PROMOTING SUSTAINABLE DEVELOPMENT THROUGH NATURAL RUBBER TREE PLANTATIONS IN GUATEMALA

Document Prepared by **ECONEGOCIOS OCCIDENTE**

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Project Title	Promoting Sustainable Development through Natural Rubber Tree Plantations in Guatemala
Project ID	VCS Project ID: 514. VCSR-350. UPN 098E6B76.
Version	03
Report ID	NEOSAPSMR-22
Date of Issue	30-09-2023
Project Location	Guatemala, Departments of Suchitepéquez & Izabal
Project Proponent(s)	Negocios Energéticos de Occidente, S.A. NEOSA Contact person: Isabel Aguirre Econegocios Occidente Manager

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Validation/Verification Body	KBS Certification Services Pvt. Ltd. (KBS) 414-424, Om Shubham Tower, Neelam-Bata Road, N.I.T., Faridabad-121001, Haryana India. Tel.: +91-129-4034513 Contact person: Kaushal Goyal Managing Director Email: director@kbsindia.in
GHG Accounting/Crediting Period	VCS: 01-June-2007 – 31-May-2049; 42 years total period CCBS: 01-September-2014 – 31-May-2049; 34 years total period VCS and CCB periods are different since validation of CCB was obtained February 27,2014 and the first completed verification period started in 01 September 2014.
Monitoring Period of this Report	01-September-2016 to 31-August-2022
History of CCB Status	The project was validated in February 26, 2,014. The Project issued an initial report on October 17, 2014 and initiated the verification process. The first verification attempt was not successful. The second verification attempt was successful and the project achieved its first verification on March 03, 2017. The current monitoring report corresponds to the second verification of the Project, under CCBS.
Gold Level Criteria	No Exceptional Biodiversity Benefits are claimed under the current report, since Bello Horizonte farm will not be seeking VCU issuances during this monitoring period. Exceptional biodiversity benefits for the first monitoring report were due to the occurrence of endangered and vulnerable species in the Bello Horizonte project zone.

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1 SUMMARY OF PROJECT BENEFITS

1.1 Unique Project Benefits

The Project aims to generate a variety of project benefits throughout its lifetime. This section outlines unique project benefits that are not captures in Section 1.2 below.

Outcome or Impact	Achievements during the Monitoring Period	Section Reference	Achievements during the Project Lifetime
1) Sources of sustainable natural rubber and wood.	No included areas have been harvested given the age of plantation (plantation production stage) and continue to provide rubber (coagulated and as latex) in the region.	2.2.1 4	1,433.36 has as reforested area, which provides sustainable sources of coagulated rubber, latex and eventually will be a source of sustainable wood in the region[1].
2) Socialization of the importance biodiversity in the region.	277 individuals participated in this monitoring period's socialization event. Participants were provided with information on project monitoring and benefits.	2.3.2 2.3.10 4.1 5.1	Social and biodiversity monitoring and socialization of the impacts of the project will be carried out; education promotes community participation to improve the ecosystem. The land use in the without-project scenario would have not generated any additional biodiversity benefits.
3) Increase species richness in project area.	Last biodiversity monitoring event recorded species richness was maintained or improved based on indicator.	2.3.2 2.3.10 4.1 5.1	Species richness serves as an indicator that proper management practices are in place[2].

[1] In addition to rubber plantations being recognized for reducing illegal harvesting, these plantations provide sustainable sources of wood. Reference: https://www.inab.gob.gt/images/boletines/2020/mayo/boletin_hule.PDF

[2] ANNEX IX. CCBS\Biodiversity monitoring\Flora and fauna studies: The studies carried out for the 2022 monitoring clearly show the increase in the fauna species found in the participating and evaluated farms, compared to the 2016 studies.

1.2 Standardized Benefit Metrics

Promoting Sustainable Development through Natural Rubber Tree Plantations in Guatemala, hereinafter Promoting Sustainable Development Project, is a large scale, long term rural sustainable development project focused on reforesting degrading and degraded land with natural rubber tree plantations in Guatemala.

Category	Metric	Achievements during Monitoring Period[3]	Section Reference	Achievements during the Project Lifetime
GHG emission reductions & removals	Net estimated emission removals in the project area, measured against the without-project scenario	The total net removals generated in this Monitoring Report were 110,207 ton CO_2 –e.	3.2.4	The project plans to sequester a total of 3,900,439 t CO2-e over 42 years.
	Net estimated emission reductions in the project area, measured against the without-project scenario	--	--	--
Forest[4] cover	For REDD[5] projects: Number of hectares of reduced forest loss in the project area measured against the without-project scenario	--	--	--
	For ARR[6] projects: Number of hectares of forest cover increased in the project area measured against the without-project scenario	1,433.36 hectares within five farms	2.2.1	Project is limited to current area of 1,433.36 hectares.

[3] Number of permanent and temporary jobs, as well as number of women employee are based on the results of the CCBS monitoring at Project areas, founded in: ANNEX IX. CCBS\CCBS-Monitoring.

[4] Land with woody vegetation that meets an internationally accepted definition (e.g., UNFCCC, FAO or IPCC) of what constitutes a forest, which includes threshold parameters, such as minimum forest area, tree height and level of crown cover, and may include mature, secondary, degraded and wetland forests (*VCS Program Definitions*)

[6] Afforestation, reforestation and revegetation (ARR) - Activities that increase carbon stocks in woody biomass (and in some cases soils) by establishing, increasing and/or restoring vegetative cover through the planting, sowing and/or human-assisted natural regeneration of woody vegetation (*VCS Program Definitions*)

Category	Metric	Achievements during Monitoring Period[3]	Section Reference	Achievements during the Project Lifetime
Improved land management	Number of hectares of existing production forest land in which IFM[7] practices have occurred as a result of the project's activities, measured against the without-project scenario	--	--	--
	Number of hectares of non-forest land in which improved land management has occurred as a result of the project's activities, measured against the without-project scenario	--	--	--
Training	Total number of community members who have improved skills and/or knowledge resulting from training provided as part of project activities	392	2.3.2 2.3.10 4.1 5.1	> 300
	Number of female community members who have improved skills and/or knowledge resulting from training provided as part of project activities of project activities	14	2.3.2 2.3.10 4.1 5.1	5% total employment
Employment	Total number of people employed in of project activities,[8] expressed as number of full time employees	392	CCBMonitoring [9]	> 300
	Number of women employed in project activities, expressed as number of full time employees	14	CCBMonitoring [10]	5% total employment

[8] Employed in project activities means people directly working on project activities in return for compensation (financial or otherwise), including employees, contracted workers, sub-contracted workers and community members that are paid to carry out project-related work.

[9] ANNEX IX. CCBS\CCBS-Monitoring

[10] ANNEX IX. CCBS\CCBS-Monitoring

Category	Metric	Achievements during Monitoring Period[3]	Section Reference	Achievements during the Project Lifetime
Livelihoods	Total number of people with improved livelihoods[11] or income generated as a result of project activities	392	CCBMonitoring [12]	> 300
	Number of women with improved livelihoods or income generated as a result of project activities	14		5% total employment
Health	Total number of people for whom health services were improved as a result of project activities, measured against the without-project scenario	392	CCBMonitoring [13]	> 300
	Number of women for whom health services were improved as a result of project activities, measured against the without-project scenario	--	--	--
Education	Total number of people for whom access to, or quality of, education was improved as a result of project activities, measured against the without-project scenario	--	--	--
	Number of women and girls for whom access to, or quality of, education was improved as a result of project activities, measured against the without-project scenario	--	--	--
Water	Total number of people who experienced increased water quality and/or improved access to drinking water as a result of project activities, measured against the without-project scenario	--	--	--
	Number of women who experienced increased water quality and/or improved access to drinking water as a result of project activities, measured against the without-project scenario	--	--	--

[11] Livelihoods are the capabilities, assets (including material and social resources) and activities required for a means of living (Krantz, Lasse, 2001. *The Sustainable Livelihood Approach to Poverty Reduction*. SIDA).
[12] ANNEX IX. CCBS\CCBS-Monitoring
[13] ANNEX IX. CCBS\CCBS-Monitoring

Category	Metric	Achievements during Monitoring Period[3]	Section Reference	Achievements during the Project Lifetime
Well-being	Total number of community members whose well-being[14] was improved as a result of project activities	392	2.3.2 2.3.10 4.1 5.1	> 300
	Number of women whose well-being was improved as a result of project activities	14	2.3.2 2.3.10 4.1 5.1	5% total employment
Biodiversity conservation	Change in the number of hectares significantly better managed by the project for biodiversity conservation,[15] measured against the without-project scenario	59.31 ha[16]	CCB Monitoring[17]	> 20 ha
	Number of globally Critically Endangered or Endangered species[18] benefiting from reduced threats as a result of project activities,[19] measured against the without-project scenario	0 Critically Endangered or Endangered species. The Morelet's Treefrog (*Agalychnis moreletii*), has been included in category 2 (Endangered), of the List of Threatened Species of Wildlife of Guatemala (LEA-CONAP). And the Northern Glassfrog (*Hyalinobatrachium viridissimum*) is recommended as a key species to monitor.	ANNEX IX. CCBS\Biodiversity assessment\CCBS-ECO2 RUBBER FORESTS-Report of the assessment of biodiversity.	In monitored areas: 0 Critically Endangered or Endangered species. The Morelet's Treefrog (*Agalychnis moreletii*), has been included in category 2 (Endangered), of the List of Threatened Species of Wildlife of Guatemala (LEA-CONAP). And the Northern Glassfrog (*Hyalinobatrachium viridissimum*) is recommended as a key species to monitor.

[14] Well-being is people's experience of the quality of their lives. Well-being benefits may include benefits reported in other metrics of this table (e.g. Training, Employment, Health, Education, Water, etc.), but could also include other benefits such as empowerment of community groups, strengthened legal rights to resources, conservation of access to areas of cultural significance, etc.

[15] Biodiversity conservation in this context means areas where specific management measures are being implemented as a part of project activities with an objective of enhancing biodiversity conservation.

[16] ANNEX V. Plantation Management\Natural forest conservation maps

[17] ANNEX IX. CCBS\CCBS-Monitoring

[18] Per IUCN's Red List of Threatened Species

[19] In the absence of direct population or occupancy measures, measurement of reduced threats may be used as evidence of benefit

2. GENERAL

2.1 Project Description

2.1.1 Implementation Description

The project plans to sequester a total of 2,053,696 t CO2-e over 42 years through the originally planned reforestation of 2,366.16 ha with rubber trees. The effective start date of the project was May 31, 2007. June 30, 2007 was the date of the first project activity, which was the preparation of the soil for the establishment of the first rubber plantations within the project boundary.

The project includes originally seven different farms with four different landowners, however in the 2014 report the Project Proponent excluded two farms: Concepción and Río Frío farms. Taking into account these exclusions, nowadays the project has established rubber tree plantations on 1,433.36 hectares of degraded and degrading lands where the traditional use has been cattle grazing. The real or effective planted area is determined by the planting density of the natural rubber plantations. This area excludes other vegetated areas within the project boundary such as creeks, border vegetation, and other small spots of vegetation. The total planted area with carbon removals reported in this Monitoring Report is 1,433.36 hectares within five farms.

The planted specie is *Hevea brasiliensis* (Müll.Arg).

The project aimed to create a model of sustainable competitiveness in the natural rubber sector in Guatemala introducing several innovative practices. The first was creating a sustainable mechanism for project finance and introducing carbon finance as a new and key financial tool in rubber plantations. The second innovation was creating a comprehensive tool-kit of methods and knowledge related to carbon project development, monitoring, and management for new rubber tree plantations. The third innovation represents a milestone in sustainable management of rubber tree plantations in Latin America, as the plantations established by the project are certified by The Climate, Community & Biodiversity Standard (CCBS).

CCBS certification for the rubber tree plantations established by the project activity ensures that the project complies with stringent standards for social and environmental responsibility. The project also has secondary objectives that provide additional climate, community and biodiversity benefits[20]:

- Decrease adverse effects of climate change via carbon sequestration and avoided deforestation.
- The project has a positive impact on the surrounding population by providing a long-term jobs, legal benefits, training, and health benefits.

[20] In accordance with CCBS indicator G3.1: Describe the project's major climate, community and biodiversity objectives.

- Relieve barriers related to the lack of access to necessary materials as well as knowledge related to rubber planting and its management, teaching the nearby communities the skills essential for rubber production.

- The project proposes to modify the rubber business model by integrating wood into the biomass processing industry as high value product or energy generation, reducing pressure on native forests.

- The project is expected to have a net positive impact on the environment (such as degraded soil, restore water recharge and mitigate wind effects) given the change from pasture to natural rubber tree plantations.

- The project protects high conservation value zones and mitigate degradation and depredation of those areas within and next to the project area by providing buffer zones and biological corridors.

The project will also have an aesthetic positive impact on the landscape as vegetation is recovered since rubber trees are native to tropical forests in America.

The monitoring event described in this Monitoring Report was carried out on August 2022. The period of carbon removal measured was from 1st September 2016 to 31th August 2022. This monitoring report corresponds to the seventh verification and was released in May 2023. This monitoring included five farms; four of them are claiming carbon removals (Palmeras, Los Patos, Asunción and El Horizonte) and one not claiming (Bello Horizonte). The total net removals generated in this Monitoring Report were **110,207.47 ton CO2 –e.**

Since the last report, the leakage was counted as 0; given that no changes at monitoring period occurred, the leakage did not change for this reported monitoring period.

The non-permanence risk factors do not reflect any changes, and given this, the risk factor remains at 10%.

A significative change in the Project, reported in this Monitoring Report, is that the legal entity of the Project Proponent, has been changed; from Producción, Industrialización, Comercialización y Asesoría de Hule Natural, S.A. -PICA- thru Negocios Energéticos de Occidente, S.A. -NEOSA-. Although both entities belong to the same group (Grupo Agroindustrial de Occidente), NEOSA's main activity makes it suitable to be, from now on, the Project Proponent.

NEOSA also has other projects that generate carbon credits (energy) and is more closely related to customers than PICA, from this strategic point of view, which on the other hand, is the company that is dedicated to the purchase and commercialization of natural rubber (raw material). Considering the suitability of the line of business of both companies and, being the same group of people that continues to be in

charge of the Project, the decision was made to make the change at the VERRA registry, with NEOSA now being the Project Proponent for this project.

Econegocios Occidente, as the developer and executor of the monitoring, reporting and verification of the Project (MRV), continues with the activities as usual.

2.1.2 Project Category and Activity Type

The sectoral scope: 14 – Agriculture, Forestry and Land Use (AFOLU)

Project category is Afforestation, Reforestation and Revegetation (ARR)

The project type is not a grouped project, since no new instances have been added subsequently to project validation.

2.1.3 Project Proponent

The project proponent and coordinator for the project is Negocios Energéticos de Occidente, S.A. -NEOSA- a private entity incorporated in Guatemala. NEOSA has legal rights to all emission reduction credits produced by the members of the project group. NEOSA direct all project activities related to the generation of emission reduction credits[21].

Organization name	Negocios Energéticos de Occidente, S.A. NEOSA
Contact person	Isabel Aguirre
Title	Econegocios Occidente, Manager
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Email	iaguirre@econegocios.com.gt

[21] In accordance with CCBS indicator G4.1: *identify a project proponent who is responsible for the project's design and implementation.*

2.1.4 Other Entities Involved in the Project

Besides Project's participants developing the project activities, there are no other entities involved in the Project.

NEOSA as the Project proponent will provide further information about the general description of the Project's participants in every monitoring report, updating the information and complementing as necessary.

Organization name	Corporación Pecuaria Nacional, S.A. (Palmeras Farm)
Role in the Project	Project Participant
Contact Person	Luis Rodrigo Zúñiga
Title	Farm owner
Address	12 avenida 15-15, Zona 10 Ciudad de Guatemala, Guatemala
Telephone	
Email	lrzuniga@cpn.com.gt

Organization name	Ingenio Magdalena, S.A. (Los Patos and Asunción Farms)
Role in the project	Project Participant
Contact Person	Javier E. Rodríguez Rodas
Title	Forestry Division Manager
Address	22 Avenida Vista Hermosa III, 11-00 zona 15 Ciudad de Guatemala, Guatemala
Telephone	
Email	erodriguez@imsa.com.gt

Organization name	Compañía Agrícola El Horizonte, S.A. (El Horizonte Farm)
Role in the Project	Project Participant
Contact Person	Elder Pérez / Paola Vásquez
Title	Agricultural Division Manager / Administrative Manager
Address	9a. Calle, 3-62 zona 1 Ciudad de Guatemala, Guatemala
Telephone	
Email	elope1971@gmail.com ; paolavasquez_@hotmail.com

Organization name	La Vega de Talismán, S.A. (Bello Horizonte Farm)
Role in the Project	Project Participant
Contact Person	Enrique Alejos
Title	Owner
Address	Diagonal 3, Calzada Atanasio Tzul 43-15 Zona 12, Ciudad de Guatemala, Guatemala
Telephone	
Email	eac@uniongt.com

2.1.5 Project Start Date (G3.4)

The effective start date of the project was May 31, 2007. This was the date that the formal decision was made to commit financial resources to the development of a carbon project to create an incentive for the establishment of natural rubber plantations was documented and signed by the board of directors of PICA (previous Project Proponent). The first project activity began with the establishment of rubber plantation in June 2007.

2.1.6 Project Crediting Period (G3.4)

The crediting period runs from June 30, 2007 until June 29, 2049, and the carbon project lifetime is 42 years[22].

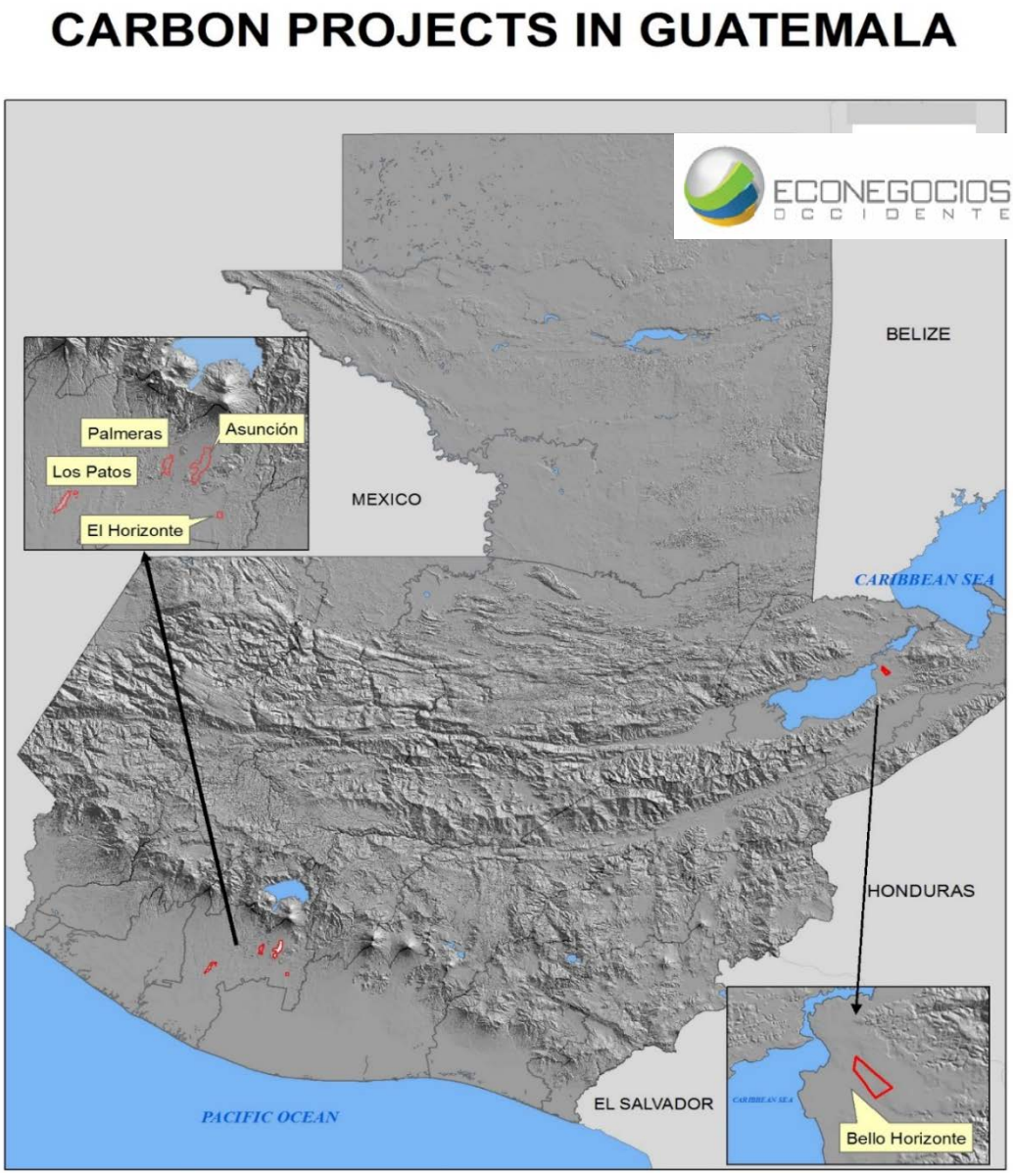
2.1.7 Project Location (G3.3)

Project location and geographic boundaries[23]: The project area consists of five different farms comprising discrete areas located in two different regions of Guatemala: North and South. The two regions are separated by a distance of 370 km.

[22] In accordance with CCBS indicator G3.4: *Include the project lifetime and implementation schedule and explain any difference with the project crediting period.*

[23] In accordance with CCBS indicators G1.1, G1.3 & G3.3: *Describe the location of the project and basic physical parameters, including specification of the project zone. Include a map identifying the project location and boundaries of the project area(s), the project zone and additional surrounding locations that are predicted to be impacted by project activities.*

Figure 1. Farm Locations of NEOSA's project in Guatemala.



The farms situated in the North of Guatemala along the Atlantic Coast are located in the Departments of Izabal (Bello Horizonte). The farms situated in the South of Guatemala along the Pacific Coast are located in the Department of Suchitepéquez (Palmeras, Los Patos, Asunción and El Horizonte).

As mentioned above, since validation it has been two farms excluded from the Project (Río Frío and Concepción farms); this fact is dully described at Section 2.2 Project Implementation Status / 2.2.4 Exclusion of two initial Project sites (farms); given this, Figure 1 only shows the 5 farms still included at the Project.

Figure 2. Project Locations in North

a) Bello Horizonte

Figure 3. Project Locations in South.

d) Palmeras

e) Asunción

f) El Horizonte

g) Los Patos

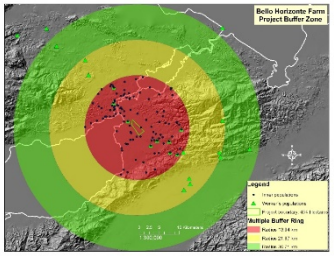
As required, the KML files of every Project location are submitted in the Annex VIII of this Monitoring Report.

A Project Zone was defined based on the location where the farms workers live. The distances between locations (project area and worker location) were summed and an average distance was acquired as the most significant project zone. There are two other zones that are defined, which represent one and two standard deviations from the mean (95% of workers). The outer zones are less likely to receive additional

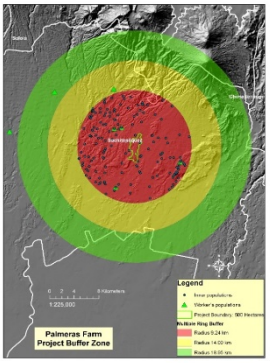
benefits from the farm besides the wages and respective benefits that the workers receive. The communities at a closer proximity are likely to see improvements in the landscape, infrastructure, erosion and water quality of the farm. The maps with the defined project area and project zone can be found under Annex IX. CCBS files: Project Zone file.

Figure 4. Project Zones

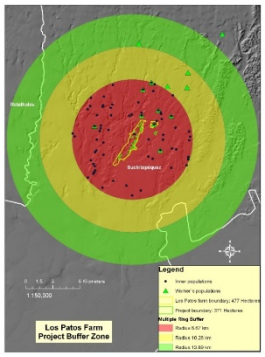
a) Bello Horizonte



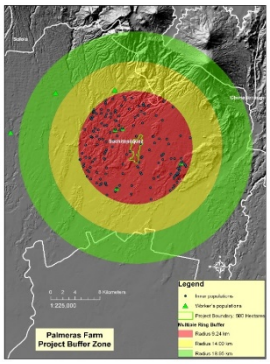
b) Palmeras



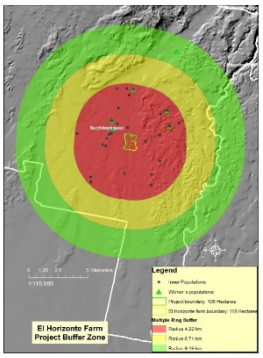
c) Los Patos



d) Asunción



e) El Horizonte



2.1.8 Title and Reference of Methodology

The Promoting Sustainable Development Project applied the CDM consolidated methodology "AR-ACM0001 Version 03, Afforestation and reforestation of degraded land"

The project area contains degraded and degrading lands that were being grazed at a low level. No other pre-project activities were taking place in the project area.

Additionally, the Project used and took into account the following tools at Validation:

CDM A/R Methodological Tool "Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities", Version 01.

CDM A/R Methodological Tool, "Tool for the identification of degraded or degrading lands for consideration in implementing CDM A/R project activities", Version 01.

CDM A/R Methodological Tool "Estimation of GHG emissions due to clearing, burning and decay of existing vegetation attributable to a CDM AR project activity", Version 03.

CDM A/R Methodological Tool "Procedure to determine when accounting of the soil organic carbon pool may be conservatively neglected in CDM A/R project activities", Version 01.

CDM A/R Methodological Tool "Calculation of the number of sample plots for measurements within AR CDM project activities", Version 02.

CDM A/R Methodological Tool "Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity", Version 01.

2.1.9 Other Programs (CL1.5)

GHG emission removals generated by the Project are not and will not be used for compliance with an emission-trading program or to meet binding limits on GHG emissions. The project is not registered nor is seeking registration under any other GHG programs.

NEOSA, as the Project Proponent states that the GHG emission reductions/removals issued during this Monitoring Report have been not be issued as other types of GHG credits or claimed as other forms of environmental credit and are not also used under emission trading programs, other mechanisms that include GHG allowance trading, or as other forms of environmental credit.

2.1.10 Sustainable Development

The declaration of Constitution of the Republic of Guatemala[24], on the 126th article declares as a national urgency and social interest the reforestation of the country and the conservation of the natural forests. One of the key activities of the project is the reforestation of degraded land, contributing directly with the constitution of Guatemala.

[24] http://www.ine.gob.gt/archivos/informacionpublica/ConstitucionPoliticadelaRepublicadeGuatemala.pdf

The National Plan of Development KATUN 2032[25], as part of its rural development priorities strives to have all rural areas that provide goods and services under sustainable management by the year 2032. In addition, the plan has as a priority the conservation and sustainable use of forest and biodiversity for the adaptation and mitigation to climate change, with a goal of no less than 2.6% of forest plantations cover in the country's territory. The project activity contributes to this national goal by increasing forestry cover in degrading areas and committing to environmental and socially responsible certifications.

The Guatemalan forestry law[26], in article 1, objective of the law, section b) states the need to promote the reforestation of forestry areas in order to provide forestry products required by the country; and in section d) support, promote and incentive public and private investment of forest activities in order to increase the production, commercialization, diversification, industrialization and conservation of forest resources. The project contributes to these objectives by reforesting degraded land and promoting private investment for the production of non-timber forest products used in the national and international market.

The National Action Plan of Climate Change[27], in its mitigation strategies, in chapter VI.4 Land Use, Change of Land Use and Forestry, promotes increasing the absorption of CO2 through agroforestry systems, and increasing the absorption of CO2 by restoring the forestry landscape. The project contributes to this goal by increasing CO_2 reductions through agroforestry systems that restore the landscape.

2.2 Project Implementation Status

2.2.1 Implementation Schedule (G3.4)

The implementation of the afforestation project generates GHG emission removals and mitigate climate change; improve soil and water conservation and forest cover; enhance local biodiversity by increasing the connectivity of forests and bring income and job opportunities for local communities. The project is estimated to generate GHG emission removals of 3,900,439 tCO_2 -e in 42 years.

Since previous monitoring report, the Project is certified by CCBS, the carbon credits generated from the reported vintage, can be issued under both standards (VCS + CCBS).

The rest of Project's original conditions, stayed as programmed, with only Bello Horizonte farm not claiming removal during the monitoring period reported, as well dully described this fact among this report.

[25] http://www.katunguatemala2032.com/nportal/
[26] http://www.inab.gob.gt
[27] http://www.segeplan.gob.gt/nportal/index.php/biblioteca-documental/biblioteca-documentos/category/97-plan-de-accion-nacional-de-cambio-climatico

Table 3. Implementation Schedule

Date	Milestone in the project's development and implementation
May 31st, 2007	Project Start date
October 26st, 2010	Project VCS Validation
February 26, 2,014	CCBS Validation
March 03, 2017	Issuance of the first VCS + CCBS carbon credits
December 31st, 2012	Cut-off date for plantation establishment included at the Project
Year 0 – Year 7	Maintenance of plantations
Year 7 – Year 36	Tapping of natural rubber sap, provide training to new employees
36 years	Plantation rotation cycle for rubber tree forests
Planting year + 36 years	Harvesting or rubber plantations with commitment to replant

2.2.1.1 Planted Area

Project areas were calculated using two different methods:

- Eligible areas: using GIS information to establish the project area.
- Effective planted area: using initial planting density.

The scope for this monitoring report includes all the plantations established between 2007 and 2012. The total area planted in this period was 1,433.36 ha within 5 farms, 4 in the South and 1 in the North; however, the area under carbon removals is claimed corresponds to 1,102.21 has, given that Bello Horizonte farm did not measure carbon removals corresponding to the vintage of this report (September 1st, 2016 to August 31th, 2022), nevertheless, it is expected to retake the measurements for the next monitoring report. The Río Frio and Concepción farms in the North, were excluded from the Project, as reported in the previous monitoring report (2014).

The rubber plantation establishment within farms has been finished.

Carbon sequestration in rubber plantations was determined using areas calculated by using planting density. Rubber tree plantations are subject to a census one year after their establishment on all the project

farms. The census information obtained is used by every farm to calculate planting densities, which are reported to Project Proponent through official reports[28].

The planting density calculated by using the above described method is conservative according to the following arguments: 1) it includes rubber tree loses that happens in the first year which is the year when the mortality rate is the highest; 2) it includes all replanted trees during the establishment year and the second year after original establishment; and 3) the use of this method allows the exclusion of small vegetated areas within baseline boundaries, keeping conservative the *ex post* GHG sequestration estimations.

In *Table 4* all the individually planted areas by farm and by year are described for the period 2007-2022. According to *Table 4*, only 86.7% of the total Project Boundary was planted; the remaining area is not going to be planted even though is eligible (included as Project Boundary). Therefore, in this monitoring period there is no report of the establishment of new rubber plantation since plantations of the project have finished in current Project area.

Table 4. Planting areas between 2007 - 2022, reported in the 2022 Monitoring Event

Farm	Planting area / year *1 (ha)							Project Boundary Area (ha)	Remaining Area not to be planted (ha)
	2007	2008	2009	2010	2011	2012	Total		
(N1) Bello Horizonte	16.58	123.81	167.91	0	0	22.85	**331.15**	391	59.85
(S1) Palmeras	9.18	114.17	0	0	0	0	**123.35**	179.71	56.36
(S2) Los Patos	325.87	25.61	0	0	9.25	0	**360.73**	369.28	8.55
(S3) Asunción	0	192.19	79.23	212.57	12.17	19.97	**516.13**	606.77	90.64
(S4) El Horizonte	18.24	57.8	25.96	0	0	0	**102**	106.4	4.4
Total	**369.87**	**513.58**	**273.10**	**212.57**	**21.42**	**42.82**	**1,433.36**	**1,653.16**	**219.80**

*Source: Planting densities reports by farms[1].

Table 4 shows that 13 different clones have been planted in plantations established in 2007, 2008, 2009, 2010, 2011 and 2012. Given the procedure used for area calculation, the areas here presented by farm are equivalent to summarizing the net individual area occupied by a certain clone. In other words, this is equivalent to summarizing the individual area occupied by every tree alive when the census happened.

[28] ANNEX V. Plantation management\Planting densities reports

Table 5. Clone Distribution within farms in years 2007 – 2012

Planting Area of clones in 2007-2012 within Project boundaries															
Farm	Planting year	HA-21	IAN-873	IRCA-18	IRCA-230	PB-217	PB-312	PB-314	PB-255	PB-260	PB-280	RRIC-100	RRIM-600	RRIM-901	TOTAL (ha)
(N1) BELLO HORIZONTE	2007								5.38	3.65	3.81		3.74		16.58
	2008	31.70							0	23.71	22.55	30.08	15.78		123.82
	2009	25.44								21.40	55.53	41.81	23.72		167.90
	2012			22.85											22.85
(S1) PALMERAS	2007				9.18										9.18
	2008				3.97			50.95			59.25				114.17
(S2) LOS PATOS	2007		28.51			38.85				135.37	0.92	37.95	83.52	0.75	325.87
	2008											18.66	6.95		25.61
	2011		9.25												9.25
(S3) ASUNCION	2008		31.94			29.41				130.84					192.19
	2009		12.52			1.67		0.98		28.05	14.80			21.21	79.23
	2010		2.79			16.25	7.09			94.83	28.94		8.27	54.4	212.57
	2011									12.17					12.17
	2012													19.97	19.97
(S4) EL HORIZONTE	2007									5.15	4.09	5.43		3.57	18.24
	2008									14.25	3.37	29.36		10.82	57.80
	2009									25.96					25.96
	Total area per Clone (ha)	57.14	85.01	22.85	13.15	86.18	7.09	51.93	5.38	495.38	193.26	163.29	141.98	110.72	**1,433.36**
	Significance of clone	3.99%	5.93%	1.59%	0.92%	6.01%	0.49%	3.62%	0.38%	34.56%	13.48%	11.39%	9.91%	7.72%	

*Source: Planting density reports by farm[29].

2.2.1.2 Identify GHG sources, sinks and reservoirs for the baseline scenario and for the project

Above Ground Biomass -AGB- was measured and monitored in this monitoring event. Below Ground Biomass -BGB- was calculated using a default value. Change in stocks of soil organic carbon was assessed using the default method allowed by AR-ACM0001 V03 and the "*Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities*".

Baseline carbon stocks were determined with direct field measurements as described in the Baseline report. Emissions of non-CO_2 GHGs resulting from use of fire in site preparation $GHG_{SPF,t} = 0$ since slash and burn is a common practice in the baseline[30].

[29] ANNEX V. Plantation management\Planting densities reports

[30] ANNEX III. Scientific Literature References/documents: 4. FAO Global Forest Resources Assessment 2015.pdf and 5. Evaluación de los Recursos Forestales Mundiales 2015-Guatemala.

2.2.2 Methodology Deviations

During this monitoring period, no methodology deviations were applied.

2.2.3 Minor Changes to Project Description (*Rules* 3.5.6)

- **Bello Horizonte farm.**

The Project Proponent informs that the farm Bello Horizonte, for administrative decisions, is not reporting any emission/removal at this monitoring period. This is the first monitoring event in which the farm does not measure or reported carbon removals, and it is expected to retake the measurements for the next monitoring report.

Bello Horizonte farm is located in Ruta CA-13, kilómetro 265, Río Dulce, Livingston, Izabal, Guatemala; the project boundary is 391.0 has and rubber plantations were established between 2007 and 2012. The rubber plantation remains on a steady state in this farm and no changes in planting area and/or carbon stocks have been made; KML file can be checked with recent satellite images at Google Earth in order to verify the remaining plantation.

Since there were no measurements for this project participant included in this report, there are no additional carbon stocks assessed for this instance, and the accumulated carbon stock is the same as the last carbon stock where measurements were made (2016 Monitoring Event). The last cumulative carbon stock reported for this farm was 76,380.32 tons CO2-e.

- **Palmeras farm.**

The Project proponent inform that since the last monitoring report, Palmeras farm has changed of owner; the previous owner was Agropalmeras, S.A. and for the present monitoring period, the owner is Corporación Pecuaria Nacional, S.A. The current owner has decided to continue with the responsible management of the rubber plantations and comply with all the Project's requirements; NEOSA as Project Proponent has admitted the new entity as Project Participant given the commitment of the new participant and to the fact that the carbon stocks have not undergone any change, that the physical space is the same.

- **Verification on a 6-year period.**

In this report, the PP also reports that, the project had not been able to be verified in the five years that are contemplated as a maximum by the CCBS Program Rules. The project is verifying within a six-year period

due to changes in ownership for the included sites (farms). This does not change the project implementation but did require additional social and biodiversity monitoring and communication to ensure that new stakeholders were informed of the VCS and CCBS certification process and requirements. Also, monitoring was conducted under new ownership, and that legal documentation had been properly updated; this legal process of change of ownership, in the host country (Guatemala), took time, and this change occurred in the last years of the 5-year period, which generated a delay of one year.

The project also consists of a smaller area and therefore, for financial reasons, cannot verify in shorter intervals. Fixed verification costs are high and to maximize the benefits of carbon revenue, the project needs to verify at longer time periods.

2.2.4 Project Description Deviations (*Rules* 3.5.7 – 3.5.10)

2.2.4.1 Developing a new allometric equation

The carbon stock for individual trees above 5 cm of DBH is estimated using the Morales 2000 equation[31]. Morales' equation has been proven for estimating carbon removals in rubber trees in a conservative way as supported in Project's PD. Morales' equation could not be applied for carbon stock estimations on trees below 5 cm of DBH, because it didn't include this range of DBH size when the study for its development was carried out.

PICA, as the previous Project Proponent, decided to create a new equation using a destructive methodology to estimate the Above Ground Biomass (AGB), harvesting for this reason, 50 trees in 2010. These trees represented the five most planted clones in the Project. The selected clones for this resource were: PB-260, RRIC-100, PB-280, RRIM-600 and HA-21. The sampling on farms was carried out in both regions: North and South. The 50 trees harvested for evaluation included sample sizes from the entire range of DBH (0 to 5 cm).

The entire field plan was created by PICA, applying the Winrock International methodology for this type of research. GPG-LULUCF in the section *4.3.3.5.1 ABOVEGROUND BIOMASS* recommends as a good practice this type of methodology. All the methodology is fully described in the document "Developing a new equation to estimate carbon quantity fixed in rubber trees (*Hevea brasiliensis*) with less than 5 cm of DBH in Guatemala".

Pablo Domínguez, as the monitoring coordinator, was in charge of the research. He conducted all field activities. PICA contracted third parties that accompanied the field data and sampling collection, conducted

[31] ANNEX III. Scientific literature references\Rubber allometric equation, Morales 2000.pdf

laboratory activities, data collection and statistical analysis. This was done to introduce transparency to this study and allow auditing to the entire process.

The measured parameters were: DBH in cm and biomass wet in kg, at field; dry biomass in kg at laboratory.

Soluciones Analíticas laboratory was hired to give support and validation in two phases of the developing a new equation: 1) to validate all the performed field activities related to data and sampling collection and 2) to obtain dry weight for all kiln samples dried in the laboratory.

Soluciones Analíticas laboratory is accredited as a "Testing Laboratory" according to the standard Coguanor NTG/ISO/IEC 17 025:2005, with accreditation registry OGA-LE-031-09.

Later, a consultant was hired to make the statistical data analysis once the laboratory results were available. To develop the new equation, SPSS 16.0 software (*Statistical Package for the Social Sciences)* was used.

The regression models evaluated were: Lineal, Logarithmic, Quadratic with constant, Quadratic without constant, Cubic with constant, Cubic without constant and Growth model.

Dispersion graphics, correlations and determination coefficients, standard error, significance within variables and coefficients were obtained for each evaluated model.

The best statistical model to predict weight of biomass in AGB was the "growth model". The selected model combines the third highest value for determination coefficient (r^2) and the lowest standard error value (se) of estimation which means the lowest sampling error in estimations when using it. Moreover, this model has the highest estimated coefficient and significance value in the variance test. This demonstrates high correlation between the variables measured: DBH (cm) and dry biomass (kg).

Models generated were tested to evaluate the results and again the "growth model" predicted the most realistic values according to field data.

As a final result, the equation obtained and used in all calculations in trees below 5 cm in DBH was:

$$\hat{Y} = e^{(-2.547 + 0.913\ DBH)} * 0.5 \qquad r^2 = 0.976$$

Where:

$\hat{Y}$ = carbon content in tree biomass with DBH below 5 cm; in kilograms. (Kg)

e = e number, base of natural logarithmic

DBH= Diameter at breast height, 1.3 meters above graft area for rubber trees; in cm.

0.5= constant used to express the relation of 50% within Biomass (kg) and carbon content (C).

Additionally, in order to establish if there were statistical differences within carbon removal in clones, within farms or within regions (North and South), mean tests with no parametric methods were applied using SPSS software. The tests used were: Kruskal Wallis test, median test and Mann Whitney test.

From data results analysis it was concluded that there was no statistically significant difference for carbon removals within clones, for different farms or in both sampled regions which means that the predictions with the equation developed have representativeness and broad applicability.

2.2.4.2 Ex ante stratification

During PD development, two project strata were established in PD: North and South. This stratification was based on Guatemala's regions, which are separated by long distances and represent differences in climate, soil quality, among other considerations. According to AR-ACM0001 V03, $M_B = 2$.

2.2.4.3 Pre sampling campaign

The pre-sampling event was carried out in 2009, in order to measure 30 plots per strata per planting year. The objective was to measure the growth in plantations established in 2007 and 2008 in order to validate the *ex ante* stratification and monitoring methodology proposed in Project's PD. The pre-sampling included measuring 120 sampling plots.

The statistical analysis showed low significance and high variability between different clones using the proposed *ex ante* stratification and monitoring methodology proposed in the PD document.

Econegocios team was able to identify three main reasons that introduced high statistical variability to the results obtained: a) differences in growth rate between clones, meaning big differences in growth between clones b) plantation management techniques differed between farms (clone selection and management), and c) differences in local weather and soils between farms. The reasons for high statistical variability identified as b) and c) were given by farm, while a) was related to every clone.

The conclusion herein was that the two main sources of error (farm & clone) in the pre-sampling event were related to differences between farms and differences between clones. These two sources of statistical error in the monitoring methodology originally proposed were targeted to be properly managed in the first Monitoring Event in 2010.

Due to the above-described situation, the requirement to change the sampling stratification to reduce high variability of the variables being measured was needed and applied for the 2010 Monitoring Event. Given

that there are more than one variable affecting the homogeneity in the statistical results, the sampling size was also significantly increased (45.5% more than methodology suggest).

2.2.4.4 Ex post Stratification

Changes in stratification were considered during the process of project development and PD writing. The VCS PD states: "*The two project strata of North and South will be further stratified by planting year and clone for monitoring of GHG removals. Post-stratification of the project area will be carried out after monitoring events if the change in carbon stocks is more or less variable than expected*"[32](see page 40. PD).

In addition, according to AR-ACM0001 V03, post-stratification is allowed in the way Project Proponet, raised the need. It is stated in page 5 of the methodology document as follows:

• *"For actual net GHG removals by sinks. The ex ante estimations shall be based on the project planting/management plan. The ex post stratification shall be based on the actual implementation of the project planting/management plan……"*

"……However, factors impacting growth (e.g., soil type) might be useful for ex post stratification if their variability in the project area is large".

The *ex post* stratification is based on farm and planting year. Every planting year plantation at each farm represents a stratum ($_i$). The number of strata depends on how many different planting years plantation exist among project's farms. In 2022 Monitoring Event 18 strata exists among the participants farms; however, given that Bello Horizonte did not measure carbon removal, only 13 were taking into account for the Project's removals calculation.

Furthermore, a sub-stratification was conducted at clone level. Sub-stratification based on clone's distribution is more detailed and provides with more representativeness to the collected data. The objective of sub-stratification is using for analysis the data generated from more homogeneous units (sub-strata) and reach the lower variance within strata (Planting year and farm, $_i$).

The *ex post* stratification was generated to increase the precision of the sampling. The sampling plots were systematic randomly distributed and located within strata and sub-strata.

As the result, in the 2022 Monitoring Event, the *ex post* stratification for this monitoring event includes 54 different sub-strata ($_i$), see *Table 6*.

[32] Project' PD\3.4.2 Sampling design and stratification, page 40.

Table 6. *Ex post* stratification

Strata					
No.	**Code**	**farm**	**Planting year**	**Sub-strata**	
1	N107	Bello Horizonte	2007	PB - 255 PB - 260 PB - 280 RRIM - 600	4
2	N108	Bello Horizonte	2008	HA - 21 PB - 260 PB - 280 RRIC - 100 RRIM - 600	5
3	N109	Bello Horizonte	2009	HA - 21 PB - 260 PB - 280 RRIC - 100 RRIM - 600	5
4	N112	Bello Horizonte	2012	IRCA - 18	1
5	N115	Bello Horizonte	2015	FDR - 5788	1
6	S107	Palmeras	2007	IRCA - 230	1
7	S108	Palmeras	2008	IRCA - 230 PB - 314 PB - 280	3
8	S207	Los Patos	2007	IAN - 873 PB - 217 PB -260 RRIC - 100 RRIM - 600 RRIM - 901	6
9	S208	Los Patos	2008	RRIC - 100 RRIM - 600	2
10	S211	Los Patos	2011	IAN - 873	1
11	S308	Asunción	2008	IAN - 873 PB - 217 PB - 260	3
12	S309	Asunción	2009	IAN - 873 PB - 260 PB - 280 RRIM - 901	4

Strata					
No.	**Code**	**farm**	**Planting year**	**Sub-strata**	
13	S310	Asunción	2010	IAN - 873	7
				PB - 217	
				PB - 260	
				PB - 280	
				PB - 312	
				RRIM - 600	
				RRIM - 901	
14	S311	Asunción	2011	PB - 260	1
15	S312	Asunción	2012	RRIM - 901	1
16	S407	El Horizonte	2007	PB - 260	4
				PB - 280	
				RRIC - 100	
				RRIM - 901	
17	S408	El Horizonte	2008	PB - 260	4
				PB - 280	
				RRIC - 100	
				RRIM - 901	
18	S409	El Horizonte	2009	PB - 260	1
				TOTAL	54

2.2.4.5 Sampling design and size

The ex post sampling size and sampling distribution between strata was defined using the tool “Calculation of the number of sample plots for measurement within A/R CDM project activities”. However, in order to be conservative and preventing the high variance in the variables measured, the sample size was increased even more than the sample size indicated by the referred tool (45.5% more) in 2010 Monitoring Event.

The sampling size and sampling distribution were designed to achieve the targeted precision level for biomass mean estimation of ±10% at a 95% confidence level.

Econegocios monitoring coordination increased the sample size; hence the number of sampling plots and its size (in terms of number of trees measured) was increased (tripling it from ten to thirty sampled trees) since 2010 Monitoring Event.

In this monitoring event 269 permanent sampling plots were measured among the four participant's farms; the data from these plots were used for the carbon removals analysis and calculations.

2.2.4.6 Exclusion of two initial Project sites (farms)

In the 2014 monitoring report the Project Proponent informed that the farms Río Frío (Agropalmeras, S.A.) and Concepcion Farm (Sistemas Operativos del Norte, S.A.) were excluded from the Project boundary. A gap validation was done under the Climate Community and Biodiversity Standard in order to actualize and validate the new project area and was successfully completed in March 3, 2016. The changes made do not impact the project additionality nor the base line identified in the original validation, nor do they impact the net benefits associated with the project's climate, community and biodiversity.

- **Case Río Frío farm**:

Río Frío farm is located in Livingston, department of Izabal, Guatemala, was owned by Agropalmeras S.A. The Project boundary was 619 has and it was planned that the rubber plantation was established in within 2012 and 2013. Nevertheless, since the 2013 Monitoring Report it was informed that "*it has been concluded that the area initially proposed to be planted with rubber plantations in Río Frío, has problems with poorly drained soils. Rubber is a specie susceptible and not adapted to poorly drained soils. Therefore, it is expected that a rubber plantation could be affected by poor drainage causing severe damage or death to a considerable percentage of trees. Hence, it has been decided not to establish a rubber plantation; instead, a Eucalyptus plantation will take place in this area*" (referred in Section 2.0.1 of this report). Thus, there was no GHG reduction reported or requested for Río Frio's Project boundary at any monitoring report. The decision of the Project participant not to plant rubber trees in the area is in fact part of an adaptive management applied in order to avoid the non-permanence risk of the carbon stocks at Río Frío Farm.

Due to the above situation, it has been decided to excluded Río Frío farm form the Project given that the project activity (the project activity is establishing a long-term rubber plantation) has not and will not be implemented within the Project boundary of this farm ever.

- **Case Concepción farm**:

Concepción farm is located in Cobán, department of Alta Verapaz, Guatemala, is owned by Sistemas Operativos del Norte, S.A. The Project boundary was 94 has and it was planned that the rubber plantations were established in between 2007 and 2009. Nevertheless, by the time of 2013 only 55.84 has were planted with rubber plantation (59.4% of the Project boundary).

The reported total carbon stocks for this farm in 2013 Monitoring Report was 2,009.50 tons ton CO2-e, representing the 0.95% (2,009.50 / 210,866.06) of the total carbon stocks removed and existing in 2013, and 0.75% (2,009.5 / 267,280.82) of the total carbon stocks removed and existing in 2014.

Even though the reforestation with rubber trees took place in some portion of the Project boundary at this farm (only within 59.4% of total Farm's Project boundary), the size of the plantations and the tree growth have not been enough to sustain the Project activity with all its requirements (e.g. FSC and CCBS certifications); the necessary changes and improvements could not be sustainable nor financially feasible with the incomes produced due to the lower removals in this plantations. The rubber plantation will remain stand in this farm in business-as-usual way of the rubber cultivation (without all the Project requirements, i.e. VCS, FSC and CCBS); the client has made the upfront investment for the establishment of the plantations and has no plans to remove the rubber trees. Given the above explanation, the Project Proponent considered as an adaptive action to exclude this farm in order to avoid any incompliance with the Project activity and its requirements.

Accordingly with the *VCS Standard Section 3.6 Project Description Deviations*, none of the two cases (Río Frío and Concepción farms) exposed in this monitoring report's section impact the applicability of the methodology, additionality of the appropriateness of the baseline scenario, and the Project remains in compliance with the applied methodology.

The deviation only affects the total Project boundary that has been reduced from 2,366.16 has through 1,653.16 has (see *Table 14*). Five farms owned by four Project Participants remain in the Project: in the North, Bello Horizonte farm (Project Participant Inversiones Agrícolas Palafox, S.A.); in the South, Palmeras farm (Project Participant Corporación Pecuaria Nacional, S.A.), and Los Patos and Asunción farms (Project Participant Ingenio Magdalena, S.A.) and El Horizonte Farm (Compañía Agrícola El Horizonte, S.A.).

Additionally to the supported and the justification presented, and in accordance with the VCS Definitions Standard, none of the above cases represents a loss of more than five percent of carbon stocks in pools included in the Project boundary and were not planned for in the Project Description; therefore it is neither a loss event nor a reversal.

This deviation will be reported in the subsequent monitoring reports.

2.2.4.7 Sustainable Project Certification

When de Project was validated, the project aimed to create a model of sustainable competitiveness in the natural rubber sector in Guatemala introducing several innovative practices.

The first was create a sustainable mechanism for project finance, introducing carbon finance as a new and key financial tool to reach the required rate of return for investors in rubber plantations. This goal continues to be achieved by the Project, and proof of this, is the financial viability that the incomes of carbon credits sales, has given to the Project, even in years when the value of the credits was low.

The second innovation was to create a comprehensive tool-kit of methods and knowledge related to carbon project development, monitoring, and management for new rubber tree plantations. This goal continues to be achieved by the Project, and proof of this, are the constant successful verifications of this Project, as well as the generation of experiences that allowed the development of another project in Guatemala (ECO2 Rubber Forests), which has already been validated in 2016 and currently generates carbon removals; ECO2 Rubber Forests is a grouped project that allows the inclusion of more participants, and with this scalability, to promote the good management practices and relations with the communities, learned in this Project.

The third innovation represents a milestone in sustainable management of rubber tree plantations in Latin America, incorporating stringent social and environmental standards by certifying the project under the the Forest Stewardship Council (FSC) principles and criteria. This goal was achieved by the Project, and proof of this, was the achievement of FSC Forest Management certification; this group certification was achieved for at least two consecutive five-year periods. This is a milestone as there were no FSC-certified rubber plantations at that time in the world, and has allowed the development of more FSC certification initiatives in Guatemala, and also within the FSC itself.

Despite all the achievements of the Project, circumscribing the sustainable management of rubber plantations to a particular certification scheme limits the options of commercialization and preference at present, where there are certification schemes currently more requested than the FSC seal itself.

Given the above, in this Monitoring Report, the Project Proponent apply a deviation from the original PD statement, that required participants to adhere specifically to the FSC standard. The Project will continue to incorporate stringent social and environmental standards as stated, however, limiting participants to one standard does not allow the project to incorporate new certification schemes and findings that are more aligned with the current requirements of buyers and clients. The project was validated under the Climate Community and Biodiversity Standard in 2014 to meet growing demand for this certification and wishes to continue to meet its requirement of incorporating stringent social and environmental standards through this certification scheme.

As part of the projects commitment to continue innovating and incorporating best management practices, project participants must now adhere to a recognized sustainable and/or responsible management certification scheme, with stringent principles regarding social and environmental issues, as long as this compliance can be verified.

2.2.5 Risks to the Project (G3.5)

Without the project, the land would remain as pastureland and continue to be overgrazed and degraded, which would have an adverse effect on biodiversity. As required by sustainable and responsible forest

management, new plantations have not cause deforestation or degradation of existing forests. Also, farms that include areas of HCV or natural reserves will serve as buffer areas and biological corridors. Without the project, biodiversity within these reserves is at a higher risk of predation and degradation.

According to Guatemalan law Accord 431-2007, an Environmental Impact Assessment for rubber plantations establishment must be completed for each plantation. Therefore, all plantations included in the project have an EIA that identifies any potential risks to the community and biodiversity and establishes measures necessary to mitigate these. An actualized risk analysis has also been conducted for the project area taking into account project management, financial viability, project longevity, land ownership and resource access/use rights, community engagement, political risk, and natural risk

Table 7. Main outcomes from environmental assessments at Project's farms.

Identify Risk	Mitigation	Status of mitigation
Impacts on air quality: gases that dissipate from ammonium and formic acid utilized for latex coagulation in the recollection cups and the subsequent smell	Only authorized personnel are allowed in farm.	Given the security and the restriction of personnel allowed within de plantations (only authorized workers), this measure prevents and avoids that people not related with the rubber production, stays unnecessarily at plantations
	Use of safety equipment by workers such as masks, helmets, protection goggles, etc.	All workers wear proper safety equipment
	The smell is nontoxic, seasonal, and only perceptible for a few meters around the plantations.	N/A
Impacts on water		Residual water by employees is disposed accordingly
	Ordinary residual water shall be disposed of through septic tanks or reused for irrigation.	Ordinary residual water is disposed accordingly
Impacts on soil quality due to organic and non-organic waste as well as chemical containers	Most waste is organic, however non-organic waste shall be buried in authorized location. There will be no burning of waste and any residual water shall follow governmental guidelines 236-2006.	Waste is disposed accordingly
	All containers that were used for pesticides and fertilizers will follow the governmental protocol for discharge 509-2001.	As per governmental protocol, containers are properly discharged.
No negative impacts are foreseen on biodiversity	All plantations will be done on cattle pasturelands, any removal will begin after 30 years of the establishment of the first plot, and there will be reforestation with rubber plantations.	N/A

Identify Risk	Mitigation	Status of mitigation
No negative impacts are foreseen on archeological or cultural sites	Not present	N/A
No negative impacts are foreseen on human health	There are minimum risks of occupational hazards since the work is simple and does not degrade workers physical or mental health at any moment.	N/A
Occupational hazards	Workers will use personal protection during any occupation that involves risk. Specifically, during the application of any chemicals.	Workers use proper personal protection during high risk tasks.
	Additional mitigation measures listed in 2.6	Measures given by the EIA to ensure health and safety are implemented in farms

In accordance with the VCS Risk Report, the project's larger risk factors include project longevity, land tenure, political risk, and natural risks due to extreme weather (Hurricanes). Although extreme weather events such as hurricanes occur in Guatemala, a conclusive assessment of plantations in both the North and South region of Guatemala demonstrated how rubber plantations have withstood some of the strongest hurricanes in Guatemala's history without more than 5% carbon stock losses. Project risk has not increased since the project validation. Risk factors are continuously monitored in every monitoring/verification event and reported in the Non-Permanence Risk Report[33].

Possible additional risks were determined following the manual: Richards, M. and Panfil, S.N. 2011, Social and Biodiversity Impact Assessment (SBIA) Manual for REDD+ Projects: Part 1 – Core Guidance for Project Proponents. Climate, Community & Biodiversity Alliance, Forest Trends, Fauna & Flora International and Rainforest Alliance. Washington, DC.

Table 8. Additional Project Risks

Identify Risk	Potential impact of risk on climate, community and/or biodiversity benefits	Actions needed and designed to mitigate the risk
Marginal Groups Left out	G3. Stakeholder Engagement, Anti-Discrimination	Equal Employment Opportunities in farm and socialization of project undertaken, have made it easier to access marginal groups and identify better ways to increase involvement.

[33] ANNEX IV. Risk analysis/document: PSDTNRTPG-Non-Permanence Risk Report-MR22and PSDTNRTPG-MR2021-VCS Risk Report Calculation Tool.xls.

Identify Risk	Potential impact of risk on climate, community and/or biodiversity benefits	Actions needed and designed to mitigate the risk
Fall in carbon credit prices	G1. Project Goals, Design and Long-Term Viability, Risk Management and Long-Term Viability	Multiple revenue sources and considered for project; carbon credits revenues allow project participants to develop protection measures
Fall in commodity prices	Project Goals, Design and Long-Term Viability, Risk Management and Long-Term Viability	Multiple revenue sources and considered for project; carbon credits revenues allow project participants to develop responsible management, especially in the period being reported, in which the prices of rubber, as a commodity have fallen a lot
Loss of access to lands for agriculture and cattle	B2. Net Positive Biodiversity Impact	Projects are implemented on degrading and degraded lands with low productivity for agriculture and cattle.

2.2.6 Enhancement of High Conservation Values (G3.6)

Threats to HCV are identified in the management plans; they include illegal poaching of fauna, forest fires, illegal invasions of the surrounding areas or/and the farm, illegal extraction of flora (especially wood species), illegal sale of flora and fauna, scarce response on behalf of the justice system in regards to environmental infractions, deforestation of surrounding forests, insufficient information about migratory species, and contamination of water sources.

Table 9. Actions to maintain HCVs

Threat	Proposed mitigation effort	Status
Illegal poaching of fauna	Elaborate and implement a patrolling plan	Farms have private security in charge of patrolling the farms in order to identify any trespassing or illegal activities in the farms.
	Coordination between the patrolling guards and FUNDAECO, CONAP, and the national police	Communication between the entities changed, because Rio Farm is no longer a participating farm in the Project. This farm was the only one that was jurisdictionally under the influence of the government entity CONAP; however, this communication did not have a formal coordination since there was never a requirement or need from both parties, and now there is no participating farm of the Project, within the jurisdiction of CONAP.
	Place signs around the farm that raise environmental awareness and warn against illegal activity	Implemented

Threat	Proposed mitigation effort	Status
Invasion of nearby areas or/and farms	Elaborate and implement a patrolling plan	Project has a natural patrolling due to the way that the project operates with constant worker engagement in farms. Additionally, farms have personal security in charge of identifying and removing trespassers and are aware of any invasions in nearby areas due to potential risks that can imply to the farms.
	Place signs around the farm that indicate its status as private property	Implemented
	Inform local authorities of specialized environmental groups of any invasion in nearby areas	Implemented although no invasions have been seen/reported.
Extraction and commercialization of illegal flora and fauna	Elaborate and implement a patrolling plan	Project has a natural patrolling due to the way that the project operates with constant worker engagement in farms. Farms have private security in charge of patrolling the farms in order to identify any trespassing or illegal activities in the farms.
	Place signs around the farm that raise environmental awareness and warn against illegal activity	Implemented
	Establish a mechanism of control for people that enter any areas of HCV in the farm, be they workers of the company or visitors	Security at entrance of farms is implemented; mechanism implemented of control for people that enter any areas of HCV in the farm, be they workers of the company or visitors.
Scarce response from the justice system to environmental infractions	Support local environmental forums	There is communication between strategic stakeholders such as INAB.
	Document and report any illegal activity within the farm, such as illegal extractions	Implemented; there is no incident reported during the present monitoring period
Deforestation of surrounding forests	Promote the sustainable and responsible development of economic activities in the surrounding forests	As part of the additional benefits that the participants offer their workers, they are allowed to remove fallen branches or parts of trees, so that they can be used as firewood, thus avoiding the depredation of surrounding forests.
	Encourage surrounding areas to join forest incentive programs	Project promotes forest incentive programs
Contamination of water sources	Avoid any forest cover loss	Project avoids forest cover loss as evidenced in plantation progress
	Avoid the construction of infrastructure on sites near the borders of water sources	No additional infrastructure has been built near water sources
	Create a waste disposal policy with the farms personnel	Waste disposal policy in progress

Threat	Proposed mitigation effort	Status
Forest fires	Elaborate and implement fire patrolling units in the beginning of the dry season with special concern in vulnerable areas	Project has a natural patrolling due to the way that the project operates with constant worker engagement in farms.
	Create a vigilance system in strategic areas	Areas with high risk have more monitoring during vulnerable periods. No fire event is reported to be affected any Project area, during the monitoring period of this report.
	Coordinate with neighbors during any burning of lands	Project is aware of neighboring fires.
	Place signs around the farm that raise environmental awareness and warn against illegal activity	Implemented.

Patrolling is one main activity of enhancement and protection, made by the project participants; this action has the effect of preventing the loss of forest cover near water sources, given that this natural forest areas has been catalogued as the principal HCV in the Project area[34]. As evidence of the effectiveness of these actions, for the present monitoring period is reported that:

- No fires have occurred at the HCVs at any participant farm;

- No encroaching to these protected areas, has occurred;

- The recent biological evaluation (flora and fauna) at two of the five participants farms, has concluded the species of fauna have increase; this is not a coincidence but an effect of the protection and enhancement of the HCHs in the farms. The main conclusion states that "*Comparing the species richness of the indicator groups evaluated between 2017 and 2023, it is evident that the species richness is maintained and even increases for the groups of amphibians, butterflies and reptiles. The increase in species richness of these indicator groups demonstrates good use of fertilizers, chemical pesticides, biological control agents, and other inputs used in the projects*"[35].

- Not less important, community wellbeing has been protected providing local labor opportunities, that provides the income for family support, that respect local laws related to minimum wage

2.2.7 Benefit Permanence (G3.7)

Rubber plantations require a strong upfront investment with a period of 6 to 7 years with no expected return and continuous management needs. For climate, community, and biodiversity benefits to be

[34] HCV4 was the value identified at the Project's CCB PD.
[35] ANNEX IX. CCBS\Biodiversity monitoring\Flora and fauna studies\ Flora and Fauna Study 2023.pdf

implemented since the start of the project and reduce the vulnerability of these areas during their most susceptible period, carbon credit finance ensures stable income at an early stage and helps implement best management practices. There is little incentive to reduce the longevity of a rubber plantations after the initial investment has been returned and therefore, the implementation of strong climate, community and biodiversity benefits since the start of the project ensures ownership and motivation o farmers to maintain agroforestry systems productive. In this regard, it is reported that all the plantations included at validation, in the participant's farms, are still stand, without substantial variations.

Additionally, in regards to the measures the project will take to maintain and enhance benefits beyond the project lifetime, at the end of the project rubber trees will be harvested for timber and the plantation will be replanted as stated in the Management Plans[36].

2.3 Stakeholder Engagement

2.3.1 Community Consultation (G3.8)

Stakeholder consultations were carried out in each project instance to give communities information about the project as well as provide the opportunity for stakeholders to give feedback regarding any impacts of project activities. The project's strategy for ongoing communication with stakeholders and incorporation of feedback into project design is outlined in the Stakeholder Communication Strategy[37].

The purpose of the stakeholder consultations is to share project information, engage with relevant stakeholders creating an open dialogue, identify potential conflicts and community needs. During the stakeholder's reunions all those attending was told what the project was trying to accomplish, how it was designed and what the Climate Community and Biodiversity standard required from the project. All project activities that were done or were going to be done in the future were explained. Neighbors were also told about impacts in relation to reforestation, climate change, employment, biodiversity and certifications.

Consultations were carried out in the form of workshops with presentations using printed out visual aids as support[38]. Over the course of the workshop, the facilitator worked with participants to resolve any identified problems. Written material (brochure) was distributed to all participants with information about all management units and results of the last monitoring event, was given to all participants during the workshop. Following the presentation, participants are invited to provide feedback, giving them the opportunity to ask questions about the project and express perceptions and concerns.

[36] ANNEX IV. Risk analysis\1) Project Management\Factor f) Mitigation\Documents: Management Plans
[37] ANNEX IV. Risk analysis\6) Community Engagement: Document: NEOSA-Politica comunicacion conciliatoria.pdf
[38] ANNEX IX. CCBS\Stakeholders and community consultations\CCBS-Socialization event-slides.pdf and CCBS-Socialization event-trifoliate.pdf

These events were recorded and summarized to provide a concise summary of the meetings, benefits, and potential risks. Facilitators reviewed videotapes of the workshops to create a report[39] that is used to integrate stakeholder feedback into the project design.

Additionally, The VCS Project Description and Monitoring Reports has been published in the VCS website. The full CCB project documentation is also published in VCS and CCB´s website for public comments, as well as the project summary in Spanish version. Local communities and other stakeholders can easily access it from the website.

Overall, the surrounding communities have a positive perception of the project because it provides employment opportunities. During the project monitoring period, no negative offsite stakeholder impacts were identified. The project has not impacted critical ecosystem services negatively, areas fundamental for basic community necessities or traditional cultural identity have not been altered. The project has shown positive feedback towards the communities allowing some of the farm resources such as wood and infrastructure to be used, with farm authorization. The requests for support that have been made at any farm, have been evacuated by each farm according to its possibilities.

2.3.2 Public Comment Period Publicity (G3.9)

The first Stakeholder consultations specific to the Climate Community and Biodiversity standard were held in November 2013, in order to inform communities and workers near the farms about the project's plans to incorporate the certification. The project's strategy for ongoing communication with stakeholders and incorporation of feedback into project design is outlined in the Stakeholder Communication Strategy[40]. During the CCBA public comment period communities and other stakeholder were contacted through managers from different units within the Project. They were also informed about the 30 day communication period.

For the current monitoring period, a summary of monitoring plan and results was made publicly available as informative brochures handed out to workers and relevant stakeholders and during socialization events[41]. Project participants are sent relevant monitoring results directly via email. Stakeholders can request additional information. In addition, the full CCB project documentation is also published in VCS and CCB´s website for public comments, as well as the project summary in Spanish version. Local communities and other stakeholders can easily access it from the website.

[39] ANNEX IX. CCBS\Stakeholders and community consultations
[40] ANNEX IV. Risk analysis\6) Community Engagement: Document: NEOSA-Politica comunicacion conciliatoria.pdf
[41] In accordance with CCBS indicators G3.8-10: *Describe how communities and other stakeholders potentially affected by the project activities have been involved in project design through effective consultation, and how their submission of comments on this monitoring & implementation report to the CCBA has been facilitated during the CCBA public comment period. Describe the implementation of the formal process for handling conflicts and grievances that arise during project planning and implementation.*

2.3.3 Distribution of Project Information (G3.9)

For the dissemination of the summary of the project document, informative brochures[42] were given with the main expected net impacts on biodiversity, climate, and communities. Those brochures are handed out to workers and during socialization events. In addition, the Spanish summary is available at each instance to be consulted by any interested stakeholder. Regional government offices are visited and given the same summaries.

Results of monitoring events are socialized in the local communities by developing workshops, as well as printed copies of the summary of the Monitoring Report, which are distributed amongst communities.

2.3.4 Conflicts and Grievances (G3.10)

For this monitoring report, no disagreement or dispute with any community is reported for any Project Participant, as in previous years.

In accordance with the Project's PD CCBS, it states that if conflicts or grievances arise, the project relies on the feedback and grievance redress policy. The Project Proponent encourages open communication with project managers (Project Participants) and for all grievances to be reported through email. This process is designed to be an efficient, fair and accessible mechanism for resolving complaints and conflicts in a transparent and comprehensive manner; is also used as an on-going communication system with local stakeholders. Verbally reported grievances will be documented by project staff and submitted into the formal system for resolution. At project locations, grievance submission shall be recorded and kept; received and resolved grievances which can be viewed upon request by project stakeholders or auditors.

Grievances will be assessed to identify and verify the cause, actors and scale of grievances, and a resolution will be recommended based on feedback from the stakeholders. If a grievance is not amicably resolved after this process, it will be submitted to an unbiased third party for a formal mediation and arbitration process, and subject to a hearing at which both disputing parties can testify. All cases will be referred and examined to the extent allowed by Guatemalan laws and regulations of the relevant jurisdiction before decisions are made.

During stakeholder consultations, stakeholders have been informed of the proper way they can make grievances, contacting the project proponent through the official email provided or by contacting the farm manager.

[42] ANNEX IX. CCBS\Stakeholders and community consultations/ CCBS-Socialization event-trifoliate.pdf

2.4 Management Capacity and Best Practices

2.4.1 Required Technical Skills and Expertise (G4.2)

Negocios Energéticos de Occidente (NEOSA, Project proponent), is the leading Project coordinator. The project requires a range of technical and managerial skills in order to implement the project activities.

Econegocios Occidente for NEOSA, lead all the development of the project's SOPs, Monitoring Plants, Project Design Documents and Monitoring Reports. This department coordinated and generated all the information for this report.

The project team is organized as follows:

Isabel Aguirre – Project Lead

Isabel has 10 years' experience in natural resource management and sustainable development in Guatemala. She led the validation of the ECO_2 Rubber Forests Guatemala project in 2016 as well as the validation and verification under the CCB Standard for Project Promoting Sustainable Development Through Natural Rubber Tree Plantations in Guatemala.

Organization name	Negocios Energéticos de Occidente, S.A. (NEOSA)
Contact person	Isabel Aguirre
Title	Econegocios Manager
Contact	iaguirre@econegocios.com.gt

Pablo Domínguez – Monitoring, Reporting and Training Coordinator

Pablo has over 13 years of experience in agriculture, agroforestry, environmental management and 14 years' experience with carbon monitoring and other environmental certifications. He has a deep understanding of project management, community engagement, farmer training, monitoring and evaluation. Pablo has also conducted audits as staff of validating/verifying bodies in REDD+ and ARR projects.

Organization name	Econegocios de Occidente
Contact person	Pablo Domínguez
Title	Econegocios MRV Specialist
Contact	pdproduvex239@hotmail.com

Refer to Annex IV. Risk Analysis[43] for project lead team CVs.

The project is closely coordinated and supported by project instance administrative team and monitoring crews. Project instances are responsible for all activities related to rubber cultivation, monitoring of rubber tree growth, and supporting social and biodiversity monitoring crews.

The following table describes how the Roles and Responsibilities are distributed within members of Econegocios team and farm collaborators:

Table 10. Activities, Roles and Responsibilities.

Activity	Role	Responsible
Activities related to rubber cultivation which take place in field, such as: · soil preparation, · planting, · growth monitoring, · tapping, · weeds management · plantations renewals Also, implementing the monitoring system at farms and supporting this process.	Develop and update the management plan of each farm.	Technical managers of each participating farm
Carbon monitoring	· Implement a carbon Monitoring plan every year and supervise it within each participating farm based on the approved Monitoring Plan. · Train personnel of each participating farm on data collection and in field activities, such as DBH and height measurements	Monitoring Coordinating Unit Project Proponent- Econegocios/NEOSA Pablo Domínguez.

[43] Annex IV. Risk Analysis/folder: 1) Project Management/folder: Risk factor c)/folder: 4) Curricula of individual experience of Project Proponent

Activity	Role	Responsible
	· Lead the monitoring process with personnel assigned in each participating farm participants. · Raw data processing and archiving.	
	· Measure the monitoring variables with personnel properly trained by Project Proponent · Raw data collecting.	Project Participants, monitoring crews
Data processing, Monitoring Report creation and follow through with Verification process	· Manage biomass and carbon database for each farm of Project Participants. · Calculate carbon offset generation for each participating farm.	Monitoring Coordinating Unit, Project Proponent–NEOSA-Pablo Domínguez and Isabel Aguirre with additional support from in house legal and administrative personnel
	· Calculate GHG emissions for each participating farm · Create the annual monitoring report · Contract and coordinate verification process	
Emissions reductions issuance and trading	· Coordinate registration process with a VCS approved registry · Contract and manage issuance and delivery of the Verified Emission Reductions in a VCS approved registry · Identify potential buyers of the Verified Emission Reductions to be produced by the project · Negotiate commercial terms · Negotiate legal agreements · Follow up on all issues regarding carbon trade.	Project Proponent –NEOSA-Isabel Aguirre and Pablo Domínguez with support from in house legal personnel
Development and managing VCS-CCBS PD implementation	· Coordinate information and data flows with Technical Managers of each Project Participant. · Evaluate and assure fulfillment of commitments within PD of each Project Participant · Provide technical training to fulfill VCS and CCBS requirements · Manage all administrative matters with VCS-CCBS' Verifiers	Project Proponent –NEOSA-Isabel Aguirre and Pablo Domínguez.
Community engagement and monitoring	· Coordinate stakeholder consultations · Create surveys that can be disseminated to stakeholders for input · Analyze stakeholder concerns and comments	Project Proponent –NEOSA-Isabel Aguirre and Pablo Domínguez.

Activity	Role	Responsible
Biodiversity monitoring and analysis	· Conduct field surveys of flora and fauna · Coordinate worker consultations to gather information regarding observations in the field	Technical managers of each participating farm in the North and South with additional support external specialist

NEOSA also seeks strategic partnerships with organizations that support the project and offer specialized expertise.

GPI Consulting Services is the main organization used for mapping and geographical information systems.

Organization name	GPI Consulting Services, S.A.
Contact person	Estuardo Lira Prera
Title	Technical specialist
Contact	estuardo.lira@gmail.com

A specialized team of biologists led by M.Sc. Daniel Ariano, have conducted the biodiversity impact design and monitoring.

Organization name	Private consulting
Contact person	Daniel Ariano
Title	Biological specialist
Contact	darianosanchez@gmail.com

Social and biodiversity monitoring and socialization of project impacts has been conducted in accordance with the Social and Biodiversity Impact Assessment (SBIA) Manual for REDD+ Projects, created by The Climate, Community and Biodiversity Alliance.

2.4.2 Worker Training (G4.3)

Capacity building is critical for the operation of project. For the projects initiatives to succeed, members of the community need the skills necessary to effectively implement their tasks. Therefore, the project cannot only create additional employment but must provide the necessary training in the skills required to maximize production. Specific training is given for each job[44], in this induction each worker is told their job responsibilities and training is provided. Local capacity is not lost through staff turnover as it is developed on the farms, as there are few skilled job opportunities in the region and once trained employees can work at other project and use their learned skills; most of topics, are updated annually and the Project activity is expected to continue throughout the project lifetime and beyond.

A specific training for each job is later given to workers depending on the job that they will carry out in the farm. In this instruction each worker is told their jobs responsibilities and what skills he needs to use. *Table 11* lists specific training themes that are commonly given to workers depending on their job requirements, in a formal or verbal (informal) way.

Table 11. Common worker training topics

Silvicultural Production	
Objective: The personnel involved in the farm receives the technical training on good practices regarding the management of the rubber plantations	
Event/Milestone	Capacity building skills
Establishment and management of the rubber plantations	Criteria for selecting sites
	Techniques for planting
	Monitoring and measuring growth
Integrated Control of Plagues	Identification of plagues and local sickness
	Methods of biological control
	Methods of chemical control
Prevention, reduction and control of fires	Techniques for preventing fires
	Dynamics of forest fire
	Techniques for fighting fires
	Use of equipment to control fires
Latex usage	Criteria, techniques and norms for tapping rubber trees
	Collection and treatment of products
	Storage, stocking and transportation of products
Labor Environment	
Objective: The personnel involved in the farm is capacitated in security at the work place	
Event/Milestone	Capacity building skills

[44] ANNEX IX. CCBS\CCBS-Monitoring

Worker Safety	Use of personal protection equipment
	First aids
	Responsible use of agricultural chemicals
	Rights and responsibilities of workers
Knowledge of Normative Medium	
Objective: The personnel involved in the farm is knowledgeable in the farms normative framework, related with the activities developed by the company for the projects purpose.	
Event/Milestone	Capacity building skills
International and National Norms	Norms related to environmental protection
	Laws linked to the productive activities of the farm
	Environmental Impact: Identification, monitoring and evaluation
	Use and transport of forest goods
Forest certification	Benefits of the forest certification
	Certification principles, criteria, and indicators
	Environmental auditing

2.4.3 Community Employment Opportunities (G4.4)

According to Zander and Durr (2011), land changes from crop cultivation to cattle farms has creating growing unemployment of an unskilled labor force in Guatemala. This is mostly because cattle have low labor requirements, the average cattle farm only creates 8 man days/ha on the regional level, about half the labor required for crop cultivation which is 28 man days/ha[45]. Rubber plantations in the areas that are reforested by the project are an attractive solution since they are suitable in terms of soil requirements and they are labor intensive, especially in the initial six to seven years. According to the Ministry of Rural Development and Ministry of Commerce and Industry, India (2013), rubber plantations require roughly 1,500 man days/ ha from mostly unskilled workers during the initial years of the plantation and are therefore capable of providing huge employment opportunities[46]. Additionally, once rubber trees reach the point where they can be tapped, they require year-round labor that provides stable jobs for the communities.

Currently, all the rubber plantations have already been planted and are in the stages of tapping. This is of particular importance for job creation since, plantations that are entering the tapping stage requires year-round labor that is capacitated in this field.

[45] Zander, M. and Durr, J. 2011. Dynamics in land tenure, local power and the peasant economy: the case of Petén Guatemala. Land Deal Politics Initiative (LDPI).
[46] Ministry of Rural Development and Ministry of Commerce and Industry, Government of India. 2013. Guidelines for taking up rubber plantations through convergence of Mahatma Gandhi Nregs and schemes of rubber board.

All of the land was previously privately owned and used as pastureland for cattle or sugar cane production. Therefore, any job lost due to the change in land use will be replaced due to the higher job demand from the rubber plantations. Most workers are hired from nearby communities due to the investment of time in training the required skills for tapping and the schedule. When employment positions arise, they are advertised to the neighboring community and communicated through word of mouth by the current workers. The most suitable candidates according to their submitted application shall be assessed to view competencies and skills.

In addition, as stated in previous sections, project activity provide economic opportunities for local community (formal and permanent job opportunities). Project proponents want to ensure that individuals are employed without discrimination; this could be reflected by the employment of women in the farm for some activities. However, since women are mostly employed in jobs related to the nursery, farms that do not have internal nurseries (they are located in another farm) do not reflect the employment opportunities given to women by project activities. Rubber tree stimulation is another activity that has an increasing employment of women; although there it is still recognized as riskier by locals.

The indirect hiring of women due to the project's activities may not reflected in the detailed account for gender in some farms.

Table 12. Current employment within the Project's farms

Forest Management Unit	Permanent Employees			Seasonal Employees		
	2014	2016	2022	2014	2016	2022
Bello Horizonte	82	58	no reporting	28	20	no reporting
Palmeras	144	32	55	53	47	19
Los Patos	100	82	100	12	15	0
Asunción	60	110	193	75	17	0
El Horizonte	13	20	20	0	0	5

Overall employment in the farm did not vary greatly. Due to the specific stage and requirements of each individual farm employments will vary from year to year. However, the farms included in the project where previously degrading cattle farms and had significantly lower employment levels.

Table 13 Previous employment within the Project's farms

Forest Management Unit	Permanent Jobs Before Project (Estimated)
Bello Horizonte	5
Palmeras	5
Los Patos	15
Asunción	5
El Horizonte	5

2.4.4 Relevant Laws and Regulations Related to Worker's Rights (G4.5)

During the start of each verification event, the Project Proponent and the verifying entity: a) share and expose if there are any relevant laws and regulations covering workers' right; and b) The process of VERRA Program verification and the validation / verification body's site visit.

All the Project participants must comply with all and any relevant local, regional and national laws, statues and regulatory frameworks.

Table 14. Relevant Laws and Regulations Related to Worker's Rights

Law	Compliance issues
• Código de Salud (Health Code)	Regulates relationship between worker and contracting party.
Decree 90-97	
• Código de Trabajo (Labor Code)	Regulates treatment of farm workers, particularly articles 138 to 145 that regulate matters relating to agriculture and livestock work.
Decree 1441	
• Reglamento sobre Higiene y Seguridad en el Trabajo (Health and Labor Safety Regulation) Presidential Accord 21-12-1957	Regulates general conditions of hygiene and safety in the workplace regardless of the nature of the work.

2.4.5 Occupational Safety Assessment (G4.6)

To ensure the health and safety of plantation workers and project staff, the Environmental Impact Assessments of each farm include the following measures:

- Provision of appropriate and adequate equipment to workers
- Special hours designated to eating to avoid any contamination
- No smoking in area
- Supply of first aid kits
- Prohibit the consumption of alcoholic beverages during work hours
- Have fire safety/prevention
- Ensure that vehicles are available for emergencies
- Seat belt use for all personnel in vehicles
- Maintain list of emergency telephone numbers
- Place signs in farm that indicate the prohibitions listed

These provisions can be found implemented at each farm. Appropriate training on worker safety is also given to workers where relevant.

2.4.6 Financial Health of Implementing Organization(s) (G4.7)

Project proponent is financially stable organization, capable of implementing and maintaining a project of the scale of the Promoting Sustainable Development Project.

The verification body may request to see more specific financial statements and to verify the financial health; this information is available for the audit.

2.5 Legal Status and Property Rights

2.5.1 National and Local Laws (G5.1)

At the time of this report, no change is reported in any relevant laws and regulations covering workers' right or any new laws.

2.5.2 Free, Prior and Informed Consent (G5.3)

The project area is private property, and NEOSA does not own any land of these farms; every project participant is an LLC (Limited Liability Company). Every farm (Project site) has its title of ownership, which is a legal document demonstrating proof of title; these have been obtained with free, prior, and informed consent of those who's right where affected. No private, community or government property have been encroached uninvited.

Project areas do not contain collective rights traditionally owned by communities. There was no involuntary relocation of people or activity since the project area was not inhabited; additionally, most work is acquired from the neighboring villages and therefore the Project does not impact the relocation of people to the area.

Previously to Project validation, project team conducts due diligence to check the veracity of all documents and conducts field assessments to establish the rightful ownership and land possession information. Relevant stakeholders are also invited to a public consultation process in which they can voice any concerns about the project ownership and possible impacts to neighboring areas and communities. If lands have been or will be affected by the project, appropriate restitution or compensation shall be allocated.

For this Report, despite the fact that Bello Horizonte farm was not included in the calculation of carbon fixations of the vintage corresponding to this Report, all the property title of the farms are available, including Bello Horizonte's farm. This legal title is a unique record for each farm recorded at Guatemala's Cadastral Registry.

In the case of Los Patos and Asunción farms, they are privately owned and managed by Ingenio Magdalena. Los Patos and Asunción are legally leased by Ingenio Magdalena for a period of 50 years. El Horizonte, Bello Horizonte and Palmeras farms, are privately owned and they are being managed by their original owners (i.e. these two farms are not leased to anybody).

In the 2014 monitoring report the Project Proponent informed that the farms Río Frío (owned by Agropalmeras, S.A.) and Concepción (owned by Sistemas Operativos del Norte, S.A.) were excluded from the Project boundary; detailed information is provided among this report.

2.5.3 Property Rights Protection (G5.4)

The ARR Project activity is implemented by voluntary private project owners focusing on degraded lands. Therefore, there no negative impacts to stakeholders are expected. The project team conducts due diligence to check the veracity of all documents and conducts field assessments to establish the rightful

ownership and land possession information. The project signs agreements only with those who possess valid and legal property documents.

All these aspects were documented properly in Project's PD, see Annex IV[47] describes all the Registered Legal Titles for each farm.

Related to changes in land property ownership:

1) As mentioned in Section 2.2.3, The Project proponent inform that since the last monitoring report, Palmeras farm has changed of owner; the previous owner was Agropalmeras, S.A. and for the present monitoring period, the owner is Corporación Pecuaria Nacional, S.A.

The current owner has decided to continue with the responsible management of the rubber plantations and comply with all the Project's requirements; NEOSA as Project Proponent has admitted the new entity as Project Participant given the commitment of the new participant and to the fact that the carbon stocks have not undergone any change, that the physical space is the same.

2) The Project Proponent also informs that the farm Bello Horizonte, for administrative decisions, is not reporting any emission/removal at this monitoring period. This is the first monitoring event in which the farm does not measure or reported carbon removals, and it is expected to retake the measurements for the next monitoring report.

However, it has to be declare that the land has change of owner; nowadays, the owner is no longer Invervsiones Agrícolas Palafox, S.A., but the entity La Vega de Talismán, S.A. The formal inclusion of the new entity will be reported in the next monitoring report, when the new entity measure and claim carbon removals. The new owner has declared the interest of been part of the Project, but will measure until next event.

Bello Horizonte farm is located in Ruta CA-13, kilómetro 265, Río Dulce, Livingston, Izabal, Guatemala; the project boundary is 391.0 has and rubber plantations were established between 2007 and 2012. The rubber plantation remains on a steady state in this farm and no changes in planting area and/or carbon stocks have been made; KML file can be checked with recent satellite images at Google Earth in order to verify the remaining plantation.

[47] Annex IV Risk Analysis/ 5) Land ownership

Table 15. Legal land tenure of the five participant farms

Farm Name	Project Participant	No. of the Registered Legal Title			Coordinates		Location Description
		Farm	Sheet	Book	NL	WL	
Palmeras	Corporación Pecuaria Nacional, S.A.	14559	40	75	14º26'0.8.14''	91º17'26.78''	Santa Bárbara and Río Bravo, Km 124.5, Suchitepéquez, Guatemala
Los Patos	Ingenio Magdalena, S.A.	3579	230	23	14º23'51.8''	91º28'54.0''	Santa Domingo, Suchitepéquez
		13556	33	70			
Asunción	Ingenio Magdalena, S.A.	43703	3	175	14º28'35.10''	91º13'34.2''	Santa Bárbara, Suchitepéquez
		43704	4	175			
		43702	2	175			
		43705	5	175			
		43706	6	175			
El Horizonte	Compañía Agrícola El Horizonte, S.A.	175	68	260	14º20'49.4''	91º10'56''	Patulul, Suchitepéquez
		167	167	260			
Bello Horizonte	La Vega de Talismán, S.A.	1618	370	23	15º36'13.43''	88º57'7.01''	Route CA-13, Km 265, Río Dulce, Livingston, Izabal, Guatemala
		1572	790	22			
		2350	59	31			

In addition, it has to be mentioned that the project is committed to recognizing, respecting, and supporting all legal property rights of communities and other stakeholders.

There was no involuntary relocation of people or activity since the project area was not inhabited; additionally, most work is acquired from the neighbouring villages and therefore the project does not impact the relocation of people to the area.

2.5.4 Identification of Illegal Activity (G5.5)

Small-scale illegal activities, such as illegal logging or hunting, are practiced in Guatemala and could be seen in some parts of the project zone, negatively impacting the rehabilitation of the forest, and impacting biodiversity connectivity.

Project proponents reduce the risks of these illegal activities by patrolling project areas, enforcing property rules and engaging with the community. In order to mitigate these, the project zone has signs that inform any person within the area about the legal status of the land, "private property," as well as signs that warm any person about the activities that should be avoided or are considered illegal such as, "no trespassing" and "hunting forbidden". Moreover, for the dissuasive (i.e. signals) and security measures (i.e. entrance control and patrolling), the rubber harvesting requires daily presence of workers within the plantations; given this, illegal activities are prevented due to worker visits and constant presence in the project boundary. At the moment projects have security that control the entrance of authorized personnel and no of incidents with unauthorized individuals found in property have been reported. Nearby communities have been informed about the value of preserving biodiversity within the area.[48].

Although reducing these risks outside of the project area is outside of the scope of this project, creating jobs in the community and successful reforestation programs promotes planting in the neighbouring areas and discourages illegal activities. The economic alternatives that the project provides are also expected to minimize the illegal activities in the forest as in most cases the drivers of these illegal activities are economic in nature.

Additionally, the Project Proponent made an assessment of all illegal activities and describes the activities and processes implemented to reduce these activities (See *Table 7*, Section 2.2.5 of this report).

[48] In accordance with CCBS indicator G5.5: *Identify any illegal activities that could affect the project's climate, community or biodiversity impacts and demonstrate that project benefits are not derived from illegal activities.*

3 CLIMATE

3.1 Monitoring GHG Emission Reductions and Removals

3.1.1 Data and Parameters Available at Validation

Table 16. Data and Parameters Available at Validation

Data / Parameter	f_j (DBH)
Data unit	Kg
Description	Above ground biomass -AGB-.Major carbon pool subjected to the project activity.
Source of data	Allometric equations.
Value applied	AGB = $0.75*(DBH)^2$, for trees above 5 cm of DBH; AGB = $e^{(-2.547 + 0.913\ DBH)} * 0.5$, for trees below 5 cm of DBH.
Justification of choice of data or description of measurement methods and procedures applied	Major carbon pool subjected to the project activity. Project's PD used and refers data and information specifically developed for the Project and other specific information, in order to avoid uncertainty of lack of representativeness of data.
Purpose of the data	Used for baseline emissions estimations and project removals calculations.
Comments	Allometric equations developed in Guatemala, by Morales Ralda 2000 and PICA 2010.

Data / Parameter	R_j
Data unit	Mg ha^{-1} (tn ha^{-1})
Description	Below-ground biomass -BGB- stock is expected to increase due to the implementation of the Project activity.
Source of data	Estimated from a default value, established for "Tropical/subtropical moist forest/plantation" (Mokany Karel et al, 2006).
Value applied	0.22
Justification of choice of data or description of measurement methods and procedures applied	The Mokany Karel et al, 2006 was a scientific research that improve the accuracy on the existing available data generating reliable root : shoot ratios for a wide range of vegetation types. This study reviewed root : shoot ratios in terrestrial biomes. In general, the use of vegetation specific root : shoot ratios were found to be a more accurate method for predicting root biomass. The use of the vegetation-specific root : shoot ratios presented in this study is likely to substantially improve the accuracy of root biomass estimates for purposes such as carbon accounting and for studies of ecosystem dynamics.
Purpose of the data	Used for baseline emissions estimations and project removals calculations.
Comments	Being conservative, the low extreme in scale was chosen for the default value. The bioma selected for the Project areas was Tropical/subtropical moist forest/plantation.

Data / Parameter	C_{DW}
Data unit	t C
Description	Dead wood comprises two components only: standing dead wood and lying dead wood.
Source of data	Measure.
Value applied	0
Justification of choice of data or description of measurement methods and procedures applied	Excluded: There were few existing pre-project activity trees existing on the degraded pastures. Deadwood is not expected to change significantly relative to the project baseline scenario. Therefore, based on the applicability conditions of the methodology, this pool was conservatively omitted.
Purpose of the data	Used for baseline emissions estimations.
Comments	

Data / Parameter	C_{LI}
Data unit	t C
Description	Litter; account for natural and anthropogenic influences on the litter accumulation.
Source of data	Measure
Value applied	0
Justification of choice of data or description of measurement methods and procedures applied	Excluded: Since the pastures were in a degraded or degrading state, it can be expected that litter is not expected to change significantly relative to the project baseline scenario. Therefore, based on the applicability conditions of the methodology, this pool was conservatively omitted.
Purpose of the data	Used for project removals calculations
Comments	

Data / Parameter	$C_{d,SOC}$
Data unit	t C
Description	Soil organic carbon -SOC- may increase (when compared to baseline) due to implementation of the Project activity.
Source of data	Estimated from a default value, according to Eq. 29 of AR-ACM0001 V03.
Value applied	0.5 t C ha^{-1} yr^{-1} and $t_{equilibrium}$ = 20 years

Justification of choice of data or description of measurement methods and procedures applied	Not included for farms situated in the baseline stratum North (Rio Frio and Bello Horizonte farms). In this stratum, the soil organic carbon stocks in the baseline scenario can be expected to decrease more or increase less, relative to the project scenario. Therefore, based on the applied methodology, this pool can be conservatively omitted.SOC only was included for farms situated in the baseline stratum South (Palmeras, Los Patos, Asunción and El Horizonte farms). In this stratum, the lands to be planted are degraded and degrading and comply with the applicability conditions set in A/R methodological tool "Procedure to determine when accounting of the soil organic carbon pool may be conservatively neglected in CDM A/R project activities".
Purpose of the data	Used for baseline emissions estimations and project removals calculations.
Comments	As per the methodology, changes in carbon stock in soil organic matter are not monitored ex post.

Data / Parameter	$E_{BiomassBurn}$
Data unit	t CO_2-e
Description	Burning of woody biomass. Carbon stock decreases due to burning were accounted as a carbon stock change
Source of data	CDM methodological tool “Estimation of emissions from clearing, burning and decay of existing vegetation due to implementation of an A/R CDM project activity”.
Value applied	Equation (1) $E_{BiornassLoss,t} = (L_{SP,\ tree,t} + L_{SP,\ shrub,t})\ 44/12$ LSP, tree/shrub,t = AS,t BAB, tree/shrub (1 + R tree/shrub) CF tree/shrub ;
Justification of choice of data or description of measurement methods and procedures applied	The simplified default approach to estimation of emissions due to site preparation is applied. Under this approach, all existing vegetation is considered to be instantaneously oxidized at the time of site preparation. The variables were either obtained by default values or measurement as follows: $L_{SP,\ tree,t} + L_{SP,\ shrub,t}$ = Mean of the carbon stock loss AS,t = area in were fire were used. Measured with GPS device in order to obtain the affected burned area; BAB, tree/shrub = Average above-ground biomass stock of existing tree or shrub vegetation at baseline in the stratum South (16.22 tCO2e/ha); R tree/shrub = Average root:shoot ratio appropriate for biomass stocks, for tree or shrub vegetation. The value applied was 0.3 t C; CF tree/shrub = Average carbon fraction of biomass for tree vegetation. The value applied was 0.50 t C.
Purpose of the data	Calculation of baseline emissions.
Comments	

Data / Parameter	CF_j
Data unit	t C t-1 d.m.
Description	Average carbon fraction of biomass for tree vegetation.
Source of data	IPCC default values for tree vegetation.

Value applied	0.5
Justification of choice of data or description of measurement methods and procedures applied	Default value of carbon in biomass vegetation derived from the IPCC literature.
Purpose of the data	Used for baseline and project removals calculations.
Comments	

Data / Parameter	$A_{BSL,i}$
Data unit	Hectares; ha.
Description	Area of project strata *i* in the baseline.
Source of data	Calculated by GPS coordinates and/or remote sensing data.
Value applied	See Annex I. Baseline.
Justification of choice of data or description of measurement methods and procedures applied	Calculated from GIS historical analysis of database and data field verification. See document PICA - Baseline Report, Annex I Baseline Reports, Project's PD.
Purpose of the data	Calculation of baseline emissions. Determined once in the lifetime of the project or when any disturbance or loss event occurs.
Comments	Every farm has defined its specific Project boundary.

3.1.2 Data and Parameters Monitored

The VCS methodology, which includes the monitoring requirements, applied was AR-ACM0001 V03 *"Afforestation and reforestation of degraded lands except wetlands"*.

The purpose of monitoring is to gather information on plantation growth and project activities that will allow the estimation of VCUs at the end of an accreditation period.

As required by the methodology, monitoring activities include both gathering information from direct and indirect sources. With these inputs, performing calculations and making estimates to establish that commonly accepted principles of forest inventory and management were implemented as well as to determine GHG removals and emissions resulting from project activities.

All monitoring activities have been implemented according to the Monitoring Plan v.6[49], and personnel have been trained to ensure compliance with Standard Operating Procedures described in the Plan. The following charts identify and describe the parameters monitored.

Additionally, in this monitoring event, the Project Proponent has included a section in the Monitoring Plan that describes all the good practices applied for the quality assurance and quality control for measurements[50].

Table 17. Data and Parameters Monitored

Data / Parameter	Plot ID.
Data unit	Alpha-numeric.
Description	Identified and mapped for each stratum and for monitoring changes in carbon stocks.
Source of data	Measured.
Description of measurement methods and procedures to be applied	Assign a code for each plot.
Frequency of monitoring/recording	Once in the lifetime of the project, and check every five years for status.
Value monitored	The Permanent Sampling Plots ID codes are updated and listed in Annex VI. Monitoring, document Monitoring Plan-PSP list and location.pdf.
Monitoring equipment	Not applicable.
QA/QC procedures to be applied	Use SOP for permanent sample plots described in Monitoring plan. Train personnel in application of SOPs.
Purpose of the data	Permanent sampling plots identification.
Calculation method	Not applicable. The plots are coded.
Comments	The used code describes the relevant information for each plot: - Describes that is a Permanent Sampling Plot; - The region where the farm is situated, e.i. North or South; - The unique number for the farm in within the region; - The plantation establishment year; and - Unique number of plot for a particular establishment year.

Data / Parameter	Plot location.
Data unit	Geographic.
Description	Geographic coordinates.
Source of data	Measured.

[49] ANNEX VII. Monitoring: Monitoring plan v.6
[50] ANNEX VII. Monitoring: Monitoring plan v.6, Section 3.9 Quality assurance and quality control for measurements/3.9.1 Verification of instrument's accuracy.

Description of measurement methods and procedures to be applied	Measure center point of the every sampling plot with a GPS unit and register it in GIS database.
Frequency of monitoring/recording	Once in the lifetime of the project.
Value monitored	The permanent sampling plots coordinates are updated and listed in Annex VI. Monitoring, document Monitoring Plan-PSP coordinates.pdf.
Monitoring equipment	GPS unit, metric accuracy (<10 meters 95% typical)
QA/QC procedures to be applied	Random verification of field data. Train personnel in application of SOPs.
Purpose of the data	Permanent sampling plots identification.
Calculation method	Record every plot location (coordinates) in the GPS unit and then register it in a GIS database. SOP described in the Monitoring Plan.
Comments	All the farms have the same kind of GPS unit.

Data / Parameter	Plot area.
Data unit	Hectare; ha.
Description	Area of permanent sample plots.
Source of data	Calculated.
Description of measurement methods and procedures to be applied	Calculated based on individual area of trees (planting position) included in the sampling plot. The planting spatial designs determine the individual tree (position) area.
Frequency of monitoring/recording	Once in the lifetime of the project
Value monitored	See the permanent sampling plots distribution in Annex VI. Monitoring, document Monitoring Plan-PSP list and location.pdf.
Monitoring equipment	Not applicable, because area is estimated based in individual tree area.
QA/QC procedures to be applied	Random verification of field data.
Purpose of the data	Calculation of Project removals.
Calculation method	The plot area is given by the number of trees (always 30) and its individual area.
Comments	

Data / Parameter	Total area of sample plots.
Data unit	Hectare; ha.
Description	Total area of permanent sample plots at substrata tier.
Source of data	Calculated.

Description of measurement methods and procedures to be applied	Calculated based on individually Plot area and total number of sample plots by sub-strata.
Frequency of monitoring/recording	Updated in every monitoring event.
Value monitored	See the permanent sampling plots size in Annex VI. Monitoring, document Monitoring Plan-PSP list and location.pdf.
Monitoring equipment	Not applicable.
QA/QC procedures to be applied	Random verification of field data.
Purpose of the data	Calculation of Project removals.
Calculation method	Estimated from the total number of PSP by their individual area size.
Comments	

Data / Parameter	DBH
Data unit	Centimeter; cm
Description	Diameter at 1.3 m above graft zone of trees in permanent sample plots.
Source of data	Measured.
Description of measurement methods and procedures to be applied	Register in paper form and record values in project database.
Frequency of monitoring/recording	Annually, at every monitoring event.
Value monitored	See Annex VI. Monitoring/Field data sheets.
Monitoring equipment	DBH tape, with an accuracy of 1 millimeter, no calibration required.
QA/QC procedures to be applied	Use SOP for permanent sample plots described in Monitoring plan and trains the measuring crews.
Purpose of the data	Calculation of Project removals.
Calculation method	Not applicable.
Comments	

Data / Parameter	Height.
Data unit	Meter; m.
Description	Height of trees in permanent sample plots.
Source of data	Measured.

Description of measurement methods and procedures to be applied	Register in paper form and record values in project database.
Frequency of monitoring/recording	Annually, at every monitoring event.
Value monitored	See Annex VI. Monitoring/Field data sheets.
Monitoring equipment	Suunto hypsometer 1520, graduated in meters with a precision of 0.25 m. No calibration is required.
QA/QC procedures to be applied	Use SOP for permanent sample plots described in Monitoring plan and trains the measuring crews.
Purpose of the data	Calculation of Project removals.
Calculation method	Not applicable.
Comments	

Data / Parameter	Year of monitoring activity.
Data unit	Number.
Description	1, 2, 3,...years following time zero.
Source of data	Measured.
Description of measurement methods and procedures to be applied	Register in paper form and record value in project database.
Frequency of monitoring/recording	Annually, at every monitoring event.
Value monitored	Not applicable.
Monitoring equipment	Not applicable.
QA/QC procedures to be applied	Apply SOPs described in Monitoring plan.
Purpose of the data	Calculation of Project removals.
Calculation method	Not applicable.
Comments	

Data / Parameter	Project area coordinates.
Data unit	Geographic.
Description	Geographic polygon coordinates to calculate the project area.
Source of data	Measured.

Description of measurement methods and procedures to be applied	Measure points with a GPS unit and compare them with the VCS PD if any disturbance or loss event occurs.
Frequency of monitoring/recording	Once at the beginning of the project or when any disturbance or loss event occurs.
Value monitored	See Annex I. Baseline, Maps of farm boundaries.
Monitoring equipment	GPS device, metric accuracy (<10 meters 95% typical)
QA/QC procedures to be applied	Use SOP for permanent sample plots described in Monitoring plan and then registers it in a GIS database.
Purpose of the data	Calculation of baseline emissions.
Calculation method	Using GIS and eligibility procedures described in Project's PD
Comments	

Data / Parameter	Stratum area coordinates.
Data unit	Geographic.
Description	Geographic polygon coordinates to calculate the project area.
Source of data	Measured.
Description of measurement methods and procedures to be applied	Measure points with a GPS unit.
Frequency of monitoring/recording	Once at the beginning of the project or when any disturbance or loss event occurs.
Value monitored	See Annex I. Baseline, Maps of farm boundaries.
Monitoring equipment	GPS device, metric accuracy (<10 meters 95% typical)
QA/QC procedures to be applied	Apply SOPs described in Monitoring plan. Train personnel in application of SOPs.
Purpose of the data	Calculation of baseline emissions.
Calculation method	Using GIS and eligibility procedures described in Project's PD
Comments	

Data / Parameter	Area of project strata.
Data unit	Hectares; ha.
Description	Area of project strata defined by planting year and geographic location.
Source of data	Calculated.

Description of measurement methods and procedures to be applied	Calculated from GIS Analysis of database and data from planting density reports. One year after plantations establishment, every farm conducts a census of existing trees and report it to Econegocios monitoring unit.
Frequency of monitoring/recording	Once in the lifetime of the project or when any disturbance or loss event occurs.
Value monitored	See Annex V. Plantation management-file Planting density reports.
Monitoring equipment	Not applicable.
QA/QC procedures to be applied	Apply SOPs described in Monitoring plan.
Purpose of the data	Calculation of baseline emissions and Project removals.
Calculation method	Using GIS and field census of the existing trees.
Comments	Every farm officially report to Econegocios unit

Data / Parameter	Disturbed area.
Data unit	Hectare; ha.
Description	Any areas effected due to plantation failure or any loss event.
Source of data	Measured.
Description of measurement methods and procedures to be applied	Field verification of project area, measurement of geographic coordinates with GPS, registration of geographic coordinates in GIS database, and calculation of area from the GPS coordinates, when the event occurs.
Frequency of monitoring/recording	Every five years or when the event occurs.
Value monitored	No report of any measurement for this monitoring report.
Monitoring equipment	GPS device, metric accuracy (<10 meters 95% typical); Suunto hypsometer 1520, graduated in meters with a precision of 0.25 m. No calibration is required; DBH tape, with an accuracy of 1 millimeter, no calibration required
QA/QC procedures to be applied	Apply SOPs described in Monitoring plan. Train personnel in application of SOPs.
Purpose of the data	Calculation of Project emissions.
Calculation method	Using GIS and if possible, a sampling of the affected area.
Comments	

The community and biodiversity related variables to be monitored are linked to the objectives listed in Section 1.1 of this report. The variables are the following[51]:

[51] In accordance with CCBS indicators CL3, CM3 & B3: *Include parameters for assessing anticipated and actual impacts (positive and negative) on communities and biodiversity resulting from the project activities.*

Table 18. Data and Parameters Monitored on communities and biodiversity

Data / Parameter	Provide economic opportunities for the community.
Data unit	Number.
Description	1,2,3… jobs created per year, permanent and seasonal.
Source of data	Farm records of employment.
Description of measurement methods and procedures to be applied	From registered documents record values into project database.
Frequency of monitoring/recording	At every monitoring event.
Value monitored	Job creation.
Monitoring equipment	Not applicable.
QA/QC procedures to be applied	Verification with farm personnel records.
Purpose of the data	To determine Community impact
Calculation method	Not applicable.
Comments	The values and results can be found at the monitoring tool "ANNEX IX. CCBS\CCBS-Monitoring-Sistema de Monitoreo y Evaluación del Manejo.xls"

Data / Parameter	Provide equal opportunity of employment.
Data unit	Number.
Description	1,2,3… jobs created per year for women.
Source of data	Farm records of employment.
Description of measurement methods and procedures to be applied	From registered document record values into project database.
Frequency of monitoring/recording	At every monitoring event.
Value monitored	Female job creation.
Monitoring equipment	Not applicable.
QA/QC procedures to be applied	Verification with farm personnel records.
Purpose of the data	To determine Community impact
Calculation method	Not applicable.
Comments	The values and results can be found at the monitoring tool "ANNEX IX. CCBS\CCBS-Monitoring-Sistema de Monitoreo y Evaluación del Manejo.xls"

Data / Parameter	Grievance process management
Data unit	Number and qualitative analysis.
Description	1,2,3… conflicts between stakeholders/workers and project owner. Qualitative analysis of whether process is implemented accordingly.
Source of data	Farm records of grievances.
Description of measurement methods and procedures to be applied	Qualitative analysis of whether the project is being implemented and whether there have been issues raised and solved.
Frequency of monitoring/recording	At every monitoring event.
Value monitored	Whether process is implemented.
Monitoring equipment	N/A.
QA/QC procedures to be applied	Random verification with workers.
Purpose of the data	To determine Community impact
Calculation method	N/A.
Comments	

Data / Parameter	Provide opportunities for community involvement planning.
Data unit	Number.
Description	1,2,3… participants of local and indigenous community, volunteers and other stakeholders in interactive consultations.
Source of data	Participation lists.
Description of measurement methods and procedures to be applied	Quantitative analysis of participation outcomes.
Frequency of monitoring/recording	At every monitoring event.
Value monitored	Number of participants.
Monitoring equipment	N/A.
QA/QC procedures to be applied	Verification with employees and other stakeholders about knowledge of project.
Purpose of the data	To determine Community impact
Calculation method	N/A
Comments	

Data / Parameter	Monitoring of significant conservation species.
Data unit	Number of sightings, number of species and qualitative analysis of species composition.

Description	1,2,3… sightings, species and qualitative analysis of species composition.
Source of data	Monitoring report.
Description of measurement methods and procedures to be applied	Qualitative and quantitative analysis of amount and type of species sighted.
Frequency of monitoring/recording	At every monitoring event.
Value monitored	Sightings and species.
Monitoring equipment	Not applicable.
QA/QC procedures to be applied	Picture documentation and third party assurance.
Purpose of the data	To determine Biodiversity impact
Calculation method	N/A
Comments	None

Data / Parameter	Monitoring habitat conditions.
Data unit	Qualitative analysis.
Description	Measure changes in habitat conditions, vegetation and insect patters.
Source of data	Third party reports and field observations.
Description of measurement methods and procedures to be applied	Qualitative analysis of whether the project has improved habitat conditions based on field observations and insect patterns.
Frequency of monitoring/recording	At every monitoring event.
Value monitored	Reports on progress.
Monitoring equipment	N/A
QA/QC procedures to be applied	Field verification.
Purpose of the data	To determine Biodiversity impact
Calculation method	N/A
Comments	

Data / Parameter	Fire management.
Data unit	Number and qualitative analysis of implementation of fire management plans.
Description	1,2,3… fires in project boundary and whether plan is implemented.
Source of data	Farm or national records and field verification.

Description of measurement methods and procedures to be applied	Quantitative analysis of number of fires reported and qualitative analysis of whether plans are implemented.
Frequency of monitoring/recording	At every monitoring event.
Value monitored	Fires reported and plan implementation.
Monitoring equipment	N/A
QA/QC procedures to be applied	Verification through habitat conditions and worker consultations.
Purpose of the data	To determine Biodiversity impact
Calculation method	N/A
Comments	

Data / Parameter	Weed management.
Data unit	Qualitative.
Description	Weed management strategy is implemented and visible in weed populations.
Source of data	Field observations.
Description of measurement methods and procedures to be applied	Qualitative analysis of whether the project is implementing weed management.
Frequency of monitoring/recording	At every monitoring event.
Value monitored	Whether process is implemented.
Monitoring equipment	N/A
QA/QC procedures to be applied	Field verification.
Purpose of the data	To determine Biodiversity impact
Calculation method	N/A
Comments	

Data / Parameter	Chemical use management.
Data unit	List of chemicals used.
Description	Chemicals are all recorded and used as registered.
Source of data	Farm records of chemical use.

Description of measurement methods and procedures to be applied	Qualitative analysis of whether the project is undergoing proper chemical management.
Frequency of monitoring/recording	At every monitoring event.
Value monitored	Whether process is implemented.
Monitoring equipment	N/A
QA/QC procedures to be applied	Random verification or storage facilitates and inventory.
Purpose of the data	To determine Biodiversity impact
Calculation method	N/A
Comments	The values and results can be found at the monitoring tool "ANNEX IX. CCBS\CCBS-Monitoring-Sistema de Monitoreo y Evaluación del Manejo.xls"

Data / Parameter	Access management.
Data unit	Number and qualitative analysis.
Description	1,2,3… unauthorized entries. Access to project by visitors is regulated.
Source of data	Farm records.
Description of measurement methods and procedures to be applied	Qualitative analysis of whether the project is implementing a proper access management strategy.
Frequency of monitoring/recording	At every monitoring event.
Value monitored	Whether process is implemented.
Monitoring equipment	N/A
QA/QC procedures to be applied	Verification of process knowledge and documentation of un authorized sightings of people.
Purpose of the data	To determine Biodiversity impact
Calculation method	N/A
Comments	

3.1.3 Monitoring Plan

3.1.3.1 Project Proponent Monitoring Plan

The Project Proponent has described all the standard operational procedures –SOP- carried out in 2022 monitoring event in the document Econegocios-Monitoring Plan v6[52].

Detailed description about organizational structure, responsibilities and competencies, methods for generating, recording and reporting data on monitored parameters is available in the Monitoring Plan.

Monitoring of permanent sample plots to determine GHG removals resulting from project activities have taken place in 4 participant farms; monitoring has been conducted by the Project Proponent monitoring & coordination in cooperation with farm managers and personnel. The monitoring coordinator reports directly to the Project Manager.

3.1.3.2 Monitoring instrumentation

The instrumentation for measurements was basic and easy to use. All the measurement crew's members were trained to use every instrument by the Project Proponent. The equipment used was the following:

- Diametric tape. For DBH measurement; it's calibrated in cm with a precision of 0.1 cm. The Diametric tape was used instead of other measurements instruments such as calipers, because a rubber tree trunk is cylindrical.
- Another calibrated stick of 1.3 meters was used to measure and mark the 1.3 m DBH line.
- Suunto Hypsometer. For total height of tree measurements; it's calibrated in meters with a precision of 0.25 m. This instrument is necessary when rubber trees reach 6 meters of height. All monitoring crew at all farms were trained for the use of this instrument.
- GPS. Garmin GPS 60Csx for PSP's geo-position. It's calibrated to use geographical or UTM coordinates. The use of GPS devices is important to avoid confusion when identifying sampling plots. Monitoring crew team leaders were trained to achieve this goal.

Figure 5. Monitoring instrumentation in Monitoring Event.

[52] ANNEX VI. Monitoring: Econegocios-Monitoring plan v.6

3.1.3.3 Data Archiving

Data archiving used different formats and backup copies were made. All the data generated in this monitoring event has been duly provided to each project participant as an annual report.

Original copies and electronic media of field measurement (either data sheets or electronic files) were placed in folders and on external memory. The storage of information included copies of all data analyses and models, the final estimate of the amount of carbon sequestered, GIS products and a copy of the measuring and monitoring reports. The original electronic and physical documents were stored in a warehouse located at 5a. avenida 11-70 zona 1, Edificio Herrera, ciudad de Guatemala, Guatemala. Location and description of the warehouse and the archiving procedure is well detailed in the Protocol for data custody. The protocol was done in Spanish in order to make it fully understandable to the personnel directly involved in the storage and archiving of the Project Proponent's project documents.

According to VCS Standard, data archiving must be done for at least two more years after the end of the project crediting period; the Project crediting period ends in 2049. The Project Proponent has assured that data archiving and storage will be carried out until year 2051, which is in accordance with the VCS Standard.

3.1.3.4 Internal auditing and non-conformities

The Project Proponent's monitoring department, Econegocios Occidente, coordinates all the monitoring activities. Project Proponent has a procedure to identify and correct preventative and corrective actions necessary given the circumstance; since has a procedure for identifying and resolving non-conformities, for the 2022 Monitoring Event the monitoring department trained the designated personnel for each project instance. The training developed capacities in how identify, settle and resolve non-conformities.

3.1.3.5 Project Proponent's QA/QC for field measurements

3.1.3.5.1 Retraining field measurements

NEOSA is responsible for all carbon measurements and of ensuring accurate field measurements. This was done using retraining/observation and audits. In order to ensure the collection of reliable field data, it is good practice to ensure that:

- Field-team members are fully cognizant of all procedures and the importance of collecting data as accurately as possible;
- All field measurements are checked by a qualified person (NEOSA monitoring unit) in cooperation with the field teams and correct any errors in techniques;
- New staff is adequately trained.

The purpose of the retraining/observation is to correct errors in techniques at the start of the sampling plot measurement activities. Before any farm begins measuring, the NEOSA monitoring unit, Econegocios, reviews all measuring techniques with the field crews and then observes the field crew members during the initial day of data collection in each farm.

This retraining/observation take place every year prior to the data collection activities. These retraining/observations were done as planned during the 2022 Monitoring Event at every participant farm (four farms, except in Bello Horizonte farm). As proof, some field sheets were filled out by Project Proponent's monitoring coordinator.

In this retraining event, NEOSA monitoring unit required all the project participants to include one more crew member in the measurement team, in order to be trained in the SOP for measurements, when the measuring team was formed by the same member of the last monitoring campaign. The goal is to have one person as a replacement in case an emergency or circumstance requires incorporating the new member in the measurement teams.

Additionally, in this retraining event the Project Proponent monitoring coordinator inspected the calibration of the equipment used in the measurements in accordance with the Monitoring Plan. The results were conclusive about the accuracy of the equipment: no systemic error has been done using the equipment checked at every farm.

3.1.3.5.2 Errors of field measurements

Audits are conducted in order to assess and quantify measurement errors. These audits consist of re-measuring a number of sampling plots by a designated auditing crew at the end of measurement activities on each farm and by reviewing all of the field data collection sheets. After the auditing measurements a comparison should have been made and the errors found could have been expressed as a percentage of all plots that were rechecked to provide an estimate of the measurement error.

For the verified plots a simple equation was applied:

$$\text{Measurement Error (\%)} = \frac{\text{(biomass of plot per ha before corrections - biomass of plot per ha after corrections)}}{\text{biomass of plot per ha after corrections}} \text{ X } 100$$

Measurement errors are determined through a comparison of the QA/QC measurements and the original measurements taken. Given the growth rate of rubber trees, it is expected that the audit data shall be bigger or the same than the original data recorded at the monitoring event (August, 2022). Additionally, to this intrinsic factor (i.e. rubber tree's growth rate), the monitoring event happened at the end of the rainy season (October) therefore growth rates are still at high.

The above equation (Measurement error %) contemplates the error within two measurements comparing the biomass predictions by the entire plot.

This is the premise applied to the QA/QC of field measurements; additionally, this event is supported by the following planned approach:

1. All the trees' DBH of the sampling plots selected for re-measuring, should be measure in the QA/QC checking. At office, all the QA/QC's event data should be compared with original data (monitoring event's data) in order to evaluate if differences are logical applying common sense. There should

not be any decreases in DBH values; otherwise, it is considered an error. If an error is determined, the following decisions should be taken:

a. If the Measurement Error is higher than 10%, the entire sub-strata shall be re-measured again.
b. If the Measurement Error is less than 1%, no correction for the entire stratum or sub-stratum shall be applied.
c. If the Measurement Error is higher than 1% but less than 10%, correction for the entire stratum or sub-stratum shall be applied, by reducing all the original data subtracting the amount of error.

2. The geographic coordinates of the center of PSP should be annotated to check out later at office if they are accurate compared to the original geographic coordinates recorded.
3. Tree numbering must be checked. Tree's numbering must be correlative and there shouldn't be any duplicate tree numbers. If this happens, correction should be carried out to fix the numbering.
4. Tree mortality must be in accordance with the data reported in data field sheets. It must match the numbers of missing trees. This provides evidence that numbering and correct sampling had been carried out.
5. Block number and clone checking shall match for each PSP according to the data originally recorded. It is useful for the QA/QC checking the support of farm workers; the crew leader must be present for the QA/QC field measurement event.
6. Every year at the QA/QC event, different PSPs should be chosen in order to cover all PSPs over time.

The Project Proponent elaborated a special field data sheet to achieve a representative control[53].

Table 19. Permanent sampling plots audited in Project's QA/QC – 2022 Monitoring Event.

Farm	Total PSPs	PSP for auditing	PSP audited and re-measured
S1-Palmeras	25	3	PPMS10802
			PPMS10805
			PPMS10814
S2-Los Patos	70	7	PPMS20720
			PPMS20721
			PPMS20726

[53] ANNEX VIII. QA QC/ QA QC Field measurements audit

Farm	Total PSPs	PSP for auditing	PSP audited and re-measured
			PPMS20802
			PPMS20822
			PPMS21104
			PPMS21105
S3-Asunción	118	12	PPMS30805
			PPMS30814
			PPMS30830
			PPMS30907
			PPMS30910
			PPMS30916
			PPMS31009
			PPMS31011
			PPMS31021
			PPMS31026
			PPMS31102
			PPMS31202
S4-El Horizonte	56	6	PPMS40710
			PPMS40812
			PPMS40813
			PPMS40827
			PPMS40903
			PPMS40905

As a result of the Quality Control of field measurements, the Project Proponent obtained the following relevant results:

1. The 2022 Monitoring Event auditing included re-measuring 28 plots of the total measured PSP in the project in 2022 (total 269 PSP); it represents 10.41% of all PSPs and represents the re-measurement intensity. This is a good practice of the Project Proponent monitoring unit, considering what references as LULUCF advice a 10% of this quality control for the field measurements.

2. After the field audit of measurements in the PSPs, no significant errors in 2022 Project Proponent's Monitoring Event were found as a result of applying all the procedures described above. *Table 20* summarizes the findings as a result of applying all the procedures described above.

Table 20. Summary of the field measurement audit in the Monitoring Event.

Information/ data audited	Findings	Corrective actions
1) Permanent sampling plots coordinates	Coordinates do not vary in more than 0.001° in latitude and/or longitude.	None. The small differences in accuracy represent a difference of less than 100 m in the location of the center point. The difference is considered as acceptable and it could be due to the instrumentation accuracy and/or satellite signal. Besides none of PSP of the same sub-strata is closer than 100 m.; that was one of the premises when establishing PSP within sub-strata.
2) Permanent sampling plots identification (codes)	No errors were found.	No error found means a correct establishment of plots, and also correct the reporting.
3) Tree's numbering	Tree's numbering at all audited plots was correct and no errors were found.	None.
4) Tree's mortality	The spaces of tree losses corresponded in all the cases to the reported in the 2022 Monitoring event's measurements.	None.
5) Block numbering and clone identity	Block numbering and clone corresponded in all cases to the information reported in the 2022 Monitoring event's measurements.	None.
6) Sampling and audit dates	In average, no more than two months since the original measure of the plots had passed, when Project Proponent carried out the audit in plots.	None.
7) DBH measures	Logic differences between original data and audit event data were found at all trees. In within measurements, the original DBH data reported (August, 2022) was lower or equal than the audited DBH data (Octuber, 2022).	None. All original field data were used for calculations. Logical differences were observed between original and audit DBH data.

3.1.3.5.3 Project Proponent's QA/QC for data entry.

The 2022 Monitoring Event followed the pre-established guidelines described below for the audit and analysis of data entry:

1. Common sense should be used when reviewing the results of the data analysis to make sure that fit within the range of expected values.
2. All data sheets should include a reference to the person or field crew who recorded data in the field; the transcriber will know to whom refer if any confusion exists.
3. Communication between all personnel involved in measuring and analyzing data should be used to solve any apparent anomaly before final analysis of the monitoring data can be completed.
4. Communication between crew leaders and Project Proponent's monitoring coordinator must be facilitated. The coordinator phone number was available for all the crew leaders; communications were effective during the monitoring campaign.
5. If there are any problems with the monitoring plot data, that cannot be resolved, the plot should not be used in the analysis. In the 2022 Monitoring Event this does not represent an issue; all the information coming from the measured Permanent Sampling Plots (PSPs) was used in calculations.
6. Errors can be reduced if the entered data is reviewed using expert judgment.
7. The information and data checked for each field sheet audited was:
    - The name of the farm;
    - Crew member responsible of filled data field sheet;
    - Year of plantation establishment;
    - Sample plot code;
    - Clone;
    - Planting block,
    - Each diameter of the 30 sampled trees.

Project Proponent established that by checking the above described variables the reliability of data is ensure. After this review no errors were found.

3.1.3.5.4 Project Proponent's QA/QC for data archiving

The Project Proponent was careful with all aspects of data archiving: maintenance and storage. For every monitoring report, the checklist of storage documents is review in order to validate the existence of all the reported documents. This procedure has to be carried out every monitoring event (QA/QC action). For the 2022 Monitoring report, all the documents listed in the checklist at the protocol were confirmed and all the documents exist according to the monitoring coordinator assessment.

Electronic copies of the data and report will be updated periodically or converted to a format that can be accessed by any future software application. The update or change in documentations must be reported when happens in the Monitoring reports and must be detailed at the Project Proponent's protocol for data Custody.

3.1.4 Dissemination of Monitoring Plan and Results (CL3.2)

A summary of the project monitoring plan was be made available in Spanish during stakeholder meetings and delivered to relevant regional government offices. Results were explained and if further information is requested additional documentation can be made available. All project proponents are given a detailed summary of monitoring results and are also informed that further evidence can be provided if requested.

3.2 Quantification of GHG Emission Reductions and Removals

3.2.1 Baseline Emissions

3.2.1 1 Estimation of increase in CO2 emissions from loss of existing woody biomass in the Baseline

The conservative approach the Project Proponent used to estimate these emissions considered that all existing vegetation was instantaneously oxidized at the time of site preparation, which means considering all the emissions instantly emitted. Under the instant oxidation assumption, the CO_2 emissions for each stratum were calculated by:

$$E_{BiomassLoss} = \left(L_{SP,tree} + L_{SP,shrub}\right) * \frac{44}{12}$$

and:

$$L_{SP,tree} = A_S B_{AB,tree}(1 + R_{tree})CF_{tree}$$

$$L_{SP,shrub} = A_S B_{AB,shrub}(1 + R_{shrub})CF_{shrub}$$

Where:

$E_{BIOMASSLOSS}$	=	Increase in CO_2 emissions from loss of biomass in existing vegetation as a result of site preparation; t CO_2
$L_{SP,tree}$	=	Carbon stock loss in existing tree vegetation as a result of site preparation; t C
$L_{SP,shrub}$	=	Carbon stock loss in existing shrub vegetation as a result of site preparation; t C
A_S	=	Area of baseline stratum; ha
B_{AB}	=	Average above-ground biomass stock of tree vegetation; t d.m. ha-1
R	=	Average root:shoot ratio appropriate for biomass stocks for tree vegetation; t d.m. ha-1
CF	=	Average carbon fraction of biomass for tree vegetation: IPCC default value for tree vegetation is 0.50
44/12	=	Conversion factor: ratio of molecular weights of CO_2 and C

Based on the measurements and calculations described in the Baseline Report[54] the mean carbon stocks in trees at time zero were 10.31 t CO_2-e per hectare for farms in the North and 16.22 t CO_2-e per hectare for farms the South.

Table 21. Existing tree biomass at the start of the project.

Strata	Average Live Tree Biomass (t CO2-e/ha)
North	10.31
South	16.22

No shrubs were found during the baseline measurements. Therefore, the sum of increases in GHG emissions from loss of biomass in existing vegetation as a result of site preparation was the carbon stock loss in existing tree vegetation.

Table 22. Sum of the increases in GHG emissions within the project boundary.

Project Year	Year	$E_{Biomassloss}$ (t CO_2-e)
0	2007	6,715
1	2008	8,733
2	2009	4,123
3	2010	4,554
4	2011	0
5	2012	5,229
6	2013	1,155
7	2014	0
8	2015	0
9	2016	0
10	2017	0
11	2018	0
12	2019	0
13	2020	0
14	2021	0
15	2022	0
16	2023	0
17	2024	0

[6] ANNEX I. Baseline: PICA - Baseline report

Project Year	Year	$E_{Biomassloss}$ (t CO_2-e)
18	2025	0
19	2026	0
20	2027	0
21	2028	0
22	2029	0
23	2030	0
24	2031	0
25	2032	0
26	2033	0
27	2034	0
28	2035	0
29	2036	0
30	2037	0
31	2038	0
32	2039	0
33	2040	0
34	2041	0
35	2042	0
36	2043	0
37	2044	0
38	2045	0
39	2046	0
40	2047	0
41	2048	0
42	2049	0
Total $E_{Biomassloss}$ (t CO_2-e)		30,510

The Baseline removals values stayed fix as were presented in PD, see *Table 22*.

In this monitoring report, it was supposed that emissions project years from 10 to 15 were taking into account; in accordance with the validated Project's PD, no emissions were estimated for project years 10 to 15 (2017-2022).

The total of emissions due to baseline removals were already reported in previous reports and GHG removals will not be reported in the future; additionally, no site preparations occurred during the monitoring period 2017-2022.

The Project Proponent uses a conservative approach considering all existing vegetation to be instantaneously oxidized at the time of site preparation; therefore, emissions are instantly considered to be emitted. Since Río Frío farm and Conception have been excluded from the project, the activities at those farms are not considered as an emission source and GHG removals will not be reported in the future; even more, all the baseline emissions were already considered in previous reports.

Hence, the total amount applied in this monitoring report was = **0 t CO_2 –e**[55]. The estimation was made up to the years of the monitoring (2017 to 2022).

Notice that in the following section 3.2.4, *Table 27 Summaries of actual net greenhouse gas removals by sinks*, the reported data was applied.

3.2.2 Project Emissions

3.2.2.1 Project Emission: Estimations of the GHG removals resulting from the growth of trees in the baseline

During the baseline analysis, an inventory of trees within the project boundary in the baseline was created to estimate the amount of carbon that would have been sequestered in the area in the "business as usual scenario".

For the purpose of estimating GHG removals by trees in the baseline, it was conservatively assumed that the trees will grow at a rate similar to that of a common Tropical America secondary forest species. That was the reason for applying the Marupa Growth Model[56].

Table 23. Ex ante baseline GHG removals by sinks

Project Year	Year	North	South	North			South			Total Annual Baseline GHG removals (t CO_2-e)	CUMULATIVE Baseline GHG removals (t CO_2-e)
		Area Planted	Area Planted	Estimated Growth Rate per Year	Total Biomass (t CO_2-e)	GHG Removals (t CO2-e)	Estimated Growth Rate per Year	Total Biomass (t CO_2-e)	GHG Removals (t CO2-e)		
0	2007	33.6	392.77		10,505			20,005		0	
1	2008	200.57	825.14	1.06	11,101	596	1.06	21,224	1,219	1,816	1,816
2	2009	399.5	952.87	1.05	11,710	609	1.06	22,472	1,248	1,857	3,673

[55] In accordance with CCBS indicator G2.3: *Calculate the estimated carbon stock changes associated with the 'without project' reference scenario described as the most likely land-use scenario in the absence of the project.*
[56] ANNEX III. Scientific literature references\ Marupa Growth Model.xlsx

Project Year	Year	North	South	North			South			Total Annual Baseline GHG removals (t CO_2-e)	CUMULATIVE Baseline GHG removals (t CO_2-e)
		Area Planted	Area Planted	Estimated Growth Rate per Year	Total Biomass (t CO_2-e)	GHG Removals (t CO2-e)	Estimated Growth Rate per Year	Total Biomass (t CO_2-e)	GHG Removals (t CO2-e)		
3	2010	399.5	1233.73	1.05	12,333	622	1.06	23,748	1,276	1,898	5,571
4	2011	399.5	1234	1.05	12,967	635	1.05	25,052	1,304	1,938	7,510
5	2012	906.5	1234	1.05	13,614	647	1.05	26,383	1,331	1,978	9,487
6	2013	1018.5	1234	1.05	14,273	659	1.05	27,740	1,358	2,017	11,504
7	2014	1018.6	1234	1.05	14,944	671	1.05	29,125	1,384	2,055	13,559
8	2015	1018.6	1234	1.05	15,627	683	1.05	30,535	1,410	2,093	15,652
9	2016	1018.6	1234	1.04	16,322	695	1.05	31,970	1,436	2,130	17,783
10	2017	1018.6	1234	1.04	17,028	706	1.05	33,431	1,461	2,167	19,950
11	2018	1018.6	1234	1.04	17,745	717	1.04	34,917	1,486	2,203	22,153
12	2019	1018.6	1234	1.04	18,474	729	1.04	36,428	1,510	2,239	24,392
13	2020	1018.6	1234	1.04	19,213	740	1.04	37,962	1,535	2,274	26,666
14	2021	1018.6	1234	1.04	19,964	750	1.04	39,521	1,559	2,309	28,975
15	2022	1018.6	1234	1.04	20,725	761	1.04	41,103	1,582	2,343	31,319
16	2023	1018.6	1234	1.04	21,497	772	1.04	42,708	1,605	2,377	33,696
17	2024	1018.6	1234	1.04	22,279	782	1.04	44,337	1,628	2,411	36,106
18	2025	1018.6	1234	1.04	23,072	793	1.04	45,988	1,651	2,444	38,550
19	2026	1018.6	1234	1.03	23,875	803	1.04	47,661	1,673	2,476	41,026
20	2027	1018.6	1234	1.03	24,688	813	1.04	49,357	1,696	2,508	43,535

The Baseline removals stayed fixed as presented in PD, see *Table 23.*

In this Monitoring Report, the emissions of project years 10 to 15 were taken into account; the total amount calculated was = (2167+2203+2239+2274+2309+2343) = **13,535 t CO_2 –e**; the emissions estimation was made up to the year of the monitoring event (2022).

Notice that in the following section 3.2.4, *Table 27 Summaries of actual net greenhouse gas removals by sinks*, the reported data was applied.

3.2.2.2 Project Emission: Estimation of increase in CO_2 emissions due to burning during site preparation

Regarding the use of fire during site preparation, of the 4 farms in South only 2 of them used fire in site preparation, the Palmeras farm on 45.85 hectares out of a total of 166.63 hectares; and the Los Patos farm used fire on 32 hectares out of a total of 374.41 hectares. The total area in which fired was used was 77.85

has in two farms. The previous land use of these areas was pasture with non-intensive use. Given that, it was needed to estimate CH_4 emissions for the project associated with the burning on these farms.

In farm located at North fire was not use during soil preparation.

The entire emissions due to fire and burning in site preparation were estimated and reported in 2010 Monitoring Report (127 ton CO_2 -e).

For this monitoring report, no emission is estimated and reported; total amount for CO_2 emission applied was **0 ton CO_2 -e**.

Notice that in the following section 3.2.4, *Table 27 Summaries of actual net greenhouse gas removals by sinks*, the reported data was applied.

3.2.2.3 Project Removal: Estimation of changes in the carbon stocks

Applying the methodology AR-ACM0001 V03, the verifiable changes in the carbon stock in tree above-ground biomass (AGB) and below-ground biomass (BGB), litter, dead wood, and soil organic carbon within the project boundary are estimated using Eq. 13 of the methodology.

$$\Delta C_P = \sum_{t=1}^{t*} \Delta C_t \times \frac{44}{12} \times 1\ year\ - E_{BiomassLoss}$$

3.2.2.3 Project Removal: Estimation of changes in tree biomass

The mean carbon stock in above-ground and below-ground biomass per hectare was estimated on the basis of field measurements in permanent sample plots (PSP). In the 2022 monitoring event, a total of 269 PSPs were used to calculate the carbon stock.

The methods for gathering these field measurements are described in the Monitoring Plan[57]. The allometric equation method of AR-ACM0001 V03 was used to estimate changes in tree biomass and GPG-LULUCF-Chp4[58] suggestion was applied and assessed as follows:

Step 1: Diameter at breast height (DBH) was conservatively measured at 1.3 m above the graft area, through field measurements of all trees in permanent sample plots (PSPs). This method excludes the

[57] ANNEX VI. Monitoring\Econegocios - Monitoring Plan v 06.pdf
[58] ANNEX III. Scientific literature references\ GPG-LULUCF-Chp4

tapping surface removed from the rubber trees when trees start to be tapping at the measurement event. Trees below 1.3 of height were not measured.

Step 2: Appropriate allometric equations linking DBH to above-ground biomass of living trees developed for *H. brasiliensis* in Guatemala were used to estimate above-ground biomass of the trees in permanent sample plots[59,60]. The equations are shown below:

- For trees above 5 cm DBH

$$AG = 0.75*(DBH)^{2}$$

Where:

AG = Carbon in above-ground live tree biomass; kg

DBH = Diameter at breast height measured at 1.3 m above graft area; cm

- For trees below 5 cm DBH

$$AG = e^{(-2.547 + 0.913\ DBH)}$$

Where:

AG = Carbon in above-ground live tree biomass; kg

e = e number, base of natural logarithmic

DBH = Diameter at breast height measured at 1.3 meters above graft area; cm.

Step 3: The above-ground biomass for each individual tree *l* of species *j* in the sample plot located in stratum *i* was estimated using the selected allometric equation applied to DBH determined in Step 1 (*column F, Excel spreadsheet*). After that, the individual tree above-ground biomass was projected in values per hectare or Kg/ha (*column G, Excel spreadsheet*) multiplying the individual value by the plot's scaling factor (*column E, Excel spreadsheet*) and finally the above-ground biomass was summarized for the sample plot according to Eq. 19 of AR-ACM0001 V03 (*column L, Excel spreadsheet*).

Step 4: The above-ground biomass (AGB) was converted to the below-ground biomass (BGB) via a root-shoot ratio according to Eq. 20 of AR-ACM0001 V03 (*column M, Excel spreadsheet*).

[59] ANNEX III. Scientific literature references\ Rubber allometric equation, Morales 2000

[60] ANNEX III. Scientific literature references\ Developing a new equation to estimate carbon stock in rubber trees (Hevea brasiliensis) below 5 cm of DBH in Guatemala

The below ground biomass (BGB) was estimated from a default[61] established for "*Tropical/subtropical moist forest/plantation*" and being conservative the low extreme in the scale (0.22) was chosen. This BGB default is also supported in other studies, which estimates for Guatemala's region values between 0.20 and 0.3 (See Annex IV: Cairns Michael et al[62]).

Step 5: The total biomass of all trees presented in the sample plot *sp* in stratum *i* at time *t* was calculated according to Eq. 21 of AR-ACM0001 V03 (*column N, excel spreadsheet*); then the result is multiplying by the carbon fraction of dry matter for species *j* (0.5 was used) and converted to tons of CO_2–e (*column O, excel spreadsheet*).

Step 6: The mean carbon stock in tree biomass for a planting year was calculated according to Eq. 18 of AR-ACM0001 V03. The stratification was based on the planting year on farms and the sub-stratification was based on clone's distribution. The total Carbon stock was obtained by an average of the weighted mean stock of each sub-strata (*clone*) in each stratum *i* (*Planting year at farm*).

Sub-step 6.1: The information of permanent sampling plots (PSPs) was processed and summarized to obtain for each sub-strata (clone): mean (x_i), standard deviation (*SD*), number of plots in sub-stratum (n_i), plantation area per clone (A_i) in hectares and clone significance (A_i /A) (*Calc. summary Excel spreadsheet*).

Notice that the sub-stratum S207 (Los Patos farm, 2007 plantation's) has two discounts from the original planted area: a) the first area discounted was 5.2 has. This was an area previously planted with other timber specie and is not take into account in the Project Boundary of the farm; b) the second discount was of 10.03 has. This area corresponds to the area that was renewed with other rubber's clone in 2011.

Sub-step 6.2: Clone significance or weight out of the total sampling made in a certain farm, was obtained dividing the clone's planting area A_i by the total planted area *A* in a specific planting year for a specific farm (A_i /A), strata $_i$.

Sub-step 6.3: Final results for removals in each strata *i* (for a planting year in farms) were calculated using a weighted average by sub-strata (clones' means carbon stock) and their significance, calculated according with the description included in Sub-step 6.2:

$$X_W = \sum X_i \ (A_i/A)$$

[61] ANNEX III. Scientific literature references\Mokany Karel et al 2006 - critical analysis of root - shoot ratios in terrestrial biomes
[62] ANNEX III. Scientific literature references\Cairns Michael et al 1997 - root biomass allocation in the world's upland forests

It was decided to use weighted mean as the average, because the different sub-strata (clones) has not the same significance (weight), and the final result in terms of biomass is influenced according with the area that was planted with every clone (weight or clone's significance).

Final calculation for sampling error was estimated after applying the follow formulas:

$$Sxw = \sqrt{\sum \left(\frac{SDi^2}{ni}\right) . \left(\frac{Ai}{A}\right)^2}$$

Where:

(A_i/A) = significance = weight.

The result from above formula was multiplied by *t-student*, obtaining the standard error (SE).

The sampling error was calculated dividing the standard error (SE) by the mean (X_w), expressed in percentage.

Sub-step 6.4: If the sampling error was above the 10%, an adjustment for the weighted mean for a specific strata *i* (planting year in farms) was be applied.

The PP selected this procedure to correct high standard error and to ensure the data used in calculations was conservative by reducing the correspondent means in the calculation. This mean adjustment consisted in subtract one confidence interval (CI) from the mean for the planting year where the standard error was high above 10%. This adjusted value was used for calculations and was estimated as follows:

$$CI = X_w - SE$$

Where:
CI = confident interval
X_w = weighted mean of stratum
SE = standard error (Standard deviation / square root of number of observations)

Table 24 shows that two Carbon stock means were needed to be adjusted.

Sub-step 6.5: Finally, the total removals (carbon stock at year *t*) in a farm for a specific planting year were obtained multiplying the weighted mean (adjusted when necessary) by the total plated area (summarizing individual clone's areas) for a specific planting year.

Table 24. Summary of Carbon removals calculations of the 2022 Monitoring report

Farm	Planting year	Mean Carbon Stock (ton CO_2-e/ha)	Sampling error	Mean Carbon Stock adjusted (ton CO_2-e/ha)	Mean Carbon Stock used in calculations (ton CO_2-e/ha)	Area (ha)	Total Carbon fixation in trees (ton CO_2-e)
Palmeras	2007	456.08	22.91%	377.71	377.71	9.18	**3,467.41**
Palmeras	2008	461.44	3.31%	not needed	461.44	114.17	**52,682.37**
Los Patos	2007	360.95	6.03%	not needed	360.95	325.87	**117,622.16**
Los Patos	2008	368.74	6.18%	not needed	368.74	25.61	**9,443.35**
Los Patos	2011	286.07	6.42%	not needed	286.07	9.25	**2,646.11**
Asunción	2008	400.31	4.97%	not needed	400.31	192.19	**76,934.90**
Asunción	2009	326.34	6.94%	not needed	326.34	79.23	**25,856.31**
Asunción	2010	299.57	4.44%	not needed	299.57	212.57	**63,679.92**
Asunción	2011	247.36	12.04%	239.92	239.92	12.17	**2,919.80**
Asunción	2012	242.88	6.64%	not needed	242.88	19.97	**4,850.37**
El Horizonte	2007	382.83	5.72%	not needed	382.83	18.24	**6,982.73**
El Horizonte	2008	349.96	3.47%	not needed	349.96	57.80	**20,227.76**
El Horizonte	2009	324.15	7.27%	not needed	324.15	25.96	**8,414.95**
TOTAL						1,102.21	**395,728.15**

The carbon stock of removals/reductions in rubber trees within project boundaries at the farm that measure removals in 2022 was **395,728.15 ton CO_2 –e.**

The total net amount for carbon removals in rubber trees (net GHG benefits) within Project boundaries in the period of September 1st, 2016 through August 31st, 2022 was **122,415.74 ton CO_2-e.**

3.2.2.4 Project Removal: Estimation of changes in soil organic carbon

Under the applicability conditions of AR-ACM0001 V03, for *ex ante* estimations, the changes in stocks of soil organic carbon were assessed using the default method described in the methodology otherwise the change were conservatively neglected.

For project strata in the South, changes in the carbon stock in the soil organic carbon pool was estimated using the default method allowed by AR-ACM0001 V03. For project strata in the North, the change in the soil organic carbon pool was conservatively neglected.

In the South, the default *ex ante* and *ex post* changes in the soil organic carbon pool was estimated according to Eq. 29 of AR-ACM0001 V03. The default value of ΔC = 0.5 t C ha^{-1} yr^{-1} and $t_{equilibrium}$ = 20 years was used for each area. As per the methodology, changes in carbon stock in soil organic matter are not monitored *ex post*. Therefore, the changes in carbon stock in soil organic matter were fixed as shown below (*Table 25*).

The change in soil organic carbon for the 2022 monitoring report was applied to the planted areas at project years 10 to 15. The total amount was = (2262+2262+2262+2262+2262+2262) = **13,572 t CO_2 –e**.

Table 25. Sum of the changes in soil organic carbon in the project scenario

Project Year	Year	Planting Area at farms (ha)				Total Area Planted (ha)	Change in soil organic carbon stocks (t CO2-e/ha)
		Palmeras	Los Patos	Asuncion	El Horizonte		
0	2007	25.38	338.55	0	28.84	392.77	0
1	2008	141.25	30.66	220.71	39.75	432.37	720
2	2009	0	0	94.39	33.34	127.73	1513
3	2010	0	0	280.86	0	280.86	1747
4	2011	0	0	0	0	0	2262
5	2012	0	0	0	0	0	2262
6	2013	0	0	0	0	0	2262
7	2014	0	0	0	0	0	2262
8	2015	0	0	0	0	0	2262
9	2016	0	0	0	0	0	2262
10	2017	0	0	0	0	0	2262
11	2018	0	0	0	0	0	2262
12	2019	0	0	0	0	0	2262
13	2020	0	0	0	0	0	2262
14	2021	0	0	0	0	0	2262
15	2022	0	0	0	0	0	2262
16	2023	0	0	0	0	0	2262
17	2024	0	0	0	0	0	2262
18	2025	0	0	0	0	0	2262
19	2026	0	0	0	0	0	2262
20	2027	0	0	0	0	0	2262
21	2028	0	0	0	0	0	1542
22	2029	0	0	0	0	0	749
23	2030	0	0	0	0	0	515
Total change in soil organic carbon stocks (t CO2-e/ha)							**45,237**

3.2.3 Leakage

3.2.3.1 Estimation of Leakage at Project's Validation

The account and evaluation for leakage is documented in the Project Description –PD- (Annex D Leakage Analysis). The A/R methodological tool "Estimation of GHG emissions related to displacement of grazing activities in A/R CDM project activity" was applied to determine leakage resulting from the displacement of grazing activities caused by implementation of project activities. There were a total of 3,065 animals grazing on lands within the project boundary at the start of project activities. The project activities leaded to the selling of grazing animals to an entity not involved in the CDM activity and to slaughtering of grazing animals as well as the displacement of animals to identified grazing lands are outside of the project boundary[63]. As allowed by the methodology, it was assumed that the slaughter of these grazing animals did not result in leakage. The establishment of the project has not decreased the availability of fuel wood. The project was fully applicable to methodology AR-ACM0001 V03.

According to Eq. 32 of AR-ACM0001 V03:

$$LK_{ActivityDisplacement} = LK_{Conversion}$$

Where:

$LK_{ActivityDisplacemnt}$	Leakage due to activity displacement; t CO_2-e
$LK_{Conversion}$	Leakage due to conversion of land to grazing land; t CO_2-e

The total annual dry matter intake of animals, the area required to sustain displaced grazing activities, and the total leakage due to overgrazing resulting from displacement were calculated using the default values showed in *Table 26*.

On none of the farms receiving grazing animals does the area required to sustain grazing activities exceeded the total area of the receiving parcel. Therefore, the methodology allows the assumption that displacement of animals to these parcels does not result in leakage.

[63] ANNEX VI. Monitoring\Leakage\Documents at validation\Document: Leakage Analysis.docx

Table 26. Default values used to calculate leakage related to overgrazing

Description		Value
Total Dry matter intake of grazing animal (kg d.m./head/day)	Cow	25.5[64]
	Horse	10[65]
Above-ground net primary productivity for Tropical - Moist & Wet Climate Zone (t d.m./ha/yr)		8.2[66]
Reference soil organic carbon stocks for tropical moist volcanic soils (t C/ha)		70[67]
Stock change factor for management regime for severely degraded grassland		0.7
Conversion factor from C to CO_2-e (t CO_2-e/t C)		44/12

3.2.3.2 Monitoring of Leakage

Project Proponent monitored in the previous reports, the movement of animals in Palmeras because it was the only farm with animals. Currently, there is no existing animals at the participating farms.

- Agropalmeras, S.A., owner of Palmeras farm, reported in the Project PD an existence of 54 cattle and 12 horses (2010).

  In the previous monitoring events, Agropalmeras S.A. reported that 87 cattle and 5 horses existed at Palmeras farm (2013); but for the next monitoring report (2014), the sale of the 87 cattle to be slaughtered and 1 horse to be transported to a riding facility was made; given this, the inventory of existing animals of Agropalmeras in the 2014 Monitoring report was: in Palmeras farm[68] 4 horses.

[64] CDM A/R methodological tool "Estimation of GHG emissions related to displacement of grazing activities in A/R CDM project activity"
[65] Dulphy et al. 1997
[66] Table 3.4.2 IPCC GPG LULUCF (http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf_files/Chp3/Chp3_4_Grassland.pdf)
[67] Table 3.4.4 IPCC GPG LULUCF (http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf_files/Chp3/Chp3_4_Grassland.pdf)
[68] ANNEX VI. Monitoring\Leakage\ Documents at 2014 verification\Agropalmeras 2013-2014 cattle sales .pdf

In the 2016 monitoring report, it was reported that the 4 horses were sold for use in riding facilities between 2014 and 2015.

Given the above, since 2016, no more animal are existing at the farm.

- Ingenio Magdalena, S.A., owner of Los Patos and Asunción farms, and Compañía Agrícola El Horizonte, S.A. owner of El Horizonte farm, has not reported any existing animal during this Monitoring Report, within these farms. As is stated in Project's PD, section 4.3.3 Leakage (*Table 12*) and in the 2013 Monitoring Report, all the animals existing at the farms were slaughtered at the start of Project activities.

- Inversiones Agrícolas Palafox, S.A., previous owner of Bello Horizonte farm has not reported any existing animal since the previous monitoring report, within this farm.

3.2.3.2 Estimation of Leakage

In accordance with the above explanation, the total amount applied in this monitoring report for leakage was = **0 ton CO_2 –e**.

Notice that in the following section 3.2.4, *Table 27* Summaries of actual net greenhouse gas removals by sinks, the reported data was applied.

3.2.4 Net GHG Emission Reductions and Removals

Attach the non-permanence risk report as either an appendix or a separate document.

The actual net GHG removals by sinks are determined according to Eq. 12 of AR-ACM0001 V03:

$$\Delta C_{ACTUAL} = \Delta C_P - GHG_E$$

Where:

ΔC_{ACTUAL}	=	Actual net greenhouse gas removals by sinks; t CO_2-e
ΔC_P	=	Sum of the changes in above-ground and below-ground tree biomass and soil organic carbon stocks in the project scenario; t CO_2-e
GHG_E	=	Increase in GHG emissions as a result of the implementation of the proposed project activity within the project boundary; t CO_2-e

The calculation results for GHG is summarize in *Table 27*.

Table 27 Summaries of actual net greenhouse gas removals by sinks

Year	Baseline emissions or removals (tCO_2-e)	Project emissions or removals (tCO_2-e)	Leakage emissions (tCO_2-e)	Net GHG emission reductions or removals (tCO_2-e)	Buffer pool allocation	VCUs eligible for issuance
2016 - 2022	**13,535.00**	**135,987.74**	**0**	**122,452.74**	**10%**	**110,207.47**

	Sources	ton CO_2 -e	ton CO_2 -e
GHG_E	Loss of existing woody biomass	**0.00**	
	Removals resulting from the growth of trees in the baseline	**13,535.00**	
	Burning of woody biomass	**0**	
ΔC_p	Changes in tree biomass (2020-2021)		**122,415.74**
	SOC (Project year 11)		**13,572.00**
	Total	**13,535.00**	**135,987.74**

No breakdown of GHG emission reductions and removals is specify by vintages where there is no intent to issue vintages separately in the VCS registry system.

All the calculations for the Net Anthropogenic GHG Removals by Sinks have been done using the equation 33 of the methodology AR-ACM0001 V03:

$$C_{AR-CDM} = \Delta C_{ACTUAL} - \Delta C_{BSL} - LK \quad (33)$$

where:

C_{AR-CDM} = Net anthropogenic greenhouse gas removals by sinks; t CO_2-e

ΔC_{ACTUAL} = Actual net greenhouse gas removals by sinks; t CO_2-e

ΔC_{BSL} = Baseline net greenhouse gas removals by sinks; t CO_2-e

LK = Total GHG emissions due to leakage; t CO_2-e

- Total change in 2022 Monitoring Report: **122,452.74 ton CO_2 -e**
- Leakage: **0 ton CO_2 –e**
- Net VCUs: **122,452.74 ton CO_2 -e**
- Overall Risk Rating: **10%**
- VCU's Buffer to be deposited: **12,245.27 ton CO_2 –e**
- Total of VCUs to be issued: **110,207.47 ton CO_2 –e**

In order to be conservative, Project Pronent has rounded down the reported value for in this 2022 Monitoring Report to **110,207 ton CO_2 –e**[69].

In Project's PD is stated that the project plans to sequester a total of **3,900,439** t CO_2-e over 42 years through the reforestation of 1,653.16 ha with rubber trees. According to VCS guidance for AFOLU, "*The maximum number of GHG credits available to projects shall not exceed the long-term average GHG benefit*.

3.2.4.1 Long Term Average

The total amount updated of the available credits to be issued is 1,254,610 VCUs, accordingly to the Project's LTA estimation[70]. The Project Proponent has been updated the estimations, taking into account latest monitoring results and Project Description deviations (Exclusion of farms, Section 2.2.4 of this report).

The total amount of VCUs issued before the current period reported is VCUs; with the VCUs claim on this report, the total amount would be VCUs, which is lower than the maximum VCUs allowed to be issued.

3.3 Optional Criterion: Climate Change Adaptation Benefits

The Project did not included this optional criterion, therefore this Section in not applicable.

[69] In accordance with CCBS indicators CL1.1-1.4 and CL2.3: *Estimate the net change in carbon stocks due to the project activities using the methods of calculation, formulae and default values of the IPCC 2006 GL for AFOLU.*
[70] ANNEX VI GHG Estimations\Document*: Promoting_Annual biomass accumulation and net GHG Removals_LTA2022.xlsx*.

4 COMMUNITY

4.1 Net Positive Community Impacts

4.1.1 Community Impacts (CM1.1)

There are no local communities living within the project area since the area is private property. In regards to the project zone, project activities have been evaluated so that they do not alter social and economic wellbeing, and avoid negative impacts on natural resources and ecosystem services that are identified as important to the communities. Community impacts will be monitored during the projects life cycle to detect any long term impacts for this project.

The project area has provided ecosystem services to the neighboring communities, such as hydrological services and erosion control. Recommended project activities have been created to address threats within the framework of the project including: preventing the loss of forest cover near water sources; preventing the construction of infrastructure near water source; creating a water management policy for personal waste; cleaning internal trails, especially in fire prone areas; patrolling the farm during seasons with high fire vulnerability; and placing signs around the farm perimeter with warning and precaution themes. None of the planned project activities will have a negative impact on HCVs in the Project area. Project activities are focused on maintaining and enhancing forests and natural ecosystems, and thus the environmental, social, and cultural benefits derived from them. Such activities will have a strong positive impact on HCVs.

During the current monitoring event of the Project areas no negative impacts were seen in the community. Neighboring communities participate in the economic opportunities provided by the project and continue to have a positive perception of project activities.

4.1.1.1 Creating economic opportunities

The project seeks to provide economic opportunities for members of the community. In this verification period it was evaluated how many members derive work opportunities from the project and whether the project provided the community with any other service. Since the previous land use was cattle ranching, there were limited positions available to the near-by community before the project was implemented. Refer to section 2.4.3 Community Employment Opportunities, where all the results related to employment, are summarized.

The socio-economic benefits provided by the project are all highly additional as they would not have occurred under the baseline scenario. With the continuation of livelihood and agricultural practices in the area it is unlikely that there would be any significant increase in income or any new livelihood activities. However, since all project areas meet country laws and therefore minimum wage all workers are

guaranteed, two additional monthly wages, and credit options with low interests that allow them to improve their well-being.

Without the project, the focus on cattle farming and planting species that are not sustainable in the area will continue increasing the degradation of the land and limiting other productive uses of the land. Project activities are therefore foreseen to have a positive impact on the social and economic conditions of local communities in the project zone.

It may be easy to read and to assume that paying the minimum wage, in a country where the majority of farms do not pay the same, constitutes something that is not important.

Recognizing these farms that, through the income from carbon credits and the commitments acquired by participating in the Project, allows the workers to:

- Have decent wages recognized by law; they also have additional benefits to the monthly salary (2 salaries additional at the year)

- Paid on time; not all neighboring farms pay wages on time

- Not in delays; it is a common practice in many farms to delay these payments

- Access to social security

- Have a local job offer; related to distance to the work issue, there is a lot of advantage in this local employment opportunity. Regarding the well-being of families, it prevents internal migration and mainly to the United States; the effect of separating families is the worst of all the negative impacts of migration

4.1.1.2 Additional community benefits

The Project activity not only generates direct benefits; it is also can be referred as additional benefits the following:

- Use of farm infrastructure for recreational activities and social reunions
- Donation of wood to organizations such as the Catholic Church in Aldea Belén, Municipio de Santo Domingo (reported in previous monitoring reports).
- Assistance with community infrastructure (such as roads) when it benefits the farm and the community
- Authorized passage through farm for low risk individuals that have a valid reason.
- Providing equal employment opportunities
- Providing fuel wood for the family subsistence

In addition, project proponents want to ensure that individuals are employed without discrimination. This is shown through the employment of women in the farm. However, since women are mostly employed in jobs related to the nursery, farms that do not have internal nurseries (they are located in another farm) do not reflect the employment opportunities given to women by project activities. However, for some other activities, women have had opportunities as reflected in the results presented at section 2.4.3 of this report.

4.1.1.3 Improving ecosystem services

Some of the farm water sources are used by the neighboring communities and some of the nurseries and rivers in the other farms are also enjoyed by the community if they solicit permission for specific reasons (case of Asunción farm).

4.1.1.4 Community involvement

A formal grievance process has been established and is already being executed. There have been no unresolved complaints recorded in the farms and there are no ongoing disputes. This can be verified in each farm's records during verification.

4.1.1.5 Negative Community Impact Mitigation (CM2.2)

None of the planned project activities foresee any negative impacts on the community and environmental values assessed during the initial stakeholder's consultation; this is clearly concluded after: a) the environmental assessment made for every farm; and b) in accordance with every community and stakeholders' consultation made for all the Project areas[71].

Furthermore, based on project's Theory of Change and consultative process with communities, there are no negative community impacts observed and hence there is no need for mitigation.

One HCV attribute related to community well-being was identified in Project Instance S3 Asunción farm where the water provide hydrological services the community. These water sources are protected within the farm perimeter though best management practices, the areas around the water sources are maintained in a natural state and the use of agrochemicals is avoided. The project does not use any of the water sources and therefore has a minimum impact on them.

[71] See section 2.2.5.5 Risk Mitigation for Grouped Projects (G1.15)

The project will closely monitor community impacts of the project via its continued social monitoring plan and apply adaptive/participative management if any negative community impact requires mitigation.

4.1.2 Net Positive Community Well-Being Impacts (CM1.1)

The without-project scenario would not generate any additional community or biodiversity benefits, given that previous land uses provide few employment opportunities, little community involvement and no ecosystem improvements. The land use in the without-project scenario would continue with its previous land use: cattle or crop cultivation in a degraded state.

From a perspective of social community development, the without-project scenario described in above sections would affect community negatively.

The project activities wellbeing impacts are predicted to be positive for all identified community groups compared with the without project land use scenario. This has been verified with stakeholder workshops where all benefits have been well received by the community.

4.1.3 Protection of High Conservation Values (CM1.2)

The project has a strong commitment to maintain and enhance any HCVs identified in the project area. The HCV identified related to the community wellbeing is currently being protected with best management practices that include, maintenance of natural area around hydrological service, controlled use of agrochemical products in area to ensure no contamination and no use of the water resource within project area. Negative effects from project activity are not expected.

4.2 Offsite Stakeholder Impacts

4.2.1 Mitigation of Negative Impacts on Other Stakeholders (CM2.2)

No potential negative offsite stakeholder impacts have been identified. The project brings benefits to the offsite communities, like providing additional employment opportunities, improving the local environment, as well as mitigating the impacts of climate change on the project zone.

The project proponent also ensured that regional governmental offices are informed about the project activities and project participants are not involved in any activity that could have negative impacts.

4.2.2 Net Impacts on Other Stakeholders (CM2.3)

No negative impacts related to project activities on other stakeholders have been identified and, therefore, there are no impacts on expected welfare*;* this is clearly concluded after: a) the environmental assessment made for every farm; and b) in accordance with every community and stakeholders' consultation made for all the Project areas.

However, there is still a need to monitor the unexpected negative impacts through the communication mechanism and in the following monitoring events.

4.3 Community Impact Monitoring

4.3.1 Community Monitoring Plan Development (CM3.3)

The project's monitoring plan is based on the theory of change approach, which proposes the development of a list of hypotheses about the possible effects of project activities, so that measurable indicators can be established, for the evaluation of the project's impact on the community. The indicators (*Table 28*) presented in the monitoring plan will be evaluated at the most convenient frequency. The objective of monitoring the indicators is to determine the level of compliance that will allow the development of new strategies or the rethinking of existing ones.

For the monitoring and evaluation of each of the indicators, a means of verifying compliance and the period in which it will be carried out is established of monitoring and reporting for each type and method. Given this, the results and evaluation for this monitoring period are presented at: ANNEX IX. CCBS\CCBS-Monitoring.

Table 28. Indicators used for assessing the social impact

Target	Indicator	Source of verification	Frequency
Increase Labor Benefits	Local communities and residents have preference in forest management activities in terms of employment, training and supply of provisions, as well as other benefits and opportunities	Number of jobs generated. Company records	Every Verification
		Name and number of local communities that benefit from having people working for the company. Entry forms contain information on the origin of the workers.	Every Verification
	Employment by gender	Gender statistics	Every Verification

Target	Indicator	Source of verification	Frequency
Develop Training and Education Benefit	Employment receiving training	Training registries	Every Verification
	Amount and type of additional benefits received by communities within or adjacent to rubber plantations	Record of letters of requests received and donations/benefits provided	Every Verification
	Amount and type of additional benefits provided to direct employees of the company	File with letters of support requested and received by employees or record of additional benefits (payment receipts, payroll)	Every Verification
Improve Occupational Safety Benefit	Workers have safety equipment in good condition, suitable for the activity they carry out.	Control sheet for the provision of safety implements, regular visual verification	Every Verification
	The paid hiring of workers under 14 years of age should not be allowed (according to article 31 of the Labor Code). In the case of hiring, the work performed must be appropriate to the age, conditions or physical condition and intellectual and moral development of the worker and comply with the provisions of the Labor Code, in relation to working hours (7 hours per day, according to article 149).	Signaling in workplaces (Labels). Worker contract record	Every Verification
	Observed changes in conditions should be identified/described in terms of: accident rates	Accident number report	Every Verification
	There are first aid kits in offices and in the field, with sufficient and adequate basic medications, as well as trained personnel for the application of first aid.	Registration of medication purchases and verification in the field/offices of the team and training provided	Every Verification
Community Donations	Cost of the donations or help made to the surrounding communities	Documents that prove the donations or aid made (invoices, letters)	Every Verification
Grievances	Number of grievances received from communities	Record of grievances received by project proponent and individual farms	Continuous and Annual Verification
Compliance with National Law on labor matters	Written contracts must be drawn up with your workers	Record of signed documents	Every Verification
	Review settlements	Documents signed by ex-collaborators	Every Verification

Target	Indicator	Source of verification	Frequency
	There must be an approved Internal Work Regulation and salary book	Document approved by the Ministry of Labor	Every Verification
Ensure Land Tenure	It must be demonstrated that the ownership of the land is clear, legally secure and documented.	Copy of property registration or other legally stipulated proof	Every Verification
Compliance with current environmental law	Environmental assessments should be carried out during management planning	Current environmental license	Every Verification

This monitoring evaluation uses a tool that was implemented since the monitoring period reported, and allows Project Proponent the evaluation of the performance of Project activity at every instance, in detail.

4.3.2 Community Monitoring Plan Results (CM3.1, CM3.2, GL2.5)

Community variables selected and described in section 4.3.1 were monitored; the results and evaluation of monitoring are presented in ANNEX IX. CCBS\CCBS-Monitoring-Sistema de Monitoreo y Evaluación del Manejo.xls.

Social, Environmental and Legal aspects were evaluated at every participating farm; given that Bello Horizonte farm was no included in this report, no monitoring was carried out at that instance.

Every indicator defined in *Table 32*, was evaluated; general results indicate that the performance of the Project activity have conducted to positive results.

4.3.3 Dissemination of Monitoring Plan and Results (CM3.3)

A summary of monitoring plan and results was made publicly available as informative brochures handed out to workers and relevant stakeholders and during socialization events. Regional government offices are visited and given the same summaries. Project participants are sent relevant monitoring results directly via email. Stakeholders can request additional information.

4.4 Optional Criterion: Exceptional Community Benefits

The Project did not include this optional criterion, therefore this Section in not applicable.

5 BIODIVERSITY

5.1 Net Positive Biodiversity Impacts

5.1.1 Biodiversity Changes (B1.1)

The net biodiversity impact for the Project Zone over the project lifetime is clearly positive when compared to the "without project" scenario. The "without project" scenario places the most likely land use scenarios as continuation of pre-project land use of pastureland due to the many barriers in the areas for other cultivations. The lands on which the rubber plantations are established were degraded and degrading pastures with herbaceous vegetation and few existing trees as live fences or shade trees for cattle. Since the project's land use is not recommended to intensive agriculture[72] but for forestry and agroforestry activities, ecological conditions present a barrier for intensive agricultural crops[73]. By implementing rubber plantations, the land is more efficiently used and will be restored instead of continuing to degrade. Deforestation in the surrounding areas is maintaining high and is impacting biodiversity in the project area negatively by removing resources. Without the project, the land will continue to be wasted and additional land will be used up due to lack of economic opportunities.

All project areas have an Environmental Impact Assessment (EIA) that identifies potential project impacts and is accompanied by an Environmental Management Plan. The Project Activity at every discrete land included, have a net positive impact on the environment given the change from pasture to natural rubber tree plantations, recovering degraded soil. Also, the project area function as a buffer zone to rivers and natural reserve.

Monitoring activities of flora and fauna have demonstrated the abundance of species located in designated conservation areas[74].

Species found in the original flora monitoring events were also collected during this monitoring event, the areas maintained with natural species have not been altered in any way. Although not all species originally sighted were found this may vary due to the month of monitoring or the specific species collected. Additionally, no invasive species from project activities were found.

Information of fauna was increased from the original monitoring event. Overall, the information collected demonstrates the presence of local fauna in the area, plantations located in more diverse areas of the country have more species utilizing the natural areas as buffer zones.

[72] ANNEX III. Scientific literature references\Document:6. Perfil Ambiental de Guatemala

[73] ANNEX III. Scientific literature references\Documents: *retrieved from* INAB-CONAP, 2015: 7. Mapa forestal por tipo y subtipo de bosque-2012.

[74] In accordance with CCBS indicator B1.1, 1.3 and 1.4: *Describe the impacts on biodiversity (positive and negative) as a result of the project and show that the net impacts on biodiversity are positive.*

The proposed monitoring activities of flora and fauna in the area will also provide insight on how biodiversity is in the area and in surrounding locations as well as reduce the amount of illegal hunting and flora extraction.

Table 29. Changes in biodiversity resulting from project activities

Biodiversity Element	Connectivity
Estimated Change	Actual / Positive / Indirect
Justification of Change	The remnants of natural broadleaf forest, riparian forest and other ecosystems that currently exist in the projects as critical habitats that provide ecosystem services and "stepping stones" for the fauna and flora of the region, contributing to the connectivity of the farms with the forests surrounding remnants. This is observed through the flora and fauna identified in the project area versus surrounding areas.

Biodiversity Element	Fauna (vulnerable and endangered species)
Estimated Change	Actual / Positive / Indirect
Justification of Change	Vulnerable and endangered species have been found in the project area. These species were found in remnant forests within the farm boundaries demonstrating how these native ecosystems promote the conservation of these species and serve as additional habitat.

According to the fauna and flora evaluations carried out in March-April 2023, it is concluded in relation to the ecosystem services (all included in the category of regulation services), that the most relevant benefits at this time are:

1. Regulation of the hydrological cycle.

2. Pollination.

3. Seed dispersal.

4. Pest and disease control.

5. Carbon sequestration and storage.

6. Provision of future options in times of climate emergency.

There is a large part of the population and regional economic sectors that depend on the goods and services provided by the ecosystems present in the evaluated rubber plantations. Rivers, streams, riparian forests and wetlands are very important areas in the service provision and regulation of the hydrological cycle, as

they are related to the water recharge of the associated micro-basins. This water recharge is also essential for the wetlands present on some participating farms, as well as those present in the basin below them.

The pollination and seed dispersal services provided by the butterflies, birds, bats, and monkeys that live in the remnant forests on the farm and flow into the surrounding landscape are critical. These animals allow the dispersal of seeds necessary for plant repopulation, crop pollination and the regeneration of native vegetation. In addition, pest and disease control services provided by snakes, insectivorous birds and birds of prey, insectivorous bats, and carnivorous mammals are a priority to maintain the health of the human communities surrounding the evaluated farm, as well as for the people who live within them. same. These groups of fauna allow population control of potential pest species such as rats, mice, flies and mosquitoes, which affect crops and/or are vectors of diseases relevant to human health.

5.1.2 High Conservation Value Protection (B1.2)

As stated in the Project's CCBS P; "*Areas that provide critical ecosystem services such as hydrological services and erosion control can be found under the areas designated as old forest, new forest and water (HCV4)*". None of the planned project activities will have a negative impact on HCVs 4-6 and their associated sub-values in the Project Zone. The key threats to these HCVs are contamination of local water sources and vulnerability to forest fires. Recommended project activities have been created to address threats within the framework of the project including: preventing the loss of forest cover near water sources; preventing the construction of infrastructure near water source; creating a water management policy for personal waste; cleaning internal trails, especially in fire prone areas; patrolling the farm during seasons with high fire vulnerability; and placing signs around the farm perimeter with warning and precaution themes. After the monitoring event, the conclusion is that none of the planned project activities have had a negative impact on HCVs in the Project Zone. Project activities are focused on maintaining and enhancing forests and natural ecosystems, and thus the environmental, social, and cultural benefits derived from them. Such activities will have a strong positive impact on HCVs 4-6.

In addition, as one of the most important premises of the Project, forests or threatened non forest habitats in the project area shall not be converted to plantations or other non-forest land use.

All high conservation areas are clearly marked in the project maps and are adequately labeled with numerous signs around the area in order to avoid any trespassing or illegal activity.

5.1.3 Invasive Species (B1.3)

The project proponents do not use invasive species and the population of any invasive species will not increase as a result of the project. Reforestation was achieved with the establishment *of Hevea brasiliensis* plantations.

5.1.4 Impacts of Non-native Species (B1.4)

The project contemplated plantations of one non-native species: *Hevea brasiliensis*, which is one of nine naturally occurring species of the *Hevea* genus originating in the Amazon region of Brazil and surrounding countries. The native rubber producing species (*Castilloa elástica*) is not commercially viable for larger scale production. *H. brasiliensis* has been successfully cultivated in Guatemala and was chosen for its hardiness and productivity. No impacts on native species and disease introduction or facilitation are expected.

Table 30. Non-native species in the project

Species	*Hevea brasiliensis*
Justification of Use	*H. brasiliensis* is one of nine naturally occurring species of the Hevea genus originating in the Amazon region of Brazil and surrounding countries. The native rubber producing species (*Castilloa elástica*) is not commercially viable for larger scale production.
Adverse Effect	*H. brasiliensis* has been successfully cultivated in Guatemala and was chosen for its hardiness and productivity. No impacts on native species and disease introduction or facilitation are expected.

The Guatemalan Rubber Association (Gremial de Huleros de Guatemala[75]) describes that since Mayan civilization the rubber (*Castilloa elástica*) has been utilized. The Guatemalan Rubber Association has experience for more than 60 years. Commercial rubber plantations with *Hevea brasiliensis* were introduced in Guatemala in 1940. The Guatemalan Rubber Association is reporting that given the agriculture and ecological adaptation, viability, productivity and the spread distribution of rubber plantations with *H. brasiliensis*, in Guatemala exist more than 100,000 ha with rubber plantations and more than 40 million of trees.

[75] http://www.gremialdehuleros.org/

5.1.5 GMO Exclusion (B1.5)

No Genetically Modified Organisms are used in this project[76].

For the establishment of the plantations, seeds were sown in germination beds; following germination seedlings were transplanted in polyethylene bags/root trainers. Material for clonation with root stock was produced in the project's clonal gardens.

5.2 Offsite Biodiversity Impacts

5.2.1 Negative Offsite Biodiversity Impact Mitigation (B2.2)

Due to the use of herbicides for weed control at the plantations, mitigation measures were established for the proper application of agrochemicals. Weed control is necessary, among other things, because it prevents workers from getting hurt when walking through the plantation and also prevents snake bites.

Table 31. Negative offsite and mitigation – Biodiversity impacts

Negative Offsite Impact	Mitigation Measure(s)
The use of chemical fertilizers and herbicides can lead to water and soil contamination that can impact local flora and fauna.	Training on proper use of chemicals is provided with personal protection equipment. Chemicals shall be disposed to a licensed hazardous-waste disposal contractor or collection site except for empty clean containers which can be disposed of as non-hazardous waste. The products are applied with precautions – ensuring natural ecosystems and protected areas are not affected. Alternative, less toxic agrochemicals are evaluated and recommended.

In the areas outside the project zone, activities such as cattle ranching will continue to degrade forest areas and affect water courses due to the expansion of the productive frontier, introduction of grasses, replacement of natural species, and the use of fire for clearing and crop management. These activities prevent the formation of forest and reduce the forest fragments that make the movement of fauna difficult (biological connectivity). Moreover, in the areas outside the project zone, hunting activities can take place and there is little oversight for agrochemical use.

By protecting natural areas and increasing forest cover on degraded lands, wildlife in the area will be positively impacted with improved connectivity across different landscapes. Furthermore, endangered, vulnerable, and important species and ecosystems will be protected, monitored and managed.

[76] In accordance with CCBS indicator B1.5: *Describe any adverse effects of non-native species used by the project, and guarantee that no genetically modified organisms (GMOs) have been used to generate GHG emissions reductions or removals.*

At the current report, no negative offsite biodiversity impacts have been detected; previous monitoring events, have reported that there is a diverse range of species in the area. In addition, High Conservation areas are frequented by local fauna. Field surveys have not found species used in the project spreading to offsite areas.

5.2.2 Net Offsite Biodiversity Benefits (B2.3)

Biodiversity offsite is only benefit from project activities since the area has been serve as a buffer zone and refuge. The farms mitigation efforts are related to and will follow with environmental regulations. All positive biodiversity impacts associated with the project are extended offsite to adjacent lands.

All project areas were previously cattle farms with degraded land therefore biodiversity was not present and no negative offsite biodiversity impacts will occur with the reforestation. Benefits from reforestation are expected as buffers and biological corridors are created around natural reserves as well as raised environmental awareness. Indirect benefits of the project such as increased employment in nearby communities and worker benefits are expected to decrease illegal activities such as illegal extraction of flora and fauna. The project also aims to create a model of sustainable competitiveness in the natural rubber sector to promote further restoration and reforestation.

Regarding to the ecosystem services (all included in the category of regulation services), the relevant benefits are related to a large part of the population and regional economic sectors that depend on the goods and services provided by the ecosystems present in the evaluated rubber plantations. Rivers, streams, riparian forests and wetlands are very important areas in the service provision and regulation of the hydrological cycle, as they are related to the water recharge of the associated micro-basins.

5.3 Biodiversity Impact Monitoring

5.3.1 Biodiversity Monitoring Plan Development (B3.3)

Not applicable.

5.3.2 Biodiversity Monitoring Results (B3.1, B3.2)

A monitoring plan model has already been created in which certain variables were identified as well as frequency and reporting in order to monitor biodiversity impact. Such variables include use of chemicals on the farm, use of exotic species, changes in land use in forested areas, areas of high conservation value, impacts on flora, impacts on fauna, impacts on the landscape, areas of protection, impacts on the soil, impacts on the water, and written guidelines on management. A detailed list of indicators for each variable

can be found in ANNEX IX. CCBS\CCBS-Monitoring-Sistema de Monitoreo y Evaluación del Manejo.xls. Environmental management plans will assess whether there are changes to baseline parameters, if the changes are related to the project activities and if mitigation measures are appropriate.

The following biodiversity variables have been monitored by the project to ensure meeting the project's biodiversity objectives.

Table 32. Biodiversity monitoring results

Variables	Areas	Types of measurements	Sampling method	Frequency	Results
Management of agrochemicals	Project area	Record of purchase and use of agrochemicals in the field.	Random sampling, key focus on areas of high impact or HCVA.	Annual or every Verification	All records of agrochemical uses that comply with the list of "inputs" of the Project Description were reviewed at every farm. Necessary measures are applied for application and disposal os agrochemical.
Monitoring forest use change	Project area	Field visits and registration	None	Annual or every Verification	No natural forest change is reported
Protection of High Conservation Value related to biodiversity	Identified HCVA in project area	Report of the results, activities or measures executed according to the HCV that the management plan indicates and community interviews.	Project areas with HCVA and areas of influence	Annual or every Verification	High Conservation Value Areas are protected in the areas surrounding the project area. The decrease in protected areas within the farms is not reported, so HCV conservation is considered efficient. During the visits to the farms, no alteration was observed in the protected areas.
Monitoring protected areas	Protected areas withing project area	Field trip. Natural forest areas (protection) are identified on the general map of the farm.	None	Annual or every Verification	There has been no conversion of natural forest. There is signage to prevent hunting and illegal logging.

Variables	Areas	Types of measurements	Sampling method	Frequency	Results
Monitoring the application of mitigation measures	Project area	Report of the results, activities or measures executed according to the authorized environmental license	None	Annual or every Verification	The farms implement best practices to mitigate possible impacts and comply with environmental impact studies or management plans.
Protection of rare and endangered species	Project area	Appendix in the Management Plan with measures for the Protection of rare and endangered species, Stakeholder interview	Project areas with HCVA and areas of influence	When actualizations exist	There are no rare species within the project area or identified in direct impact areas. Despite the fact that endangered species were detected until the biological evaluation carried out in March-April 2023, the maintenance measures for the remnants of natural forests will be maintained with greater sense.
Establishment of Agroforestry systems	Project area	Tree count reports, generation report, field visits.	Permanent sampling plots	Annual or every Verification	The Project has 1,510.17 ha of reforested area with natural rubber.

To measure the impact on HCVs related to globally, regionally or nationally significant biodiversity present in the project zone, a monitoring for fauna species was conducted. The following focal groups were determined indicative of the conservation status of the selected project areas: butterflies, amphibians, reptiles, birds and mammals. Vulnerable and/or endangered species were present in the two Project locations evaluated (Palmeras and Asunción farm). These species and others evaluated in the biodiversity study serve as indicators to changing ecosystems, agrochemical use and fragmented landscapes. Suggestions on how to maintain and improve HCVA areas were given and shall be incorporated to management plans.

For specific monitoring results please see ANNEX IX. CCBS\Biodiversity monitoring\Flora and fauna studies.

5.3.2.1 Management of effectiveness monitoring

- Fire management

Monitoring of fire management has been conducted to ensure that the policies placed by the Project participants are followed. The following mitigation efforts have been followed:

1. Implement patrol during times of high vulnerability to fires; the daily presence of the workers and the guards who patrol the properties, has allowed that fire events do not arise without being attended to immediately. It is well known by Project participants that not only protected forest areas are at risk, but also productive rubber plantations.

2. Coordinate with neighbors to be aware of any purposeful burning that takes place in the surrounding locations; during the monitored period, no activity in this regard, have been coordinate.

3. Have signs that warn against illegal activities in area; signals are in place at the farms.

In this verification period, no fire has been reported within the project site. In addition the National Forest Institute map 2001-2013 shows that the projects are located in areas with the lowest fire incidents.

- Weed management

The effectiveness of the projects weed management was also assessed during the current verification period. Project areas are constantly monitored and groomed in order to avoid any spreading of internal plants. None of the species used in the project area have spread to neighboring conditions, this can be verified during field visits.

- Chemical use management

In order to ensure that the project implements proper chemical use, all chemicals' inventories are recorded. An environmental impact assessment was made for the farms, and according to Guatemalan legislation the use of these chemicals is allowed.

5.3.3 Monitoring Plan and Results Dissemination (B3.3).

A summary of the project monitoring plan was made available in Spanish during stakeholder meetings and delivered to relevant regional government offices. Results were discussed and if further information is requested, additional documentation can be made available.

All project proponents are given a detailed summary of monitoring results and are also informed that further evidence can be provided if requested.

6 ADDITIONAL PROJECT IMPLEMENTATION INFORMATION

In the previous report, the Project opted for the Gold Level Selection/Exceptional Biodiversity Benefits, given that species listed as endangered and vulnerable (according to the UICN Red List.), were sighted in the Bello Horizonte project zone: Baird's Tapir (*Tapirus bairdii*), Salamandra de O'Donnell (*Bolitoglossa odonnelli*) and *Ptychohyla panchoi*. This information was collected by FUNDAECO during a study to identify High Conservation Values within the area.

Nevertheless, Bello Horizonte farm was not monitored during this monitoring event and is not seeking VCU issuance. Further monitoring of area needs to be conducted to determine species are still in the area.

New information about the biodiversity studies carried out at Palmeras and Asunción farms has shown that vulnerable species of fauna were sighted and found on these farms. As there are endangered species in the area, for future monitoring reports, it is not discarded to opt for the Gold Level Selection/Exceptional Biodiversity Benefit again.

7 ADDITIONAL PROJECT IMPACT INFORMATION

No additional information is presented in this section.

Appendix X: supporting information

UNCERTAINTY ASSESSMENT

According to the VCS Standard, the Project Proponent made a complete uncertainty assessment and analysis related to all the possible sources of uncertainty.

The analysis of uncertainties at different levels was done by the Project Proponent, in order to reduce uncertainty in present and future inventories. In Accordance with 2006 IPCC Guideline for National Greenhouse Gas Inventories (2006 IPCC GL), the Project Proponent "*identified significant sources of uncertainty in the inventory to help prioritize data collection and efforts to improve the inventory. Definitions associated with conducting an uncertainty analysis include uncertainty, accuracy, precision and variability. Good practice requires that bias in conceptualizations, models, and inputs to models be prevented wherever possible, such as by using appropriate QA/QC procedures*".

Project Proponent, in accordance with methodologies made a priority of uncertainty inputs that had the greater impact on the overall monitoring uncertainty.

Quantitative statistical analysis of uncertainty was performed by estimating the 95 percent confidence interval of the emissions and removals estimates for individual categories and for the total inventory.

Future monitoring events will have the same uncertainty assessment; these actions will be carried out in order to detect new causes or inputs of uncertainties to the inventory and monitoring that might raise the uncertainty, and the new Project Proponent is responsible hereinafter.

Accordingly, to 2006 IPCC Guideline for National Greenhouse Gas Inventories (2006 IPCC GL), the inventory developer should consider eight broad causes of uncertainty; the Project Proponent considered and applied on its uncertainty assessment actions to reduce uncertainty related to every possible cause of uncertainty:

Cause of Uncertainty 1, Lack of completeness: related to where "*measurement or other data are not available either because the process is not yet recognized or a measurement method does not yet exist*".

The Project Proponent monitoring system implemented the following actions as part of the Uncertainty assessment in order to prevent lack of completeness:

Action 1

PICA, as the previous Project Proponent, conducted a pre-sampling event in 2009 measuring the growth in plantations established in 2007 and 2008 in order to validate the *ex ante* stratification and monitoring methodology proposed in PICA's first project Promoting Sustainable Development Through Natural Rubber Tree Plantations in Guatemala. The pre-sampling included measuring 120 sampling plots within project farms located in areas similar to those of the current project activities. After data statistical analysis, the main result of the 2009 pre-sampling event determined that a new ex post stratification was needed. Given this, improvements were implemented and performed. A new ex post stratification was implemented in

order to reduce high statistical variability and increasing representativeness. Ex post stratification is based in clone's distribution among planting year and farm. It is more detailed and more exhaustive; this data is used in this monitoring report.

Action 2

Project uses a Monitoring Plan that has been used in validated and verified monitoring reports. The Monitoring Plan has been used in the Promoting Sustainable Development Through Natural Rubber Tree Plantations in Guatemala project at six verifications of this Project.

Cause of uncertainty 2, Model: "*The use of models to estimate greenhouse gas emissions and removals can introduce uncertainty, including both bias and random error, for a variety of reasons*". Project Proponent, as part of uncertainty assessment implemented the following actions to prevent uncertainty in models:

Action 1

Allometric equations were used to predict carbon removals in calculations. The Project Proponent used two allometric equations in the 2022 Monitoring Event: Morales 2000 and PICA 2010. In Project's PD, the carbon stock for individually trees above 5 cm of DBH was determinate to be estimated using the Morales 2000 equation. Morales' equation has been proven for estimating carbon removals in rubber trees in a conservative way as supported in Project's PD.

Nevertheless, Morales' equation can´t be interpolated for carbon stock estimations on trees below 5 cm of DBH, because it didn't include this range of DBH size when the study was carried out. Given that, PICA, as the previous Project Proponent, decided to create a new equation using a destructive methodology to estimate the Above Ground Biomass (AGB), harvesting 50 trees in 2010.

The result was that the best statistical model to predict weight of biomass in AGB for trees below 5 cm DBH was the "growth model". The selected model combines the third highest value for determination coefficient (R2) and the lowest standard error value (SE) of estimation among the seven models evaluated. This means the lowest sampling error in estimations when using PICA's allometric equation.

Moreover, this model has the highest estimated coefficient and significance value in the variance test. This fact demonstrates high correlation between the variables measured: DBH (cm) and dry biomass (kg).

Models generated were tested and related to real values, to evaluate the results and again the "growth model" predicted the most realistic values according to field data. The actions that Project Proponent performed reduce the risk of "*limited information that creates additional uncertainties beyond the model formulation*" and leads to more accurate annual estimates of removals.

Action 2

During the study for the new equation, the trees sample was composed of the five most planted clones in the Project areas. This increased representativeness in the new equation.

Cause of uncertainty 3, Lack of data: "*In some situations, there simply may not yet be data available that would be necessary to characterize a particular emission or removal. In these situations, a common approach is to use proxy (or surrogate) data for analogous or similar categories or to use interpolation or extrapolation as a basis for making estimates*".

The Project Proponent not only has specific and available data since the beginning of Project´s activities, but has improved it throughout the monitoring process. According to this, specific relevant data and information was used for ex ante and ex post estimations and calculations. Given this, no interpolation or extrapolation was used as basis for making estimates.

Information in Project's PD and 2022 Monitoring Report has been supported by scientific, specific and documented information well proved in the Annexes in both documents. The affirmations and statements are well referenced.

Cause of uncertainty 4, Lack of representativeness of data: "*This source of uncertainty is associated with lack of complete correspondence between conditions associated with the available data and the conditions associated with real world emissions/removals or activity*".

Related to this premise, the Project Proponent performed the following actions:

Action 1

Project's PD and 2022 Monitoring Report used and refers data and information specifically developed for the Project and other specific information (e.g. information and equations developed for *Hevea brasiliensis*).

Action 2

The *ex post* stratification was implemented by Project Proponent as one of the major effective action to reduce uncertainty. The *ex post* stratification is based on farm and planting year. Every planting year plantation at each farm represents a stratum; this is a detailed and exhaustive tier of stratification as practical as possible. The number of strata depends on how many different planting years plantation exist among project's farms.

Action 3

A sub-stratification was conducted at clone level. Sub-stratification based on clone's distribution is more detailed and provides with more representativeness to the collected data, reduces bias, and uncertainties can be quantified. The objective of sub-stratification is using for analysis the data generated from more homogeneous units (sub-strata) and reach the lower variance within strata

(Planting year and farm). The *ex post* stratification was generated to increase the precision of the sampling.

Cause of uncertainty 5, Statistical random sampling error: this source is associated "*with data that are a random sample of finite size and typically depends on the variance of the population from which the sample is extracted and the size of the sample itself (number of data points). This source of uncertainty is associated It can often be reduced by increasing the number of independent samples taken*".

The Project Proponent has performed a wide and exhaustive plan to reduce bias and uncertainty in different procedures and conceptions. Actions included in that plan are described below:

Action 1

Sampling size: The Project Proponent increased strongly the sample size. Among other reasons, the increase was performed to improve representativeness (all planted clone was sampled), accuracy (more quantity of permanent sampling plots) and exhaustiveness in order to reduce bias (inventory design randomly stratified), variability (increasing accuracy) and uncertainties. The above actions are in accordance to 2006 IPCC GL, because "*Uncertainty associated with random sampling error can be reduced by increasing the sample size*".

Following guidance of the CDM tool "*Calculation of the number of sample plots for measurement within A/R CDM project activities" Version 2.1.0*, the Project Proponent was supposed to sample less plots than the final number sampled. The sampling size and sampling distribution were designed to achieve the targeted precision level for biomass mean estimation of ±10% at a 95% confidence level.

Additionally, in previous monitoring events, some permanent sampling plot at farms were increased, in order to improve the measurement error. In future events, the Project Proponent will continue increasing another PSPs in the substrata that requires.

Action 2

Inventory design: The Project Proponent performed a randomly stratified monitoring design. It was random by distributing, selecting and establishing all new Permanent Sampling Plots –PSP- within strata. It was stratified by dividing individual farm Project's area in homogeneous sub-strata based on clone's distribution at planting years.

According to LULUCF methodology, "*random sampling reduces the risk of bias and allows an objective assessment of the uncertainty of the estimates because relies on random selection of a sample from the population; each unit in the population has a specific probability of being included in the sample; randomly sampled data generally should be used where available*". Thereby, "*systematic random*

sampling generally is superior to other designs given that sample plots will be distributed evenly to all parts of the target area".

About stratification in sampling design, LULUCF methodology states: "*Stratified surveys will generally be more efficient in terms of what accuracy can be achieved at a certain cost. Stratification increases efficiency in two main ways: (i) by improving the accuracy of the estimate for the entire population; and (ii) by ensuring that adequate result is obtained for certain subpopulations*". The Project Proponent used reliable and accurate data and incorporated within monitoring event, e.g. thematic maps, remote sensing data, planting density reports, precise identification of clone's distribution at field.

In addition, as Project Proponent, NEOSA has appropriate knowledge of legal, administrative boundaries and project baseline boundaries. Given that, the *ex post* stratification performed by the Project Proponent was based in appropriate and accurate data; therefore, Project Proponent's *ex post* stratification increases efficiency of the monitoring without changing the basic field design.

Cause of uncertainty 6, Measurement error: this source is related to "*errors in measuring, recording and transmitting information, approximations and assumptions incorporated in the measurement method and estimation procedure*".

The Project Proponent thru a complete QA/QC and uncertainty assessment has ensuring the reduction of measurement error. The follow activities are part of Project Proponent's uncertainty assessment:

Action 1

Adjustments to strata's means: Quantitative uncertainty analysis was performed estimating the 95 percent confidence interval of the emissions and removals estimates for individual categories and for the total inventory.

When statistical analysis under the above premise reached more that 10% of sampling error in strata statistical analysis, the Project Proponent applied an adjustment for the weighted mean for specific strata i (planting year in farms). This mean adjustment consisted in subtract confidence interval (CI) from the mean for the planting year where the standard error was high above 10%.

The Project Proponent selected this procedure to correct high standard error and to ensure the data used in calculations was conservative by avoiding uncertainties.

Action 2

Field measurement techniques: Basic, accurate and direct measurements were performed by monitoring crews in order to avoid measurement errors and uncertainties recording the main variable used in carbon removals calculations (DBH). Detailed Standard Operational Procedures (SOP) are

available in Project Proponent's Monitoring Plan. Within this SOP, the Project Proponent has ensured that measurement techniques and equipment are appropriately used and calibrated.

Moreover, conservativeness in measurement techniques has been applied, e.g. if the DBH measurement taken happens to be in the middle of two-millimeter marks of diametrical tape, conservatively the lowest value was reported and recorded. Detailed of this procedure is available in Project Proponent's Monitoring Plan.

Thereby 2006 IPCC GL supports the above premise when states "*the variables of interest (e.g., removals of greenhouse gases) are assumed to be directly recorded at the sampling units; thus, no errors due to model conversions need to be considered*".

Annually a retraining/observation procedure is carried out with each measurement crew at the beginning of monitoring events. The objective is to ensure at the monitoring beginning that SOP's will be performed and implemented as Project Proponent requires; the retraining/observation procedure is also part of Project Proponent's QA/QC procedure. Additionally, the Project Proponent conducted a measurement field error audit determining the tier of this error. No corrections were needed to any sub-strata in this monitoring event in accordance with Project Proponent's QA/QC procedures.

Action 3

Instrumentation precision: The use of instrumentation is easily understandable for any crew member in the farms. Project Proponent's Monitoring Plan describes with detail the Standard Operational Procedures (SOP) performed by measurement crew members at farms. Basic instrumentation with good precision was used in field measurements.

The main variable used in removals estimations in Project Proponent's Project is Diameter at Breast Height –DBH-, throughout using allometric equations related to DBH. A diametrical tape with accuracy of 1 mm was used to obtain direct DBH data records. Thereby, DBH data is not estimated but directly measured at each sampled tree.

The easy use of instrumentation and direct measure reduce bias and uncertainties.

Essential instruments such as GPS and hypsometer have been used in the current Monitoring Event. GPS is important when locating the sampling plot. Proper knowledge of GPS' use avoids bias and uncertainties given the precision in plot identification. Further description of instrumentation is in section 3.3.2 Monitoring instrumentation

Action 4

Project Proponent's QA/QC program: according to 2006 IPCC GL "*measurement errors may result from errors in measuring, recording and transmitting information*".

In order to reduce errors of transmitting information, an electronic platform was created where employees can enter measurements directly into a tablet. This reduces errors of transmitting since the

data is directly digitalized. In addition, through uncertainties assessment, the Project Proponent developed a complete QA/QC for data entry and data archiving.

QA/QC for field measurement assessment was conducted through field measurement audits (blind checks). To ensure the collection of reliable field data, blind checks in Project Proponent's internal auditing included re-measuring the 10% of all PSPs. This was support by GPG LULUCF methodology, in where it is stated that "*it is good practice to conduct careful check assessments on a (small) fraction of the plots, in order to assess measurement errors. This fraction may be in the order of 1% to 10%. If major measurement errors are found in a carefully conducted control survey, it is good practice to correct for these errors before the final estimates of greenhouse gas emissions/removals are calculated*". Project Proponent's QA/QC plan ensures that any errors found are corrected before removals estimations.

QA/QC for data entry assessment was done by reviewing information collected. The Project Proponent has established that 10% of the total Permanent Sampling Plots are reviewed in every monitoring event.

QA/QC for data archiving assessment was done by implementing Project Proponent's protocol for data custody. In every monitoring event, the checklist of storage documents must be review in order to validate the existence of all the archiving documents.

The Project Proponent established that by checking the above described variables in the QA/QC internal audit, the reliability of data is ensuring.

Action 5

Assumptions and default values: For *ex ante* and *ex post* removals estimations, the Project Proponent mainly used specific information related to the Project. In some cases, scientific studies were used as reference for default values where specific information was not available, e.g. below ground biomass ratio (0.22), biomass and carbon content ratio (47%), and default values from the IPCC Guidelines. The Project Proponent ensured that default values were applicable to Project reality and methodology. Conservatively, when a default value was expressed in a confidence interval by the scientific reference, the Project Proponent applied and used the lower limit of the confidence interval for estimations and calculations.

Cause of uncertainty 7, Misreporting or misclassification: the cause of uncertainty *"may be due to incomplete, unclear, or faulty definition of an emission or removal. Proper QA/QC should help avoid this*". The Project Proponent has implemented successfully its QA/QC internal audit assessment; applying QA/QC procedures to the main aspects for inventory and monitoring events such as data entry and data archiving, provides the support for avoiding uncertainties.

Cause of uncertainty 8, Missing data: according to this cause, 2006 IPCC GL states that "*Uncertainties may result where measurements were attempted but no value was available*". Related to this particular cause of uncertainty, the Project Proponent always has utilized reliable and specific data for ex ante and ex post estimations. No assumptions are made, only estimations have been done in Project's estimations. The main carbon pool to measure is well defined; no lack of information has happened in monitoring events.

Table 33. Summary of Project Proponent's Uncertainty assessment.

Typical strategies for dealing with different causes of Uncertainties				
Causes of Uncertainty	Suggested strategy by IPCC 2006 GL			Project Proponent's Actions
	Evaluated Conceptualization and Model Formulation	Empirical and Statistical	Expert judgment	
1) Lack of completeness	✶			1) PICA, as the previous Project Proponent, conducted a 2009 pre-sampling event to validate PD information and estimations. Thru data analysis new *ex post* stratification was performed since 2010 Monitoring Event. 2) Complete, probed and recognized Monitoring Plan existed before first monitoring event.
2) Model (bias and random errors)	✶	✶	✶	1) PICA, as the previous Project Proponent, improved Morales equation (the model used for carbon estimations) and developed a new equation, to estimate biomass for rubber trees below 5 cm of DBH. 2) The Project Proponent, increase representativeness (improve the original model) of new equation using the most planted clones in the study of the new equation.
3) Lack of data			✶	1) Specific relevant data and information was used for *ex ante* and *ex post* estimations and calculations. Affirmations, reports and statements are well referenced at Project PD and in the current Monitoring Report.

Typical strategies for dealing with different causes of Uncertainties				
Causes of Uncertainty	**Suggested strategy by IPCC 2006 GL**			**Project Proponent's Actions**
	Evaluated Conceptualization and Model Formulation	**Empirical and Statistical**	**Expert judgment**	
4) Lack of representativeness of data	✶	✶	✶	1) The Project Proponent used data and information specifically developed for the Project and it is referred at Project PD and the current Monitoring Report. 2) A *ex post* stratification was implemented by the Project Proponent as one of the most effective action to reduce uncertainty. It is based on Farm and Planting year as reflection of individual project areas reality. 3) Furthermore, the Project Proponent conducted a detailed sub-stratification at clone tier for monitoring events at Project farms.
5) Statistical random sampling error		✶		1) The Project Proponent increased strongly the sample size than required by CDM tools. This action improves the monitoring event in representativeness, accuracy and exhaustiveness. 2) The Project Proponent performed a randomly stratified monitoring design which reduces risk of bias and uncertainty.

Typical strategies for dealing with different causes of Uncertainties				
Causes of Uncertainty	**Suggested strategy by IPCC 2006 GL**			**Project Proponent's Actions**
	Evaluated Conceptualization and Model Formulation	**Empirical and Statistical**	**Expert judgment**	
6) Measurement error: random and systematic component (bias)	✶	✶	✶	1) Quantitative uncertainty analysis was performed estimating 95% confidence interval of removals. In addition, adjustments to means were carried out when sampling error was above 10%. 2) Basic, accurate and direct measurements were performed by monitoring crews at sampling plots. All the measurement techniques are well described in the Project Proponent's Monitoring Plan. 3) The easy use and accuracy of instrumentation used in Project Proponent's monitoring events, avoid bias and uncertainties. 4) The Project Proponent developed a QA/QC for internal audits covering field measurements, data entry and data archiving. 5) The Project Proponent apply conservativeness in the use of assumptions and default values.
7) Misreporting or Misclassification		✶	✶	1)The Project Proponent has implemented successfully its QA/QC internal audit assessment to the main aspects for inventory and monitoring events
8) Missing data		✶	✶	1) The Project Proponent has always had available of reliable and specific data for *ex ante* and *ex post* estimations. In Project Proponent's monitoring events, the variables of interest were directly recorded at sampling units.