matriz de evaluación socioeconómica

According to the evaluation matrix, it can be determined that the CultivO2 project activities do not represent negative impacts within the area of influence of the project, because all activities are aimed at generating social and economic benefits with respect to climate change mitigation actions, in order to reduce and remove greenhouse gases (GHG) within the areas established and enrolled in the CultivO2 project.

The following is a list of the main activities for which the highest positive impact rating was obtained:

7.2.3.1 Socioeconomic Evaluation Component 3- Project Activities.

It was determined that, in terms of socioeconomic evaluation, this activity had the greatest positive impact, standing out above all other project activities:

Implement training and accompaniment processes that strengthen land planning, biodiversity conservation, and sustainable forest management, with a score of twenty-two (22) points,

Identify and adopt the principles of forest governance for sustainable forest management, with a score of twenty-one (21) points, and,

Apply training and accompaniment processes through training cycles that strengthen silvicultural practices (installation, establishment, growth and development, harvesting and post-harvesting), with a score of twenty-one (21) points.

The training generated positive social impacts through the transfer of knowledge on topics such as biodiversity conservation and sustainable forest management, which translates into informed property owners whose skills have been strengthened. In addition, the foundations and principles of forest governance have enabled the communities in the project's reference area to implement better

practices in their cacao and cashew plantations. Finally, organizational capacity and productivity have been strengthened, improving their living conditions.

Similarly, from the positive economic effects, it was possible to analyze that of the economic components related to the valuation, the formalization of environmental services as an economic activity, the implementation of sustainable productive practices and the generation of economic benefits, obtained a greater impact reaching qualification levels of up to four (4), indicating a higher likelihood of alterations in the evaluated actions due to their significant relative weight. This is because the development of these actions is directly related to the additionality of the initiative, which allows demonstrating a registration impact of the project that derives reductions or removal of greenhouse gases translated into verified carbon certificates, which after its commercialization generates economic benefits for the enrolled beneficiaries, being this the only way in which the project generates economic returns, guaranteeing in turn a financing of the climate change mitigation efforts during the project's period of validity.

Similarly, the economic benefit is highlighted in large part by the implementation of sustainable productive practices in the project area, achieving at the same time to strengthen the capacities in the establishment of crops and other practices of each of the properties, but in the direction of sustainability and maximizing their income, which has an impact on improving the quality of life of both them and their families and local economic development indirectly.

Finally, the implementation of an Integrated Management System (IMS) by the project owner, allowed identifying those economic aspects such as the formalization of environmental services in economic activity, that is, the registration of beneficiaries as providers of environmental services, thus giving them productive and fiscal quality in relation to the economic activity 0210 "Forestry and other agroforestry activities" according to the National Tax and Customs Directorate (DIAN) and the internal goods and services procurement procedure, evidencing compliance with quality and environmental parameters such as those framed in ISO 9001 and 14001 of 2015 and affirming the positive impact of the actions with the best qualification score.

8. CONSULTA A LOS INTERESADOS

Fundación Cataruben efectuó la consulta a los interesados en el área de implementación del proyecto, de acuerdo a lo dispuesto en el numeral 16 del Estándar para el Mercado Voluntario de Carbono ESTÁNDAR BCR. Versión 3.1 de julio de 2023; notificando a los representantes de las entidades territoriales, gubernamentales y entidades no gubernamentales de los 6 departamentos de la Orinoquia y Andes, dando como resultado, 60 dependencias notificadas para los 8 departamentos en mención y 15 respuestas emitidas de acuerdo a las solicitudes efectuadas en el marco de la consulta. 2.1.5. Consulta de interesados

8.1. Resumen de los comentarios recibidos

Fundación Cataruben ha recibido respuestas de las entidades notificadas a través de diferentes canales de comunicación, como correo electrónico, llamadas telefónicas y WhatsApp, con el propósito de coordinar la socialización de la iniciativa. Se han planificado reuniones con las diversas

dependencias y se ha brindado apoyo tanto telefónico como por WhatsApp para abordar preguntas específicas relacionadas con el proyecto. El objetivo ha sido establecer una colaboración efectiva y fomentar un ambiente de trabajo positivo con todas las entidades involucradas. Para más detalles, consultar 2.1.3.2. Respuestas sobre la consulta de interesados y los comentarios recibidos.

8. STAKEHOLDER CONSULTATION

Fundacion Cataruben consulted stakeholders in the project implementation area, in accordance with the provisions of paragraph 16 of the Voluntary Carbon Market Standard BCR STANDARD. Version 3.1 of July 2023; notifying the representatives of the territorial, governmental and non-governmental entities of the 6 departments of the Orinoquia and Andes,resulting in 60 units notified across the aforementioned 8 departments and 15 responses issued according to the requests made within the framework of the consultation. 2.1.5. Consulta de interesados

8.1. Summary of comments received

Fundacion Cataruben has received responses from the notified entities through different communication channels, such as email, phone calls and WhatsApp, with the purpose of coordinating the socialization of the initiative. Meetings have been planned with the various units and support has been provided both by telephone and WhatsApp to address specific questions related to the project. The objective has been to establish effective collaboration and foster a positive working environment with all entities involved. For more details, refer to 2.1.3.2. Respuestas on stakeholder consultation and comments received.

8.2. Consideration of Comments Received

As previously mentioned, a personalized communication was carried out for each entity that responded to the consultation, considering the preferences and convenience of both parties. Throughout the virtual or in-person meetings with stakeholder, collaboration possibilities were explored, relevant information was shared and potential areas for the project were evaluated. It is important to note that no complaints or claims were received from stakeholders.

8.3. Public Consultation

Below is the pre-registration documentation for the project on the BCR standard platform, along with the date of the public consultation.

Image 14. Public Consultation

Source: Biocarbon Registry, 2023.

During the month in which the initiative was in public consultation no requests for information or comments were generated, as evidenced in the following link 2.1.3.3. Consulta Pública.

9. SUSTAINABLE DEVELOPMENT GOALS

The Sustainable Development Goals (SDGs) were established in 2015 by the United Nations General Assembly (UNGA) with the aim of achieving them by 2030 (Agenda 2030). According to the United Nations, the Sustainable Development Goals are a universal call to action to end poverty, protect the planet and improve the lives and prospects of people around the world.

As part of the climate change mitigation initiative, CultivO2 made use of BioCarbon Registry's TOOL herramienta TOOL ODS to identify the Sustainable Development Goals (SDGs) applicable to the project. The project clearly aligns with SDG 6 (Water and sanitation), SDG 13 (Climate action), and SDG 15 (Life on land).

Image 15. Applicability of SDGs for CultivO2 P1 (REDD+ and AR)

Identificación de ODS aplicables al proyecto

Nombre del Proyecto:	CultivO2 Project 1	Sector:	AFOLU	Tipo:	REDD+
ID del Proyecto:	BCRCO-635-14-004	Titular del Proyecto:	FUNDACION CATARUBEN		

ODS Aplicables de acuerdo al Tipo de Proyecto

ODS	ODS por defecto	Otros ODS	Indicadores Sugeridos							
12	NA	NA	NA	NA	NA	NA	NA	NA	NA	
2	NA	NA	NA	NA	NA	NA				
3	NA	NA	NA	NA						
4	NA	NA	NA	NA	NA					
5	NA	NA	NA	NA						
6	APLICA	NA	6.3.1	6.4.1	6.6.1	6.6.1				
7	NA	NA	NA	NA	NA	NA				
8	NA	NA	NA	NA	NA	NA	NA	NA		
9	NA	NA	NA	NA	NA					
10	NA	NA	NA	NA	NA					
11	NA	NA	NA	NA						
13	NA	NA	NA	NA	NA					
13	APLICA	NA	13.1.1	13.1.2	13.1.2	13.2.1				
14	NA	NA	NA	NA	NA					
15	APLICA	NA	15.1.1	15.1.2	15.2.1	15.3.1	15.4.1	15.4.2	15.7.1	15.8.1.b
16	NA	NA	NA	NA	NA	NA	NA	NA	NA	
17	NA	NA	NA	NA	NA	NA	NA	NA	NA	

Identificación de ODS aplicables al proyecto

Nombre del Proyecto:	CultivO2 Project 1	Sector:	AFOLU	Tipo:	Actividades de Remoción de GEI
ID del Proyecto:	BCRCO-635-14-004	Titular del Proyecto:	FUNDACION CATARUBEN		

ODS Aplicables de acuerdo al Tipo de Proyecto

ODS	ODS por defecto	Otros ODS	Indicadores Sugeridos							
12	NA	NA	NA	NA	NA	NA	NA	NA	NA	
2	NA	NA	NA	NA	NA	NA				
3	NA	NA	NA	NA						
4	NA	NA	NA	NA	NA					
5	NA	NA	NA	NA						
6	NA	NA	NA	NA	NA	NA				
7	NA	NA	NA	NA	NA	NA				
8	NA	NA	NA	NA	NA	NA	NA	NA		
9	NA	NA	NA	NA	NA					
10	NA	NA	NA	NA	NA					
11	NA	NA	NA	NA						
13	APLICA	NA	13.1.1 (AFOLU)	12.5.1	12.8.1					
13	APLICA	NA	13.1.1	13.1.2	13.2.1	13.2.2				
14	NA	NA	NA	NA	NA					
15	APLICA	NA	15.1.1	15.1.2	15.2.1	15.3.1	15.4.1	15.4.2	15.7.1	15.8.1.b
16	NA	NA	NA	NA	NA	NA	NA	NA	NA	
17	NA	NA	NA	NA	NA	NA	NA	NA	NA	

Source: BioCarbon Registry.

CultivO2 P1 contributes to the fulfillment of the Sustainable Development Goals, which are adopted by the Colombian state as a member of the United Nations, and as part of the 2030 Agenda. From the adoption of the BCR tool for the AFOLU sector type REDD+ and GHG Removal Activities, it was identified that the initiative must show impact with the goals targets: 6 (Water and Sanitation: Ensure availability and sustainable management of water and sanitation for all), 12 (Responsible Production and Consumption: Ensure sustainable consumption and production patterns) AND 13 (Climate Action: Take urgent action to combat climate change and its impacts) and SDG 15 (Life of terrestrial ecosystems: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation and halt biodiversity loss).

The CultivO2 P1 of Fundacion Cataruben, applies the "Tool for the determination of contributions to the fulfillment of the Sustainable Development Goals (SDGs) of Greenhouse Gas (GHG) mitigation projects", in accordance with the provisions provided by the BioCarbon Registry standard in its version 3.0. Under this premise and taking into account the project typology (REDD+ and AR), the application of the SDGs is listed below:

According to the above, it was identified that some SDGs were indicated by default, a fact that implies a mandatory nature. In this sense, we proceed to identify those indicators and targets applicable by SDG, as listed below.

Table 10. SDGs applicable to the CultivO2 initiative

SDG	APPLICABILITY	INDICATOR	GOAL
	Default	6.4.1	Change in water use efficiency over time
	Default	12.1.1 12.5.1 12.a.1	**Not applicable** Note: SDG 12 suggests the applicability of the indicators mentioned in the previous column according to the SDG TOOL. However, after a thorough review, it was NOT identified that project activities contribute to the achievement of the targets related to SDG 12. The justification for each item is provided in Table 11. Justifications for Non-Applicability -

SDG	APPLICABILITY	INDICATOR	GOAL
			SDG 12 (Project Cultivo2 P1).
	Default	13.2.2	*Total greenhouse gas emissions per year*
	Default	15.1.1	*Forest area as a proportion of total land area*
		15.1.2	*Proportion of important sites for terrestrial and freshwater biodiversity that are covered by protected areas, by ecosystem type*

Source: Fundación Cataruben, 2023

With regard to the non-applicability of the indicators of SDG 12 (Responsible production and consumption), the justifications for this decision are listed below:

Table 11. Justifications for Non-Applicability - SDG 12 (CultivO2 P1 Project)

SDG	INDICATOR	GOAL	JUSTIFICATION OF NON-APPLICABILITY
	12.1.1	Number of countries developing, adopting, or implementing policy instruments to support the transition to sustainable consumption and production patterns	The project activities are not carried out at the national level. Furthermore, there are no policy instruments in place aimed at facilitating a transition to sustainable consumption patterns.

	12.5.1	National recycling rate, tons of recycled material.	The activities carried out by the properties involved in the initiative do not generate a sufficient amount of material for recycling on a medium or large scale. As a result, there is no contribution to the achievement of this indicator.
	12.a.1	Installed capacity of renewable energy generation in developing countries (expressed in watts per capita).	The project activities do not include the generation of renewable energy.

Source: Fundación Cataruben, 2023

Under this premise, it could be determined that the SDGs applicable to the project are concentrated in the REDD+ component, these being : Water and Sanitation (SDG 6), Climate Action (SDG 13) and Life of Terrestrial Ecosystems (SDG 15). On the other hand, it is important to note that although the TOOL ODS relates to the AR component (GHG Removal Activities) in SDG 12, the project addresses the justifications for non-compliance with the suggested indicators and in effect omits these for the reporting of the initiative's sustainable development goals.

These goals represent global commitments to address key challenges in pursuit of a more sustainable and equitable future. Each has significant implications in terms of social, economic and environmental development. In that sense, the project in question focuses on the implementation of the first stage of the SDGs, and seeks to achieve the goals set out in each of them. By emphasizing care for the environment, it seeks to ensure sustainable development that benefits present and future generations.

9.1. SDG 6. Clean water and sanitation

The CultivO2 project seeks to contribute to this goal by significantly increasing the efficient use of water resources in all sectors and ensuring the sustainability of freshwater abstraction and supply to address water scarcity and significantly reduce the number of people suffering from water scarcity. This is developed through indicator (6.4.1)which measures the change in water use efficiency over time. To ensure compliance with this SDG, the initiative is developing a water saving and efficient use plan consisting of three main phases: (i) diagnosis and formulation of the PUEAA, (ii) implementation of PUEAA and (iii) monitoring of the PUEAA management sheets. The following formula is used to measure the percentage of compliance with the goal:

% compliance = ((# PUEAA formulated * 0.25 + # PUEAA Implemented * 0.5 + # PUEAA in

Follow-up * 0.25) / Total number of properties)*100.

Image 16. SDG 6 (Clean water and sanitation)

Source: *https://gestionabierta.cba.gov.ar/index.php/cat_ods_principal/ods-06/, 2022.*

9.2. SDG 13. Climate action.

The specific target to which the project contributes in the thirteenth goal on climate action is to incorporate measures related to climate change in strategic policies (13.2); to this end, CultivO2 focuses on the indicator of total greenhouse gas emissions per year (13.2.2) in order to reduce them. In order to comply with Objective 13, the project provides support and talks to landowners to strengthen the sustainable management of the Property. The procedure for the evaluation of this goal will be the monitoring of the aforementioned indicator, the evaluation of the knowledge acquired and its subsequent implementation in the activities developed in each Property.

Image 17 . SDG 13 (Climate Action)

Source: https://gestionabierta.cba.gov.ar/index.php/cat_ods_principal/ods-13/, 2022.

9.3. SDG 15. Life of terrestrial ecosystems.

The target to which the project contributes to the fifteenth goal on Terrestrial Ecosystem Life is to ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and the services they provide, in particular forests, wetlands, mountains and drylands (15.1). To this end, the project focuses on the following indicators: forest area as a proportion of total area (15.1.1) and proportion of sites important for terrestrial and freshwater biodiversity that are part of protected areas, broken down by ecosystem type (15.1.2). In order to fulfill this objective (15.1), secondary information was compiled from different reports and research from institutes, associations and authors that provide a reliable and updated bibliographic basis for the prioritization of biodiversity conservation areas. Areas of global importance for the conservation of terrestrial biodiversity, carbon and water, the red list of the International Union for Conservation of Nature

(IUCN) for both ecosystems and threatened species, the National Water Assessment of the Institute of Hydrology, Meteorology and Environmental Studies (IDEAM) and eligible forest areas (REDD+) of the project properties were used to define the areas in which the signaling will be carried out. The following equation is used to keep track of important sites for biodiversity:

% compliance = ((# properties identified * 0.25 + # properties implementing signage * 0.75)/ # properties identified)*100.

Fundacion Cataruben thus contributes to the protection and sustainable use of ecosystems and the ecosystem services they provide.

Image 18. SDG 15 (Life of terrestrial ecosystems).

Source: https://gestionabierta.cba.gov.ar/index.php/cat_ods_principal/ods-15/, 2022.

9.4. Sustainable Development Goal Monitoring Plan

The CULTIVO2 P1 project adheres to the BCR (BioCarbon Registry) version 3.1 standard, which requires the project manager to evaluate its contribution to the Sustainable Development Goals (SDGs). Fundacion Cataruben, in its role as project developer, uses the "Tool for Determining Contributions to SDG Compliance," also known as TOOL ODS.

In addition, according to the BCR standard, the "No Net Harm" tool establishes the obligation to design and implement a detailed monitoring plan in the corresponding section of the project. This plan must provide comprehensive information to monitor project activities and evaluate the results of mitigation measures, while demonstrating how the project contributes to the Sustainable Development Goals (SDGs). In this regard, 2.1.5.1. Plan de Monitoreo ODS.xlsx is listed below.

10. GROUPED PROJECT

CultivO2 P1 is contemplated as a grouped project, a condition that allows the addition of areas after validation. The project will be expanded taking into account the guidelines established in the "Standard for the Voluntary Carbon Market - BCR STANDARD" and the methodology "BCR0001 Quantification of GHG Emission Reductions, Removal Activities".

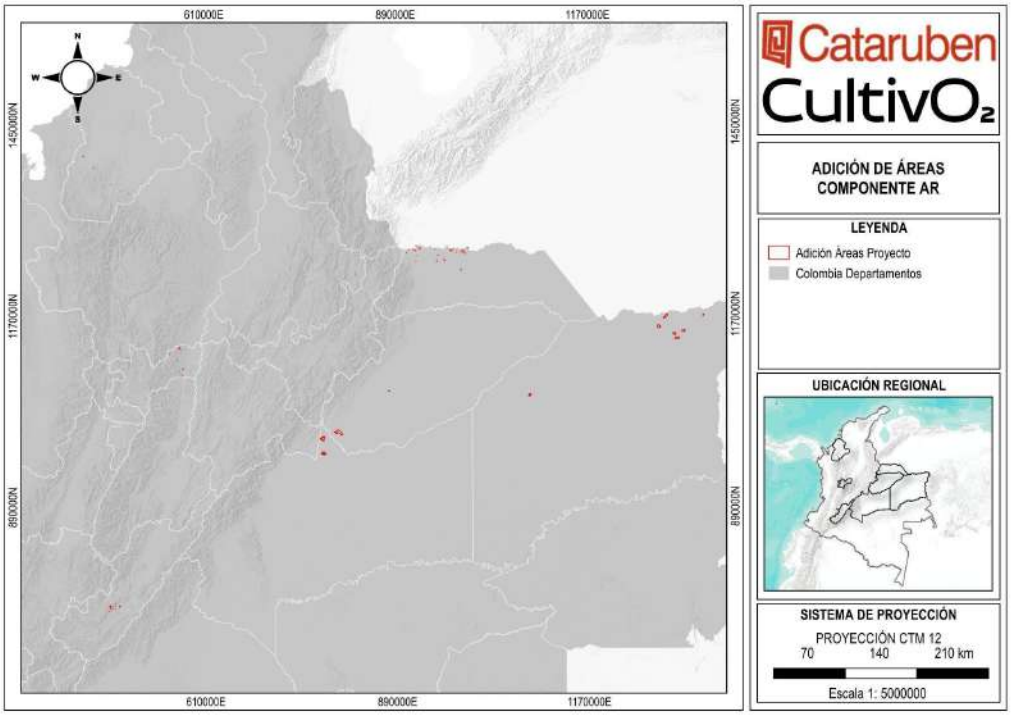
Table 12 . Addition of areas after validation

CONDITIONS FOR ADDING AREAS TO THE PROJECT
a). The project owner should identify the expansion area of the project during the validation process and define the criteria for adding new areas.
The areas for subsequent validation are closely enrolled with the suitability of the crop, therefore the project will gradually enrolled agroecological zones of the crops and restoration areas referenced in Image 19.
b). The default criteria that an area must meet to be added to the project are:
Compliance Criteria
i. Comply with the BCR Standard guidelines in the most recent version.
ii. Comply with all provisions of the methodological documents of the BCR that they apply, in its most recent version.
iii. Include emission reductions only for validated activities.
iv. Implement the removal activities described in the validated project document.
v. Demonstrate that additionality, tenure and baseline scenario (in the new areas) are consistent with the descriptions validated in the project document.
vi. Have a start date after the start date of the areas included in the validation.

Source: Fundación Cataruben, 2023.

In relation to the above, the expansion areas are represented in the following image, which illustrates the incorporation of new areas in the properties included in the project:

Image 19. Addition of AR component areas



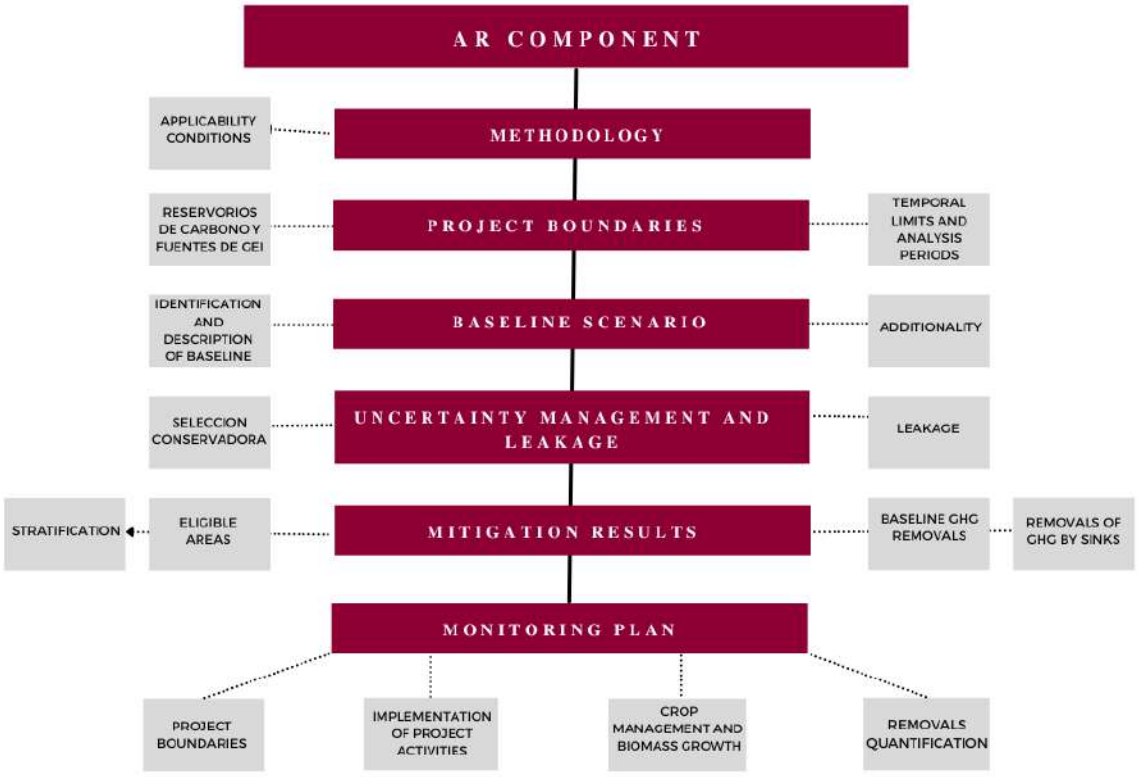
Source: Fundación Cataruben, 2023.

SECTION 2.
REMOVAL ACTIVITIES

11. QUANTIFICATION OF GHG EMISSION REMOVALS

The following is a list of the methodological guidelines required by the BCR0001 methodology, applicable to project areas with cacao and/or cashew production systems enrolled in the initiative.

Figure 3. AR component structure



Source: Fundación Cataruben, 2023.

11.1. AR Quantification methodology

For the development of the project, the BCR STANDARD Version 3.1 of 2023 will be used as a basis, which will provide the requirements applicable to the project, as well as the following methodologies:

- Methodological document AFOLU Sector / BCR0001 Quantification of GHG Emission Reduction, Removal Activities. of BIOCARBON REGISTRY. Version 3.0. April 13, 2022

11.1.1 Applicability Conditions of the Methodology BCR0001 Removal Activities

Regarding compliance with the applicability conditions of the AFOLU SECTOR METHODOLOGICAL DOCUMENT. BCR0001 Quantification of GHG Emission Reduction REMOVAL ACTIVITIES. Version 3.0, it is concluded that;

Table 13. Applicability conditions of the Removal Activities methodology.

APPLICABILITY CONDITION	COMPLIANCE
a) The areas in the project boundary shall not correspond to the forest category (according to the national definition adopted by the country in which the project activity is proposed), nor natural vegetation different to a forest, at the beginning of project activities and not five years before the project start date	A multi-temporal analysis was conducted to determine that the AR project areas do not belong to natural vegetation cover, nor to the forest category. According to the iinterpretación de coberturas from optimal satellite images and field visits, it is shown that the current crop areas belonged to transformed coverages, especially pastures.
b) The areas in the project boundary do not fall in the wetland category.	The project areas are crossed with the national wetlands map and the result is that the properties do not correspond to the wetland category (corresponden a la categoría de humedal). The project areas do not have natural vegetation cover typical of wetlands, nor are they located in hydromorphic soil.
c) The areas in the project boundary do not contain organic soils.	Colombia's soil layers were reviewed and intercepted with the project areas, concluding that they do not contain organic soils. The information is corroborated in the crop stratification analysis 2.2.3. Emisiones. Condiciones Aplicabilidad
d) Carbon stocks in soil organic matter, litter, and deadwood decrease or remain stable, in the absence of project activities, that is relative to the baseline scenario	Dado el contexto económico y productivo identificado en la línea base, el desarrollo de las actividades agrícolas identificadas, propende a que una alta probabilidad de que las reservas de carbono en el suelo, la hojarasca y la madera muerta disminuyan, debido a las transformaciones de las coberturas vegetales que tendrían lugar.
	Given the economic and productive context

e) Flood irrigations is not used	identified in the baseline, the development of the agricultural activities identified, there is a high probability that carbon stocks in the soil, litter and dead wood will decrease, due to the transformation of vegetation cover that would take place.
f) The effects of drainage are negligible, so GHG emissions, other than CO2, can be omitted	Inland wetlands, natural forests and croplands are not drained. Therefore, GHG emissions/removals from these practices are not estimated.
g) Soil disturbances due to project activities, if any, are carried out following appropriate soil conservation practices and have not been repeated for less than 20 years	The project activities provide for proper silvicultural practices during and after crop establishment.

Source: Fundación Cataruben, 2023.

11.2. Project boundaries

11.2.1. Carbon reservoirs and GHG sources

Para el área correspondiente a actividades de remoción de GEI, se tienen en cuenta los reservorios y fuentes descritos en la metodología "BCR0001 Cuantificación de la Reducción de emisiones de GEI: Actividades de Remoción".

11.2.1.1. Carbon Reservoirs

The Intergovernmental Panel on Climate Change establishes 5 compartments that can be measured to estimate changes in carbon stocks: aboveground biomass, belowground biomass, dead wood, litter and soil organic carbon (IPCC, 2003; 2006). Thus, following the guidelines of the methodological document and the project activities for the AR component, Table 14 describes the carbon reservoirs applicable to the areas with Removal Activities of the CultivO₂ initiative.

Table 14. Selected GHG reservoir

CARBON RESERVOIR	SELECTED (YES/NO)	JUSTIFICATION/EXPLANATION
Above-ground biomass	Yes	The change in carbon content in this reservoir is significant depending on project activities.

Below-ground biomass		
Deadwood and litter	Yes	The project areas do not have significant leaf litter or dead wood content, which is expected to increase given the proposed crop management activities.
Soil organic carbon	Yes	An increase in carbon content is expected with implementation of project activities, relative to the bas scenario.

Source: Fundación Cataruben.

11.2.1.2. GHG Sources

The emission sources and associated GHGs are described in the following table.

Table 15. Emission sources and selected GHGs

SOURCE	GHG	SELECTED (YES/NO)	JUSTIFICATION/EXPLANATION
Burning of woody	CO_2	No	CO2 emissions due to woody biomass combustion are not quantified as carbon stock changes.
	CH_4	Yes	The methodology allows for the combustion of woody biomass due to site preparation.
	N_2O	Yes	The methodology allows combustion of woody biomass due to site preparation.

Source: Fundación Cataruben.

Although the methodology allows burning of woody biomass as part of the site preparation process, in compliance with national regulations (Decree 4296 of 2004), these activities are not contemplated for the development of the project. Therefore, potential emissions from burning in the cultivation area are not considered in the quantification.

11.2.2. Time Limits and Analysis Periods

The initiative began removal Activities and GHG reductions as of June 09, 2017, determining an accreditation period of 20 years, concluding on June 09, 2037. The beneficiaries signed letters of intent as a sign of commitment to improve crop establishment processes and generate actions to ensure biodiversity conservation and maintenance of the areas included in the initiative. The

quantification and monitoring period of the reductions/removals presented in this report is 2017 - 2021.

11.3. Identification and description of the baseline scenario

The BioCarbon Registry Standard states that the baseline represents the GHG emissions that would occur in the absence of a mitigation activity in order to comply with the methodologies applicable to the initiative. Regarding the additionality criterion, the methodologies define it as the effect of the project activity to reduce anthropogenic GHG emissions below the level that would have occurred in the absence of the mitigation initiative or project activity.

To determine the baseline scenario for the project, the criterion in C (changes in carbon stocks at the project boundaries, identifying the most likely land use at the start of the project) was selected and the guidelines of the Baseline and Additionality Tool "BCR GUIDELINES, Baseline and Additionality" version 1.1 were followed.

11.3.1. Step 0. Project Start Date

For the start date of the removal activities, the small producers enrolled in the CultivO2 P1 Project were visited between February 6 and May 8, 2017, in order to define the schedule of activities (site preparation) to be implemented for the establishment of crops. Subsequent to the planning activities, the owners began the crop establishment processes for the projected date, which in this case was defined as June 2017. The above is supported in the organization's documentary system 2.1.1.4 Inicio de actividades y Documentos de vinculación propietarios, which corresponds to the project initiation act Acta inicio de actividades, letters of intent Cartas de Intención, field logs and attendance records Soportes de implementación de actividades, activity execution form, invoices for the purchase of plant material by the properties Soportes Actividades de establecimiento and fundamental supports to establish a contractual enrolled landowner Documentos legales de vinculación. In the case of medium and large producers (greater than 50 ha), supports of collection accounts, invoices and contracts for the supply of plant material are attached, which demonstrates the beginning of activities specifically in the establishment of crops that translate into effective GHG removals. June 09, 2017 is established as the start date of the project and AR activities considering that on this date the Luker and Mataguaro Properties begin their planting activities. In addition to the above, the presence of Fundacion Cataruben in the territories is demonstrated through the Contrato consultoria executed with FEDECACAO, which allowed enrolled different producers in the municipalities of Tame, Arauca and San Vicente de Chucurí.

11.3.2. Step 1. Identification of Land Use scenarios

The following is a description of the most common land use scenarios that will be used to develop the baseline through the following sub-steps:

11.3.2.2.1. Substep 1a. Identification of Probable Land Use Alternatives in the Project Area (Orinoco & Andina Region).

A continuación se describen los escenarios más comunes de uso del suelo, que servirán para el desarrollo de la línea base mediante los siguientes subpasos:

11.3.2.1. Sub-step 1a. Identification of Probable Land Use Alternatives in the Project Area (Orinoco & Andina Region).

- *Continuation of previous land use (prior to project)*

The Orinoquia and Andina regions are two important regions of Colombia, both in terms of their natural wealth and their economic and cultural importance. Both regions have a great diversity of soils and climates, which allows them to develop a variety of land uses, from agriculture to natural resource extraction.

- **Agricultural Sector**

The Orinoquia region is one of the largest in Colombia and is of great importance for food production, especially beef and other livestock products. This region is also rich in oil and minerals, which has driven the development of natural resource extraction activities. Anthropogenic pressure has increased in these activities, and the region is expected to continue to transform into a livestock, agricultural, and oil-producing region in the future. The National Planning Department (DNP), in CONPES 3797 of 2014, established a goal for 2024 of having 780,000 ha destined for agricultural uses such as oil palm, rice, corn, cattle ranching, oil extraction, among others, and increasing Colombia's GDP by 0.4%. According to the Instituto Geográfico Agustín Codazzi, of the 25.3 million hectares that make up the departments of Arauca, Casanare, Meta, and Vichada, 9.4 million hectares have soils for some type of production (37.1% of the Orinoquia). About 15.9 % of the region corresponds to soils and lands suited for livestock vocation; about 4.02 million hectares have soils suitable for livestock; in the case of the agricultural sector, this accounts for 11.3 % of the total of the Orinoquia (2.8 million hectares) (Vargas 2022). At the national level, the departments of Casanare and Meta are among the 10 most representative departments in terms of cattle and buffalo population. According to the 2022 cattle census, the country has a total of 29,301,392 animals, of which Meta is in third place with 7.8% of the population and Casanare is in fourth place with 7.5%. Regarding the buffalo population, the Colombian territory has 5,540 Properties with a total of 451,713 buffaloes of which Meta occupies the ninth position concentrating 2.8% of the population and Casanare the tenth position concentrating 2.6% (ICA, 2022).

The Andina region is home to a large part of the country's population and an important economic activity, mainly based on agriculture and livestock. This region is also an important producer of coffee and flowers, two of Colombia's main export products. In addition, it has a great natural wealth, including mountains, rivers, forests and moorlands. This region has all types of crops, but the most recognized are: coffee, corn, cacao, sugar cane, avocado, soursop, tomato, onion, among others. In addition, there are also crops of flowers and other products such as fique, rubber and oil palm (Asohorfrucol, 2020).

At the national level, Santander is among the 10 most representative departments in terms of sheep, goats and buffalo population. Colombia has a total of 1,805,877 sheep, of which Santander is in eighth place, accounting for 2.3% of the population. With respect to the goat population in the

country, there are approximately 1,149,054 animals, of which Santander is in fifth place, accounting for 2.3% of the population. Finally, Santander ranks second in the buffalo population, accounting for 13.7% of the national population (ICA, 2022). In the department of Santander the crops that represent the largest harvested area between the years 2015 - 2019 correspond to oil palm, cacao and coffee, however, the crops of greater representativeness in harvested hectares (Tons of production) in the mentioned years correspond to pineapple, oil palm and sugarcane (UPRA 2021).

For the department of Huila, the products that occupied the largest harvested area between 2012 and 2016 were: coffee, which on average covered 103,741 ha harvested, followed by irrigated rice (31,522 ha), technified beans (16,250 ha), yellow technified corn (11,424 ha) and traditional corn (11,326 ha). Regarding the average production in tons between 2012 and 2016 coffee and rice crops have been the most economically important for the department of Huila with participation index of 28.23% (220,710 tons) for rice and 15.96% (124,794 tons) for coffee allowing the department of Huila to consolidate as one of the largest producers of coffee nationally (UPRA, 2018). In the livestock activity for the department of Huila, an important social impact is generated by having around 15,000 families dedicated to livestock farming with about 430,000 head of cattle, 70% of them correspond to small livestock farmers with less than 100 cattle. The farming system is not sustainable and approximately half of them do not have a livestock vocation, which is why the internal agenda for the department's productivity and competitiveness plans to promote modern livestock farming with adequate technological packages that allow for five times the current carrying capacity (Gobernación del Huila and Neiva Chamber of Commerce, 2016).

For the department of Córdoba, the products that represented on average the largest harvested area between 2015 and 2019 correspond to traditional corn with 59,626 ha (34%), manual and technified rainfed rice with 28,783 ha (16%), plantain (24,881 ha 14%), cassava (22,320 ha 12%), yam (9,873 6%) and cotton (7,898 ha 4%). This department also stands out in cattle and buffalo production, occupying first and second place with 19.5% of the country's buffalo population and 7.8% of the country's cattle population. Regarding the sheep population, it occupies the fifth place with 3.8% of animals at national level.

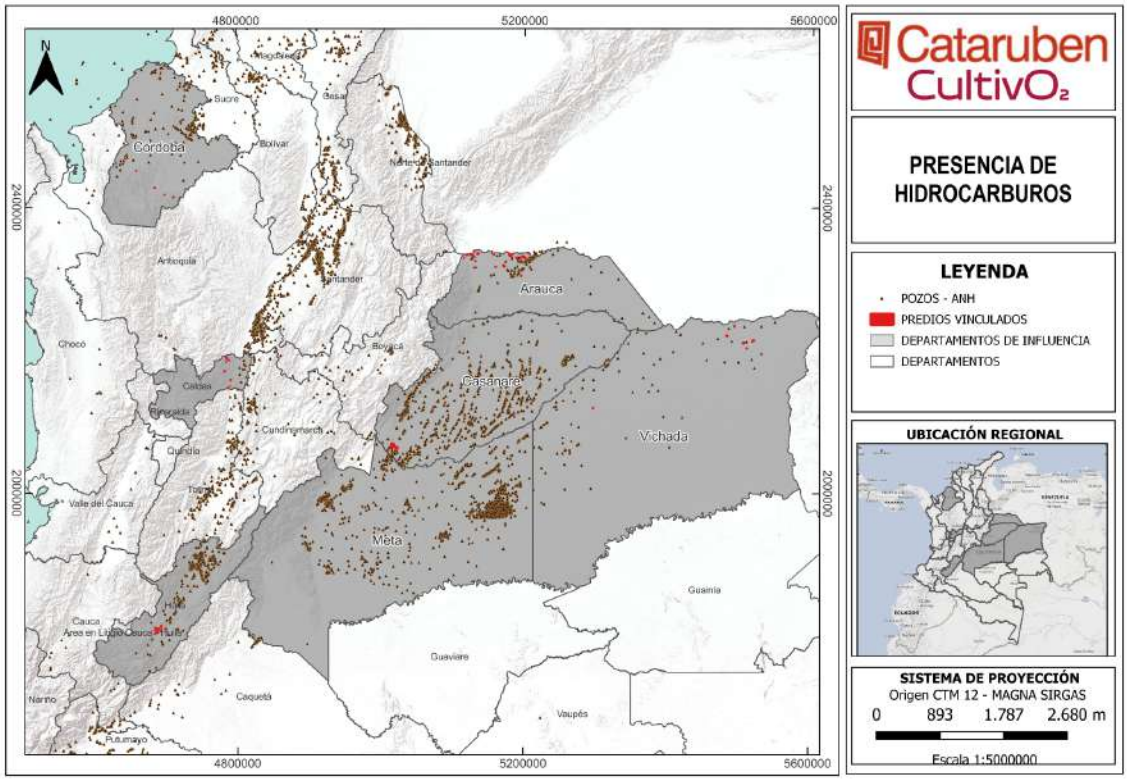
- **Oil Sector**

The Orinoquia region is one of the most important areas for oil production in Colombia. This region has a large number of hydrocarbon deposits, mainly of heavy and extra heavy crude oil. The departments of Arauca, Casanare, Meta and Vichada are the main oil producers in the region, and are home to important oil fields such as Caño Limón, Rubiales and Cusiana. Due to its soil conditions and characteristics the Orinoquia region is positioned as one of the areas with the highest oil production concentrating in the departments of Meta, Casanare and Arauca 74% of the national production (Cerquera-Losada et al. 2018; Peralta 2013). Oil production in the Orinoquia region has been an important engine for the economic development of the area, generating employment, investment and fiscal resources. However, it has also generated challenges in environmental and social terms, such as water and soil contamination, deforestation and the affectation of local communities and indigenous peoples.

The departments involved in the project have 64% of the oil wells in the Colombian region, with the departments of Meta (6325), Santander (4992 wells), Casanare (2141 wells) and Huila (1353 wells) standing out.

The La Cira Infantas field is located 22 kilometers from the Colombian district of Barrancabermeja in the township of El Centro. It is the oldest oil field in the country thanks to its discovery in 1918, through the Mares Concession (concession that in turn was granted to the Tropical Oil Company-TROCO), with the drilling of the Infantas 2 well, in 1939 it reached the highest production in its history with 64,971 barrels of oil per day.

Image 20. Hydrocarbon Presence



Source: National Hydrocarbons Agency. **Prepared by:** Fundacion Cataruben, 2022.

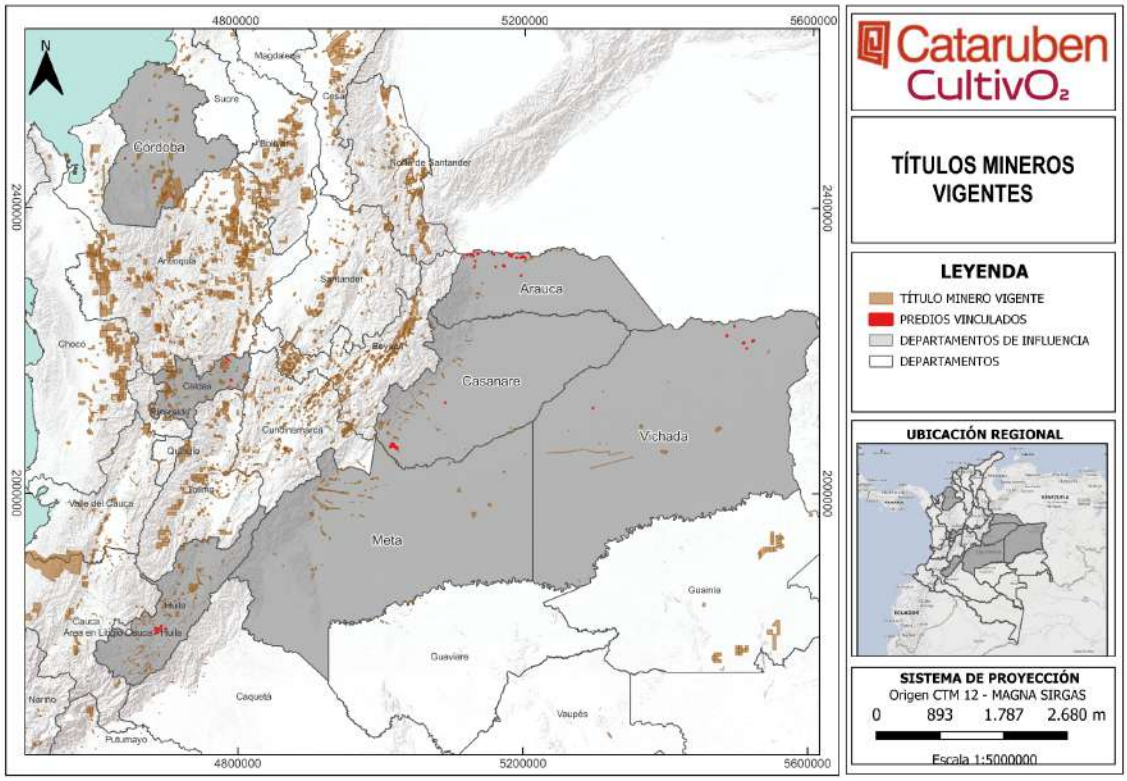
- **Mining Sector**

For the department of Vichada, legal mining in 2017 had 6 titles in force representing an area of 6626.8 Ha, corresponding to 0.07% overlap of the Department; of these titles 1 is in exploration and 5 in exploitation; three of them are exploited for construction materials, one for construction materials-hill and 2 for other minerals. Production comes from the municipalities of Cumaribo and Puerto Carreño for black sands and Puerto Carreño for construction materials. On the other hand, the department has 43 contract proposals and requests for temporary authorization by type of mineral: 2

for coal, 3 for coltan - other minerals, 17 for construction materials, 1 for construction materials - other materials, 2 for gold and precious metals - construction materials, 2 for gold and precious metals - other minerals, 3 for other minerals. (Departmental Development Plan of Vichada 2020 - 2023).

The mining titles identified for the departments included in the project were obtained from the open data portal of the National Mining Agency. They show that the largest departments with active mining titles are Caldas 358, Santander 353, Huila 250, Meta 160 and Casanare 130.

Image 21. Mining Title



Source: National Mining Agency.. **Prepared by:** Fundacion Cataruben, 2022.

- *Crops and establishment*

The CultivO2 P1 initiative leads to an increase in the establishment rate of cacao and cashew crops. This is achieved by identifying suitable land for the crops, providing training and technical assistance, promoting sustainable practices, and promoting access to new markets. A detailed description of each of these actions is provided below.

Identification of suitable land: In identifying suitable land for cultivation in the regions, factors such as climate and soil quality are taken into account, allowing farmers to select suitable areas of land for their crops, optimizing their production and motivating an increase in the rate of crop establishment.

Training and technical assistance: Providing training and technical assistance to local farmers improves their sowing practices (soil preparation, planting), crop management (fertilization) and implementation of integrated pest and disease management practices, which helps farmers maximize their production and improve the quality of their harvest.

Promotion of sustainable practices: The project promotes sustainable land use practices, such as soil conservation and reducing the use of pesticides and chemical fertilizers. These practices can improve soil quality and reduce dependence on external inputs, which lowers investment costs and promotes a higher rate of long-term crop establishment.

Access to finance and markets: The project encourages farmers to earn additional income from GHG removals from crops, allowing them to invest in their land and improve their productivity. This activity overcomes barriers that prevent farmers from becoming more competitive and engaging in fair trade.

- *Probable land use alternatives*

According to the characteristics of each region described above, the departments in the project area have predominant practices that would continue to be developed in the absence of the carbon project.

In the Orinoquia region, in the departments of Casanare, Arauca and Meta, a predominant activity is extensive cattle ranching, which with the fire cycle gives continuity to burning to take advantage of grass regrowth. Other predominant activities include agricultural uses such as oil palm, rice, corn, and oil extraction. In the livestock sector, the Department of Vichada's main activity is cattle raising, with a total of 560,546 head of cattle and buffalo, which will continue to be developed in the project area (ICA 2020). In general, agriculture revolves around the establishment of subsistence crops in small areas, which are located in areas bordering river valleys, bushes or conucos that cut down small areas of forest. Currently, the municipalities of La Primavera and Puerto Carreño are promoting the development of commercial soybean plantations, natural rubber, Acacia mangium, Pino caribea, eucalyptus and, recently, cashew (without the carbon component). The agricultural sector does not prioritize the implementation of crops as an alternative for soil recovery and protection, mechanisms to reduce pressure on ecosystems, improve livelihoods and alternative employment for the region. This indicates that policies are inconsistent with the potential of the region and the prioritizations in the development plans.

For the Andina region, the department of Santander will continue its vocation in the livestock sector with buffalo, goats, and sheep. In the agricultural sector, oil palm, coffee, and cacao, the latter of which is being grown in forested areas. The Department of Huila has a significant cattle-raising activity that is distributed among small cattle ranchers who operate in an unsustainable manner, and the department plans to strengthen this activity. In terms of agricultural production, coffee, beans and corn predominate for implementation.

The department of Córdoba stands out for its cattle and buffalo activity at the national level, which has been strengthened over the years. In addition, corn, rice, plantain and yucca are the most extensive and dominant crops.

11.3.2.2. Sub-step 1b. Consistency of Land Use Alternatives with Applicable Laws and Regulations (Orinoquía & Andina Region).

The agricultural productive activities established for the departments of Casanare, Meta, Huila, Santander and Córdoba are prioritized in the agricultural diagnosis carried out by the Agricultural and Livestock Rural Planning Unit (UPRA).

In addition, following a review of policy instruments promoted by the Ministry of Agriculture and Rural Development (MADR), including Resolution 000006 of 2020, which aims to promote the insertion of the peasant, family and community economy into local, regional and national value chains.

Cashew is one of the most promising crops in Colombia. According to researchers from Agrosavia (Corporación Colombiana de Investigación Agropecuaria) in their article entitled: "Cashew, a crop with productive potential: technological development and prospects in Colombia", world demand for this fruit has grown at more than 7% per year, while production is growing at a rate of 6%. This condition of the global market places Colombia as one of the main importers (270 tons per year), and also gives it the possibility of becoming one of the largest producers of cashew kernels, along with India, Ivory Coast, Ghana and Vietnam, which are in turn considered the largest producers in the world (González, 2022).

In Colombia, cashew has gained some recognition and space as an alternative crop in some regions. According to Orduz J. and Rodriguez E., there are two nuclei of great importance in the national territory: the Atlantic coast and the department of Vichada. Precisely in the department of Vichada, work is being done in an increasingly technical manner to cultivate and process cashews, obtain their almonds, which are highly sought after in world markets, and turn this agroindustry into one of the main ones in the country. Cashew exports can generate a large flow of foreign exchange for Colombia. However, it is clear that the country needs more support from the government in terms of regulations, knowledge, infrastructure and production promotion.

Among the national policies that motivate cashew development in the regions that make up the project areas (Department of Vichada) is Resolución No. 000087 de 2022, which recognizes and registers the Cashew Chain Organization under the name of the National Cashew Chain Organization and its agroindustry, which will act as an advisory body to the National Government on policy matters for the cashew subsector and as a permanent consultation body between the different links in the chain. It should be noted that the creation of this body contributes to the growth of the agricultural sector in rural areas with the potential to expand the crop in a sustainable, inclusive and competitive manner.

Law 811 of 2003 amends Ley 811 de 2003 and creates chain organizations in the agricultural, fishing, forestry and aquaculture sectors, the Agricultural Transformation Companies (SATs) and other provisions. This law specifically addresses certain strategic objectives aimed at improving productivity and competitiveness, developing the market for goods and factors in the chain, reducing transaction costs among the different agents in the chain, developing strategic alliances, improving information among chain agents, enrolled small producers and entrepreneurs in the chain, managing natural resources and the environment, training human resources, and technological research and development. Given that the scope of the law is national, its applicability to cashew cultivation in the project area (department of Vichada) was identified, since this department represents 91% of the area planted and 78% of annual production at the national level, according to figures from the Ministry of Agriculture and Rural Development (2021).

Finally, the Plan Departamental de Extensión Agropecuaria - Departamento de Vichada 2020-2023 defines the strategic and operational elements to promote the production of this fruit in this territory, with the future projection of becoming one of the agricultural products that will diversify Colombia's agricultural market abroad.

11.4. Additionality

CultivO2, demonstrates additionality following the guidelines of the additionality tool "BCR GUIDELINES, Baseline and Additionality" version 1.1. and through a barrier analysis that analyzes the barriers that would prevent the implementation of the initiative.

11.4.1. Step 3. Barrier Analysis

- *Investment barriers, inter alia.*

- *Debt funding is not available for this type of project:*

In Colombia, the implementation of projects aimed at mitigating climate change and reducing greenhouse gas (GHG) emissions faces significant financial barriers. The lack of financial leverage opportunities in the Colombian market, stemming from uncertainty in the financial and political sectors, severely limits the scope and effectiveness of these projects. Public sources of financing present significant challenges due to institutional weakness, exacerbated by a balance of payments deficit and a lack of political will evidenced by high levels of institutional distrust among the population. On the other hand, private financing requires considerable financial and administrative backing, which excludes implementers with limited resources, promoting a selection of beneficiaries based on their economic capacity rather than the environmental impact they can generate. This scenario limits sustainable forestry initiatives, as the management of resources, partners and beneficiaries is severely restricted.

The analysis of the forestry sector highlights a lack of effective strategies and operational mechanisms to promote sustainable forest management at both the national and Latin American levels. Landowners who embark on conservation activities find themselves with a negative cash flow,

which represents an outflow of money without a return on investment, limiting their ability to obtain external financial support and encouraging them to opt for more profitable but less sustainable activities. Although there are entities that finance agricultural activities such as cacao and cashew cultivation, these efforts are not necessarily aligned with environmental conservation and GHG emission reduction goals, and there is insufficient oversight to ensure that these funds are used in ways that promote sustainability and biodiversity protection.

- *No private capital is available due to the real or perceived risks associated with domestic or foreign direct investment in the country where the project is to be implemented:*

In the Colombian market, there is a marked lack of opportunities for financial leverage in agricultural projects, this situation is exacerbated by an unfavorable economic and political context, characterized by a high perception of risk in agricultural investments, originating in the country's historical political and economic instability. Farmers wishing to engage in these crops face significant financial obstacles, exacerbated by considerable competition with illicit crops, which may offer higher short-term economic returns, but represent much greater legal and sustainability risks. This scenario severely limits farmers' possibilities of obtaining the necessary financing to initiate or expand legitimate and sustainable agricultural projects.

Additionally, the uncertainty generated by climate change further impedes access to financial leverage opportunities, as it increases the risks associated with agriculture, including extreme weather events and drastic changes in climate conditions, directly affecting the viability and productivity of crops. This environment of uncertainty can discourage investors, as agriculture is perceived as a high-risk industry.

- *Lack of access to credit:*

Farmers' access to capital markets faces significant obstacles that considerably limit their ability to expand and modernize their operations. One of the main problems lies in poor infrastructure, which not only restricts the quantity and quality of products that can reach markets, but also reduces farmers' bargaining power to obtain fair prices for their goods. In addition, the lack of knowledge about the opportunities that capital markets can offer exacerbates this situation, as many farmers are unfamiliar with the financing options available that could help them improve and expand their businesses, leaving them at a disadvantage in a highly competitive and market-oriented economic environment.

In addition, the current regulatory scenario presents a series of restrictions that prevent small farmers from easily accessing capital markets. Bureaucratic mazes, a high tax burden and a regulatory framework that often favors large companies over small producers are significant additional challenges. This restrictive environment not only limits growth opportunities for farmers, but also perpetuates cycles of poverty and underdevelopment.

El análisis del sector forestal resalta una falta de estrategias y mecanismos de operación efectivos para promover el manejo forestal sostenible tanto en el ámbito nacional como latinoamericano. Los propietarios que se embarcan en actividades de conservación se encuentran con un flujo de caja negativo, lo que representa una salida de dinero sin un retorno de inversión, limitando su capacidad para obtener apoyo financiero externo e incentivándolos a optar por actividades más rentables pero menos sostenibles. Aunque existen entidades que financian actividades agrícolas como el cultivo de cacao y marañón, estos esfuerzos no están necesariamente alineados con las metas de conservación ambiental y reducción de emisiones de GEI, y no hay suficiente supervisión para garantizar que estos fondos se utilicen de manera que fomenten la sostenibilidad y protección de la biodiversidad.

- *Institutional barriers, inter alia.*

Barrier related to changes in government policies or laws and lack of enforcement of forestry and land use legislation. This barrier refers to obstacles that affect the exercise of the right to citizen participation, such as lack of knowledge of the State's duties and limited participation. Within the framework of the project, community participation, transparency and access to information are guaranteed, respecting legal determinations and complying with current national regulations. In general, different barriers have been identified at the regional, departmental and municipal levels, reflecting institutional weakness and lack of presence in the territories. These barriers include limitations in investment and promotion of forest management, lack of information on the production chain, limited participation of forest sector actors, lack of clarity in policies and resolutions, lack of infrastructure, labor informality, limited training and unfair competition from illegal loggers, among other challenges. The CultivO2 P1 initiative addresses these institutional challenges by complying with forestry legislation and demonstrating responsive actions.

- *Technological barriers, inter alia*

Technological barriers in the globalization of markets lead to an ecological collapse that affects the sustainability of small-scale agriculture. This small-scale agriculture is developed by small producers who usually have an area of such size that they do not require hiring day laborers on a permanent basis and that an important part of their production is marketed in consumer and processing markets, with the remainder for self-consumption (Becerra & Perfetti, 2013, #). Small producers are important in terms of number and participation in national agricultural production, such as cacao cultivation, which in Colombia has an average of 3 ha per producer (Minagricultura, 2021, #). The yields per hectare of cacao in small producers are not usually the most optimal and, in addition to this, the families are usually located in the rural population, which has the highest and most persistent levels of poverty. This implies significant limitations for access to land, capital, technology and marketing that would allow them to remunerate their activity and accumulate capital, reaching adequate welfare levels (Becerra & Perfetti, 2013, #). (Becerra & Perfetti, 2013, #)

Understanding the Colombian reality in terms of type of producer and type of production, it is necessary for small producers to have access to economic incentives that improve their income and facilitate access to inputs and tools used in the development of their activities.

- *Barriers related to local tradition, inter alia*

Las barreras que impedirían la implementación del proyecto relacionadas con la tradición local, presentan múltiples aristas que abarcan desde lo cultural, lo histórico, lo normativo, el entorno de mercado, el acceso a la tecnología e incluso la capacitación ambiental disponible recibida por los habitantes de los ecosistemas de bosques y de los agroecosistemas cultivados. Lo anterior genera el interrogante de cómo se han llegado a construir las tradiciones locales sobre el uso del suelo en zonas rurales de Colombia. Se encuentra entonces que esta reflexión también pasa por una relación estrecha entre la ley y la cultura. De cómo las prácticas y usos del suelo se vuelven normas y de cómo las norma legales, a lo largo del tiempo, establecen también prácticas en el territorio, generando efectos socio jurídicos y ambientales particulares (Beltrán Bustos, 2021).

The barriers related to local tradition that would impede the implementation of the project are multiple, ranging from cultural, historical, regulatory, market environment, access to technology and even the available environmental training received by the inhabitants of forest ecosystems and cultivated agroecosystems. This raises the question of how local traditions on land use in rural areas of Colombia have come to be constructed. It is found then that this reflection also passes through a close relationship between law and culture. How practices and land uses become norms and how legal norms, over time, also establish practices in the territory, generating particular socio-legal and environmental effects (Beltrán Bustos, 2021).

Such is the case of the titling of baldíos (Villaveces Niño, 2015) and the experiences of agrarian reform. This process can be traced back to the post-independence period of the 19th century, in the United States of Colombia, when through Law 61 of 1874, access to state lands was guaranteed through individual occupation of up to 4 thousand hectares per livestock farm. This law may have concentrated the land in the hands of landowners (Arango Restrepo, 1987). Subsequently, through Law 48 of 1882, the occupation process was further limited on the condition that the land be used for agriculture and cattle raising. This law confirmed the principle that "ownership of vacant lands is acquired by cultivation", adding that in order to acquire an additional extension for livestock "it is necessary that said occupied portion be covered with artificial pastures". In addition, it was established that the cattle kept in natural pastures of the baldíos would only have the right as long as they were occupied. Then, the people who cultivated those lands had to have "house and farm" to be considered bona fide possessors, to avoid being deprived of the right of possession, of which they could only be dispossessed by means of a judicial sentence. And, if a lawsuit were to be filed against the owner, then the owner would have to prove the legal title deeds, clearly specifying the boundaries. If all the above were successful, even the settler or cultivator could not be evicted from the land until he was compensated for the "improvements put on the land as a good faith possessor". And here the norm strengthens a concept that will be fundamental for the future relationship of the possessors with the ecosystems: "the improvements". These improvements were defined in the paragraph of article five of the aforementioned law as "clearings, palisades, crops and dwellings". (Congress of the United States of Colombia, Law 48 of 1882, on uncultivated lands).

Additionally, and from another cultural and scientific aspect, we find for this same period of formation of Colombian nationality the work entitled ***Memoria científica sobre el cultivo del maíz en los climas***

cálidos del Estado de Antioquia by one of the members of the Escuela de Ciencias i Artes, by Gregorio Gutiérrez González. This work would become a cultural synthesis of reference that exhibited, in verse form, the practices of colonization on the tropical forest ecosystems of Colombia (Gutiérrez, G. 1866).

This is how his first chapter entitled ***De los terrenos propios para el cultivo, y manera de hacerse los barbechos, que decimos rozas***, describes:

Buscando en dónde comenzar la Roza,

De un bosque primitivo la espesura,

Treinta peones y un patrón por jefe

Van recorriendo en silenciosa turba.

Another fragment of his second chapter entitled ***Que trata de la limpia y abono de los terrenos, muy especialmente por el método de la quema***, adds:

Por la orilla del monte los peones *Vagan alrededor del derribado,* *Con los hachones de cortezas secas* *Con flexibles bejucos amarrados.*	*Ensordece los aires el traquido* *De las guaduas y troncos reventando,* *Del huracán el mugidor empuje,* *De las llamas el trueno redoblado.*
Prenden la punta del hachón con yesca, *Y brotando la llama al ventearlo* *Varios fogones en contorno encienden,* *La Roza toda en derredor cercando.*	*Y nubes sobre nubes se amontonan* *Y se elevan, el cielo encapotando* *De un humo negro que arrebata chispas,* *Pardas cenizas y quemados ramos.*
Lame la llama con su inquieta lengua *La blanca barba a los tendidos palos;* *Prende en las hojas y chamizas secas,* *Y se avanza, temblante, serpeando.*	*Aves y fieras asustadas huyen;* *Pero encuentran el fuego a todos lados,* *El fuego, que se avanza lentamente,* *Su círculo de llamas estrechando.*
Vése de lejos la espiral del humo *Que tenue brota caprichoso y blanco,* *O lento sube en copos sobre copos,* *Como blanco algodón escarmenado.*	*Al ave que su prole dejar teme,* *La encierra el humo alrededor volando,* *Y con sus alas chamuscadas cae* *Junto del nido que le fue tan caro.*

La llama crece; envuelve la madera *Y se retuerce en los nudosos brazos,* *Y silba, y desigual chisporrotea,* *Lenguas de fuego por doquier lanzando.* *Y el fuego envuelto en remolinos de humo,* *Por los vientos contrarios azotado* *Se alza a los cielos, o a lo lejos prende* *Nuevas hogueras con creciente estrago.*	*Aquí y allá se vuelve la serpiente,* *Una salida con afán buscando,* *Se desliza, se enrosca, se retuerce,* *Y el fuego cierra el reducido campo.*

This document, in addition to its artistic and descriptive characteristics, also has an important historical value in describing what would come to be instituted as generalized practices of land use of forest ecosystems that have not stopped colonizing since then.

In a complementary manner, expressions that designate the forest as something unknown or wild (Chaparro Rojas, 2021), which must be domesticated, subdued as a sign of civilization, "to open or to cut down the forest", are rooted in the mestizo culture of the provinces and Andean and piedmont communities, from which the waves of colonization originated. For the same reason, it is considered that the rules are not complied with there, as in the expression "the law of the forest" which alludes to the fact that, in the midst of nature, in the absence of the State, the law is not obeyed in the same way as "in the towns"; in the same sense, the expression "enmaniguarse" refers to getting lost in the mangrove, or "enmontarse", "jungle inside" for reasons of fleeing, seeking refuge or isolation.

This places the forests in a social frontier zone in which, on the one hand, the rules are not enforced in the same way or there is an absence of control, and on the other hand, there is a need to "clear" the forest, to show "improvements" as an evidentiary strategy to demonstrate dominion and apply to receive the title of the properties in possession.

In the 20th century, after the so-called Green Revolution, in the years following the world wars, systems of production, commercialization and application of improved varieties of wheat and rice seeds were established around the world, as well as the massive use of agrochemicals on soils and crops in order to increase production and "eliminate weeds" (Garavito, J. Palacio, J.A. 2007). This context influenced the appropriation of agricultural practices and technological packages by those who would become the grandparents of the current owners of the colonized land.

Subsequently, the traditional tools used in pruning and logging (machetes, axes and saws) were joined by scythes and fuel-powered chainsaws that increased sawmillers' yields and deforestation rates. Generations of sawmillers and their families grew up with the perspective that progress came from making environmental goods and services available to the rest of society (Guerrero, 2018). Precisely, this frames the limited market conditions available to the inhabitants of forest ecosystems, in piedmont, highlands and savannas. Lacking sustainable economic alternatives (including illicit crops) and lacking sufficient training processes, community members do not practice sustainable timber harvesting or conduct forest inventories necessary for conservation practices, but have taken and

take what is at hand, which is the forest and its biodiversity.

All of the above presents a complex panorama of cultural practices and local traditions of land use, with historical roots, driven both by institutions and by necessity, by the lack of training and opportunities to make the life of the ecosystems and the development of their inhabitants sustainable. The very conformation of Colombian nationality was linked to the relationship of the provinces with their forests and to the adaptation and change of land use, which has resulted in a constant deterioration of the natural and social environment.

- *Barriers due to local ecological conditions, inter alia.*

Invasive species: invasive species constitute a very big problem for ecosystems and species in degree of threat in the properties where project activities are developed, as well as they are a big problem for biodiversity associated with cacao agroforestry systems, since they take advantage of fertilization conditions to populate the areas associated with the SAF, making necessary bad agricultural practices of eradication of these invasive plant species, likewise, the introduction of invasive species to the crop can constitute a dissemination and dispersion of these species towards natural covers that are in degree of protection and/or conservation. (IPBES, 2019)

Climatological phenomena such as El Niño and La Niña: Colombia's climatic conditions present alterations to the natural climatological cycles due to the intertropical convergence zone, as well as changes in the water supply that comes from the evaporation of water in the pacific ocean, In this sense, these alterations in evaporation generate greater humidity in the air during the "La Niña" season, which translates into greater precipitation in unusual seasons due to the condensation of water in the Andes mountain ranges, On the other hand, when evaporation decreases during the "El Niño" season, the available humidity in the atmosphere decreases and water precipitation is less than normal cycles. This means that there are changing periods every 5 to 7 years in the normal precipitation in the Colombian territory, which means that the rainy seasons are longer during the "La Niña" phenomenon and the dry seasons are longer during the "El Niño" phenomenon. Considering the above, the "La Niña" season presents risks for agroforestry systems due to the excess rainfall that occurs during these periods, which can affect the health of seedlings and drag biomass and nutrients due to runoff erosion; on the contrary, during the "El Niño" season, the drought season is much longer, putting agroforestry systems at risk due to water stress and less surface and groundwater available (IDEAM, 2022). (IDEAM, 2022).

Loss of the rhizosphere due to erosion and plowing: agricultural activities that present an inadequate management of the soil resource usually affect one of the most important resources for agroforestry systems, the rhizosphere constitutes the set of elements that make up the soil, organic matter, microorganisms and macroorganisms associated with the most superficial layer of the soil play an important role in the contribution of nutrients to agroforestry systems, For this reason, good agricultural practices constitute a fundamental step in the conservation of the soil resource and there is a great risk for the project on the permanence of the AFS if the healthiness of the soil resource and the rhizosphere is not preserved over time (Gómez-Calderón). (Gómez-Calderón, Villagra-Mendoza, & Solorzano-Quintana, 2018).

Climate change: alterations to the carbon cycle have generated changes in the climate worldwide, which translates into more difficult conditions for agricultural activities due to the constant increase in the global average temperature, in this sense the availability of water in project areas will be affected in the coming years, which constitutes a risk if measures to adapt to climate change are not generated to ensure the survival of agroforestry systems and natural vegetation cover that are a central part of the carbon project. (Christian Bunn, 2022).

- ***Barriers due to social conditions, inter alia:***

This barrier is related to local communities, their rights, expectations and concerns, as well as to possible tensions and conflicts existing in the region. The processes of anthropic pressure in the eastern Andina and Orinoquía regions have been influenced by various social and environmental factors. The contemporary history of the population in these areas is marked by strong migration and internal conflict, and a diversity of land tenure forms involving land appropriation, urban development and different productive vocations in the regions.

The following is a summary of the current conditions in several departments in these regions, highlighting the social barriers that could interfere with the implementation of a Fundacion Cataruben project:

Arauca:

- High demographic pressure, with 30% of the territory affected by land use conflicts.
- Large number of inhabitants affected by the armed conflict and presence of armed actors involved in illegal economies.
- Aggressive deforestation, with a chain that leads to the depletion of ecosystems.
- High unemployment rate and an increase in unskilled labor.

Casanare:

- Serious environmental problems due to mining, cattle ranching and agriculture.
- Return of self-defense groups and warnings about the presence of dissident factions of armed groups.
- Illegal deforestation practices with a large number of endangered species.
- Need for strengthening of community organizations.

Vichada:

- Significant transformation of natural areas into crops and pastures with 60% loss of forest cover.
- Persistent violence and forced displacement due to conflicts between armed groups.
- Illegal logging and timber exploitation.
- Labor precariousness and high levels of informality.

Huila:

- Significant reduction of forest area due to demographic pressure and agricultural production.
- History marked by violence with a high number of victimizing events.

- Illegal practices related to deforestation and illegal mining.
- Impact of the pandemic on employability, significantly affecting young women and rural areas.

Caldas:

- Increasing pressure on soils due to deforestation and expansion of agricultural areas since the time of colonization.
- High rate of deforestation in recent decades, with significant loss of natural areas.

- ***Barriers relating to land tenure, ownership, inheritance and property rights, inter alia.***

In Colombia, the project in question faces several barriers related to land tenure, including a hierarchy of rights for different stakeholders that often limits the incentives to undertake the project. Despite having a regulatory framework and legal figures such as possession and occupation, which are regulated by the Colombian Civil Code and adjacent laws, there is still no clear hierarchy of rights for carbon owners. The main barrier arises when a person does not comply with being the owner, possessor or holder of a piece of land, being vital that they comply with the established requirements to be able to participate in the project. The team in charge of the project provides the necessary advice to help individuals initiate the procedures to acquire the necessary status as stipulated in the current regulations.

Despite having a legal framework that clearly establishes property rights in the country, security of tenure is hampered by a high degree of informality and lack of knowledge among the population about tenure rights and the importance of formalizing these rights in the corresponding registries. In addition, there is the added challenge of a lack of clearly defined and regulated rights with respect to natural products and services, although the project holder conducts exhaustive studies to ensure legal certainty of land tenure and associated rights before including a real estate property in the initiative. In addition, both the formal and informal tenure systems present increase the risk of land fragmentation, which translates into additional difficulties in settling inheritances and the need for occupants to follow specific processes to achieve proper adjudication and registration of land.

- **Barriers relating to markets, transport and storage; inter alia**

High transportation and storage costs represent a threat to the sector's competitiveness. The government is seeking to strengthen the market by stimulating a reduction in tariffs and market protection by encouraging foresters to adopt an action plan for commercial reforestation, seeking to strengthen the targets for cultivated forests. Departments such as Vichada have a road system with 80.92% of the roads in their natural state, with the remainder being roads that have undergone some type of intervention.

The transportation of cacao beans and their derivatives plays an important role in the

competitiveness of the final product and its commercialization due to the difference in the climates of origin and destination; the containers accumulate humidity, generating a serious threat to the product and can reduce competitiveness at the time of processing.

Colombia manages an average domestic price to the producer close to 90%, in relation to the benchmark price of the New York Stock Exchange, minus other costs depending on the length of the intermediation chain. Colombia had a historic cacao production in 2012, according to figures from the National Federation of Cacao Growers (Fedecacao), which recorded a consolidated production of 69,040 tons last year, 8.9% more than in 2020, when it reached a figure of 63,416 tons. To date, the cacao production chain has 17,106 producers enrolled in the contract farming strategy with total sales of agricultural products estimated at 171 million pesos.

In 2021, the Congress of the Republic approved the law that allows Colombia to join the International CacaoOrganization (ICCO), thereby supporting the competitiveness and economic growth of the cacao sector. The cacao sector exports to more than 70 countries around the world and its main destinations are Mexico, Italy, Belgium, Holland and the United States; according to the ICCO, our country is recognized as a producer and exporter of 95% of fine and aromatic cacao.

The world demand for cashew nuts has grown more than 7% annually; the global market places cashew as a promising agricultural alternative in Colombia; our country has 6,000 hectares of cashew cultivation, mostly located in the Vichada, according to projections in 20 years could amount to 20,000 hectares that would position us as a supplier of this fruit.

It is important to highlight the double intention and multiplicity of benefits of cashew cultivation, because in addition to its use as an input for different market products that have the potential to diversify Colombia's exports, it also rehabilitates degraded soils, making its production more sustainable and environmentally friendly. The cashew nut is a fruit that should come out of the ignorance of Colombians to become a source of pride as coffee and bananas have been.

The market for this nut and its fruit is endemic to the Orinoquía, but it is also cultivated in the Caribbean Coast to such an extent that there are two important production nuclei: the core of the Atlantic coast and the core of the highlands; this sector moves 8,000 million dollars a year. According to the corporation, the countries that import the most are the United States, India and Vietnam.

Our country ranks third in Latin America and 43rd worldwide in terms of ease of doing business (Doing Business, 2012), being ranked sixth in Latin America in terms of forestry investments (Nascimento, 2006). Colombia is a global supplier of timber, carbon credits, renewable energy, and environmental goods and services, all of which lead to social inclusion through community work and development. The national government has developed incentives and regulations for the development of the sector. In addition, the forestry law generates tax benefits that promote the commercial forestry sector.

Within the legal framework for global green supply chains (Shanghai, October 2019) of ITTO. Created the Global Green Supply Chains Network with the objective of encouraging responsible production

and consumption of tropical timber products. *Plan Colombia siembra* 2015 that seeks to increase the agricultural supply to guarantee the country's food security, increase the area and yields destined for production and the promotion of agricultural and agro-industrial exports, boosting the development of agricultural businesses to improve the income of producers. Law No. 1955 of 2019 "Whereby the National Development Plan 2018 - 2022 "Pact for Colombia, Pact for Equity" is issued.

Law 2173 of December 30, 2021 promotes ecological restoration through the planting of trees and creation of forests in the national territory, stimulating environmental awareness to citizens, environmental civil responsibility to companies and environmental commitment to territorial entities; life areas are created and other provisions are established.

The global demand for timber is growing significantly, and a large part of this demand is met by natural forests, so it is evident that the supply must be diversified with a greater participation of cultivated forests in order to avoid damage and strengthen the sector.

Similarly, the importance of developing the cacao production chain is to optimize and help increase production, distribution and marketing on a larger scale. To this end, it is important to generate economic incentives to strengthen the production chain.

Commercial forestry plantations have significant potential in Colombia, especially in the regions of Antioquia, Lower Magdalena, Córdoba and Orinoquía, due to the excellent climatic, geographic and topographic conditions. In addition, Colombia has an enormous diversity of forest species with high commercial value and a strategic geographic position for entering the main international markets for forest products, as well as the existence of numerous Free Trade Agreements signed in recent years.

There are magnificent opportunities for producers to expand their domestic and international markets and take advantage of foreign investment in the sector. In Colombia, the GDP of wood and its manufactures reached a value of US$1,945 million in 2020, a figure that represents a growth of 2% compared to 2019. From the outlook of each scenario according to the projection to 2026 the sector could increase from 0.69% of GDP contribution to 1.4% at constant 2021 prices as well as generate 400 thousand formal skilled and unskilled rural jobs.

11.4.2. Impact of Project Registration

The certification and registration of the project, and the associated benefits and incentives derived from this, diminish the impact of the identified barriers and thus, demonstrate that the project is carried out for the estimated accreditation period.

The benefits and incentives are as follows:

- *Net anthropogenic greenhouse gas removals by sinks:*

The project drives the implementation of low-carbon productive systems with good management practices in crops that translate into tCO_2e removed by crops and restoration areas. The area of establishment of the productive systems does not correspond to forests and through good

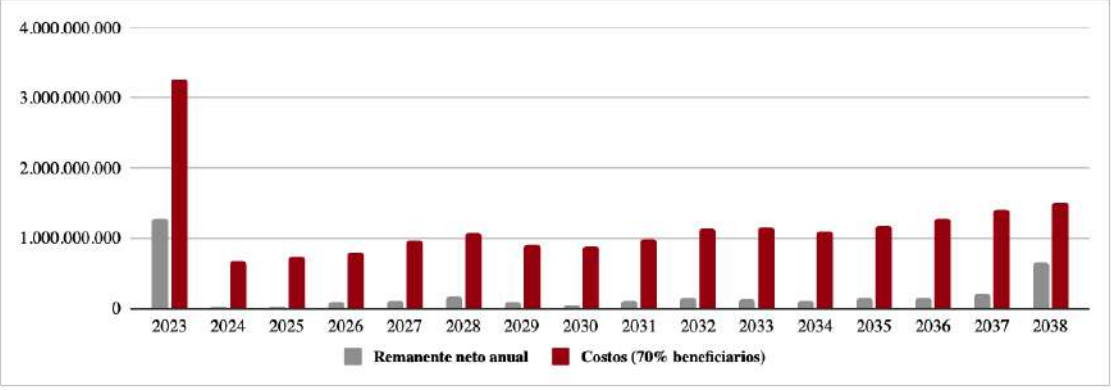
management practices the emissions resulting from the removal of herbaceous vegetation, fertilizer application, use of woody biomass and decomposition of leaf litter and fine roots of nitrogen-fixing species can be considered insignificant.

- *Revenue's financial benefit from the sale of CVVs including its certainty and predefined timing:*

To make it possible to deliver economic benefits to landowners implementing sustainable production practices, it is necessary to start with a financial analysis. This analysis takes into account the project monitoring period, which includes the initial investment required, and the period of quantification of GHG reductions and/or removals, known as the action window. In this way, the financial situation can be projected from 2017 to 2037 for the verification and certification processes, and from 2023 to 2038, the period in which the project will receive income from the sale of carbon certificates.

Financial planning is carried out using a financial model tool, which details aspects such as macroeconomic projections, investment items, costs and expenses, and projects the CCV inventory in accordance with the quantification analysis, thus establishing the income to be generated. It is important to note that since this is a predominantly social project involving small producers, it is not feasible to carry out a separate financial analysis for the removal Activities component and the REDD+ activities. Therefore, the financial analysis encompasses both components in a unified manner, establishing a basis for determining the results through subsequent calculations, which are shown below:

Graph 9. Economic performance of the project during its carbon certificate marketing and sales cycle.



Source: Fundación Cataruben.

Graph 9 represents the economic performance of the project during its life cycle, evidencing a positive financial behavior both for the beneficiary (red-brown color) thus financing the project activities, and for the sustainability of the project (gray color), with high peaks in years such as 2023

and rising in a trending manner as of 2024, which demonstrates sustainability and eliminates a scenario of financial losses.

- Cash flow:

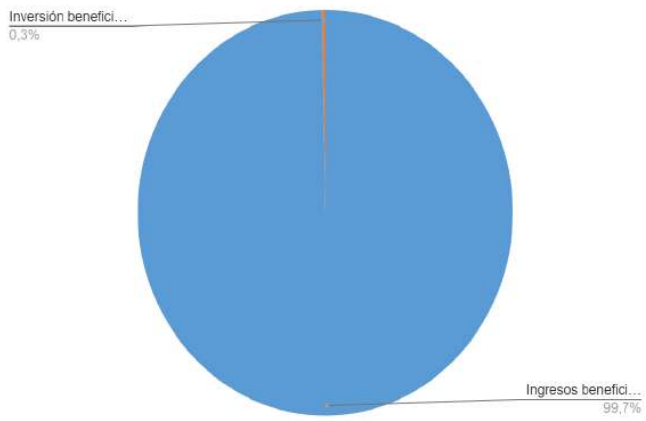
Graph 10. Project liquidity during the project period

Source: Fundación Cataruben

As in Graph 9 of the income statement, Graph 10 shows optimistic figures for the Cultivo2 Project, evidencing a financial projection with a positive net cash flow, i.e., once the total expenditures are projected with respect to the total income during the execution period, it can be concluded that there is sufficient liquidity and solvency to give continuity and sustainability to the development of this project.

Thus, the economic benefits generated by the sale of carbon certificates as a consequence of the implementation of sustainable productive practices, generate sustainability for the beneficiary, since, of the total retributed as financial benefit, the beneficiaries of CultivO2 only invest 0.3% in the project income investment value is made only once during the validation period of the project, returning 99.7% for the project activities, as shown in Graph 11.

Graph 11. Initial investment by beneficiaries in the Cultivo2 Project



Source: Fundación Cataruben.

Table 16.Beneficiary's investment in the project

		PRICE PER HECTARE	TOTAL HECTARES PER YEAR	TOTAL
Beneficiaries	**Forest**	$28.000	1.787	$ 50.036.560
	AR	$4.300	2.023	$ 8.697.352

$ 58.733.912	**Total, investment**	0,3%
$18.893.821.800	**Total, remuneration for sale of carbon certificates 70%**	99,7%

Source: Fundación Cataruben.

The above is supported by the estimated financial model for the project, based on the investment period and future monitoring of the initiative (2.1.5.2. Modelo financiero del proyecto).

- *Attracting new stakeholders that provide the ability to implement a new technology/practice,*

The outlined project is articulated in a series of multifaceted strategies that seek to address and overcome the various barriers identified, all with the central objective of fostering a sustainable pathway towards significant greenhouse gas (GHG) removals.

In the first instance, we have the "Establishment of Crops and Restoration Zones" which addresses technological and ecological barriers in a timely manner. In the technological aspect, it provides for the use of appropriate techniques for crop establishment, thus facilitating access to vital inputs and materials for this task, and thus promoting sustainable agricultural development. From the ecological perspective, emphasis is placed on the restoration of previously degraded areas, a crucial strategy to mitigate persistent problems associated with degraded soils and to prevent catastrophic natural disasters, promoting a recovery of the natural balance of these ecosystems.

Secondly, traditional and social barriers are addressed through "Training and Accompaniment Processes". Here, a strong emphasis is placed on education and the promotion of sustainable practices among local communities, thus breaking down the barriers of traditional knowledge and fostering a more collaborative and comprehensive approach to natural resource management.

The "Characterization and Implementation of Silvicultural Practices" is designed to overcome institutional and social obstacles. This activity aligns project interventions with government policies and laws, ensuring a symbiosis between project objectives and existing regulatory frameworks. At the

social level, it seeks to enhance existing productive systems by combating the shortage of skilled labor through specific training programs.

Subsequently, a "Disturbance Event Monitoring" strategy is implemented to enable a rapid response to emerging ecological problems, such as fires or pests, thus maintaining effective control over ecological variables that could negatively affect the project.

To ensure a long-term view of progress, a "Planted Lot Growth Assessment" has been established, overcoming investment barriers by demonstrating sustained and healthy plantation growth, thus attracting conscious and meaningful investment.

Finally, the "Monitoring and Quantification of Net Removals" aims to overcome barriers linked to markets, transportation and storage, providing accurate data on net GHG removals, and generating additional revenues that allow the producer to be locally competitive.

The enrolled owners are models of change that have the opportunity to generate an increase in their resources through the sale of CCVs, reflecting the implementation of their practices and demonstrating the importance of technologies that increase production yields and optimize production inputs. The economic benefit is an incentive that attracts new stakeholders who in turn will be drivers of change in their territories, reducing the different barriers identified in the "Barrier Analysis".

11.5. Management of uncertainty

Under the BCR standard, uncertainty is determined by the quality and applicability of the information used. Thus, according to the BCR0001 methodology, the uncertainty management and discount factors are defined according to the quality and origin of the estimation data used, as shown in the following table.

Table 17: Quality discounts and applicability of GHG estimation models

Source of the estimation model and data/parameters	Discount factor (%)
Project-specific above-ground and below-ground biomass data, and density values of the project	0
Project-specific above-ground biomass data and (R:S)[i] for below-ground biomass factor	5
Regional above-ground and below-ground biomass data	10
Regional above-ground data[ii] and (R:S) factor for below-ground biomass	15

National data for above-ground and below-ground biomass	15
National data for above-ground and y (R:S) factor for below-ground biomass	20
Above-ground and below-ground biomass data from other countries or regions with similar environmental conditions (climate-soils)	25
Above-ground biomass data and (R:S) factor for below-ground biomass from other countries or regions with similar environmental conditions (climate-soils)	30
Project-specific density values and factor (R:S) for below-ground biomass	15
IPCC density values and factor (R:S) for below-ground biomass	20
IPCC density and (R:S) factor for below-ground biomass	30
Volume equations from other countries or IPCC data, in areas with similar environmental conditions (climate-soils), IPCC density, and (R:S) factor for below-ground biomass	40
(i) The ratio between above-ground biomass and below-ground biomass (ii) Regional is the Project area where approximately the same climatic conditions are maintained	
reductions	

Source: Biocarbon Registry, 2023.

In this case, the project uses its own data for the estimation of aboveground biomass and factor (R:S) for belowground biomass. Thus, adjustments for discount factors will be taken into account in the project's GHG removal monitoring. In the case of the ex ante estimate, since it is not subject to uncertainty control, it is not included in the calculations.

11.5.1. Conservative Selection of Default Values

Under the conservative principle established by the BCR Standard, for the estimation of net GHG removals in dead wood, litter and soil organic carbon, default data from forest inventories for the same ecological zone, endorsed by BCR0001 methodology (Section 11.7.4.2 and 11.7.4.3), will be taken into account.

The estimation of carbon content in the aboveground biomass in cacao and cashew will be done by using our own data. Meanwhile, belowground biomass will be estimated by applying allometric equations.

11.6. Leakage

According to the methodology, the tool is not applicable if the displacement of agricultural activities, in itself, does not result in leakage. Leakage attributable to displacement by agricultural activities is considered insignificant and can be quantified as zero. For the project in particular, displacement by subsistence livestock farming does not represent a significant change because it is incipient, non-mechanized livestock farming..

11.7. Mitigation results

11.7.1. Eligible Areas in the GHG Project Boundaries

To determine the eligible areas of the CultivO2 project, it was necessary to perform a multitemporal analysis of land cover under the CORINE Land Cover methodology adapted for Colombia at a scale of 1:10,000 according to item 9 "Eligible areas for GHG projects in the AFOLU sector" Methodology BCR0001. The multi-temporal analysis must demonstrate that the areas of the geographical boundaries of the project do not correspond to the forest category, nor to natural vegetation cover other than forest (these must belong to category 2 "Agricultural Territories" of the Corine Land Cover legend), at the beginning of the project activities, nor five years before the project start date.

The project start date is June 09, 2017, it was necessary to perform the Corine Land Cover for the year 2016 and 2012, in some properties there was no availability of images for the year 2012, in that case high resolution satellite images as close as possible to 2012 were used. In order to determine the accuracy of the interpretation, field visits were made for the year 2016, in addition to using the AcATaMa Complement, which allows evaluating the pressure of the interpretation. For the project, the accuracy is 100%, due to the fact that 50% of the interpreted coverages belong to weededed savannas or pastures before the implementation of Removal Activities.

The Project is present in 7 departments (Arauca, Caldas, Casanare, Córdoba, Huila, Meta and Vichada), with removal activities in Cacao (Theobroma cacao L.) and Cashew (Anacardium Occidentale L.) crops. Table 18 shows the contrast between the total area of the properties and the eligible and enrolled area for the project.

Table 18. Eligible Areas AR

ELIGIBILITY	INSTANCE 1	
	AREA (HA)	PERCENTAGE
Eligible Cacao	1.467,18	72,9 %
Eligible Cashew	543,72	27.1 %
Total	2010,9	100 %

Source: Fundación Cataruben, 2023.

11.7.2. Stratification

Considering that the project contemplates the establishment of different species, in order to optimize the accuracy in the projection of GHG removals, for the baseline and monitoring scenario the stratification was defined according to the crop establishment plans (species/year). The defined strata are presented below (Table 19).

Table 19. Stratification of the eligible areas for the AR component

No	ID	Year of Planting	Crop Species	Area (ha)	Planting Density (tree/Ha)
1	C_2017	2017	Cacao	745,98	850
2	C_2018	2018	Cacao	214,37	850
3	C_2019	2019	Cacao	15,67	850
4	C_2020	2020	Cacao	39,00	850
5	C_2021	2021	Cacao	141,47	850
6	C_2022	2022	Cacao	310,69	850
7	M_2017	2017	Marañón	374,34	56
8	M_2018	2018	Marañón	28,09	56
9	M_2020	2020	Marañón	46,09	56
10	M_2021	2021	Marañón	95,17	56
			TOTAL	**2010,87**	

Source: Fundación Cataruben, 2023.

11.7.3. Baseline net GHG removals by sinks

Removals in the baseline scenario can be estimated according to the following equation:

$$\Delta C_{BSL,t} = \Delta C_{TREE_{BSL,t}} + \Delta C_{SHRUB_{BSLt}} + \Delta C_{DW_{SBL,t}} + \Delta C_{LIT_{BSL,t}}$$

Where:

$\Delta C_{BSL,t}$ Baseline net GHG removals by sinks in year t; tCO_2-e

$\Delta C_{TREE_{BSL,t}}$ Change in carbon stock in baseline tree biomass within the project boundary in year t, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; tCO_2e

$\Delta C_{SHRUB_{BSL,t}}$ Change in carbon stock in baseline shrub biomass within the project boundary, in year t, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; tCO_2e

$\Delta C_{DW_{BSL,t}}$ Change in carbon stock in baseline dead wood biomass within the project boundary, in year t, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"; tCO_2e

$\Delta C_{LI_{BSL,t}}$ Change in carbon stock in baseline litter biomass within the project boundary, in year t, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"; tCO_2e

However, section 15.1 of the methodology document BCR0001 establishes the following conditions under which carbon stocks in the baseline scenario can be counted as zero:

Table 20. Conditions for baseline carbon stock estimation.

Condition	Compliance	Justification
The pre-project trees are neither harvested, nor cleared, nor removed throughout the project horizon;	Yes	The areas of crop establishment do not correspond to forests and do not project the use of existing trees.

The pre-project trees do not suffer mortality because competition from trees planted by the project, or damage because of implementation of the project activity, at any time during the project horizon;	Yes	Project activities involve good silvicultural practices that include adequate planting distances that do not involve competition with established crops and existing trees prior to the start of the project.
Pre-project trees are not inventoried along with the project trees during carbon stocks monitoring.	Yes	The trees considered for carbon stock monitoring correspond to those with a planting date after the project start date.

Source: Fundación Cataruben, 2023.

Thus, all three conditions are met, so baseline GHG removals are counted as ZERO.

11.7.4. Actual net GHG removals by Sinks

The methodology considers emissions resulting from the removal of herbaceous vegetation, fertilizer application, use of woody biomass and decomposition of leaf litter and fine roots of nitrogen-fixing species to be insignificant. Thus, the estimated removals are calculated according to the changes in carbon stocks in the project area from the following equation:

$$\Delta C_{ACTUAL,\,t} = \Delta C_{P,\,t} - GHG_{E,\,t}$$

Where:

$\Delta C_{ACTUAL,\,t}$ Actual net GHG removals by sinks, in year t; tCO2e

$\Delta C_{P,\,t}$ Change in the carbon stocks in project, occurring in the selected carbon pools, in year t; tCO2e

$\Delta GHG_{E,t}$ Increase in non-CO2 GHG emissions within the project boundary as a result of the implementation of the A/R CDM project activity, in year t, as estimated in the tool "Estimation of non-CO2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity"; tCO2e

Since woody biomass burning is not considered as part of the crop preparation and establishment process, the net removals in the project scenario are equivalent to the changes in carbon stocks occurring in the carbon pools. This value is estimated from the following equation:

$$\Delta C_{P,\,t} = \Delta C_{TREE,PROJ,\,t} + \Delta C_{SHRUB\ PROJ\ ,\,t} + \Delta C_{DW\ PROJ,\,t} + \Delta C_{LI\ PROJ,\,t} + \Delta SOC_{AL,\,t}$$

Where:

$\Delta C_{P,t}$ Change in the carbon stocks in project, occurring in the selected carbon pools, in year; t CO_2-e.

$\Delta C_{ARB\ PROY,t}$ Change in carbon stock in tree biomass in project in year t, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; tCO_2e

$\Delta C_{ARBUST\ PROY,t}$ Change in carbon stock in shrub biomass in project in year t, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; tCO_2e

$\Delta C_{MM\ PROY,t}$ Change in carbon stock in dead wood in project in year t, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"; tCO_2e

$\Delta C_{HOJ\ PROY,t}$ Change in carbon stock in litter in project in year t, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"; tCO_2e

$\Delta COS_{A,t}$ Change in carbon stock in SOC in project, in year t, in areas of land meeting the applicability conditions of the tool "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities", as estimated in the same tool; tCO_2e

11.7.4.1. Carbon in total biomass

11.7.4.1.1. Cacao (Theobroma cacao L.)

The estimation of total biomass content in Cacao crops under the ex ante scenario was carried out by applying the growth model proposed by Ortiz, Riascos and Somarriba (2008), which relates tree age as a determinant variable.

Table 21. Growth model for ex ante estimates in Cacao.

Species	Model	Variables
Biomasa total *T. cacao*	$B_t = -2,02 + 0.19 * E - 3.7x10^{-4} * E^2$	Bt = Total biomass (kg/árbol) E= Age in years

Source: Ortiz, Riascos and Somarriba, 2008.

11.7.4.1.2. Cashew (Anacardium occidentale L.)

For the case of **cashew crops**, the development of allometric models is represented in studies conducted in Africa (Awé Djongmo et al., 2021; Biah et al., 2018; Malimbwi, Eid & Chamshama, 2018), while for Colombia there are still no validated models that adapt to the characteristics of the project. In this sense, in order to reduce the level of uncertainty regarding the estimation of GHG removals, for the estimation of aboveground biomass, an allometric model was built from measurements taken in crop plots eligible for the project with ages of 1, 4 and 5 years. Likewise, in order to contemplate a longer period of time, measurements were taken in crop plots of 2, 11 and 15 years old, planted in areas adjacent to the project areas and with similar planting conditions.

The procedure for the construction of the allometric model is described below.

Definition of sampling points. The selection of the number and location of sampling points was determined according to FC-GPP-23. Procedimiento diseño de inventario para monitoreo de crecimiento de biomasa, taking into account the variation of biomass content in reference data and the area of each stratum. Thus, 62 sampling points were defined in cashew forest crops, 26 of which were located within the eligible areas of the project, located in the department of Vichada, municipality of Puerto Carreño in the Cantarrana, Mataguaro, Manantial and Prosperidad properties and the neighboring property of Nuevo Horizonte (Table 22).

Table 22. Location of sampling points for Cashew allometric model.

ID	PROPERTY	ACTIVITY	SEDD_YEAR	PLOT_ID	LATITUDE	LENGTH
1	CANTARANA	Cantarrana	2017	Cantarrana P1 (2017)	6° 5' 47,350" N	68° 31' 33,758" W
2	CANTARANA	Cantarrana	2017	Cantarrana P2 (2017)	6° 5' 28,057" N	68° 32' 3,502" W
3	CANTARANA	Cantarrana	2017	Cantarrana P3 (2017)	6° 5' 39,358" N	68° 31' 53,983" W
4	MANANTIAL	El Manantial	2017	El Manantial P2 (2017)	5° 53' 5,557" N	68° 24' 59,404" W
5	MANANTIAL	El Manantial	2017	El Manantial P9 (2017)	5° 53' 0,762" N	68° 24' 53,986" W
6	MANANTIAL	El Manantial	2017	El Manantial P7 (2017)	5° 52' 58,584" N	68° 25' 12,443" W
7	MANANTIAL	El Manantial	2017	El Manantial P6 (2017)	5° 53' 1,309" N	68° 25' 29,208" W
8	MANANTIAL	El Manantial	2017	El Manantial P10 (2017)	5° 52' 57,108" N	68° 25' 37,621" W

9	MANANTIAL	El Manantial	2017	El Manantial P4 (2017)	5° 52' 52,378" N	68° 25' 36,199" W
10	MANANTIAL	El Manantial	2017	El Manantial P1 (2017)	5° 53' 14,096" N	68° 24' 28,588" W
11	MANANTIAL	El Manantial	2017	El Manantial P5 (2017)	5° 53' 2,170" N	68° 24' 25,042" W
12	MANANTIAL	El Manantial	2017	El Manantial P8 (2017)	5° 53' 6,659" N	68° 24' 34,733" W
13	MANANTIAL	El Manantial	2017	El Manantial P3 (2017)	5° 53' 5,050" N	68° 24' 43,369" W
14	MATAGUARO	Mataguaro	2018	Mataguaro P4 (2018)	5° 54' 39,571" N	68° 18' 13,018" W
15	MATAGUARO	Mataguaro	2020	Mataguaro P13 (2020)	5° 54' 37,422" N	68° 18' 16,931" W
16	MATAGUARO	Mataguaro	2020	Mataguaro P11 (2020)	5° 54' 34,607" N	68° 18' 22,478" W
17	MATAGUARO	Mataguaro	2020	Mataguaro P12 (2020)	5° 54' 38,250" N	68° 18' 24,185" W
18	MATAGUARO	Mataguaro	2020	Mataguaro P16 (2020)	5° 54' 27,918" N	68° 18' 19,760" W
19	MATAGUARO	Mataguaro	2020	Mataguaro P15 (2020)	5° 54' 28,080" N	68° 18' 14,360" W
20	MATAGUARO	Mataguaro	2020	Mataguaro P14 (2020)	5° 54' 22,504" N	68° 18' 27,137" W
21	MATAGUARO	Mataguaro	2017	Mataguaro P9 (2017)	5° 54' 43,560" N	68° 17' 35,754" W
22	MATAGUARO	Mataguaro	2017	Mataguaro P10 (2017)	5° 54' 54,799" N	68° 17' 51,378" W
23	MATAGUARO	Mataguaro	2018	Mataguaro P5 (2018)	5° 54' 50,728" N	68° 18' 3,283" W
24	MATAGUARO	Mataguaro	2018	Mataguaro P2 (2018)	5° 54' 42,937" N	68° 18' 2,891" W
25	MATAGUARO	Mataguaro	2018	Mataguaro P1 (2018)	5° 54' 42,109" N	68° 18' 7,175" W
26	MATAGUARO	Mataguaro	2018	Mataguaro P6 (2018)	5° 54' 35,683" N	68° 18' 3,906" W
27	MATAGUARO	Mataguaro	2018	Mataguaro P3 (2018)	5° 54' 47,135" N	68° 18' 14,342" W
28	MATAGUARO	Mataguaro	2017	Mataguaro P8 (2017)	5° 55' 8,882" N	68° 17' 24,788" W
29	MATAGUARO	Mataguaro	2017	Mataguaro P20 (2017)	5° 54' 56,052" N	68° 17' 30,570" W
30	MATAGUARO	Mataguaro	2017	Mataguaro P7 (2017)	5° 54' 58,946" N	68° 17' 37,586" W
31	MATAGUARO	Mataguaro	2021	Mataguaro P17 (2021)	5° 54' 9,1" N	68° 18' 32,4" W
32	MATAGUARO	Mataguaro	2021	Mataguaro P18 (2021)	5° 54' 12,2" N	68° 18' 37,9" W
33	MATAGUARO	Mataguaro	2021	Mataguaro P19 (2021)	5° 54' 21,7" N	68° 18' 35,8" W
34	HORIZONTE	Nuevo Horizonte	2008	Nuevo Horizonte P10 (2008)	6° 7' 1,567" N	68° 1' 51,694" W
35	HORIZONTE	Nuevo Horizonte	2012	Nuevo Horizonte P30 (2012)	6° 7' 6,852" N	68° 2' 6,612" W
36	HORIZONTE	Nuevo Horizonte	2008	Nuevo Horizonte P18 (2008)	6° 7' 6,629" N	68° 2' 1,957" W
37	HORIZONTE	Nuevo Horizonte	2008	Nuevo Horizonte P15 (2008)	6° 7' 9,797" N	68° 2' 4,679" W
38	HORIZONTE	Nuevo Horizonte	2008	Nuevo Horizonte P19 (2008)	6° 7' 14,484" N	68° 1' 47,251" W
39	HORIZONTE	Nuevo Horizonte	2008	Nuevo Horizonte P20 (2008)	6° 7' 9,840" N	68° 1' 44,188" W
40	HORIZONTE	Nuevo Horizonte	2008	Nuevo Horizonte P17 (2008)	6° 7' 5,120" N	68° 1' 49,462" W
41	HORIZONTE	Nuevo Horizonte	2008	Nuevo Horizonte P16 (2008)	6° 7' 9,822" N	68° 1' 50,938" W
42	HORIZONTE	Nuevo Horizonte	2012	Nuevo Horizonte P24 (2012)	6° 6' 59,612" N	68° 2' 9,892" W
43	HORIZONTE	Nuevo Horizonte	2012	Nuevo Horizonte P22 (2012)	6° 6' 56,815" N	68° 2' 6,454" W
44	HORIZONTE	Nuevo Horizonte	2012	Nuevo Horizonte P23 (2012)	6° 6' 55,667" N	68° 2' 1,442" W
45	HORIZONTE	Nuevo Horizonte	2012	Nuevo Horizonte P25 (2012)	6° 6' 59,285" N	68° 2' 7,033" W
46	HORIZONTE	Nuevo Horizonte	2012	Nuevo Horizonte P26 (2012)	6° 7' 0,034" N	68° 2' 2,454" W
47	HORIZONTE	Nuevo Horizonte	2012	Nuevo Horizonte P27 (2012)	6° 7' 2,762" N	68° 2' 5,888" W

48	HORIZONTE	Nuevo Horizonte	2012	Nuevo Horizonte P21 (2012)	6° 7' 0,372" N	68° 1' 59,380" W
49	HORIZONTE	Nuevo Horizonte	2012	Nuevo Horizonte P29 (2012)	6° 7' 3,432" N	68° 1' 59,920" W
50	HORIZONTE	Nuevo Horizonte	2012	Nuevo Horizonte P28 (2012)	6° 7' 4,814" N	68° 2' 2,962" W
51	HORIZONTE	Nuevo Horizonte	2008	Nuevo Horizonte P14 (2008)	6° 7' 37,913" N	68° 1' 45,962" W
52	HORIZONTE	Nuevo Horizonte	2008	Nuevo Horizonte P11 (2008)	6° 7' 29,986" N	68° 1' 47,125" W
53	HORIZONTE	Nuevo Horizonte	2008	Nuevo Horizonte P13 (2008)	6° 7' 29,593" N	68° 1' 35,587" W
54	HORIZONTE	Nuevo Horizonte	2008	Nuevo Horizonte P12 (2008)	6° 7' 36,257" N	68° 1' 50,563" W
55	PROSPERIDAD	Prosperidad	2017	Prosperidad P7 (2017)	5° 48' 53,028" N	68° 22' 29,222" W
56	PROSPERIDAD	Prosperidad	2017	Prosperidad P6 (2017)	5° 48' 55,246" N	68° 22' 35,137" W
57	PROSPERIDAD	Prosperidad	2017	Prosperidad P5 (2017)	5° 48' 48,830" N	68° 22' 37,589" W
58	PROSPERIDAD	Prosperidad	2017	Prosperidad P2 (2017)	5° 49' 15,838" N	68° 22' 38,921" W
59	PROSPERIDAD	Prosperidad	2017	Prosperidad P3 (2017)	5° 49' 13,174" N	68° 22' 42,244" W
60	PROSPERIDAD	Prosperidad	2017	Prosperidad P1 (2017)	5° 49' 22,739" N	68° 22' 50,686" W
61	PROSPERIDAD	Prosperidad	2017	Prosperidad P8 (2017)	5° 49' 14,401" N	68° 22' 50,052" W
62	PROSPERIDAD	Prosperidad	2017	Prosperidad P4 (2017)	5° 48' 57,280" N	68° 22' 42,172" W

Source: Fundación Cataruben, 2023.

Field measurements: For the field data collection, the guidelines of the methodological document BCR0001 and the procedure of FC- GOP-18FC-GOP-18 Metodología Levantamiento de Parcelas en Cultivos y Plantaciones Forestales, which in turn is based on the National Forest Inventory of Colombia (Olarte et al. 2021), were followed. Thus, each sampling unit consisted of circular plots of 17.84 m2 corresponding to an area of 999.86 m2, where dasometric variables were recorded for all forest individuals found.

Each sampling unit began with the location of the central point, which was previously georeferenced. After this, reference points were selected to help locate the central point of the plot in the future, each reference point was demarcated with aluminum plates where the code of each plot was recorded; in addition, the azimuth and the horizontal distance from the central point were recorded.

Subsequently, for each individual reported within the plot boundaries, location data (azimuth and horizontal distance from the center point), trunk diameter (d30), stem height, total height and crown cover were recorded. Additionally, the phytosanitary status of the individual and relevant observations on any type of damage it may present were recorded (Image 22).

Image 22. Registration and measurement of individuals a) distance and azimuth measurement; b) trunk diameter measurement; c) stem height measurement; d) total height; e) crown diameter measurement.

Source: Fundación Cataruben, 2023.

Additionally, wood density measurements were made using the non-destructive method. For this, ten plots were randomly selected from the 2008, 2012 and 2017 strata; in turn, within each plot, three individuals of good size and optimal phytosanitary condition were selected. Using a Pressler auger, cylindrical wood samples (wood dowels) of at least 10 cm in length at a height of 30 cm from the ground were extracted from each individual. Finally, to avoid any type of pathogenic damage to the tree, the openings made in each stem were duly sealed (Image 23).

Each extracted wood sample was stored and coded according to the plot code, individual number and corresponding stratum. These samples were then sent to the analytical services laboratory of the

Biodiversity International Alliance and the International Center for Tropical Agriculture (CIAT) (Image 23).

Image 23. Sampling for wood density determination: a) and b) sampling with Pressler auger; c) extraction of cylindrical wood sample; d) sealing of sampling hole; e) storage and coding of samples.

Source: Fundación Cataruben, 2023.

Laboratory analysis: A total of 27 samples were sent to the laboratory for density analysis using the water displacement method, which relates the quotient between the mass of dry material divided by the mass of water displaced and its green volume (Figure 24).

Image 24 Process for determining wood density a) Hydration of the billets; b) Determination of the volume by the displacement method; c) Arrangement of wood billets to enter the kiln; d) Drying of the samples.

Source: CIAT, 2023.

Data analysis: Based on the information collected in the field, an exploratory data analysis was initially carried out in order to identify outliers that could affect subsequent modeling.

For the construction of the allometric model, the dependent variable was the biomass content per tree (kg), which was estimated from the calculation of the volume of wood for each individual recorded, and the trunk diameter, height and crown diameter as independent variables. The selection of the appropriate model was evaluated according to the degree of correlation between the variables evaluated.

Similarly, since there are no growth models for the trunk diameter variable, a linear regression analysis was performed between age and diameters measured in the field.

The step-by-step calculations and the technical report on the construction of the models can be found in Annex 1 / 2.2 Monitoring plans / 2.2.2 AR removals / 2.2.1.1. Project activities and crop management / Modelo alométrico Marañón.

Finally, for the estimation of belowground biomass, the equation of Cairns et al., 1997, which calculates the value of belowground biomass in relation to the value of Cashew aboveground biomass, will be taken into account.

In this order of ideas, Table 23 shows the models defined for the ex ante estimation of GHG removals in Cashew crops.

Table 23. Growth models for ex ante estimations in cashew.

Species	Model	Variables	Data source
Diametric growth model for *A. occidentale*	D_{30} = 4,945 + 1,704 (Edad)	D_{30}=Trunk diameter at 30 cm (cm). Age = age in years.	Fundación Cataruben (locally developed model)
Aboveground biomass in *A. occidentale*	$LN(BA) = -3,777 + 3,158LN(D_{30}) - 0,118LN($	BA = Aboveground biomass (kg). D_{30}=Trunk diameter at 30 cm (cm).	Fundación Cataruben (locally developed model)
Relationship between aboveground biomass and belowground biomass	$BRG = e^{(-1,085+0,9256*ln(BA))}$	BRG = Coarse root biomass (t/ha) BA = Aboveground biomass (t/ha)	Cairns et al., 1997

Source: Fundación Cataruben.

Thus, the projected carbon contents in the total biomass for the project areas are presented in Table 24. The calculations can be reviewed in the Annex. 2.2 Monitoring Plans > 2.2.2 AR Removals > 2.2.1.2 Removals > 1. Cuantificación de remociones - Cultivo2 V6 > Sheet 0. Ex ante values and Sheet 1.1 EX ANTE Total Biomass.

Table 24. GHG removals by aboveground and belowground biomass.

Monitoring period	Accumulated carbon removals (tCO2e)	Total net carbon removals (tCO2e/year)
1	293	293
2	3.548	3.255
3	7.344	3.796
4	11.161	3.817
5	15.036	3.875
6	19.420	4.384
7	24.934	5.514
8	30.221	5.287
9	35.393	5.172
10	40.453	5.060
11	45.404	4.951
12	50.247	4.843
13	54.983	4.736
14	59.613	4.630
15	64.137	4.524
16	68.558	4.421
17	72.873	4.315
18	77.083	4.210
19	81.189	4.106
20	85.191	4.002

Source: Fundación Cataruben.

11.7.4.2. Deadwood and litter

Tool 12 of the AR Methodology ACM0003[2] provides guidelines for the estimation of carbon content in dead wood and litter, establishing two methods: 1) from field measurements and 2) by using predetermined factors, provided that dead wood and litter are not removed. Therefore, for the project estimates, the second method will be chosen, assuming that the organic matter derived from pruning (training, maintenance and phytosanitary) and natural death processes in some individuals is not removed from the crop area during the entire project cycle.

In this order of ideas, the following equations are taken into account to estimate carbon stocks in dead wood and litter:

[2] A/R Methodological tool: Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities Version 03.1

$$C_{DW,i,t} = C_{TREE,i,t} x\ DF_{DW}$$

Where:

$C_{DW,i,t}$	Carbon stock in deadwood in stratum i at a given point of time in year t; t CO_2-e.
$C_{TREE,i,t}$	Carbon stock in trees biomass in stratum i at a point of time in year t; tCO_2e
DF_{DW}	Conservative default factor expressing carbon stock in deadwood as a percentage of carbon stock in tree biomass, percent
i	1, 2, 3… biomass estimation strata within the project boundary
t	1, 2, 3… years elapsed since the start of the project activity

y,

$$C_{LI,i,t} = C_{TREE,i,t} x\ DF_{LI}$$

Where:

$C_{HOJ,i,t}$	Carbon stock in litter in stratum i at a given point of time in year t; t CO_2-e.
$C_{ARB,i,t}$	Carbon stock in trees biomass in stratum i at a point of time in year t; tCO_2e
DF_{HOJ}	Conservative default factor expressing carbon stock in litter as a percentage of carbon stock in tree biomass
i	1, 2, 3… biomass estimation strata within the project boundary
t	1, 2, 3… years elapsed since the start of the project activity

Thus, to define the DF_{DW} and DF_{LI} factors, an analysis was carried out on the areas of crop establishment, based on elevation (msnm) and average precipitation (mm/year) (Table 25).

Table 25. Default values for the estimation of carbon content in deadwood and litter.

No	ID	Year of planting	Crop species	Area (ha)	Elevation (msnm)	Precipitation (mm/año)	DF MM (%)	DF HOJ (%)
1	C_2017A	2017	Cacao	718,46	< 2000	< 1000	2,00%	4,00%
2	C_2017B	2017	Cacao	21,55	< 2000	> 1600	6,00%	1,00%
3	C_2017C	2017	Cacao	5,97	< 2000	1000-1600	1,00%	1,00%
4	C_2018A	2018	Cacao	213,65	< 2000	< 1000	2,00%	4,00%
5	C_2018B	2018	Cacao	0,72	< 2000	> 1600	6,00%	1,00%
6	C_2019A	2019	Cacao	8,71	< 2000	< 1000	2,00%	4,00%
7	C_2019B	2019	Cacao	6,96	< 2000	> 1600	6,00%	1,00%
8	C_2020A	2020	Cacao	13,21	< 2000	< 1000	2,00%	4,00%
9	C_2020B	2020	Cacao	25,79	< 2000	> 1600	6,00%	1,00%
10	C_2021A	2021	Cacao	138,96	< 2000	< 1000	2,00%	4,00%
11	C_2021B	2021	Cacao	2,51	< 2000	> 1600	6,00%	1,00%
12	C_2022A	2022	Cacao	310,53	< 2000	< 1000	2,00%	4,00%
13	C_2022B	2022	Cacao	0,16	< 2000	> 1600	6,00%	1,00%
14	M_2017A	2017	Marañón	374,34	< 2000	< 1000	2,00%	4,00%
15	M_2018A	2018	Marañón	28,09	< 2000	< 1000	2,00%	4,00%
16	M_2020A	2020	Marañón	46,09	< 2000	< 1000	2,00%	4,00%
17	M_2021A	2021	Marañón	95,17	< 2000	< 1000	2,00%	4,00%
			TOTAL	**2010,87**				

Source: Fundación Cataruben, 2023.

In this sense, the projected carbon contents in the dead wood and litter deposit for the project areas are presented in Table 26.

Table 26. GHG removals in deadwood and litter

Monitoring period	*Accumulated carbon removals (tCO2e)*	*Total net carbon removals (tCO2e/year)*
1	15	15
2	184	169
3	380	196
4	573	193
5	776	203
6	1.003	227
7	1.288	285
8	1.561	273
9	1.828	267
10	2.090	262
11	2.344	254
12	2.595	251
13	2.838	243
14	3.076	238
15	3.309	233
16	3.536	227
17	3.759	223
18	3.974	215
19	4.185	211
20	4.390	205

Source: Fundación Cataruben.

The step-by-step calculations can be reviewed in the Annex. 2.2 Monitoring Plans > 2.2.2 AR Removals > 2.2.1.2 Removals > 1. Cuantificación de remociones - Cultivo2 V6 - Cultivo2 > Sheet 1.2 EX ANTE MOM.

11.7.4.3. Soil organic carbon (SOC)

To calculate the soil organic carbon content, the methodology assumes that the contents increase due to project activities until reaching the natural cover conditions, under a constant rate in the following 20 years after crop establishment, so that:

(a) Litter remains on-site and is not removed from the project area; and.

(b) Soil disturbance attributable to the project activity, id any, is:

- By appropriate soil conservation practices;

- Limited to site preparation before planting and is not repeated for less than twenty years;

Thus, the project does not contemplate the removal of leaf litter in the project area, and soil disturbance is only projected at the beginning of the implementation period, as part of the planting of individual cacao and Cashew trees. Therefore, to estimate soil carbon contents, first the default reference value was established based on the soil type and climatic region of the project area.

Subsequently, the value for initial SOC was calculated based on initial land use, management and baseline input use. Finally, the year-to-year rate of change of SOC then represents the baseline value of natural cover minus the initial value in the project areas, under a constant scenario over a 20-year period (Table 27). To avoid overestimation, an upper limit value of 0.8 tC ha/year was established.

Table 27. Default values for soil carbon content estimation.

No	ID	Year of planting	Crop species	Area (ha)	Climatic region	Soil type	REF	Soil use	fLU	fMG	fIN	COS INITIAL	COS LOST	dCOS (tC/ha)
1	C_2017A	2017	Cacao	15,49	Tropical montano	HAC	88	Pastizales	1	0,96	1	84,48	0	0,18
2	C_2017B	2017	Cacao	634,94	Tropical húmedo	HAC	65	Cultivos permanentes	0,48	1,15	1	35,88	0	0,80
3	C_2017C	2017	Cacao	55,93	Tropical húmedo	HAC	65	Pastizales	1	0,97	1	63,05	0	0,10
4	C_2017D	2017	Cacao	1,94	Tropical húmedo	LAC	47	Pastizales	1	0,97	1	45,59	0	0,07
5	C_2017E	2017	Cacao	30,83	Tropical muy húmedo	HAC	44	Pastizales	1	0,97	1	42,68	0	0,07
6	C_2017F	2017	Cacao	6,85	Tropical muy húmedo	LAC	60	Pastizales	1	0,97	1	58,2	0	0,09
7	C_2018A	2018	Cacao	183,18	Tropical húmedo	HAC	65	Cultivos permanentes	0,48	1,15	1	35,88	0	0,80
8	C_2018B	2018	Cacao	26,49	Tropical húmedo	HAC	65	Pastizales	1	0,97	1	63,05	0	0,10
9	C_2018C	2018	Cacao	3,77	Tropical muy húmedo	HAC	44	Pastizales	1	0,97	1	42,68	0	0,07
10	C_2018D	2018	Cacao	0,93	Tropical muy húmedo	LAC	60	Pastizales	1	0,97	1	58,2	0	0,09
11	C_2019A	2019	Cacao	2,81	Tropical montano	HAC	88	Pastizales	1	0,96	1	84,48	0	0,18
12	C_2019B	2019	Cacao	12,04	Tropical húmedo	HAC	65	Pastizales	1	0,97	1	63,05	0	0,10
13	C_2019C	2019	Cacao	0,82	Tropical muy húmedo	HAC	44	Pastizales	1	0,97	1	42,68	0	0,07
14	C_2020A	2020	Cacao	6,81	Tropical montano	HAC	88	Pastizales	1	0,96	1	84,48	0	0,18
15	C_2020B	2020	Cacao	13,67	Tropical húmedo	HAC	65	Pastizales	1	0,97	1	63,05	0	0,10
16	C_2020C	2020	Cacao	9,29	Tropical húmedo	LAC	47	Pastizales	1	0,97	1	45,59	0	0,07
17	C_2020D	2020	Cacao	9,23	Tropical muy húmedo	HAC	44	Pastizales	1	0,97	1	42,68	0	0,07
18	C_2021A	2021	Cacao	1,55	Tropical montano	HAC	88	Pastizales	1	0,96	1	84,48	0	0,18
19	C_2021B	2021	Cacao	86,50	Tropical húmedo	HAC	65	Cultivos permanentes	0,48	1,15	1	35,88	0	0,80
20	C_2021C	2021	Cacao	32,91	Tropical húmedo	HAC	65	Pastizales	1	0,97	1	63,05	0	0,10
21	C_2021D	2021	Cacao	2,00	Tropical húmedo	LAC	47	Pastizales	1	0,97	1	45,59	0	0,07

22	C_2021E	2021	Cacao	10,56	Tropical muy húmedo	HAC	44	Pastizales	1	0,97	1	42,68	0	0,07
23	C_2021F	2021	Cacao	7,95	Tropical muy húmedo	LAC	60	Pastizales	1	0,97	1	58,2	0	0,09
24	C_2022A	2022	Cacao	303,72	Tropical húmedo	HAC	65	Cultivos permanentes	0,48	1,15	1	35,88	0	0,80
25	C_2022B	2022	Cacao	6,17	Tropical húmedo	HAC	65	Pastizales	1	0,97	1	63,05	0	0,10
26	C_2022C	2022	Cacao	0,80	Tropical muy húmedo	HAC	44	Pastizales	1	0,97	1	42,68	0	0,07
27	M_2017A	2017	Marañón	234,34	Tropical montano	HAC	88	Pastizales	1	0,96	1	84,48	0	0,18
28	M_2017B	2017	Marañón	140,00	Tropical montano	LAC	63	Pastizales	1	0,96	1	60,48	0	0,13
29	M_2018A	2018	Marañón	28,09	Tropical montano	LAC	63	Pastizales	1	0,96	1	60,48	0	0,13
30	M_2020A	2020	Marañón	46,09	Tropical montano	LAC	63	Pastizales	1	0,96	1	60,48	0	0,13
31	M_2021A	2021	Marañón	87,02	Tropical montano	HAC	88	Pastizales	1	0,96	1	84,48	0	0,18
32	M_2021B	2021	Marañón	8,15	Tropical montano	LAC	63	Pastizales	1	0,96	1	60,48	0	0,13
			TOTAL	**2010,87**										

Fuente: Fundación Cataruben, 2023.

Thus, GHG removals in soil organic carbon are presented in Table 28. The step-by-step calculations can be reviewed in the Annex. 2.2 Monitoring Plans > 2.2.2 AR Removals > 2.2.1.2 Removals > 1. 1. Cuantificación de remociones - Cultivo2 V6 > Sheet 1.3 EX ANTE COS..

Table 28. GHG removals in soil organic carbon.

Monitoring year	*Accumulated carbon removals (tCO2e)*	*Total net carbon removals (tCO2e/year)*
1	578	578
2	1.309	731
3	2.036	727
4	2.778	742
5	3.605	827
6	4.681	1.076
7	5.752	1.071
8	6.828	1.076
9	7.899	1.071
10	8.975	1.076
11	10.046	1.071
12	11.122	1.076
13	12.193	1.071
14	13.270	1.077
15	14.340	1.070
16	15.417	1.077
17	16.487	1.070
18	17.564	1.077
19	18.634	1.070
20	19.711	1.077

Source: Fundación Cataruben, 2023.

11.7.4.4. Net GHG Removals

Net GHG removals by sinks are estimated from the following equation:

$$\Delta C_{AR,t} = \Delta C_{ACTUAL,t} - \Delta C_{BSL,t} - LK_t$$

Where:

$\Delta C_{AR,t}$	Net anthropogenic GHG removals by sinks, in year t; tCO2e
$\Delta C_{ACTUAL,t}$	Actual net GHG removals by sinks, in year t; tCO2e
$\Delta C_{BSL,t}$	Baseline net GHG removals by sinks, in year t; tCO2e
LK_t	GHG emissions due to leakage, in year t; tCO2e

Since displacement by subsistence livestock does not represent a significant change in GHG emissions, as stated in section 11.6, emissions due to leakage in the CultivO2 project are calculated as zero.

Thus, Table 29 shows the results of the calculations, columns 5 and 6 indicate the projected removals year by year for cacao and Cashew crops respectively, for a period of 20 years, for a total of 109,292 tCO2e.

Table 29. GHG removals from the project

Year	*15.1 GHG removals in the baseline scenario (tCO2e)*	*15.2 GHG removals in the scenario with project in CACAO (tCO2e)*	*15.2 GHG removals in the Cashew project scenario (tCO2e)*	*15.3 Leakage*	*15.4 Net GHG removals (tCO2e))*	*15.4 Net annual removals (tCO2e/year)*
1	0,00	519	367	0,00	886	886
2	0,00	4.333	707	0,00	5.041	4.155
3	0,00	8.625	1.135	0,00	9.760	4.719
4	0,00	12.726	1.786	0,00	14.512	4.752
5	0,00	16.867	2.550	0,00	19.417	4.905
6	0,00	21.643	3.461	0,00	25.104	5.687
7	0,00	27.447	4.527	0,00	31.974	6.870
8	0,00	32.858	5.752	0,00	38.610	6.636
9	0,00	37.978	7.142	0,00	45.120	6.510
10	0,00	42.822	8.696	0,00	51.518	6.398

11	0,00	47.376	10.418	0,00	57.794	6.276
12	0,00	51.653	12.312	0,00	63.964	6.170
13	0,00	55.640	14.374	0,00	70.014	6.050
14	0,00	59.349	16.610	0,00	75.959	5.945
15	0,00	62.770	19.016	0,00	81.786	5.827
16	0,00	65.913	21.598	0,00	87.511	5.725
17	0,00	68.767	24.352	0,00	93.119	5.608
18	0,00	71.342	27.279	0,00	98.621	5.502
19	0,00	73.628	30.381	0,00	104.008	5.387
20	0,00	75.638	33.654	0,00	109.292	5.284

Source: Fundación Cataruben.

12. MONITORING PLAN AR COMPONENT

The following is the monitoring plan outline designed for the project accreditation period (20 years), in order to evaluate changes in the Project boundaries, execution of activities, monitoring of crops and biomass growth, and quantification of removals, based on the established methodological guidelines, in order to generate accurate and quality information in the verification process.

12.1. Monitoring plan of the Project Boundaries

The methodology establishes the monitoring of the geographic limits of the project for the executed activities, which must be included in a robust and organized geographic information system, georeferencing each of the lots and cultivation areas with their respective ID including the coverage for the reference dates.

Project areas will be monitored for boundaries and eligible areas, which are included in Geodatabase del proyecto.

Verification of the project areas will be carried out through the evaluation of high resolution satellite images, consistent with the eligibility analysis of the project areas as described in section 16.1 of the methodology.

12.2. Monitoring plan of the implementation of Project Activities

According to the technical and silvicultural management requirements in the implementation of productive systems that demonstrate net GHG removals in the framework of the CultivO2 P1 project, a 20-year monitoring plan was established, with measurable time periods that guarantee the implementation of the following activities (See Annex 1. Plan de monitoreo AR.xlsx)

A) Establishment of crops and restoration zones.

The project areas will be delimited based on satellite images or field visits. The goal for planted areas is 2,500 hectares in the total period of 20 years. The indicator to measure the progress of compliance with the activity is verification of areas, whose unit of measurement will be in hectares (ha) and monitoring frequency will be annual.

B) Apply training and support processes through training cycles to strengthen silvicultural practices (installation, establishment, growth and development, harvesting and post-harvesting).

There will be 20 training sessions, which will be supported with attendance and audiovisual records; monitoring frequency will be every two (2) years.

C) Characterization and implementation of silvicultural practices

The crops will be characterized, as well as the Property, and the implementation of silvicultural practices will be monitored. The indicator is the number of properties with productive systems characterized and implementing silvicultural practices; the goal for the next 20 years is to characterize and monitor 57 properties. The supports for verifying the implementation of this activity will be completed forms of characterizations, monitoring, field logs and audiovisual records. The

monitoring frequency will be every five (5) years.

D) Monitoring of disturbance events

A monitoring report will be made on the AR eligible areas, which will include an annual crop monitoring table. The activity's progress indicator is the number of properties with analysis to identify changes due to fire, wind, flooding, pests, etc. The goal is to submit twenty (20) reports and the monitoring frequency will be annually.

12.3. Crop Management and Biomass Growth Monitoring Plan

The purpose of this activity is to guarantee the permanence of the crops in the project area; in this sense, activities were designed to evaluate the strata associated with the productive systems. This includes date, location, coordinates, species (s) affected, type of event (fire, pests, falls due to winds, floods, etc.), corrective measures implemented, changes in Project boundaries.

E) Evaluation of the growth of planted plots

Plots will be established to monitor the biomass and stratification of planted plots (Procedimientos AR). The indicator is tons of accumulated biomass per stratum, the unit of measurement is Ton/year and the monitoring frequency will be every four (4) years.

12.4. Removal Monitoring

According to the methodological document BCR0001, the estimation of actual removals considers the changes in carbon stocks in the project area, minus the estimation of GHG emissions other than CO2 at the project boundaries.

F) Monitoring quantification of net removals

The measurement of dasometric variables and the use of allometric equations for the estimation of carbon stocks in planted plots will be carried out. The unit of measurement is net removals in the monitoring period (Ton CO2eq) and the monitoring frequency will be every four (4) years.

For Cacao, estimates will be made from the survey of plots and by using allometric models, such as the one proposed by Andrade et. al (2008), which has been validated by other researchers in cocoa plantations in the country (Marín et al., 2016; Andrade et. al, 2013).

For the case of carbon content in Cashew, it will be done by using its own allometric model and the estimation of aboveground biomass values from measurements of dasometric variables collected through temporary plots implemented in eligible areas of the project.

In this sense, the following phases will be considered for the monitoring of net removals.

Preliminary phase: During this stage the field plan of the field trip will be designed, which includes the location of sampling points and sample size, field visit schedule and definition of material readiness.

The selection of the number and location of sampling points will be done according to FC-GPP-23. Procedimiento diseño de inventario para monitoreo de crecimiento de biomasa, taking into account the area of each stratum and the variation of biomass content established from reference data for the study region.

Once the sample size is defined, a random distribution of the sampling points will be made, taking into account the proportion of the area of each stratum with respect to the eligible area of the project.

Field stage: This stage begins with the displacement of professionals to the study areas, the establishment of plots and the collection of information. On the other hand, for the management of data and information generated in this stage, the ODK collect tool will be used, which allows the recording of information on mobile devices.

The information to be recorded includes general data on the location of the Property, date of crop establishment, planting density of the plot, location of the central point of the plot and the measurement of individuals.

The measurement of individuals will consist of the registration of dasometric variables for each Cashew tree within the 17.84 m2 radius; in this way, location data is recorded with respect to the central point (azimuth and horizontal distance), trunk diameter at 30 cm (d30), trunk height, total height and canopy cover. In addition, the phytosanitary status and any relevant observations on the condition of the individual are recorded (FC-GOP-18 Metodología Levantamiento de Parcelas en Cultivos y Plantaciones Forestales).

For data quality control purposes, the guidelines of methodology BCR0001 section 6.5.1 are followed. In this way, 10% of the sampling points are verified in order to identify the accuracy and consistency of the values recorded by the professionals. For this purpose, remeasurements of 10% of the sampling points are carried out, where the data are reported again under the procedure FC- GOP-18.

Data analysis.

Based on the results obtained from the field, an exploratory data analysis is carried out to verify the relevance of the information collected, as well as to identify and treat missing and/or atypical data that may be present in order to avoid underestimates or overestimates in the biomass contents.

After this, aboveground biomass values will be calculated, for which allometric equations will be taken into account for each type of crop; in this way, the aboveground biomass of Cacao is carried out taking into account the equation proposed by Andrade et. al., 2008 while for Cashew, the allometric equation developed with own data is taken into account. In addition, the estimation of the belowground biomass is carried out following the equation proposed by Cairns et al., 1997.

Table 30. Allometric equations for estimation of carbon in total biomass

Species	Model	Variable	Source
Theobroma cacao	$BA = 10^{(-1,625+2,63*log(d30))}$	**BA** = Aboveground biomass (kg/tree) D_{30}= Diameter of trunk at 30 cm height (cm)	Andrade et. al., 2008
Relationship between aboveground biomass and belowground biomass	$BRG = e^{(-1,085+0,9256*ln(BA)}$	**BRG** = Biomass of coarse roots (t/ha) **BA** = aboveground biomass (t/ha)	Cairns et al., 1997
Anacardium occidentale	$LN(BA) = -3,777 + 3,15$	**BA** = aboveground biomass (kg). **D_{30}**= Trunk diameter at 30 cm (cm).	Fundación Cataruben (locally developed model)

Source: Fundación Cataruben, 2023.

After this, the calculation of carbon will be made taking into account the total aboveground biomass, the dry matter fraction value (0.47) and the molecular ratio constant between carbon and carbon dioxide (44/12). Finally, the net removals avoided by the implementation of project activities are estimated for each analysis period.

In the case of litter, dead wood and soil organic carbon, the estimation will be done using default values accepted by the methodological document BCR0001.

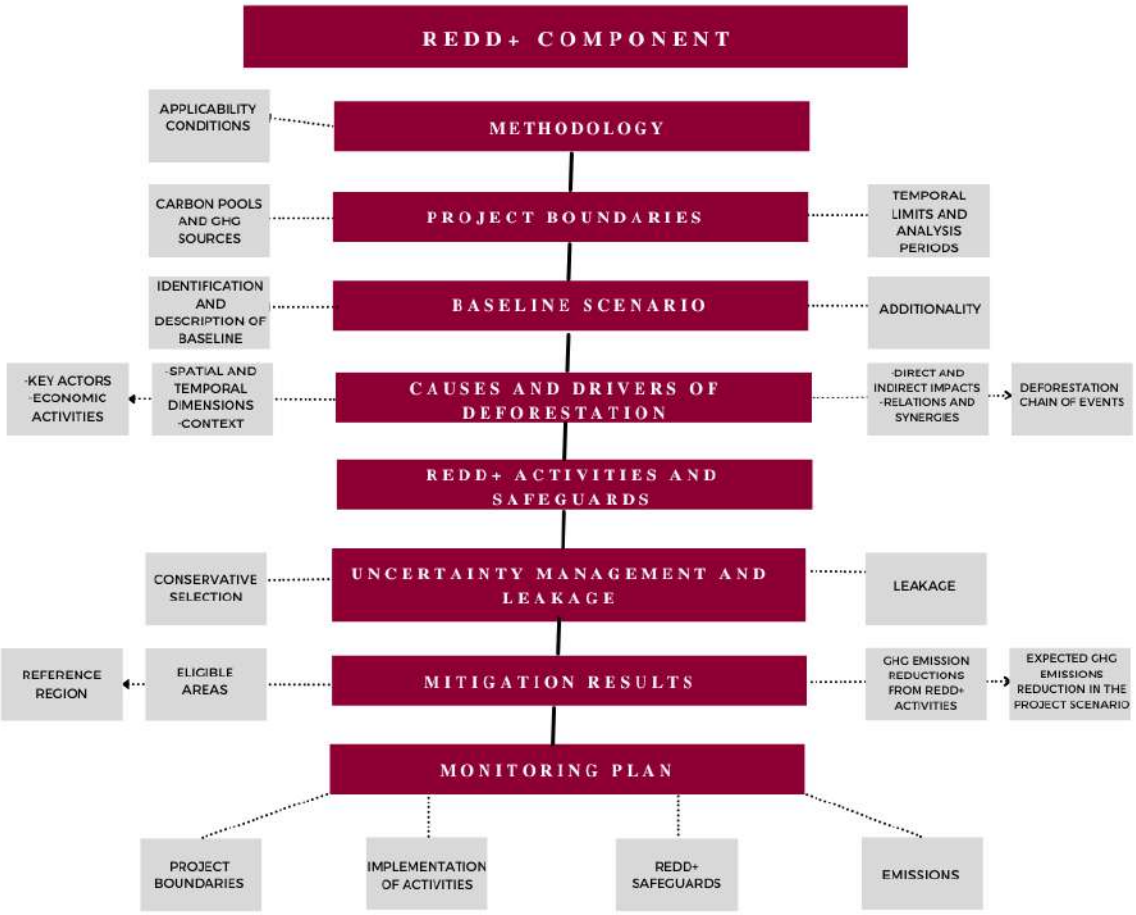
Regarding uncertainty management, the application of discount factors will be carried out under the guidelines established in section 14 of the methodology document BCR0001, taking into account the origin of the data and/or models, and the uncertainty associated with the data collected.

SECTION 3.
REDD+

13. QUANTIFICATION OF GHG EMISSION REDUCTIONS

The following is the structure for the development of the REDD+ component chapter, which establishes the methodological guidelines to demonstrate emission reductions from the implementation of activities that avoid deforestation of forest ecosystems in previously prioritized areas.

Figure 4. REDD+ component structure



Source: Fundación Cataruben.

13.1. REDD+ Quantification Methodology

For the development of the project, the BCR Standard Version 3.1 of 2023 will be used as a basis, which will provide the requirements applicable to the project, as well a the following methodology:

- Methodological document AFOLU Sector / Quantification of GHG Emission Reduction REDD+ Projects BCR0002 of BIOCARBON REGISTRY. Version 3.1. September 15, 2022.

13.1.1. Applicability conditions of the Methodology BCR0002 REDD+ Projects

Regarding compliance with the applicability conditions of the AFOLU SECTOR METHODOLOGICAL DOCUMENT. Quantification of GHG Emission Reduction REDD+ Projects BCR0002. Version 3.1, it is concluded that;

Table 31. REDD+ methodology applicability conditions.

CONDITION OF APPLICABILITY	COMPLIANCE
a) The areas in the project boundaries correspond to the forest category (as outlined by the national forest definitions for the Clean Development Mechanism) at the start of project activities and ten years before the project start date.	The non-forest forest maps generated by the Forest and Carbon Monitoring System of the IDEAM, official cartography of the Republic of Colombia, are used as inputs.
b) The identified causes of deforestation may include, among others: expansion of the agricultural frontier, mining, timber extraction, and infrastructure expansion.	The causes associated with deforestation and identified for the project baseline correspond to; expansion of the agricultural frontier (Agriculture - Livestock), infrastructure, oil sector and mining sector. The information is addressed in the analysis of causes and agents of deforestation.
c) The causes of forest degradation identified may include logging, fuelwood extraction, forest fires, forest grazing, and expansion of the agricultural frontier - illicit crops;	The causes associated with the identified forest degradation analyzed correspond mainly to the agricultural expansion of crops such as rice, corn and oil palm in the Orinoco region and coffee and sugar cane in the Andean region. Other causes include cattle ranching (involving grazing) and firewood extraction.
d) No reduction in deforestation is expected to occur in the absence of the project.	Based on the baseline, additionality and deforestation agent analyses, no reduction in deforestation is expected to occur in the absence of the project.
e) The carbon stocks in the organic matter of soil, the litter and deadwood in project boundary may decrease or remain stable;	If the agricultural activities identified in the baseline continue, the probability that carbon stocks in soil, litter and dead wood will decrease

	is high, given the natural cover transformations that would occur in the project area. However, in the project scenario, these carbon stocks are expected to remain stable or increase due to the development of the proposed conservation activities
f) The quantification of GHGs other than CO2 should be included in the quantification of emissions caused by forest fires (if applicable) during the monitoring period.	Project emissions monitoring will include quantification of non-CO2 GHGs in the event that forest fires are identified

Source: Fundación Cataruben.

13.2. Project boundaries

13.2.1. Carbon pools and sources of emissions

For forest areas, the reservoirs and sources described in the methodology "Quantification of GHG Emissions: REDD+ Projects - BCR0002" are taken into account.

13.2.1.1. Carbon pools

Taking as a reference the carbon pools established in the IPCC Good Practice Manual (2003, 2006) and the AFOLU Sector Methodological Document Quantification of GHG Emissions: REDD+ Projects - BCR0002, the following pools will be taken into account for the estimation of changes in carbon stocks.

Table 32. Carbon pools applied to REDD+ project areas.

CARBON POOL		WHETHER SELECTION	JUSTIFICATION/EXPLANATION
Abovegro und biomass	Aboveground biomass Arboreal vegetation	Yes	Considering that it is the deposit that suffers the greatest change as a consequence of anthropogenic activities.
	Aboveground biomass Non-tree vegetation	No	The final use of the soil (after the change) does not consist of the establishment of permanent crops.
	Belowground biomass	Yes	Its total value is representative in carbon stocks, taking into account roots larger than 2 mm in diameter.

Dead Organic Matter	Deadwood and litter	No	Its total value is not representative in carbon stocks.
Soils	Soil organic carbon	Yes	Taking into account carbon sequestration in mineral and organic soils in the project area is representative.

Source: Fundación Cataruben.

13.2.1.2. Sources of emissions

The emission sources and GHG associated with forest areas for REDD+ activities are presented in Table 33.

Table 33. Emission sources and GHGs applied to project REDD+ areas

SOURCE	GHG	WHETHER SELECTION	JUSTIFICATION/EXPLANATION
Burning of woody biomass	CH_4	Yes	Emissions will be taken into account if fires occur in the project areas during the monitoring period.
	N_2O	Yes	Emissions will be taken into account if fires occur in the project areas during the monitoring period.

Source: Fundación Cataruben.

13.2.2. Temporal Limits and Analysis Periods

The initiative began Removal Activities and GHG reductions at the end of June 2017, determined an accreditation period of 20 years, concluding in June 2037. The beneficiaries signed letters of intent as a sign of commitment to improve crop establishment processes and generate actions to ensure biodiversity conservation and maintenance of the areas included in the initiative. The quantification and monitoring period of the reductions/removals presented in this report is 2017 - 2021.

13.2.2.1. Historical period of deforestation

To estimate deforestation (reference regions and leakage areas), the historical average method was used. As inputs, the "non-forest forest" maps for the period 2005 - 2016 provided by the SMByC were used, complying with the use of national data sources as established in the methodological document "*Quantification of GHG emission reductions from REDD+ projects*", Section 13.2.

13.2.2.2. Estimated emission reductions

According to the methodology, the project's emissions reduction estimate corresponds to the period of quantification of removals and reductions of GHG emissions, in order to request the issuance of Verified Carbon Credits (VCC). Therefore, the GHG emissions reduction estimate contemplates the following periods:

- Crediting period: June 9, 2017 - June 9, 2037.
- REDD+ verification period: September 29, 2017 - December 31, 2021.

13.3. Identification and description of the baseline scenario

The BCR STANDARD establishes that the baseline represents the GHG emissions that would occur in the absence of a GHG mitigation activity, so that they comply with the methodologies applicable to the initiative. Regarding the additionality criterion, the methodologies define it as the effect of the project activity to reduce anthropogenic GHG emissions below the level that would have occurred in the absence of the GHG mitigation initiative or project activity.

To determine the project baseline scenario, criterion C (changes in carbon stocks at the project boundaries, identifying the most likely land use, at the start of the project) was selected and the guidelines of the BCR GUIDELINES, Baseline and Additionality Tool version 1.1 were followed.

13.3.1. Step 0. Project Start Date

The project start date is from June 9, 2017, and from September 29, 2017 the execution of REDD+ activities and conservation actions begins in order to avoid deforestation of forest cover, which together translate into removals and/or effective GHG reductions. Additionally, the organization's documentary system is supported 2.1.1.4 Inicio de actividades y Documentos de vinculación propietarios, which include the planning and initiation of the project and correspond to the project initiation act Acta inicio de actividades, letters of intent, Cartas de Intención, field logs and attendance records, Soportes de implementación de actividades and activity execution form,

In addition to the above, Fundacion Cataruben's presence in the territories is demonstrated through the consultancy contract Contrato consultoría executed with Fedecacao, which made it possible to meet with the different producers in the municipalities of Tame and Arauca.

13.3.2. Step 1. Identification of Land Use scenarios

The following is a description of the most common land use scenarios, which will be used for the development of the baseline through the following sub-steps:

13.3.2.1 Sub-step 1a. Identification of Probable Land Use Alternatives in the Project Area (Orinoco & Andina Region).

The Colombian Llanos Orientales have three landscape systems: the piedmont, the alluvial plains and the highlands. These areas belong to a macrosystem of global importance, whose topography allows

agricultural mechanization and land uses that require adequate management (Mora-Fernández et al. 2015). Seasonal savannas have the characteristic of retaining abundant water during the rainy season and presenting a deficit during the dry season, a phenomenon that allows the development of the region (IIAV, 1997). In recent decades, anthropogenic pressure has increased, and the region is expected to continue transforming into a livestock, agricultural, and oil-producing region in the future. The National Planning Department (DNP), in CONPES 3797 of 2014, established a goal for 2024 of having 780,000 ha destined for agricultural uses such as oil palm, rice, corn, cattle ranching, oil extraction, among others, and increasing Colombia's GDP by 0.4%. According to the Instituto Geográfico Agustín Codazzi, of the 25.3 million hectares that make up the departments of Arauca, Casanare, Meta, and Vichada, 9.4 million hectares have soils for some type of production (37.1% of the Orinoquia). About 15.9 % corresponds to soils and lands with a livestock vocation; about 4.02 million hectares have soils suitable for livestock; in the case of the agricultural sector, this accounts for 11.3 % of the total of the Orinoquía (2.8 million hectares) (Vargas 2022).

Considering the above, there are similarities between land uses in the Orinoquía and the Andina regions. The latter plays a strategic role in the country's economic development, as evidenced by population growth, the demand for natural resources and the expansion of the agricultural frontier. These activities generally promote a series of disturbances on ecosystems, expressed in the transformation of soil vegetation cover (Rudas et al., 2007). The main land uses are focused on agriculture, livestock, mining and the oil sector. Colombian soils vary according to the region where they are located; 85 % of the soils in the Andina region are humid, which allows livestock and agricultural activities to be more extensive and to be developed with optimal productive results (Tafur et al. 2014).

- Agricultural Sector (Agriculture and Livestock)

The agricultural sector has historically played an elemental role in the country's development, contributing to the growth of the Gross Domestic Product (GDP). However, in recent decades, difficulties in agricultural productivity, market access and quality standards, among other factors, have affected the sector's performance. Official statistics report that Colombian agriculture is far from regaining its share in the 1970s, which was close to 20% of GDP. Currently, the agricultural sector contributes about 6% to the national GDP. The growth of the agricultural sector has traditionally depended on the production of coffee and sugar, and in recent years, on the expansion of other crops such as fruit (avocado and pineapple), and the livestock, poultry and swine sectors (Ministry of Agriculture and Rural Development 2019).

According to official figures from IGAC (2012), of the 22.1 million hectares with vocation for agricultural use, Colombia only uses 5.3 million (24.1% of the potential). In addition, the country's agricultural potential is approximately 36.2% of the territory, where agriculture accounts for 19.3%, livestock for 13.3% and agroforestry and grazing for 3.55%. Colombia has an important productive potential that would ensure the country's food demand; thus, Colombia has sufficient land that, through territorial planning and management, can consolidate its food security (Malagón, 2002). Since the year 1990, an increase in the area planted in permanent crops has been observed, from 2,333,471 hectares to 3,339,278 hectares in 2016 representing 43.10% increase, mainly in African

palm, banana, plantain, banana, fruit trees and yam, associated with the opening of new markets internally and externally (Departamento Nacional de Planeación-DNP, 2016).

- *Orinoquía Region:*

The Orinoquia region is characterized by its high agricultural activity, which is focused on the main production of rice, oil palm, soybean and corn (mass consumption products); many of which are related to a wide variety of companies dedicated to their commercialization. For 2015, rice occupied the majority of the cultivated area with 136,207 hectares; in that year, 751,330 tons of rice were produced, which corresponded to 30% of the country's total production. The departments of Meta and Casanare accounted for 57.9% of total national rice production. The rice yield in the department of Meta in 2016 was 5,642 tons and in the department of Casanare it was 5,791 tons (FINAGRO 2014).

Palm oil production in Colombia generates an estimated value of 3.7 Billion pesos covering 160 municipalities in 21 departments in which the Orinoquia region stands out, where in 2015 it reached 524,435 tons of crude palm oil representing about 43% of the country's production. Meta and Casanare planted 36% of the total area, with a production of 30.1% of the total in Colombia, the yields in Meta were 2,675 hectares and in Casanare 4,492 hectares respectively. The differences in production are due to the quality of the soils in the region. Meta is the first national producer of oil palm (FINAGRO 2014; Ceballos et al. 2018).

In the case of livestock, of the 23 million head of cattle present in Colombia in 2015, 21.52% were found in the Orinoquia region. Traditionally, this region has been characterized by extensive cattle raising dedicated to meat production, exhibiting an orientation of 50% for beef, 40% dual purpose and 10% milk. Historically, the departments of Casanare and Meta have contributed the largest number of animals to the region's inventory, followed by the departments of Arauca and Vichada (Molina-Benavides et al. 2019).

- *Andina Region:*

This region has all types of crops, but the most recognized are: coffee, corn, corn, cacao, sugar cane, avocado, soursop, tomato, onion, among others. In addition, there are also flower crops and other products such as fique, rubber and palm oil. The Andina region accounts for 80% of the country's total coffee production, distributed mainly in the Coffee Axis (Caldas, Risaralda, Quindío, Antioquia, Valle del Cauca and Tolima) (Asohorfrucol, 2020).

Colombia has reported a 3% annual growth in the area planted with fruits and vegetables since 2010, occupying 1.06 million hectares in the last year. The departments with the largest crops are Antioquia, Tolima, Meta, Nariño, Valle del Cauca, Cundinamarca and Córdoba, which account for 53% of the area planted with fruit and vegetables in Colombia. National agricultural production presented an average growth of 4% and of this, fruit and vegetable production accounts for 24%, which is why it is considered one of the most relevant sectors in the Colombian agricultural sector (Asohorfrucol, 2020).

In Colombia, cattle ranching occupies the largest part of the agricultural sector. The area dedicated to cattle raising is nine times larger than agricultural production; it constitutes 67% of the value of livestock production and 30% of the value of agricultural production. It occupies 38.3 million hectares, and by 2010 the Colombian herd reached 24 million head of cattle, of which 58.7 % is dedicated to beef production, 35 % to dual purpose and 6.4 % to dairy (Gaviria et al. 2012). Livestock activity is predominant throughout the country; 27 of the 32 departments have a significant share. In the Andina region there are numerous valleys that allow for the development of livestock farming. Livestock production includes cattle (18%), sheep and pigs (12%), small animals (20%) and camelids (5% between wool and meat). The main livestock activity is found in Boyacá, Caldas and Risaralda, with other departments such as Santander, Antioquia and other producers, but in lower quantity and quality (Martínez et al. 2017). Production systems dedicated to livestock in general do not apply appropriate technologies that allow greater carrying capacity such as improved pastures, cutting and forage crops (Palacios et al. 2014).

Petroleum Sector

As in other production sectors in the country, oil extraction is mainly located in regions of the national territory such as the Andina and Orinoquía Regions, where greater activity is evident. Given the soil conditions and characteristics of the Orinoquía, the eastern plains are the area with the highest oil production in Colombia, specifically in the departments of Meta, Casanare and Arauca, which account for 74% of total oil production nationwide. The department of Meta produces around 46% of the national oil, where the country's main oil production centers are located: Campo Rubiales, Chichimene, Castilla, Ocelote, Avispa, Akacias and Quifa. In addition to Meta, Casanare also plays a fundamental role in the Colombian oil industry as it has oil fields throughout its territory, such as: Pauto Sur, Túa, Jacana, Floreña and Cupiagua; it is the department with the second largest oil production area in the country and covers half of the region's hectares. Although this region does not have the most representative production fields, it is still the one that leads the oil industry in Colombia, having in its territory 13 of the 20 main oil fields in the country, which produce two thirds of the total national oil (Cerquera-Losada et al. 2018; Peralta 2013).

Despite the above, it is noteworthy that the Andina Region also has relevant data regarding oil extraction. Oil production in this area is lower due to the fact that its geological and geographical characteristics are not the most suitable for this type of activity. However, in the lower areas of the region, such as some municipalities of Santander, Boyacá, Tolima or in the territory of Magdalena Medio, there are areas and spaces suitable for this activity. Within the list of the twenty oil fields where 66 % of the country's oil is produced, the Andina region has five representative fields, which are: La Cira Infantas, Yariguí-Cantagallo, Moriche, Casabe and Guando fields (Cerquera-Losada et al. 2018; Peralta 2013).

Mining Sector

The mining sector in Colombia is particularly characterized by the production of coal, nickel, gold and emeralds. According to the UPME report published in December 2018 which relates to the second

quarter 2019 emerald production report published by the ANM, Colombia ranks second worldwide in emerald production. According to ANM figures (2018), Colombia ranks ninth in coal production, thirteenth in nickel production and eighteenth in gold production. Although mining activities in Colombia are mainly concentrated in the northern coast, due to the fact that large coal companies are located there, the National Mining Agency established through its work of Monitoring, Control and Inspection of titles, that mining is not concentrated in a single area of the country. Of the 9,602 mining titles in force in Colombia, 17% of them are located in different departments, 16.5% correspond to areas of Cundinamarca, 16% are in charge of the Governorate of Antioquia, 8% to the PARs (Regional Mining Attention Point) Ibagué and Cúcuta, which together account for 65% of the total number of titles. The remaining 35% is distributed in PAR Bucaramanga 7%, Cartagena 6%, Manizales 5%, Cali 5%, Valledupar 5.5%, Medellín 2%, Pasto 2% and Quibdó 2%. This demonstrates the high mining activity in the regions of interest (Boza & Montoya 2020).

- *Continuation of previous land use (prior to project)*

In the area of influence of the CultivO₂ Project of Fundacion Cataruben (Orinoquía and Andina regions), it was possible to determine (based on the activities and economic trends mentioned above) the loss of biodiversity and Greenhouse Gas (GHG) emissions due to deforestation, and transformation of natural ecosystems in a considerable manner. This is directly related to the activities described in Sub-step 1a, such as the expansion of the agricultural frontier, industrialization and extraction of fossil fuels and minerals in the regions of interest.

Taking this information into account, the Ministry of the Environment and Sustainable Development is working on a wide variety of conservation and crop management plans that not only make it possible to change unsustainable land uses in the regions of influence, but also promote the conservation of high mountain and eastern plains ecosystems. Minambiente together with entities in charge and focused on environmental preservation such as World Wildlife Fund (WWF), Latin American Association of Conservation and Wildlife Management, SQUALUS Foundation, CALIDRIS, ICA, Wetlands Foundation, National University, among many other entities, are betting in current and future years to increase actions to combat climate change.

Among the significant conservation-oriented projects, the Andean Forests - Building Well-being and Sustainability in Community project stands out. Andean forests contribute to reducing vulnerability and, at the same time, to mitigating climate change. Having this certainty is fundamental to understand the importance of integrating their problems into the development of management strategies and policies for sustainability, and thus achieve greater recognition and prioritization of work in mountain forests in the international debate on sustainable development. In this period, the Andean Forests Program (PBA), as a regional initiative facilitated by the HELVETAS Swiss Intercooperation - CONDESAN Consortium, contributes to the Andean population reducing its vulnerability to climate change and receiving social, economic and environmental benefits through its conservation (HELVETAS 2021).

The lines of action focus on public policy advocacy and financing, which not only seeks to scale up best practices and take advantage of the knowledge generated within the framework of the PBA, but also poses future challenges for the sustainability over time of the achievements harvested under the

program. This line of action seeks to generate attractive financing mechanisms for all the actors involved. Examples include BANCO2 in Antioquia, Colombia, or the Mechanism for Remuneration for Ecosystem Water Services (MERESEH), implemented in Apurímac, Peru (HELVETAS 2021).

Other projects of interest managed in the national territory refer to the National Plan for Migratory Species; National Program for the conservation of the endemic species of Colombia, the savannah skipper fish (Eremophilus mutisii) - 2017; Management Plan for the conservation of otters in Colombia - 2016; Strategy for the conservation of continental turtles in Colombia, among other projects aimed at the conservation of plant and animal species. Among these initiatives is the National Plan for Migratory Birds, this initiative allows the diagnosis and identification of actions for the conservation and sustainable management of migratory species of biodiversity in Colombia. The National Plan for the Conservation, Recovery and Sustainable Management of Migratory Species of Colombian Biodiversity was structured within the framework of the obligations established by Law 99 of 1993 and Decree 216 of February 2003 to the Ministry of Environment, Housing and Territorial Development, regarding: formulating and implementing policies, plans, programs, projects and regulations, with respect to the conservation, management, restoration and sustainable use of biodiversity and adopting the technical criteria required for the formulation of the necessary measures to ensure the protection of wild fauna species (Minambiente 2009).

In the case of Cacao, there is a document entitled GOOD AGRICULTURAL PRACTICES IN THE CULTIVATION, PROCESSING AND MARKETING OF CACAO (Theobroma cacao L.), Compañía Nacional de Chocolates S.A.S. (Compañía Nacional de Chocolates S.A.S.). According to FAO/WHO, good agricultural practices consist of the application of available knowledge to the sustainable use of basic natural resources for the production of safe and healthy food and non-food agricultural products, while ensuring economic viability and social stability. Such good practices allow improving the quality and safety of products; welfare for producers and the community; protecting the environment (minimizing negative environmental impact); improving production efficiency (organization and higher production at lower cost); achieving price differentiation when marketing the product; reducing pests and diseases in the crop (Compañía Nacional de Chocolates 2019).

- **Projects without certification of emissions reductions:**

This aspect is very likely to happen in several areas of the reference regions of the CultivO₂ initiative, since there is a lack of knowledge on the part of the entities regarding the operation of climate change mitigation projects and the steps that precede to certify GHG reductions and/or removals. Within the types of projects without certification the following were identified: Forced investment of no less than 1%, Mechanisms of payments for environmental services with destination to supplying watersheds and/or conservation agreements. Currently, several governments and mayors' offices in the departments focused on the project's area of influence are generating initiatives aimed at reducing and offsetting the carbon footprint through activities that are not certified by a certifying entity. These activities include not only those mentioned in this sub-step 1a, but also reforestation and conservation plans for natural parks or recreational areas. Although in many cases these initiatives include aspects of REDD+ activities, as mentioned above, they are not usually certified in terms of greenhouse gas emission reductions.

- *Probable land use alternatives:*

CULTIVO2 participants are distributed in eight departments: Arauca, Meta, Casanare, Casanare, Vichada, Caldas, Córdoba, Huila, and Santander.

The Orinoquia Master Plan (2016) formed by the departments of Meta, Arauca, Casanare and Vichada contemplates tourism as a potential economic activity in the region, taking into account the demand for nature tourism in the world. According to the World Tourism Organization (2002), nature tourism is all types of nature-based tourism, in which the main motivation is the observation and appreciation of nature, as well as traditional cultures. On the other hand, a study conducted by the newspaper La República (Colombia) reveals that traditional tourism products are giving way to nature tourism and that contemporary travelers favor privacy, freedom of movement, ecology, tranquility and wellbeing. In this sense, this represents excellent news for Colombia, as it is one of the most biodiverse paradises on the planet.

Over time, nature and culture have been considered endangered and/or at risk of disappearance/irreversible transformation. In this context, rural spaces and places of residence of non-Western cultures have become highly valued by urban and industrial societies. Indeed, these places are increasingly being considered as a reservoir where to find pre-existing values that have been swept away by modern urbanization and industrialization. Thus, nature tourism becomes another land use alternative in the CULTIVO2 project area.

The central region includes the departments of Huila and Caldas.

Huila has been a pioneer in the implementation of innovative models for biodiversity conservation, declaring the first national natural park in 1960, the Cueva de Los Guácharos National Natural Park. It currently has six regional natural parks, 27 municipal parks and 261 civil society reserves, which together account for approximately 21% of the territory, conserving 54% of the 31 identified ecosystems. In addition, the department is part of the Cinturón Andina Biosphere Reserve, one of five in Colombia.

Tourism as an economic activity has historically been identified as a productive commitment of the department, recognized by the forces alive, the productive sector, civil society and unions; Huila destination is now considered one of the most important in the country with a very positive projection at the international level, given its potential and strengths, which are based according to judicious technical studies in two main product axes: Culture and Heritage Tourism and Nature Tourism.

Caldas, allows us to appreciate in all its magnificence its natural values. Its geographical location in the center west of the country between the western and central mountain ranges and the valleys of the Cauca and Magdalena rivers where 27 municipalities are located, spaces full of life and hope that make Caldas a department of biodiverse contrasts. And most importantly, inhabited by creative, supportive and hard-working people.

It is an area of scenic landscapes characterized by high mountains, valleys and a profusion of rivers that provide water to the urban and rural population. It is the best place to host two ecosystemic icons that support tourism, agricultural and business projects: the National Natural Park of Los Nevados and a significant extension of the Coffee Cultural Landscape, declared by Unesco as a World Heritage Site.

Tourism is an important industry that is growing more and more in the region due to the quality of its people, the coffee landscape, its relief, the most mountainous in the country, the biodiverse cloud forests, its architecture, and its cultural and artistic richness.

In the Andina region, the department of Santander is characterized by river valleys and rugged terrain, including the steep mountains of the Chicamocha National Park. The park is known for its cable car that crosses the Chicamocha river canyon, in addition to its water park. The high-altitude town of Barichara is famous for its cobblestone streets and colonial architecture.

Santander has been betting on tourism as part of its competitiveness strategy, taking advantage of its environmental, climatological and topographical richness for the development of ecotourism and extreme sports, rescuing its cultural heritage and artisanal gastronomy, and developing an outstanding industrial and business platform that opens up important opportunities for business tourism.

13.3.2.2. Sub-step 1b. Consistency of Land Use Alternatives with Applicable Laws and Regulations (Orinoquía & Andina Region).

The land use alternatives identified in the previous sub-step comply with all the legal and regulatory requirements of national and sectoral policies applicable to the project activities; however, the production techniques are not appropriate for the Orinoquía and Andina regions, causing the transformation of the strategic ecosystems located in these regions due to the excessive use of agrochemicals, contamination of water sources and GHG emissions.

It should be noted that Colombian constitutional regulations establish in articles 64 to 66 that the essential purposes of the State include guaranteeing conditions that allow the rural population to promote their social and economic wellbeing, protecting national food production in order to ensure food sovereignty by prioritizing the integral development of agricultural activities, agricultural, livestock, fishing, forestry and agro-industrial activities, guaranteeing compliance with the social and ecological function of land ownership and agricultural resources, the adequate use of the country's soils, and the social and ecological management of property.

- **Agriculture and Livestock Sector (Agriculture and Livestock)**

Taking into account that Colombia has significant lags in agricultural, livestock and extensive livestock production yields, in 2019, the Ministry of Agriculture and Rural Development in alignment with the National Development Plan "Pact for Colombia - Pact for Equity", with the recommendations of the Organization for Economic Cooperation and Development (OECD) for the country and the strategies of the Framework Implementation Plan of the "Final Agreement for the Termination of the

Conflict and the Construction of a Stable and Lasting Peace", regarding point one of the Comprehensive Rural Reform, created the Agricultural and Rural Development Policy for the four-year period from 2018 to 2022, which seeks to promote productive transformation, agricultural competitiveness and rural development, promoting adequate conditions for the provision of goods and services, investment, innovation, entrepreneurship and agro-industrial development for the generation of opportunities for well-being and greater equity in the rural population.

- **Mining Sector**

Article 332 of the Colombian Constitution (1991) states that "the state is the owner of the subsoil and non-renewable natural resources", in accordance with Article 5 of Law 685 (2001), which extends the ownership of mining resources to minerals of any kind and location, lying in the soil and subsoil, even if the ownership, possession and tenure of the land is held by public entities, private individuals, communities or groups.

There is relevant and oriented information on technical, economic, legal and environmental aspects of mining, such as;

Decree 1666 of 2016 when defining subsistence mining, not only defines it as the activity of mineral extraction to subsistence miners who meet the conditions described in the same decree, but in turn should be understood as enabled to develop the other activities of the chain that makes up the mining industry, by systematic and harmonious interpretation of the norm. In this sense, transportation and commercialization activities for subsistence miners are authorized by law.

In terms of mitigation, with respect to the oil and mining sector, the Ministry of Mines and Energy will incorporate the actions and guarantee the conditions for the implementation of the following measures:

1. The diversification of the national energy matrix and the transformation of the Non-Interconnected Zones (ZNI), through the dynamization of electricity generation and self-generation through Non-Conventional Renewable Energy Sources (FNCER), as well as the increase in coverage for the provision of electric power service, through the use of reliable technologies with a lower emission factor or its integration to the National Interconnected System.

2. In order to stimulate the conversion of coal to cleaner energies, the agents of the electric power and fuel gas chains may make new projects or expansions that imply an increase in demand viable." Article 8 Law 2169 of 2021.[3].

[3] Ley 2169 de 2021 La presente ley tiene por objeto establecer metas y medidas mínimas para alcanzar la carbono neutralidad, la resiliencia climática y el desarrollo bajo en carbono en el país en el corto, mediano y largo plazo, en el marco de los compromisos internacionales asumidos por la República de Colombia sobre la materia.

13.4. Additionality

CultivO₂ demonstrates additionality through a barrier analysis ..

13.4.1. Step 3. Barrier Analysis

The CultivO₂ climate change mitigation initiative faces barriers that:

a) Prevent or limit implementation of this type of GHG project; and.
b) Do not prevent the implementation of at least one of the likely land use alternatives.

In relation to the project activities, it is analyzed that the barriers that would prevent the implementation of the CultivoO2 initiative, if it will not contemplate participation in the carbon market, are: investment barriers, institutional, social conditions, those related to land tenure, ownership, inheritance and property rights, each of the aspects to be analyzed are detailed below

- *Investment barriers, inter alia.*

- *Debt funding is not available for this type of project:*

One of the main barriers to implement GHG projects is the lack of opportunities that exist in the Colombian market to obtain financial leverage, since these projects behave differently from the productive sector and/or any other sector, to support the above, it is necessary to evaluate the main means in the search for resources for climate change mitigation initiatives, which are of public or private origin and that especially for GHG projects suggest a critical role in their scope.

To this end, it is important to note that public entities do not represent a stable, governable and direct financing for the implementation of GHG project activities, given the institutional weakness caused by the deficit in the country's balance of payments, specifically during the period projected for the validation, verification and certification process of this project and its validity, as evidenced by the report on the behavior of Colombia's balance of payments published by Banco de La República (Sept/2021)[4] and the lack of political will, which is represented in the citizen's vision, by the high index of institutional distrust, according to the methodology and support of the Social Capital Barometer (BARCAS) in its latest study[5]. On the other hand, private financing sources mean having a strong financial and administrative muscle for both the organization that implements the project and the

[4]Banco de la República Banco de la República, (sept/2021), Informe del comportamiento de la balanza de pagos de Colombia. https://www.banrep.gov.co/es/informe-comportamiento-balanza-pagos-colombia

[5]El Barómetro del Capital Social (Barcas) es una medición que identifica dónde hay Capital Social y cuál es su nivel en Colombia. Para su cuarta publicación emite los siguientes resultados:https://contrial.co/bases-de-datos-capital-social-colombia/

beneficiaries that belong to it, forcing the possible implementers of GHG projects that do not comply with this financial support not to participate in actions that positively impact the environment and the project implementer to sectorize the community to benefit by its economic capacity but not by the environmental impact they mitigate.

At the same time, there is no evidence at the national level of financing strategies specifically for forestry activities "adequate for sustainable forest management, due to the fact that existing local resources cannot be applied to native forest management and forest plantations, This is due to a lack of operational mechanisms (such as a forestry bank or fund), as indicated in the document analyzing the forestry sector in the context of adaptation to climate change in the land use, land change and forestry sector in Ecuador for the year 2010[6], which is not very far from the Latin American and national context.

In addition, the conservation activities carried out by the owners of these Properties to guarantee the reduction of CO2 emissions and protection of the biodiversity they host, do not allow them to have a cash flow and therefore a profitability with which they can economically sustain their properties only for the implementation of these actions, This means that there is no internal rate of return, which reduces the possibility of leveraging financially with an external party, thus leaving open the alternative of implementing other types of activities that do not aim to mitigate climate change but represent profitability; In the case of access to debt financing for agricultural activities such as Cacao and Cashew with respect to the establishment of their crops, there are both private and public entities in Colombia that direct their efforts especially to this economic sector in order to boost its growth, however, the direction of these resources does not guarantee that they will be used to finance the establishment of the crops, However, the direction of these resources does not guarantee actions that reduce the emission of greenhouse gases due to the conservation of the biodiversity of these agro systems, so there is no monitoring and reporting of these activities by the entities that finance the debt, according to the criteria mentioned by the Ministry of Environment and Sustainable Development to identify lines of agricultural sustainability and green business[7].

- *No private capital is available due to the real or perceived risks associated with domestic or foreign direct investment in the country where the project is to be implemented:*

"In human activity there is a long list of environmental priorities that require large investments,

[6] Documento de análisis del sector forestal en el contexto de adaptación al cambio climático del sector uso del suelo, cambio de suelo, y silvicultura en el ecuador. Autor Antonio Viteri, Agosto del 2010.
https://d1wqtxts1xzle7.cloudfront.net/30236413/05_ecuador_nip_forestry_mitigation-libre.pdf?1390881517=&response-content-disposition=inline%3B+filename%3DSECTOR_FORESTAL_EN_EL_CONTEXTO_DE_ADAPT.pdf&Expires=1671783199&Signature=TBM0~JSyUE4hI8Qgx8drvcduJEPwSBHPfrlZgZa-G9g6DaxpKmA0ORYZCqX6jCJg5q-HPuYy1-3duTwzbRFzK1~QaraEwj1Xvl9qlbOrl1fpF4tNOeA5zG2n~90JtmIOvgmb0v2qRkkqbo6uF~wGDk3cZa4LrXjYbZK3XA2WL7SJKJqxxseaukDVvjMohtDqrlZwcnWguJmNpbrrtM2f3VlUjw3BZC-ffahU5Yad8bPaC3h3j38oqZfd6lEjvNXlovRxk0x6NEpb7EprJx1cfCvGJV903w60WQFSkzQSkPcN0f0Rj~mvWuh0b5vcYRTsYIQ4wXg3RYAgcDfqChqYJ4A__&Key-Pair-Id=APKAJLOHF5GGSLRBV4ZA

[7] Criterios para identificar los negocios verdes.
https://www.minambiente.gov.co/negocios-verdes/criterios-para-identificar-los-negocios-verdes/.

ranging from the atmosphere (to reduce greenhouse gas emissions), to local conservation of biological and genetic diversity", as stated by Droste, B. and P. Dogse in their article "Sustainable development in the role of investment[8]". However, despite the above premise, there is evidence of limitations in the implementation of the project in terms of the investment capital market at the national and international level; For example, with respect to the General Royalties System for the year 2021, only 8% of the country's resources were directed for the operation of the Ministry of Environment and Sustainable Development and 10% for the Ministry of Agriculture and Rural Development[9], hence those operating resources allocated for these sectoral ministries distribute the income in their different government programs, This does not guarantee 100% access to the capital market and in terms of foreign direct investment for the year 2021, there is no evidence of resources allocated to environmental issues according to reports from the Banco de la República (Evolution of the Balance of Payments and the International Investment Position January - September 2021, Monetary Policy and Economic Information - Balance of Payments)[10] and the quarterly report on total foreign direct investment in Colombia and by economic activity[11], so access to capital markets in domestic or foreign direct investment for this type of projects generates a high uncertainty, this is due to the country's economy, the security and political stability of the country, the transformation of soils, the extraction of raw materials that continue to affect climate change and at the microeconomic level the risks of permanence of the areas subject to implementation, the costs of validation, verification and certification, and the little knowledge on the subject by the private sector.

On the contrary, access to the capital market for direct investments in environmental issues is mostly driven by national and international investors, who inject a large amount of financial capital into activities that contribute to climate change, such as mining, unsustainable agricultural activities, oil extraction and its derivatives, among others, especially in protected areas or with large amounts of money in private properties, as are some of those enrolled in this project, so this barrier translates as an opportunity for the implementation of GHG projects through the financing of carbon credits and regarding the adaptation of the use of these ecosystems in sustainable productive and conservation

[8] El desarrollo sostenible en el papel de la inversión, Bernd von Droste.
https://dialnet.unirioja.es/servlet/articulo?codigo=576937

[9] Departamento Nacional de Planeación, Informe de ejecución financiera de los recursos asignados para el funcionamiento del Sistema General de Regalías (SGR) Bienio 2021-2022 (enero - diciembre 2021)
https://colaboracion.dnp.gov.co/CDT/Inversiones%20y%20finanzas%20pblicas/Documentos%20GFT/Informe%20Trimestral%20Enero%20-%20diciembre%20Bienio%202021-2022.pdf

[10] Evolución de la Balanza de Pagos y de la Posición de Inversión Internacional, Enero – Septiembre de 2021 Subgerencia de Política Monetaria e Información Económica - Balanza de Pagos.
https://www.banrep.gov.co/sites/default/files/ibp_ene_sep_2021.pdf.

[11] Inversión extranjera directa en Colombia - Total y por actividad económica, 2022.
https://totoro.banrep.gov.co/analytics/saw.dll?Go&Action=prompt&path=%2fshared%2fSeries%20Estad%c3%adsticas_T%2f1.%20Inversi%c3%b3n%20directa%2f1.1%20Historico%2f1.1.3%20Inversion%20extranjera%20directa%20en%20Colombia%20-%20Actividad%20economica_Trimestral&Options=rdf&lang=es&NQUser=publico&NQPassword=publico123

actions in the framework of local economic development[12] (Devisscher, Cronenbold and Coll, 2015).

It is also possible to analyze the lack of access to capital markets associated with foreign and national direct investment due to the lack of knowledge of the existence or not of investment mechanisms interested in working with communities of private properties that aim to implement reforestation and restoration activities or even the establishment of sustainable productive practices, which could bias the opportunity to access a diversification of markets, which determines a notorious barrier to investment indirectly.

- *Lack of access to credit:*

Even though in Colombia there are special lines of credit with interest rate subsidies demanded by the government that target agricultural sustainability and green businesses, their financing does not frame the fulfillment of GHG project activities such as those cited by the CultivO2 initiative, given that the functionality of these credit options seeks to sustain the establishment of the crop and/or the inclusion of sustainable practices to a lesser extent, so that the protection of biodiversity in these agrosystems does not prevail over productivity indicators and economic profitability forecasts, In addition, because financial entities seek to reduce the risk of their financial capital, they do not support applications that do not demonstrate sufficient solidity to respond to the medium and long term obligation, even when there are subsidiary rates, thus avoiding a sinister portfolio, so they look for figures that support the loan, such as co-debtor, credit history, gross equity, cash flow, financial projections based on financial modeling, documents of title, among others; On the other hand, the increase of usury percentages in Colombia have had an increase of up to 36% by interest rate for the year 2021, reducing the ranges of financial sustainability for the borrower in the short term; on the other hand, the lack of knowledge of a correct financial evaluation can lead to bad debt decisions and therefore not give sustainability to the implementation of GHG projects as well as to the owners who wish to finance their conservation activities.

Thus, there is clear discrimination in accessing credit due to these systemic barriers of the banking system; additionally, the time, conditions and behavior of the projects in terms of operability and guarantee in the permanence of the areas subject to conservation slows down the implementation of GHG projects in economic terms, even though it is clear that this type of project demands a substantial increase in income to ensure the conservation of ecosystems and the biodiversity found there.

- *Institutional barriers, inter alia.*

CultivO2 P1 takes into account the presence of institutional barriers related to changes in government policies or laws, as well as the lack of enforcement of forestry or land-use legislation.

[12] Barreras, fortalezas y oportunidades para la adaptación basada en ecosistemas. Rumbo a la implementación de acciones piloto en el BMCh, Tahia Devisscher, Romy Cronenbold, Monica Coll Besa, 2015.

In order to better understand this context, it is important to define what is meant by institutional barrier. In the first place, the term "barrier" refers to an obstacle to the exercise of the fundamental right to citizen participation. A barrier is usually present when: i) there is an unjustified interference in the exercise of the right through regulation; ii) the State's duties to respect, ensure, protect and promote are ignored; and iii) the scope of universality and expansiveness of the principle of participation inscribed in the model of the social rule of law is violated (Montoya and Villegas, 2021). On the other hand, when we speak of citizen participation we are talking about a constitutional right that facilitates the intervention of citizens and stakeholders in public management, allowing social control (monitoring and evaluation of public policies), dialogue, access to information and continuous improvement; this in function of achieving the recognition to participate, associate, demonstrate and be heard by the state, in accordance with the provisions of the Universal Declaration of Human Rights and national legislation in force.

One of the most important commitments that the State has with the right to participation is to ensure that the freedoms of citizens can be exercised without any kind of interference by the authorities or private individuals. In this sense, from the CultivO₂ initiative, the project developer is respectful of these determinations and legal provisions, for such reason, within the framework of the development of the project activities, the full and effective participation of the communities is guaranteed, as well as transparency and access to information.

The CultivO₂ initiative also evidences in the exercise of its development, the compatibility and consistency of its implemented actions with the applicable national legal regulations. Likewise, it identifies and verifies the different international agreements and/or conventions signed by Colombia, as well as their compliance within the framework of current national forestry policies, programs and plans.

Specifically, the barriers identified have regional, departmental and municipal variations, but they share, in general, the same scenario of institutional weakness and little presence in the territories. The above is evidenced in the departmental and environmental authorities' diagnoses, which recognize, among others: (i) the limited investment and lack of promotion in regional forest management (DNP, 2018 - p25), (ii) the deficit of information on all links in the chain that represents a major difficulty to correctly understand the functioning of the sector to plan, attract investments and fight against illegality (DNP, 2018 - p.59), (iii) the weak participation of forest chain actors, including producers, in events related to timber and non-timber forest products (DNP, 2018 - p.59), (iv) the lack of clarity in forest sector policies and resolutions, which leaves the matter to the interpretation of each one and results in uncertainty for the forest sector (DNP, 2018 - p.28), (v) the lack of infrastructure, institutions, and suppliers in peripheral areas which evidences a model of geographic distribution with insufficient intermediary poles and results in high production costs (DNP, 2018 - p. 49), (vi) informality in the sector of micro-enterprises participating in forest harvesting (DNP, 2018 - p 84), (vii) some companies do not comply with decent work conditions, this implies that there is lack of social security and social benefits, job uncertainty and instability, low pay, disrespect of labor rights, gender discrimination, informality, among others (UPRA 2016 - p 86), (viii) workers have little training in better forest management practices, (ix) limited circulation of scientific or official publications on

the sector (DNP, 2018 - p 89), (x) the traditional forestry market is selective which produces greater pressure on few forest species. Likewise, (xi) there is unfair competition from illegal extractors that encourages bad practices without sustainable forest management, and on the other hand, (xii) the presence of weak mechanisms to verify the provenance of timber, a fact that does not allow for accurate monitoring from logging areas.

This panorama of institutional barriers presents institutional challenges related to regulations, monitoring and sanction capacity, and the investment required for these processes. The management of the initiative takes into account the applicable forestry legislation in accordance with the nature of the project and the ecosystems that converge in it. One way to corroborate the project's response to the institutional barriers present is by demonstrating compliance with the safeguards attached to this document in order to demonstrate the response actions implemented.

- *Barriers due to social conditions, inter alia:*

There is a close relationship in the processes of anthropic pressure on the eastern Andina and Orinoquía regions. The very history of the contemporary settlement of the Orinoquía dates back to the displacement of successive migratory waves that, since colonial times and with greater intensity throughout the 20th century, generated the appropriation of wastelands in the foothills and the coexistence of different forms of land tenure: possession lots, cattle ranches, houses in municipalities and the subsequent growth of cities and their networks of commercial exchange and services (Chaparro, 2021). However, pressures on land are different depending on the demographic density, the productive vocation of the region, its geographic location, its relationship with the internal national conflict and its dynamics with the centers of administrative, commercial and industrial power.

Therefore, in order to provide a documented context for the analysis of the social barriers that would prevent the implementation of the project, if it were not carried out from the perspective of the carbon market, a departmental review was carried out that gives an account of the local background that determines the concrete conditions in which Fundacion Cataruben implements climate change mitigation and conservation activities.

For the case of the department of Arauca, it is found that population pressure impacts about 30% of the territory, due to land use conflicts, due to overuse, especially in the Arauca foothills, in the territory of the municipality of Tame (UniLlanos, 2016). Regarding the social conflict present in the department, it is necessary to highlight that of the nearly 270 thousand inhabitants reported by DANE, 103 thousand are registered as victims of the armed conflict, with the presumption that 45 thousand more are off the registry (Truth Commission. 2020). Armed actors such as the ELN, the EPL, the FARC-EP and the paramilitaries of the Catatumbo and Vencedores de Arauca blocks have disputed their participation in extractive economies, in drug trafficking scenarios and even considering local political and electoral results as bureaucratic spoils (Truth Commission. Website). The municipality of Tame is considered along with five others in the country "places of historical affectation by these artifacts" (CNMH, Fundación Prolongar. 2017). Regarding the widespread illegal practices related to deforestation, in the department of Arauca there is a chain that, from logging for

timber sales, leads to the depletion of ecosystems that harbor fauna and flora, increasing their vulnerability (Corporinoquia, 2020a). In this sense, there are coordinated actions between the environmental authority and the security forces aimed at seizing about 127 m3 of illegal timber by 2020 (Corporinoquia, 2020b). Regarding the lack of skilled labor, in 2018 the department was considered, among 27 departments, the last in competitiveness, with more than 23% of the economically active population unemployed, with the additional situation of an increase in unskilled labor due to Venezuelan migration (CPC, 2018). Completing the departmental panorama, and of its capital of the same name, is the weak organization of local communities, due to various factors, such as the same historical conflict and, at times, low participation discouraged by socioeconomic factors, as described in the Diagnosis of the Development Plan 2020-2023 "Así Todos Ganamos" (Municipality of Arauca, 2020).

For the department of Casanare, it has been noted that demographic pressure due to livestock, agriculture, mining and hydrocarbon activities leads municipalities to face serious environmental problems both in piedmont areas and in the lower parts of watersheds to which their natural use has been transformed (Corporinoquia, 2013). Regarding the social conflict in the department, it is evident that, even recently, the early warning system of the Ombudsman's Office warns of the return of self-defense groups in order to combat the expansion of dissident factions of the former FARC-EP and ELN guerrillas (Ombudsman's Office, 2021). On illegal practices related to deforestation the environmental authority estimated that more than 925 m3 of timber were mobilized between the years 2010-2015, increasing the vulnerability or danger of extinction of a large number of species (Gobernación del Casanare, 2017). Regarding community organization, the same grassroots organizations recognize in the diagnosis of the COMMUNAL AND COMMUNITY PUBLIC POLICY OF CASANARE that they need strengthening because they do not know the functions to be developed, the lack of management and leadership skills and the need for empowerment of youth and women (Gobernación del Casanare, 2016).

The department of Meta is the one that, due to demographic pressure on the land, contributes the greatest amount of CO2e emissions (51.7%) in the Colombian Orinoquía region (Fundación Grothendieck, 2021), especially due to the focus on cattle ranching, oil extraction and agricultural production as priority land uses. The internal armed conflict in this department is established by the territorial power dispute between the different illegal armed groups and the State's military force. The National Information Network of the Victims Unit estimates that, between 1984 and 2018, 239,638 people have been expelled from the 29 municipalities that make up the department of Meta (Observatorio del Territorio. UniLlanos. 2020.) About illegal practices related to deforestation it is found that while in 1997 there were 3,619,466 ha of Forest, by 2017 these were reduced to 3,044,124 ha, which indicates a loss of forest of more than 15% or 575,341 ha in 20 years (Reza, 2022). Additionally, it alerts the IDEAM in its 2018 deforestation monitoring that this year the department had the largest increase in deforestation with more than 8 thousand hectares devastated (IDEAM, 2018). Another social barrier scenario starts from the analysis of the labor force that, according to the labor market report, places Meta, along with two other departments, in the places with the highest unemployment rate, reporting that out of 414,000 available workers, nearly 91,000 are unemployed (DANE, 2021)

Vichada is a department of the Colombian Orinoquía where demographic pressure on the land has led, in the last 32 years, to a transition from natural forests and savannas to crops and pastures for livestock production, with a documented loss of 60% of forest cover. These changes were mainly guided by institutional policies that promoted land occupation, monocultures and forest plantations of non-native species (Vitar-Mendoza, et al. 2022). In terms of social conflict, the Ombudsman's Office has established in its early warning system that there is a structural risk due to the confluence of violent actions coming from ELN threats, FARC dissidents and paramilitary successor groups that violently subjugate the population. Additionally, in 2022, 936 people from 277 families were forcibly displaced to Puerto Carreño (Defensoría del Pueblo, 2022). In terms of deforestation caused by illegal practices, Vichada is one of the departments with the most trees cut down in the country for timber exploitation and land use changes (IDEAM, 2021). In an analysis of employability, it is found that there are high rates of informality and labor precariousness, especially among the young population, due to the limited opportunities for diversification of economic activities (Pacto por la Juventud, 2021). The above is framed in the context that the department is frequently located in the last places of competitiveness at the national level (CPC, 2022). Regarding the installed capacity of local organizations, there is a lack of an associative model to strengthen collaborative work between small, medium and large producers (Gobernación del Vichada, 2020).

In the last three decades the department of Huila has reduced its forest area by more than 30%, going from having 7,000 km2 in 1990 to having 4,776 km2 in 2017. This is mainly due to anthropic pressure due to population growth and agricultural production, resulting in ecological disconnection, loss of species and transformation of areas (Gobernación del Huila, 2019). Also, due to its strategic location, the department connects the center with the south of the country, being the crossroads of four strategic corridors: the Sumapaz, the northern Amazon, the southern Amazon and the Pacific corridor. This nodal position has turned the department into a scenario of struggle of illegal forces for territorial dominance, leaving at least 192,000 victimizing events in its wake, according to the Single Registry of Victims (Truth Commission, 2019). In line with this situation, the Administrative Unit for the Attention and Integral Reparation of Victims (UARIV) reports that as of 2016, more than 170,000 people are recognized as victims of the armed conflict in the department (Gobernación del Huila, 2016). On the other hand, illegal practices related to deforestation have remained active, with 17 arrests for environmental crimes in 2021, which led to the seizure of more than 148 m3 of timber, as well as the seizure of vehicles and machinery used in illegal mining (MinDefensa, 2021). Regarding the labor force in the department, it is noted that employability has been affected by the pandemic, which forced at least 40% of employers to reduce their workforce (Red ORMET, 2021). Another notorious affectation is noted in the case of young women and in rural areas (Diario del Huila, 2021).

Caldas is a department of the Andina region, located in the central mountain range of the country, on which high pressures on soils have been exerted since the time of the so-called Antioquian colonization due to deforestation and modification of agricultural areas (Valencia, 2017). In recent decades, however, this pressure has increased considerably. Studies indicate that in the period 2000-2010 and 2010-2014 there were high rates of deforestation due to agriculture and cattle ranching with area losses over 37% (Rey-Valencia et al, 2021). Particularly, for the year 2020, in the municipality of Victoria, alarms have been generated by logging and burning of vegetation in about 20

hectares (Diario La Patria, 2020).

Córdoba is a department located on the Colombian Atlantic coast that has expanded its agricultural frontier by eradicating its forest areas for agriculture and cattle ranching. This has occurred especially in the regions of the San Jorge River basin and in the Paramillo node, due to anthropogenic influences such as uncontrolled growth of urban areas, change of land use, modification of vegetation cover, deforestation and inadequate surface water management (POMCA, San Jorge River. 2015) (IDEAM,2017) (IDEAM,2017). Additionally, illegal deforestation practices have had an impact on the selective extraction of timber, affecting the different forest cover (CVS, 2017). On the other hand, the dynamics of the social and armed conflict in the region have affected the civilian population, especially ethnic and peasant communities, of which more than 380,000 have suffered forced displacement and mobility restrictions (OCHA, 2022). In the labor aspect, there is a perceived need for training and labor formation for strategic sectors, which generates a lack of productivity due to a shortage of qualified and certified workers (MinTrabajo 2016). Regarding local organizations, there is a diagnosis of weakening due to the conflict, leading to low community participation and the need to strengthen leadership issues (CNMH, 2017). In addition, there are alerts for systematic persecution of social and environmental leaders (Colombian Commission of Jurists, 2019).

The above social panorama of the departments and regions of Arauca, Casanare, Meta, Vichada, Huila, Santander, Caldas and Córdoba, participants in the CultivO2 initiative, documents the existence and magnitude of social barriers, with local nuances and variations, but with the common indicator of having suffered their population from the Colombian internal conflict, having employability difficulties and generating impacts on their ecosystems due to deforestation and land use change, product of these social situations.

- *Barriers relating to land tenure, ownership, inheritance and property rights, inter alia.*

- Land ownership, with a hierarchy of rights for different stakeholders, limits the incentives to undertake the project.

Ownership is a right that is acquired according to the existing legal mechanisms in our Colombian regulatory framework. Indeed, there are legal figures such as possession and occupation (vacant property or state property) regulated by the civil code that, also, grant rights proper to a person who is an owner. Thus, as far as the Project is concerned, there is no hierarchy of rights for the owners of the carbon, but rather the quality of tenure held by each beneficiary at the moment of being enrolled in the project and enjoying the benefits derived from the contractual scope within the framework of the initiative.

The barrier materializes when the quality of owner, possessor or holder is not met, for which the project owner provides advice and assists the person to initiate the necessary procedure in order to acquire the quality to which he/she is entitled according to the provisions of the Colombian Civil Code, Law 160 of 1994 and other concordant norms.

- *Lack of land tenure legislation and regulation, adequate to support tenure security:* The legal framework that defines property rights in Colombia is well defined and the actors involved in it will be fully identified; however, at present there are amusing problems of informality. There is a high percentage of informality in land tenure because the holders do not have a registered title or inventory in the registry of public instruments. This is largely due to a high degree of ignorance among the population about the different types of land rights, their implications and the importance of formalizing property rights in the public registry of public instruments and in the cadastral information base.

- *Absence of clearly defined and regulated property rights in relation to natural products and services:* As mentioned in literal a, the project holder, prior to enrolled a real estate property to the initiative and within the framework of the provisions of Resolution 1447 of 2018, makes a study and analysis of ownership and tenure of the land and, therefore, of the rights held with such prerogative. Thus, by having legal certainty of the quality that the beneficiary has, it is possible to determine on whom the ownership of the carbon falls and consequently, the legal capacity to dispose of the use and enjoyment of the land.

- *Formal and informal tenure systems that increase the risk of land fragmentation:* There are different situations regarding informality in the exercise of land tenure, such as: **a.** Lack of liquidation of inheritances when the previous owner remains in the cadastre and registry, requiring the adjudication of the properties to the heirs. **b**. It is necessary for the occupants to carry out the necessary legal procedures for the land use and enjoyment of the land. **c.** The occupants of the land are required to make a legal declaration of ownership of the land. **d**. The land must be registered in the land registry. e. The land must be held in the land registry. It is necessary that the occupants carry out the proper process for the adjudication and are incorporated both in the cadastre and in the registry of public instruments.

13.4.2. Impact of Project Registration

The certification and registration of the project, and the associated benefits and incentives derived from this, diminish the impact of the identified barriers and thus, demonstrate that the project is carried out for the estimated accreditation period.

The benefits and incentives are as follows:

1. Net anthropogenic greenhouse gas removals by sinks: The CultivoO2 project manages reductions and/or removals by avoiding deforestation of Forest areas; efforts that translate into tCO2 removed per hectare, which guarantees net anthropogenic greenhouse gas removals and finally access to economic benefits from the sale of carbon certificates in the regulated and/or voluntary market, as an effective mechanism to avoid land use change and deforestation of forest cover.

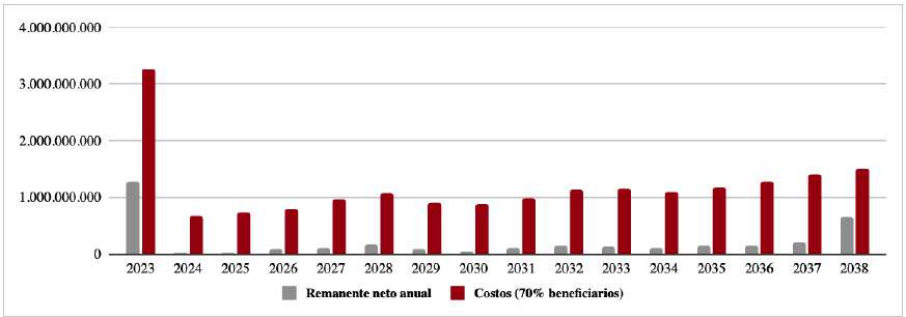
2. Revenue's financial benefit from the sale of CVVs including its certainty and predefined timing: To facilitate the delivery of economic benefits to landowners that contribute to the prevention of deforestation, as well as the restoration and conservation of ecosystems in the project area, it is

essential to start with a financial analysis. This analysis covers the project monitoring period, which includes the initial investment required, as well as the action window, which is the period in which greenhouse gas (GHG) reductions and/or removals are quantified. In this way, we can project the financial situation from 2017 to 2037, taking into account the verification and certification processes. In addition, we cover the period from 2023 to 2038, during which the project will generate revenue through the sale of carbon certificates.

Financial planning is carried out using a financial model tool, where aspects such as macroeconomic projections, investment items, costs and expenses are detailed, and the CCV inventory is projected according to the quantification analysis, thus establishing the income to be generated. It is important to note that since this is a predominantly social project involving small producers, it is not feasible to carry out a separate financial analysis for the removal Activities component and the REDD+ activities. Therefore, the financial analysis encompasses both components in a unified manner, establishing a basis for determining results through subsequent calculations, shown below:

- Income statement:

Graph 12. Economic performance of the project during its marketing cycle and sale of carbon certificates.



Source: Fundación Cataruben.

Graph 13 represents the economic performance of the project during its life cycle, showing a positive financial behavior both for the beneficiary (red-brown color), thus financing the project activities, and for the sustainability of the project (gray color), with high peaks in years such as 2023 and tendentially increasing from 2024 onwards, which shows sustainability and eliminates a scenario of financial losses.

- Cash flow: :

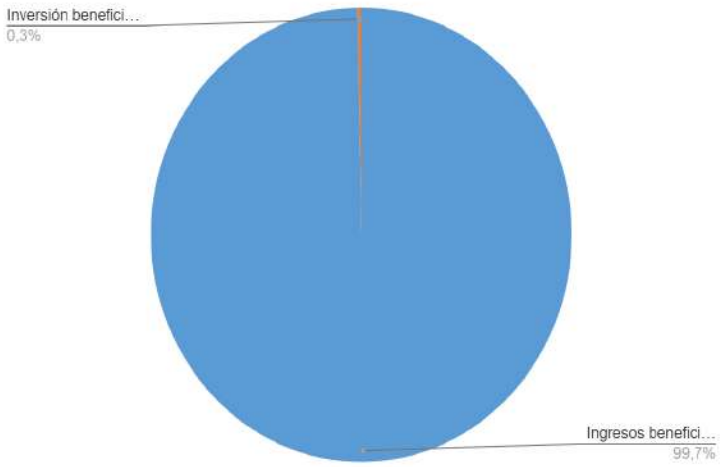
Graph 13. Project liquidity over the life of the project.

Source: Fundación Cataruben.

As in Graph 12 of the income statement, Graph 13 shows optimistic figures for the Cultivo2 Project, evidencing a financial projection with a positive net cash flow, i.e., once the total expenditures are projected with respect to the total income during the execution period, it can be concluded that there is sufficient liquidity and solvency to give continuity and sustainability to the development of this project.

Thus, the economic benefits generated by the sale of carbon certificates as a consequence of the possible non-deforestation and the restoration of the project's ecosystems, generate sustainability for the beneficiary, since, of the total paid as financial benefit, the CultivO2 beneficiaries only invest 0.3% in the project income investment value is made only once during the project validation period, returning 99.7% for the project activities, as shown in Graph 14.

Graph 14. Initial investment of beneficiaries in the Cultivo2 Project



Source: Fundación Cataruben.

Table 34. Beneficiary's investment in the project

		PRICE PER HECTARE	TOTAL HECTARES PER YEAR	TOTAL
Beneficiaries	**Forest**	$28.000	1.787	$ 50.036.560
	AR	$4.300	2.023	$ 8.697.352

$ 58.733.912	**Total, investment**	0,3%
$18.893.821.800	**Total, remuneration for sale of carbon certificates 70%**	99,7%

Source: Fundación Cataruben.

The above is supported by the estimated financial model for the project, based on the investment period and future monitoring of the initiative (2.1.5.2. Modelo financiero del proyecto).

3. *Attracting new stakeholders that provide the ability to implement a new technology/practice,*

The outlined project is articulated in a series of multifaceted strategies that seek to address and overcome the various barriers identified.

Through the implementation of training and accompaniment processes, institutional and social barriers are significantly addressed, and to a lesser extent, investment and land tenure barriers. Trainings designed to transfer knowledge crucial for sustainable land management play a vital role in preventing illegal practices and cultivating a culture focused on conservation. In addition, building a solid foundation in land planning can open doors to credit and market opportunities, while facilitating the enforcement of regulations pertaining to sustainable land tenure and use.

Identifying and adopting the principles of forest governance is a strategy aimed primarily at removing institutional and social barriers. By promoting sustainable forest management, arbitrary deforestation is reduced, ensuring conscious and informed planning. This, together with land characterization and planning, simplifies land tenure issues, thus helping to better implement government policies and mitigating land conflicts.

Rigorous monitoring of terrestrial hot spots stands as a powerful tool to counter ecological and social barriers. By enabling early detection and control of forest fires, large-scale natural catastrophes that can generate social conflicts and significant deterioration of natural capital are avoided. This strategy also lays the groundwork for attracting investment focused on environmental preservation.

By generating early warnings of adverse changes due to deforestation, it facilitates overcoming institutional and social barriers. This activity promotes compliance with environmental regulations and encourages the preservation of nature, which will have a positive impact on both local

communities and the environment in general.

Constant monitoring of threatened ecosystems contributes greatly to the elimination of ecological and social barriers. Through such monitoring, measures can be taken to actively conserve vulnerable ecosystems, prevent social conflicts arising from environmental degradation, and maintain healthy natural capital, which is essential for future investments and community well-being.

Finally, participatory monitoring of threatened species with the active collaboration of local communities represents a firm step towards overcoming social and educational barriers. By educating and raising awareness among local people, not only does this promote a culture of conservation and respect for biodiversity, but it also lays the foundation for a better informed society that can successfully address institutional and investment barriers in the future.

The enrolled landowners are models of change that have the opportunity to generate an increase in their resources through the sale of CCVs, reflecting the implementation of project activities. The economic benefit is an incentive that attracts new stakeholders who in turn will be drivers of change in their territories by decreasing the different barriers identified in the "Barrier Analysis".

13.5. Causes and drivers of deforestation

Deforestation are two of the most important environmental problems we face today. Deforestation refers to the total loss of forest cover, often as a result of anthropogenic activities. Processes are caused by a variety of factors, including agricultural expansion, illegal logging, infrastructure construction, mining and hydrocarbons, among others (FAO, 2016).

Recognizing the amount and location of both processes is of vital importance for decision making at local, regional and national levels. However, understanding the anthropic dynamics that explain the phenomenon is the only way to design and implement policies, measures and actions that effectively mitigate their negative consequences on ecosystems and the population. In order to identify the anthropic activities that are carried out in the territory of the landowners and their influence on the environment, the detection and identification of the agents and causes of deforestation produced in the properties analyzed and that are part of the CultivO2 initiative is generated. The main objective is to describe these actions involved in the loss of forest cover and reduction of carbon stocks within these forest areas, which in addition to this, allows clarifying the implementation of policies to mitigate damage to ecosystems.

These evaluations were carried out taking into account the methodology proposed by the Institute of Hydrology, Meteorology and Environmental Studies (IDEAM): "Conceptual and methodological guidelines for the characterization of causes and agents of deforestation in Colombia". Specifically, the conceptual guidelines for a Medium Characterization Scenario (ECM) were implemented.

13.5.1. Spatial and Temporal Dimensions

The Andina region is one of the most important in the country in terms of biodiversity and natural resources. The Andina forests are home to a large number of unique plant and animal species, many of which are found nowhere else, and are considered one of the most important biodiversity hotspots in the world. Forests are also an important source of water for the region, acting as natural regulators of the hydrological cycle and helping to maintain river and stream flows throughout the year by preventing soil erosion (Rangel, 2015).

The Orinoquia region of Colombia is a region characterized by large plains and important rivers such as the Orinoco River. The forests of the Orinoquia region are especially important for species such as the jaguar and tapir, which depend on the forests for their survival. Forests are also home to many indigenous communities that depend on forest resources for their subsistence and culture (Rangel, 2015).

Deforestation are defined on a spatial and temporal scale; this part of the initiative is reported and delimited, and is established over a period of 10 years prior to the project start date, collecting with primary and secondary information the possible activities that cause deforestation in the forests in the specified area.

- Deforestation have these two scales, which must be characterized. In the case of the spatial scale, it was imperative to identify and study the location and extent of the deforestation process in the properties included in the CultivO2 initiative.
- As for the temporal scale, this allowed us to understand deforestation in terms of its behavior and historical background, its dynamics over time.

13.5.2. Context

The following is a description of the territorial, socio-cultural, economic and historical context, which allows us to determine the causes and agents of deforestation. This characterization contributes to a complete and adequate description of these aspects in the properties analyzed. This analysis implies recognizing and understanding the socio-environmental setting of the process, as well as analyzing its influence on the dynamics of the causes that generate the loss of vegetation.

- *Territorial context*

This context refers to the biophysical environment and the way in which societies relate to it; it provides evidence of land use and social interaction. Taking this premise into account, the reference regions are distributed among the departments of Arauca, Casanare, Vichada, Meta (Orinoquia biome); Caldas, Córdoba, Huila and Santander (Andina biome).

The population in these departments is estimated at approximately 530,9343 inhabitants for the year 2020. It is important to highlight that in the Orinoquia biome, about 29.57% of the inhabitants of

these departments are located in populated and dispersed rural centers (DANE 2018). For 2018, DANE reported that the departments of Casanare, Arauca, Meta and Vichada presented a population made up of 50.5% men and 49.4% women. In contrast to the Orinoquia biome, the Andina biome reported a population of 49.9% men and 50.0% women in the department of Huila; the department of Santander reported a population of 48.9% men and 51.0% women.

The project area, which is included in the Orinoquia biome of reference, is characterized by a great wealth of natural resources, mainly made up of two bioclimatic landscapes, the floodable savannah and the highlands. The floodable savannah (4.5 million hectares) predominant in the departments of Arauca and Casanare is an area dedicated to livestock (they contribute 7% of the country's livestock production); the altillanura (13.5 million hectares) of Meta and Vichada, has agricultural, livestock and/or forestry potential (Hernández, 2018). However, these landscapes have in common that they have large hydrocarbon reserves and whose exploitation since 1990 has been increasing; in the case of the inhabitants, they have destined their land, for the planting of oil palm, rice, rubber, soybeans and corn and other agricultural activities, taking advantage of the large extensions that characterize the Orinoquia region (Hernández, 2018). Considering the above, it is noteworthy that the accelerated population growth not only produces an increase in the urban area and these activities, but has caused the affectation of various ecosystems that function as wildlife habitats, highlighting 210 species of mammals, 682 species of birds, and the numerous environmental goods and services provided by the Orinoquia biome.

Considering the protected areas, in the case of the Andina biome, Huila is characterized for being the national leader in conservation and protection of strategic ecosystems through declared protected areas. There are about 612 thousand hectares in protected areas and conservation strategies that have been declared by entities, with an equivalence of 33% of the department's area. No human activity is permitted in these areas. In the south of Huila are the most recent zones declared by the Regional District of Integrated Management (DRMI). The Andina region is rich in biodiversity, due to the variety of thermal floors, where different ecosystems are generated, many of which are endemic; 16 Regional Autonomous Corporations are present in the region.

- *Socio-cultural context*

From the sociocultural point of view, agriculture has played a fundamental role in the country. In both developed and developing countries, it has been seen how agriculture has been the engine for the growth of other sectors. In this regard, the World Bank (2008) emphasizes that agriculture contributes to the overall development of nations in three ways: as an economic activity, as a means of subsistence and as a provider of environmental services. Evidence shows how agriculture is important for: reducing poverty, combating hunger, and ensuring food security for the world's population (Fan, 2011).

In this sense, agriculture has been betting on conservation, which is a sustainable production system with broad benefits for producers. This system benefits society, which can obtain higher quality food, with low environmental impact and even at better prices. The authors point out that this activity offers several benefits, most of them related to important ecosystem services, such as reducing soil

erosion, water and air pollution, increasing water infiltration, mitigating deforestation and reducing greenhouse gas emissions (Fan, 2011).

Currently, it is estimated that the number of hectares planted in the Andina and Orinoquia region increases every year, and with it the change in vegetation cover is accelerated, which brings with it the deterioration of natural ecosystems such as grasslands, morichales and gallery forests. Therefore, in addition to having information on the species present in natural ecosystems, it becomes relevant to know the species present in transformed ecosystems, such as agricultural crops to monitor the participation of society in the regions (Minagricultura, 2016).

For 2016, the Ministry of Agriculture reported 979,019 ha cultivated with oil palm, rice, sugarcane, corn, forestry, rubber and Cashew in the departments of Meta, Casanare and Vichada. The distribution of hectares by crop for these departments is: 429,038 ha. in oil palm, 168,639 ha. in sugarcane, 154,115 ha. in rice, 100,943 ha. in forestry, 90,420 ha. in corn, 2,711 ha. in rubber and 900 ha. in Cashew. The Department of Meta has the most cultivated hectares, with 6.51% (557,726 ha.) of its area planted in oil palm, sugarcane, corn, rice, forestry, soybeans and rubber; followed by the Department of Casanare with 6.39% (285,290 ha.) of its area planted in oil palm, rice, sugarcane, corn and rubber. The department of Vichada has 1.36% (136,002 ha.) of its area planted in forest crops, maize, sugarcane, oil palm and Cashew, and is the only department in the Orinoquia where Cashew is grown (Minagricultura, 2016).

Similarly, in the Andina region, agriculture is an activity of high economic and social relevance, one of the few that did not have a drop in 2020 on account of the COVID-19 pandemic. The growth of agriculture (0.4%) is surpassed only by public administration and defense (0.9%) and financial intermediation (3.3%) (Minagricultura 2021).

Accordingly, both the Andina region and the Orinoquia, have been characterized for being the pantry of a great variety of food products for the Colombian territory; crops such as Cacao, oil palm and Cashew, are of great socio-cultural importance in the country, as they are productive systems that contribute to the economy. Together with conservation agriculture, this practice contributes to the sustainability of the environment and a wide range of ecosystems. Socioculturally, these crops have allowed peasants to work with legal products and crops; this generates a favorable development of the agricultural sector, which not only reduces one of the most relevant problems in the country, such as drug trafficking, but also recognizes eligible areas for the conservation and promotion of biodiversity.

- *Economic Context*

The Andina and Orinoquía regions of Colombia include areas of great economic relevance where oil exploitation contributes to Colombia's development. The ecosystems present in these regions make them suitable for agricultural production, but above all for cattle raising, the main economic activity developed.

For the year 2009, the Bank of the Colombian Republic identified that about 45% of Colombia's Gross Domestic Product (GDP) is produced in the Andina region. Due to the fact that the GDP of the city of Bogota is equivalent to 55% of the region's GDP in 2007 (i.e. 25% of the country's GDP). Industry is the largest sector in this region, followed by services in general. The aggregate GDP of the

seven study departments is basically generated in the industrial sector (21%), followed by agriculture (13%). Services in general account for more than 20% of the region's production. Mining owes its weight to oil exploration and extraction activities in the department of Huila, which represent 24% of its GDP, while in Tolima it reaches 5% and in Boyacá 4%. In the other departments it does not exceed 2%. Agriculture represents 18% of GDP in Boyacá, but only 7% in Santander. In the other departments it varies between 13 and 16%. Industry is especially important in Santander (29%), Cundinamarca (23%) and Boyacá (18%). In Norte de Santander, Tolima and Huila it does not exceed 10% of value added (Banco de la República 2010).

Agriculture is currently one of the most important economic activities in the Andina region. This area is characterized by being purely agricultural; the climatic variety allows the production of a wide range of crops. The different natural conditions mean that each crop has its own specific location and climate. Crops vary according to the altitude where they are grown, since they have the following thermal floors: warm, temperate and cold. The cultivation of flowers also stands out in places such as the Magdalena Medio valley. Colombia is the second largest flower exporter in the world (Banco de la República 2010).

Cacao cultivation is one of the most important activities for the Andina region's economy. The region's production represents 6% of the world total. It involves more than 150,000 farming families throughout the region. Colombia is one of the world's largest producers of Cacao, reaching different places with this product. This product is a reference within the country, as it is planted in 29 of the 32 departments of the country. However, 77% of production is concentrated mainly in 6 departments: Santander (42.1%), Antioquia (8.8%), Arauca (7.6%), Huila (6.8%), Tolima (6.6%) and Nariño (5.5%) (Ministry of Commerce Industry and Tourism 2020).

Between 1990-2007, the Gross Domestic Product (GDP) of the Orinoquia grew rapidly from 4.1% to 5.9%, mainly due to oil exploitation in Arauca and Casanare. In 1999, the GDP of the Orinoquia departments grew an average of 6.4% annually. In the following three years, the situation changed as the Orinoquia economy contracted due to the deceleration of oil activity in Arauca and Casanare. Meta has had the largest economy in the region during the years under study, with the exception of the 1998-2003 period, when Casanare had a higher GDP. Throughout the period, Casanare had an average annual growth rate of 6.1%, compared to 3.9% for Meta and negative growth in Arauca (-1.3%). The economies of Arauca and Casanare have been marked by the oil bonanzas in recent years: in the former, its economy represented 31% of regional GDP in 1990, but fell to 12.8% at the end of the period (Banco de la República 2009).

Currently, Colombia is projected as the first country in Latin America in palm oil production. Its plantations have been expanding for several decades and are located mainly in the Caribbean region, Orinoquía and Chocó. Oil palm has been catalogued as one of the main drivers of deforestation worldwide, a crop that provides raw material to large companies for the production of various products such as cosmetics, soaps, cookies, biofuels, inks, margarines, detergents and chocolates. Colombia's Orinoquia is one of the regions where this crop is most common. According to Fedepalma, the department of Meta has 161,737 hectares of oil palm planted in 21 municipalities. In 2019, crude palm oil production in Meta reached 458,677 tons (30.03 percent of national production). For its part, Casanare has 57,794 hectares of oil palm planted in 10 municipalities. Fedepalma reported that production of this crude oil in 2019 reached 169,975 tons, 11.1 percent of national production (Banco de la República 2010).

Another of the flagship crops in the national territory is Cashew; in Colombia, Cashew is grown in mainly dry areas with low levels of rainfall, which is why the country has a high potential to competitively produce Cashew in regions such as Vichada, Meta, Casanare, Atlántico, Bolívar, Magdalena, savannas of Córdoba, la media Guajira and Cesar.

According to the above, the different agricultural activities generated in the aforementioned departments are the basis of the productive chain and economy of the Colombian territory; however, other aspects such as livestock, floriculture, the oil sector, among others, also contribute to the country's economic development.

- *Historical Context*

The Andina region has an area of approximately 283,000 km2 (Galindo, 2020). This region is made up of the departments of Antioquia, Boyacá, Cundinamarca, Santander and Tolima; in previous years these areas were states during the federalist era and were converted into departments by the Political Constitution of 1886. The region is also made up of other departments, founded at different times in history: Caldas and Huila in 1905, Norte de Santander in 1910 and, finally, Quindío and Risaralda in 1966. The economy during the XVII and XVIII centuries was made up of five socioeconomic aspects, among which were the mining northwest in present-day Antioquia, the agricultural and cattle-raising center-east corresponding to the territories of Tolima, Boyacá and Cundinamarca, and the artisanal north-east in the now department of Santander, among others. Until the end of the first half of the 19th century, commercial companies were scarce due to the economic instability that the country went through, specifically due to the armed conflict, the protectionist model of the State, and drug trafficking, among other reasons. Despite its history, the Colombian people have proven to be resilient in the face of multiple inconveniences. Today, the economy of the Andina region is focused on the aforementioned aspects with the premise that agriculture has positioned itself as a sector of great economic relevance for the country.

In the case of the historical context of the Orinoquia region, it is to take into account that currently the productivity of landowners is described according to Corporinoquia (2015) in: Ancestral occupation of indigenous peoples; since the Orinoquía, was originally populated by hunters and gatherers associated with the exploitation of the forest, dedicated to the cultivation of corn, cassava and other agricultural activities complementary to hunting activities. Livestock colonization process; the Orinoquia community formed a new scenario, where livestock exploitation determined the settlement of the territory, the forms of social organization typical of the region and the growth of the economy. In this regard, it should be noted that the war led to the expansion of the cattle ranch. Lastly, the intensive agricultural activity; rice cultivation transformed the ecosystems, being an activity restricted to specific and geographically limited areas, in addition to the implementation of technologies in land adaptation to obtain an intensive water consumption and as the only criterion for displacement, the irreversible depletion of the resource. On the other hand, palm crops have been predominant in municipalities such as Villanueva, Maní and Orocué Casanare, and this type of crop has drastically changed the territory. However, currently, with the Cultivo2 P1, objectives and strategies for conservation and reduction of greenhouse gases are being developed by the owners by

preserving forest areas and the crops themselves, specifically high duration crops, such as oil palm, Cacao and Cashew.

13.5.3. Key Actors, Interests and Motivations

Deforestation processes are associated with multiple actors that promote forest transformation processes directly or indirectly according to their interests and motivations. The key actors involved in the deforestation dynamics identified for the project area are described below:

- Agricultural sector: Includes direct and indirect actors.

Agricultural expansion: Direct stakeholder; The lack of land management associated with a lack of technical capacities and precarious training in sustainable practices leads to inadequate development of agriculture as a source of income. These actors establish crops such as oil palm, rice, soybeans, implement controlled burns, deforest forest areas or add excessive agrochemicals and fertilizers (FAO & MAGBMA, 2004-2014).

Timber harvesting: Direct and indirect; They harvest timber from the natural forest for domestic and commercial consumption as a common practice. They are generally unaware of the processes for forest harvesting with the approval of the CAR in their jurisdiction and are part of the 35-42% of illegal timber harvested (Mogollon, 2022, #). In some cases, timber is harvested without the knowledge of the property owner.

Land grabbers: Direct and indirect; Policy instruments have encouraged "improvements" (converting forest areas to pasture with crops) to land as a basis for obtaining land titles and accessing credit and institutional support (Negret et al., 2019). Individuals with large capital to accumulate land encourage deforestation.

- Infrastructure sector

Establishment of local, regional and national roads: Direct; produces forest fragmentation reduce and/or subdivide forest. Habitat fragmentation threatens the persistence of species due to the so-called barrier effect and edge effect (Arroyave et al., 2006, #).

13.5.4. Economic Activities and their Importance

The economy in the reference regions (Andina and Orinoquía regions) is centered on activities such as oil exploitation, livestock, agriculture, mining and commerce. In the Orinoquía biome, the main activities involve the livestock sector (livestock and forestry), the agricultural sector (oil palm cultivation and timber extraction), and the mining and oil sector (Reyes 2004). Both oil exploitation and mining have been important actors in the Andina and Orinoquía regions, as they are a source of resources for the departments and their municipalities. In addition, cattle ranching is the most important sector in Orinoquía, mainly in municipalities such as Paz de Ariporo, Hato Corozal and Trinidad, due to the characteristics of the eastern savannas. This practice is closely related to the culture of the region (Delgado & Pérez 2018).

According to data reported by Delgado and Pérez (2018), based on the average GDP growth by region for the periods 2000- 2010 and 2010-2016; indicating that the region with the highest growth between 2010 and 2016 was the Orinoquía with an average annual rate of 5.5%. For its part, the Andina region maintained growth levels close to 4% during the two periods. However, despite the increase in the average GDP growth rate of the Orinoquía region, this did not imply an increase in its contribution to the national GDP; while, in the Andina region, such contribution has been around 32%, without presenting major modifications between the periods considered.

Regarding the Andina region, DANE population projections estimated a total of 16,348,471 inhabitants for 2016, which represented 33.54% of the country's total population. In the 2010-2016 period, this region recorded an average growth rate of 4.04%, slightly lower than that recorded by the national total, 4.13%, and its average contribution to the national GDP was 32.31%. For those periods evaluated, the activities that contributed to the region's economy were the Agricultural sector (Agriculture, Livestock, Hunting, Forestry and Fishing); mining and quarrying; manufacturing industry; electricity, gas and water supply; construction; trade and repair, restaurants and hotels; transportation, storage and communications; financial establishments, insurance, real estate activities and business services; social, communal and personal services activities (Delgado & Pérez 2018; Mejia 2010).

In relation to the Orinoquía region, it registered during the 2010-2016 period the highest average growth in its GDP among the country's regions with 5.4%, as a result of the impact of hydrocarbon extraction, especially in the departments of Meta and Casanare. For 2016, the population of the region corresponded to 1,723,446 inhabitants, which represented 3.54% of the total Colombian population in that period. The strong economic expansion presented by this region in recent years contributed to the reduction of the incidence of monetary poverty, which in 2016 was 24.5%, the second lowest among the country's regions. Its economy focused on the agricultural sector (agriculture, livestock, hunting, forestry and fishing); mining and quarrying; manufacturing industry; electricity, gas and water supply; construction; commerce, repair, restaurants and hotels; transportation, storage and communications; financial establishments, insurance, real estate activities and business services; social, communal and personal services activities (Delgado & Pérez 2018).

13.5.5. Direct and Indirect Impacts

The causes and agents of change on the project areas can be qualitative or quantitative, the latter can be estimated by means of a spatial analysis that identifies the causes and the respective calculated impact.

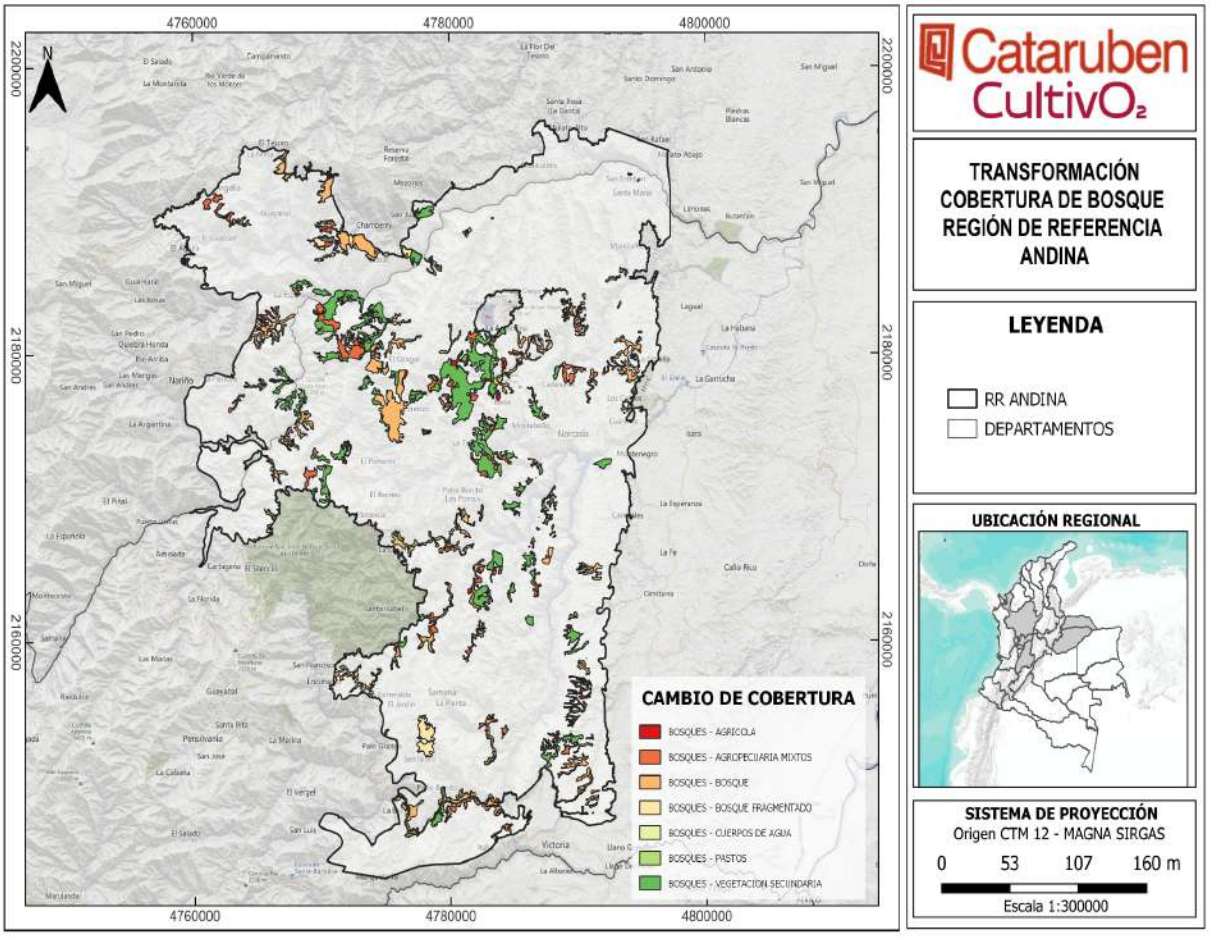
The combined impact of multiple drivers of deforestation on the two reference regions defined in the CultivO2 initiative is shown below.

The Andina region, as the country's economic mainstay, has experienced an accelerated demographic increase and the lack of planning has contributed to the accelerated destruction of ecosystems. Image 25 summarizes the transformation of the forest to other coverages, which

endangers the sustainability and resilience of the biome. On the other hand, in 2000 IDEAM reported that only 26.5% of natural forest remained in this region and in 2015 according to IDEAM figures (2016) the percentage has been reduced to 18%. In general, the main causes of forest deforestation in the Andina Region is the expansion of the agricultural frontier. Illegal exploitation of forest products for firewood and charcoal for domestic purposes has also been reported. Illegal logging and selective overexploitation of some timber species contribute to the loss of forest ecosystem services, increasing the deforestation relationship. Mining is a determining factor, as the area is rich in industrial minerals such as aluminum, cadmium, copper, gold, zinc, bauxite, clays, and kaolin, which generate changes in the behavior of the water cycle and, therefore, a decrease in the capacity to generate ecosystem services.

Meanwhile, for the Orinoquia biome, especially the region of the departments of Casanare and Arauca where the reference region is located, the expansion of the agricultural frontier, cattle ranching for meat production through extensive grazing, rice and palm agroecosystems and the effects generated by the exploration and extraction of hydrocarbons become an amalgam of situations and factors that cause deforestation and the progressive loss of ecosystem services through fragmentation of forests.

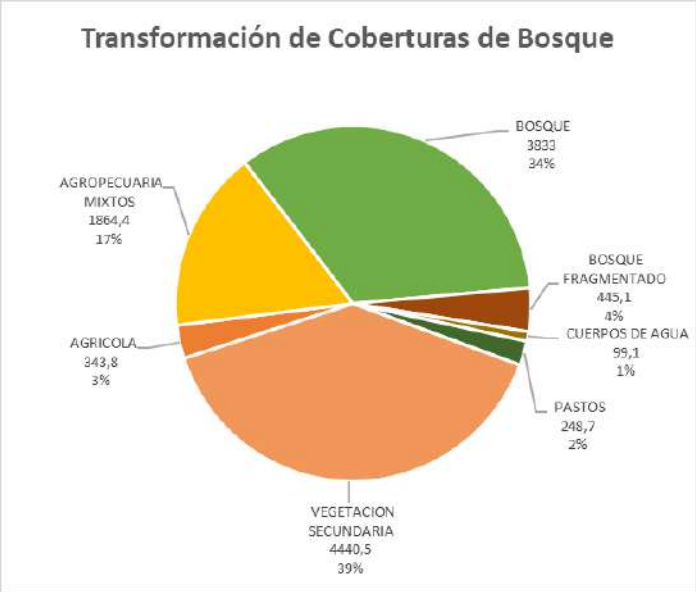
Image 25. Map of forest cover transformation in the Andina region.



Source: Fundación Cataruben, 2023.

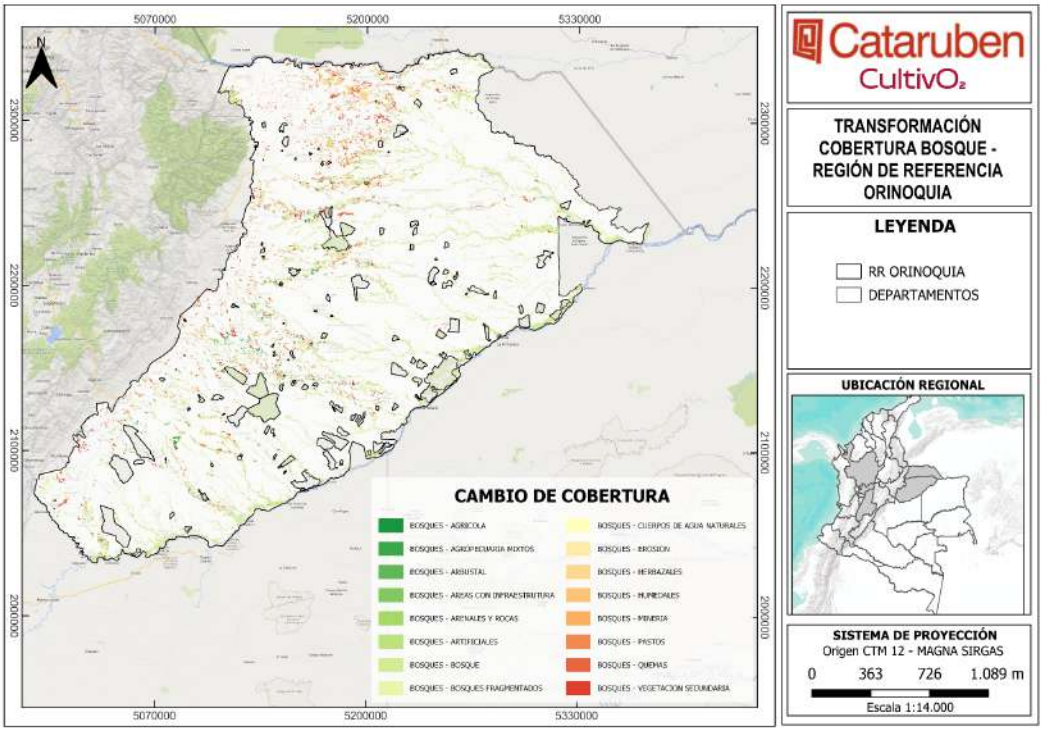
In the 2012 and 2018 period, approximately 7441.6 ha were deforested in the reference region of the Andina region, generating a transformation in 66% of the total forest areas. Of the deforested areas, 39% became secondary vegetation, 17% became mixed agricultural zones due to the expansion of the agricultural frontier, 4% became fragmented forest and the remaining areas had less impact.

Graph 15. Map of forest cover transformation in the Andina region.



Source: Fundación Cataruben, 2023.

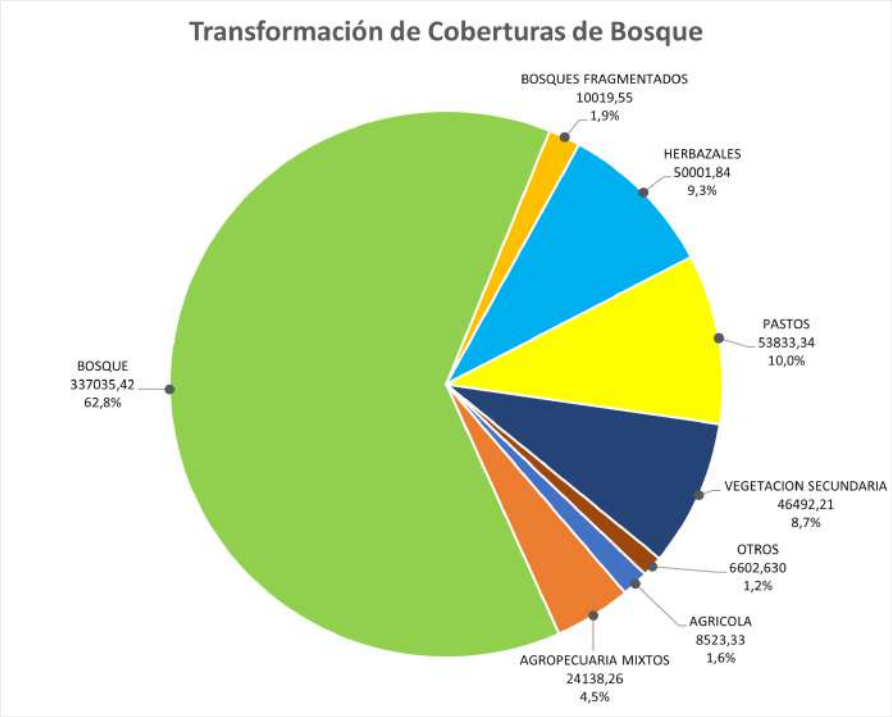
Image 26. Map of forest cover transformation in the Orinoquia region.



Source: Fundación Cataruben, 2023.

In the 2012 and 2018 temporality approximately 199,611.16 ha were deforested in the reference region of the Orinoquia region generating a transformation in 37.2% of the total forest areas. Of the deforested areas, 10% became pasture, 9.3% became part of grasslands, 8.7% became secondary vegetation and the remaining factors of lesser impact.

Graph 16. Map of land use change in deforested areas in the Orinoquia region.



Source: Fundación Cataruben, 2022.

13.5.6. Relations and Synergies

Understanding the relationships and synergies between the causes and drivers of deforestation is fundamental to effectively address this problem. Deforestation is a complex phenomenon involving multiple actors and processes, and often the causes and drivers of deforestation are interconnected and have multiplier effects that exacerbate the situation. Understanding the interrelationships and synergies among the causes and drivers of deforestation is fundamental to designing effective policies and strategies to address this problem. In this way, measures can be implemented that address the different aspects contributing to deforestation in an integrated and coordinated manner, and the positive effects of forest conservation and restoration actions can be maximized.

The following is a description of the interactions and synergies between the actors in the study that define REDD+ activities. It identifies how the actors act and interact in relation to these activities, allowing for a deeper understanding of the causes and agents of deforestation, generating future proposals for decision making. In the Cultivo2 P1 of Fundacion Cataruben, the direct and indirect

causes related to deforestation that were evidenced in each of the regions of interest (Orinoquía and Andina biomes) were listed. Eight (8) aspects of ecosystem transformation were designated, which indicate from their analysis the strong and weak synergies and interactions; for the above, information on the underlying agents involved was available.

Agriculture (1) has a strongly established synergistic activity with cattle ranching (2) and timber extraction (6), given that generally the expansion of agriculture and cattle ranching is carried out by cutting down forests, which allows the conversion of forests into cropland or pasture. Cattle ranching (2) is strongly related to timber extraction (6), because they deforest areas for extensive cattle ranching. The need to deforest in relation to the expansion of infrastructure (5) for the settlement of populations is also generated by the praderization of forests.

Mining (3) generates a relevant relationship with timber extraction (6). Mining cuts down trees for the construction of mining camps and eliminates vegetation to access the mineral veins, causing biodiversity loss. Hydrocarbons (4) have a strong relationship with infrastructure (5) due to the construction of roads to search for and transport them. Deforestation is carried out to build roads to facilitate mobility and access to hydrocarbon sites.

In the case of infrastructure (5), it is directly related to the transformation of the ecosystem for the development of economic activities that benefit the country's economy. The construction of infrastructure can open new areas for hydrocarbon exploitation (4), which can increase the demand for timber and other forest products, which can also encourage timber extraction (6) in forests.

Timber extraction (6) is the most synergistic with the other deforestation agents, being strongly related to activities such as cattle ranching (2), agriculture (1), infrastructure (5), mining (3) and oil (4).

Finally, there is a strong synergy between natural and arson fires, meaning that controlled burns are carried out in order to clear the soil to sell or rent land, which can end in arson fires that affect the area of the forest ecosystem and generate deforestation.

Considering the above, the synergies analyzed in the attached document called "Agents of deforestation" are reported below. (1. Agentes de deforestación.xlsx).

13.5.7. Deforestation Chain of Events.

The Fundacion Cataruben CultivO2 initiative shows the chain of deforestation events where the main agents and causes that define this problem are reported. For each activity that generates deforestation, the causes that affect biodiversity in the Andina and Orinoquia regions were identified. The causes can be seen in Annex 2.3.5. Cadena de eventos de Deforestación y Degradación, where these are defined for each region.

The attached document shows the agents involved in the transformation of natural forests for the development of other types of activities, such as the expansion of the agricultural frontier, which is defined by agricultural and livestock production. Livestock production is mainly focused on cattle breeding and fattening systems, the latter providing greater ecosystem conservation than cattle breeding because it represents greater wildlife conservation. Another activity associated with deforestation is the oil sector. The oil industry has become increasingly important in this area,

specifically in the Orinoquia, which contributes to the modification of aspects of biodiversity (Fundación Grothendieck, 2021).

To understand in advance the chain of events of biodiversity loss, it should be taken into account that during the last 30 years, in the case of the Orinoquia region, it has lost an annual average of about 40,000 hectares of forest. At the departmental level, Meta and Vichada are home to the largest extension of forests in the region, with more than 80% of the total remaining forest area, being the department of Arauca the one that has suffered the greatest loss of forest cover, where the annual rate of deforestation in this department reached -1.5%. For the case of the south of the department of Meta during the third quarter of 2020, it was reported as the most affected by deforestation, raising a figure of more than 1,500 hectares of forest lost according to the Early Deforestation Detection Bulletin No 24 (Grothendieck Foundation, 2021).

In relation to this, the agricultural sector plays a fundamental role, a wide variety of crops would be associated with both conservation and deforestation issues. If these practices are not implemented with a sustainable policy and monitoring, they could affect the environment in the areas of influence and accelerate deforestation in the territory. In addition to the advance of agricultural activities in the regions, the discovery of oil fields in Caño Limón, Arauca; Cusiana and Cupiagua in Casanare; Apiay in Meta; among others, has generated an increase both in oil drilling and in the migratory flow to the region; this another fundamental aspect that affects the increase in deforestation (Salinas, 2017).

The most recent large hydrocarbon discoveries have been, in these regions, Caño Limón in Arauca, Cusiana-Cupiagua in Casanare and Rubiales Quifa in Meta, which by 2016 presented a participation of the national crude oil production of approximately 70% (Fundación Grothendieck, 2021). Meta is the predominant department in this activity, in 2016 it contributed with the production of 57.4% of the national crude, given the production in the Rubiales, Castilla and Chichineme fields, which represent half of Ecopetrol's production (Martínez and Delgado, 2018). Similarly, Arauca since the eighties has been an oil zone in Caño Limón, being the second largest oilfield in the country; however, it is located below the Lipa Lagoon, which was unprotected to allow mineral extraction with the construction of an artificial island called Chiperón that connects with thirty wells (Kroener, 2018).

In addition to soil exploitation, mining is another mineral extraction process in the regions, especially in the departments of Guainía and Vaupés. Despite the fact that 96% of the territory of the Orinoquia is forest reserve, mining is also one of the economic sources that has been gaining strength over the years, since it is one of the labor alternatives for part of the population. From this perspective, some inhabitants of these departments sell the precious metal in hamlets near the banks of the Inírida River and the municipality's airport. Likewise, this is where the largest source of precious metal that is traded in Villavicencio comes from (López 2018).

Specifically the Andina region, presents high rates of deforestation, due to direct causes such as the expansion of the agricultural frontier and conversion to pasture for livestock and mountain and lowland forest areas (these areas decreased from 11006893 ha in 1985, to 9528961 ha in 2005). The negative impacts of this trend include the destruction of riparian forests, which causes loss of

taxonomic and functional diversity of biological communities (Galeano-Rendón & Mancera-Rodríguez 2018).

As last aspects, natural factors are defined, referring to that natural capacity or predisposition to changes in biodiversity due to variables such as climate, soils, lithology, topography, relief, hydrology and vegetation; where attention is focused on mass removals and forest fires, which, although they are not the focus or engine of deforestation, they are occasional in the area of influence (López 2018).

Each of the activities described above produce deforestation of forest ecosystems. Apart from the expansion of the agricultural and livestock frontier; selective logging, timber or firewood extraction and forest fires also add up as activities that influence biomass loss and prevent ensuring biomass regeneration. This expansion requires a sustainable approach to avoid increasing pressure on the region's natural resources and environment.

13.6. REDD+ Activities

Project activities are formulated based on the work carried out with private property owners and the analysis of the causes and agents of deforestation in the project's area of influence. These activities seek to reduce emissions due to deforestation by addressing the direct or underlying causes identified. The following link presents the implementation schedule of the project activities for twenty (20) years in compliance with the requirements established in section 11 of the BCR002 methodology (Ver anexo. Plan de monitoreo - Actividades REDD+).

Six (6) REDD+ activities are presented, which are classified into two groups. The four (4) activities in the first group are focused on implementing prevention and mitigation measures to reduce deforestation of natural forests, while the two (2) activities in the second group seek to implement monitoring and conservation measures for fauna and flora.

- *Implement prevention and mitigation measures to reduce deforestation of natural forests:*

A) Apply training and accompaniment processes through training to strengthen land planning, biodiversity conservation and sustainable forest management.

Among the causes of forest deforestation was identified the lack of knowledge and misinformation regarding the impacts of productive activities, natural resource management and ecosystem services. For this reason, it is proposed to implement training and support processes through the implementation of twenty (20) face-to-face and/or virtual training sessions on land planning, biodiversity conservation and sustainable forest management. These trainings will be provided by Fundacion Cataruben and/or allies.

The indicator to report the progress of the activity will be measured in number of trainings carried out. The supporting documents for these activities will be the attendance lists, audiovisual record and training protocol, and the monitoring frequency will be every two (2) years.

B) **Identify and adopt the principles of forest governance for sustainable forest management.**

In order to strengthen sustainable forest management and forest governance structures, the identification and adoption of forest governance principles is proposed as an activity through the implementation of three phases. The first phase is the characterization of the forest properties, which serves as an input for the second phase, which consists of the generation of property planning documents, which are constructed in a participatory manner. Finally, the third phase is the monitoring of the implementation of the land plan.

The indicator to report the progress of the activity is the percentage of implementation progress of the three phases. The frequency of progress monitoring will be every five (5) years, and the supporting documents will be the land characterizations carried out, land plan documents and supports of the implemented practices.

C) Monitor terrestrial hot spots

Among the causes that generate loss of vegetation cover are forest fires, whether caused by natural phenomena or anthropogenic activities. For this, Fundacion Cataruben will carry out permanent monitoring of terrestrial hot spots in the areas of influence of the project and in the leakage area, taking into account the hot spots reported by IDEAM. Once the hot spot is identified, a report and follow-up will be made to the owners to confirm the presence of fires and, if so, their status.

The indicator for reporting progress in the implementation of this activity is the number of hot spot monitoring in REDD+ eligible areas, with a target of 20 monitoring reports.

D) Generate alerts of changes due to deforestation and/or transformation of ecosystems in the project area and surrounding areas.

Other causes of loss of vegetation cover are the development of productive activities, such as livestock and agriculture, and natural phenomena, such as the El Niño and La Niña phenomena. Fundacion Cataruben will permanently monitor the changes in vegetation cover due to deforestation through the analysis of satellite images.

The indicator to report the progress of this activity is the percentage of conserved REDD+ hectares. The monitoring frequency will be every four (4) years and the documents that support the progress are the land cover monitoring reports. And as a goal, five land cover monitoring reports will be generated.

- *Implement fauna and flora monitoring and conservation measures:*

Changes in land use and deforestation due to anthropogenic activities have generated affectation in different ecosystems such as forests, this is why the following activities are proposed. The monitoring of ecosystems and fauna will make it possible to evaluate their condition and detect changes in their composition, which will make it possible to take preventive measures to avoid their deforestation.

E) Monitoring threatened ecosystems

Threatened ecosystems will be monitored with the layer obtained from: Update of the Red List of Terrestrial Ecosystems of Colombia (2018). Etter, et al. Alexander Von Humboldt Biological Resources

Research Institute.

The indicator to report the progress of this activity is the number of monitoring of threatened ecosystems in the project area, as a goal it is projected to present five (5) reports, with a monitoring frequency of every four (4) years.

F) Conduct participatory monitoring of threatened species

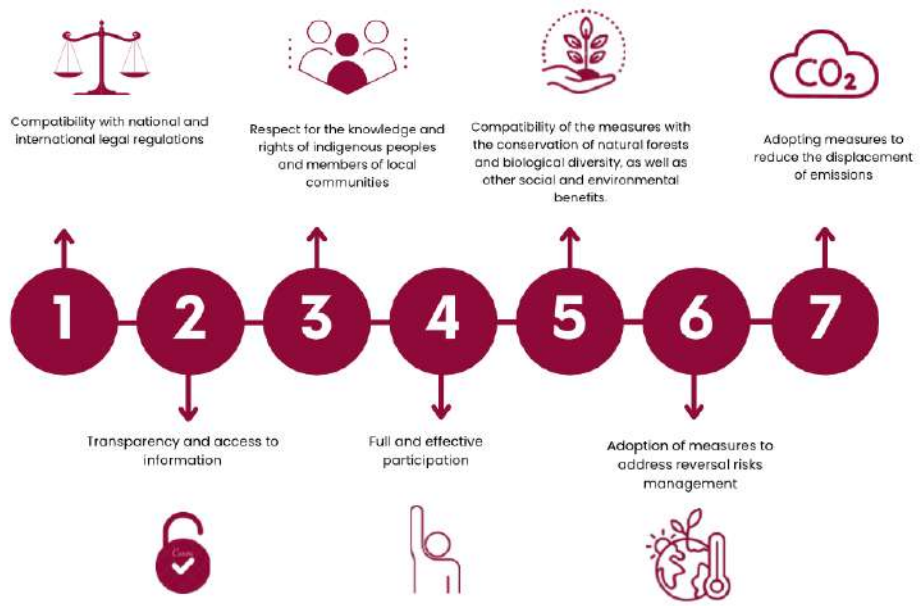
Report secondary information on species with possible distribution in the project areas and participatory monitoring of fauna.

The indicator for reporting progress in the implementation of this activity is the number of reports of species with some degree of threat in the project area. The goal is to present (5) reports, with a monitoring frequency of every four (4) years.

13.7. Safeguards REDD+

The BioCarbon Registry (BCR) Standard establishes criteria for demonstrating compliance with safeguards in projects structured under its guidelines. To this end, it urges project developers to make use of the "safeguards compliance document", a tool that establishes the criteria for demonstrating compliance with safeguards in order to identify and mitigate social and environmental risks that may arise during project implementation. The purpose of this is to reduce and eliminate the occurrence of negative effects on the environment, communities and their economy after project implementation.

Figure 5. REDD+ Safeguards



Source: Fundación Cataruben, 2023.

The safeguards address issues related to legal regulations, transparency and access to information, respect for the rights of communities and stakeholders, full and effective participation, forest conservation and biological diversity, among other aspects. To ensure compliance with REDD+ safeguards, the provisions provided by the BCR (BioCarbon Registry) standard in its version 3.1 are taken into account, which includes the approach of two main tools: (i) Tool to demonstrate compliance with REDD+ safeguards and (ii) No Net Harm" - Environmental and social safeguards NNH (No Net Harm - Environmental and social safeguards NNH).

On the one hand, the "Tool for demonstrating compliance with REDD+ safeguards (Version 1.0)" points out those fundamental clarifications on how the safeguards should be interpreted, applied and complied with in light of the BioCarbon Registry standard at the national and international level (BioCarbon Registry, n.d.). In this sense, in section "4. Interpretation of safeguards" of this document it is mentioned that projects should promote and respect the following safeguards:

Table 35. Identification of REDD+ Social and Environmental Safeguards (BCR Safeguards Tool)

ID	SAFEGUARDS
01	The actions complement or are consistent with the objectives of national forest programs and relevant international conventions and agreements.
02	The transparency and effective national forest governance structures, taking into account national legislation and sovereignty.
03	Respect for the knowledge and rights of indigenous peoples and members of local communities, by considering international obligations, national circumstances and relevant laws, and noting that the United Nations General Assembly has adopted the United Nations Declaration on the Rights of Indigenous Peoples.
04	The full and effective participation of relevant stakeholders, in particular indigenous peoples and local communities.
05	That actions are consistent with the conservation of natural forests and biological diversity, ensuring that the action referred to in paragraph 70 of this decisión are not used for the conversion of natural forests but are used to incentivize their protection and conservation of natural forest, and their ecosystem services, and to enhance other social and environmental benefits.
06	Action to address the risk of reversals.

07	Action to reduce the displacement of emissions.

Source: Fundación Cataruben, 2023.

On the other hand, the "No Net Harm" - Environmental and social safeguards NNH tool mentions in section "3. No harm to the environment and society", more specifically in the "REDD Safeguards" section the following:

- *'The implementation of REDD+ activities can generate benefits for communities and the environment and reduce GHG emissions. However, there may be some social and environmental risks associated with their implementation. In this sense, REDD+ safeguards are measures aimed at preventing the undermining of fundamental social, economic or environmental rights and the occurrence of negative impacts arising from the design and implementation of REDD+ activities. They also include measures to improve the capture and distribution of benefits generated by REDD+ activities. (pg 6)*

Taking into account these considerations, the BioCarbon Registry standard (version 3.0) indicates that Fundacion Cataruben in its role as "project developer" must meet the requirements of the "No Net Harm - NNH" tool to guarantee the approach and compliance with the REDD+ Safeguards, as listed below:

Table 36. Identification of requirements of the "No Net Harm" tool for social and environmental REDD+ safeguards

ITEM	NO NET HARM" TOOL REQUIREMENT
a	The Actions complement or are consistent with the objectives of national forest programs and relevant international conventions and agreements
b	Transparent and effective national forest governance structures, considering national legislation and sovereignty.
c	Respect for the knowledge and rights of indigenous peoples and members of local communities, by considering international obligations, national circumstances and relevant laws, and noting that the United Nations General Assembly has adopted the United Nations Declaration on the Rights of Indigenous Peoples.
d	The full and effective participation of relevant stakeholders, in particular indigenous peoples and local communities, in the actions referred to in paragraphs 70 and 72 of this decision.
e	That actions are consistent with the conservation of natural forests and biological diversity, ensuring that the actions referred to in paragraph 70 of this decision are not used for the conversion of natural forests, but are used to incentivize the protection and conservation of natural forests and their ecosystem services, and to enhance other social and environmental benefits.

f	Actions to address the risks of reversals
g	Actions to reduce displacement of emissions.

Source: Fundación Cataruben.

13.8. Uncertainty management

Uncertainty is a property of a parameter estimate that denotes the degree of accuracy of the data used for that estimate. Thus, "under the BCR Standard, uncertainty management is determined by the accuracy of the maps used to estimate activity data values and the application of discounts to emission factors. For activity data, the accuracy should be greater than 90%. The accuracy assessment should be made from the use of field observations or analysis of high resolution imagery. For emission factors, an uncertainty of 10% is acceptable for the use of average carbon values (the assessment should be done per reservoir). If the uncertainty is greater than 10%, the lower value of the 95% confidence interval should be applied".

Aboveground biomass, belowground biomass and soil organic carbon values proposed in the reference emission levels for Colombia were used for the emission factors, so they represent conservative official data.

To estimate the activity data, the non-forest forest maps generated by the SMByC were used as input, the reasons for using national data is to manage uncertainty[13]

13.9. Leakage and non-permanence

This is the area of forest to which a deforestation activity may result in displacement, and which is beyond the control of the REDD+ project holder.

The area of leakage was determined from a spatial proximity analysis, where the average distance of deforestation displacements is evaluated from the neighborhood count using as inputs SMByC maps in the period 2005-2016 and 2021.

The 2005 - 2016 maps allow us to understand the dynamics of deforestation outside the project areas, while the 2021 analysis allows us to infer where emissions may have been displaced by project activities.

The leakage area is established using the following criteria:

A) All forest areas within the range of mobility of the agents identified in Section 10 should be included.

[13] For activity data, the accuracy should be greater than 90%. The evaluation should be based on the use of field observations or analysis of high-resolution images.

B) Exclude areas of restricted access to deforestation agents.

From the above, a leakage belt of 200 meters around the Property was delimited, where the behavior of the forest in the historical period and its monitoring is evaluated. Thus, it was defined (Table 37) that the eligible area of the project corresponds to 1411.72 ha and the leakage area to 998 ha.

Table 37. Leakage area of the project.

ELIGIBLE PROJECT AREAS (ha)	LEAKAGE AREA (ha)
1411,72 ha	998

Source: Fundación Cataruben, 2022.

13.10. Mitigation results

13.10.1. REDD+ Eligible Areas in GHG Project Boundaries

These are the areas that comply with the condition of presence of the forest category at the beginning of the project activities, and ten years before the project start date. (Cultivo 2/2.PDD & Anexos/Anexos/2.5Reporte de Monitoreo/SIG/1.Geodatabase Cultivo 2)

To determine the areas with forest category, the geographic layer of non-forest forest generated by the SMByC of the Forests group of the Ecosystems and Environmental Information Sub-Directorate of IDEAM is used, the reasons for using national data are for the management of uncertainty as it is a product of national origin it is not necessary to apply levels of precision.

Eligible areas are the result of performing a cross-classification between the 2005 - 2016 Non-Forest Forest layers, where the ones enrolled in the project are the areas that are maintained in both time periods. This spatial analysis is performed through the free software called Quantum GIS - QGIS.

Table 38, is the result of the eligibility analysis, where the total eligible areas and their proportion with respect to the total area of the properties can be related. The CULTIVO 2 initiative has 1,411.72 ha of eligible forest located in 37 properties.

Table 38. REDD+ Eligible areas

ELIGIBILITY	AREA(ha)	PERCENTAGE (%)
Eligible	1.411,72	9 %
Not Eligible	14.232,78	91 %
Total	15.644,50	100 %

Source: Fundación Cataruben, 2022.

13.10.2. Reference Region

In order to comply with item 8.2 reference region for baseline estimation, of the BCR0002 Version 3.1 methodology, the following table was prepared, specifying compliance with each criterion.

Table 39. Compliance with BCR0002 reference region criteria.

BCR0002 Section 8.2 Criteria	Description of Compliance
The reference region may include all or part of the project area.	**Compliant:** The Andes reference region includes 86.0 % of the project area. **Compliant**: The Orinoquia reference region includes 57.0 % of the project area.
The agents and drivers of deforestation identified in the reference region can access the project area.	**Complies:** Given that the project areas, as well as the reference region, include private property owners with similar interests in generating subsistence economic resources within regulated markets. Likewise, there is an ample road network that makes access to the project areas possible for agents and stakeholders.
The project area is of interest to the agents identified in b, above.	**Complies:** Land tenure conditions are similar in the reference region and in the project areas. This, together with the road network, facilitates access for agents to carry out deforestation activities.
Land tenure and land use rights should be characterized in the reference region.	**Complies:** Land tenure conditions are similar in the region; it only includes areas of private properties whose land tenure is similar to those of the project areas.
Exclude areas of restricted access to agents and drivers of deforestation.	**Complies:** Areas where agents have restricted access are excluded, according to the criteria used by IDEAM to define non-accessible forest in Annex 1 of the NREF: Adjustments for natural conditions[14]. In addition to the above, collective territories are excluded, such as: Legalized and Intended Indigenous Reserves, Community Councils of Titled Black Communities and Peasant Reserve Zones information available in the

[14] https://redd.unfccc.int/files/31122019_anexo_circunstancias_nref_nal_v7.pdf

	open data portal of the National Land Agency -ANT[15]. And if applicable, Article 329 of Decree Law 2811 of 1974, which establishes the different types of areas that make up the National Parks System, available in RUNAP[16].

Source: Fundación Cataruben, 2022.

It is a geographic space where deforestation that could occur in the project baseline is estimated. The reference region must be similar to the project areas in terms of transforming agents, environmental determinants, roads, land ownership, use, climatic factors. (Cultivo 2/2.PDD & Anexos/Anexos/2.5Reporte de Monitoreo/SIG/1.Geodatabase Cultivo 2)

This is supported by the agroecological distribution of the project areas with Cacao (Theobroma Cacao) and Cashew (Anacardium Occidentale) crops, as these agroforestry crops have a woody component from which benefits can be extracted, making them attractive for REDD+ programs.

To obtain the result of Image 27, it was necessary to exclude the areas defined in Annex 2 of the NREF "Adjustment for national circumstances" corresponding to:

- Overlap corresponding to other REDD+ forestry projects.
- Areas of National Natural Parks
- Legalized Indigenous Reserves (corroborated by resolution number ST-1158 of August 10, 2023 issued by the directorate of the national authority for prior consultation).

To define the geographic limits of the reference region, the criteria described in the methodology BCR0002 V3.1. section 8.2 reference region for baseline estimation were used.

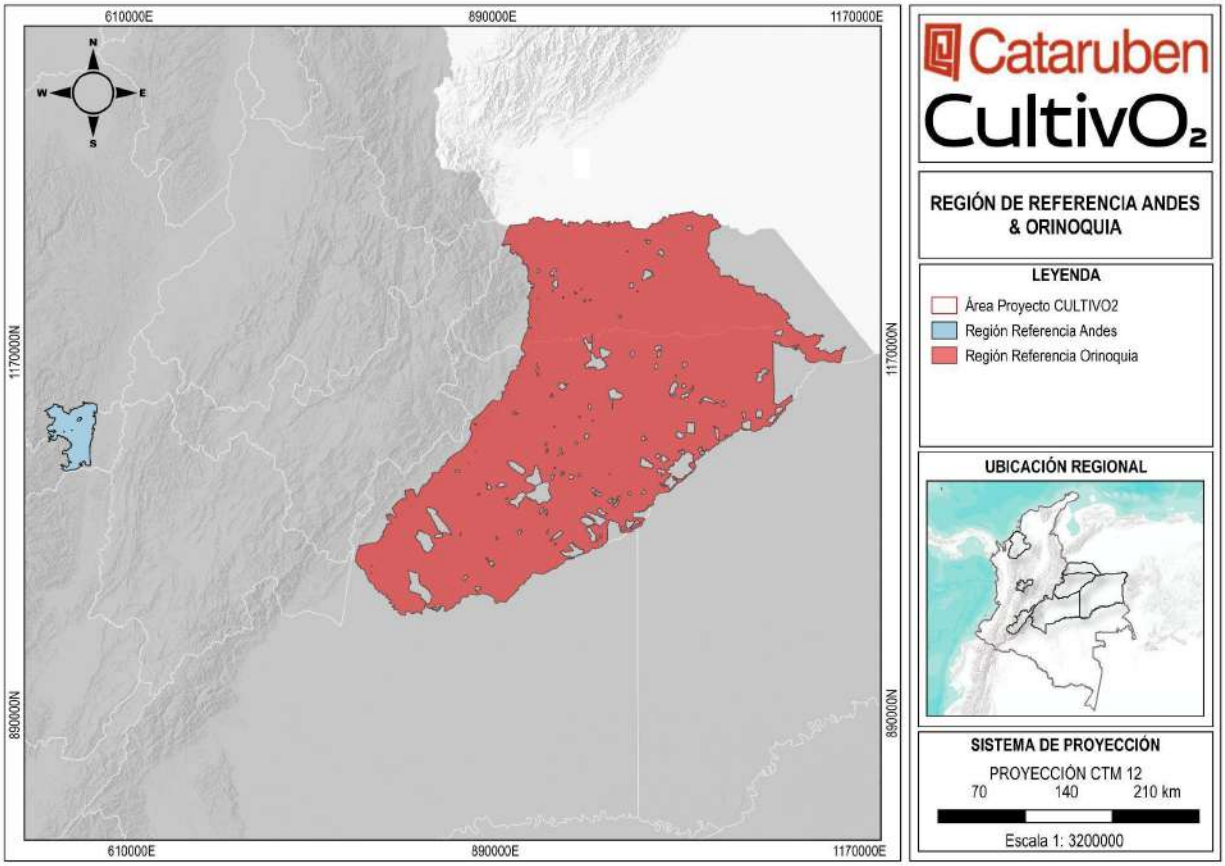
For the delimitation of the reference region for the Andes Biome, a document called drive Andes was generated, where the main deforestation agents and the location of the Hydrobiome, Orobiome and Nechí-San Lucas Zonobiome in the biomes are listed, as well as the bioma Orinoquia document.

The abiotic characteristics of the reference region are described below.

[15] https://data-agenciadetierras.opendata.arcgis.com/

[16] https://runap.parquesnacionales.gov.co/cifras

Image 27. Reference region Andina and Orinoquia Biome



Source: Fundación Cataruben, 2022.

- *Geographic Information*

This section describes characteristics of the geographic space called reference region, drainage, watersheds, elevation, among others.

Image 27 is located in the Orinoquia and Andina biome. The Colombian Orinoquia is located in eastern Colombia, traditionally known as a natural region dominated by natural savannahs, with a relatively homogeneous climate, where the concept of watershed is broad because it has different formations that consolidate different heterogeneous landscapes with complex ecological environments.

The social and economic dynamics are very similar in its regions, since cattle raising, subsistence cattle raising is a denominated of the agricultural and livestock activities of the region.

The Andina region is located in the center of the country, bordering the Caribbean region to the north, Venezuela to the northwest, the Orinoquia to the east, the Amazon to the southeast, Ecuador to the

south and the Pacific region to the west. The climate is temperate and mountainous, has a great diversity of climate and natural resources, such as minerals that lie in the subsoil. The agricultural activity is highly developed and focuses on a diversity of crops such as cereals, oilseeds, sugar, fruit, among other products. It has an integrated transportation and telecommunications network that allows the mobility of more than 70% of the total inhabitants of Colombia.

- Terrain Slope

It is obtained by executing an algorithm called "Slope Analysis" on a Digital Elevation Model (DEM) in the Quantum GIS software, also known as QGIS. The DEM is obtained from the **Shuttle Radar Topography Mission** (SRTM). It calculates the degree or percentage of slope. For the reference area the slope is represented in percentage according to FAO (2009), being divided into 10 classes. Image 28 shows the results of the slope analysis for the Orinoquia reference region and Image 29 for the Andina region. Table 40 distribution of territory by slope class for Orinoquia, Table 41 distribution of territory by slope class for Andina.

The Orinoquia reference region is mainly dominated by the "Slightly sloping" class with a percentage of 51.1%. While the Andina reference region is dominated by the "Steep" class with 44.53%.

Table 40. Slope of the terrain and its distribution in the Orinoquia region

Class	Description Class	Description Percentage	Hectareas	% RR
1	Plano	0 - 0,2	63.454,27	1,244
2	Nivel	0,2 - 0,5	34,31	0,001
3	Cercano al nivel	0,5 - 1,0	26.4261,85	5,182
4	Muy ligeramente inclinado	1,0 - 2,0	818.100,74	16,043
5	Ligeramente inclinado	2,0 - 5,0	2.608.817,97	51,159
6	Inclinado	5,0 - 10,0	1.116.689,11	21,898
7	Fuertemente inclinado	10,0 - 15,0	131.406,67	2,577
8	Moderadamente escarpado	15,0 - 30,0	76.198,43	1,494
9	Escarpado	30,0 - 60,0	20.008,31	0,392
10	Muy Escarpado	> 60,0	466,06	0,009

TOTAL	**5.099.437,71**	**100**

Source: Fundación Cataruben, 2022.

Table 41. Terrain slope and its distribution in the Andina region.

Clase	Descripción Clase	Descripción Porcentaje	Hectáreas	% RR
1	Nivel	0,2 - 0,5	5,89	0,004
2	Cercano al nivel	0,5 - 1,0	99,02	0,083
3	Muy ligeramente inclinado	1,0 - 2,0	210,51	0,176
4	Ligeramente inclinado	2,0 - 5,0	13497,66	11,346
5	Inclinado	5,0 - 10,0	63924,88	53,736
6	Fuertemente inclinado	10,0 - 15,0	40310,13	33,885
7	Moderadamente escarpado	15,0 - 30,0	510,53	0,429
8	Escarpado	30,0 - 60,0	233,84	0,196
9	Muy Escarpado	> 60,0	167,93	0,141
TOTAL			**118960,39**	**100**

Source: Fundación Cataruben, 2022.

- Terrain Elevation

To obtain the elevation of the terrain, it was necessary to use the DEM, which determines the height in meters above sea level (masl). This product is obtained through the SRTM Downloader Plugin v3.1.17 installed in QGIS. The DEM is a raster file with a cell value of 30 m x 30m. According to the information, the highest elevation values are those of the Andina region.

The Orinoquia reference region has an elevation range from 75 to 814 masl, while the Andina region has a higher elevation range due to the foothills of the central mountain range and has an elevation range from 192 to 3,601 masl. (Image 30 ; Image 31)..

- Type of Relief

Due to the characteristics, slope, elevation ranges, among others, facilitate the formation of various types of shapes on the territory. Table 42 describes the relief of the Orinoquia, the dominant form for this reference region is the lomerío with 40.85%, followed by the Altiplanicie with 40.3% and mountain with 14.51%.

Table 42. Type of relief and distribution in the Orinoquia Region

Id	Tipo de Relieve	Hectáreas	% RR
1	Altiplanicie	2.055.157,974	40,30
2	Lomerío	2.083.069,061	40,85
3	Montaña	740.129,5743	14,51
4	Piedemonte	139.968,8129	2,74
5	Planicie	47.024,50181	0,92
6	Planicie aluvial	23.341,2361	0,46
7	Planicie eólica	9.137,44055	0,18
8	Valle	1.609,113177	0,03
TOTAL		**5.099.437,713**	**100,00**

Source: Fundación Cataruben, 2022.

Table 43 describes the relief of the Andina reference region, which is mainly dominated by high plains (57.45%) and valleys (15.68%).

Table 43. Type of relief and distribution in the Andina Region

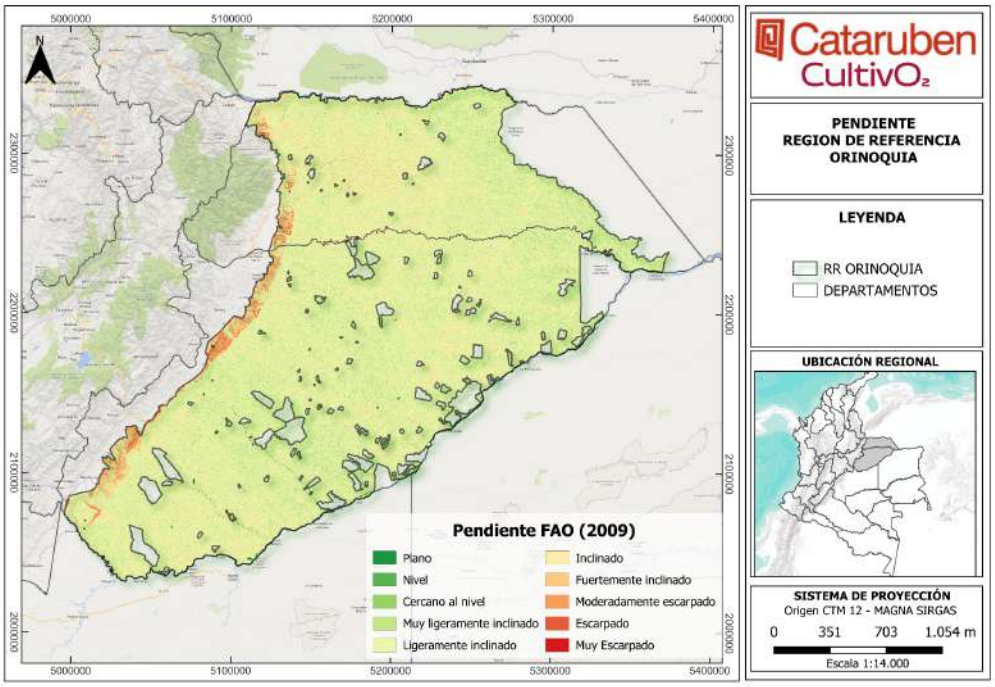
Id	Tipo de Relieve	Hectáreas	% RR
1	Altiplanicie	42941,78	35,76
2	Lomerío	8094,24	6,74
3	Montaña	7578,19	6,31
4	Piedemonte	16296,07	13,57
5	Planicie aluvial	21025,84	17,51
6	Valle	24131,31	20,09
TOTAL		**120067,46**	**100**

Source: Fundación Cataruben, 2022.

- Hydrography

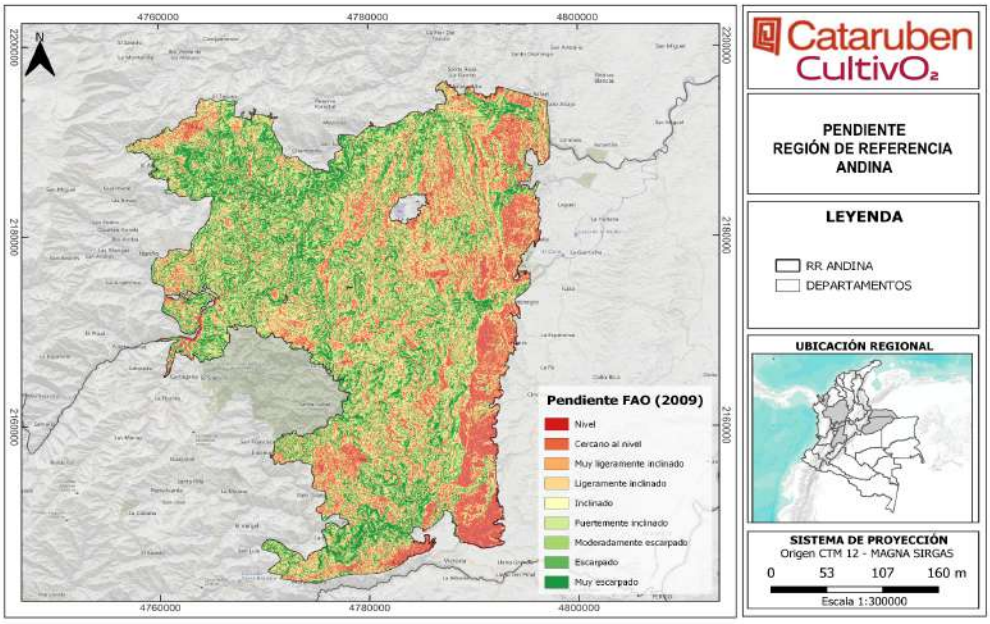
In addition to its geological origin, biodiversity and multiple cultural expressions, the Orinoquia is also classified by its water types: rivers that originate in the peaks of the Eastern Cordillera, and others that emerge in the savannas, as well as wetlands, estuaries, zurales and morichales. The hydrographic zones of the Orinoquia reference region. They are closely linked to the hydrographic network or drainage (Image 35), visualizing that it is a very drained territory, highlighting the Cravo Norte, Casanare, Arauca, Pauto, Cravo Norte rivers, among others.

Image 28. Slope of the Orinoquia reference region.



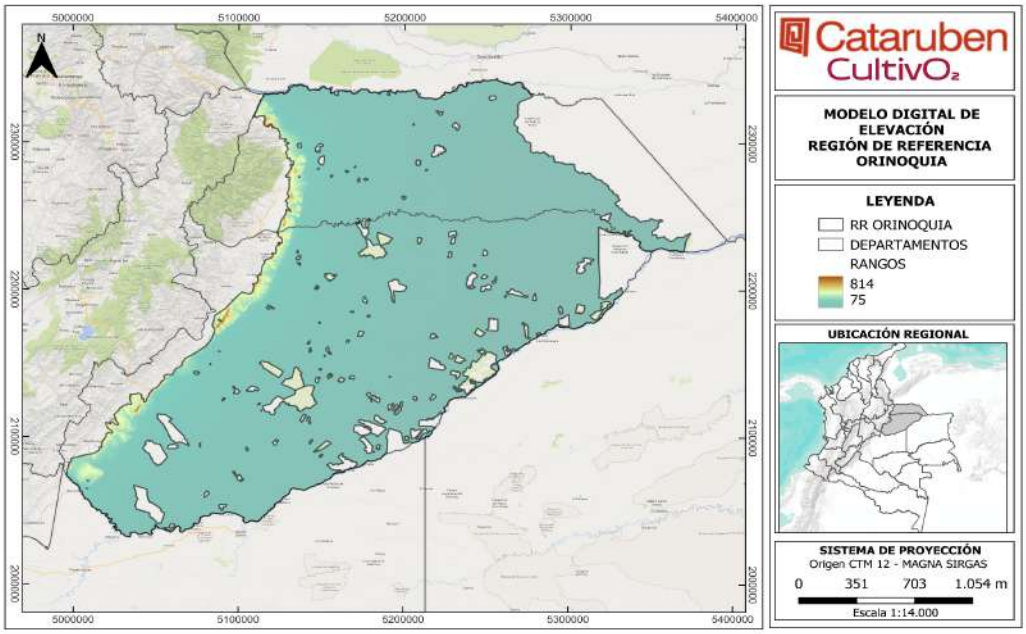
Source: Fundación Cataruben, 2022.

Image 29. Slope of the Andina referential region



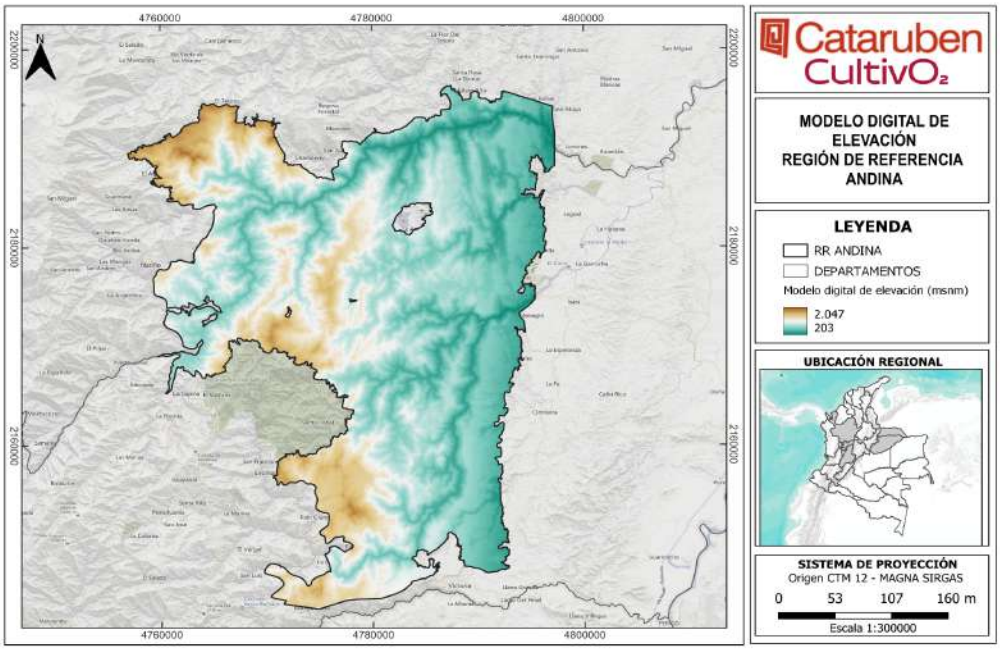
Source: Fundación Cataruben, 2022.

Image 30. Elevations from DEM - Orinoquia reference region.



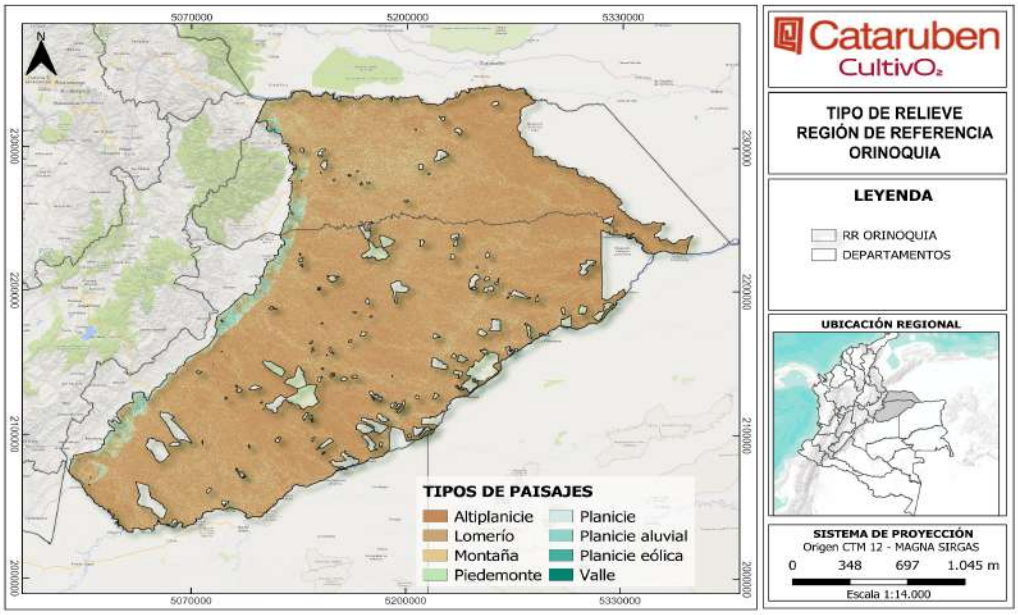
Source: Fundación Cataruben, 2022.

Image 31. . Elevations from DEM - Andina reference region.



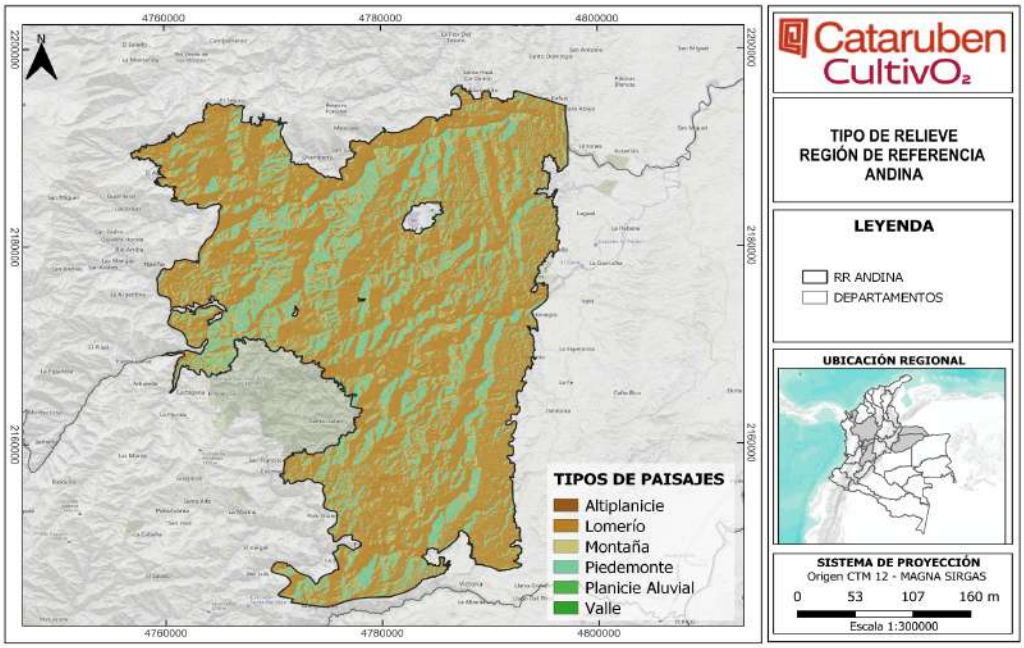
Source: Fundación Cataruben, 2022.

Image 32. Relief type - Orinoquia reference region



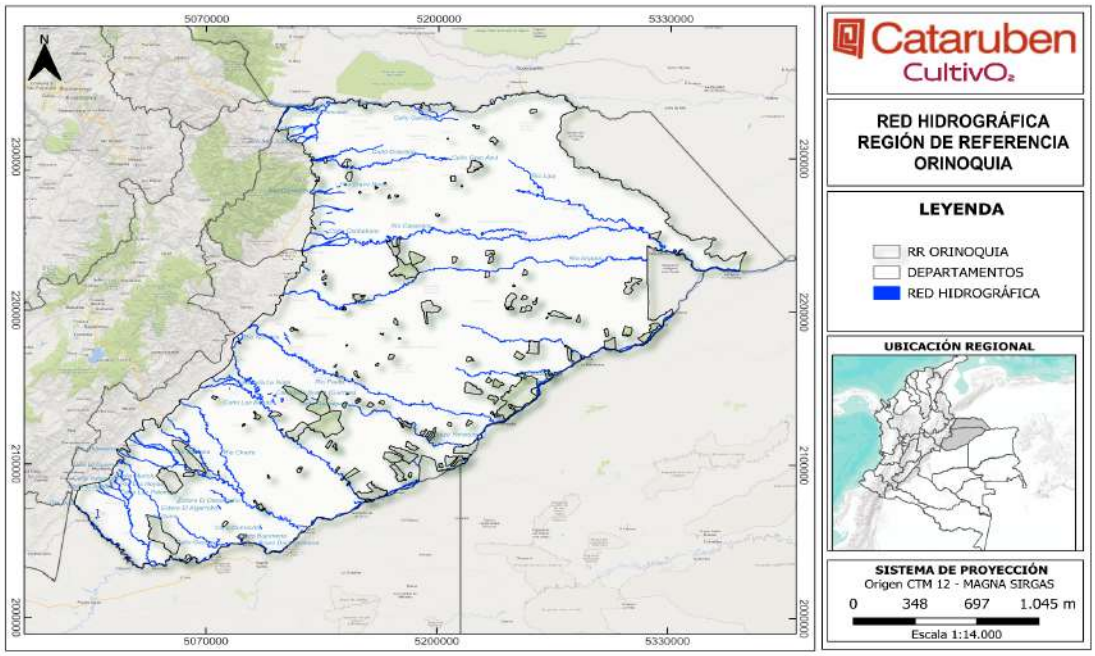
Source: Fundación Cataruben, 2022.

Image 33. Type of relief - Andina reference region



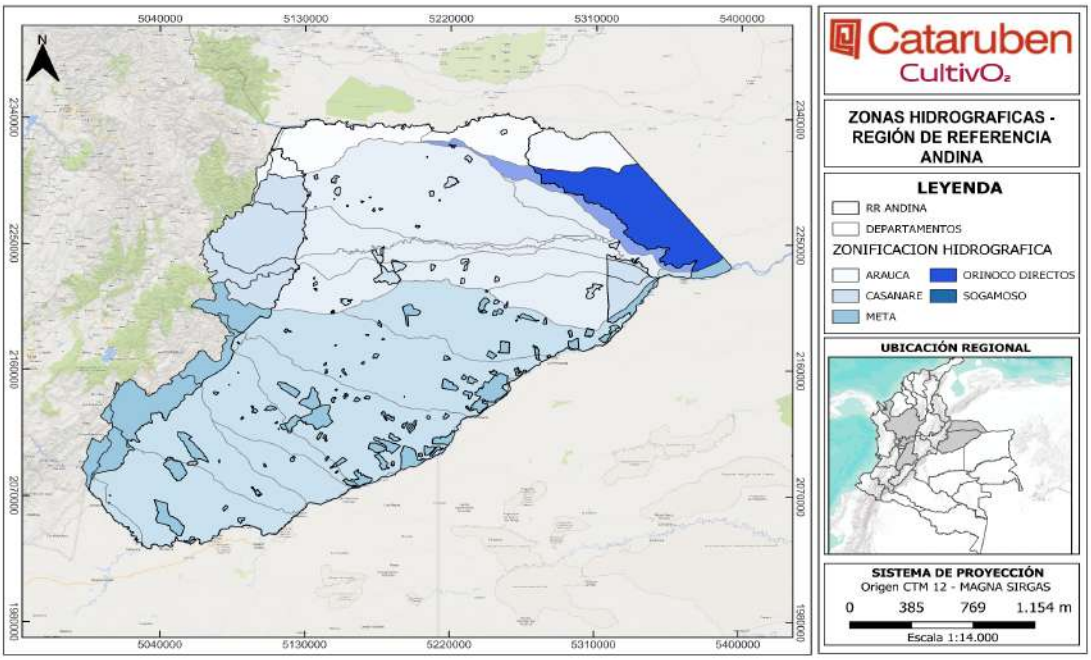
Source: Fundación Cataruben, 2022.

Image 34. Drainage network Orinoquia Reference region



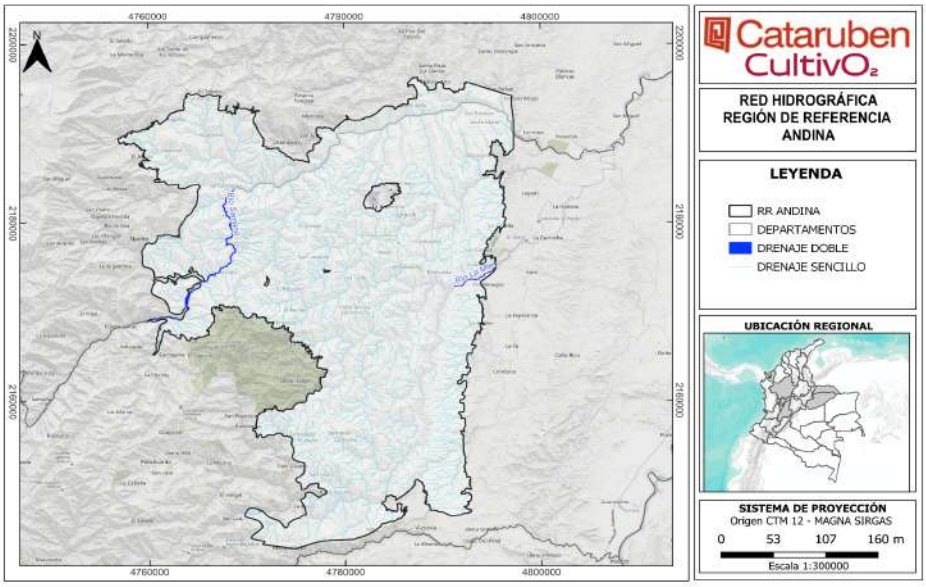
Source: Fundación Cataruben, 2022.

Image 35. Hydrographic Zones of the Orinoquia Reference Region



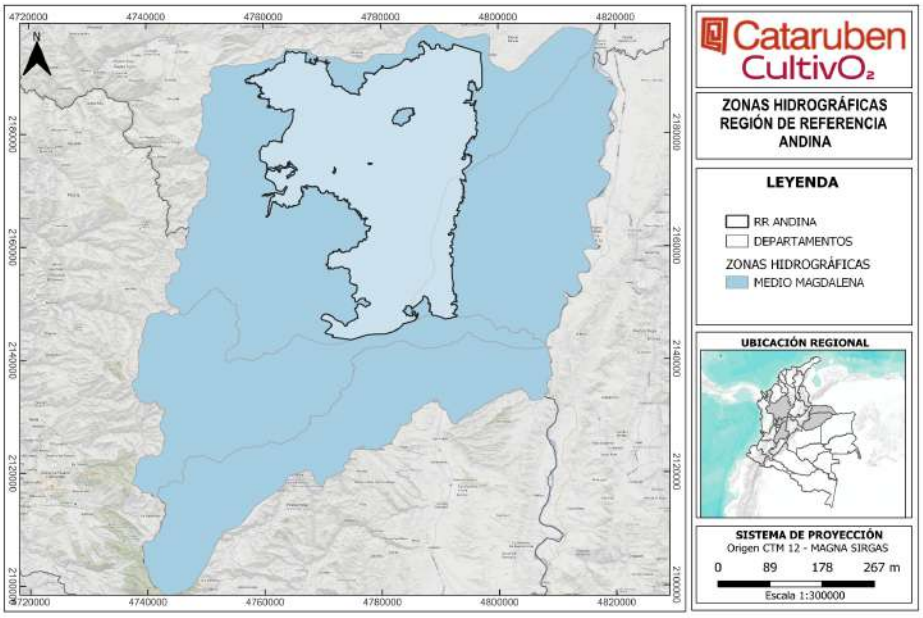
Source: Fundación Cataruben, 2022.

Image 36. Drainage network Andina Reference Region



Source: Fundación Cataruben, 2022.

Image 37. Hydrographic Zones of the Andina Reference Region



Source: Fundación Cataruben, 2022.

The hydrographic zones of the Andina reference region Image 37. They are closely linked to the hydrographic or drainage network Image 36, visualizing that it is a hydrographically important territory because it has part of the Magdalena and Cauca River basin.

13.10.3. GHG emission reductions from REDD+ Activities

13.10.3.1. Activity Data

➢ Historical and projected deforestation

The data on the change in the area covered by forest (CSB) constitute the activity data for estimating deforestation. Thus, the following procedure is established for its estimation:

- Determination of reference regions (ha) for the Andes and Orinoquía biome;
- Estimation of the annual BSC for the reference regions, through multitemporal analysis between the periods 2005 - 2016, applying the following equation:

$$FSC_{yr} = \left(\frac{1}{t_2 - t_1}\right) x \left(A_1 - A_2\right)$$

Where:

FSC_{yr} Annual change in the surface covered by forest in the reference region; ha

t_1 Initial year of the reference period; yr

t_2 Final year of the reference period; yr

A_1 Forest surface in the reference region in the initial moment; ha

A_2 Forest surface in the reference region in the final moment; ha

- Projected annual deforestation for the scenario with the project, applying the following equation.

$$FSC_{project,yr} = FSC_{bl,yr} x(1 - \%DD)$$

Where:

$FSC_{project,yr}$ Annual change in the surface covered by forest in the project scenario; ha

$FSC_{bl,yr}$ Annual change in the surface covered by forest in the baseline scenario; ha

$\%DD$ Project decrease in deforestation due to the implementation of REDD+ activities.

Similarly, the respective adjustment was made for national conditions[17], a value taken from the information submitted by Colombia to the UNFCCC, thus representing a more conservative figure.

- Determination of the leakage area and estimation of annual BSC, through multitemporal analysis between the periods 2005-2016, applying the following equation:

$$FSC_{lk,yr} = (\frac{1}{t_2 - t_1}) \, x \, (A_{1,\,lk} - A_{2,lk})$$

Where:

$FSC_{lk,yr}$ Annual change in the surface covered by forest in the leakage area ; ha

t_1 Initial year of the reference period; yr

t_2 Final year of the reference period; yr

$A_{1,f}$ Forest surface in the leakage area in the initial moment; ha

[17] La propuesta de nivel de referencia de las emisiones forestales por deforestación en Colombia para pago por resultados de REDD+ bajo la CMNUCC considera un cálculo del ajuste por circunstancias nacionales. El titular del proyecto podrá ajustar el valor de CSBlb siguiendo los lineamientos del anexo para la estimación del ajuste por circunstancias nacionales (https://REDD+.unfccc.int/files/31122019_anexo_circunstancias_nref_nal_v7.pdf

$A_{2,f}$ Forest surface in the leakage in the final moment; ha

- Projection of the CSB in the leakage area in the scenario with project (ha), assuming a 10% increase due to project activities, applying the following equation:

$$FSC_{REDD+lk,\,yr} = FSC_{lk,bl} x(1 + \%E_{lk})$$

Where:

$FSC_{REDD+lk,\,yr}$	Annual change in the surface covered by forest in the leakage area in the project scenario; ha
$FSC_{lk,bl}$	Annual change in the surface covered by forest in the leakage area in the baseline scenario; ha
$\%E_{lk}$	Percentade of emissions increase in the leakage area due to the implementation of REDD+ activities.

13.10.3.2. Emission factors

➢ **Deforestation**

Emission factors were estimated according to the biomass content and SOC established for the Andes and Orinoquia biomes in the most recent NREF document, Numeral 7.4.3 C. Emission estimates. The values are presented in the following table:

Table 44. Aboveground and belowground biomass and soil carbon content defined for the Andes and Orinoquia biomes.

Biome	BA (t/ha)	BS (t/ha)	BT (t/ha)	COS (t/ha)
Andes	154	35	189	125
Orinoquia	86	21	107	65

Source: MinAmbiente and IDEAM, 2019.

- ***Factor emission of biomass total carbon***

The estimation of carbon dioxide equivalent contained in total biomass (BT) is estimated from the following equation:

$$CBFeq = BT\ x\ FC\ x\ \frac{44}{12}$$

Where:

$CBFeq$ Carbon dioxide equivalent equivalent content in the total biomass; tCO2e ha^{-1}

BT Total Biomass; t ha^{-1}

FC The molecular ratio constant between carbon © and carbon dioxide (CO2) (0,47)

- ***Soil organic carbon emission factor***

The estimation of the equivalent carbon dioxide contained in soils is estimated from the following equation:

$$COSeq = \frac{COS}{20} x \frac{44}{12}$$

Where:

$COSeq$ Carbon dioxide equivalent in organic soils; tCO2e ha^{-1}

COS Soil organic carbon content; tC ha^{-1}

- ***Total carbon emission factor***

The total carbon emission factor is estimated from the sum of the carbon dioxide equivalent contained in the total biomass and soil carbon pools. The values applied to the project are shown in Table 45.

Table 45. Emission factor for deforestation

Biome	CBTeq (tCO2e/ha)	COSeq (tCO2e/ha)	CTeq (tCO2e/ha)
Andes	325,71	22,92	348,63
Orinoquia	184,40	11,92	196,31

Source: Fundación Cataruben, 2022.

13.10.3.3. GHG emissions in the analysis period

The calculation of GHG emissions in the analysis period is performed as defined in the methodological document BCR0002, section 13.4. Thus, the annual estimate for deforestation in the baseline scenario is estimated taking into account the following equation:

$$AE_{bl,yr} = (AD_{bs} \, x \, TCO2_{eq})$$

Where:

$AE_{bl,yr}$	Annual emission in the baseline scenario; tCO_2/ha
AD_{bs}	Historical annual deforestation in the baseline scenario; ha
$TCO2_{eq}$	Total carbon dioxide equivalent; tCO_{2e}/ha.

The annual emission from deforestation in the project scenario is calculated according to the equation:

$$AE_{REDD+project,yr} = (AD_{REDD+project} \, x \, TCO2_{eq})$$

Where:

$AE_{REDD+project,yr}$	Annual emission in the project scenario; tCO_2/año
$AD_{REDD+project}$	Projected deforestation with project activities; ha
$TCO2_{eq}$	Total carbon dioxide equivalent; tCO_{2e}/ha.

Finally, the annual emission from deforestation in the leakage area was calculated as follows.

$$AE_{lk,yr} = AD_{lk} \, x \, TCO2_{eq}$$

Where:

$AE_{lk,yr}$	Annual emission in the leakage area; tCO_2/ha
AD_{lk}	Annual projected deforestation in leakage area; ha
$TCO2_{eq}$	Total carbon dioxide equivalent; tCO_{2e}/ha.

13.10.4. Expected GHG Emissions Reduction in the Project Scenario

The emission reduction projection is calculated from the difference between the annual emission in the baseline scenario, the project area and the leakage area. Therefore, the avoided deforestation emissions reduction is estimated according to the following equation.

$$RE_{DEF,REDD+proy} = (t_2 - t_1) \, x \, (EA_{DEF,lb,año} - EA_{DEF,REDD+proy,año} - EA_{DEF,f,año})$$

Where:

$RE_{DEF,REDD+proy}$ Emission reduction due to avoided deforestation; tCO_2e

t_2 Final year of the reference period; yr

t_1 Initial year of the reference period; yr

$EA_{DEF,lb,año}$ Annual emission by deforestation in the baseline scenario; tCO_2e

$EA_{DEF,REDD+proy,año}$ Annual emission by deforestation in the project scenario; tCO_2e

$EA_{DEF,f,año}$ Annual emission by deforestation in the leakage area; tCO_2e

Table 46 shows the results of the calculations, column 1 indicates the projected reductions year by year for a period of 20 years, for a total of 38.189 tCO2e reduced by avoided deforestation. Similarly, it should be noted that the projections are monitored and verified in the monitoring report for the period 2017-2021.

Table 46. Projected reduction of emissions from deforestation in the period of analysis 2017-2037.

$RE_{DEF,REDD+proy}$ (tCO2e)	t_1	t_2	$EA_{DEF,lb,año}$	$EA_{DEF,REDD+proy,año}$	$EA_{DEF,f,año}$
382	2.016	2.017	5.130	258	3.342
1.781	2.017	2.018	5.395	271	3.342
1.713	2.018	2.019	5.323	268	3.342
1.884	2.019	2.020	5.503	277	3.342
2.017	2.020	2.021	5.642	284	3.342
2.011	2.021	2.022	5.637	284	3.342
2.006	2.022	2.023	5.631	283	3.342
2.001	2.023	2.024	5.626	283	3.342
1.995	2.024	2.025	5.620	283	3.342
1.990	2.025	2.026	5.614	282	3.342
1.984	2.026	2.027	5.609	282	3.342
1.979	2.027	2.028	5.603	282	3.342
1.974	2.028	2.029	5.597	282	3.342
1.968	2.029	2.030	5.592	281	3.342
1.963	2.030	2.031	5.586	281	3.342
1.958	2.031	2.032	5.581	281	3.342
1.952	2.032	2.033	5.575	280	3.342
1.947	2.033	2.034	5.569	280	3.342

1.942	2.034	2.035	5.564	280	3.342
1.937	2.035	2.036	5.558	280	3.342
947	2.036	2.037	5.553	279	3.342
38.331	**TOTAL tCO2e**				

Source: Fundación Cataruben, 2023.

Step-by-step calculations can be reviewed in Annex GOF-053.Cálculo de emisiones REDD + Cultivo2 V5 > Hoja 1. Deforestation.

14. MONITORING PLAN REDD+ COMPONENT

The following is the general structure to be adopted for the REDD+ component, taking into account the methodological guidelines, which will allow demonstrating GHG emission reductions during the initiative's crediting period.

14.1. Monitoring plan of the Project Boundary

The methodology establishes the monitoring of the geographic boundaries of the project, this activity is developed in each verification, following a Geographic Information System (GIS) for the total areas of the project and the eligible areas and the leakage belt, related information in the geodatabase.

14.2. Monitoring of the REDD+ Activities implementation

The following is the monitoring plan for the execution of REDD+ activities, based on goals with indicators, monitoring frequencies and their projection to 20 years, time in which emission reductions are demonstrated by real actions to reduce deforestation of natural forests, as well as the conservation of fauna and flora. (Ver anexo. Plan de monitoreo - Actividades REDD+)).

The monitoring of each of the proposed activities will be carried out as follows:

- *Implement prevention and mitigation measures to reduce deforestation of natural forests*

A. Apply training and accompaniment processes through training to strengthen land planning, biodiversity conservation and sustainable forest management.

The indicator to report the progress of the activity will be measured in number of training sessions carried out. The supporting documents for these activities will be the attendance lists, audiovisual record and training protocol, and the monitoring frequency will be every two (2) years.

B. Identify and adopt the principles of forest governance for sustainable forest management.

The indicator for reporting the progress of the activity is the percentage of implementation progress of the three phases. The frequency of monitoring of progress will be every five (5) years, and the supporting documents will be the site characterizations carried out, site plan documents and support

for the practices implemented.

C. Monitor terrestrial hot spots

The indicator for reporting progress in the implementation of this activity is the number of hot spot monitoring in REDD+ eligible areas, with a target of 20 monitoring reports.

D. Generate alerts of changes due to deforestation and/or transformation of ecosystems in the project area and its surroundings.

The indicator for reporting the progress of this activity is the percentage of hectares conserved REDD+. The monitoring frequency will be every four (4) years and the documents that support progress are the land cover monitoring reports. And as a goal, five land cover monitoring reports will be generated.

- *Implement fauna and flora monitoring and conservation measures:*

Changes in land use and deforestation due to anthropic activities have generated affectation in different ecosystems such as forests, this is why the following activities are proposed. The monitoring of ecosystems and fauna will make it possible to evaluate their condition and detect changes in their composition, which will make it possible to take preventive measures to avoid their deforestation.

E. Monitoring threatened ecosystems

The indicator for reporting the progress of this activity is the number of monitoring of threatened ecosystems in the project area; the projected goal is to present five (5) reports, with a monitoring frequency of every four (4) years.

F. **Participatory monitoring of threatened species**

The indicator for reporting progress in the implementation of this activity is the number of reports of species with some degree of threat in the project area; the target is to present five (5) reports, with a monitoring frequency of every four (4) years.

14.3. Monitoring of the REDD+ Safeguards

The BCR standard (version 3.1) states in section 18 that the REDD+ project holder must demonstrate compliance with the Safeguards, considering the national context and including the definition of indicators for monitoring, reporting and verification.

Fundacion Cataruben - as the project developer - takes this into account and uses the "Tool to demonstrate compliance with REDD+ Safeguards". In addition, the BCR Program includes a tool related to avoided damages, which includes the evaluation of REDD+ Safeguards. This tool established by the BCR 3.1 standard is called "No Net Harm" and states in the "Monitoring Plan" section that the project holder must design and explain a monitoring plan that, as required by the standard and the methodology applied, presents in detail the appropriate information to monitor project activities and mitigation results.

On the other hand, considering the provisions provided by the "Methodological Document AFOLU Sector - Quantification of GHG Emission Reduction REDD+ Projects BCR0002" regarding the Monitoring of the Safeguards REDD+ it is important to take into account that the required content aspects are considered (indicators, targets, methodology and frequency of monitoring, responsible parties, among others).

Finally, in order to ensure compliance with social and environmental safeguards and in response to the provisions provided by the aforementioned tools, the following is the Plan de Monitoreo de Salvaguardas REDD+ - Cultivo2 P1.

14.4. Monitoring of the Project Emissions

Monitoring for the estimation of emissions is carried out according to the verification periods stipulated by the project, updating the activity data and taking into account the emission factors that are validated. The calculations follow the guidelines of the BCR0002 methodology, numeral 14.5.

14.4.1. Activity Data

➢ *Deforestation*

The estimation of deforestation in the project area during the monitoring period is estimated with the following equation:

$$CSB_{proy,año} = \left(\frac{1}{t_2 - t_1}\right) x \left(A_{REDD+proy,1} - A_{REDD+proy,2}\right)$$

Where:

$CSB_{proy,año}$	Annual change in the surface covered by forest in the project area; ha
t_2	Final year of the reference period; yr
t_1	Initial year of the reference period; yr
$A_{REDD+proy,1}$	Forest surface in the project area at the beginning of the monitoring period; ha
$A_{REDD+proy,2}$	Forest surface in the project area at the end of the monitoring period; ha

The estimation of deforestation in the leakage area, during the monitoring period, is estimated with the equation::

$$CSB_{f,año} = \left(\frac{1}{t_2 - t_1}\right) x\ (A_{f1} - A_{f2})$$

Where:

$CSB_{f,año}$	Annual change in the surface covered by the forest in the leakage area; ha
t_2	Final year of the reference period; yr
t_1	Initial year of the reference period; yr
A_{f1}	Forest surface in the leakage area at the beginning of the monitoring period; ha
A_{f2}	Forest surface in the leakage area at the end of the monitoring period; ha

14.4.2. GHG emissions

Project emissions are estimated from the relationship between deforestation and the defined emission factor, applying the process to the leakage area and project area. For this purpose, the following equations are taken into account:

$$AE_{REDD+projec,\,yr} = AD_{REDD+project,\,yr} \times TCO_{2eq}$$

and

$$AE_{lk,\,yr} = (AD_{lk,\,yr} \times TCO_{2eq}) - AE_{bl,\,lk,\,yr}$$

Where:

$AE_{REDD+projec,\,yr}$	Annual emission in the project area tCO2e/ha
$AE_{lk,\,yr}$	Annual emission in the leakage area; tCO2e/ha
$AD_{REDD+project,\,yr}$	Annual deforestation in the project area; ha
$AD_{lk,\,yr}$	Annual deforestation in leakage area; ha
TCO_{2eq}	Total carbon dioxide equivalent; tCO2e/ha

$AE_{bl,\,lk,\,yr}$	Annual emission in the leakage area, in the baseline scenario; tCO2e/ha

14.4.3. Quantification of Reductions

Emission reductions from avoided deforestation during the monitoring period are estimated from the following equations:

$$RE_{DEF,\,REDD+proy} = (t_2 - t_1)x(EA_{DEF,lb,año} - EA_{DEF,REDD+proy,año} - EA_{DEF,f,año})$$

Where:

$RE_{DEF,\,REDD+proy}$	Emission reductions due to avoided deforestation in monitoring period; tCO2e
t_2	Final year of monitoring period; year
t_1	Initial year of monitoring period; year
$EA_{DEF,lb,año}$	Annual emission by deforestation in the baseline scenario; tCO2e
$EA_{DEF,REDD+proy,año}$	Annual emission by deforestation in the project area for the monitored period; tCO2e
$EA_{DEF,f,año}$	Annual emission by deforestation in the leakage area for the monitored period; tCO2e

SECTION 4.
QUALITY MANAGEMENT

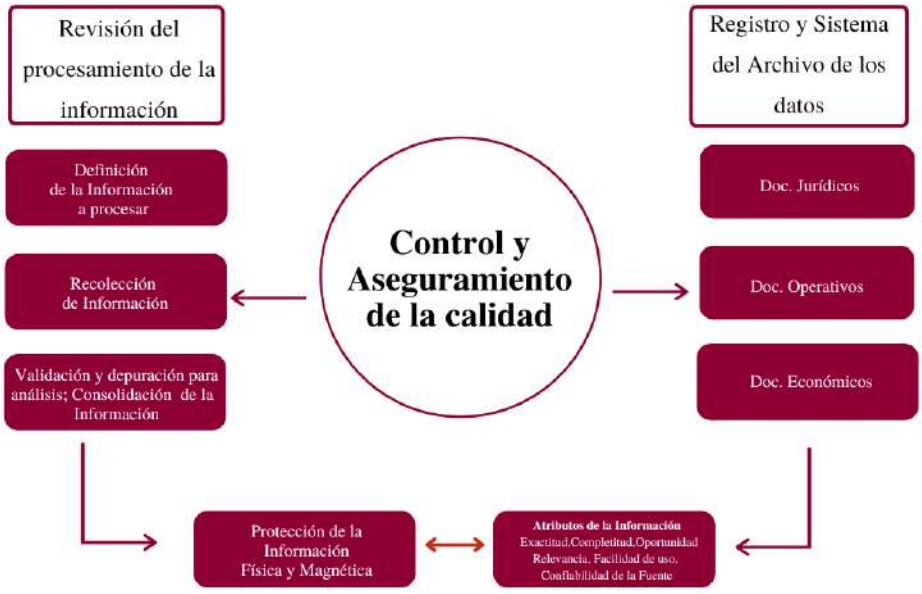
15. QUALITY CONTROL AND QUALITY ASSURANCE PROCEDURES

Good quality control and quality assurance are two of the most important elements of a successful operation. Achieving, guaranteeing and maintaining the quality of the information is fundamental to obtain the expected results in the implementation of the methodologies applicable to each project.

While quality assurance focuses on the processes involved in the production of the information output, quality control is the quality inspection of the information supplied, to evaluate whether it passes certain quality standards. Quality control aims to detect quality deficiencies, while quality assurance aims to prevent them from occurring.

The figure below summarizes in detail the process carried out at the Cataruben Foundation to ensure proper quality control and quality assurance.

Figure 6. Basic structure of QA/QC.

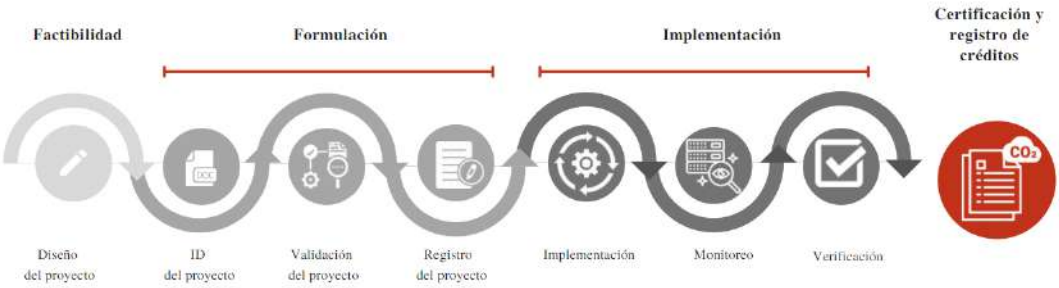


Source: Fundación Cataruben.

The Fundacion Cataruben has foreseen the measures described below to ensure and control the quality during the implementation of the Methodological Document AFOLU Sector / Quantification of GHG Emission Reductions from REDD+ Projects. Version 3.1. of September 15, 2022 and Document BCR0001 Quantification of GHG Emission Reductions Removal Activities. Version 3.0. of April 13, 2022, for each of the CultivoO2 project phases (Figure 7), taking into account the applicable legal and technical requirements, and, in this way comply with the following aspects:

- Ensure the correct development and management of the project;
- Identify and control resources (economic, support, human, etc.) to carry out the activities during all stages of the project;;
- The implementation of the necessary manuals, procedures, instructions, and formats should ensure that the requirements and expectations indicated in the methodologies and requirements of ISO 9001/2015, ISO 14001/2015, as well as legal and regulatory requirements and those of the Fundacion Cataruben's own Integrated Management System are met;;
- Identify and control the interrelationships between the participants during the execution of the project phases, indicating for each of them their scope, roles and responsibilities.

Figure 7. Project phases



***Source**: Adapted from, Cercarbono,2021*

Taking into account that the implementation of the methodologies has as its fundamental basis the geographic, social, economic and environmental information that characterizes the CultivO2 project, the quality assurance and control actions of this aspect are relevant, which is why the following attributes are established throughout the data collection and processing process:

- **Accuracy:** Accuracy means that the data are free of errors (arithmetic and grammatical), are clear, unbiased and reflect the meaning of the data on which they are based.
- **Completeness:** Data should be complete and meet all your needs. Incomplete or partial information can result in erroneous decisions and financial and social cost overruns.
- **Timeliness:** Timeliness means that the data must reach its intended recipients in a pre-established time frame, allowing them to decide on appropriate actions based on the information received.
- **Relevance:** Data is said to be relevant if it answers stakeholders' questions and enables them to make decisions. At this point it is important that the information is communicated to the right people.

- **Ease of use:** Data must be understandable. Thus reports should be constructed in such a way that no additional time is spent in processing it and the required information can be extracted directly.
- **Reliability of Source:** Information should come from reliable sources. The reliability of the source must be evaluated in each delivery of information, taking into account the metrics of collection, validation, debugging and consolidation of information.

To comply with these principles, Information Management activities should be implemented under the parameters established in the methodologies applied here and based on the same Integrated Management System of Fundacion Cataruben, giving applicability to the continuous improvement cycle (PHVA), in order to prevent non-conforming outputs during the process, as described below:

Figure 8. Information Management Cycle.

Source: *Fundación Cataruben.*

15.1. Field Data Verification

For the CultivO2 project, the project holder plans to comply with the AFOLU Sector Methodological Document / BCR0002 Quantification of GHG Emission Reductions - REDD+ Projects. Version 3.1, September 15, 2022 . Version 3.1, September 15, 2022 and of document BCR0001 Quantification of GHG Emission Reductions - Removal Activities. Version 3.0, April 13, 2022. in relation to numeral 16.5.1 verification of field data, which estimates that between 10% and 20% of the records of the information collected from the plots established for sampling should be reviewed, in order to prevent errors from occurring during the consolidation of the information for analysis..

15.2. Review of information processing.

The review of the information processing consists of 5 (five) stages for information management, the first refers to the definition of the information, where the review of the methodological documents applicable to the project is made, the second stage is the collection, where the information that was identified as necessary for the implementation of the AFOLU Sector Methodological Document is collected, This is followed by the data validation and filtering stage, followed by the consolidation of information for analysis, where the information is consolidated in a digital and physical database, and finally the officialization, publication and dissemination of the results to interested parties (Table 47). .

Table 47. Information Processing Review

Stages of information management	Responsible	Controls
Definition of information Review of the Methodological Document Sector AFOLU / BCR0002 Quantification of GHG Emission Reductions - REDD+ Projects. Version 3.1, September 15, 2022 applicable through the ODK Collect application, to identify the type of data required, as well as the appropriate tools, means and strategies for its collection, so as to prevent duplication of efforts and ensure compliance with applicable technical and legal requirements. In this first step, the structure of the information, the relationships and its integrity are identified, in addition to identifying and ensuring that the sources are reliable and official such as IDEAM and IGAC (see annex 7. Procedimiento para el monitoreo de límites del proyecto).	- Project Manager. - Operational Control Unit. - Governance Unit. - Geospatial Unit. - Implementation Unit. - Quantification Unit - S.O.C. Unit	This project design stage must be recorded in the minutes of the meeting, in which at least the following aspects are described and approved: Project initiation minutes Technical requirements Legal requirements Formats and content (geographic, social, biodiversity, land tenure) Data collection tools and means (official and appropriate) Responsible for each activity

Collection In accordance with the means and tools established in the previous stage, the information identified as necessary for the implementation of the Methodological Document AFOLU Sector / Quantification of GHG Emission Reductions from REDD+ Projects. Version 3.1. of September 15, 2022 and Document BCR0001 Quantification of GHG Emission Reduction Removal Activities. Version 3.0. dated April 13, 2022. For this process we have competent personnel and the appropriate tools to collect the information.	- Project Manager. - Operational Control Unit. - Governance Unit. - Geospatial Unit. - Implementation Unit. - Quantification Unit. - S.O.C. Unit	Prior to the start of data collection activities, the operability of the equipment to be used and the competence of the personnel performing this activity must be verified, both for the use of the tools (procedures and forms) and for the use of the technological equipment. Any noncompliance must be reported to the corresponding area to prevent delays in scheduling and/or inadequate processing of the information collected. Procedures and instructions have been established for the collection of information at this stage, which have been validated in the previous stage by the leaders or persons responsible for the project and each of the units involved in the process.
Validation and cleaning Once compliance with the principles of the information in the previous stage has been reviewed, the data are validated and cleaned using the technological tools and equipment initially established.	- Project Manager. - Operational Control Unit. - Governance Unit. - Geospatial Unit. - Implementation Unit. - Quantification Unit. - S.O.C. Unit	The data collected must be verified by the Operational Control Unit, for which the approval of the person responsible for the Operational Control Unit is established in the records (both physical and digital). If inconsistencies are found in the data collected, they must be recorded in the corresponding form and managed through the procedure for non-conforming outputs.

Consolidation of information for analysis. The information gathered is stored in digital and physical databases in compliance with the Procedimiento interno de Control de Información Documentada (FC-GAP-10) y Manual de Seguridad de la Información (FC-GAM-03). This information is processed and analyzed in accordance with the AFOLU Sector Methodological Document / Quantification of GHG Emission Reductions from REDD+ Projects. Version 3.1. of September 15, 2022 and Document BCR0001 Quantification of GHG Emission Reduction Removal Activities. Version 3.0. dated April 13, 2022.	- Project Manager. - Operational Control Unit. - Governance Unit. - Geospatial Unit. - Implementation Unit - Quantification Unit. - S.O.C. Unit	At this stage the PDD is prepared, which is reviewed and validated by the Carbon Line Superleader and the Project Manager, according to the requirements identified in the initial stage and the applicable methodology. To validate compliance with the requirements, the information is audited by the corresponding entity and corrective actions are established in case of significant findings.
Officialization, publication and dissemination Once the PDD has been generated and validated, the results are published and disseminated to the relevant stakeholders	- Carbon Line SuperLeader - Project Manager.	The information generated throughout the process is stored in physical and digital media in accordance with the Manual de Seguridad de la Información (F-GAM-03) y el Manual de Archivo (FC-GAM-04), in order to ensure the security and proper maintenance of the information for as long as required.

Source: Fundación Cataruben, 2023.

All documented information generated during the process must comply with the following characteristics:

- They must be written in the present tense of the verb.
- They must have uniformity in terminology and wording.
- They must have uniformity in terminology and wording.
- They must comply with Fundacion Cataruben's image in terms of icons, logos, fonts, color palette, among other aspects.

- The process leader and/or project manager is responsible for ensuring compliance with the project's document management requirements.

During all phases of the CultivO2 project, various documents are obtained, including the following:

Table 48. Data Recording and Filing System

ADMINISTRATIVE DOCUMENTS	LEGAL DOCUMENTS	TECHNICAL DOCUMENTS	FINANCIAL DOCUMENTS
During all stages of the project, administrative documents are generated to support and guarantee the veracity of the project information, such documented information is classified into: Procedures, norms, policies. Resource request records (human, financial, procurement, among others). Administrative records (POA, risk matrices, among others). Follow-up reports. Performance evaluation. Meeting records.	*Copies of documents that support the tenure of the Property.* - Public deed of the Property. - Certificate of tradition and freedom. - Real estate registration. - Certificate of sound possession. - Cadastral certificate. - Property tax. *Copies of the identification documents of the beneficiaries of the projects.* - Citizenship card. - Chamber of Commerce Certificate. - RUT *Conservation agreements:* - Letter of intent. - Act of truthfulness of the information. - Control of documented information. - Legal feasibility. - Technical feasibility. - Title study. - Enrolled contracts. - Confidentiality agreements. - OTHER (if applicable). - Special power of attorney (if applicable). - Authorization for payment of economic incentives to third parties (if applicable). *In the event of the death of a beneficiary of the project, the following must be available:* - Death certificate of the beneficiary. - Birth certificate of the beneficiary's	Before, during and after the execution of the field trips, the following are taken into account: - Guides, programs, procedures and manuals that provide guidelines for the collection and analysis of the information obtained. - Data bases. - Field records. -Maps of the properties. -Photographic evidence. - List of assistance. - Property plan	The economic documents include: - Supplier registration. - Financial simulators. - Certificate issuance statement. - Accounts receivable. - Payment of accounts receivable. -

Audit reports.	heirs. - Support of succession. - If the aforementioned documents are not available, the project holder will not be able to make any disbursement until the legal situation of the property enrolled in the project is clear.		

Source: Fundación Cataruben, 2023.

15.3. Data recording and archiving system

During the CultivO2 project phases, from design to verification, different documents are obtained, among which are the following:

Table 49. Data Recording and archiving System

Legal Documents	Operational Documents	Economic Documents
Copies of documents that support the tenure of the Property. Public deed of the Property. Certificate of tradition and freedom. Real estate registration. Certificate of sound possession. Cadastral certificate Property tax. Power of attorney Copies of the identification documents of the beneficiaries of the projects. Citizenship card.	Before, during and after the execution of the field trips, the following are taken into account: Instructions, programs, procedures and manuals that provide guidelines for the collection and analysis of the information obtained. Field records Maps of the properties. Photographic evidence	The economic documents include: Financial simulators. Accounts receivable. Accounts receivable payments

Conservation agreements Enrolled letter of enrollment Enrolled contracts of enrollment Confidentiality agreements		

Source: *Fundación Cataruben*

These documents are classified and treated according to the guidelines established by the procedures, manuals and policies, where it is required:

- Organize physical and electronic documents through document classification.
- Establish conservation and elimination deadlines for information and electronic records in Document Retention Tables (TRD).
- Execute partial or complete elimination processes in accordance with the times established in the Documentary Retention Tables (TRD).
- Ensure the authenticity of records and information throughout the document life cycle.
- Maintain the integrity of the documents, through document groupings, in series and subseries.
- Preserve the documents and their documentary groupings, in series and subseries, in the long term, regardless of the technological procedures used for their creation.

15.4. Protection of records

Fundacion Cataruben has established the following methodologies for the protection of records associated with the implementation of the methodology as described below:

- Physical Records: records are stored in filing cabinets that are located in the archiving area of the Fundacion Cataruben facilities, free from humidity, direct sunlight and any other feature that may accelerate their deterioration. The Document Management Coordinator must guarantee their protection, as well as control their access and consultation.
- Digital Records: To ensure the protection of Fundacion Cataruben's digital records, these are stored in the "Google Drive" application assigned to the project. Ensuring the protection of their integrity through access credentials assigned to the Project Manager.

Additionally, the following Policies and Manuals are in place to ensure compliance with legal requirements for the treatment of information during the execution of the project:

➢ FC-GDN-07. Política de Propiedad Intelectual. It establishes an active, transparent and responsible internal and external management and regulation process through principles and guidelines that allow strengthening and encouraging scientific research and the creation of

works of this nature in the Foundation. Likewise, to have the necessary mechanisms to mitigate the risk of the use, exploitation and appropriation of its intangible assets.

- FC-GDN-08. Política de Protección de Datos Personales. Fundacion Cataruben, and in compliance with the constitutional right to Habeas Data, only collects Personal Data, when previously authorized by its Owner, implementing for this purpose, clear measures on confidentiality and privacy of Personal Data.

- FC-GAM-03. Manual de Seguridad de la Información. Establish the security measures and control mechanisms for the information assets of FUNDACION CATARUBEN, within the framework of the Information Security Management Manual.

- FC-GAM-04. Manual de Archivo. The purpose of this manual is to establish the guidelines for the application of document transfers, consultation and loan of documents, bibliographic collections, updating and application of the Documentary Retention Tables (TRD), opening of new files, establishing the information security and document management policies together with the handling of electronic documents. On the other hand, it is intended that the management of the Fundacion Cataruben's archives is functional and complies with the service required by the entity and the applicable regulations, taking into account the importance of document management as the knowledge management of the institutions and the improvement of the quality of the services to the user.

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