# AFFORESTATION OF DEGRADED GRASSLANDS IN VICHADA, COLOMBIA

Document Prepared By

South Pole Carbon Asset Management SAS

Contact: +57 4 520 5000; m.buitrago@southpole.com

| | |
|---|---|
| **Project Title** | Afforestation of degraded grasslands in Vichada, Colombia |
| **Version** | 5 |
| **Date of Issue** | 01-03-2022 |
| **Project Location** | Colombia, Vichada |
| **Project Proponent(s)** | Forest First Colombia (FFC) SAS<br>Contact Name: Jairo Vargas<br>Email: Jairo.vargas@forestfirst.com<br>Phone: +57 1 745 0560 |
| **Prepared By** | South Pole Carbon Asset Management SAS<br>Contact Name: Maria Fernanda Buitrago<br>Email: m.buitrago@southpole.com<br>Phone: +57 4 520 5000 |
| **Validation Body** | Instituto Colombiano de Normas Técnicas (ICONTEC)<br>Contact Name: Laura García |

| | |
|---|---|
| | Email: lmgarciam@icontec.org<br>Phone: +57 4 319 8020 |
| **Project Lifetime** | September 15, 2016 – September 14, 2046: 30-year lifetime |
| **GHG Accounting Period** | September 15, 2016 – September 14, 2046: 30-year total period |
| **History of CCB Status** | Under validation and first verification process |
| **Gold Level Criteria** | The project is not applying for any Gold Level criteria. |
| **Expected Verification Schedule** | First verification: March 2022 |

**Table of Contents**

# 1 SUMMARY OF PROJECT BENEFITS

The grouped project aim is to recover degraded grasslands in Vichada, Colombia, through the establishment of timber plantations. The first instance consists of the afforestation of 22,104 ha of low-fertility grasslands that have been degraded by livestock in the municipalities of Puerto Carreño and La Primavera, it includes the planting of Eucalyptus (*Eucalyptus pellita*) and Acacia (*Acacia mangium*) as timber species.

Through afforestation activities to recover degraded lands, the project aims to promote connectivity between ecosystems. In addition, this project is expected to provide more than 200 full-time employment opportunities (with equal access to women and men) in a zone historically affected by poverty. Furthermore, the increase in the forest cover and sequestration of carbon in living biomass will contribute to the reduction of GHG emissions by acting as sink that sequesters an average of 98,588 $tCO_2e$ per year. This amounts to 2,957,638 $tCO_2e$ over the 30-year crediting period.

## 1.1 Unique Project Benefits

| Outcome or Impact Estimated by the End of Project Lifetime | Section Reference |
|---|---|
| 1) Empowerment of women and communities | 4.2.1 |
| 2) Increase in perception/recognition of the value of forest resources | 4.2.1 |
| 3) Promote connectivity between ecosystems | 5.2.1 |
| 4) Maintain the local habitat of wildlife | 5.2.1 |

### 1.2 Standardized Benefit Metrics

| Category | Metric | Estimated by the End of Project Lifetime | Section Reference |
|---|---|---|---|
| GHG emission reductions or removals | Net estimated emission removals in the project area, measured against the without-project scenario | 2,957,638 $tCO_2e$ | 3.2 |
| | Net estimated emission reductions in the project area, measured against the without-project scenario | Not applicable | |
| Forest[1] cover | For REDD[2] projects: estimated number of hectares of reduced forest loss in the project area measured against the without-project scenario | Not applicable | |
| | For afforestation, reforestation, and revegetation (ARR)[3] projects: estimated number of hectares of forest cover increased in the project area measured against the without-project scenario | Instance 1: 22,104 ha | 2.1.5 |
| Improved land management | Number of hectares of existing production forest land in which IFM[4] practices are expected to occur as a result of project activities, measured against the without-project scenario | Not applicable | |
| | Number of hectares of non-forest land in which improved land management practices are expected to occur as a result of project activities, measured against the without-project scenario | Not applicable | |
| Training | Total number of community members who are expected to have improved skills and/or knowledge | Approximately 200 (full-time employees) | 2.1.1 |

[1] 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*)
[2] Reduced emissions from deforestation and forest degradation (REDD): activities that reduce GHG emissions by slowing or stopping the conversion of forests to non-forest land and/or reduce the degradation of forest land where forest biomass is lost (*VCS Program Definitions*)
[3] 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*)
[4] Improved forest management (IFM): activities that change forest management practices and increase carbon stock on forest lands managed for wood products such as saw timber, pulpwood, and fuelwood (*VCS Program Definitions*)

| | | | |
|---|---|---|---|
| | resulting from training provided as part of project activities | | |
| | Number of female community members who are expected to have improved skills and/or knowledge resulting from training as part of project activities | Approximately 40 (20% of the staff are women) | 2.1.1 |
| Employment | Total number of people expected to be employed in project activities[5], expressed as number of full-time employees[6] | Approximately 200 | 2.1.1 |
| | Number of women expected to be employed as a result of project activities, expressed as number of full-time employees | Approximately 40 | 2.1.1 |
| Livelihoods | Total number of people expected to have improved livelihoods[7] or income generated as a result of project activities | Approximately 200 (full-time employees) | 2.1.1 |
| | Number of women expected to have improved livelihoods or income generated as a result of project activities | Approximately 40 (20% of the staff are women) | 2.1.1 |
| Health | Total number of people for whom health services are expected to improve as a result of project activities, measured against the without-project scenario | The 235 inhabitants of Venturosa, through the annually support to the health center | 4.1.1 |
| | Number of women for whom health services are expected to improve as a result of project activities, measured against the without-project scenario | The 71 women inhabitants of Venturosa, through the annually support to the health center | 4.1.1 |

[5] 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.
[6] Full time equivalency is calculated as the total number of hours worked (by full-time, part-time, temporary, and/or seasonal staff) divided by the average number of hours worked in full-time jobs within the country, region, or economic territory (adapted from the UN System of National Accounts (1993) paragraphs 17.14[15.102];[17.28]).
[7] 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). Livelihood benefits may include benefits reported in the Employment metrics of this table.

| | | | |
|---|---|---|---|
| Education | Total number of people for whom access to, or quality of, education is expected to improve as result of project activities, measured against the without-project scenario | Not applicable | |
| | Number of women and girls for whom access to, or quality of, education is expected to improve as result of project activities, measured against the without-project scenario | Not applicable | |
| Water | Total number of people who are expected to experience increased water quality and/or improved access to drinking water as a result of project activities, measured against the without-project scenario | Not applicable | |
| | Number of women who are expected to experience increased water quality and/or improved access to drinking water as a result of project activities, measured against the without-project scenario | Not applicable | |
| Well-being | Total number of community members whose well-being[8] is expected to improve as a result of project activities | Approximately 200 (full-time employees) | 2.1.1 |
| | Number of women whose well-being is expected to improve as a result of project activities | Approximately 40 (20% of the staff are women) | 2.1.1 |
| Biodiversity conservation | Expected change in the number of hectares managed significantly better by the project for biodiversity conservation[9], measured against the without-project scenario | 29,796 ha | 2.1.5 |
| | Expected number of globally Critically Endangered or Endangered species[10] benefiting from reduced threats as a result of project activities[11], measured against the without-project scenario | One flora species: *Oxandra espintana* and; one fauna | 5.1.1 |

[8] 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, Livelihoods, Health, Education, and Water), and may also include other benefits such as strengthened legal rights to resources, increased food security, conservation of access to areas of cultural significance, etc.
[9] Managed for 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, e.g. enhancing the status of endangered species.
[10] Per IUCN's Red List of Threatened Species
[11] In the absence of direct population or occupancy measures, measurement of reduced threats may be used as evidence of benefit.

| | | | |
|---|---|---|---|
| | | species: *Crocodylus intermedius* | |

# 2 GENERAL

## 2.1 Project Goals, Design and Long-Term Viability

### 2.1.1 Summary Description of the Project (G1.2)

The grouped project is a commercial afforestation project in which wood chips are produced to generate wood energy; this first instance consists of planting 22,104 ha of low-fertility grasslands in the municipalities of Puerto Carreño and La Primavera (Vichada, Colombia) with Eucalyptus (*Eucalyptus pellita*) and Acacia (*Acacia mangium*) as timber species.

Through afforestation activities, the project aims to promote connectivity between ecosystems. In addition, this project is expected to provide more than 200 full-time employment opportunities in an area historically affected by poverty. Furthermore, the increase in forest cover and sequestration of carbon in living biomass will contribute to the reduction of GHG emissions by acting as a sink that sequesters an average of 98,588 $tCO_2e$ per year. This amounts to 2,957,638 $tCO_2e$ over the 30-year crediting period.

To do this, Forest First Colombia SAS (FFC) will implement the most appropriate global business practices across all its operations in accordance with local, national, and international laws and regulations. The forestry activities are described in a series of documents detailing the characteristics, objectives, responsible parties, processes, and procedures (Appendix 2: List of forest activity reference documents). Appendix 3: Main characteristics of the silvicultural activities described in Appendix 2., briefly describes the main characteristics of the silvicultural activities described in those documents.

### 2.1.2 Project Scale

| Project Scale | |
|---|---|
| Project | x |
| Large project | |

### 2.1.3 Project Proponent (G1.1)

| | |
|---|---|
| Organization name | Forest First Colombia SAS |
| Contact person | Jairo Vargas |
| Title | Sustainability manager |
| Address | Calle 75 No. 5-88 |
| Telephone | +57 4 7450560 |
| Email | Jairo.vargas@forestfirst.com |

### 2.1.4 Other Entities Involved in the Project

| | |
|---|---|
| Organization name | South Pole Carbon Asset Management SAS |
| Contact person | Maria Fernanda Buitrago |
| Title | Senior Lead – ARR and IFM projects |
| Address | Carrera 46 No. 7-59. Medellín, Colombia |
| Telephone | +57 4 5205000 |
| Email | m.buitrago@southpole.com |

South Pole will be the developer entity of the project and will be in charge of the elaboration and supervision of the validation and verification of the project before the VERRA and CCB through techniques endorsed by the standards.

### 2.1.5 Physical Parameters (G1.3)

#### *2.1.5.1 Project location*

The grouped project is located in the jurisdiction of the Corporación Autónoma Regional de la Orinoquía (CORPORINOQUIA) in the Vichada Department, in the Puerto Carreño and La Primavera municipalities (Figure 1). The total project zone for instance I is 29,796 ha distributed across 34 farms (Table 1) located between the Bita and the Meta Rivers.

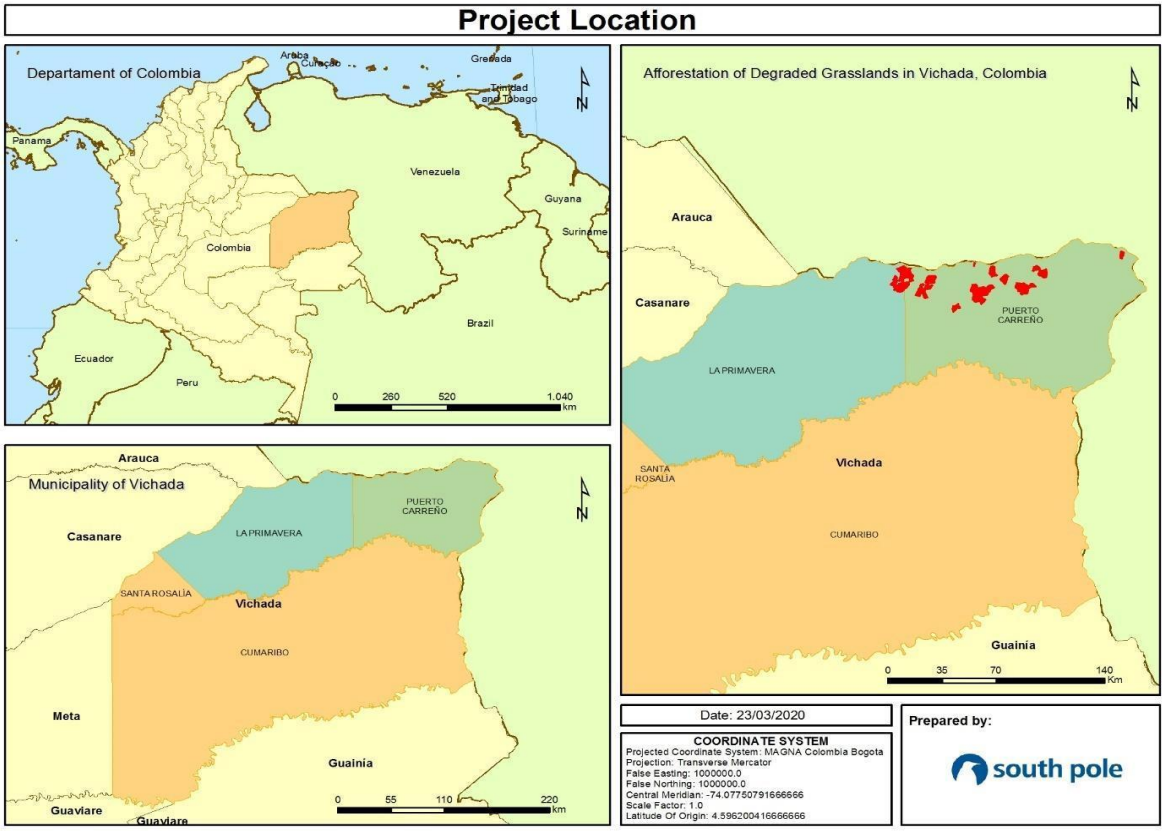



*Figure 1: Project location*

The eligible area of the project was defined according to the requirements of the VCS standard, the "AR-ACM003. Afforestation and reforestation of lands except wetlands. Version 2.0" methodology and the CORPORINOQUIA resolution no. 500.41-15-1753 of 2015.[12] From which, the next conditions were identified and apply:

a) the areas must not have presented forest cover in the last 10 years (from the project activities start date);

b) the land subject to the project activity does not fall in wetland category;

c) the establishment of plantations must be at least 100 m away from water bodies and areas with forest cover;

d) the project must exclude the areas under any other carbon project scheme.

Currently, the project proponent is the owner of 34 farms (instance I) located in Puerto Carreño and La Primavera municipalities (Vichada, Colombia); however, the project plans to buy other properties and will include them as new instances in future verifications. To comply the conditions mentioned above, the areas

[12] Supporting information: [Corporinoquia/500.41-151-1753].

covered by forest and wetland (riparian forest and *morichales*[13]) within the properties were delimited: first with satellite images of free consultation (as google earth) and then the information was verified in the field with GPS (Figure 2). These areas and their respective buffers (100 m) were defined as ineligible areas.

Additionally, to verify the criterion of "non-forest in the last 10 years", the results (for the years 2006-2016) of the forest/non-forest analysis developed from 1990 onwards by the Colombian institute of hydrology, meteorology, and environmental studies (IDEAM) were used. Finally, the areas under other carbon schemes were excluded (FFC had developed and validated a reforestation project in the same region, under national standards). The final eligible area is 22,104 ha (Figure 3; Table 1).

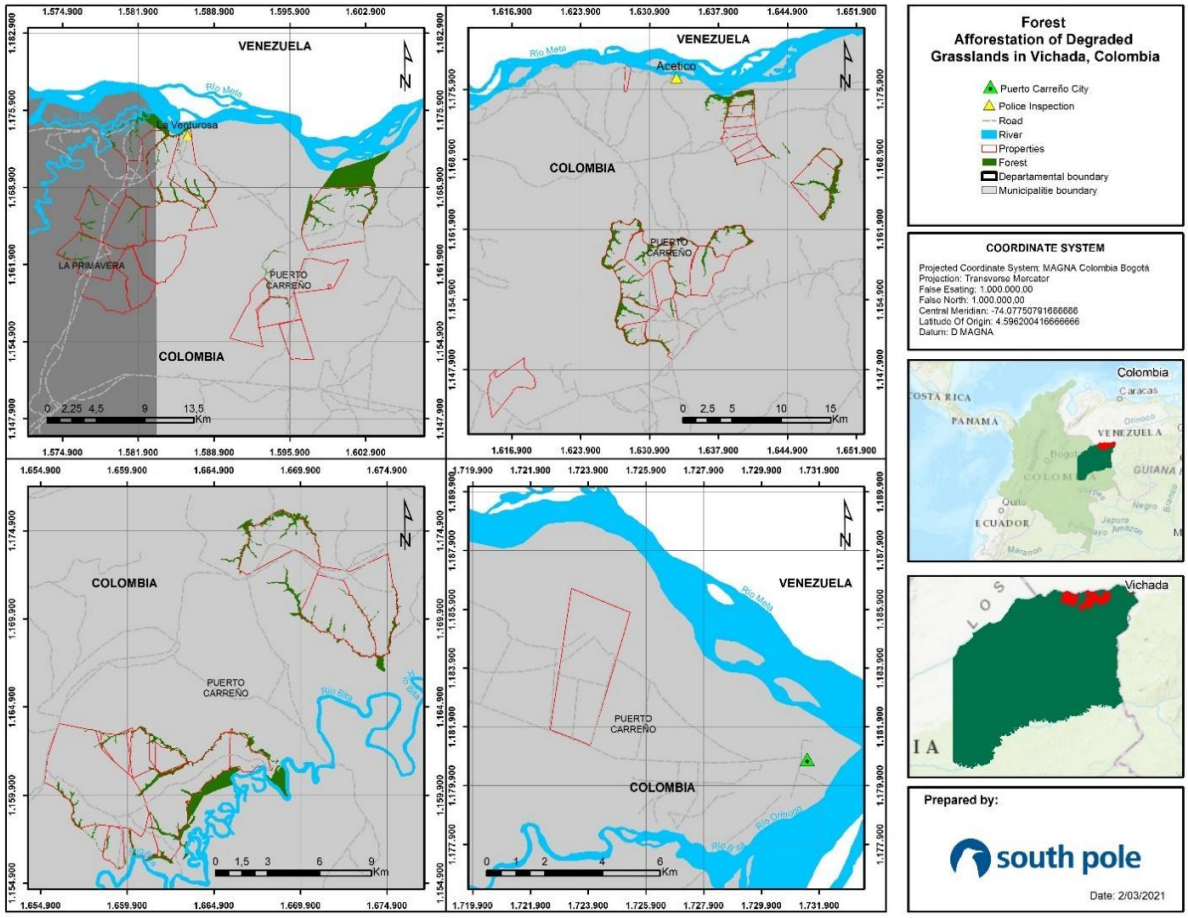



*Figure 2: Forest areas: morichales and riparian forest*

[13] Vegetation composed of numerous of herbaceous and shrub species, dominated in size and abundance by the moriche palm (*Mauritia flexuosa*), which are scattered in the savannas or in the altillanura (Pacheco et al., 2014). They are associated with seasonal water courses, in areas where water currents are very slow (Trujillo et al., 2016).

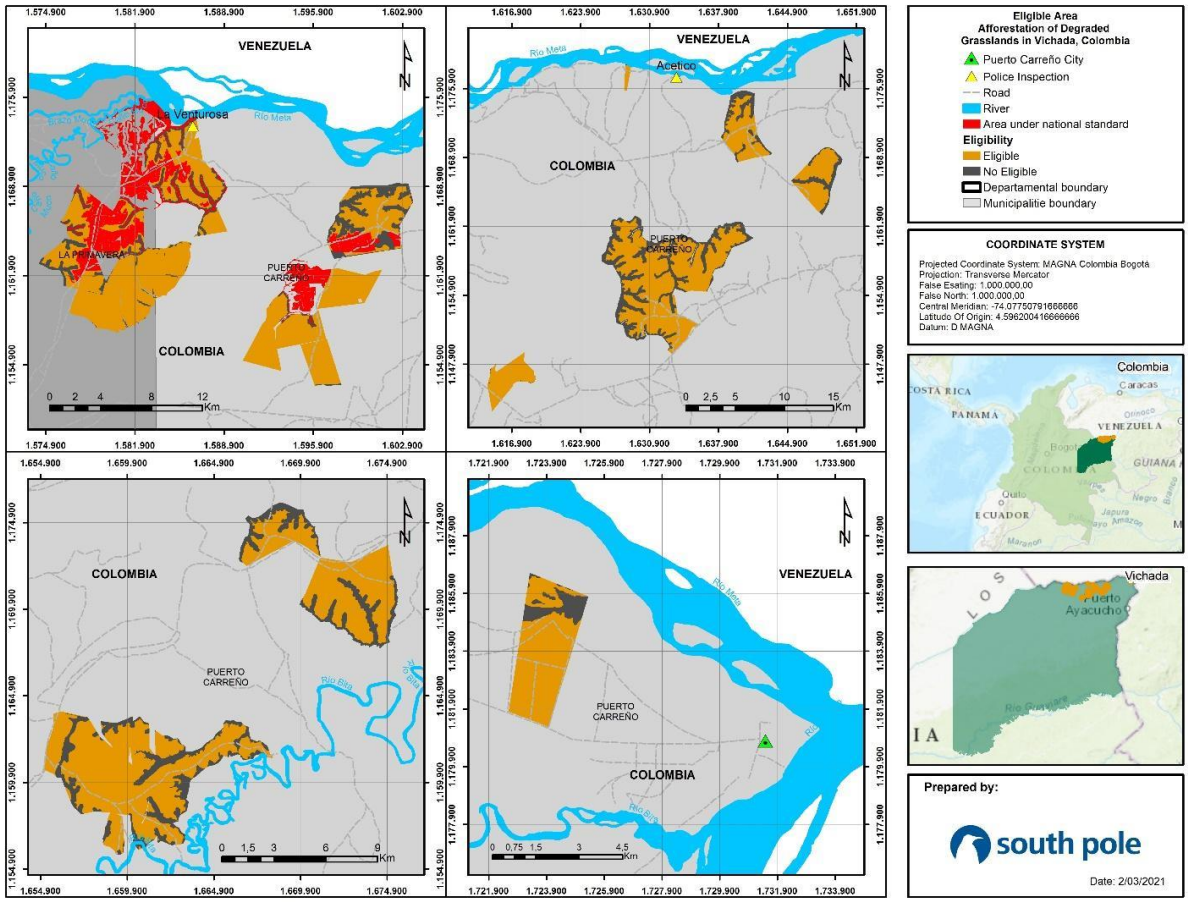



*Figure 3: Project area*

*Table 1: Eligible area by individual farm*

| Farm ID | Farm name | Eligible area (ha) | Non-eligible area (ha) | Total area (ha) |
|---|---|---|---|---|
| 540-4770 | Carraito | 597 | 139 | 736 |
| 540-4664 | Los Cuatro Amigos | 491 | 290 | 781 |
| 540-1691 | Cuerna Vaca | 632 | 342 | 974 |
| 540-4786 | El Barajuste | 1003 | 226 | 1,230 |
| 540-4785 | El Comienzo | 826 | 328 | 1,153 |
| 540-4837 | El Triunfo | 800 | 335 | 1,134 |

| Farm ID | Farm name | Eligible area (ha) | Non-eligible area (ha) | Total area (ha) |
|---|---|---|---|---|
| 540-643 | Hato Nuevo | 1386 | 994 | 2,379 |
| 540-5763 | La Cordobeza | 312 | 143 | 455 |
| 540-4740 | La Fe | 564 | 445 | 1,009 |
| 540-4841 | La Fortaleza | 538 | 371 | 909 |
| 540-2550 | La Garza Morena | 729 | 257 | 985 |
| 540-2202 | La Josa | 907 | 181 | 1,088 |
| 540-4671 | La Orqueta | 927 | 384 | 1,312 |
| 540-6297 | La Pista | 1016 | 0 | 1,016 |
| 540-4670 | La Victoria | 234 | 197 | 440 |
| 540-1031 | La Delicia | 1,394 | 205 | 1,599 |
| 540-6298 | Las Malvinas | 110 | 1 | 112 |
| 540-2209 | Llano Lindo | 840 | 248 | 1,087 |
| 540-221 | El Paraiso I | 926 | 211 | 1,137 |
| 540-222 | El Paraiso II | 973 | 331 | 1,304 |
| 540-4823 | El Paraiso – PR/LP | 483 | 136 | 619 |
| 540-1374 | Tierra Adentro | 1,995 | 277 | 2,272 |
| 540-6508 | Tierra Dentro 2 | 242 | 49 | 291 |
| 540-6581 | Tierra Dentro 5 | 142 | 73 | 214 |
| 540-1219 | El Paraiso – Tierradentro/TAD | 1071 | 497 | 1,568 |

| Farm ID | Farm name | Eligible area (ha) | Non-eligible area (ha) | Total area (ha) |
|---|---|---|---|---|
| 540-975 | El Toro 2 | 93 | 213 | 306 |
| 540-4453 | El Toro 2-1 | 163 | 143 | 306 |
| 540-4454 | El Toro 2-2 | 235 | 71 | 306 |
| 540-4479 | El Toro 2-4 | 267 | 39 | 306 |
| 540-4478 | El Toro 2-5 | 292 | 14 | 306 |
| 540-4477 | El Toro 2-6 | 220 | 86 | 306 |
| 540-4476 | El Toro 2-7 | 271 | 35 | 307 |
| 540-976 | El Toro 3 | 1,201 | 344 | 1,545 |
| 540-5757 | El Toro 301 | 215 | 89 | 304 |
| **Total** | | **22,104** | **7,692** | **29,796** |

### *2.1.5.2 Physical parameters*

The project zone is in the tropical humid forest life zone (bh-T). According to the Koppen classification, the region is dominated by the Awi and the Ami climates, with temperatures between 26-28°C and marked seasonality of a monomodal type: a dry season between December and April and a wet season from April to November. The annual precipitation is 2,398 mm, with an average monthly precipitation of 199.8 mm (Valoración Económica Ambiental, 2017).

The Vichada Department is part of the Orinoco slope. In this region, the rivers flow to the east, which leads to what is called the Eastern Slope. The hydrographic network of the Vichada Department is made up of large rivers, streams, and creeks that flow into the Orinoco River through the Meta, Vichada, Guaviare, and Tomo rivers, as well as the Bita River and the Juriepe and Muco streams (Cardozo *et al.,* 2009). According to IDEAM (2014), most of the streams that belong to the Orinoco hydrographic area originate in the Eastern Cordillera, in the Departments of Boyacá, Meta, and Cundinamarca. Then, they flow through the Eastern Plains by currents of large flows such as those of the rivers Meta, Guaviare, Inírida, Arauca, Vichada, Guayabero, and Upía.

The landform of the Vichada Department is constituted by extensive plains belonging to the Eastern Plains of Colombia, conformed by a set of peneplains with different degrees of dissection in sediments of the tertiary and quaternary, which extend from the foothills of the Eastern Cordillera to the Bolivarian Republic

of Venezuela, on the basin of the Orinoco River. Near the left bank downstream of the Orinoco River, there are outcrops of Precambrian igneous rocks in the form of small hills or inselbergs that stand out from the peneplain (Cardozo *et al.,* 2009).

The main geomorphological units in the department of Vichada are *montes islas* (inselbergs), peneplains forming savannas and hills, and alluvial landscape systems. The inselbergs are isolated, scattered bodies with a rounded and elongated morphology. They can be seen from Puerto Carreño to Casuarito, especially in the Bita, Laguna, El Pañuelo, Santa Helena, Ventanas, Guarípa, Bachaco, and Casuarito hills. These geomorphological units are presented in a strip running northeast, bordering the left bank downstream of the Orinoco River (Cardozo *et al.,* 2009).

In the peneplain, two geomorphological units are differentiated according to the degree of erosion and the relief that they leave. The first is the flat peneplain, wide-ranging savannas that do not present notable topographical protrusions or water dividers and are observed in sectors like the Bita River. The second one is the undulating peneplain, characterized by an undulating morphology of peneplain dissected by networks of dendritic drainage to subdenditrics that, in some sectors, form hills and dissected hills. These bodies are in the Juriepe, Negro, and Bita rivers and their tributaries, the Caños Negro, Tigre, Murciélago, and San Roque. This unit is also observed on the left bank of the Orinoco River (Cardozo *et al.,* 2009).

Finally, floodplain deposits are broad alluvial deposits of flat relief that are highly dissected by drainage and suffer flooding in winter seasons. They are located along the Meta and Orinoco Rivers and their respective tributaries (Cardozo *et al.,* 2009).

The Vichada Department contains the soil orders Ultisols, Oxisols, and Entisols. The ultisols have an argillic horizon that is characterized by the removal of clay from the upper to lower horizons through the eluviation process. These soils are found in the lower terraces farthest from the rivers. Oxisols are the most abundant soils in the region and are characterized by clear colors and low organic matter content that includes the surface horizon. In the order of the entisols, an albic horizon was found from which clays and free iron oxides have been leached. These soils are present during the winter season, where they are then washed away by the infiltration water, which causes a diminishing of the bases and acidification of the profile (Alvarez & Suarez, 1965). Chemically, the soils of the region are very acidic, with low nutrient content and low fertility, and their organic matter and phosphorus content is very low compared to aluminum content (Trujillo & Lasso, 2017).

The municipality of Puerto Carreño is surrounded by vegetation distributed in diverse habitats; these includes varillales[14], morichales, zurales[15], and the savannas. The wild flora has an acceptable degree of conservation and a rich floristic composition. It is of high importance as it offers goods and ecosystem services to the region (Valoración Economica Ambiental, 2017).

[14] Forests on White sands and substrates with a low amount of nutrients and acidic pH, highly oligotrophic, with thin stems and short to medium height.
[15] Aquatic environment in the microrelief of the floodplains, generated by the cycle of reticular erosion, in which unevenness of the terrain occurs due to water runoff and the differential accumulation of its sediments, causing mounds of 0.2 to 2 m.

### 2.1.6 Social Parameters (G1.3)

#### *2.1.6.1 General*

The project area interacts with two important stakeholder groups. The first corresponds to the actors present in the project's area of indirect influence, entities and stakeholders present in the department of Vichada and in the municipality of Puerto Carreño. The second comprises the actors in the area of direct influence, corresponding to members of the communities neighboring Forest First Colombia (FFC)'s forestation zones*: Inspección de Policía*[16] Venturosa and *Inspección de Policía* Aceitico, located in the rural area of Puerto Carreño (Figure 3).

As the capital of the department of Vichada, the municipality of Puerto Carreño is the main focus for the development of the geographical, cultural, commercial and educational environment of the *Inspecciones de Policía*. According to information from the Municipal General Secretariat, there are six *Inspecciones de Policía* in the rural area: Casuarito, Garcitas, La Esmeralda, Puerto Murillo, Venturosa and Aceitico, and two veredas: La Libertad and El Progreso.

With regard to the indigenous population in the municipality, the Municipal Development Plan 2016-2019 (Alcaldía de Puerto Carreño, 2016) states the six indigenous reservations recognized by the Ministry of the Interior, comprising 18 communities, are present in the rural area of the municipality (Table 2).

*Table 2: Population present in indigenous reservations in Puerto Carreño*

| Indigenous reservation | Communities belonging to the reservation | Total population |
|---|---|---|
| Caño Guaripa | Kaliawirrinae, Las Delicias, Yakapana | **390** |
| Caño Hormiga | Joval | **102** |
| Caño Mesetas Dagua | Nueva Esperanza, Santa Maria, Patio Bonito, Santa Marta, Chaparral, Campo Florido, Morichal. Gualema, Matabokua | **449** |
| Caño Bachaco | Ekonay, Cejal | **174** |
| Guacamayas Maiporé | Warraguanae, Morrocoy | **192** |
| Cachimaco | Cachicamo | **129** |
| **Total population** | | **1,436** |

*(Source: South Pole, based on data from the Municipal Development Plan of Puerto Carreño, 2016-2019)*

Additionally, in the municipality there are three rural indigenous settlements and seven in urban areas that are not linked to any of the reservations recognized by the ministry (Table 3).

[16] In Colombia, a “Inspección de Policía” is one of the categories for settlements.

*Table 3: Unrecognized indigenous settlements in Puerto Carreño*

| **Unrecognized indigenous settlements in Puerto Carreño** | |
|---|---|
| **Settlement in rural areas** | **Total population** |
| Port of Colombia | 134 |
| La Mayera | 27 |
| The Tuteque | 43 |
| **Total** | **204** |
| **Settlements in urban areas** | **Total population** |
| Mateo Ocima | **1,599** inhabitants distributed in the different neighborhoods of the urban area |
| Tiatiato | |
| Makobacabo | |
| Manuamene Yopiji | |
| Join | |
| Ibotokopia | |
| Unuma | |

*(Source: South Pole, based on data from the Municipal Development Plan of Puerto Carreño, 2016-2019)*

According to DANE[17], the population projection for 2015 in the department of Vichada is 71,074 inhabitants, of whom 36,502 are men and 35,472 are women, distributed over an area of 105,947 km$^2$, equivalent to 9.2% of the national territory.

In the case of the municipality of Puerto Carreño, a total population of 15,753 inhabitants is recorded for the same year, corresponding to 21.9% of the total for the department. According to its distribution by area, the majority of the population (84%) is estimated to live in the center of the town, while 16% is located in a dispersed manner in the rural area. The population distribution by sex in the municipality presents a 6% difference between men and women, with the majority of the population being women.

With regard to the age distribution of the population, it can be stated that Puerto Carreño has a young population, with about 59% of its population of working age (>15 or >59 years).

[17] 1985-2005 estimates and 2005-2020 national and departmental projections, disaggregated by sex, area and five-year age groups. Available at : https://www.dane.gov.co/index.php/estadisticas-por-tema/demografia-y-poblacion/series-de-poblacion

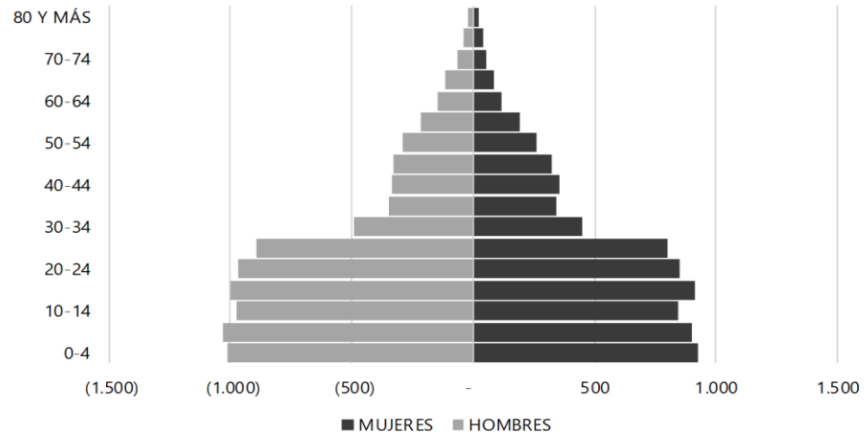



*Figure 4: Population pyramid for municipality of Puerto Carreño*
*(Source: DANE, 2015. Recovered from the Municipal Development Plan of Puerto Carreño 2016-2019)*

Additionally, approximately 2,753 inhabitants are recognized as indigenous, of which only 25% are registered within the 6 reservations declared in the municipality and the remaining 75% live in unrecognized rural settlements (Alcaldía de Puerto Carreño, 2016). With regard to other ethnic groups, the municipality has registered 657 inhabitants as Afro-Colombian and 8 as Raizal.

An estimated 67% of unsatisfied basic needs (UBN) in Vichada is expected by 2015. Puerto Carreño is the municipality that faces the greatest problems and challenges in this regard. Displacements of population from other departments and municipalities due to the armed conflict have led to an increase in unemployment and misery in the municipality. According to data from the current Municipal Development Plan, in 2015, 46.62% of its population will have an UBN, "21.7% will have an UBN for housing, 15% for public services, 27.3% for overcrowding, 6.8% for school attendance and 13.8% for economic dependence" (Puerto Carreño Mayor's Office, 2016).

In terms of health, the municipality has a total of 5,367 people registered in the contributory regime and 16,471 in the subsidized regime. The municipality has only one Subsidized Health Promotion Company, which is the responsibility of Nueva EPS, which has a Territorial Coordination office that depends on the Target Zone, Central Eastern Regional.

Below are data related to the two *Inspecciones de Policía* present in the project's area of influence: Venturosa and Aceitico. This information was collected in the socio-economic baseline study conducted in the project area in 2017[18].

### *2.1.6.2 Venturosa*

By 2017, Venturosa had an estimated of 235 inhabitants, 70% men and 30% women, approximately 48 families. The predominant composition of the population is peasant and indigenous, due to the location of the Morichalito indigenous community in the vicinity of the town.

[18] Supporting information: [Social_Baseline/Estudio de línea base/Final Report].

*Table 4: Population structure of Venturosa*

| **Population of Venturosa** | |
|---|---|
| **Description** | **Number** |
| **Total population** | 235 |
| **Families** | 48 |
| **Male** | 164 |
| **Female** | 71 |
| **0-12 years** | 75 |
| **13-65 years** | 128 |
| **Over 65** | 32 |

*(Source: South Pole, based on the socio-economic baseline study, 2017[19])*

According to information presented in a socio-economic baseline study conducted in 2017, Venturosa had a young population structure. 31% of the total population was between the ages of 0 and 12, while people over 65 accounted for 13% of the population. No deaths were reported in 2017. In the same period, four births were reported, three male and one female.

UBN rates in the community are high, the difficult conditions of access to public services such as drinking water, continuous electricity (24 hours), the conditions of health facilities, and the limited supply of jobs and education, are evidence of this. At the departmental and municipal level, the UBN figures for this population are unknown.

#### *2.1.6.3 Aceitico*

By 2017, Aceitico had an estimated of 168 inhabitants. Between 2014 and 2015 a total of 305 inhabitants was registered, which shows a population decrease of 48%; this situation, according to the inhabitants, is due to the limited work and educational opportunities in the territory. The children reach the ninth grade, and their parents must transfer them to other educational institutions to continue their studies both in Puerto Carreño and in the municipality of La Primavera, including in the neighboring department of Meta.

Of the 41 families reported, 73% live in the town centre and 27% are scattered in rural areas. 54% of the adult population is male and 46% female. The population structure of Aceitico is young, with 50% of its inhabitants between 0 and 17 years of age, while 7% are over 65 years.

[19] Supporting information: [Social_Baseline/Estudio de línea base/Final Report].

*Table 5: Population structure of Aceitico*

| **Population of Aceitico** | |
|---|---|
| **Description** | **Number** |
| **Total population** | 168 |
| **Families** | 41 |
| **Male** | 91 |
| **Female** | 77 |
| **0-17 years** | 80 |
| **18-65 years** | 77 |
| **Over 65** | 11 |

*(Source: South Pole, based on the socio-economic baseline study, 2017)*

### 2.1.7 Project Zone Map (G1.4-7, G1.13, CM1.2, B1.2)

The grouped project expansion area corresponds to the Puerto Carreño and La Primavera municipalities (Vichada, Colombia). Both municipalities meet the eligibility criteria for grouped projects described in the section 2.1.21. The project zone (of Instance 1) corresponds to 34 farms located mainly in Puerto Carreño (

Figure 5).

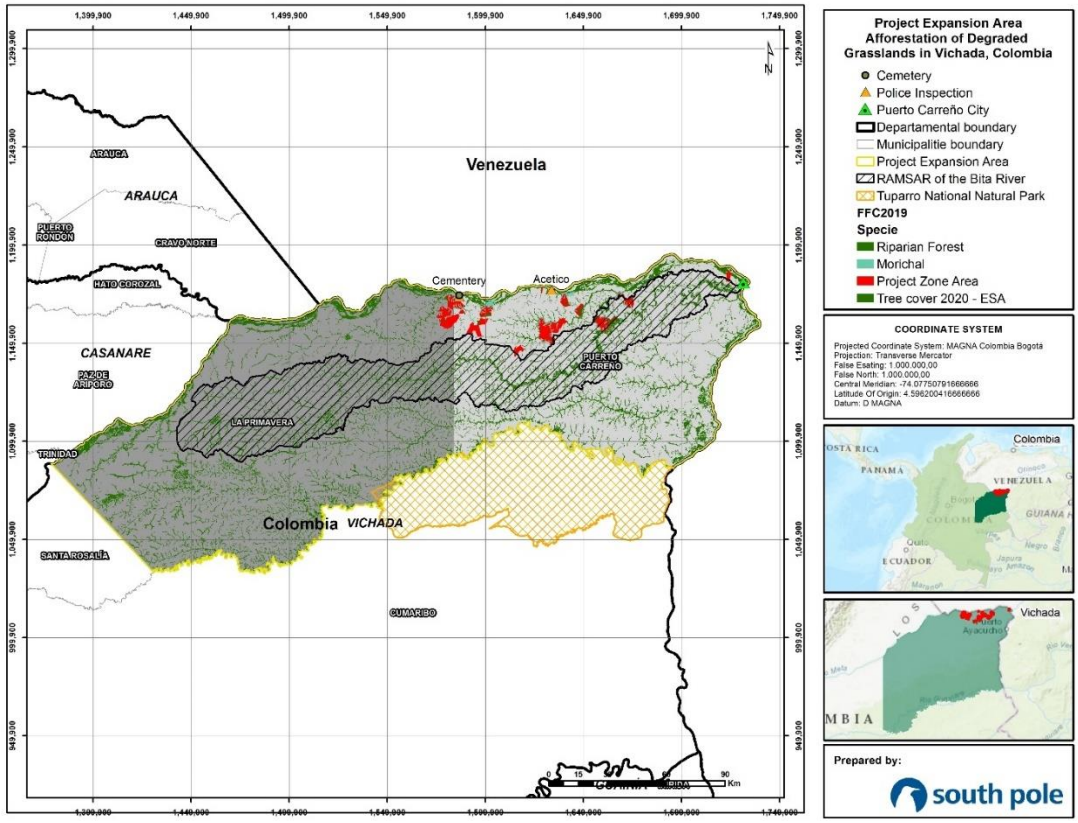


Figure 5: Project expansion area and project zone area

### 2.1.8 Stakeholder Identification (G1.5)

The general environment in which FFC's project is established is made up of different local actors: municipal authorities, an environmental authority, and rural and urban organizations.

The area of influence of the project and the community groups directly or indirectly affected by it were established for the identification of stakeholders. The identification of these areas of influence was determined according to the proximity of the planting areas to the rural communities and the level of community participation in the project. Similarly, environmental and governmental entities that could have a potential interest in being aware of or participating in the project were identified.

The process of identifying actors was initially carried out during the socio-economic study developed by FFC as a fundamental part of its corporate social responsibility. The result of this exercise allowed the recognition of the productive activities of the inhabitants, settlements and communities in the area.

Secondary information was collected from direct requests to the following municipal agencies: Ministry of Culture, Ministry of Public Health, Ministry of Education, Ministry of Social Development, Ministry of Government, Ministry of Municipal Finance, Municipal Agricultural Technical Assistance Unit (UMATA), Ministry of Departmental Health, Ombudsman's Office, Municipal Authorities, Regional Autonomous Corporation of Orinoquia (CORPORINOQUIA), National Identification System for Potential Beneficiaries of Social Programs (SISBEN) Office, Chamber of Commerce and Tourism Coordinator. This information was confirmed and complemented with primary information obtained through two socioeconomic surveys and

interviews with the population settled in the area of influence, in addition to socialization meetings with communities and municipal authorities, and case studies.

According to the results obtained in the study, it was determined which of the identified actors had the greatest relevance in the development of the carbon project, to be convened in the processes of consultation and socialization of the project. Subsequently, a complete description of the rights, interests and relevance of each actor was constructed. The complete description of each identified actor is presented in Table 6. Additionally, an importance and influence matrix was developed (Appendix 2).

Communities

- *FFC workers*
- *Rural community based in Venturosa and Aceitico*
- *Morichalito Indigenous Community*

NGOs, Foundations, Universities

- *Orinoquía Foundation*
- *Omacha Foundation*
- *Von Humboldt Institute*
- *National University*

Other Organizations and Foundations

- *Vichada Women Foundation*
- *Marañon Producers Association*
- *Religious Organizations*
- *Colombian Agricultural Society*
- *Regional Producer Associations*

National Government

- *Ministry of Environment*
- *Interior Ministry (Prior Consultation Agency)*
- *Ministry of Agriculture (Upra, Land National Agency)*
- *Ministry of Transport*
- *Presidential Office (PINE Designation)*
- *Corporinoquia*
- *Tuparro National Natural Park*

### 2.1.9 Stakeholder Descriptions (G1.6, G1.13)

All communities, community groups and other stakeholders in the project are listed below and a brief description of their rights, interests and relevance to project activities is included (Table 6). All these stakeholders were invited to participate in the project's socialization sessions (Section 2.3).

*Table 6: Stakeholder identification*

| Main stakeholder | Rights, interest and overall relevance to the project |
|---|---|
| FFC workers | **Rights** |

| | |
|---|---|
| | Have an environment and working conditions that guarantee minimum welfare conditions.<br>Discuss, review and suggest improvement actions in work environment.<br>Receive training on issues related to the development of project activities.<br>Give an opinion on the direct or indirect impact of the project on the interests of the community.<br>**Interest**<br>Empowering the local community: plantation-specific knowledge<br>Providing more and better job opportunities for both men and women.<br>Providing financial support to workers and their families.<br>**Relevance**<br>Direct participation in the project activities.<br>Direct and indirect beneficiaries of the project's impact on climate, biodiversity and communities. |
| Rural community settled in Aceitico and Venturosa<br><br>Morichalito Indigenous Community | **Rights**<br>Have an environment that guarantees minimum well-being and security conditions.<br>Have equal rights to participate and apply for employment opportunities in their environment.<br>**Interests**<br>Contributing to the social and organizational development of the community.<br>Developing the working capacity of young people in the community.<br>Improving the economic and social conditions of the farmers.<br><br>**Relevance**<br>Direct participation in project activities.<br>To work together with the community for the social and economic growth of the territory. |
| **Other stakeholders** | **Rights, interest and overall relevance to the project** |
| National and local Government | **Rights**<br>Regulate interventions in associated ecosystems and ensure compliance with environmental standards related to the development of environmental projects developed in the territory.<br>Provide recommendations on the environmental management of the project.<br>**Interest**<br>Ensuring the sustainable development of its jurisdiction by verifying compliance with the environmental regulations in force for the different interventions in ecosystems and associated resources.<br>**Relevance**<br>National, regional and local environmental Authority |
| El Tuparro National Natural Park | **Rights**<br>Provide recommendations on the environmental management of the project.<br>Receive information about the activities carried out.<br>**Interest** |

| | |
|---|---|
| | Ensuring compliance with current regulations on land use and environmental care.<br>**Relevance**<br>Entity in charge of the administration and management of the National Natural Parks System and the coordination of the National System of Protected Areas. |
| Other local Organizations | **Rights**<br>Know the activities of the project aimed at research and conservation of the ecosystem.<br>**Interest**<br>Generate possible alliances for the benefit of both parties.<br>**Relevance**<br>Local associations that develop activities related to the ecosystem present in the municipality of Puerto Carreño. |
| Foundations | **Rights**<br>Provide recommendations on the environmental management of the project.<br>Receive information on the activities carried out to generate possible alliances for the conservation of the environment.<br>**Interest**<br>Sharing knowledge for the joint elaboration of management plans<br>**Relevance**<br>Foundations in charge of developing strategies to ensure the conservation and sustainable use of aquatic and terrestrial ecosystems and species |

### 2.1.10 Sectoral Scope and Project Type

The project corresponds to VCS scope 14 “Agriculture, Forestry and Other Land Use” as an ARR. The project is a grouped project that aims to recover degraded lands, which are expected to remain degraded or to continue to degrade in the absence of the project.

### 2.1.11 Project Activities and Theory of Change (G1.8)

The project aim is to increase carbon sequestration, maintain local biodiversity, and contribute to local sustainable development by planting commercial plantations on degraded lands with cattle raising activities. The impacts of the implementation of the project activities were evaluated through the theory of change presented in the next table.

| Activity Description | Expected Climate, Community, and/or Biodiversity | | | Relevance to Project’s Objectives |
|---|---|---|---|---|
| | Outputs (short-term) | Outcomes (medium-term) | Impacts (long-term) | |
| Recovery of degraded lands: | Increase forest cover. | Improve the local environment. Generate | Generate GHG emission | Climate: sequestration of |

| Activity Description | Expected Climate, Community, and/or Biodiversity | | | Relevance to Project's Objectives |
|---|---|---|---|---|
| | **Outputs (short-term)** | **Outcomes (medium-term)** | **Impacts (long-term)** | |
| the first instance consists of planting 22,104 ha of low fertility grasslands with timber species (see section 2.1.1). | | new habitats for biodiversity. | removals. Increase wildlife population through increased forest cover. | carbon in living biomass will contribute to the reduction of GHG emissions<br>Biodiversity: increase forest cover will promote connectivity between ecosystems. |
| Conduct continuous management and forest protection: the area under wetlands and forest cover inside the properties will be protected through patrols and trainings on fire control (see sections 2.1.1 and 5.2.1). | Maintain the current forest cover. | Maintain the local habitat of wildlife. | Improve local fauna and flora biodiversity, including one flora species (*Oxandra espintana,)* and one fauna species (*Crocodylus intermedius)* under globally endangered category. | Biodiversity: the preservation of native vegetation and ecosystems contribute to the protection of the flora and fauna associated with them. |
| Generation of employment (with equal opportunities for men and women): the plantation activities will be carried out mainly by local labor. | Increase the incomes of local villages. | Improve the livelihoods of local villages. Rural population increased (due to in-migration resulting from employment opportunities). Empower women. | Increase in economic livelihood opportunities. Increase in gender equality. | Community: The project will provide full-time employment opportunities in an area historically affected by poverty, improving the livelihoods of local villages. Additionally, employment of |

| Activity Description | Expected Climate, Community, and/or Biodiversity | | | Relevance to Project's Objectives |
|---|---|---|---|---|
| | Outputs (short-term) | Outcomes (medium-term) | Impacts (long-term) | |
| | | | | both woman and men without any restrictions will ensures gender equality within the project. |
| Provide community training: the project conducts regular trainings in forest management, fire control, and the importance of conservation (See section 4.2) | Improvements in community's knowledge and skills. | Increase in perception/recognition of the value of forest resources. Enhance capabilities of local communities. | | Community: specific knowledge will provide more and better job opportunities for both men and women. |

#### *2.1.11.1 Projects registered as a jurisdictional REDD+ program*

The project is not located within a jurisdiction covered by a jurisdictional REDD+ program.

According to the VERRA[20] Registry and RENARE website[21], the project expansion area does not have any jurisdictional REDD+ program. Therefore, the project is not located within a JNR REDD+ program.

Colombia has established the action on Climate Change, called the ENREDD+, which aims to formulate the development of REDD+ programs at the sub-national level (by groups of CARs/climate change nodes). Those programs prioritize areas with the greatest forest cover and where it is urgent to include forest conservation as a development option for communities that live in and depend on forests; also, where there are high rates of deforestation. The Amazon and Pacific regions are those where the country has initially prioritized the implementation of REDD+ strategies and options. In particular, Colombia has advanced in the implementation framework of the Amazon region with the Amazon vision program[22] [23], which does not overlap with the project area.

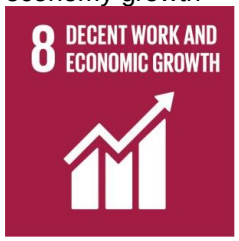
### 2.1.12 Sustainable Development

[20] https://registry.verra.org/app/search/JNR/All%20Projects
[21] http://renare.siac.gov.co/GPY-web/#/gpy
[22] MinAmbiente and ONU-REDD. Program: Strengthening of national capacities for REDD+ in Colombia. In: file:///C:/Users/amatute/Downloads/undp-co-prodoconuredd-2015.pdf
[23] MinAmbiente. 2016. REPORTE NACIONAL REDD X: Seguimiento al Financiamiento para REDD+ Período 2009–2014. In https://www.forest-trends.org/wp-content/uploads/imported/REDDX-Colombia-v3.pdf

To achieve compliance with the Sustainable Development Goals, Colombian government proposed in "Plan Nacional de Desarrollo 2018-2022"[24] different strategies to each country region based on their social, economic, and environmental issues. The project zone is in the Llanos-Orinoquia region, which has one of the highest levels of multidimensional poverty index. The Vichada Department has the most critical situation, with eight of every ten people living in multidimensional poverty. Due its high agricultural and forestry vocation, the Colombian government's strategy for this region is to strengthen it as a "sustainable pantry" for the country and the world. The project will contribute to the national sustainable development goals listed in the Table 7.[25] In order to evaluate the project's contribution to the SDGs, FFC established some goals (Table 7), which will be measured with the metrics proposed in section 1.2.

[24] https://colaboracion.dnp.gov.co/CDT/Prensa/PND-Pacto-por-Colombia-pacto-por-la-equidad-2018-2022.pdf
[25] http://humanumcolombia.org/ods/.

*Table 7: Sustainable development project contributions and monitoring*

| SDG | National associated goal | Activities developed by the project | Metric | Project goal | Periodicity | Responsible |
|---|---|---|---|---|---|---|
| 5. Gender equality   | 5.5 Ensure women's full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic and public life | Employment of women and men without any restrictions ensures gender equality within the project. On average, 17% of the staff hired for the project activities have been women. | Total number of people employed in of project activities, expressed as number of full-time employees<br><br>Number of women employed in project activities, expressed as number of full-time employees | Maintain the ratio between women and men hired above 20% of the permanent staff throughout the life of the project<br><br>100% of the women receive the same salary of men with similar responsibility level/charge.<br><br>Guarantee of equal access to training hours for 100% workers and others. | Annual | Human Resources leader |
| 8. Decent work and economy growth   | 8.5 By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value. | The project aims to generate decent employment through formal recruiting. Currently, the project has created approximately 100 full-time positions, thus the project is promoting economic growth in the region.<br><br>Throughout 2018 and 2019, different training sessions were offered: 64, on technical aspects; 47, on harvesting; and 25, on job security. An average attendance of | Total number of people employed in of project activities, expressed as number of full-time employees<br><br>Total number of people with improved livelihoods or income generated as a result of project activities<br><br>Total number of community | 100% of labor calls by open process, where the hiring of local labor is prioritized<br><br>Maintain 100% of the formal employment relationship with guarantees by law.<br><br>100% of employees with initial training from the plantation manager and at least 90% of target attendees in different training sessions offered.<br><br>Provision of 100% of | Annual | Human Resources leader and HSEQ Leader |

| SDG | National associated goal | Activities developed by the project | Metric | Project goal | Periodicity | Responsible |
|---|---|---|---|---|---|---|
| | | 201 employees was achieved in each of the topics.<br><br>All new workers receive initial training from the plantation manager.<br><br>The percentage of people hired from the local communities directly by FFC has increased form 21% (first year, 2016) to 74% (last year, 2020), improving their livelihoods by providing stable jobs. | members who have improved skills and/or knowledge resulting from training provided as part of project activities | safety equipment required to employees.<br><br>100% of the work accidents and incidents are properly recorded and attended to solve the situation/conditions that causes them.<br><br>100% areas signage according to safety at work. | | |
| 13. Climate action   | 13.2 Integrate climate change measures into national policies, strategies and planning. | All the project activities are urgent actions required to combat climate change and its impact while simultaneously providing positive social impact through developing an economically profitable product. The project has contributed to the reduction of GHG emissions by acting as sinks and sequestering 482,168 $tCO_2e$ in the 4.2 years corresponding to the current verification period.<br><br>The current staff have | Net estimated emission removals in the project area > the without-project scenario<br><br>For ARR projects: Number of hectares of forest cover increased in the project area measured against the without-project scenario | Maintain the planted areas in 100% compliance with the VCS standard.<br><br>Forest Management Plan updated and 100% executed according to the operational goals for each year.<br><br>Remove the GHG established in the Long-term average (LTA)<br><br>Establish an annual training cycle and workshops to remember the most important issues related to what is | Annual | ESG manager |

| SDG | National associated goal | Activities developed by the project | Metric | Project goal | Periodicity | Responsible |
|---|---|---|---|---|---|---|
| | | been trained in the project activities, including conservation actions, as part of the mandatory initial training. Additionally, several workshops and meetings have been developed with the local communities, the main topics have been the importance of trees, the difference between planted forest and natural forest, sowing, and various fertilization and fire control methods. | | established in this standard and update the pertinent measures. | | |
| 15. Life on land   | 15.2 Promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally. | The main project goal is to restore land degraded by cattle raising through afforestation activities. Furthermore, the project protects 2,332 ha of native ecosystems: *morichales* and riparian forest. Both activities promote the connectivity and improve the habitat for the wild fauna. | Change in the number of hectares significantly better managed by the project for biodiversity conservation, measured against the without-project scenario | Maintain 100% of the native forest. Furthermore, FFC will established the new planted area out of wetlands areas nor deforested lands. | Annual | ESG Manager |

### 2.1.13 Implementation Schedule (G1.9)

| Date | Milestone(s) in the project's development and implementation |
|---|---|
| 2016-2028 | Planting trees (new areas) |
| 2016-2046 | Maintenance of plantation |
| 2016-2046 | Generation of employment |
| 2016-2046 | GHG accounting period (verification at least every five years) |
| 2017 | Initial engagement with communities (Socio-economic baseline study) |
| 2019 | Local stakeholder consultation |
| 2020-2046 | Forest inventory (at least every five years) |
| 2023-2046 | Harvested and re-planting trees (rotation period: seven years) |

### 2.1.14 Project Start Date

The afforestation activities began on September 15, 2016. This date corresponds to the first planted lot (A227B and A235) in the project area.[26]

### 2.1.15 Benefits Assessment and Crediting Period (G1.9)

The crediting period of the project is 30 years. The project started on September 15, 2016 and will end on September 14, 2046.

### 2.1.16 Differences in Assessment/Project Crediting Periods (G1.9)

There are no differences between the GHG emissions accounting, climate adaptive capacity, and resilience and community and biodiversity assessment periods.

### 2.1.17 Estimated GHG Emission Reductions or Removals

| Year | Estimated GHG emission reductions or removals ($tCO_2e$) |
|---|---|
| 2016 | 0 |

[26] Supporting information: [StartDate/INFORME PLANTACION 2016]. Page 9.

| Year | Estimated GHG emission reductions or removals ($tCO_2e$) |
|---|---|
| 2017 | 8,443 |
| 2018 | 304,628 |
| 2019 | 277,894 |
| 2020 | 301,686 |
| 2021 | 360,508 |
| 2022 | 973,518 |
| 2023 | 730,960 |
| 2024 | 0 |
| 2025 | 0 |
| 2026 | 0 |
| 2027-2045 | 0 |
| Total estimated ERs | 2,957,638 |
| Total number of crediting years | 30 |
| Average annual ERs | 98,588 |

### 2.1.18 Risks to the Project (G1.10)

A risk analysis over a period of 100 years was conducted following the guidance of the VCS AFOLU Non-Permanence Risk Tool.[27] The project area was divided according to two different social conditions and consequently two risk analysis were conducted: 1. an eligible area of 1,626 ha under the influence of the Morichalito indigenous community, this zone was defined as the area from the community settled to the Chaquichaque stream, the natural barrier for community mobilization[28]; 2. an eligible area of 20,478, corresponding to the territory that is not under the indigenous community influence. The result of the non-permanence risk was 18% for the area 1 (under indigenous community influence) and 16% for the area 2 (Not under indigenous community influence), the following specific risks were identified:

[27] Supporting information: [NPRT]
[28] Appendix 3: Indigenous community influence map

| Identify Risk | Potential impact of risk on climate, community and/or biodiversity benefits | Actions needed and designed to mitigate the risk |
|---|---|---|
| Ongoing enforcement to prevent encroachment by outside actors is required to protect more than 50% of stocks. Just for an eligible area of 1,626 ha. | 1.3 Km from the project properties called Paraiso, an indigenous community was settled in 2016, and in the project area under its influence (1,626 ha, defined as the area from the community settled to the Chaquichaque stream, the natural barrier for the community mobilization), community activities, such as hunting or fires for honey collection could occur. | The project owner has a good relationship with the indigenous community and activities are being carried out to improve the community's livelihoods, such as support in productive activities and job offers. |
| Project cash flow breakeven point is between seven and 10 years from the current risk assessment. The project has secured 40% to 80% of the funding needed to cover the total cashout required before the project reaches breakeven. | The lack of cash flow to cover the establishment and maintenance of project activities might impede the positive climate, community, and biodiversity impacts expected from project implementation. | The project has 43% of total cash available as callable financial resources before it breaks even, as discussed with the project representatives. Furthermore, the project is currently looking for investors to cover the remaining 57%. |
| The project longevity is 30 years without legal agreements or requirements to continue the management practice. | Not continuing project activities may bring a halt to the positive climate, community, and biodiversity impacts of the project. | Even if there is no legal agreement to continue with the management practice over the length of the project, the project representatives plan to continue with the management and conservative activities for at least 50 years. |
| Political risk: the average (of the available data for the last five years) Colombian Governance score is: -0.187. | The interruption of project activities due to governmental decisions make these kinds of incentives for reforestation less attractive and/or important. | Colombia has ratified the UNFCCC (1995) and the Kyoto Protocol (2005) and has submitted three National Communications to the UNFCCC (in 2001, 2010, and 2015). Colombia is a member of the World Bank Forest Carbon Partnership Facility and became a UNREDD+ partner country in 2013.[29] Therefore, it |

[29] REDD in Colombia: Available at: http://theredddesk.org/countries/colombia

| Identify Risk | Potential impact of risk on climate, community and/or biodiversity benefits | Actions needed and designed to mitigate the risk |
|---|---|---|
| | | does not seem likely that the Colombian government will backtrack on its commitment to climate change. |
| Risk of fire, pest, and disease | If the plantations are affected by fire, pest, or disease, the establishment, growth, and productivity of the trees would be affected. | The project has implemented protocols to avoid and control the loss by fire, pest, and disease. |

Conservatively, the risk buffer of 18% was applied for the total ex-ante estimations.

### 2.1.19 Benefit Permanence (G1.11)

The project intends to maintain the climate, community and biodiversity benefits beyond its lifetime through community empowerment as a result of training in forest management, fire control, and the importance of conservation (see section 4.2 Net Positive Community Impacts).

### 2.1.20 Financial Sustainability (G1.12)

The project has at least 43% of its total cash available as callable financial resources before it breaks even, as discussed with the project representatives, and they are looking for investors to cover the remaining amount. Additionally, the income from carbon sequestration will help Forest First Colombia SAS tackle the barriers that the plantation activities present and continue with social investment and the biodiversity monitoring activities.

### 2.1.21 Grouped Projects

For the grouped project, the following boundaries were defined:

- project area: covers only the eligible areas for ARR activities belonging to FFC. For the first instance, the project area corresponds to 22,104 ha distributed across 34 farms located in the municipalities of Puerto Carreño and La Primavera (Figure 3).
- project zone: covers the entire area of the properties belonging to FFC, including the areas of forest and non-forest. The total project zone is 29,796 ha distributed across 34 farms (
- Figure 5).
- project expansion area: the expansion area of the grouped project consists of the total area of the municipalities where the first instance is located, Puerto Carreño and La Primavera (
- Figure 5).

**1) Eligibility Criteria for Grouped Projects (G1.14)**

The following are the eligibility criteria to include new instances in the project:

- the area is under control of the project proponent, FFC, and the management and monitoring activities are the same of the project;
- the area is in Puerto Carreño and La Primavera, the municipalities where the first instance is located. This means that the most-likely climate, community and biodiversity without-project scenarios are the same as those determined in the baseline analysis developed for the first instance;
- the main activity consists of the afforestation of degraded grasslands through activities such as livestock raising; and
- the instances meet the same applicability and additionality conditions defined in the section 3.1.5 of this document.

**2) Scalability Limits for the Grouped Projects (G1.15)**

The scalability of the project is limited to Puerto Carreño and La Primavera municipalities in the Vichada Department of Colombia. Forest First Colombia SAS will be responsible for performing management activities, ensuring the sustainability of plantations, and monitoring. In addition, project scalability could be limited by financial resources: the addition of new instances to the project should have a financial plan and a schedule for activities[30].

**3) Risk Mitigation Approach for Grouped Projects (G1.15)**

To ensure that the new areas are subjected to similar baseline scenario and additionality characteristics, the location (inside the expansion area) and the land use (degraded grasslands) will be reviewed before the inclusion of new areas. Additionally, the financial risk will be reviewed to ensure the activities in the new area achieves climate, social, and biodiversity benefits.

## 2.2 Without-project Land Use Scenario and Additionality

### 2.2.1 Land Use Scenarios Without the Project (G2.1)

See section 3.1.4, which contains the description of the baseline scenario.

### 2.2.2 Most-Likely Scenario Justification (G2.1)

The most likely use scenario is cattle farming (see section 3.1.5). Under the without-project scenario, tree-related $CO_2$ sequestration increases would not have happened because of the continuation of cattle

[30] Currently, the financial resources and planting plan is reported in the project cash flow. Supporting_information: [NPRT\InternalRisks\Financial_Viability\Project Ofelia – Financial model 2019].

farming. In this scenario, grasses would remain the dominant ecosystem, accumulating much less $CO_2$. Furthermore, under the without-project scenario, there would likely be high emissions of methane from grazing livestock. Degraded pastures in Colombia generate GHG emissions of about 3 $tCO_2$/ha/year (Naranjo *et al.,* 2012).

### 2.2.3 Community and Biodiversity Additionality (G2.2)

Project activities will generate employment - approximately 200 full-time employees will be required. This would not be possible without project implementation due to the lack of government intervention and the absence of opportunities in the region. This is expressed in the high poverty index: multidimensional poverty in the departments of the Orinoquia Region is 62.8%, higher than the country average of 49%. The situation in Vichada is the most critical, with eight of 10 people living in multidimensional poverty (Plan Nacional de Desarrollo, 2019). Additionally, Vichada has been one of the principal centers for the cultivation and transportation of illicit products (ODC, 2015).

Overall, governance in the region where project instances are located is unable to provide communities with the project benefits, as one of the principal needs in the region is the creation of quality jobs and improvement of local livelihood. The lack of governance is due to the isolation: The Department is located in a remote area from the center of the country, which lacks infrastructure.

On the other hand, the project has high pressure on habitats that support key fauna and flora – cattle trampling and the clearing of forests and savannas with fire are common practices. According to the project activities, the area under forest cover will be protected and trainings on fire control will be developed. Additionally, the increase in forest cover due to the afforestation activities will promote connectivity between natural ecosystems. This would not be possible without project implementation, since, as previously mentioned, there is no government presence in the zone and no activities to control the deforestation and degradation of the region's habitats are being implemented.

### 2.2.4 Benefits to be used as Offsets (G2.2)

There are no distinct benefits for community, and biodiversity that are intended to be used as an offset.

## 2.3 Stakeholder Engagement

### 2.3.1 Stakeholder Access to Project Documents (G3.1)

Project design documents and monitoring reports will be consolidated virtually on FFC's websites. For the people without access to internet, traditional communication channels will be implemented, with physical copies available in the common areas of the local communities. In this case, this corresponds to the residence of the police inspector of Venturosa and Aceitico and to schools and communal houses. All the actors involved will be invited to review the documents and make suggestions and contributions. The direct access links to the project document will be published on the VERRA platform.

Finally, meetings (workshops, conversations, informative talks) will be arranged with the different audiences, in order to inform them about the progress of the project's implementation.

### 2.3.2 Dissemination of Summary Project Documents (G3.1)

There are different communication channels designed for the exchange of messages with the different types of actors involved. These are determined by the characteristics of the message, the type of information and the type of audience to which it is addressed.

**Employees:**

Information on project documents, implementation of activities and monitoring will be communicated to each team through their supervisors, who will report on the progress of the carbon project at team meetings. Therefore, the heads of supervisors and contracting companies will incorporate this item in the agenda of their work sections.

**Communities:**

The communication with the population settled within the *Inspecciones de Policía* will be done through members of the Community Action Board (CAB). The CABs will mediate communication between FFC and the community, and the police inspector will be a key actor in the territory for communication of the project.

Communication within the *Inspecciones de Policía* is given by voice or by megaphone. This will be the means used to make the call to the meetings in the territory.

**Public institutions:**

Communication with the public institutions and civil associations identified in the project (see Table 8) is more formal given the type of public and the difficulty in travelling from the rural camps to the municipal capital of Puerto Carreño. Accordingly, information on the project's progress or calls for meetings will be made through e-mails, formal letters and telephone calls.

In addition to the above, during the consultation meeting with the communities and public entities, communication mechanisms were defined between the parties, as detailed in Section 2.3.12.

### 2.3.3 Informational Meetings with Stakeholders (G3.1)

The informational meetings with the communities began in 2017 with the baseline study of the project, during this year, several meetings were held with the communities to evaluate the scenario without project and the potential social activities to be implemented. Additionally, in 2019, different informative meetings were held with the communities with the objective of socializing the carbon emissions reduction certification to which FFC was applying, in these meetings, the impacts of the implementation of the project and their mitigation actions were identified.

#### *2.3.3.1 Socio-economic baseline study (2017)*

FFC has carried out information and participation meetings in the different phases of the project, in which municipal authorities, public institutions, social organizations and rural (Venturosa and Aceitico) and indigenous communities (Morichalito Community) present in the project area have been invited to participate.

Different participatory processes have been carried out with the communities and local authorities, including workshops for the primary collection of information for the characterization of the territorial units settled in the area of influence. In these workshops, important information was gathered to establish the baseline of the project. As a result of these meetings, the communities were able to reconstruct their history based on

a timeline of significant moments and iconic rural events such as the construction of the school (Álvarez-Cortés *et al.,* 2017).

The topics addressed in these meetings were initially focused on the diagnosis of community conditions prior to the start of the project and on the identification of community projections and interests in the territory. Meetings have also been held to socialize, with the interested parties, the development of the FFC's initiatives to work alongside the communities, related to the following topics: incentive program for controlled burning, support for festivals and cultural celebrations, awareness of the goods and services of the forests in the framework of the day of the tree, climate change, forest carbon projects, among others. All the above has been done in an appropriate and easy to understand language, and the activities, benefits, potentials, effects of participation and work within the projects have been described. Table 8 shows the meetings held during the project design process.

*Table 8: Meetings and socializations in the framework of project formulation*

| Date | Place | Led by | Participants | Objective |
|---|---|---|---|---|
| 12/04/2017 | City Hall Meeting Room, Puerto Carreño | Social group – contractor | Ombudsman's Office, UMATA, Government Secretariat, Municipal Council Representative | Development of socio-economic baseline study |
| 12/06/2017 | Communal room, Venturosa | Social group – contractor | Community leaders | Development of socio-economic baseline study |
| 12/06/2017 | Communal room, Venturosa | Social group – contractor | FFC employees | Development of socio-economic baseline study |
| 12/07/2017 | Communal Hall, Aceitico | Social group – contractor | Community leaders | Development of socio-economic baseline study |
| 12/07/2017 | Communal Hall, Aceitico | Social group – contractor | FFC employees | Development of socio-economic baseline study |

(Source: prepared by South Pole)


*Meeting with the indigenous community (Source: Álvarez-Cortés et al., 2017)*

*Meeting with Venturosa leaders (Source: Álvarez-Cortés et al., 2017)*

Meeting with the municipal authorities of Puerto Carreño (Source: *Álvarez-Cortés et al., 2017*)


*Meeting with Aceitico leaders (Source: Álvarez-Cortés et al., 2017)*

### *2.3.3.2 Socialization of the carbon project certification (2019)*

#### 2.3.3.2.1 Preparation of the consultation process

The stakeholder consultation process considered several guidelines within the process of formulating and conducting the meetings, which included:

- definition of the consultation process and socialization of the project;
- identification of relevant actors who should be invited;
- identification of time and place for the development of the consultation according to the availability of the communities;
- definition of invitation methods according to the type of actor; and
- definition of content and strategies for presenting information.

**Identification of relevant actors who should be invited:**

Before initiating the convening process, the relevant actors to be convened were identified. These included leaders, government entities, regional environmental entities, project workers and the community in general that could be impacted by the project activities. A full description of the stakeholder identification process is presented in Section 2.1.8.

**Identification of the time and place for the consultation**

Four meetings were held during the stakeholder consultation: in each of the Venturosa and Aceitico community rooms, in the auditorium of the Hotel La Vorágine in Puerto Carreño and in the auditorium of FFC's main camp. Table 9 shows general information about the time and place of the meetings.

*Table 9: Time and place of meetings*[31]

| Type of meeting | Date | Place, Municipality | Duration |
|---|---|---|---|
| Meeting with local authorities | 12/09/2019 | Auditorium of the Hotel La Vorágine | 3 hours |
| Meeting with FFC employees | 12/10/2019 | Auditorium of FFC's San Cristobal Work Camp | 3 hours |
| Meeting with the community of Venturosa | 12/11/2019 | Venturosa communal house | 4 hours |
| Meeting with the community of Aceitico | 12/12/2019 | Aceitico communal house | 4 hours |

*(Source: prepared by South Pole)*

*Figure 6: Socialization meetings with the Morichalito, Venturosa and Aceitico communities*
*(Source: South Pole, 2019)*

**Definition of methods of convening**

After the identification of the actors and stakeholders, the convening process was conducted in a formal manner with letters, emails and phone calls. The rights, interests and relevance of the person or institution to which the invitation was made were taken into account in the convening process. Individuals were contacted 20 days prior to the scheduled meeting date[32].

**Definition of content and strategies for presenting information**

For the meetings with the actors, an operational work plan was produced, defining the moments of the meeting, the activities to be carried out, a set of guiding questions to direct each activity, estimated duration of each activity, materials and persons responsible. For the meeting with local authorities, the operational plan included a presentation of basic concepts to communicate general aspects of the project and a subsequent discussion session with the attendees; in the meetings with communities, an activity was carried out to identify species of fauna present in the project area through social mapping.

[31] Supporting information: [Local Stakeholder Consultation/Assistance Lists].
[32] Supporting information: [Local Stakeholder Consultation/letters of invitation].

The moments for the meeting were the following:

- Welcome to the attendees and presentation of the facilitating team
- Communication of the objective of the activity
- Contextualizing the problem of climate change and carbon markets
- Project overview
- Standard for certification and state of progress with regard to certification
- Presentation of the project activities
- Explanation of the social scope of the related project: social investment, employment generation, improvement of access roads, improvement of land quality thanks to the plantations
- Identification of fauna species present in the project area
- Socialization of the mechanism of continuous communication and means of access to information about the project
- Question session

#### 2.3.3.2.2 Description of meetings and information provided

The meeting began with a presentation of the objective of the meeting and of those present. The most important aspects of the Carbon Project were then presented. Attendees were given information about:

- objectives of the stakeholder consultation process;
- the greenhouse effect and climate change, its causes and main effects in the country;
- social and environmental goods and services provided by trees. In this sense, the community discussed the benefits to the fauna that the presence of trees in the area has brought, since it has served as a place of transit for deer and peccaries that were previously scarce in the area;
- certification of forest carbon projects, specifically afforestation and reforestation projects that aim at harvesting;
- project activities and planting areas. At this point it was explained how the project cycle offsets GHG emissions when wood is harvested, due to the planting and harvesting cycles used; and
- mechanism used to communicate with the community; this was validated with the community and other mechanisms were established in addition to those already established between the board of directors and FFC's *Development and Training Manager*. It was agreed with the community that a logbook would be available for any person in the community to access and leave their suggestions, comments, complaints and requests related to the project activities.

At the end of the presentation, a knowledge appropriation activity was carried out to identify the level of understanding of the topics presented and to clarify gaps.

In the meeting with local authorities, a discussion was held to resolve doubts about the issues discussed during the presentation and to explore possibilities of articulation in the medium and short term.

**Identification of fauna species present in the project area**

This activity was carried out in groups, organized according to the number of attendees. Each group was assigned a facilitator to guide the work and solve questions. In order to identify fauna species, each group was asked to locate on a map the types of ecosystems present in the area, water sources (streams/rivers), cultivation areas, grassland areas, natural forest areas and flood areas. From this first identification, each group located on the map the species they have sighted according to the zone. The species located corresponded to those that are characteristic of the territory and that are in a vulnerable or endangered state: *Panthera Onca* (jaguar), *Leopardus wiedii* (margay), *Puma concolor* (puma), *Puma yagouaroundi* (jaguarundi), *Tayassu pecari* (white-lipped peccary), *Tapirus terrestris* (South American tapir), *Myrmecophaga tridactyla* (giant anteater), *Pridontes maximus* (giant armadillo), *Lontra longicaudis* (neotropical otter), *Pteronura brasiliensis* (giant otter), *Inia geoffrensis* (Amazon river dolphin), *Crocodylus*

*intermedius* (Orinoco crocodile), *Chelonoides carbonaria* (red-footed tortoise), *Podocnemis expansa* (Arrau turtle), *Pauxi pauxi* (helmeted curassow), *Ara militaris* (military macaw).

The purpose of the exercise was to locate the transit areas of the species and to identify those that are no longer present there.

During the consultation and socialization meetings of the project, impacts of the project were not identified, since this exercise was addressed during the 2017 meetings (See Table 8). Comments from these meetings are presented below and in the Supporting information: [Social_Baseline/Estudio de línea base/FORMATOS ACTAS Y LISTAS DE AS].

**Community perception of the project:**

Community members perceive FFC's presence as positive. In the meetings held in November 2017, attendees identified the following factors to work together with the FFC, leaders and authorities:

*Venturosa*

In Venturosa the presence of FFC is seen in a positive light since it has enacted changes in relation to the generation of employment, the transformation of the landscape, and the dynamization of the local economy. FFC was asked for transparency in terms of recruitment and social security payments (management of contractors). The community wishes to work together with FFC to create an action plan, identify lines of investment and articulate actions with the municipal authorities.

*Aceitico*

- Positive perception of FFC's presence.
- Information on notification of recruitment and access to this is required. In this community there are two FFC workers who travel by motorcycle to the locations.
- Request for support in medicines for the health center.

*Morichalito Indigenous Community*

- Include the working-age population in recruitment.
- Support for water supply to the community.
- Support for indigenous children attending school (school supplies), hammocks and bednets.
- Provision of sports equipment such as balls for indoor soccer and volleyball to encourage sport among young people (they have a field).

*Authorities and leaders*

- There is recognition of FFC's activities and importance to the region.
- Need for more fluid communication between the mayor's office, control bodies and FFC.
- Need to identify a clear FFC contact (social professional).
- There are information gaps regarding: FFC's environmental permits; social responsibility activities; personnel hiring; control of contractors: payments, social security; and indigenous community management.

**Identification of programs that could be developed considering the findings in the baseline:**

1. Social management for community investment (tripartite agreement between the mayor's office, the community and FFC)
2. Information to the community and authorities (participation guidelines)
3. Hiring of local labor (professional or non-professional)
4. Support for participatory governance initiatives in the territory
5. Payments for environmental services (not necessarily through monetary mechanisms)
6. Relationship with indigenous communities

### 2.3.4 Community Costs, Risks, and Benefits (G3.2)

FFC has always considered the community as a strategic ally in the optimal development of its activities in the territory. It is constantly looking for spaces of collective construction in which the knowledge and experiences of the community feed into FFC's activities. Communication with the communities has been based on participatory and timely communication, through the different methods and spaces determined for this purpose (letters, telephone contact, meetings, workshops, e-mail, etc.).

In this sense, during 2017, FFC conducted a study to collect socio-economic baseline information on the two settlements near its plantations. The study also considered the evaluation of social impacts[33] related to project activities.

During the stakeholder consultation process, held in November 2019, the characteristics, objectives, and benefits of the forest carbon project were presented to the communities and local authorities, as well as the formulation, validation and verification processes under the VCS and CCB standards.

Since the formulation of the project, FFC has ensured that information is available through the appropriate channels and media for each type of actor and according to the type of information to be shared (See Sections 2.3.1 and 2.3.2). Similarly, all the socialization, consultation and information spaces have been conducted in Spanish and in simple language. In addition, appropriate material has been provided to facilitate the understanding of all attendees and to guarantee the transparency of the information.

During the accreditation period, the communication channels defined in the communication mechanism (See Table 9 will remain active, which will allow communities to express all their questions, comments, requests and/or complaints to the project's steering and technical committees and thus be taken into account during the discussion, socialization or training sessions prior to the implementation of the activities (see Sections 2.3.12 and 2.3.13).

### 2.3.5 Information to Stakeholders on Validation and Verification Process (G3.3)

The communication channels defined in the communication mechanism during the consultation process (See Table 10) are used to communicate about the publication of the project documents and the visit of the auditor. The communication channels are defined according to the characteristics of the actors (see Table 9). Therefore, formal emails and letters with local authorities will be used to inform about the public comment period and to inform about the location of the digital and physical documents.

With the rural communities and the indigenous community, a summary copy of the project document is left with the board of directors of JAC of Venturosa and Aceitico, while with the indigenous community there is direct communication with the governor and captain. In the case of the workers, a summary of the project document is available at each of the employee camps; in addition, team supervisors are responsible for informing employees about the project's progress.

### 2.3.6 Site Visit Information and Opportunities to Communicate with Auditor (G3.3)

The local consultation meetings also informed the local community and authorities about the auditor's visit and its relevance for obtaining validation of the project. It was mentioned that the community will be informed in advance about this visit through the means mentioned in Section 2.3.12, i.e. through emails, formal letters

[33] Supporting information: [Social_baseline/Forestal de la Orinoquia - Part II]

and phone calls. The community leaders and the CAB presidents will play an important role in disseminating the information.

During the consultation process, it was reported that, during the visit, the auditor will have the opportunity to interview stakeholders close to the project, even in the absence of the project proponent; with their consent and if required by the auditor, some meetings can be held directly with the community and other stakeholders.

### 2.3.7 Stakeholder Consultations (G3.4)

Since 2017, meetings and socializations have been held with the CABs and the communities where the project activities have been developed.

In October 2017, as part of the socioeconomic baseline study, meetings were held with local authorities in the municipality of Puerto Carreño with the aim of socializing the purpose and scope of the study. Additionally, workshops were held with the communities to collect primary information needed for the study. The main results of this exercise are presented in Section 2.3.3.2.

During the same year, meetings were held with the Venturosa CAB in order to present issues of interest to both the community and the project. Some of the topics discussed are as follows:

1. FFC Social Plan 2017
2. Projects to support the community by donating medicines and books to the school
3. Presentation of the results of the 2016 Fire Prevention Incentive Program
4. FFC contributions to neighborhood roads
5. Plan for the use of road building machines in the neighborhood and project area

At the end of October 2019 the first meetings were held to inform the two communities close to the project that had expressed their continued interest in being part of the project about the start of the project formulation process (writing of the project document and collection of the information for validation and verification under VCS and CCB). In addition, during these meetings the communities had the opportunity to comment on the project's activities related to the communities.

According to comments received at the meeting by the Venturosa CAB, little cohesion is identified within the community, as it is generally difficult for people in the community to attend meetings convened by CABs or FFC. Therefore, one CAB member suggests channeling all media to ensure that information reaches everyone, and for that purpose suggests putting the comment log in a specific place where the FFC manager can regularly come and respond to comments, in addition to reporting through the community megaphone.

The following are the comments received during the meetings in Venturosa and Aceitico.

*Table 10: Comments received in the local consultation process in Venturosa and Aceitico*

| Comments | FFC's response |
|---|---|
| **Venturosa** | |
| The community asks about the possibility of investing the resource of the fire control incentive in the well and the water tower, where it is proposed to continue with the construction started by the mayor's office of | FFC agrees to invest the resource in whatever way the community sees fit. However, it is necessary that a vote be taken where it is democratically guaranteed that the majority of the population of Venturosa approves of the investment of the resource in the water well. |

| Comments | FFC's response |
|---|---|
| **Venturosa** | |
| Puerto Carreño more than nine years ago. Currently, drinking water is a limited resource. | |
| The community reports that it is not known who receive the medicine donation at the health center. They therefore request more control over this resource. | It is up to the CAB to follow up on the availability of this resource and ask for a report from the health center nurse. The community CAB is in charge of gathering the community and reporting on the resources received by the health center. However, FFC will look for a strategy to ensure the proper disposition of the resource. |
| **Aceitico** | |
| The nurse at the health centre asks how the project works with health centres and how the one in Aceitico could be included. | Donations are made twice a year. At the moment the money is going to Venturosa, but it is expected that by 2020 support will start in Aceitico. It will be done through the CAB. |
| It is important that there is a person in the community who is in daily contact with FFC, a link that allows for greater communication. | A forest ranger will be available to serve as a liaison in the territory, as planting will begin by 2020 and it is expected that people living in the Aceito will be employed by the project. |
| What are the requirements for joining FFC? We want FFC to share with us what requirements we need to meet to work there, and to provide us with training on how to go about a job interview, since we people in the community are not familiar with these processes and the FFC's rules. On other occasions it has happened that people are fired from companies for not complying with the rules, but this happens because they are not aware of them. | This will be taken into account for future meetings. |
| The community has different productive activities: How can the initiatives of small producers generate trade channels with FFC to supply them? | This type of trade link has already been established with some Venturosa producers. Communication can be started with the contractor of the workers' canteen so that these trade channels are created during the year 2020. |

**Comments from FFC workers**

*Table 11:Comments received from FFC workers*

| Comments | FFC's response |
|---|---|

| | |
|---|---|
| What are the next activities to be implemented in the community?<br>Who in FFC is in charge of these activities? | A water purification project is currently being considered with the community of Morichalito.<br>The community has a credit of 11 million from the fire control incentive program, and the investment of this resource is yet to be defined.<br>The people in charge are the Manager of Development and Training and the Head of Security. |
| Some of the people at Venturosa are not aware of the fire control incentive program and it may be that decisions regarding investment in this resource are biased towards the interests of a few. | The responsibility for informing the community about projects between FFC and the community lies with the CAB's board of directors, who must keep the community informed. |

**Comments from local authorities**

After the meeting with local authorities, comments were collected on the basis of an evaluation form. These comments are presented in Table 12.

*Table 12: Comments from local authorities*

| What is your impression of the meeting? | What aspects of the project do you like? | What aspects of the project do you not like? | Additional comments |
|---|---|---|---|
| It is important to see that the formalization of a valuable project for humanity is starting. | Applied research in the territory<br>Social and environmental investment and economic development | - | Sharing with other producers. |
| The socialization of this type of project is interesting and important. It widens the range of possibilities for the development of the region. | The development of the social component: the wider the range of coverage, the better the quality of life of the population. | The absence or non-attendance of some important actors[34] | - |
| Interesting to know everything related to climate change and reforestation in Vichada. | Inclusion of the community in conservation training. | - | - |
| Okay. | The fact that they initiate such projects encourages new alternatives. | None | - |
| The scope of the project is very clear, and the intentions and actors in its development are very well expressed. | Social inclusion is so important for the region and the promotion of sustainability. | The plant species that are expected to be planted and the negative impacts that these may cause. | Very clear presentation |

[34] Public entities such as the Mayor's Office, the Governor's Office of Vichada and National Natural Parks were invited to the meeting but did not attend. Project information will be sent via email.

| | | | |
|---|---|---|---|
| Attendance: continue with the meetings even if apathy of the entities (governor's office, mayor's office) continues – it is their loss.<br><br>It was a very interesting meeting, a very nice topic. | All | That the invitees are not interested in the subject. | Continue to issue invitations. |

### 2.3.8 Continued Consultation and Adaptive Management (G3.4)

The communication plan designed to keep stakeholders informed of the project's progress is part of the *Continuous Communication Mechanism*, which was adjusted according to comments received during the project's socialization meetings. The description of the communication mechanism is presented in Section 2.3.5.

The Development and Training Manager will be in charge of maintaining communication with the communities and ensuring that the project's indicators are followed up. In addition, he or she will make the necessary modifications through the continuous communication mechanism according to the project's dynamics in relation to the impacts and risks that may be generated in the community during the life of the project.

### 2.3.9 Stakeholder Consultation Channels (G3.5)

Socialization meetings have been held with stakeholders on issues related to the formulation and implementation of the Forest Carbon Project. During these meetings the communities had the opportunity to express their comments and suggestions. Based on the results of this exercise, relevant changes were incorporated into the project design document.

The process of convening all the events with the interested parties is carried out through the communication channels for each of the actors to be reached. In the case of rural and indigenous communities, the date, time and place for the desired activity is agreed in advance, and a formal letter is sent to the CAB board of directors with general information about the event or meeting to be held in the territory. The CABs are in charge of communicating to the community members; normally this information is provided to the community through the megaphone or door to door. In addition, the letter sent by the FFC is published outside the house of the police inspector of the village.

In the long term, it is hoped to generate other communication strategies in the villages so that the community can have easy access to the project information. This is related to the physical publication of the project summary.

All consultations and participatory processes have been carried out directly with communities and other stakeholders or through their legitimate representatives. In order to identify the leaders of the CABs and governors of the indigenous reservations present in the municipality of Puerto Carreño, in addition to the actors present in the area of direct influence, a stakeholder analysis was conducted (see Section 2.1.8).

### 2.3.10 Stakeholder Participation in Decision-Making and Implementation (G3.6)

In order to conduct a meaningful consultation process with stakeholders (Table 6) some preliminary steps have been taken:

- The identification of relevant actors, who might have a direct or indirect influence on the development of the project

- The selection of the place, date and time for the development of the activities with the community is made considering the characteristics of the event. Venues tends to be places that are easily accessible to the communities, with sufficient capacity to accommodate the participants, e.g. community halls and rural schools. The location is defined according to the type of activity and the target audience.
- Dates and times of meetings are chosen at times convenient to the community, i.e. times that do not clash with work activities.
- All socialization, consultation and participation processes are promoted in a public manner, that is, all actors are invited to participate without any preference for culture or gender. However, in the specific case of the indigenous community, the call and delivery of project information is made through the governor and captain of the community, and they are the ones who inform the families.

In order to respect the governance and organizational forms of both indigenous and rural communities, FFC communicates with the legitimate representatives of the communities. Therefore, contact between FFC and the communities is handled through the CABs in the case of Venturosa and Aceitico and through the governor in the case of the indigenous community.

### 2.3.11 Anti-Discrimination Assurance (G3.7)

FFC has a *Gender Equity Promotion Policy*[35] that applies to all employees, officers, directors and third parties acting on behalf of FFC and its affiliates. FFC defends and promotes fair labor in Colombia and the principles of equality and non-discrimination expressed in national legislation. A gender equality promotion policy is therefore adopted as a mechanism to promote equal opportunities for men and women in access to employment, working conditions, professional development, training and participation in decision-making processes within our organization.

The following guidelines have been established for compliance:

Promote a healthy and safe working environment, which articulates appropriate measures to prevent accidents and reduce risk.

Include equal opportunities for men and women in our procedures and processes for recruiting and selecting employees.

Ensure that under working conditions of equal value, i.e. women and men are paid equally and receive the same social benefits

To offer equal opportunities in the promotion and development of professional, technical and operational skills according to the position to our collaborators without distinction of gender.

Reject any type of discrimination or violence and establish mechanisms for the prevention and attention of the different forms of harassment within the Organization.

### 2.3.12 Feedback and Grievance Redress Procedure (G3.8)

During local stakeholder consultation meetings, communities and local authorities were informed about the general functioning of the carbon markets, the certification standards to which the project will be subject,

[35] Supporting information: [Social_baseline/politica de promocion de equidad de género – V2]

the nature of the carbon credits and the certification process for achieving these credits. During the presentation, the steps required to achieve certification, from the project idea to the issuance of the credits, were highlighted. All participants, workers and communities were informed about the validation and registration process, involving a visit from an external auditor (from a validation and verification body), the results of which will subsequently be issued in an evaluation report.

In addition, the communication mechanisms established to convey all the information related to the project were validated with the attendees.

The communication mechanism agreed with the communities for the purposes of the project will consist of direct communication between FFC and the board of directors of the Venturosa and Aceitico CAB. Additionally, a letter box will be available at the Aceitico and Venturosa police stations, and at the office of Puerto Carreño for the registration of comments, where all community members can approach and express their disagreement or suggestions concerning the project.

Main purposes of this grievance mechanism are:

- To provide an accessible, rapid, transparent, and effective response to concerned stakeholders,
- To allow stakeholders the opportunity to raise comments/concerns anonymously through using different channels to communicate.
- To structure and manage the handling of comments, responses, and grievances, and allow monitoring of effectiveness of the mechanism.

For the registration of comments by the workers, each camp has a suggestion box. In addition, the supervisor of each team is responsible for resolving doubts and taking the team's comments to their superiors.

The following are the main means of communication available to interested parties.

*Table 13: Ongoing communication channels with stakeholders*

| Stakeholder | Channels/Method | Details |
|---|---|---|
| Local communities: La Venturosa, El Aceitico. Indigenous people Morichalito | Regular meetings.<br>Letter box.<br>Community officer.<br>WhatsApp. | Grievance reception format<br>Letter boxes have been installed in three points:<br>- Venturosa police inspector's residence<br>- Aceitico police inspector's residence<br>- FFC office in Puerto Carreño. Carrera 12 # 18-26 (Barrio Las Acacias) |
| Employees | Email access<br>Letter box | Additional to official e-mail channel (contactenos@forestfirst.com)<br>for the registration of grievance by employees and contractors, each camp and office have a letter box and formats available. |

| Stakeholder | Channels/Method | Details |
|---|---|---|
| Local government and environmental authority | Regular meetings.<br>Email access.<br>Telephone. | e-mail: cotactenos@forestfirst.com.<br>Telephone: + 57 300 782 19 17 |
| Contractors | Email access<br>Letter box | e-mail: contactenos@forstfirst.com.<br>Each camp and office have a letter box and formats available. |
| National government and NGO´s | Web site<br>Email access | e-mail: contactenos@forestfirst.com<br>web site: https://forestfirst.com/; info@forestfirst.com |
| All stakeholder | Offices | Puerto Carreño Office:<br>Address: Carrera 12# 18-26. Las Acacias Neighborhood<br>Phone: 3043541529<br>Bogotá Office:<br>Address: Calle 75 5-88 piso 6<br>Phone: +57 (1) 7450560 |

*(Source: prepared by South Pole)*

The grievance committee is the team responsible for receiving the grievance, the members of this committee are the head of human resources, the head of security and the sustainable manager, and they should provide a timely communication back to the complainant(s) that their grievance has been received. Complaints should be referred by the Grievance Committee to the most appropriate department of FFC, the referral process will likely depend on the type of issue raised and whether it is low or high risk.

Investigation and response: Then the grievance should be investigated by the department (team) assigned, FFC will aim to complete investigation within two weeks of the grievance first being logged. The team responsible for investigating and crafting a response needs to determine whether the grievance can be addressed directly through a relatively simple action agreed with the complainant; or whether the grievance is complex enough that it requires additional assessment and engagement with the complainant and other stakeholders to determine how best to respond.

Once the response is crafted, this must be presented to the Grievance Committee in order to obtain agreement of the organization and if the result is positive proceed to implement the response.

Next step is to communicate proposed response to complaint and seek agreement on the response, the complainant may or may not agree with the proposed response. If there is agreement, then FFC can proceed with the proposed response. If the complainant considers that response is not enough, FFC need to clarify the reasons why the complainant does not accept the proposed response, provide additional information, and, where possible, revise the proposed approach.

The final step is to close out the grievance. If the response has been successful, the team responsible of execute response should document the satisfactory resolution, in consultation with the complainant.

If the grievance has not been resolved, FFC staff should document steps taken, communication with the complainant (and other stakeholders if there has been substantial effort to initiate or complete a multi-stakeholder process), and the decisions made by the organization and the complainant about referral or recourse to other alternatives, including legal alternatives.

Monitoring, review, and notification: It is very important to monitor the effectiveness of the action taken to response the grievance, appropriate measures for this include quarterly reporting on the number of grievances received, resolved and outstanding. This will be undertaken by the grievance committee and reported to the Chief Country Officer. Additional if the grievance is ranked as high or above according to risk score, it is necessary to notify to Senior Management Team.

### 2.3.13 Accessibility of the Feedback and Grievance Redress Procedure (G3.8)

To ensure access to the communication mechanism, the project has established the following:

Dial-up access

The officials in charge of receiving the requests and their associated telephone numbers are provided in Table 13.

Any person from the community can call and present any situation, request, complaint, claim or suggestion to any process, or report a problem related to the implementation of project activities in the area. During the call, as much information as possible will be taken and the procedures described in Section 2.3.12.

Physical or digital letter

In order to facilitate the collection of information with respect to the request made, individuals in the community may also make a petition, claim or complaint through an official letter to FFC. These letters can be sent to the office in Puerto Carreño, via email or through FFC's website.

Comments box

The permanent comments box installed will be used.

Logbook

This book is included as part of the strategies to ensure access to the communication mechanism, especially for rural communities. The logbook is a special book designed for the project and will include, in addition to relevant information about the Carbon Project (general description, benefits, contact information, etc.), the procedures related to the mechanism (Table 13) and considerations regarding the handling of applications.

The continuous communication mechanism was defined during the socialization meetings in 2019, where the functioning of the mechanism was explained as well as the places where the logbooks and responses will be available.

### 2.3.14 Worker Training (G3.9)

All management, implementation and human resource teams include personnel with extensive experience and knowledge of carrying out plantation management activities, such as nursery production, maintenance work and harvesting of selected species.

Basic training relating to the project activities and specific training in each topic of the activities is carried out periodically, as the technical procedures are verified and updated. Training is carried out every time a person starts to develop a new activity, either because he or she enters FFC for the first time or because he or she is transferred from another area. This process can last between one and two months, depending on the activities to be developed, and is the responsibility of the head of each area; in this way knowledge is not lost due to staff rotation. In addition to training in technical subjects, all the people who enter FFC for the first time are informed about the values and the policy of FFC, and the mission, vision and labor risks of the specific activity in which they will work.

### 2.3.15 Community Employment Opportunities (G3.10)

Within the framework of the project activities, job opportunities are generated, both as permanent jobs, and short- and long-term temporary jobs. The jobs generated by FFC involve people from the local territory and other regions of the country. FFC continuously promotes the involvement of members of the communities near the plantation area.

Candidates for the positions are subject to a selection process, which is disclosed through a public announcement in the media/social networks, in which the terms of the position and the profile of the candidates are specified. The profiles of the candidates are evaluated in an objective way, identifying the adjustment of their profile to the needs of the project.

In the case of project activities that do not require technical or professional training, the call is made in the village closest to the plantation area. The call for participation is made in a broad and inclusive manner, directly inviting all people in the community through the CAB. The policy of promoting gender equity is complied with in all the FFC's hiring processes.

The general staff skills required to work on the project are as follows:

- Specialized personnel: professionals who perform specific technical and administrative tasks and who usually have experience in plantations. Contractor companies usually hire this group of people, and many of them are part of their permanent staff.
- Qualified personnel: corresponds to personnel who have acquired training and experience in the implementation of planting activities through their work and who have specialized in a particular task.
- Unskilled personnel: workers involved in tasks that do not require technical or professional training to perform the work. The project proponent and the contractor companies give priority to the inhabitants of the communities neighboring the project area.

### 2.3.16 Relevant Laws and Regulations Related to Worker's Rights (G3.11)

During the initial training process, workers are informed about their labor rights and the benefits acquired by being directly linked to the plantation as an employee. Additionally, supervisors provide information to their team at any time as required. FFC and the service providers comply with the national labor laws in Colombia; the contracts signed between the companies and the employees are in accordance with Colombian regulations.

The laws regulating the working environment are built based on the Substantive Labor Code adopted by Decree-Law 2663 of 1950, the recommendations adopted by the organization, international Labor conferences and the Political Constitution of Colombia.

Within the Substantive Labor Code, the following general principles are relevant to project activities:

- Definition of work and casual work (Article 5 and 6)
- Freedom of work (Article 7)
- Equality of workers (Article 10)
- The right to work, unionize and strike (Articles 11 and 12)
- The modalities, execution, effect and termination of contracts (Chapter IV, V and VI)

This has been modified by Decree 1072 of 2015 and by the following laws:

| | |
|---|---|
| Law 188 of December 30, 1959 | Law 4a of 1976 |
| Law 141 of December 16, 1961 | Law 6o of 1981 |
| Law No 171 of December 14, 1961 | Law 1846 of 2017 |
| Law 73 of December 13, 1966 | Law 1822 of 2017 |
| Law 21 of June 14, 1967 | Law 1610 of 2013 |
| Law 22 of June 14, 1967 | Law 1563 of 2012 |
| Law 48 of December 16, 1968 | Law 1562 of 2012 |
| Law 3a of October 13, 1969 | Law 1496 of 2011 |
| Law 5a of October 13, 1969 | Law 1468 of 2011 |
| Law 27 of December 20, 1974 | Law 1429 of 2010 |
| Law 1788 of 2016 | Law 1280 of 2009 |
| Law 1098 of 2006 | Law 755 of 2002 |
| Law 995 of 2005 | Law 584 of 2000 |
| Law 962 of 2005 | Law 550 of 1999 |
| Law 789 of 2002 | Law 311 of August 12, 1996 |
| Law 278 of April 30, 1996 | Law No. 23 of March 21, 1991 |
| Law 119 of February 9, 1994 | Law 50 of 1990 |
| Law 1210 of 2008 | Law 71 of December 19, 1988 |
| Law 54 of December 18, 1987 | Law 24 of 1986 |
| Law 75 of 1986 | Law 39 of February 5, 1985 |
| Law 11 of February 24, 1984 | Law 20 of January 22, 1982 |

Additional laws, decrees and resolutions that apply to project workers include (but are not limited to):

- Decree Law 21 of 1982: Prevention of evasion of the Social Security System.
- Law 100 of 1993: Creation of the Integral Security System, with the objective of guaranteeing the fulfillment of the rights of all people.
- Law 119 of 1994: Restriction and regulation the National Learning Service

- Decree 1266 of 1994: Creation of the System of Professional Risks as part of the Integral Security System to protect workers from physical, chemical, biological, psychosocial, sanitary and safety risks they may incur at work.
- Law 278 of 1996: Creation of the permanent commission for the coordination of wage and labor policies in accordance with the Ministry of Labor.
- Law 789 of 2002: Creation of the Social Protection Fund to promote the fulfillment of the rights to health, pension and work.
- Law 931 of 2004: Protection of workers against age discrimination.
- Law 1280 of 2009: Establishment of five working days of paid bereavement leave.
- Law 1468 of 2011: Declaration of 14 weeks paid maternity leave.
- Law 1429 of 2010: Creation of incentives for business formalization (Title II), generation of employment and labor formalization in the rural and urban sectors (Title III)
- Law 1438 of 2011: Transformation and regulation of the General System of Social Security in Health.
- Law 1496 of 2011: Guarantee of wage equality between men and women and implementations of mechanisms to eradicate gender discrimination.
- Law 1562 of 2012: Definition of work-related accidents (Article 3) and occupational diseases (Article 4), establishment of rules for their prevention (Article 11) and for basic income in case of temporary injuries (Article 5).
- Law 1610 of 2013: Regulation of labor inspections and labor formalization agreements.
- *Law 1636 of 2013: Creation and regulation of the Census Protection Mechanism.*

To comply with worker's rights protection regulated by the laws listed above, FFC promotes decent wages payment, according to each role. Furthermore, FFC complies with the payment of social security obligations and the performance of admission and periodic medical examinations, according to worker's rights regulations. FFC extends these unavoidable requirements to contractors as part of its work policy. FFC also develops annual training plans to maintain and progressively increase the skills and knowledge of the people involved in the different stages and areas of the project. Likewise, it provides personal protective equipment to all people exposed to operational risks and manages work operations and rest areas to provide maximum safety[36].

### 2.3.17 Occupational Safety Assessment (G3.12)

For FFC, the safety of its employees during forestry activities is very important. It therefore designed an *Emergency Plan* covering the necessary training and procedures to respond to any type of eventuality that puts the health or life of its employees at risk.

The *Emergency Plan* establishes prevention plans and procedures for the preparation of emergencies, considering labor needs and legal requirements during the development of forestry activity. The Emergency Plan has been designed to provide an initial response to sudden undesired events during forestry operations and contemplates the assistance of external relief or support organizations such as the Fire Department, Civil Defense, the Red Cross, health service providers and others related to emergency care for the total control of possible events.

The *Emergency Plan* aims to mitigate the consequences of possible catastrophic events that may occur in the development of the forestry operation, reducing the cost of accidents and offering a product to the workplace that will be attractive for its seriousness, continuity and responsibility.

[36] Supporting information: [Workers Rights]

In the implementation of the *Emergency Plan,* several strategies are developed to ensure compliance with risk mitigation measures. Training meetings are held during the worker induction process; during field work the supervisor is in charge of reinforcing information on possible occupational accidents, in addition to ensuring compliance in the use of safety implements provided by FFC to all workers. Signage at the camps and planting areas is also necessary to reduce the possibility of accidents. Each camp has the instruments needed for emergency care, such as a stretcher, first aid kit, fire extinguisher, and signs to the designated meeting point in case of evacuation.

Similarly, a protocol has been established for teams working inside the plantation areas. The trolleys in which the personnel move must not exceed the speed limit authorized FFC. Each cart must have an up to date first aid kit and water for dehydration.

In addition, FFC is implementing a workplace co-existence committee through which complaints are received and processed for cases of workplace harassment in accordance with the provisions of Law 1010 of 2006.

Article 6 of Resolution 652 of 2012 determines the functions of the Coexistence Committee:

1. To receive and process complaints submitted describing situations that may constitute workplace harassment, as well as the evidence supporting them.
2. To examine in a confidential manner the specific cases in which a complaint or claim is made, which could typify conduct or circumstances of harassment at work, within the public entity or private company.
3. To listen separately to the parties involved about the facts that gave rise to the complaint.
4. To organize meetings in order to create a space for dialogue between the parties involved, promoting mutual commitments to reach an effective solution to disputes.
5. To formulate a plan of improvement agreed between the parties, to build, renew and promote work coexistence, guaranteeing in all cases the principle of confidentiality.
6. To follow up on the commitments made by the parties involved in the complaint, verifying their compliance with what was agreed.
7. In cases where no agreement is reached between the parties, the recommendations made are not complied with or the conduct persists, the Labor Coexistence Committee must refer the complaint to the Attorney General's Office, in the case of the public sector. In the private sector, the Committee shall inform the company's senior management, close the case and the worker may either present the complaint to the labor inspector or sue before the competent judge.
8. To present to the senior management of the public entity or private company recommendations for the effective development of preventive and corrective measures for harassment at work, as well as an annual report of the results of the management of the Labor Coexistence Committee and the reports required by the control bodies.
9. To follow up on recommendations given by the Coexistence Committee to human resources and to the occupational health units of public and private companies and institutions
10. To prepare quarterly reports on the management of the Committee, including statistics on complaints, follow-up of cases and recommendations, which will be presented to the senior management of the public entity or private company.

## 2.4 Management Capacity

### 2.4.1 Project Governance Structures (G4.1)

The entity responsible for the project is FFC, a forestry company located in the Colombian Orinoquia region since 2010, whose mission is to produce fast growing and high-performance certified hardwoods for domestic and international use.

FFC implements the most appropriate global business practices in all its operations, and therefore, is committed to obtaining Forest Stewardship Council (FSC) certification for the products it will market. Operationally, the project management verifies that all activities are carried out in accordance with the principles of social and environmental responsibility.

To achieve greater legitimacy and recognition in the territory, FFC decided to use a friendlier name associated with the region: "*Forestal de la Orinoquía* (Orinoquía forest)". However, the registration with the competent bodies is "Forest First Colombia SAS", as it appears in all legal documentation.

Figure 7 presents the structure of the staff involved in the project activities, as well as their functions and competencies.

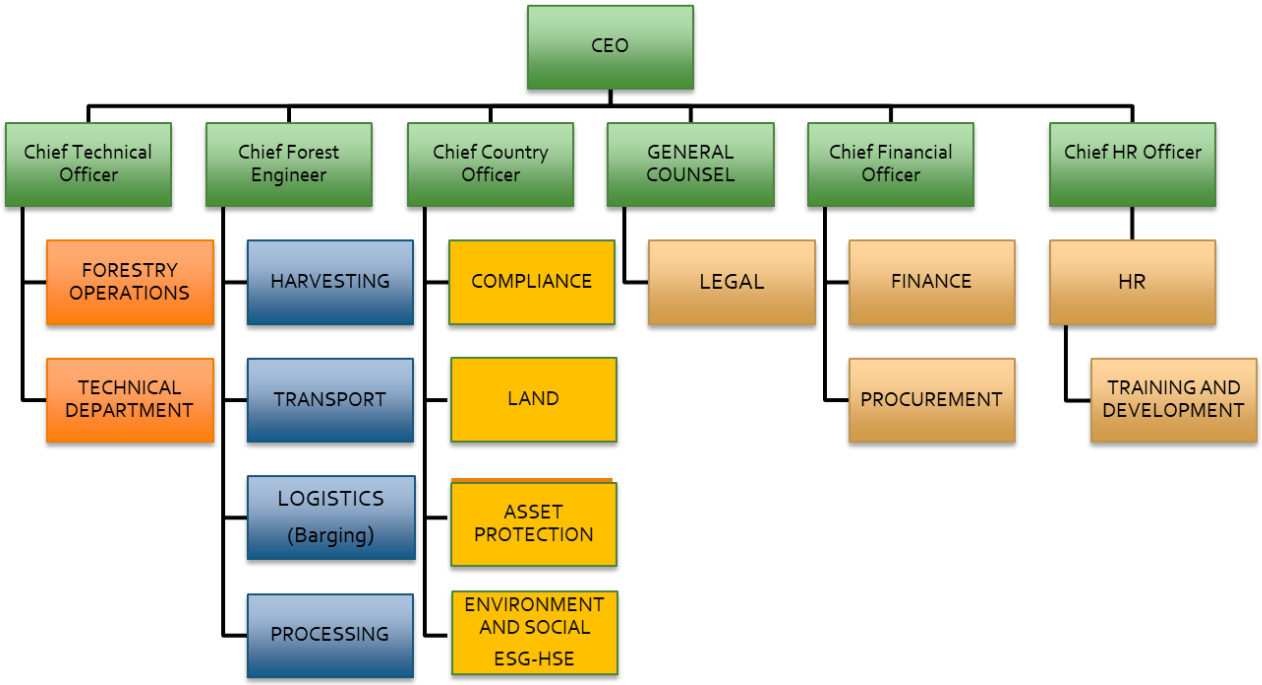



*Figure 7: Staff structure*

### 2.4.2 Required Technical Skills (G4.2)

The new employees participate in an induction program to know all the field and operations activities. During this period, the employee learns about environmental and social sensitivities (See section 2.3.14).

For the existing employees with field labors, FFC developed the following safety meetings (See section 2.3.17):

- road safety (two hours);
- duties and responsibilities in safety (one hour); and
- proper use of respiratory protection during herbicide application (30 minutes).

In addition, first aid training was provided with the Red Cross and road safety training with a highly experienced trainer.

Contractor companies that provide services to FFC are regularly informed and trained on the operational procedures that incorporate FFC's Environmental and Social (E&S) aspects. This is done primarily by the forestry supervisors and through on-the-job training.

South Pole accompanied the entire formulation of the project document (PD) and will support the monitoring and verification processes of the climate, community, and biodiversity benefits, and will document any complaints and claims through a mechanism defined by the project participants. In addition, South Pole will support validation and verification under the VCS/CCB standard by meeting with the auditor, responding to corrective actions, and performing project registration and any clarifications requested by controls.

### 2.4.3 Management Team Experience (G4.2)

FFC's Management team[37] is highly experienced in establishing, managing, and implementing forestry projects in Colombia and several other countries. FFC has a 10-year presence in the region. The team is composed of highly qualified members with top-level global experience across several fields, including forestry activities, sustainability, business development, project management, governance, capital raising, stakeholder mapping, and management, among others.

This experienced team will ensure that the project is developed with a strong foundation and that the management is performed to the highest standards. As evidence, the project has already achieved certification for Colombia's compliance market on land in the same region. In the same way, FFC is preparing to obtain FSC certification for forest management. Above all, FFC has the support of Finnfund, who only finances responsible, sustainable projects that comply with high management standards.

### 2.4.4 Project Management Partnerships/Team Development (G4.2)

FFC Colombia has partnered with highly experienced forest operators in the country to support the operations in the field. The operators are:

**Silvics SAS:**

Forestry company with more than 16 years of experience in the forestry sector, characterized by its high-quality services. Its mission is to provide forest operation, consulting, environmental, and forest heritage management services with high-quality standards and corporate social responsibility principles that generate value to its stakeholders. Silvics SAS provided support for silvicultural activities since July 2018 until April 2020.

**Silvotecnia SAS**[38]

Provides integral services in the area of forestry plantations, environmental services, and environmental, forestry, and timber industry consulting. Its commitment is based on guaranteeing good performance in the sustainable development scenario, along with social equity, environmental respect, and economic feasibility. It is characterized by the provision of high-quality services to the forestry sector that generate employment and development under a concept of sustainability and corporate social responsibility.

[37] http://www.forestfirst.com/en/management-team/
[38] http://www.silvotecnia.com

Silvotecnia SAS currently provides support to the project in the silvicultural activities of the Bita sector, such as the establishment and reestablishment of plantations, fertilization, pruning, weed control, pest control and fire protection. Its participation has been since June 2018 and will continue during the timeline of the project.

**Enbosque SAS**[39]

Enbosque provides silvicultural management services. The company has had a presence in the region since 2009 and offers services such as soil analysis, pest management and control, and forestry operations that include nursery management, soil preparation, planting, pruning, and weeding, among others. Its staff has more than 20 years of experience in forestry operations within the country.

Besides its technical and operational capacity, Enbosque also has management capacity and experience in the Vichada Department. All the processes are developed in compliance with the national legal framework regarding environment, labor, social, and legal aspects. Currently, FFC employs almost 40 people from Enbosque in different activities across the company.

Enbosque currently provides support to the project in the silvicultural activities of the Muco sector, such as the establishment and reestablishment of plantations, fertilization, pruning, weed control, pest control and fire protection. Its participation has been since the beginning of the project and will continue during the timeline of the project.

In addition to local partners, FFC also works with international partners:

**South Pole**

South Pole has been contracted to support the process of project formulation by providing advice on the construction of the PD and the processes of validation and verification under the VCS and CCB standards.

South Pole is a global sustainability service provider, dedicated to working with clients in the public and private sectors to deliver solutions that help create more sustainable societies and economies. Its vision is to positively impact the climate and ecosystems and communities. South Pole's team of over 300 experts spread across 18 offices focuses on key sustainability issues such as climate change, renewable energy, forestry and land use, water, and sustainable cities and buildings.

Over 14 years, South Pole has, together with its clients, achieved the following results:

- positive impact on 20 million people around the world;
- prevented 170 million tons of $CO_2$ emissions;
- developed more than 700 projects across the renewable energy, forestry, agricultural, industrial, household, and public sectors;
- protected or restored more than 2 million of hectares of land; and
- created 100,000 jobs in developing countries.

[39] https://enbosque.com/

Forests and communities have been part of South Pole's core activities from the beginning. South Pole successfully verified the first community forestry project in South America under the VCS and CCBS standards in 2011: the Asorpar Degraded Land Regeneration Project in Colombia. In 2013, South Pole verified one of the largest community-based REDD+ projects worldwide: the Kariba REDD+ Project in Zimbabwe.

South Pole has a technical and professional team that combines extensive knowledge in GHG emission reduction certification for forestry and land use projects, VMR systems, and the ecology and dynamics of coastal marine ecosystems, enabling them to comprehensively address all aspects of the project. More information on South Pole can be found at: https://www.southpole.com

**Finnfund**

Finnfund is a development financier that supports responsible and profitable businesses in developing countries. It provides risk capital, long-term investment loans, mezzanine financing, and expertise on how to invest in the developing markets.[40] They emphasize sectors that are critical to sustainable development, including sustainable forestry, and produce positive development impacts.

In 2017, Finnfund invested in FFC. This investment was an important milestone as it provided external validation of sustainable forestry practices and recognized FFC's commitment to positively impact the region and its community and environment.

As an investor and shareholder of FFC, Finnfund provides support in the environmental and social governance aspects by developing and monitoring the implementation of an Environmental and Social Action Plan transversally during the timeline of the project.

**Sappi**

Sappi is "a global diversified woodfiber company focused on providing dissolving wood pulp, packaging, and specialty papers, graphic papers, as well as biomaterials and biochemicals".[41] It is one of the leading global providers of sustainable woodfiber products and solutions. FFC's partnership with Sappi began in 2016. They act as a strategic investor and, as part of their investment, entered into an offtake agreement for up to 2.5 million tons per year. There is also a technical cooperation agreement that will allow FFC to benefit from Sappi's expertise in genetic improvement, silviculture, and pest control and disease management. Its participation is transversally during the timeline of the project.

### 2.4.5 Financial Health of Implementing Organization(s) (G4.3)

FFC is financially healthy, they are audited periodically by a Baker Tilly Colombia LTDA.[42] Additionally, it has the support of a large and globally-recognized fund focused on profitable and responsible business, the Finnfund. At the same time, financing support in the form of cashflow is provided.[43]

### 2.4.6 Avoidance of Corruption and Other Unethical Behavior (G4.3)

FFC has an anti-corruption police force, which shows that FFC is committed to doing business ethically and in compliance with all anti-corruption, anti-money laundering, and anti-terrorism laws that apply to FFC. The

[40] https://www.finnfund.fi/en/finnfund/
[41] https://www.sappi.com/group-profile
[42] Supporting _information: [Audited_Financial_Statements]
[43] Supporting _information: [NPRT\InternalRisks\Financial_Viability]

scope of such policy[44] applies to all employee's officers, directors, and third parties acting on behalf of FFC and its affiliates. The policy complies with Articles 488 and 323 of the Colombian Criminal Code and will be amended should the law change.

Additionally, there is a code of conduct that is given to all employees, in which FFC's position against corruption and bribery is discussed. The issue is openly discussed with employees who are considered most vulnerable to this type of situation.

#### 2.4.7 Commercially Sensitive Information (*Rules* 3.5.13 – 3.5.14)

No sensitive information has been generated or excluded from the public version of the project.

### 2.5 Legal Status and Property Rights

#### 2.5.1 Statutory and Customary Property Rights (G5.1)

Ownership and resource access/use rights are both held by FFC. They have gained real ownership rights to the properties through trusts generated by different banking entities. Copies of the Real State Registration (RSR) documents are available for the validation process.[45]

#### 2.5.2 Recognition of Property Rights (G5.1)

The project area is on private property (See section 2.5.1). According to FFC's Land Rights Acquisition Policy[46], the acquired of land is in line with the legislative requirements of the Republic of Colombia and does not manage land rights or undertake any activities on land that has not been fully titled or is not under private ownership. For this, FFC undertakes a technical and legal due diligence exercise on new land parcels prior to purchase, with the next objectives:

- ensure that the title was properly acquired and is legal and valid;
- ensure that the parcel of land is suitable for forestry activities and determine its eligibility areas;
- ensure that the parcel of land is free from invasions and/or illegal occupiers, and that there are no additional claims to it;
- identify sensitive environmental areas for future conservation;
- identify cultural heritage sites to allow free access to these sites; and
- avoid the forced eviction and displacement of people.

[44] Supporting _information: [Social Baseline\anti-corruption policy]
[45] Supporting _information: [Legal_status/RSR_reports]
[46] Supporting_information: [Legal_status/0200-003-01E Land Acquisition Policy]

### 2.5.3 Free, Prior and Informed Consent (G5.2)

The project is on private land and FFC does not purchase any property before clarifying the legal status (see section 2.5.2), according to this, there are no collective territories awarded to black or indigenous communities in the project area.[47]

Additionally, according to the Lands Rights Acquisition, the cultural heritage sites are identified and delimited to allow free access to the community, as is the case of the cemetery of one of the nearby settlements, Venturosa, which is located within the boundary of a property owned by FFC. This area was abandoned but FFC delimited it, is now protecting and preserving it, and allows free access for the community.[48]

### 2.5.4 Property Rights Protection (G5.3)

Because the project owner has real ownership rights to the properties (see section 2.5.1), the project activities do not lead or force property right holders to involuntarily remove or relocate their habitation or activities.

### 2.5.5 Illegal Activity Identification (G5.4)

There are no illegal activities that could affect the project's impacts. Currently, around 200 people live inside the six camps located in the project area. Each camp has a heritage guardian in charge of patrolling project properties to identify, as early as possible, fire events, the presence of cows (which could damage saplings), or any other natural or illegal activity that could negatively affect the project.

### 2.5.6 Ongoing Disputes (G5.5)

There are currently no land disputes in the project area. The RSR documents report, as annotations, all changes over land rights since the first allocation, indicating that the land tenure of the project properties has been clear for at least the last 14 years.[49]

In potential future disputes over land tenure, the project will take the necessary steps to resolve the disputes or clarify overlapping claims.

### 2.5.7 National and Local Laws (G5.6)

Firstly, it is important to point out that Colombia is part of the United Nations Framework Convention on Climate Change (UNFCCC) and an active member of the International Tropical Timber Organization. The country has ratified the UNFCCC (1995) and Kyoto Protocol (2005) and has also established a Designated National Authority under the Clean Development Mechanism (CDM). Colombia has submitted three National Communications to the UNFCCC (in 2001, 2010 and 2015[50]) and has signed the Paris Agreement (Paris 2015, COP21[51]).

[47] Supporting_information: [Legal_status/Certificacion_0818_de_2019]
[48] Supporting_information: [Legal_status/0750-003-01E ASI-001 Cementery at La Venturosa]
[49] Supporting _information: [Legal_status/RSR_reports]
[50] http://www.cambioclimatico.gov.co/comunicacion-nacional-bur-2015
[51] https://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf

Over the past two decades, the Colombian government has been increasingly interested in preventing the negative effects that economic activities have on the environment. Hence, the approval and issuance of norms and regulations by both the Colombian Congress and the Colombian Executive Branch, aimed at promoting environmental protection within the country's borders, encourage local governments, companies, and citizens to adopt environmentally friendly measures, such as reforestation and the sustainable use of land (Table 14).

*Table 14: Environmental legislation for the forestry sector*

| Law | Description | Project compliance |
|---|---|---|
| Law 2811 of 1974 | Determines the areas of forest reserve (protective and productive) and prohibits the adjudication of wastelands in them, except for reasons of public utility and social interest. It defines the forest uses as persistent, unique, or domestic. | The project area is not within the protective and productive forest reserve areas. |
| Agreement 0027 of 1980 | By which the regime of the faunistic territory of El Tuparro was changed. It is given the category of National Natural Park, its surface is increased, and new boundaries are established. | The project area is not within the El Tuparro National Natural Park area. Additionally, with the increase in the forest cover, the project expects to increase the connectivity between protected areas, including El Tuparro. |
| Law 99 of 1993 | Created the Ministry of the Environment, reorganized the public sector agency in charge of the management and conservation of the environment and renewable natural resources, and organized the National Environmental System (SINA). | The project fulfills the requirements defined by the environment authorities. |
| Decree 2915 of 1994 | Whereby the Special Administrative Unit of the National Natural Parks System is organized. | The project is not within the protected areas of the National Natural Parks System. However, due to its proximity to the El Tuparro National Park, the National Parks officials from the Puerto Carreño office were invited to the project socialization.[52] |

[52] Supporting _information: [Social Baseline\Local Stakeholder Consultation 2019\Parques Nacionales]

| | | |
|---|---|---|
| Law 299 of 1996 | The conservation, protection, propagation, investigation, knowledge, and sustainable use of Colombian flora resources with strategies for the country as a priority within the environmental policy. | In the project area, the water margins and the natural forest cover are protected. Similarly, there are areas of wetlands that are protected and are not used for the establishment of commercial timber plantations.[53] |
| Decree 196 of 1999 | This decree regulates Articles 109 and 110 of Law 99 of 1993 on Natural Reserves of the Civil Society. It establishes that the objective of the constitution of natural reserves will be to guarantee the conservation, preservation, regeneration, or restoration of the natural ecosystems contained in them, to enable the generation of environmental goods and services (Article 2). | The project area is not within areas of the Natural Reserves of the Civil Society. Additionally, with the increase in the forest cover, the project expects to increase the connectivity between protected areas, including the Civil Society Reserves. |
| National Forestry Development Plan, 2000 | This was established with the objective of improving the management of forest resources and, in turn, improving the quality of life of communities that occupy natural forests, in addition to seeking to offer more sustainable productive alternatives. | The FFC project is articulated with the productive forest chain development program defined in the National Forestry Development Plan. It is particularly aligned with the consolidation of forestry development centers that enable investment in new productive projects under favorable conditions of competitiveness. It promotes the technological modernization of forest transformation and marketing companies, considering that the production of wood chips as an energy replacement for fossil fuel is planned. |
| Law 1333 of 2009 | This establishes the environmental sanctioning procedure | As indicated by FFC, the project's area has no environmental sanctioning process in place. |
| Law 1377 of 2010 | The objective of this law is to regulate commercial reforestation activity and define and regulate the forest | This FFC project complies with all the parameters defined for commercial plantations in Law 1377 of 2010: |

[53] Supporting _information: [Plantations_documents\0900-001-02E_Plantation_Management_Plan]

| | | |
|---|---|---|
| | plantations and agroforestry systems for commercial purposes. | 1) registration: forest plantations have their respective registry in the MADR[54];<br><br>2) free use and mobilization: up to now, there has been no exploitation that does not require permission from the Environmental Authority; and<br><br>3) protection of natural forests and strategic ecosystems: the commercial plantation of the FFC complies with this parameter and is documented in the management plan.[46] |
| CONPES 3680 of 2010 SINAP | Guidelines for the consolidation of the National System of Protected Areas | The project area is not within any protected area. However, with the increase in the forest cover, the project expects to increase the connectivity between protected areas, including El Tuparro (the closest National Natural Park). |
| Policy for the integrated management of biodiversity and its ecosystem services (2012) | This is designed to promote the Integrated Management of Biodiversity and its Ecosystem Services in order to maintain and improve the resilience of socio-ecological systems, at national, regional, local and transboundary scales, considering scenarios of change and through joint, coordinated and concerted action by the State, the productive sector and civil society. | In the project area, the water margins and the natural forest cover are protected. Similarly, there are areas of wetlands that are protected and are not used for the establishment of commercial timber plantations.[47] |
| Decree 1640 of 2012 | This regulates the instruments for the planning, organization and management of hydrographic basins and aquifers and issues other provisions. | The management plan of the Bita River basin is been developed but has not been published, FFC participated in the socialization process and is in accordance with the proposed plan. |

[54] Supporting _information: [ICA_records]

| | | |
|---|---|---|
| | | Once the management plan is launched, FFC will review the fulfillment of all the regulations defined in it. |
| Corporinoquia's Regional Environmental Management Plan 2013-2025 | This is the corporation's long-term strategic planning instrument for the area under its jurisdiction. It guides its management and integrates the actions of all stakeholders so that the development process advances the sustainability of the regions. | The project is in accordance with the sustainability objectives of the regional management plan. |
| Decree 1071 of 2015 | Relating to the registration of commercial forest plantations. | The project area plantations are commercial eucalyptus and acacia species, which have been registered in accordance with the procedure described in Decree 1071 of 2015.[47] |
| Sole Regulatory Decree 1076 of 2015 | By means of which the Single Regulatory Decree of the Environment Sector and Sustainable Development is issued. | The activities of the project comply with what is defined in the decree in terms of procedures, permits, and licenses.[46] |
| National Plan for Ecological Restoration, Rehabilitation and Recovery of Degraded Areas (PNR; 2015) | Guides and promotes ecological restoration, recovery, and rehabilitation of disturbed areas. This is intended to lead to the equitable distribution of benefits, the conservation of biological diversity, and the sustainability and maintenance of environmental goods and services, within a framework of adaptation to global changes. | The project aim is to recover grasslands degraded by livestock activities, it is in accordance with the recovery and conservation goals of the PNR. |
| National Climate Change Policy (2016) | It establishes the strategic line "Management and conservation of ecosystems and their ecosystem services for low-carbon and climate-resilient development". | The afforestation and conservation activities of the projects are in line with the National Climate Change Policy. |

| | | |
|---|---|---|
| Decree 926 of 2017 | Determines the guidelines for the implementation of forestry projects for the mitigation of climate change that may or may not be subject to the national carbon tax. | The project follows the guidelines proposed by this decree, including the registration of the project in RENARE. |
| Resolution 500.4115-1753 of 2015 – Corporinoquia | By means of which the regional environmental criteria for the development of forest projects in the jurisdiction of Corporinoquia are defined and other determinations are established. | FFC developed the "Technical study - Environmental management measures - Orinoquia Forest Project" [55], from which the environmental criteria are complied with as established in the resolution. This document was sent to CORPORINOQUIA in November 2017 for review and will guide plantation management. To date, no official pronouncement has been received from the corporation. |
| National Development Plan 2018-2022 | It contains a section titled "*Pacto por la sostenibilidad: Producir conservando y conservar produciendo*" (Pact for sustainability: producing conserving and conserving by producing). The pact for sustainability seeks to consolidate actions that enable a balance between conservation and production, in such a way that the natural wealth of the country is considered a strategic national asset. | The afforestation and conservation activities of the project meet the objectives of the National Development Plan. |
| Decree 1235 of 2018 | By which a section is added to Decree 1076 of 2015, to designate the wetland complex of the Bita River basin to be included in the Ramsar Conservation's list of Wetlands of International Importance, in compliance with the provisions of Law 357 of 1997. | The management plan of the Bita Ramsar site has not been launched; the project will evaluate the fulfillment of its regulations once it is published. |

[55] Supporting _information: [Bibliography/ValoracionEconomicaAmbiental_2017]

| | | |
|---|---|---|
| CONPES 3934 of 2018 | The Council of the National Economic and Social Policy (CONPES) formulated the Green Growth Policy, with the objective of boosting the country's productivity and economic competitiveness by 2030, while ensuring the sustainable use of natural capital and social inclusion in a climate-friendly manner. | The project provides economic, environmental, and social benefits, in line with the CONPES. |
| Decree 1447 of 2018 | Regulates the system for monitoring, reporting and verifying mitigation actions at the national level. This resolution was launched in July 2018 and the platform (RENARE) in September 2020. | The project evaluated the fulfilment of the criteria proposed by this resolution and was registered in January 2021.[56] |
| Resolution 831 of 2020 | Modifies the terms and deadlines defined in the Decree 1447 of 2018. | The project is already registered in the platform, as required by Article 10 of Resolution 1447 of 2018.<br><br>However, it is important to note that this platform is still in the stabilization phase and the official communication from which these deadlines come into force (referred to in Article 4 of Resolution 831 of 2020) has not yet been issued. |

### 2.5.8 Approvals (G5.7)

The commercial plantations have been registered in accordance with the national regulations described in Decree 1071 of 2015.[47]

Regarding traditional authorities, not approvals are required, the project is on private land and there are no collective territories or traditional authorities in the project area.[57]

### 2.5.9 Project Ownership (G5.8)

The land is private property. Copies of the RSR documents are available for the validation process.[31] Acacia and eucalyptus plantations belong to FFC. Therefore, FFC will manage the carbon credits.

[56] http://renare.siac.gov.co/GPY-web/#/gpy/datbasreg/13/2541
[57] Supporting_information: [Legal_status/Certificacion_0818_de_2019]

### 2.5.10 Management of Double Counting Risk (G5.9)

Last year, FFC developed and validated a reforestation project in the same region under Colombian national standard. The current project excludes the validated areas under the national standard, ensuring the complete independence of these and any other carbon project scheme and no double counting. Additionally, the project was registered in the RENARE (*Registro Nacional de Reducción de Emisiones de Gases de Efecto Invernadero*) platform.

### 2.5.11 Emissions Trading Programs and Other Binding Limits

Emissions reductions or removals as a result of this project will not be used for compliance under any other trading program or mechanism. The current project is entirely independent of any other carbon project scheme being developed in Colombia such as REDD programs; therefore, no double counting has occurred.

### 2.5.12 Other Forms of Environmental Credit

The project has not sought or received any other GHG environmental credit.

### 2.5.13 Participation under Other GHG Programs

The project has not been registered, nor is it seeking for been registered under any other GHG program.

### 2.5.14 Projects Rejected by Other GHG Programs

No other GHG program has rejected the project. Additionally, the project was registered in the RENARE platform.

### 2.5.15 Double Counting (G5.9)

The project does not seek to generate or receive any other form of environmental or social credit, including any tradable climate, community, or biodiversity unit.

# 3 CLIMATE

## 3.1 Application of Methodology

### 3.1.1 Title and Reference of Methodology

This is an AFOLU A/R project that aims to remove GHG by incrementing C sinks through $CO_2$ fixation from the growth of forest plantations.

Methodologies applied:

1) AR-ACM0003 A/R Large-scale Consolidated Methodology – Afforestation and reforestation of lands except wetlands. Version 02.0.[58]

[58] This methodology is available online at: https://cdm.unfccc.int/methodologies/ARmethodologies/approved

Tools applied[59]:

1) AR-AM Tool 02: combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities. Version 1.0
2) AR-AM Tool 08: estimation of non-$CO_2$ GHG emissions resulting from the burning of biomass and attributable to an A/R CDM project activity. Version 4.0
3) AR-AM Tool 12: estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities. Version 3.1
4) AR-Tool 14: estimation of carbon stocks and the change in carbon stocks of trees and shrubs in A/R CDM project activities. Version 4.2
5) AR-AM Tool 15: estimation of the increase in GHG emissions attributable to the displacement of pre-project agricultural activities in A/R CDM project activities. Version 2.0
6) AR-AM Tool 16: tool for the estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities. Version 1.0

### 3.1.2 Applicability of Methodology

**Applicability conditions of the methodology**

*Table 15: Applicability conditions for the AR-ACM0003 methodology*

| Applicability Condition | Compliance |
|---|---|
| a) The land subject to the project activities does not fall into the wetland category. | Fragile lands such as riparian forests, "*morichales*", lagoons, flood plains, wetlands, and water bodies were excluded from the project area (according to the land eligibility analysis, section 2.1.5). Additionally, these areas are protected by the project owner and only grasslands are subject to AR project activities.[60] |
| b) Soil disturbance attributable to the project activity covers no more than 10% of the area in each of the following types of land (when they included within the project boundary):<br>● land containing organic soils; and<br>● land that, in the baseline, is subject to land-use and management practices | Two types of ecosystems that potentially contain organic soils in Colombia are *paramos* and wetlands. The project activity does not take place in these ecosystems.<br><br>In the absence of the project activities, the baseline is expected to remain as unmanaged grasslands (without receiving inputs nor management such as those listed in appendices 1 and 2 to the AR-ACM003 methodology). Grasslands in tropical conditions under the common practice of periodical burnings of 2-3 |

[59] These documents are available online at: https://cdm.unfccc.int/methodologies/DB/C9QS5G3CS8FW04MYYXDFOQDPXWM4OE
[60] Supporting information: [0900-001-02E_Plantation_Management_Plan]. Pages 15 and 16

| Applicability Condition | Compliance |
|---|---|
| and receive inputs listed in appendices 1 and 2 of the AR-ACM0003 methodology. | times per year have less carbon compared to plantations and forest cover. Therefore, it is expected that soil organic carbon would be reduced in the absence of the project, relative to the baseline. |

**Applicability conditions of the tools**

*Table 16: Applicability conditions for the AR-ACM0003 methodology*

| Applicability Condition | Applicability Condition | Compliance |
|---|---|---|
| **AR-AM Tool 02** Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities. Version 1.0 | a) *Forestation of the land within the proposed project boundary performed with or without being registered as the A/R DCM project activity shall not lead to the violation of any applicable law, even if it is not enforced.*<br><br>b) This tool is not applicable to small-scale A/R project activities. | a) Forestation of the land will not lead to violation of any applicable law (see section 3.1.5).<br><br>b1) Net anthropogenic GHG removals by sinks is expected to be higher than 16,000 tons of $CO_2$ per year.<br><br>b2) The project activity is not developed by low-income communities; instead, it is conducted by an international company in the forest sector. |
| **AR-AM Tool 08** Estimation of non-$CO_2$ GHG emissions resulting from the burning of | a) The tool is applicable to all fire occurrences within the project boundary. | Non-$CO_2$ GHG emissions resulting from any occurrence of fire within |

| Applicability Condition | Applicability Condition | Compliance |
|---|---|---|
| biomass attributable to an A/R CDM project activity. Version 4.0 | b) Non-CO2 GHG emissions resulting from any fire occurrence within the project boundary shall be accounted for each incidence of fire that affects an area greater than the minimum threshold area reported by the host party for the purpose of defining forest, provided that the accumulated area affected by such fires in a given year is ≥ 5% of the project area. | the project boundary will be accounted. Emission of non-$CO_2$ GHGs resulting from the loss of aboveground tree biomass due to fire (if it occurs) is considered and calculated using the aboveground biomass in trees of relevant strata. |
| **AR-AM Tool 12** Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities. Version 3.1 | This tool has no internal applicability conditions. | - |
| **AR-Tool 14** Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities. Version 4.2 | This tool has no internal applicability conditions. | - |
| **AR-AM Tool 15** Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity | This tool is not applicable if the displacement of agricultural activities is expected to cause, directly or indirectly, any drainage of wetlands or peatlands. | The displacement of agricultural activities, such as cattle raising in the project area, will not directly or indirectly cause any drainage of wetlands or peatlands. It is expected that any displacement will occur toward other cattle grasslands, as this is the main landuse in the area, as showed in Figure 11 and confirmed by the local development plan (*Plan de Desarrollo* |

| Applicability Condition | Applicability Condition | Compliance |
|---|---|---|
| | | *municipal*[61]) for La Primavera. The application of this tool resulted in zero leakage. The details are described in section 3.2.3 |
| **AR-AM Tool 16** Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities. Version 01.1.0 | This tool is applicable when the areas of land, the baseline scenario, and the project activity meet the following conditions:<br>(a) The areas of land to which this tool is applied:<br>(i) Do not fall into wetland category; or<br>(ii) Do not contain organic soils as defined in Annex A: glossary of the IPCC GPG LULUCF 2003;<br>(iii) Are not subject to any of the land management practices and application of inputs as listed in the Tables 1 and 2;<br>(b) The A/R CDM project activity meets the following conditions:<br>(i) Litter remains on site and is not removed in the A/R CDM project activity; and<br>(ii) Soil disturbance attributable to the A/R CDM project activity, if any, is:<br>• In accordance with appropriate soil conservation practices, e.g., follows the land contours;<br>• Limited to soil disturbance for site preparation before planting and such disturbance is not repeated in less than twenty years. | a) The project is not established on soils belonging to the wetlands, peatlands, or organic category, as was described in the Table 15. Moreover, pre-planting uses are not subject to sustainable land management practices.<br>b) This project will not consider the accumulation of soil carbon (SOC) because the project do not comply with the requirement of "Limited to soil disturbance for site preparation before planting and such disturbance is not repeated in less than twenty years" since the harvesting cycle is of seven years. |

### 3.1.3 Project Boundary

[61] Supporting information: Plan de desarollo municipal La Primavera

The relevant GHG sources, sinks, and reservoirs for the project and baseline scenarios are presented below.

| Source | | Gas | Included? | Justification/Explanation |
|---|---|---|---|---|
| Baseline | Above- and below-ground biomass | $CO_2$ | Yes | Carbon stock in these pools is associated with the native shrublands vegetation affected by the project activity in some specific areas. |
| | | $CH_4$ | No | This is not a requirement of the methodology. |
| | | $N_2O$ | No | This is not a requirement of the methodology. |
| | Dead wood, litter, and soil organic carbon | $CO_2$ | Yes | It is expected that, in these pools, except for soil organic carbon, the carbon stock will be affected by project activities.<br><br>In the case of soil organic carbon, it is expected that the carbon stock in this pool will not increase due to the implementation of the baseline activity. |
| | | $CH_4$ | No | This is not a requirement of the methodology. |
| | | $N_2O$ | No | This is not a requirement of the methodology. |
| AR – Project activities | Above- and below-ground biomass | $CO_2$ | Yes | Carbon stock in aboveground biomass is the major carbon pool affected by the project activity. Carbon stock in below ground biomass is expected to increase because of the implementation of the project activity. |
| | | $CH_4$ | No | This is not a requirement of the methodology. |
| | | $N_2O$ | No | This is not a requirement of the methodology. |
| | Dead wood, litter, and soil organic carbon | $CO_2$ | Yes | Carbon stock in these pools may increase as a result of the AR project activity. |
| | | $CH_4$ | No | This is not a requirement of the methodology. |
| | | $N_2O$ | No | This is not a requirement of the methodology. |
| | | $CO_2$ | No | $CO_2$ emissions due to burning of biomass is not measured directly. However, it will be |

| Source | | Gas | Included? | Justification/Explanation |
|---|---|---|---|---|
| | Burning of woody biomass | | | reflected in the estimation of the change in the carbon stock (AR activities). |
| | | $CH_4$ | Yes | Emission of non-$CO_2$ GHGs resulting from the burning of woody biomass due to fire ($GHG_{FF,t}$) is allowed under this methodology (see section 3.2.2.2) |
| | | $N_2O$ | Yes | Emission of non-$CO_2$ GHGs resulting from the burning of woody biomass due to fire ($GHG_{FF,t}$) is allowed under this methodology (see section 3.2.2.2). |

The physical locations where the project activities will take place are presented in Figure 1.

### 3.1.4 Baseline Scenario

We use AR-AM Tool 02 "Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities. Version 1.0" to identify the alternative scenarios and evaluate additionality of the project. We describe the steps 0 and 1 in this section 3.1.4, and the steps 2 to 4 in section 3.1.5.

The project is in the Vichada Department, a region characterized by low-lying grasslands known as the "Llanos", which correspond to an ecoregion of grasslands and savannas. The Llanos is specially characterized by a high grazing pressure and by one of the highest rates of human-induced fire in South America[62] (Figure 8).

[62] Jarvis, A., Touval., J.L., Castro, M., Sotomayor, L., Hyman., G.G. (2010). Assessment of threats to ecosystems in South America. Journal of Nature Conservation 18, 180-188

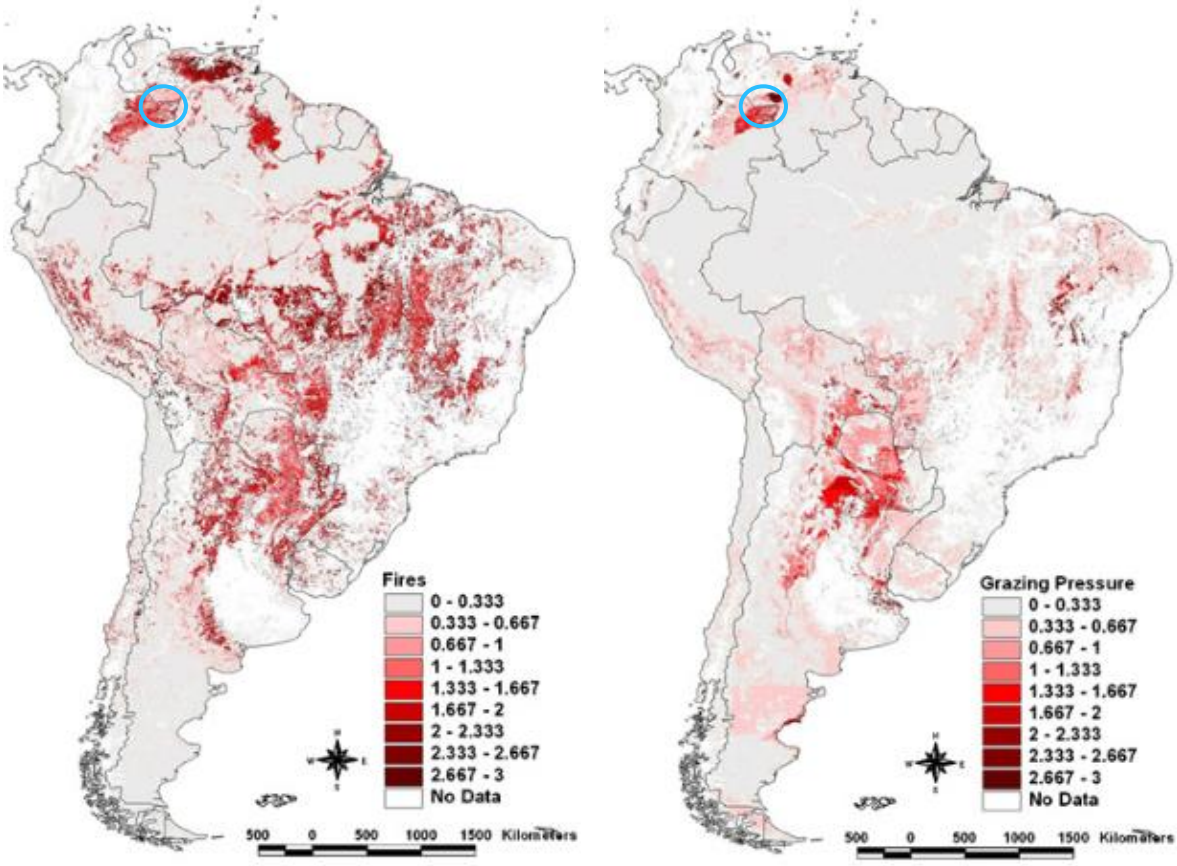



*Figure 8: Continental-wide threat layers for South America for fires and grazing pressure. The project area is located at the Llanos site in the Orinoco Region of Colombia (blue circle).*

Extensive cattle grazing has been common in the territory since the 1960-70s[63] due to a landscape typified by dispersed shrubs and natural grasslands. This land use is accompanied by induced fires in an uncontrolled manner 2 to 3 times per year to make green grass with better palatability available for cattle. This common practice of the baseline scenario can be catalogued as a degraded grassland without input or management practices such as fertilizer addition, improved grass species, or irrigation practices.

[63] Gonfrier, P.J. Capitulo 6. Ganadería Sostenible en Sabanas del Vichada.

*Figure 9: Cattle farming – burning of grasslands*

The alternative scenarios were identify considering the above and following the steps 0 and 1 of the "Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities Version 01".

*Step 0. Preliminary selection based on the start date of the project activity.*

The start date of the project is after December 31, 1999 but prior to the date of registration. Considering the methodological requirements of the tool:

- evidence should be provided that the start date of the project activity was after December 31, 1999: see Section 2.1.14; and
- evidence is provided that the incentives derived from the sale of carbon credits were seriously considered in the decision to proceed with the project activity: the promotion and implementation of a payment for environmental services scheme such as the Afforestation Project, were considered six years before the project start date, as can be corroborated the agreement signed with the World Wild Fund for Nature (WWF) on July 26, 2010.[64] The objective of this agreement was: "Develop and promote strategies aimed at reducing the potential impact on natural ecosystems that can occur through the establishment of forest plantations…"

*Step 1. Identification of alternative land use scenarios under the AFOLU activity of the project*

Alternative land-use scenarios were identified with respect to the proposed project activities, and their relevance as baseline scenarios.

Sub-step 1a. Identification of alternative land use scenarios to the proposed project activity under VCS.

Realistic and credible land-use scenarios were identified, which would have occurred in the project area in the absence of AR project activities with the VCS. These scenarios are fully feasible for the project area,

[64] Supporting information: [Preliminary_consideration]. Pages 1, Considerations (i).

considering the relevant national or sectoral policies and circumstances, as well as historic land uses, the practices and economic trends of the communities settled in the north of the Vichada Department, in the municipalities of Puerto Carreño and La Primavera. These communities have both direct and indirect interaction with forest plantations, and possess ecological and socioeconomic conditions similar to those that have been present in the project area over the past 10 years.

- Scenario 1: Livestock farming

Livestock farming is a widespread practice in the Colombian Orinoquía, including the Vichada Department, and is considered a socioeconomic activity of great importance for local development. According to the Diagnosis of the Vichada Department (Universidad Nacional de Colombia, 2018), animal husbandry is the economic base of the department, with 88.5% coming from livestock (mainly cattle and, to a lesser extent, buffalo production), followed by pig production at 4%, and equine production at 3.7%. In the Vichada Department livestock accounts for 33.2% of land use; followed by forests with 31.5%, and pastures and forages with 25.1%. In Puerto Carreño, a higher percentage of land is used for livestock purposes (42.1%), followed by pastures and forages (32.7%). The land use in La Primavera municipality is very similar to that of Puerto Carreño, as can be seen in Figure 10.

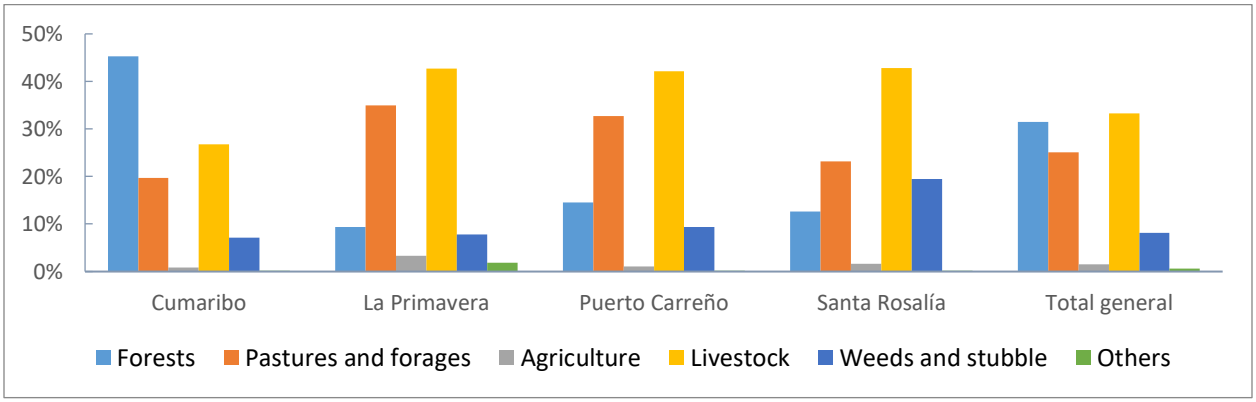



*Figure 10: Land use in the Vichada municipalities (2017)*
*(Source: Encuesta Nacional Agropecuaria (DANE, 2016) and Diagnóstico Departamento del Vichada (Universidad Nacional de Colombia, 2018).*

According to the 2009 cattle population census (Adan, 2010), the municipalities of Puerto Carreño and La Primavera have 66.5% of total cattle in the Vichada Department (Table 17). The tendency in both municipalities has been to increase the number of cattle and expand to new lands that were not previously devoted to these activities. Between 2004 and 2017 the cattle inventory of the Department increased by 96% (UPRA, 2017), almost doubling the population. This means that land requirements for livestock purposes increase by 5.46% each year, as can be seen in Figure 12.

*Table 17: Livestock census, lands, and cattle population in the Vichada Department, 2009*

| Municipality | Number of farms | Cattle | Share of total livestock (%) |
|---|---|---|---|
| Cumaribo | 220 | 21,021 | 12.0% |
| La Primavera | 440 | 99,300 | 56.8% |
| Puerto Carreño | 180 | 19,960 | 9.7% |
| Santa Rosalía | 160 | 37,535 | 21.7% |

| Municipality | Number of farms | Cattle | Share of total livestock (%) |
|---|---|---|---|
| Total | 1,000 | 174,816 | 100.0% |

*(Source: Prepared by South Pole, based on Adan, 2010)*

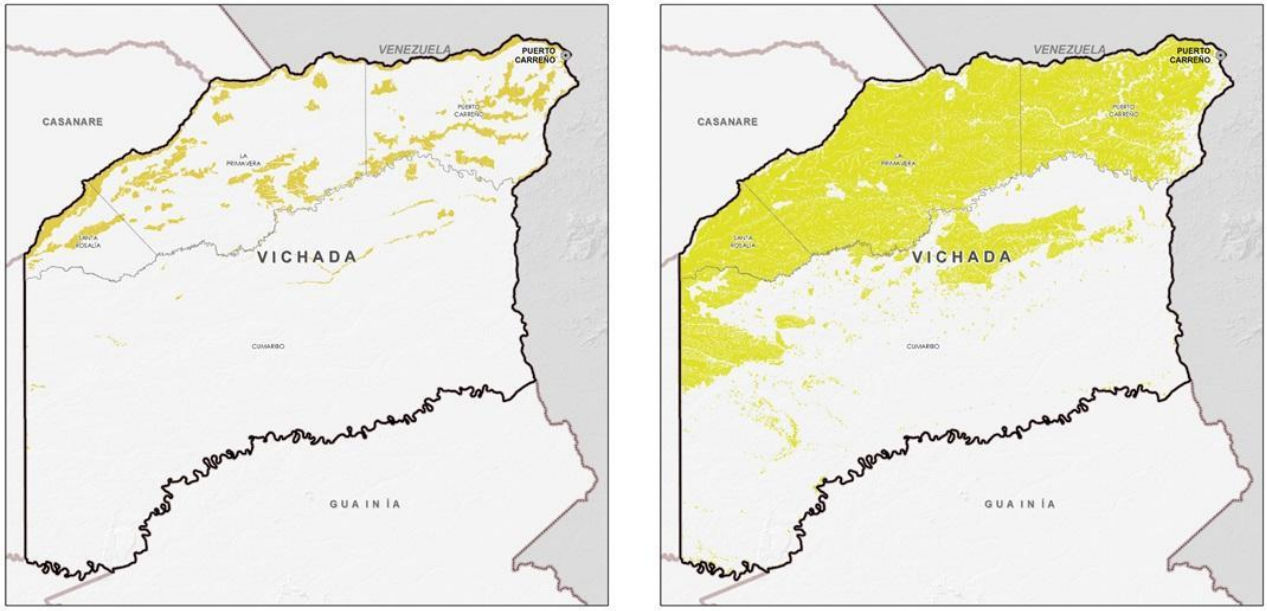



*Figure 11: Livestock and grazing areas in the Vichada Department. Left: potential areas. Right: current areas. (Source: UPRA 2017, based on UPRA, 2014)*

There are several conditions that make livestock farming a credible alternative land use. First, extensive livestock farming in the Vichada Department is currently characterized by a lack of modernization; there are high costs associated with the introduction of technological improvements to increase productivity per hectare. As a result, the extensive livestock practice has chosen to make up for this shortcoming by expanding large areas of cultivation of improved and artificial grasses from African origin, mainly of the *Brachiaria* genus. Approximately, 1.4 million hectares of the high plain are covered with this type of extremely invasive grass, which increased by 170,000 hectares from 1992 to 1999, between Meta and Vichada (Arias, 2004). The practices to transform land use into livestock farming in Vichada requires, burning prairies to produce organic matter and, fertile soil for the germination of African grasses.

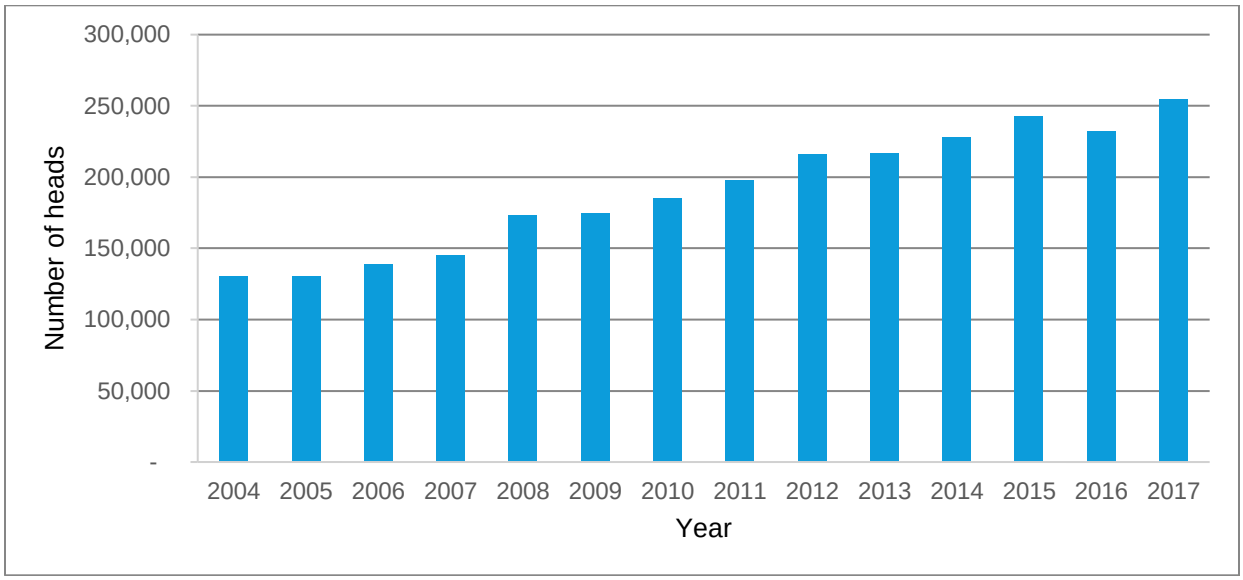



*Figure 12: Inventory of cattle in Vichada. 2004-2017*
*(Source: UPRA 2017, based on UPRA, 2014)*

In the municipality of Puerto Carreño, the yearly practice of burning pastures is used to improve the quality and promote the renewal of grass shoots for livestock. This practice, however, is performed without any measure or control. These cyclical fires cause soil degradation, because the soil loses minerals and porosity, which, in turn, produces larger areas prone to flooding during the winter months and decreases the natural resilience of native flora. Furthermore, the flames from burning practices may occasionally affect gallery forests (many of which spread through extensive grassland areas) and decrease their density and land cover.

Second, although soils must be adequate for developing livestock farming and the associated costs are considerable, the practice is widespread throughout the territory because of the ability to transport —along the Meta river— large volumes of animals, dairy, and meat products, at prices and times lower than those of the traditional grazing systems. Thus, livestock farming has lower costs than other productive activities undertaken in the region.

Livestock farming represents the baseline scenario of the project activity, which corresponds to grasslands degraded by regular burning to primary facilitate extensive cattle and buffalo rearing.

- Scenario 2: Agriculture

For many years, Vichada Department's lands were classified as unsuitable for agriculture because of their high acidity level. Nevertheless, according to a recent study of soils and the zoning of Vichada's lands conducted by UPRA (2017), 17.5% of the department's land is suitable for farming vocation and, 13.9% for agroforestry (Figure 13: left). Two structural conditions related to agriculture are present in the Vichada Department. On the one hand, there is a significant amount of land that has potential for large-scale soybean, corn, and rice production, which has attracted many investors. In 2017, according to the Municipal Agricultural-Livestock Assessments (2017), agricultural production in Vichada is 39% corn, 34% palm oil, 9% cashew, 6% banana, 4% cocoa, and 8% other crops. In total, Vichada has 57,850 hectares devoted to agriculture (Figure 13: right).

Nevertheless, in municipalities such as Puerto Carreño, cashew cultivation has expanded in recent years thanks to its adaptability to agroclimatic conditions. While, the cashew crop is marketed effectively, the

agro-industrial chain is incomplete, as it leaves out unprocessed pseudo-fruits, oils, and other usable elements. The structure of agricultural production in Puerto Carreño is different from that of the rest of the Department, as cashew is the main crop (63.2%), followed by cassava (17.2%), banana (12.5%), and traditional corn (7.1%) (Figure 14).

On the other hand, small-scale agriculture is incipient, and is currently only suitable for subsistence due to poor soil conditions, labor limitation, and high production and transport costs (Gobernación de Vichada, 2013).

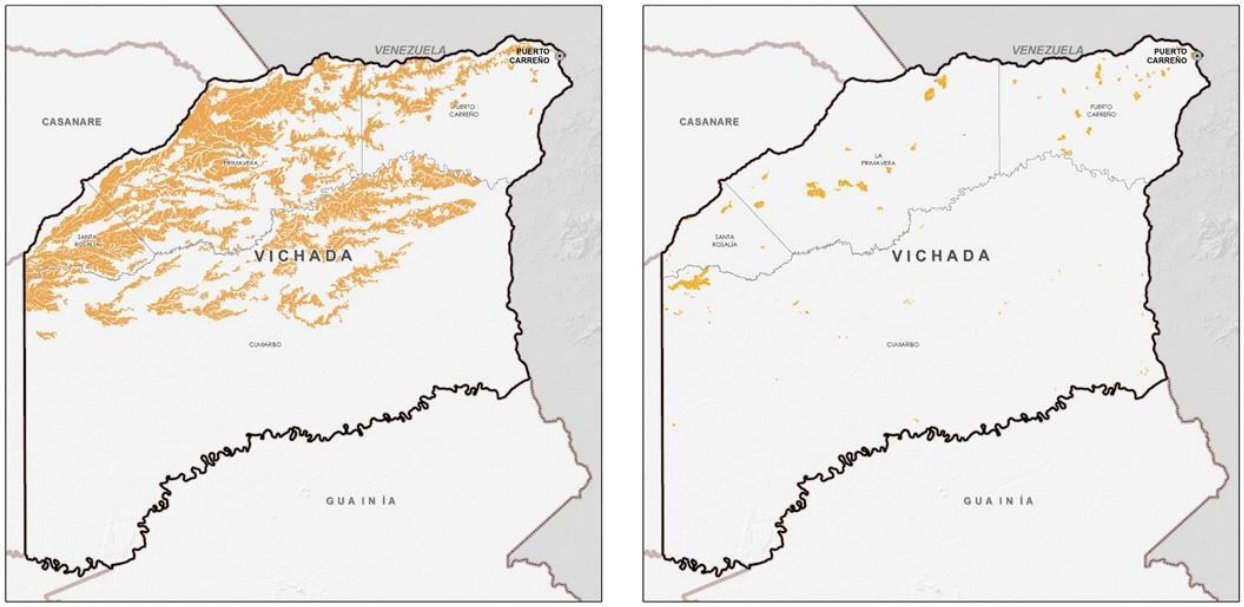



*Figure 13: Agriculture areas in Vichada Department. Left: Potential areas. Right: Current areas.*
*(Source: UPRA 2017, based on UPRA, 2014)*

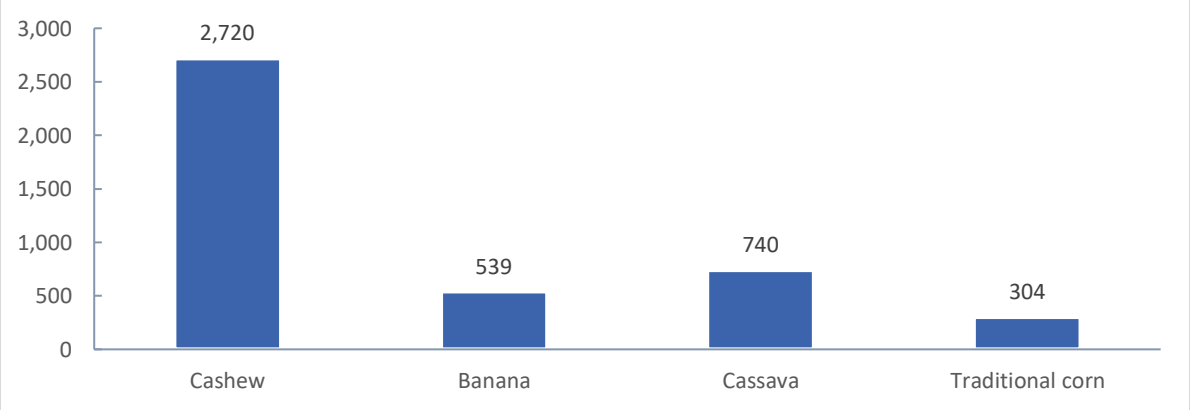



*Figure 14: Production in tons of the main crops in Puerto Carreño, 2017.*
*(Source: Prepared by South Pole based on Municipal Agricultural-Livestock Assessments, 2017)*

Farming is a credible alternative land use of land because it has expanded into the Department, especially in areas that once had forest cover, because soils can be more easily cultivated than those that have been used and degraded through livestock production. Oil palm has also been planted extensively throughout the country, including in the Vichada Department, replacing natural land covers (Forumo and Mitchell, 2017).

- Scenario 3: commercial forest plantations without VCS certification

Some areas of the Vichada Department have favorable conditions to develop forestry on a large scale. Its climate, rich hydrography, location in the tropics, and almost three million hectares suitable for forestry, provide a rich habitat to develop this activity without affecting natural ecosystems, including, gallery forests and wetlands.[65] According to data provided by UPRA (2017), the Vichada Department has 422 hectares with a high potential for the implementation of commercial forest plantations, 120,020 hectares with medium potential, and 2,857,485 hectares with low potential. All these areas account for 29.8% of the Department's territory.

The municipality of Puerto Carreño has the areas with the highest suitability to implement commercial forest plantations (422 hectares), whereas, in the municipality of La Primavera, there are 29,229 hectares with medium suitability and 947,354 with low suitability (as shown in Table 18). However, not all the areas suitable for forestry are being used for such activities, because the other alternative land-use scenarios exert steady pressure that leads to other activities or prevents the development of plantations, a topic that is discussed in depth in the following section.

*Table 18: Suitability of Vichada Departament't territory to implement commercial forest plantations*

| Suitability | Vichada (ha) | Vichada (%) | Puerto Carreño (ha) | Puerto Carreño (%) | La Primavera (ha) | La Primavera (%) |
|---|---|---|---|---|---|---|
| High | 422 | 0.0% | 422 | 0.0% | 0 | 0.0% |
| Medium | 120,020 | 1.2% | 59,721 | 4.95 | 29,229 | 1.6% |
| Low | 2,857,485 | 28.5% | 445,150 | 36.5% | 947,354 | 51.6% |
| Technically unsuitable | 7,030,830 | 70.2% | 715,272 | 58.6% | 860,600 | 46.8% |
| Total | 10,008,757 | 100.0% | 1,220,565 | | 1,837,183 | |

*(Source: UPRA 2017, based on UPRA, 2014)*

The Forest First project is developed in the municipalities of Puerto Carreño and La Primavera. The diagnosis for the Municipal Development Plan of Puerto Carreño 2016-2019 (Alcaldía de Puerto Carreño, 2016) identifies that, over the past 15 years, reforestation has been the productive vocation of this municipality. According to this information, in 2014, Puerto Carreño registered 48,400 hectares of cultivated forest plantations, equivalent to 4.0% of the total of the municipality, compared to 3,248 reported in 2012; that is, there was a growth of 1.378% over two years.[66]

For its part, in the Vichada Department —according to the 2016 National Livestock and Agriculture Survey— there were 332,849 hectares with commercial plantations, accounting for 3.3% of the Department's total land area.

The commercial plantations projects that effectively use the land with this potential focus on the use of exotic species with edaphoclimatic requirements available in the Department. Among the species used, *Acacia mangium*, *Pinus caribea*, *Eucaliptus grandis*, *Eucaliptus pellita*, *Eucaliptus tereticornis* and *Pinus oocarpa* stand out. These plantations belong to private-sector companies and some of them have the

[65] Plan de Desarrollo Turístico Departamento de Vichada, 2012
[66] The Agroforestry Trade Association of Vichada reported, in the last forestry forum, that there were around 100,000 ha of forest species planted in the Department, of which only about 10,000 ha are registered before the Colombian Livestock and Agricultural Institute (ICA), showing the poor coordination with other entities thar are important for the development of forestry activities in the country.

Forestry Incentive Certificate (CIF), an economic stimulus from the government for commercial reforestation activities.

Nevertheless, although there are forest projects in the area, some of them are in danger (as the case of Forest First) because of the financial risk that the investment involves for the project partners. The expansion in the area cultivated for forestry species associated with the plantations has been constrained due to the high costs derived from the use of agrochemicals that are necessary to achieve the required growth rates of each of the species.[67] These forestry practices, however, keep on being promoted and included in the Land Management Plan (POT), whose focal point is the possible reforestation that allows for a better use of land and the possibility of creating artificial forests and managing natural forests as an alternative to reduce the destructive pressure currently exerted on this renewable resource.

**Results of sub-step 1a:** Alternative land use scenarios to the proposed project activity, include:

- livestock farming;
- agriculture; and
- commercial forest plantations without VCS certification

Sub-step 1b. Consistency of credible land-use scenarios with enforced mandatory applicable laws and regulations

The identified scenarios from Sub-step 1a are legal and regulated in Colombia and the Orinoquía region under the following norms, agreements, and structural programs:

- CONPES 3797 of 2014: mentions that there is a potential for agricultural, livestock and forestry exploitation on an estimated in 2.8 million hectares of the high plan;
- National Livestock Development Program 2006-2019: the government goal for 2019 is to achieve around 48 million head of livestock on 28 million hectares suitable for bovine production in the country, that is, a capacity of 1.27 heads/ha;
- Municipal Development Plan of Puerto Carreño 2016-2019: development support and strengthening of the agricultural and livestock sectors;
- Law 139 enacted in 1994, which created the Forestry Incentive Certificates (CIF);
- Law 1377 enacted in 2010, which regulates forestry activities in the country.
- Resolution number 500 41 13 1571, which defines the criteria for the development of forestry, agricultural and agroforestry projects in the jurisdiction of Corporinoquía.
- Law 1776 enacted in 2016, by which the Areas of Interest for Economic and Social Development (ZIDRES) are created and developed. These are special areas suitable for livestock and agricultural purposes, located on national territory that is isolated from the most important urban centres. They require high costs related to production processes, due to the lack of infrastructure to transport and market products and, due their agrologic and climatic characteristics. They are unsuitable for developing family production units. The incentives associated with the development of these areas are:
    - special credit lines for mallholders, agricultural workers, rural women, and entrepreneurs;
    - special mechanisms of guarantee on the production of productive projects;
    - incentives for the promotion, education, and training of smallholders, agricultural workers, and rural women;

[67] (Diagnóstico Departamento de Vichada, 2018)

- incentives for companies resulting from partnerships that are devised for the development of productive projects; and
- resources of the productive projects are backed up, up to 100%, through the Livestock-Agriculture Guarantee Fund, when required.

Vichada holds more ZIDRES than any other department in the nation, with nearly 2.5 million hectares.

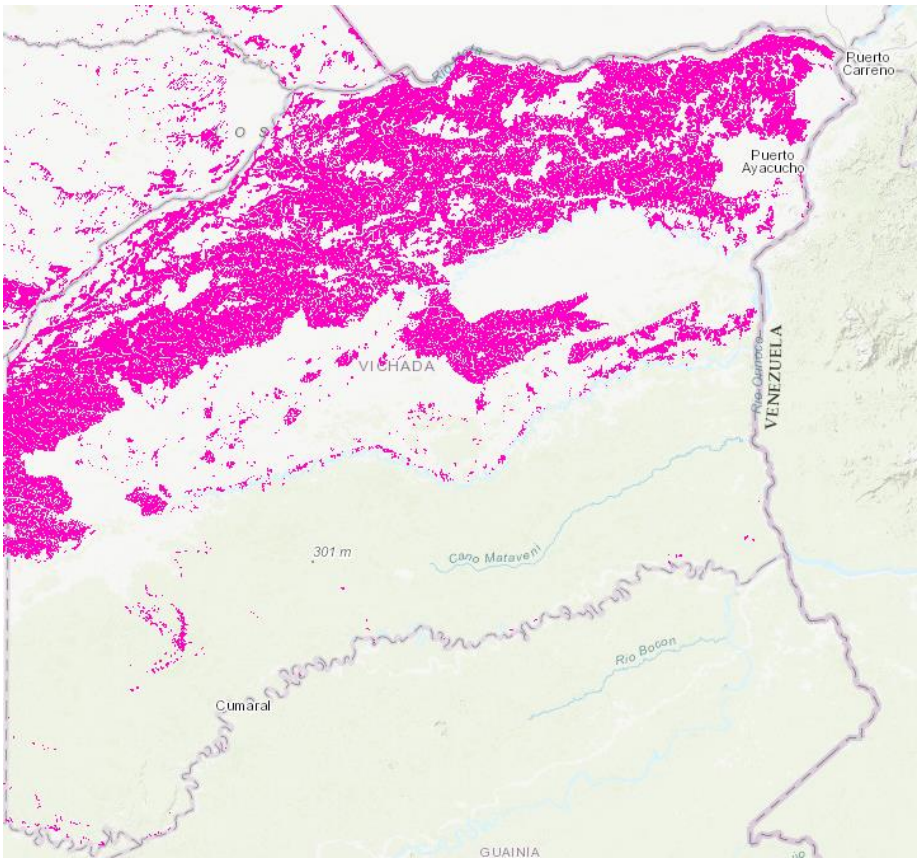



*Figure 15: ZIDRES in Vichada, 2017.*
*(Source: UPRA 2017, based on UPRA, 2014)*

**Result of Sub-Step 1b**. According to the information presented and considering the systematic lack of application of the law due to financial and institutional barriers in the project area, the same scenarios identified in Sub-Step 1a are maintained.

### 3.1.5 Additionality

Additionality was analyzed by following the steps 2 to 4 of the "Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities Version 01".

*Step 2. Analysis of barriers*

This step serves to identify the barriers and evaluate which of the land-use scenarios identified in sub-step 1b are not anticipated by these barriers.

Sub-step 2a. Identification of barriers that would prevent the implementation of at least one alternative land use scenario

**Financial barriers - forest plantations**

FFC has developed plantation of acacia (*A. mangium*), and eucalyptus (*E. pellita*) hardwood in Colombia, since 2010. Before it began operating, it announced its intention to trade Voluntary Carbon Units (VCU), for which it contracted a firm in 2009 to perform a financial analysis considering potential revenue from the carbon credits. Over subsequent years, they carried out research and development (R&D) actions and proof-of-concept activities, including plantation trials. In 2016, funds were raised by strategic investors to focus attention on improving the environmental, climate, and social components of the project. In this context, the capture and storage of $CO_2$ and the subsequent marketing of carbon credits resulting from rendering this ecosystem service became increasingly relevant in FFC's revenue forecasts, as it will enable them to gain the capital required to continue activities with a positive impact on the environment and society.

The innovative nature of this carbon scheme in the Vichada Department requires an estimated capital of USD 50 million to ensure the first inflow of revenues, which is only likely until the end of 2021.To this end, FFC is currently negotiating with preferred providers of capital and debt to obtain the USD 50 million in the coming months. These resources depend on the ability to generate future VCUs and, therefore, to guarantee the long-term sustainability of the project.

This section demonstrates how the commercial forest plantations under which the project falls are not feasible without revenues from the sale of carbon credits. To perform the investment analysis, the following actions were undertaken:

- Determination of the appropriate analysis method

The first action is to determine whether simple cost analysis, investment comparison analysis, or benchmark analysis should be applied. If the project VCS AFOLU does not yield financial or economic gains other than VCU-related revenues, the simple cost analysis should be applied (option I). Otherwise, the investment comparison analysis (option II) or the benchmark analysis (option III) are to be used. It should be noted that options I, II and III are mutually exclusive; therefore, only one of the three can be applied.

According to the tool, option I is not applicable for the proposed project, because the project will yield other financial or economic gains: income from sales of lumber chipping, which is sold abroad, mainly in Africa and Europe, and is not considered VCU-related revenue. Therefore, the investment comparison analysis (option II) will be applied to demonstrate the financial barrier to the proposed project.

- Application of the investment comparison analysis

The valuation methodology implemented in this analysis is the "Free Cash Flow to Equity (FCFE), through a Dividend Discount Model (DDM) based on the idea that the value of an investment is the present value of its future flows (with future flows being dividends). Taking this into account, the Net Present Value (NPV) financial indicator for the project was calculated, under two conditions:

**condition 1:** the project proposed activity, without revenues from the sale of carbon credits, is not financially viable; and

**condition 2:** the project proposed activity needs the revenues from the sale of carbon credits to be a financially viable alternative.

- Calculation and comparison of financial indicators

Analysis of condition 1:

The appropriate financial indicator for the proposed VCS AFOLU project was calculated under condition 1 without the financial gains from the VCU.

This analysis is based on the estimated revenues and costs arising from forestry activities planned by FFC, a company that planted approximately 12,000 ha (as of 2019) during the first phase. FFC plans to double the plantation for 2020 (i.e., cultivate another 12,000 ha) and, from 2021, plant around 20,000 ha annually, until it reaches a total of 150,000 ha planted (for further information about the planting projection, refer to the project cash flow[68]). The following considerations were taken into account:

- the expected return rate is the minimum return required from the investment, which is nothing more than the risk-free rate plus the risk premium associated with that action. The greater the risks perceived by FFC, the greater the return that will be required from the investment. For the specific case, a nominal rate of 30% was taken (26% effective), considering that the PIK[69] interest rate on the debt is 15%;
- a constant discount rate is assumed for the timeframe of the project, with the consideration that, as time passes, it should decrease since the risk is lower;
- the capital structure is estimated at USD 50 million, represented in debts (credit) and own capital;
- prices include discount rates;
- valuation of the DDM of 100% of FFC shares, before capital increases were made in 2020;
- the evaluation target date of the financial model is 2045;
- the debt grace period is five years;
- FFC's capitalization period is five years;
- the initial year of debt is 2019; and
- the price of timber is estimated at USD 74/ton.

The analysis included all costs and relevant revenues of the project, including:

- net income from harvests from which the direct costs of planting, maintenance and transportation incurred in the period have been discounted;
- operating cash flows: includes planting and maintenance costs, changes in working capital, operating expenses (opex), and taxes;[70]
- capital expenses (capex): includes everything related to the acquisition of land, infrastructure, vehicles, and equipment to develop the project activity;

[68] Supporting information: [NPRT/InternalRisks/Financial_Viability].
[69] With a mean return of 15% per year, this debt does not require the payment of principal and interests, which are capitalizing until maturity (five-year terms). Taken from the Expansión blog https://www.expansion.com/blogs/capitalriesgo/2010/05/31/pik-en-pigs.html
[70] Art. 240. General rate for legal entities. The general income tax rate applicable to national corporations and its assimilated entities, permanent establishments of foreign entities, and foreign legal entities residing or not in the country, required to file the annual tax return and related taxes, will be thirty-three-percent (33%) for the taxable year 2019.

- the cash flow from financing activities incorporates net financial costs, interests, debt payment, and dividends; and
- operating flows, capital expenditures and flows of financing activities are discounted from net income, resulting in a free cash flow after taxes (see Table 19).

Once the free cash flow is obtained, a discount rate of 30% is used to determine the Net Present Value, this is one of the most appropriate indicators to assess the financial feasibility of the projects.

*Table 19: Free cash flow without VCUs (Values in USD thousands)*

| Year | Total revenues | Cash flow from operation | Capex | Cash flow from financing activities | Free cash flow | Free cash flow after taxes |
|---|---|---|---|---|---|---|
| 2019 | (1,243) | -11,501 | -13,379 | 10,034 | (14,847) | (16,090) |
| 2020 | (2,535) | -30,837 | -16,485 | 41,042 | (6,281) | (8,816) |
| 2021 | (2,755) | -45,224 | -16,528 | 1,610 | (60,142) | (62,897) |
| 2022 | 6,227 | -50,860 | -20,202 | -2 | (71,065) | (64,838) |
| 2023 | 15,026 | -47,239 | -15,411 | 2,167 | (60,483) | (45,457) |
| 2024 | 18,198 | -42,452 | -18,155 | 546 | (60,061) | (41,863) |
| 2025 | 35,595 | -37,769 | -19,390 | -24,032 | (81,191) | (45,596) |
| 2026 | 65,369 | -19,272 | -19,882 | -25,217 | (64,371) | 999 |
| 2027 | 88,289 | -1,246 | -14,438 | -22,391 | (38,074) | 50,214 |
| 2028 | 157,040 | 31,422 | -8,154 | -21,632 | 1,635 | 158,675 |
| 2029 | 269,400 | 109,680 | -4,739 | -21,068 | 83,873 | 353,274 |
| 2030 | 281,331 | 158,129 | -7,417 | -2,441 | 148,270 | 429,601 |
| 2031 | 292,912 | 166,109 | -9,733 | -2,588 | 153,788 | 446,699 |
| 2032 | 316,652 | 178,935 | -5,684 | -2,699 | 170,552 | 487,204 |
| 2033 | 334,901 | 192,404 | -1,621 | -2,849 | 187,934 | 522,835 |
| 2034 | 354,590 | 205,883 | -9,659 | -3,029 | 193,195 | 547,785 |
| 2035 | 406,698 | 232,694 | -2,108 | -3,170 | 227,416 | 634,115 |
| 2036 | 415,968 | 255,594 | -3,420 | -3,411 | 248,763 | 664,731 |
| 2037 | 457,140 | 273,519 | -5,854 | -3,491 | 264,174 | 721,314 |

| Year | Total revenues | Cash flow from operation | Capex | Cash flow from financing activities | Free cash flow | Free cash flow after taxes |
|---|---|---|---|---|---|---|
| 2038 | 466,968 | 291,233 | -6,599 | 134 | 284,767 | 751,735 |
| 2039 | 477,055 | 297,406 | -1,842 | 134 | 295,698 | 772,753 |
| 2040 | 506,808 | 311,097 | -4,056 | 134 | 307,175 | 813,983 |
| 2041 | 517,705 | 326,366 | -4,176 | 134 | 322,323 | 840,028 |
| 2042 | 528,835 | 333,292 | -5,756 | 134 | 327,671 | 856,506 |
| 2043 | 540,205 | 340,360 | -4,631 | 134 | 335,862 | 876,068 |
| 2044 | 551,820 | 347,587 | -5,523 | 134 | 342,198 | 894,017 |
| 2045 | 563,684 | 354,971 | -2,988 | 134 | 352,117 | 915,801 |

*(Source: Prepared by South Pole with data provided by Forest First)*

By applying the methodology, an NPV < 0 was obtained. Consequently, the project is not financially viable, since by discounting cash flows and carrying them forward to present value, they do not meet the investment requirements (see Table 20).

*Table 20: NPV of the project, condition 1*

| Financial indicators | Results |
|---|---|
| Required working capital | USD 50,000,000 |
| Nominal discount rate | 30% |
| Net Present Value | USD -12,651,000 |

*(Source: Prepared by South Pole with data provided by FFC)*

Analysis of condition 2:

The appropriate financial indicator for the proposed VCS AFOLU project was calculated under condition 2, with the financial gains from the VCU (see Table 21). To that end, the following considerations were taken into account:

- it starts off with the considerations of condition 1; and
- the price of carbon credits is estimated at USD 4.4/ton $CO_{2e}$

Variables included in the analysis:

- it includes all relevant costs and revenues of the project obtained from the sale of timber and carbon credits; and
- it includes all operating expenses, working capital, and financing expenses.

*Table 21: Free cash flow with VCUs (values in USD thousands)*

| Year | Total revenues | Cash flow from operation | Capex | Cash flow from financing activities | Free cash flow | Free cash flow after taxes |
|---|---|---|---|---|---|---|
| 2019 | (1,243) | 2,496 | 1,253 | (10,091) | (13,379) | 56,783 |
| 2020 | (2,535) | 1,984 | (551) | (29,871) | (16,485) | 67,558 |
| 2021 | (2,755) | 2,586 | (169) | (44,242) | (16,528) | 627 |
| 2022 | 6,227 | 4,110 | 10,337 | (49,254) | (20,202) | 150,391 |
| 2023 | 15,026 | 6,827 | 21,853 | (44,748) | (15,411) | (323) |
| 2024 | 18,198 | 11,169 | 29,366 | (38,221) | (18,155) | (3,685) |
| 2025 | 35,595 | 15,206 | 50,801 | (31,138) | (19,390) | (30,663) |
| 2026 | 65,369 | 17,009 | 82,379 | (11,188) | (19,882) | 99,577 |
| 2027 | 88,289 | 17,668 | 105,957 | 7,143 | (14,438) | (1,382) |
| 2028 | 157,040 | 15,470 | 172,509 | 40,192 | (8,154) | (47,944) |
| 2029 | 269,400 | 7,649 | 277,050 | 116,072 | (4,739) | (125,468) |
| 2030 | 281,331 | 2,820 | 284,151 | 158,129 | (7,417) | (156,199) |
| 2031 | 292,912 | 3,837 | 296,748 | 166,109 | (9,733) | (160,501) |
| 2032 | 316,652 | 4,413 | 321,065 | 178,935 | (5,684) | (178,854) |
| 2033 | 334,901 | 4,613 | 339,514 | 192,404 | (1,621) | (197,516) |
| 2034 | 354,590 | 4,886 | 359,476 | 205,883 | (9,659) | (201,461) |
| 2035 | 406,698 | 3,381 | 410,079 | 232,694 | (2,108) | (239,585) |
| 2036 | 415,968 | 2,155 | 418,123 | 255,594 | (3,420) | (255,152) |
| 2037 | 457,140 | 1,293 | 458,432 | 273,519 | (5,854) | (132,415) |
| 2038 | 466,968 | 219 | 467,187 | 291,233 | (6,599) | (284,633) |
| 2039 | 477,055 | 454 | 477,509 | 297,406 | (1,842) | (295,564) |
| 2040 | 506,808 | (228) | 506,580 | 311,097 | (4,056) | (307,041) |

| Year | Total revenues | Cash flow from operation | Capex | Cash flow from financing activities | Free cash flow | Free cash flow after taxes |
|---|---|---|---|---|---|---|
| 2041 | 517,705 | - | 517,705 | 326,366 | (4,176) | (322,189) |
| 2042 | 528,835 | - | 528,835 | 333,292 | (5,756) | (327,537) |
| 2043 | 540,205 | - | 540,205 | 340,360 | (4,631) | (335,728) |
| 2044 | 551,820 | - | 551,820 | 347,587 | (5,523) | (342,064) |
| 2045 | 563,684 | - | 563,684 | 354,971 | (2,988) | (351,983) |

*(Source: Prepared by South Pole with data provided by FFC)*

By discounting after-tax cash flows at a nominal rate of 30%, an NPV > 0 was obtained; that is, it is financially viable as flows meet capital requirements and it also yields surpluses for FFC. This corroborates what is stated in condition 2: the project needs the revenues from the sale of carbon credits to become a financially viable alternative.

*Table 22: NPV of the project, condition 2*

| Financial indicators | Results |
|---|---|
| Required working capital | USD 50,000,000 |
| Nominal discount rate | 30% |
| Net Present Value | USD 89,279,000 |

*(Source: Prepared by South Pole with data provided by FFC)*

In addition to this, the project requires robust financial indicators to continue relying on resources from the investors. The characteristic of commercial forest plantations is that investment is recouped in the medium term, the first harvest is obtained in seven years. To ensure that private capital is invested in these reforestation activities, investors should be offered additional incentives to participate. that is why one of the determinants to maintaining the investment in the activities of the FFC project is the link to a certified carbon scheme under a standard that allows it to market credits for the capture and storage of carbon.

- Sensitivity analysis

A sensitivity analysis is a technique used to determine how different values from an independent variable impact a specific dependent variable under a given set of assumptions. In this document, the sensitivity analysis aims to show whether the conclusion regarding financial attractiveness is robust to reasonable variations in the critical assumptions. To carry out the sensitivity analysis of the project, the projected quantities of timber from planting trees were considered, as well as the sale price and the discount rate. The results of the sensitivity analysis of the project are shown in Table 23.

*Table 23: Sensitivity Analysis*

| Benchmark | NPV condition 1 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | -25% | -20% | -15% | -10% | -5% | 0% | 5% | 10% | 15% | 20% | 25% |
| Volume of timber harvested* | (42,133) | (36,237) | (30,340) | (24,444) | (18,547) | (12,651) | (6,754) | (858) | 5,039 | 10,935 | 16,832 |
| Timber price (USD/green ton) | (42,133) | (36,237) | (30,340) | (24,444) | (18,547) | (12,651) | (6,754) | (858) | 5,039 | 10,935 | 16,832 |
| Discount rate | 153,521 | 103,898 | 64,397 | 32,854 | 7,603 | (12,651) | (28,916) | (41,987) | (52,486) | (60,910) | (67,653) |

| Benchmark | NPV condition 2 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | -25% | -20% | -15% | -10% | -5% | 0% | 5% | 10% | 15% | 20% | 25% |
| Volume of timber harvested* | 59,796 | 65,693 | 71,589 | 77,486 | 83,382 | 89,279 | 95,175 | 101,072 | 106,968 | 112,865 | 118,762 |
| Timber price (US/green ton) | 59,796 | 65,693 | 71,589 | 77,486 | 83,383 | 89,279 | 95,175 | 101,072 | 106,968 | 112,865 | 118,762 |
| Discount rate | 230,986 | 190,763 | 157,797 | 130,616 | 108,075 | 89,279 | 73,522 | 60,246 | 49,006 | 39,443 | 31,270 |

*conversion factor m3/green ton

*(Source: Prepared by South Pole with data provided by Forest First)*

In general, we can observe that the NPV financial indicator is always greater in condition 2 as the benchmarks considered vary. Regarding the volume of timber harvested and its price, the NPV in each condition varies to the same degree, since both are factors of the income from the sale of green wood (i.e., they are multiplying). With a variation of 15+% in the price of timber or the quantity of timber harvested, the NPV in condition 1 becomes positive. With this same variation, the NPV of condition 2 is 21 times greater than that of condition 1. However, as the quantity of timber or its price increases in percentage terms, this gap is reduced, because the commercialization of timber starts to influence the net income of FFC. When the variation is 20+%, the NPV of condition 2 is 10 times greater than that of condition 1; if the variation is 25%, the NPV of condition 2 is seven times greater than that of condition 1. Another interesting result is that all other assumptions of the financial being equal, even if the quantity or price of the timber decreases by up to -25%, in condition 2, the NPV is still positive, showing the viability of the project. This indicates that income from carbon credits, besides yielding economic gains to will attract investors to the project, also reduces the risk of losses for FFC in the event of shocks affecting income from the sale of timber (the economic purpose of FFC). These shocks can be related to variations in international prices on which FFC has no influence. In such a situation, and considering that personnel and input costs do not vary, FFC could face serious problems if it was unable to secure additional sources of financing. This would put the

reforestation and the environmental co-benefits in jeopardy. Other related risks, such as forest fires, would also have the same effect.

Regarding the discount rate, results are consistent with what could be expected. At the business level, a higher discount rate indicates that capital investment alternatives are yielding more. Consequently, the present value of future flows of the project decreases. Nevertheless, if the variation is negative, the value of the project increases. This happened in the sensitivity analysis presented in this document. An interesting result shows that, when the discount rate decreases by 10%, the NPV of condition 2 is four times greater than that of condition 1. As this decrease becomes greater, the gap between both NPV starts to close. With a variation of 25% in the discount rate, the NPV of condition 2 is 1.5% higher. In conclusion, the sensitivity analysis helps to understand the consistency of the results from the barrier analysis.

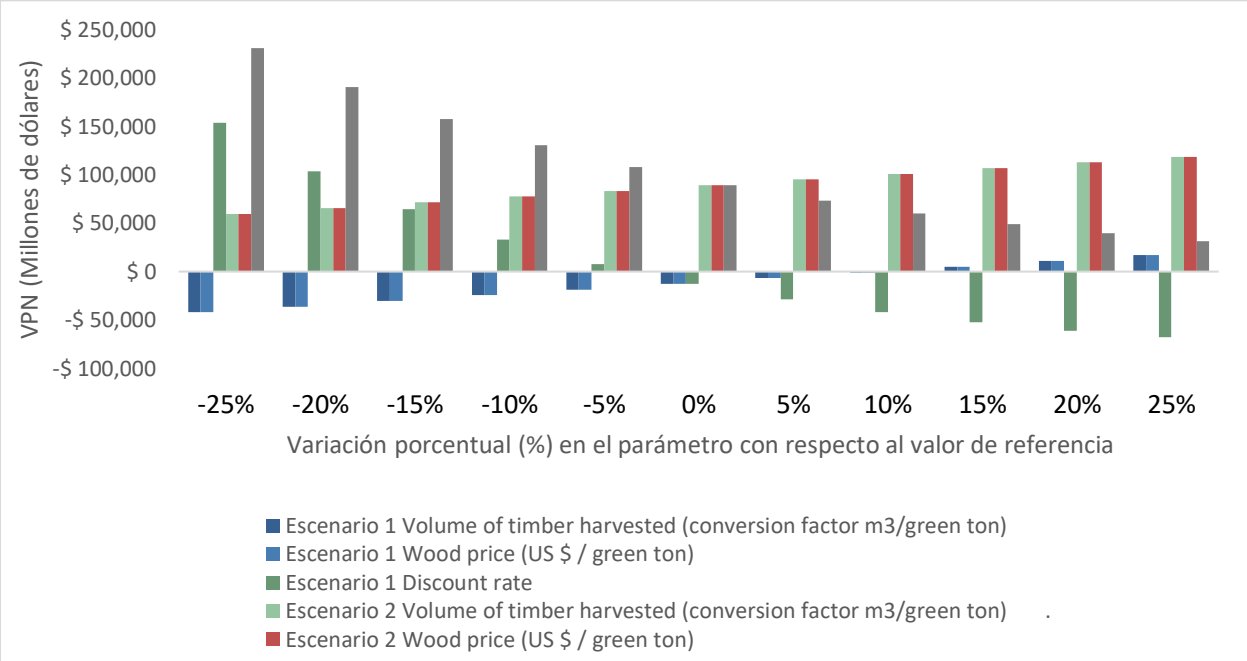



*Figure 16: Results of the sensitivity analysis*
*(Source: South Pole calculations based on data provided by Forest First)*

**Financial barriers – agriculture and livestock**

The financial barriers of the operation of agriculture in the Department of Vichada are associated with the lack of presence of financial institutions. The institutions that could potentially drive innovation and incentivize project activities have little presence in the region. An example of this is Finagro, the main institution providing credits to Colombian farmers. Between 2010 and 2019, Finagro provided support by delivering 1,531 credits in the Vichada Department, for a total amount of 699 billion pesos. However, it represents only 0.76% of the total funds disbursed by the institution in Colombia during the period (Finagro, 2019).

In the case of cattle raising, the Department is in the process of consolidation and conformation of the Sustainable Livestock Roundtable of the Department of Vichada, this exercise has been carried out with the support of the project “Transformando la OriNoquia (TONINA)” led by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) of Germany. Likewise, in the Municipality of Puerto Carreño, a group of about 80 cattle producers has been organized in the ASOGAT association, and the Ministry of Agriculture and Rural Development (MADR) is leading the process of construction of the livestock policy guidelines for the region. All of this, with the purpose of turning the department of Vichada

into an important producer of beef for meat marketing purposes at the national and international level (Secretaría de Agricultura y Desarrollo Económico del Vichada, 2020).

**Infrastructure barriers**

The urban and rural road and transport systems of the municipality of Puerto Carreño, and the Vichada Department in general, are in poor condition. At present, there is a road from Villavicencio to Puente Arimena that passes through Puerto López and Puerto Gaitán. Overland communication between Puente Arimena and Puerto Carreño is only possible during summer, a road has not been built that enables transit throughout the year. The existing dirt road is rutted from the trucks and all-terrain vehicles that travel along it during four months of the year. River transportation, in particular on the Meta and Orinoco rivers, is used in the winter season. This alternative, although less expensive, is not ideal as it is unable to accommodate cargo and passenger vessels year-round. Air transportation is the most used means for passengers and the transport of delicate and perishable cargo to and from within the Vichada Department (Diagnóstico Departamento de Vichada, 2018).

The remoteness and isolation of the Vichada Department from the main production and market centers, coupled with a poor transport infrastructure, raise the cost of many inputs necessary for the production and marketing of products in the region. As does the high cost of fuel, which is driven by transport costs and hydrocarbon restrictions imposed by the authorities (who fear that trucks be diverted to the cultivation centers of coca). Furthermore, the high costs of overland, river, and air freight are factors that undermine the social and economic development of the region.

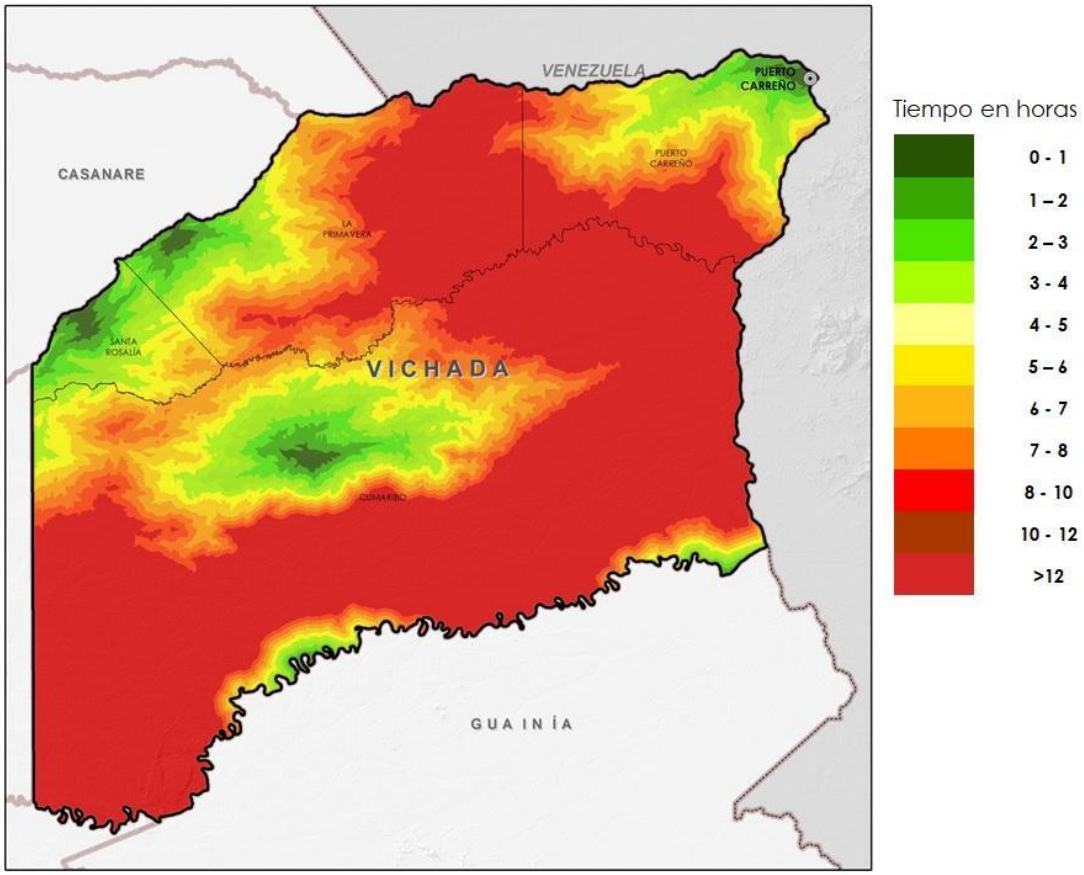



*Figure 17:Travelling times from municipal government seats and capital cities. Legend: time in hours (Source: UPRA 2017, based on UPRA, 2014)*

In conclusion, the competitiveness of the department of Vichada is seriously affected by poor and deficient road and logistical coverage. The lack of road and river infrastructure limits connections at the departmental and national levels, resulting in high costs for the transportation of produce and agricultural inputs (Secretaría de Agricultura y Desarrollo Económico del Vichada, 2020)

**Social barriers**

According to the Development Plan of Puerto Carreño 2016-2019 (Alcaldía de Puerto Carreño, 2016), the municipality has been experiencing population growth and urban sprawl, a situation that has led to the emergence of slums without access to basic public services, and a range of additional social problems. This population growth has been fueled by the arrival of people displaced due to armed conflict and indigenous people leaving reservations to seek opportunity. This influx has led to "poverty belts" developing around the municipality's capital, which has negatively impacted the quality of life of the entire population.

The average index of Unsatisfied Basic Needs (NBI) for the Vichada Department is 67%, whereas Puerto Carreño has an average of 45.62% of the population with NBI; 21.7% of housing NBI; 15% of public services NBI; 27.3% of overcrowding NBI; 6.8% of non-attendance at school NBI; and 13.8% economic-dependence NBI. Of the four municipalities in the Department, Puerto Carreño faces the greatest social problems as the unemployment rate is high among the population displaced from other Vichada municipalities, and departments. The people living in the growing poverty belts survive by engaging in the informal economy and, in some cases, illegal activities.

The customs and livelihoods of indigenous communities that have been significantly affected by a history of colonization. Consequences range from the abandonment of farming and the adoption of customs from settlers that led to malnutrition an increase in morbidity and mortality, the abuse of licit and illicit psychoactive substances, pregnancy in minors, sexually transmitted diseases, and domestic violence.

The above-mentioned social barriers primarily impact commercial forest plantations because it is an activity that —due to its nature— recoups the investment over a longer period of time than in the case of agriculture and livestock. This is not attractive to the different actors in the territory seeking to meet their consumption needs in the short term.

An additional factor that affects the development of the project activities in the area is armed conflict. In 2019, several members of the FARC-EP took up arms again, breaking the Peace Accord with the government headed by Juan Manuel Santos in 2016 (ONU, 2019). The Orinoquía region is a focus for the proliferation of those illegal groups, which take advantage of the challenges police face in dismantling the illicit activities these groups engage in to finance their fight against the state. In the case of commercial forest plantations with foreign capital, there is a high risk of extortion. This, coupled with the significant investment required to implement the activities and the payback period (less flexible than for livestock and agricultural activities), is a significant risk and a social barrier of paramount importance.

**Economic barriers**

FFC does not have clear market targets in the Colombian Orinoquía, its goal is to export timber to other countries, including South Africa. The coming revaluation of the Colombian peso, compare to the US dollar, may reduce incomes, making it more difficult to cover domestic workface costs. The central bank (Banco de la República, Banrep) through consultation with experts, considers a 3.68% revaluation of the currency against the dollar from September 2019 to September 2021, as can be seen in Table 24.

*Table 24: Expectations of the Market Representative Rate at the end of the period, according to a survey made by the central bank (Banrep), 2019*

| Statistics | Average (COP) | Minimum (COP) | Maximum (COP) |
|---|---|---|---|
| As of September 2019 | $ 3,370.11 | $ 3,300.00 | $ 3,492.00 |
| As of December 2019 | $ 3,320.01 | $ 3,130.00 | $ 3,600.00 |
| As of September 2020 | $ 3,297.44 | $ 3,100.00 | $ 3,800.00 |
| As of December 2020 | $ 3,273.59 | $ 2,900.00 | $ 3,835.00 |
| As of September 2021 | $ 3,246.15 | $ 2,750.00 | $ 4,072.00 |

*(Source: Banco de la República, 2019)*

Sub-step 2b. Elimination of land use scenario that are prevented by the identified barriers

*Table 25: Analysis of barriers results*

| Barriers | Livestock | Agriculture | Forest plantations without VCS |
|---|---|---|---|
| Financial | | X | X |
| Infrastructure | X | X | X |
| Social | | | X |
| Economic | | | X |
| **Final consideration** | **No barriers** | **Barriers** | **Barriers** |

*Step 3. Investment analysis*

Not applicable to this project. According to A/R Methodological tool "Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities", if forestation without being registered as an A/R CDM project activity is not included in the list of land use scenarios that are not prevented by any barrier, the step 3 (investment analysis) is not required.

*Step 4. Common practice analysis*

The FFC project is not a standard practice in the Vichada Department since, although other commercial plantations are developed in the project's area, these are not comparable if regulation variables are analyzed.

1. The product to be marketed as a result of the project is lumber chipping, which is used as an energy source in some countries. The project prevents those who use chipping lumber from resorting to other alternatives obtain fuel, including clearing forest not related to reforestation activities in the territories receiving the product. This element is extremely important in terms of protecting the environment. If the project manages to overcome the above-mentioned barriers —which for the most part are summarized as barriers to accessing additional resources for financing activities—,

it would provide environmental benefits for the surrounding populations and the population where the product is ultimately consumed.

2. The FFC plantation accounts for 2.8% of the total areas with high forest suitability in the Vichada Department. As can be seen, it is not a large-scale practice, but its contribution to the environment and the surrounding community is important, as shown in the previous sections. In addition to this, as land areas containing the plantations are not clustered, the displacement among them turns out to be very expensive (considering the times and distances to cover two municipalities in a department as large as Vichada).
3. The project does not have the CIF. With the CIF, the national government recognizes —through the Ministry of Agriculture and Rural Development— the positive externalities of reforestation in its commercial component. In turn, the Ministry makes such a recognition through FINAGRO. This incentive offers a contribution in cash of 50% of the costs of establishing and maintaining the forest plantation up to the fifth year.
4. Another forest plantation project in the area is the Grouped Project for Commercial Forest Plantations Initiatives in the Department of Vichada (hereinafter, the Grouped Project). Its business model is different from that of FFC because the promoter of the Grouped Project is a non-governmental organization (NGO), that brings together the different owners to be certified with the VCS, whereas FFC is a private company that operates internationally. The Grouped Project activities are co-financed by the ONG, and the other owners provide the remaining capital. In the case of FFC, the project is entirely financed by investors, from which good financial returns are expected, as well as positive externalities for the environment stemming from the project activities.

In conclusion, regarding the FFC project, the forest projects existing in the expansion area of the grouped project employ very different business approaches, both in scale and focus, with respect to forest and/or industrial production. The activities of the proposed project aim to change the land use from livestock to activities with a reduced impact on the land. This will enable the recovery of the natural environment and the connectivity between the forest cover. The financial proceeds from carbon sequestration will help FFC overcome the barriers explained and continue with plantations expansion and maintenance activities.

#### 3.1.6 Methodology Deviations

No methodology deviations were applied.

## 3.2 Quantification of GHG Emission Reductions and Removals

### 3.2.1 Baseline Emissions

#### *3.2.1.1 Carbon stock in in the baseline*

The carbon stock in shrubs in the baseline was made following the AR-Tool 14 “Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities Version 04.2, section 11; equation 26”. Thus:

$$C_{SHRUB,t} = \frac{44}{12} \times CF_s \times (1 + R_s) + \sum_i A_{SHRUB,i} \times b_{SHRUB,i}$$

where:

| | |
|---|---|
| $C_{SHRUB,t}$ | Carbon stock in shrubs within the project boundary at a given point of time in year t; tCO2-e |
| $CF_s$ | Carbon fraction of shrub biomass; t C (t.d.m.)$^{-1}$. A default value of 0.47 is used unless transparent and verifiable information can be provided to justify a different value. |
| $R_s$ | Root-shoot ratio for shrubs; dimensionless. The default value of 0.40 is used unless transparent and verifiable information can be provided to justify a different value. |
| $A_{SHRUB,i}$ | Area of shrub biomass estimation stratum i; ha |
| $b_{SHRUB,i}$ | Shrub biomass per hectare in shrub biomass estimation stratum i; t d.m. ha$^{-1}$ |

The estimation of carbon stocks of litter and dead wood was performed following using AR-Tool 12 "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities version 03.0". Values of the conservative default-factors estimate the carbon stock in dead wood and litter as a percentage of carbon stock in tree biomass. This was selected according to the guidance provided in the methodological tool.

The parameters and key data for the carbon stock estimations in shrubs are presented in Table 26Table 26. The aboveground biomass value for shrubs was selected according to a study developed in the same ecological zone where the project is located.

*Table 26: Parameters used for shrub carbon stock estimation*

| Parameter/Key Data | Vegetation Type | Value | Source |
|---|---|---|---|
| Aboveground biomass (t/ha) | Shrubland | 2.4 | Rao *et al.* (2001). Producción de Biomasa Vegetal Epígea e Hipógea en las Sabanas Nativas. In: Agroecología y Biodiversidad de las Sabanas en los Llanos Orientales de Colombia. Rippstein et al. Editores. CIAT, No. 322 |
| Root-shoot ratio (R) | Shrubland | 0.4 | CDM_AR_tool_14. "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities" |
| Carbon fraction | All species | 0.47 | IPCC "Good Practice Guidance for LULUCF". 2006. Table 4.3 |
| Factor C to $CO_2$ | All species | 3.667 | IPCC "Good Practice Guidance for LULUCF". 2006. Table 4.3 |
| $DF_{DW}$ (%) | All species | 6 | CDM_AR_tool_12. "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities". Biome: tropical; Elevation: < 2,000 m; Precipitation: > 1,600 mm/yr |
| $DF_{LI}$ (%) | All species | 1 | |

### *3.2.1.2 Changes in carbon stock in trees and shrubs in the baseline*

The estimation of change in carbon stocks in the baseline was carried out using the AR-Tool 14 Methodological tool: "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R

CDM project activities Version 04.2". According to this tool, the change in carbon stock in shrubs in the baseline can be accounted as zero if one or more of the conditions presented in section 5.12 of this tool are fulfilled.

For the project area, burning cycles before the project start date do not allow the successful establishment of vegetation other than grasslands, fulfilling the condition (f)[71] of section 5.12. Furthermore, the changes in carbon stocks in trees and shrubs in the baseline have been measured as zero.

### 3.2.2 Project Emissions

The quantification of project emissions and/or removals was calculated following the section 5.5 of the AR-ACM003 methodology "A/R Large-scale Consolidated Methodology Afforestation and reforestation of lands except wetlands".

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

Where:

| | |
|---|---|
| $\Delta C_{ACTUAL,t}$ | Actual net GHG removals by sinks, in year t; t $CO_{2\text{-}e}$ |
| $\Delta C_{P,t}$ | Change in the carbon stocks in project, occurring in the selected carbon pools, in year t; t $CO_{2\text{-}e}$ |
| $GHG_{E,t}$ | Increase in non-$CO_2$ GHG emissions within the project boundary as a result of the implementation of the A/R CDM project activity, in year t, as estimated in the tool "Estimation of non-CO2 GHG emissions resulting from the burning of biomass attributable to an A/R CDM project activity"; t $CO_{2\text{-}e}$ |

#### *3.2.2.1 Change in carbon stock*

The quantification of project removals by changes in the project carbon stock ($\Delta C_{P,t}$) was calculated following the section 5.5 of the AR-ACM003 methodology "A/R Large-scale Consolidated Methodology Afforestation and reforestation of lands except wetlands":

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

| | |
|---|---|
| $\Delta C_{TREE\_PROJ,t}$ | Change in carbon stock in tree biomass in project in year t, as estimated using the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; t $CO_{2\text{-}e}$. |
| $\Delta C_{SHRUB\_PROJ,t}$ | Change in carbon stock in shrub biomass in project in year t, as estimated using the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; t $CO_{2\text{-}e}$. |
| $\Delta C_{DW\_PROJ,t}$ | Change in carbon stock in dead wood in project in year t, as estimated using the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"; t $CO_{2\text{-}e}$. |

[71] AR-Tool 14 – Section 5.12 about the conditions under which change in carbon stock may be estimated as zero, for which the condition (f) says: …Land is subjected to periodic cycles (e.g., slash-and-burn or clearing-regrowing cycles) so that the biomass oscillates between a minimum and a maximum value in the baseline.

$\Delta C_{LI\_PROJ,t}$ Change in carbon stock in litter in project in year t, as estimated using the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"; t $CO_{2\text{-}e.}$

$\Delta SOC_{AL,t}$ Change in carbon stock in soil organic carbon in the project in year t, in areas of land meeting the applicability conditions of the "Tool for the estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities", as estimated in the same tool; t $CO_{2\text{-}e.}$

#### 3.2.2.1.1 Stratification

The stratification was defined according to "AR-ACM0003 A/R Large-scale Consolidated Methodology Afforestation and reforestation of lands except wetlands Version 02.0". If biomass distribution over the project area is not homogeneous, stratification should be carried out to improve the precision of biomass estimation. Different stratifications may be appropriate for the baseline and project scenarios to achieve optimal precision of estimation of net GHG removals by sinks. The stratification was based on the project planting schedule plan. In the case of the project area in the first instance, stratification included the establishment date of the project area and the tree species planted (Table 27).

*Table 27: Stratum for plot sampling*

| Species | Year of Establishment | Stratum | Area (ha) |
|---|---|---|---|
| *E. pellita* | 2016 | Ep2016 | 110 |
| | 2017 | Ep2017 | 2,332 |
| | 2018 | Ep2018 | 1,339 |
| | 2019 | Ep2019 | 920 |
| | 2020 | Ep2020 | 1,200 |
| | 2021 | Ep2021 | 6,400 |
| | 2022 | Ep2022 | 5,995 |
| *A. mangium* | 2016 | Am2016 | 164 |
| | 2017 | Am2017 | 865 |
| | 2018 | Am2018 | 679 |
| | 2019 | Am2019 | 191 |
| | 2020 | Am2020 | 300 |
| | 2021 | Am2021 | 1,600 |

#### 3.2.2.1.2 Change in carbon stock in tree and shrub biomass

To estimate the carbon stock in tree biomass at a given point in time, the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities AR-Tool14 Version 04.1" was used. According to section 8.2 of this tool, this method is used for ex-ante estimation of the carbon stock in tree biomass. The default values used are presented in Tables 29 and 30.

The estimation of standing tree biomass for each stratum was calculated according to equation 13 of the AR-Tool14 and the equation 5 of the Appendix 1 of the AR-Tool14:

$$B_{tree} = A \times b_{tree}$$

| | |
|---|---|
| $B_{TREE}$ | Tree biomass in the tree biomass estimation strata; t d.m. |
| $A$ | Sum of areas of the tree biomass estimation strata; ha |
| $b_{TREE}$ | Mean tree biomass per hectare in the tree biomass estimation strata; t d.m. $ha^{-1}$ |

And,

$$b_{TREE} = [V_{TREE} \times D\ x\ BEF_2] \times (1 + R)$$

| | |
|---|---|
| $b_{TREE}$ | Mean tree biomass per hectare in the tree biomass estimation strata; t d.m. $ha^{-1}$ |
| $V_{tree}$ | Mean tree volume per hectare in the tree biomass estimation strata; $m^3$ $ha^{-1}$. For this case, it will be the mean annual increment (MAI) value of each species multiplied by the respective year of plantation establishment. |
| $D$ | Basic wood density; t $m^{-3}$ |
| $BEF_2$ | Biomass Expansion Factor; dimensionless |
| $R$ | Root-shoot ratio; dimensionless |

The conversion of the standing tree biomass for each stratum in term of carbon units was calculated according to equation 12 of the AR-Tool14:

$$C_{TREE} = \frac{44}{12} \times CF_{tree} \times C_{tree}$$

| | |
|---|---|
| $C_{TREE}$ | Carbon stock in trees in the tree biomass estimation strata; t $CO_2e$ |
| $CF_{TREE}$ | Carbon fraction of tree biomass; t C (t d.m.)$^{-1}$ |
| $B_{TREE}$ | Tree biomass in the tree biomass estimation strata; t d.m. |

*Table 28: Models and parameters used for tree biomass or carbon estimation (see section 3.3.1)*

| Parameter/ Key Data | Species | Value | Source |
|---|---|---|---|
| MAI (vol) ($m^3$/ha/year) | *E. pellita* | 20 | Yepes *et al.* (2011). Protocolo para la estimación nacional y subnacional de biomasa-carbono en Colombia. Table 11. Supporting information: [Bibliography/Yepes_IDEAM_2011] |
| | *A. mangium* | 26 | |
| Root-shoot ratio (R) (dimensionless) | Trees | 0.25 | CDM_AR_tool_14. "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities". Page 18. |
| Carbon fraction | *E. pellita* | 0.509 | Local estimations. Supporting information: [Wood_analysis/Carbon] |
| | *A.mangium* | 0.513 | |
| Factor C to $CO_2$ | All | 3.667 | IPCC "Good Practice Guidance for LULUCF". 2006. Table 4.3 |

*Table 29: Biomass Conversion and Expansion Factors (BCEF)*

| Growing stock level (m3) | Species | BCEF | Source |
|---|---|---|---|
| < 10 | All | 4.0 | IPCC (2006). Good Practice Guidance for LULUCF. Table 4.5. https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_04_Ch4_Forest_Land.pdf |
| 11 - 20 | | 2.5 | |
| 21 - 40 | | 1.4 | |
| 41 - 60 | | 1.2 | |
| 61 - 80 | | 1.2 | |
| 80 - 120 | | 1.0 | |
| 120 - 200 | | 0.9 | |
| > 200 | | 0.7 | |

#### 3.2.2.1.3 Change in carbon stock in dead wood and litter

See section 3.2.1.1 Carbon stock in in the baseline.

### *3.2.2.2 Increase in non-$CO_2$ GHG emissions*

According to the AR-TOOL 08 "Estimation of non-$CO_2$ GHG emissions resulting from the burning of biomass attributable to an A/R CDM project activity" version 04.0.0. the estimation of the emissions of non-$CO_2$ GHGs resulting from the burning of biomass and forest fires within the project boundary was estimated as follows:

$$GHG_{E,t} = GHG_{SPF,t} + GHG_{FMF,t} + GHG_{FF,t}$$

| | |
|---|---|
| $GHG_{E,t}$ | Emission of non-$CO_2$ GHGs resulting from the burning of biomass and forest fires within the project boundary in year *t*; $tCO_2$-e |
| $GHG_{SPF,t}$ | Emission of non-$CO_2$ GHGs resulting from the use of fire in site preparation in year *t*; t $CO_2$-e |
| $GHG_{FMF,t}$ | Emission of non-$CO_2$ GHGs resulting from the use of fire to clear the land of harvest residue prior to replanting of the land or other forest management, in year *t*; t $CO_2$-e |
| $GHG_{FF,t}$ | Emission of non-$CO_2$ GHGs resulting from fire in year *t*; $tCO_2$-e |

The emissions resulting from the use of fire in site preparation is accounted as zero in accordance with the section 7, condition (a): "$GHG_{SPF,t}$=0 for all areas of land where: (i) slash-and-burn is a common practice in the baseline, and (ii) fire has been used in the area at least once during the period of ten years preceding the start of the A/R CDM project activity". As presented in the section 3.1.4, slash and burn are a common practice in the project area.

In the same way, the emissions resulting from the use of fire to clear the land of harvest residue prior to replanting the land or other forest management ($GHG_{FMF,t}$) is accounted as zero in accordance with the project management, in which the use of fire for the replanting activities is not planned. This condition will be reviewed every verification.

Forest fires ($GHG_{FF,t}$) are not planed in the project area, however, if an unplanned forest fire occurs in the project area, the non-$CO_2$ GHGs emissions will be estimated following the equations of the AR-TOOL08:

$$GHG_{FF,t} = GHG_{FF_{TREE},t} + GHG_{FF_{DOM},t}$$

Where:

| | |
|---|---|
| $GHG_{FF,t}$ | Emission of non-$CO_2$ GHGs resulting from forest fires in year t; t $CO_2$-e |
| $GHG_{FF_{TREE},t}$ | Emission of non-$CO_2$ GHGs resulting from the loss of aboveground biomass of trees due to forest fires in year t; t $CO_2$-e |
| $GHG_{FF_{DOM},t}$ | Emission of non-$CO_2$ GHGs resulting from the loss of dead organic matter due to forest fires in year t; t $CO_2$-e |

### 3.2.3 Leakage

As per indicated int the AR-TOOL15 "Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity" Version 2.0, leakage emission attributable to the displacement of grazing activities under the following conditions is considered insignificant and hence accounted as zero:

(a) Animals are displaced to existing grazing land and the total number of animals in the receiving grazing land (displaced and existing) does not exceed the carrying capacity of the grazing land;

(b) Animals are displaced to existing non-grazing grassland and the total number of animals displaced does not exceed the carrying capacity of the receiving grassland;

(c) Animals are displaced to cropland that has been abandoned within the last five years;

(d) Animals are displaced to forested lands, and no clearance of trees, or decrease in crown cover of trees and shrubs, occurs due to the displaced animals;

(e) Animals are displaced to zero-grazing system.

In the project scenario, the condition that applies is **a)** as the animals were displaced to other existing grazing lands, as cattle grazing is a traditional activity in the area, and the main land cover corresponds to shrubs and grasslands (Figure 10).

With regards carrying capacity, although there are no official indicators developed for the project area, they exits for the neighbouring departmets of Casanare and Meta. For both departments, the carrying capacity is between 0,3 and 0,4 heads/ha:


*Figure 18. Carrying capacity in Casanare and Meta, departments from the Orinoquia region*
Source: Fedegán- Fondo nacional del Ganado Year: 2014

Based on the official cattle inventory, developed by *Instituto Colombiano Agropecuario* ICA[72], the historical numbers, in terms of cattle/ha in Vichada are the lowest in the entire Orinoquia Region:

*Table 30. Cattle inventory in the municipalities of the project area*

| Zone/year | 2016 | 2018 | 2021 |
|---|---|---|---|
| Puerto Carreño | 25,820 | 24,037 | 18,323 |
| La Primavera | 132,460 | 135,208 | 141,228 |
| Vichada department | 242,633 | 254,820 | 256,954 |
| Orinoquia region[73] | 4,796,549 | 5,358,172 | 5,696,374 |

Finally, when crossing the information with the land cover information (Figure 19) grasslands area, we have the following carrying capacity:

[72] https://www.ica.gov.co/areas/pecuaria/servicios/epidemiologia-veterinaria/censos-2016
[73] Departmens of Casanare, Arauca, Meta, Vichada,

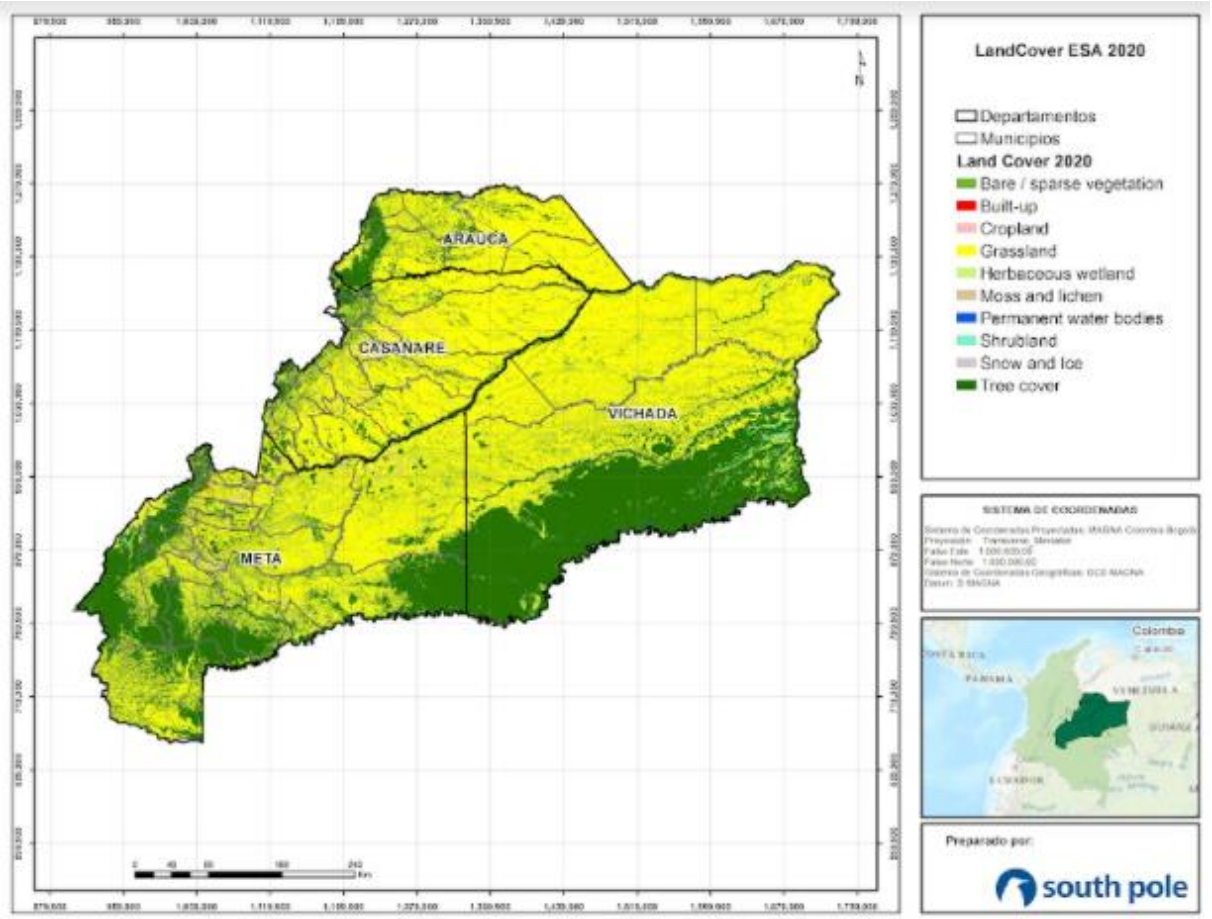



*Figure 19. Land covers for the Orinoquia Region 2020*

*Table 31. Carryiing capacity in the municipalities of the project area*

| Zone/year | Grassland area (ha)[74] | Carrying capacity (cattle/ha) | | |
|---|---|---|---|---|
| | | 2016 | 2018 | 2021 |
| Puerto Carreño | 984,058 | 0.03 | 0.02 | 0.02 |
| La Primavera | 1,564,049 | 0.08 | 0.09 | 0.09 |
| Vichada department | 5,135,904 | 0.05 | 0.05 | 0.05 |
| Orinoquia region | 14,230,849 | 0.34 | 0.38 | 0.40 |

As a conclusion, as the carrying capacity of the municipalities of the project areas is significantly below of the regional average, the condition a) of the tool is met and there is no leakage in the project area.

### 3.2.4 Net GHG Emission Reductions and Removals

According to the equation 5 of the methodology AR-ACM0003 v2.0, the net anthropogenic GHG removal by sink is:

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

[74] Obtained from a Land Cover análisis for the year 2020. Available in the supporting documents folder as LandCover_2020_region Orinoquia

Where:

| | | |
|---|---|---|
| $\Delta C_{AR-CDM,t}$ | = | Net anthropogenic GHG removals by sink in year t; $tCO_2$-e |
| $\Delta C_{ACTUAL,t}$ | = | Actual net GHG removals by sink in year t; $tCO_2$-e |
| $\Delta C_{BSL,t}$ | = | Baseline net GHG removals by sink in year t; $tCO_2$-e |
| $LK_t$ | = | GHG emissions due to leakage in year t; $tCO_2$-e |

Additionally, according to the standard requirements, for those projects where harvesting practices are considered in the project activities, the loss of carbon due to harvesting shall be include in the quantification of the project emissions. Because the project activities consider an increase in project area during the first seven years of implementation and a harvesting period every seven years. The long-term average (LTA) GHG benefit was calculated considering scenario 4: "ARR project with a rotational planting and harvest cycle" raised in "AFOLU Guidance: Example for Calculating the Long-Term Average Carbon Stock for ARR Projects with Harvesting" as follows:

- We established the period over which the long-term average GHG benefit shall be calculated. The period for these estimations was 36 years, including the last harvest period in the cycle, since our project has a crediting period of 30 years, a harvest cycle of seven years, and seven planting dates, starting the first one in 2016 and the last in 2022.
- The LTA was estimated considering the division of the area conducted in the risk analyses: an eligible area of 1,626 ha under the influence of the Morichalito indigenous community (buffer NPR = 18%)[75]; and an eligible area of 20,478, corresponding to the territory that is not under the indigenous community influence (buffer NPR=16%)[76].
- We Determined the expected total GHG benefit for each NPR scenario and year of the established period. For each year, the total GHG benefit was estimated:

$$GHG_{t,i} = PE_{t,i} - BE_{t.i}$$

Where:

$GHG_{t,i}$ to date GHG emission reductions and removals at year t and i NPR scenario.

$PE_{t,i}$ the total to-date GHG emission reductions and removals generated in the project scenario ($tCO_2e$) in the year t and i NPR scenario. Project scenario emission reductions and removals shall also consider project emissions of $CO_2$, $N_2O$, $CH_4$, and leakage.

$BE_{t,I}$ The total to-date GHG emission reductions and removals projected for the baseline scenario (tCO2e) in the year t and i NPR scenario.

i NPR scenario. There are two scenarios one with buffer NPR=16% or buffer NPR = 18% scenario.

t Year

- *We calculated the total GHG benefit as the sum of each scenario:*

$$GHG_t = GHG_{t,NPR=16\%} + G_{t,NPR=18\%}$$

- We summed the total GHG benefit of each year ($GHG_t$) over the established period in each NPR scenario.
- We calculated the average GHG benefit of each NPR scenario over the established period, using the following[77]:

[75] Supporting information: [ER/ 220128_ExanteER_AR-ForestFirst_Risk18].
[76] Supporting information: [ER/ 220128_ExanteER_AR-ForestFirst_Risk16].
[77] Supporting information: [220216_ExanteER_AR-ForestFirst_Consolidated].

$$LA = \frac{\sum_{t=0}^{n} GHG_t}{n}$$

Where:

GHGt the total GHG benefit at year t
t Year.
n Total number of years in the established period

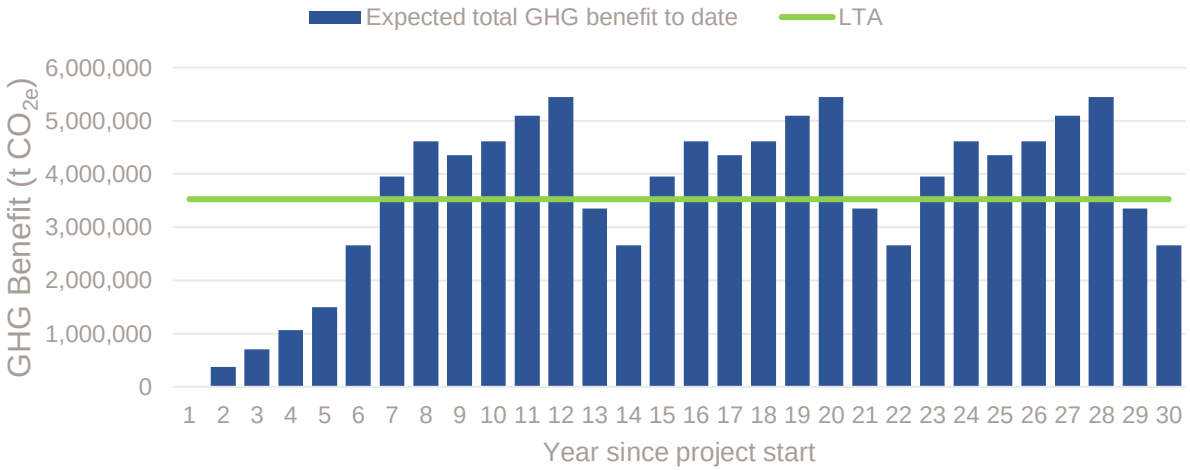



*Figure 20: Illustration of the expected total GHG benefit of the project's long-term average.*

*Table 32: Net GHG emission reductions or removals*

| Year | Estimated baseline emissions or removals ($tCO_2e$) | Estimated project emissions or removals ($tCO_2e$) | Estimated leakage emissions ($tCO_2e$) | Estimated net GHG emission reductions or removals ($tCO_2e$) |
|---|---|---|---|---|
| 2016 | - | - | - | - |
| 2017 | - | 8,443 | - | 8,443 |
| 2018 | - | 304,628 | - | 304,628 |
| 2019 | - | 277,894 | - | 277,894 |
| 2020 | - | 301,686 | - | 301,686 |
| 2021 | - | 360,508 | - | 360,508 |
| 2022 | - | 973,518 | - | 973,518 |
| 2023 | - | 730,960 | - | 730,960 |
| 2024 | - | - | - | - |

| Year | Estimated baseline emissions or removals ($tCO_2e$) | Estimated project emissions or removals ($tCO_2e$) | Estimated leakage emissions ($tCO_2e$) | Estimated net GHG emission reductions or removals ($tCO_2e$) |
|---|---|---|---|---|
| 2025 | - | - | - | - |
| 2026 | - | - | - | - |
| 2027-2046 | - | - | - | - |
| **Total** | | 2,957,638 | | 2,957,638 |

## 3.3 Monitoring

### 3.3.1 Data and Parameters Available at Validation

| | |
|---|---|
| Data/parameter | Carbon Fraction of dry matter (CF) |
| Data unit | T C t d.m $^{-1}$ |
| Description | Biomass proportion corresponding to carbon. CF is used to convert biomass to carbon. |
| Source of data | IPCC (2006). Good Practice Guidance for LULUCF. Chapter 4. Forest Land. Table 4.3. https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_04_Ch4_Forest_Land.pdf |
| Value applied | 0.47 |
| Justification of choice of data or description of measurement methods and procedures applied | The default value from IPCC. |
| Purpose of data | Estimation of GHG Emission Reductions and Removals. |
| Comments | |

| | |
|---|---|
| Data/parameter | Carbon Fraction of dry matter (CF) |

| | |
|---|---|
| Data unit | T C t d.m $^{-1}$ |
| Description | Biomass proportion corresponding to carbon. CF is used to convert biomass to carbon. |
| Source of data | Local estimations. Supporting information: [Wood_analysis/Carbon]. |
| Value applied | *E. pellita:* 0.509<br>*A. mangium:* 0.513 |
| Justification of choice of data or description of measurement methods and procedures applied | Destructive samples were taken directly from the field. |
| Purpose of data | Estimation of GHG emission reductions and removals |
| Comments | |

| | |
|---|---|
| Data/parameter | Biomass Conversion and Expansion Factor (BCEF) |
| Data unit | Dimensionless |
| Description | Ratio of aboveground oven-dry biomass to oven-dry biomass of the steam |
| Source of data | IPCC (2006). Good Practice Guidance for LULUCF. Table 4.5. https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_04_Ch4_Forest_Land.pdf |
| Value applied | From 0.7 to 4.0. See Table 29. |
| Justification of choice of data or description of measurement methods and procedures applied | The aboveground tree biomass is calculated using the BCEF in connection to the increment in volume data used for both project species. The BCEF value for the Humid Tropical Zone and Natural Forest Type was used. |
| Purpose of data | Estimation of GHG emission reductions and removals |
| Comments | |

| | |
|---|---|
| Data/parameter | Mean annual increment (Iv) |
| Data unit | $m^3/ha/yr^-$ |
| Description | Parameter used to calculate the standing tree volume of each stratum for the age of the plantation |
| Source of data | Yepes et al. (2011). Protocolo para la estimación nacional y subnacional de biomasa-carbono en Colombia. Table 11. Supporting information: [Bibliography/Yepes_IDEAM_2011] |
| Value applied | *E. pellita:* 20.0<br>*A. mangium:* 26.0 |
| Justification of choice of data or description of measurement methods and procedures applied | As the forest plantation has not yet been measured, data reported in the literature was used for the estimation of GHG removals. Once the monitoring is developed, this value will be replaced for the actual diameter of the trees to applying volume and biomass equations. |
| Purpose of data | Estimation of GHG emission reductions and removals |
| Comments | |

| | |
|---|---|
| Data/parameter | Root-shoot ratio (R) |
| Data unit | Dimensionless |
| Description | Ratio of the weight of the roots to the weight of the top of the tree. Used for belowground tree biomass estimation according to the standing aboveground biomass. |
| Source of data | CDM_AR_tool_14. "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities". Page 18 and 20 |
| Value applied | Trees = 0.25<br>Shrubs = 0.40 |
| Justification of choice of data or description of measurement methods and procedures applied | Belowground biomass is usually estimated with this factor, as belowground sampling is destructive and expensive. |

| | |
|---|---|
| Purpose of data | Estimation of GHG emission reductions and removals |
| Comments | |

| | |
|---|---|
| Data/parameter | Dead wood ($DF_{DW}$) |
| Data unit | % |
| Description | Conservative default factor expressing carbon stock in dead wood as a percentage of carbon stock in tree biomass |
| Source of data | CDM_AR_tool_12. "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities", Version 03.0 |
| Value applied | 6% |
| Justification of choice of data or description of measurement methods and procedures applied | Dead wood biomass is usually estimated with this factor, as dead wood sampling is destructive and expensive. |
| Purpose of data | Estimation of GHG emission reductions and removals |
| Comments | |

| | |
|---|---|
| Data/parameter | Litter ($DF_{LI}$) |
| Data unit | % |
| Description | Conservative default factor expressing carbon stock in litter as a percentage of carbon stock in tree biomass |
| Source of data | CDM_AR_tool_12. "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities", Version 03.0 |
| Value applied | 1% |
| Justification of choice of data or description of measurement methods and | Litter biomass is usually estimated with this factor, as litter sampling is destructive and expensive. |

| | |
|---|---|
| procedures applied | |
| Purpose of data | Estimation of GHG emission reductions and removals |
| Comments | |

| | |
|---|---|
| Data/parameter | Factor C to $CO_2$ |
| Data unit | $tCO_2\ tC^{-1}$ ($CO_{2equivalent}$) |
| Description | Factor applied to convert the tree carbon sequestered to tree $CO_2e$ sequestered. |
| Source of data | CDM_AR_tool_12. "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities", Equation 12. Page 14 |
| Value applied | 3.667 |
| Justification of choice of data or description of measurement methods and procedures applied | CDM default value |
| Purpose of data | Estimation of GHG emission reductions and removals |
| Comments | |

### 3.3.2 Data and Parameters Monitored

| | |
|---|---|
| Data/parameter | A |
| Data unit | ha |
| Description | Project area (planted area) |
| Source of data | Survey databases of each polygon that is part of the project |
| Description of measurement methods | Field measurement: the area shall be delineated either on the ground, using GPS or from geo-referenced remote sensing data. |

| | |
|---|---|
| and procedures to be applied | |
| Frequency of monitoring/recording | At the beginning of site preparation, in final establishment of the Project and each time a verification is conducted. |
| Value applied | Ex-post |
| Monitoring equipment | GPS equipment (precision 1-5 m) and Remote Sensing data |
| QA/QC procedures to be applied | Quality control/quality assurance (QA/QC) procedures prescribed under national forest inventory are applied. In the absence of these, QA/QC procedures from published handbooks, or from the IPCC GPG LULUCF 2003, are applied. See section 3.3.3.4. |
| Purpose of data | Calculation of project emissions |
| Calculation method | Measurement |
| Comments | |

| | |
|---|---|
| Data/parameter | $A_i$ |
| Data unit | Ha |
| Description | Area of stratum i |
| Source of data | Monitoring of stratum and stand boundaries is done employing Geographical Information Systems (GIS) allowing the integration of data from different sources (including GPS coordinates and remote sensing data). |
| Description of measurement methods and procedures to be applied | Field measurement: the area shall be delineated either on the ground using GPS or from geo-referenced remote sensing data. |
| Frequency of monitoring/recording | Each time a verification is conducted |
| Value applied | Ex-post |
| Monitoring equipment | GPS equipment (precision 1-5 m) and remote sensing data |

| | |
|---|---|
| QA/QC procedures to be applied | QA/QC procedures prescribed under national forest inventory are applied. In the absence of these, QA/QC procedures from published handbooks or the IPCC GPG LULUCF 2003 are applied. Calculation of project emissions |
| Purpose of data | Calculation of project emissions |
| Calculation method | Measurement |
| Comments | The stratification for ex-post estimations is based on the actual implementation of the project planting/management plan. It may even be necessary to evaluate the possibility of re-stratification of the project boundary according to the development of the stand models, as it would enable the merging of several strata to optimize the costs and improve the outcomes in forest inventories. |

| | |
|---|---|
| Data/parameter | $A_{p.i}$ |
| Data unit | $m^2$ |
| Description | Area of sample plot in stratum *i* |
| Source of data | Field measurement |
| Description of measurement methods and procedures to be applied | Standard operating procedures (SOPs) prescribed under the national forest inventory are applied. In the absence of these, SOPs from published handbooks or from the IPCC GPG LULUCF 2003 are applied. See the description for the establishment of permanent and temporary plots in section 3.3.3.2.2. |
| Frequency of monitoring/recording | Each time a verification is conducted |
| Value applied | Ex-post |
| Monitoring equipment | Tape measure and GPS |
| QA/QC procedures to be applied | QA/QC procedures prescribed under the national forest inventory are applied. In the absence of these, QA/QC procedures from published handbooks or from the IPCC GPG LULUCF 2003 are applied. |
| Purpose of data | Calculation of project emissions |
| Calculation method | |

| | |
|---|---|
| Comments | Sample plot location is registered with a GPS and marked on the Project map. See the description for the establishment of permanent and temporary plots in section 3.3.3.2.2. |

| | |
|---|---|
| Data / Parameter | N |
| Data unit | Dimensionless |
| Description | Number of plots to be established in the project area |
| Source of data | Estimation |
| Description of measurement methods and procedures to be applied | This value will be estimated based on a pre-sampling developed in the project area before monitoring. |
| Frequency of monitoring/recording | Each time a verification is conducted |
| Value applied | Ex-post |
| Monitoring equipment | |
| QA/QC procedures to be applied | QA/QC procedures prescribed under national forest inventory are applied. |
| Purpose of data | Estimate the number of plots needed for complying with a sampling error less than 15% |
| Calculation method | See section 3.3.3.1.3 |
| Comments | |

| | |
|---|---|
| Data/parameter | $n_i$ |
| Data unit | Dimensionless |
| Description | Number of plots to be established in each stratum |
| Source of data | Estimation |

| | |
|---|---|
| Description of measurement methods and procedures to be applied | This value will be estimated using the total number of plots and the area of each stratum. |
| Frequency of monitoring/recording | Each time a verification is conducted |
| Value applied | Ex-post |
| Monitoring equipment | |
| QA/QC procedures to be applied | QA/QC procedures prescribed under national forest inventory are applied. |
| Purpose of data | Estimation of the number of plots needed for each stratum for complying with a sampling error less than 15% |
| Calculation method | See section 3.3.3.1.3 |
| Comments | |

| | |
|---|---|
| Data/parameter | Plot location |
| Data unit | Latitude/longitude |
| Description | Localization for each sampling plot |
| Source of data | Data field sampling |
| Description of measurement methods and procedures to be applied | Measured with GPS |
| Frequency of monitoring/recording | Each time a verification is conducted |
| Value applied | Ex-post |
| Monitoring equipment | GPS |

| | |
|---|---|
| QA/QC procedures to be applied | QA/QC procedures prescribed under national forest inventory are applied. In the absence of these, QA/QC procedures from published handbooks or from IPCC GPG LULUCF 2003 are applied. |
| Purpose of data | Calculation of project emissions |
| Calculation method | See section 3.3.3.1.3 |
| Comments | The sample plot location is registered with a GPS and marked on the project map. |

| | |
|---|---|
| Data/parameter | DBH |
| Data unit | centimeter |
| Description | Diameter at breast height of the trees |
| Source of data | Field measurements in sample plots |
| Description of measurement methods and procedures to be applied | Typically measured 1.3 m aboveground. Measure all the trees above some minimum DBH in the permanent sample plots that result from the project activity. The measurement will be carried out with the use of a digital caliper.[78] |
| Frequency of monitoring/recording | Each time a verification is conducted |
| Value applied | Ex-post |
| Monitoring equipment | Digital caliper |
| QA/QC procedures to be applied | Persons involving in the field measurement work should be fully trained in field data collection. Field measurements shall be checked by a qualified person to correct any errors in techniques. |
| Purpose of data | Calculation of project emissions |
| Calculation method | |

[78] Supporting information: [Forest_Inventory_Protocols/Uso de equipos de medición forestal]

| | |
|---|---|
| Comments | Section 3.3.3.2.3 provides the detailed procedures to be applied. |

| | |
|---|---|
| Data/parameter | H |
| Data unit | meter |
| Description | Total height of trees |
| Source of data | Field measurements in sample plots |
| Description of measurement methods and procedures to be applied | Measure all the trees height in the permanent sample plots that result in the Project activity. Height measurements will be taken with a digital hypsometer.[49] |
| Frequency of monitoring/recording | Each time a verification is conducted |
| Value applied | Ex-post |
| Monitoring equipment | Digital hypsometer |
| QA/QC procedures to be applied | Persons involved in the field measurement work should be fully trained in field data collection. Field measurements shall be checked by a qualified person to correct any errors in techniques. |
| Purpose of data | Calculation of project emissions. |
| Calculation method | See section 3.3.3 |
| Comments | Section 3.3.3.2.3 provides the detailed procedures to be applied. |

| | |
|---|---|
| Data/parameter | T |
| Data unit | Year |
| Description | Period elapsed between two successive estimations of carbon stock in trees and shrubs |
| Source of data | Verification records |

| | |
|---|---|
| Description of measurement methods and procedures to be applied | See section 3.3.3 |
| Frequency of monitoring/recording | Each time a verification is conducted |
| Value applied | Ex-post |
| Monitoring equipment | N/A |
| QA/QC procedures to be applied | N/A |
| Purpose of data | Calculation of project emissions |
| Calculation method | $T= t_2-t_1$ |
| Comments | If the two successive estimations of carbon stock in trees are carried out at different points of time in the year, $t_2$ and $t_1$, (e.g., in the month of April in year $t_1$ and in the month of September in year $t_2$), then a fractional value is assigned to T. |

### 3.3.3 Monitoring Plan

#### *3.3.3.1 Verification of changes in carbon stocks in the pools selected*

This monitoring plan provides guidance on monitoring and standard operational procedures for the ARR project activity. This monitoring plan fulfills the requirement that the project activity should have credible and accurate monitoring procedures in place to enable the evaluation of project performance and verification of the net anthropogenic GHG emission removals.

During the monitoring process, the senior personnel overseeing the project activity will verify the data collected by the field staff. The project entity will implement procedures that will ensure independent verification. Attention will be paid to monitoring and measurement errors. This issue will be addressed through mandatory data checks and the training of field personnel.

Only the aboveground biomass of trees established will be measured. Therefore, only the individual growth of trees will be monitored in permanent plots.

The carbon content below-ground, in dead wood and in litter pools in the project activities will not be monitored. These will be estimated by using default values and suggested methods using the tools “Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities”. The root-shoot ratio (R) will be used for the estimation of belowground biomass given the aboveground measures.

#### 3.3.3.1.1 Stratification

The data sampling will be designed according to the strata defined for the project corresponding to the planting date and the species: *E. pellita* and *A. mangium.* Therefore, the sample plots will be established in each stratum according to its area, planting date, and growth variability (section 3.2.2.1.1 Stratification).

The strata will be monitored to identify different growth patterns inside each stratum that can lead to a unification between strata or an optimally detailed stratification. An annual update of the project area is suggested due to the gradual process of intervention – this allows for permanent control and monitoring of the area. The areas will be periodically monitored, and the process seeks to identify if the stratums defined ex-ante need to be changed. According to changes in the accumulation of carbon during each monitoring period, a new stratification that groups based on biomass growth can be created. The findings from each monitoring period will allow a re-stratification for the next one, within the following parameters:

- age;
- silviculture management; and
- disturbances (plagues, fire, pathologies, etc.)

#### 3.3.3.1.2 Plot type and size

Permanent plots will be used for sampling of carbon stock in all the areas. Permanent plots are considered as more efficient statistically because it permits monitoring of carbon stock changes over time.

The sample plots will be used to take measurements such as tree height (H) and diameter at breast height (DBH). For all trees, the DBH measurement will be taken at a height of 1.3 m. Permanent plots of 500 $m^2$ and 700 $m^2$ will be used for collecting data[79]. Permanent plots will be circular (radius of 12.62 m and 14.92 m) for forest plantations as they are easy to establish and re-measure. All permanent plots shall be properly numbered, geo-referenced, and located within a coverage/layer map present in the project scope.

#### 3.3.3.1.3 Number of plots

The number of plots required for measuring the variation within the project boundary and strata shall be estimated by using the CDM tool "A/R Methodological Tool" for "Calculation of the number of sample plots for measurements within A/R CDM project activities". [80]

The number of plots to be established and measured will be estimated as follows:

$$n = \frac{N * t^2 * (\sum_{i=1}^{I} w_i * s_i)^2}{N * E^2 + t^2 * \sum_{i=1}^{I} w_i * s_i^2}$$

Where:

| | |
|---|---|
| n | Number of sample plots required for estimation of biomass stocks within the project boundary; dimensionless |

[79] Based on statistics analysis, the company is studying and determining the most appropriate sampling methodology for the forest inventories. Supporting information: [Forest_Inventory_Protocols/Plot_size_justification]
[80] CDM "A/R Methodological Tool: Calculation of the number of sample plots for measurements within A/R CDM project activities" available at: https://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-am-tool-03-v2.1.0.pdf

| | |
|---|---|
| I | Total number of strata within the project boundary |
| i | 1, 2, 3, … biomass stock estimation strata within the project boundary |
| N | Total number of possible sample plots within the project boundary (i.e. the sampling space or the population); dimensionless |
| t | Two-sided student's t-value, at infinite degrees of freedom, for the required confidence level; dimensionless |
| wi | Relative weight of the area of stratum i (i.e. the area of the stratum i divided by the project area); dimensionless |
| Si | Estimated standard deviation of biomass stock in stratum i; (t $ha^{-1}$) |
| E | Allowable error (between 10 and 15%) |

The number of plots will be allocated among the strata as per the equation below:

$$n_i = n * \frac{w_i * s_i}{\sum_{i=1}^{I} w_i * s_i}$$

Where:

| | |
|---|---|
| ni | Number of sample plots allocated to stratum i; dimensionless |
| n | Number of sample plots required for estimation of biomass stocks within the project boundary; dimensionless |
| Si | Estimated standard deviation of biomass stock in stratum I (t $ha^{-1}$) |
| I | Total number of strata within the project boundary |
| i | 1, 2, 3, … biomass stock estimation strata within the project boundary |

#### *3.3.3.2 Standard operating procedure SOP*

SOP Establishment of Plots will be used to establish all plots. The plots will be randomly located in each stratum to avoid the subjective choice of plot locations (plot centers, plot reference points, movement of plot centers to more "convenient" positions). To do so, GIS tools will be used to identify the center of the plot on a map for each stratum. The plot locations will be identified with the help of a GPS device in the field. For each plot, the GPS coordinates, administrative location, and stratum code will be recorded and archived. The plots will be established before any monitoring takes place. In the case of exceptional circumstances in permanent plots (e.g., forest fires, uneven growth), additional plots may be laid out.

##### 3.3.3.2.1 Access to plots

The plots will be located with the help of cartography tools. Some reference points that facilitate orientation in the field will also be identified on the maps. Orientation in the field will be facilitated using GPS, where the central points of each plot have been registered as waypoints.

#### 3.3.3.2.2 Establishment of permanent plots

When arriving at the point selected based on GIS methods for the location of the plot, the central tree will be marked (with yellow paint). Additionally, the number (with plaques) and the point of DBH measurement (with paint) of the trees inside the plots will be marked.

The coordinates of plot marker positions are determined using GPS as an average position. An identification number will be assigned to each of the points recorded by the GPS.

#### 3.3.3.2.3 Data collection in the field

All trees over 1.5 cm of DBH will be measured and this data will be recorded (section 3.3.3.2.4). Trees located on the border of the plot will be considered as being inside the plot if at least half of the stem diameter at breast height is with the limit of the plot. Data collected include records of plant species, height, and diameter. Tree diameter and height measurement methods are crucial for the accurate reporting of data.

***Tree DBH measurement***

Tree diameter is measured over bark at breast height, 1.3 m above the ground except in the cases mentioned below. The measurement will be carried out with the use of a digital caliper[81] (Figure 21).

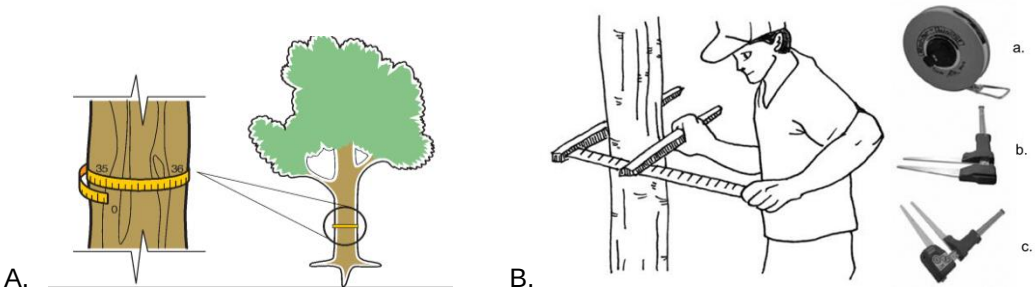



*Figure 21: Illustration of diameter measurement methods (A: diameter tap; B. manual clipper) and possible measurement devices: (a) diameter tap, (b) manual calipers, (c) and digital calipers (Source: Yepes et al., 2011)*

Some precautionary measures must be considered (Figure 22):

- measurement instruments are to be kept in a position that perpendicularly cuts the tree axis at 1.3 m;
- on inclined terrain, DBH tree measurement at 1.3 m is taken from the highest part of terrain;
- for fork trees (trees where the stem or trunk divides), measurements vary depending on the point at which the stem forks. If the fork begins below 1.3 m in height, each stem with the required diameter (≥ 3 cm) will be considered as a tree and will be measured. The diameter measurement of each stem will be taken at 1.3 m height. If the fork begins at 1.3 m or higher, the tree will be counted as a single tree. The diameter measurement is thus carried out below the crotch intersection point, just below the bulge that could influence the DBH;

[81] Supporting information: [Forest_Inventory_Protocols/Uso de equipos de medición forestal]

- Trees with an irregular stem at 1.3 m, like trees with bulges, wound, hollows, and branches, etc. at breast height, are to be measured just above the irregular point, there where the irregular shape does not affect the stem.

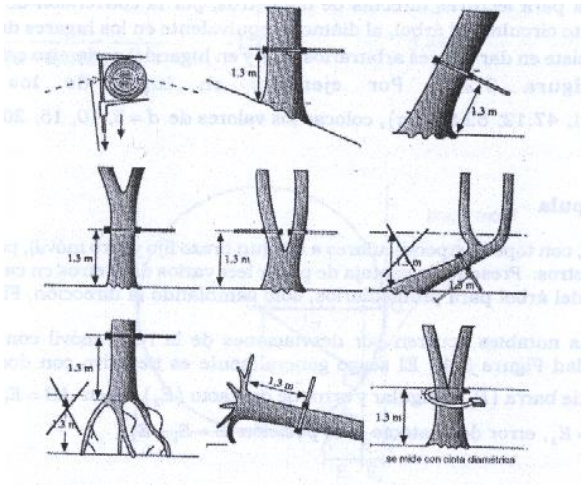



*Figure 22: Correct ways for diameter measurement at breast height (Source: Lema, 2003)*

***Tree height measurement***

Height measurements will be taken with a digital hypsometer[66] – 40% of the trees in each plot will be measured. With the data collected in the first monitoring, a tree height model will be constructed for all the species planted in the project. This model will be used to estimate the tree height for the remaining trees. The model will be updated after each monitoring period with the new data collected. The tree height model will have the following structure:

$$H = aDBH^b$$

Where:

$H$ = Total height (metres)

$DBH$ = Diameter at breast height (cm)

$a, b$ = Parameters to be estimated for the model

#### 3.3.3.2.4 Recording the data

The field data collected will be recorded using the internal memory of the digital caliper and download in accordance with the respective protocol.[82] The data will be collected, calculations, and related outputs recorded, and backup copies made.

[82] Supporting information: [Forest_Inventory_Protocols/Descarga de datos de la forcípula digital]

#### 3.3.3.2.5 Monitoring intervals and frequency

According to the CCB rules, the project will be monitored at least once every five years until the end of the crediting period.

### *3.3.3.3 Analysis of the monitored data and parameters*

The data recorded in the forest inventory (DBH and height) will be the input for growth models that will define the total biomass accumulated for the project at the time of monitoring.[83]

For ex-post estimates, the monitored data will be used in connection with volume and biomass equations appropriated for the species and the project region, always looking for compliance with the AR tool for carbon stock estimation. Besides, dead wood, litter, and soil carbon will be calculated according to the tools "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities" and "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities". The conservative default approach might be selected.

See section 3.2.4 for the ex-ante estimates.

### *3.3.3.4 Procedures for internal auditing and QA/QC*

The implementing organization will be responsible for centralizing the documentation required for project planning and implementation. QA/ QC procedures will be implemented to ensure that net anthropogenic GHG removals by sinks are measured and monitored precisely, credibly, verifiably, and transparently.

The project will follow the IPCC GPG method of using two types of procedures to ensure that the inventory estimates and their contributing data is of high quality. Since a QA/QC plan is fundamental for creating credibility, one that outlines QA/QC activities with a scheduled time frame from preparation to final reporting has been developed. The QA/QC plan describes specific procedures for both assessments. Here are some abstracts from the QA/QC plan:

- SOPs will be established for all procedures, such as GIS analysis, field measurements, data entry, data documentation, and data storage;
- training will be held for all relevant personnel on all data collection and analysis procedures; and
- steps will be taken to control errors in the sampling and data analysis to develop a credible plan for measuring and monitoring carbon stock change in the project context. The same procedures shall be used during the project life to ensure continuity.

#### 3.3.3.4.1 Field data collection

The staff involved in the measurement of carbon pools will be fully trained in field data collection and analysis. SOPs will be developed for each step of the field measuring and followed so that measurements are comparable over time. If different interpretations of the SOPs exist among the field teams, they will be jointly revised to ensure clearer guidance. This procedure will be repeated during the field data collection.

[83] All the data proposed can be updated.

To verify that plots have been installed and the measurements taken correctly, a minimum of 5% of randomly selected plots will be re-measured by a supervisor.

The re-measurement data will be compared with the original measurement data. Any errors found will be corrected and recorded. The level of errors recorded will be calculated and reported using the following equation:

$$Error\ (\%) = \frac{Estimate1 - Estimate2}{Estimate2} * 100$$

The proper entry of data into the data analysis spreadsheets is required to produce reliable carbon estimates. Direct communication between all staff involved in measuring and analyzing data will be used to resolve any apparent anomalies before final analysis of the monitoring data can be completed. If there are any problems with the monitoring plot data that cannot be resolved, the plot will not be used in the analysis.

Due to the long length of the project and the speed at which technology changes, raw data archiving is essential. Data will be archived in several forms and copies of all data will be provided to each project participant. Original copies of the field measurement (electronic files) will be stored in a secure location. Copies of all data analysis and models, the final estimate of the amount of carbon sequestered, any GIS products, and the measuring and monitoring reports will be stored in a dedicated and safe place (preferably offsite). Electronic copies of all data and reports will be updated periodically and converted to any new format required by future software or hardware. An employee involved in the field measurements will be assigned to implement this updating. The data collected shall be archived for a period of at least two years after the end of the last crediting period of the project activity. The main activities to be developed for the QA/QC process are described in Table 33.

*Table 33: Verification and checklist considered to guarantee the quality of the information gathered and its management*

| QC Activity | Procedures |
|---|---|
| Check that assumptions and criteria for the selection of emission factors and other estimation parameters are documented | • Cross-check descriptions of project activities, emission factors, and other estimation parameters with information on source and sink categories and ensure that these are properly recorded and archived |
| Check for transcription errors in data input and reference | • Confirm that bibliographical data references are properly cited in internal documentation<br>• Cross-check a sample of input data (either measurements or parameters used in calculations) for transcription errors |
| Check that removals are calculated correctly | • Redo a representative sample of removal calculations<br>• Selectively mimic complex model calculations with abbreviated calculations to judge relative accuracy |
| Check that parameter and units are correctly recorded and that | • Check that units are properly labeled in calculation sheets<br>• Check that units are correctly carried through from beginning to |

| QC Activity | Procedures |
|---|---|
| appropriate conversion factors are used | end of calculations<br>● Check that conversion factors are correct<br>● Check that temporal and spatial adjustment factors are used correctly |
| Check the integrity of database files | ● Confirm that the appropriate data processing steps are correctly represented in the database<br>● Confirm that data relationships are correctly represented in the database<br>● Ensure that data fields are properly labeled and have the correct design specifications<br>● Ensure that adequate documentation of database and model structure and operation are archived |
| Check that the movement of inventory data among processing steps is correct | ● Check that removal data is correctly reported when preparing summaries<br>● Check that removal data is correctly transcribed between different intermediate products |
| Check that uncertainties in removals are estimated or calculated correctly | ● Check that qualifications, assumptions, and expert judgments are recorded<br>● Check that calculated uncertainties are complete and calculated correctly, following the methodology requirements |
| Undertake review of internal documentation | ● Check that there is detailed internal documentation to support the estimates and to enable reproduction of the emission removal estimates<br>● Check that inventory data, supporting data, and inventory records are archived and stored to facilitate detailed review<br>● Check the integrity of any data archiving arrangements of outside organizations involved in inventory preparation |
| Check time series consistency | ● Check for temporal consistency in time series input data for biomass estimation<br>● Check for consistency in the algorithm/method used for calculations throughout the time series |
| Undertake completeness checks | ● Confirm that estimates are reported for all years<br>● Check that known data gaps that may result in incomplete emissions estimates are documented and treated in a conservative way |
| Compare estimates to previous estimates | ● Current inventory estimates should be compared to previous estimates, if available. If there are significant changes or departures from expected trends, re-check estimates and explain the difference. |

#### 3.3.3.4.2 Verification of project emissions

The project will quantify and monitor the non-CO2 GHG emissions resulting from the occurrence of forest fire within the project boundary – the accumulated area affected by such fires in a year is ≥ 5% of the project area. These events will be monitored, and the affected area will be recorded.

Emission of non-$CO_2$ GHG resulting from the loss of aboveground tree biomass due to fire will be calculated in each verification period by using the aboveground biomass in trees of relevant strata calculated in the previous verification and the default values for the combustion factor, the emission factors, and the global warming potential.

### 3.3.4 Dissemination of Monitoring Plan and Results (CL4.2)

Monitoring Plans and all documents and information about the results of the monitoring and verification of this project will be published in the Verra platforms, as usual.

Additionally, the project owners will prepare summaries of the monitoring plan and results to be communicated to the communities and other stakeholders. Please refer to section 2.3.2 “Dissemination of Summary Project Documents” for more detail PD dissemination with communities and workers.

## 3.4 Optional Criterion: Climate Change Adaptation Benefits

The project does not seek to be validated to the Gold Level for climate change adaptation benefits.

### 3.4.1 Regional Climate Change Scenarios (GL1.1)

The project does not seek to be validated to the Gold Level for climate change adaptation benefits.

### 3.4.2 Climate Change Impacts (GL1.2)

The project does not seek to be validated to the Gold Level for climate change adaptation benefits.

### 3.4.3 Measures Needed and Designed for Adaptation (GL1.3)

The project does not seek to be validated to the Gold Level for climate change adaptation benefits.

# 4 COMMUNITY

## 4.1 Without-Project Community Scenario

### 4.1.1 Descriptions of Communities at Project Start (CM1.1)

The information provided in this section is part of the information presented by the municipal mayor's office in its government plan for 2016-2019 (Alcaldía de Puerto Carreño, 2016). In addition, it includes information on the results of the socio-economic baseline study carried out by FFC during 2017, which presents accurate information of Venturosa and Aceitico settlements.

#### 4.1.1.1 Venturosa

By 2017 Venturosa had an estimated of 235 inhabitants, 70% of whom were men and 30% women, and made up of 48 families. The predominant composition of the population is peasant and indigenous, since the indigenous community Morichalito is located near the town.

Venturosa has a young population structure. 31% of the total population is between the ages of 0 and 12, while those over 65 make up 13% of the population.

The population dynamics of Venturosa correspond to what is happening at the national level. The migratory processes resulting from the dynamics of the armed conflict, drug trafficking, the search for better living conditions, the development of some companies and the crisis in Venezuela are, among others, determining factors in the current social composition. In the last year, two families from Casanare (Colombia), two from Venezuela and one from Cumaribo (Vichada, Colombia) have entered the area.

The UBN rates in the community are high, demonstrated by the difficult conditions of access to public services such as drinking water and reliable electricity, the conditions of the health care center, and the limited supply of jobs and education. At the departmental and municipal level, the UBN figures for this population are unknown.

**Cultural references**

The traditional festivities through which we seek to recover and strengthen cultural manifestations in Venturosa are the "Festival del Trompo y la Saranda", celebrated in Holy Week, and the "Fiestas Patronales de la Soga", celebrated every second week of December. Other important dates and celebrations are: Women's Day (March 8), Mother's Day (second Sunday of May), Tree Day (April 29), Halloween (October 31) and Christmas (December 24).

Among the activities that generate cohesion and community gatherings are: the indoor soccer sports championship, the *minitejo*[84] championship and the clean-up days. The predominant religions in the community are Catholic and Evangelical Christianity, each with its own church.

**Use of natural resources**

The community settled in Venturosa makes use of natural resources, seeking to supply and satisfy its immediate needs. As is the case at the municipal, departmental and national level, there are no programs for the use and conservation of their resources. Daily practices, such as the burning of garbage, cooking with firewood and hunting of animals, produce imbalances in the ecosystems.

Within the community development plan, management of environmental compensation was requested by foresters with land near the settlement. These compensations should be oriented towards the reforestation and recovery of the water sources with trees. (Alcaldía de Puerto Carreño, 2016)[85].

[84] a traditional throwing sport in Colombia. It is characteristic for its use of small targets containing gunpowder, which explode on impact.
[85] http://www.puertocarreno-vichada.gov.co/Transparencia/InformesYRendiciondeCuentas/PLAN%20DE%20DESARROLLO%20PUERTO%20CARRE%C3%91O%20SOMOS%20TODOS%202016%20-%202019.pdf

**Utilities**

Aqueduct service: the inhabitants of Venturosa do not have access to aqueduct systems from the municipality; the water is acquired from the Venturosa pipe and is distributed through a communal aqueduct to 37 of the 48 homes that make up the population center; that is, 77% of homes have access to this service. This water is not treated, and is usually used for human consumption, domestic and productive activities. The families that do not have access to the aqueduct obtain water from deep wells or cisterns located on their property or with motor pumps in streams near the houses, such as the Joropo stream.

Sewage service: in the town center houses are not connected to any sewage system; in both the rural area and in the town center inhabitants generally use a toilet connected to a septic tank, disposing of sewage in septic tanks or, where there are no such tanks, in open fields.

Electrical energy and telecommunications: the electrical energy service is provided by a power plant supplied by the municipality. This service is generally available from 17:00 to 21:00 (four hours a day), although it is sometimes in operation only for three hours. According to the inhabitants, the charge for this service is high: COP 40,000 per month for those who have some kind of business, COP 20,000 for homes and COP 10,000 for those who use only one light bulb. Due to the scarcity of this service, some villagers meet the need with the use of diesel plants and solar cells.

As for telecommunications, inhabitants do not have access to a landline; there is only a mobile service, with the operators TIGO, Avantel and Claro providing the best signal in the area. In the town center they can access the internet at a digital kiosk between 15:00 and 18:00. This service is not available in the farms. They listen to few radio stations, and it is not easy to get a signal from these.

Solid waste collection service: there is no solid waste management in the community; most solid waste is burned, and some families bury it. The residents of Venturosa use propane gas, electricity, and firewood to cook food. Some people recycle beer cans, which are then transported to Puerto Carreño.

**Education**

The La Conquista boarding school is in Aceitico Village (Figure 23). Students have difficulties with continuity of education, since, while they must study at the Aceitico site up to the ninth grade then complete their secondary education at the municipal seat of Puerto Carreño (a six-hour drive), excluding most families because child support at these sites is expensive.

*Figure 23: La Conquista Boarding School.*
(Source: *Álvarez-Cortés et al., 2017)*

There are five professionals in Venturosa, such as environmental engineers, lawyers and doctors. However, these people live outside the settlement, as they have no opportunities to exercise their professions there. Most of the adults in the Venturosa have completed primary education, and some are validating the high school.

The community considered the school's infrastructure is good. There are currently 81 students; this has decreased from 118 at the beginning of 2017 due mainly to a high drop-out rate among indigenous students. Efforts were made to enable this population to attend, with 20 bicycles supplied to indigenous children. However, it is difficult for this population to continue to study in one place since they tend to move continually. A major reason given for students leaving was that they do not have school supplies to do their homework. Moreover, the children speak their native language rather than Spanish, and the school does not cater for this.

**Health**

In terms of health, there is a health center in the settlement, staffed by an auxiliary nurse, with a supply of medicines every three months (supported by FFC). A doctor and dentist attend are available once a month through the town's collective intervention plan. Health problems they encounter in the child population include flu, and stomach diseases due to consumption of contaminated water. With the adult population they typically attend to dengue, flu, fevers, viruses, hypertension, kidney and gall bladder diseases (isolated cases).

With respect to recreation spaces, the town has sports facilities located in the school; there are a soccer field and a *manga de coleo*[86], so they hold indoor soccer championships and *minitejo* competitions among the inhabitants. In addition, in the summer season, they use the beaches of the Meta River.

[86] Straight track up to 350 m long and 12 m wide where Coleo is performed, an autochthonous sport that consists of knocking down a bull with the hand and from a horse that is chasing it.

*Figure 24: Health Center and Community Room in Venturosa.*
(Source: *Álvarez-Cortés et al., 2017)*

**Housing**

Based on the information gathered in the nine case studies for this settlement, it was found that the homes have been built in wood and concrete. For the floors they use cement, the roofs are usually zinc and moriche palm tiles, to a lesser extent fiber cement tiles. Inside, they usually have a dining room, one or two bedrooms, and a bathroom connected to a septic tank; some also have a cellar. The most frequent defects are humidity and wear and tear. There are 48 houses and 22 properties in Venturosa.

*Figure 25: Streets and houses of the Venturosa*
(Source: *Álvarez-Cortés et al., 2017)*

**Access routes**

The inhabitants of Venturosa have two means of access to the settlement, route 4015 (95.76 km road between Gaucacias in Santa Rosalia and Puerto Carreño). Although this road is national, it is mainly made of gravel and can be used only in the summer season, since it becomes unpassable in rainy weather. 10.32% of the Puerto Carreño-Juriepe road, which links up to Venturosa, is paved; that is, 89.68% is unpaved, even though it is a national road. Invias began studies in 2016 for the construction of the new road corridor that would connect the departments of Vichada and Meta.

In the rainy season, inhabitants cross the waters of the Meta River to go to Puerto Carreño. There are two companies that provide this service from Puerto Carreño to Puerto Gaitán and vice versa, with a stop at

the Venturosa pier (Transporte Fluvial El Boral S.A.S. and Transporte Fluvial Oriente), at a cost of COP 80,000 one way to Puerto Carreño. Close to the town center there is a runway for the use of small planes. According to the inhabitants, this was made and used by drug traffickers; it is currently not used.

*Figure 26: River transport on the Meta river*
*(Source: Álvarez-Cortés et al., 2017)*

In Venturosa, the villagers have a basic economic dynamic, depending on the income of the families. They have five shops, a hotel, a restaurant, an entertainment venue and a butcher's shop. The inhabitants usually buy from the bongos (local canoes) that come every week, stopping at the pier of Venturosa, competing with the shops in the town center. The nearest municipality is Puerto Carreño, a six-hour drive away. Since transportation costs are high, inhabitants organize visits to the municipality only when this is extremely necessary.

#### *4.1.1.2 Morichalito Indigenous Community (located in Venturosa)*

Their forms of settlement were formerly in accordance with their nomadic customs. However, the processes of colonization and, in the last 30 years, the dynamics of the country's internal armed conflict have profoundly modified their way of inhabiting the territory.

By 1990, the indigeous families living in the area had to be forcibly displaced due to harassment and threats by the armed groups present. From then until 2015, they settled in the Caño Mochuelo reservation located in the department of Casanare. According to the community, two families managed to survive the dynamics of violence, which allowed the rest of the community to return by 2016.

However, this process of return has not received adequate state support to ensure the rights of the indigenous community. On the contrary, various social problems have been unleashed in Venturosa, related to theft and begging, to which the indigenous population is forced to resort to ensure their survival and quality of life in the face of scarce resources.

**Language**

Today, the whole community speaks their indigeouns language, from children to adults. It is also recorded that about 20% of the community speaks Spanish as a second language.

**Demographics**

The community consists of an estimated 28 families and 121 inhabitants. 21.4% of the population are children under 12 years, 7.4% are between 13 and 18 years, and 3% over 65 years. For the year 2016, three births were registered, for 2017 six were reported, four boys and two girls. Some of these births occurred in Puerto Carreño, while others were carried out in the community by midwives. The deaths recorded were a newborn baby girl in 2016 and an elderly person in 2017.

Basic needs are completely unmet in the community. There is no access to drinking water, electricity, bathroom and shower facilities or garbage disposal. The houses are built with moriche palm roofs and canvas walls that last approximately five years. Hammocks are used for rest, although according to the community, the number of hammocks and bednets is insufficient. The water is taken from a pipe called Morichalito, which dries up in the summer, when the community has to resort to the Meta River for its water supply.

**Health**

The inhabitants make use of traditional medicine, based on medicinal plants that they themselves cultivate or that are already in the territory. There are four traditional doctors, who work on both spiritual and physical health.

Morbidity is mostly caused by stomach infections due to the consumption of undrinkable water; some children show characteristic features of malnutrition (low height and ‘flag sign’ hair discoloration). In the community, there is no equipment to attend a health emergency.

**Education**

The community does not currently have its own education system. The school-age population attends the local "La Conquista" educational institution, which offers education up to fifth grade. For secondary education, the nearest school is in Aceitico, and for other complementary studies it is necessary to travel four hours to Puerto Carreño. The community has requested a bilingual teacher to attend to the (18) school-age children.

**Culture, uses and customs**

The main character in the ritual and spiritual life is the shaman or so-called traditional doctor, who begins the training from the age of nine. The most important medicinal plant is the yopo; this is used in celebrations and rituals alongside other hallucinogenic plants as well as tobacco. In the community young people are allowed to marry from the age of 15.

The traditional celebration of the community is the "Rezo del Pescado", through which they pay homage to a woman’s first period, preparing her for adult life. Other important festivities are birthdays and weddings.

**Economy**

The economic activities engaged in by the inhabitants of Morichalito are mainly for subsistence. The cultivation of yucca, plantain, corn, pineapple, yam, sweet potato, and squash is mostly for self-consumption, with a small percentage is taken for sale in the town center of Venturosa. This activity is predominantly carried out by men. Women weave backpacks in cassava and manioc, offering them for sale to visitors to the community. It is important to note that there are very few people who travel and that the community has not been able to market its textiles effectively and receive a price reflective of their commercial and cultural value. Fishing and hunting are also activities carried out in the community. They fish mainly on the Meta River and consume species such as piranha, catfish and zaino.

**Socio-Cultural Organization**

The political and social organization within the settlement is made up of a governor, a male and female captain, and 12 sheriffs. The organizations with which they have contact are: UMATA, which provided assistance for the planting of plantains, and FFC, which provided inputs for the planting of cassava and wood for the construction of a community meeting space.

**Utilities**

In Venturosa there is no access to aqueduct systems provided by the municipality; inhabitants therefore acquire water from the school's pipe, which is distributed through a communal aqueduct to 37 of the 48 homes that make up the town center, i.e. 77% of homes have access to this service. This water is not treated, and is usually used for human consumption, domestic and productive activities. The families that do not have access to the aqueduct obtain water from deep wells or cisterns located on their property or with motor pumps in pipes near the houses, such as the Joropo pipe.

**Use of natural resources**

The water is taken from the Morichalito stream, which dries up in the summer, leaving the community without water. They hunt, mainly capybara, and fish for piranha and catfish. Additionally, they burn beehives to obtain honey. They cook with firewood and extract palm and wood for the construction of houses.

#### *4.1.1.3 Aceitico*

In 2017, the Aceitico was populated by an estimated 168 inhabitants. Between 2014 and 2015, a total population of 305 people was registered, a decrease of 48%; this situation, according to the inhabitants, is due to the few work and educational opportunities in the territory. In addition, when children reach the ninth grade, their parents must transfer them to other educational institutions to continue their studies in Puerto Carreño, the municipality of La Primavera or the Department of Meta.

Of the 41 families that are reported, 73% live in the town center and 27% are scattered throughout the rural area. 54% of the adult population is male and 46% female. The population structure of Aceitico is young, with 50% of its inhabitants between 0 and 17 years old, while 7% are over 65.

The poor condition of the access roads, the five hours of daily electricity, three hours of daily water service, lack of a garbage collection service, difficult access to internet and houses built with canvas and bahareque walls and palm and zinc roofs, show that the community located in the Aceitico has a high UBN percentage.

**Historical references and predominant structures**

The dynamics of population settlement in Aceitico are part of the national logic. The armed conflict, the search for a better quality of life, forced displacement, and the economy surrounding drug trafficking, among other factors, have been determining factors in the social configuration of Aceitico. By 1970, the first families had arrived from the departments of Arauca, Casanare and Boyacá. Later, in 1975, the Communal Action Board was created and two years later the health care center was founded.

There is no exact record of the school's foundation and construction; however, it is reported that by the early 1980s the educational institution was already operating as a boarding school in the headquarters built on the slopes of the Meta River. By then, the school gave rise to the settlement of new inhabitants. By the end of the 1990s, the sixteenth front of the Revolutionary Armed Forces of Colombia (FARC) sporadically moved in.

In 2003, Aceitico ceased to be a village attached to the town of Murillo and was created as *Inspección de Policía.* As a result, and in response to the possible arrival of a displaced population for the armed conflict in the country, in 2004 a process of clarification and definition of territorial limits was initiated by the farmers who live in the area.

For 2011, the community was highly impacted by the arrival of Indupalma, a company that invests in oil palm and rubber crops. Around it, a collection of 42 houses was built, designed for 1400 workers, and the boarding school was moved from the bank of the Meta River to the start of the town center along the road near the houses. The community's expectations grew with regard to employment and improvement of the quality of life, and new settlers arrived. However, three years later, Indupalma's project failed, and the company was forced to withdraw from the area, leaving the houses it had built abandoned. As a result, many inhabitants of Aceitico left in search of employment and better opportunities in Puerto Carreño.

**Cultural references**

The main festival and traditional gathering of the community based in the Aceitico is the Chigüiro del rio Meta (Capybara of the river Meta) festival, held over two days in October, during which folk competitions are held. Other dates of celebration are: July 20, a festival organized by the educational institution; Mother's Day, Women's Day and Father's Day.

As leisure and recreation activities in collective spaces, football and billiards games are played, mostly by men. Church attendance is also mentioned in this regard.

**Use of natural resources**

The Aceitico community’s use of its natural resources cannot be separated from the social and cultural conditions that have shaped it. The lack of public services, access and communication channels, and in general the community’s unsatisfied basic needs create a subsistence relationship with the environment, causing an inappropriate use of resources.

In this regard, the requests made by the community in the current development plan are:

- "a site to dispose of solid waste, as well as a plan to manage it and prevent it from ending up in water sources such as the target river";
- "support for planting trees in public areas, training in recycling, reuse or proper disposal of solid waste in conjunction with the community"; and
- "support to recover the protection areas of streams and natural springs".

**Utilities**

Aqueduct service: the inhabitants of Aceitico do not have access to aqueduct systems from the municipality. They acquire water from a deep well by means of a pump, and store it in an elevated tank located at the entrance of the town center; this tank is in a poor condition. Water is then distributed through a communal aqueduct to 42 houses of the 52 houses in the town centre, i.e. 81% of houses. It is used for domestic consumption and food preparation. There is water disposal for only three hours a day, i.e. only 12.5% of the time.

Sewerage service: in the town center there is no sewerage system. In the houses in the rural area as well as in the town center they usually use a toilet connected to a septic tank or in open fields.

Electrical energy and telecommunications: the electrical energy service in the town center is provided by a power plant, and is available for five hours a day (from 17:00 to 22:00), i.e. 21% of the time. Given the minimal availability of this service, inhabitants have used solar cells to provide additional electricity, especially on the farms.

As for telecommunications, they do not have access to a landline. There is only a mobile service, with the operators TIGO, Avantel and Claro providing the best signal in the area. In the town center there is no access to the internet; in the farms, the communal president has access to internet, although this service is scarce.

Solid waste collection service: there is no solid waste management in the community; most is burned or buried. Organic elements such as husks are buried or watered in the pastures to decompose, while inorganic elements are burned. The residents of Aceitico use wood, gasoline, propane gas and/or electricity for cooking food, depending on the need and the family's economy.

**Education**

The facilities of the Aceitico Boarding School are located in Aceitico and cater for students up to ninth grade. It has six teachers, two of whom are women, and 91 students. Families are usually mobile, which affects the continuity of students in this institution. The headquarters of the institution are located at the entrance of Aceitico, approximately 2 km away.

*Figure 27: Aceitico Boarding School*
(Source: *Álvarez-Cortés et al., 2017)*

These headquarters were moved to the outskirts of the town; the government approved this transfer as a result of the presence of Indupalma's housing, expecting that the school would serve the children living in these houses. As detailed above, these houses were left unoccupied after the company left the area in 2014.

At present, young people have difficulty in continuing their education. In order to continue with their secondary education, they have to go to the municipal capital of Puerto Carreño (a four- to six-hour journey), in the municipality of La Primavera, or go to the department of Meta, a situation that many families cannot afford, as child support is expensive and income is minimal. 60% of the adult population has completed primary school.

**Health**

In the town center there is a health center attended by an auxiliary nurse, with a minimum supply of medicines. Sometimes medical attention is available through 'medical days' provided by the municipality. There they attend to health problems in the child population such as flu or conjunctivitis outbreaks; with the adult population they attend to the presence of viruses.

According to information collected in the field, cases of drug addiction and micro-trafficking in narcotics are presented at Aceitico, a situation that has not yet been resolved, following the history of the illegal trade in narcotics.

*Figure 28: Health Center Aceitico*
(Source: *Álvarez-Cortés et al., 2017)*

**Social infrastructure**

As for recreation, they have a soccer field in poor condition and a space for volleyball, also with a *manga de coleo* and a small park for children. In summer, the inhabitants usually go for a walk and bathe in the Caño Las Viejas.

**Housing**

In Aceitico there are 52 houses, whose condition was categorized as worn, with predominance of walls in wood, cement and canvas, as well as roofs in zinc and moriche palm. They have dirt floors or floors covered in cement and tiles. The houses in the best condition can have up to four bedrooms and a cellar. The most frequent defects are cracks and wear.

*Figure 29: Housing in the Aceitico*
(Source: *Álvarez-Cortés et al., 2017)*

**Access routes**

The inhabitants of Aceitico have access to a road that connects them from the town center to Route 4015; this is approximately 6 km long and is made of gravel. Along route 4015 they can travel to the municipalities of Puerto Carreño and La Primavera; this road is national; however, it is mostly made of gravel. They described the roads as in poor condition.

*Figure 30: Rural roads*
(Source: *Álvarez-Cortés et al., 2017)*

In the summer, the trip to Puerto Carreño can take up to four hours in a Flota La Macarena bus, costing COP 25,000. They also use private vehicles, motorcycles, and horses. In the town center there is a main street made of gravel, which links to other streets. During the rainy season, they use the waters of the Meta River to go to Puerto Carreño. There are two companies that provide this service from Puerto Carreño to Puerto Gaitán and vice versa, with a stop at the downtown pier.

#### *4.1.1.4 Livestock in the communities of Venturosa and Aceitico*

The predominant economic activity in the area of influence is cattle ranching, with a total of 6,504 head of cattle identified (Álvarez-Cortés, 2017). In Venturosa, a cattle herd of 4,592 animals (on 32 farms) is estimated, with a load of between 8 and 10 hectares per head, assuming 45,000 hectares for the cattle herd, while in Aceitico the cattle inventory is 1,912 heads of cattle (on 31 farms) (Álvarez-Cortés, 2017). Given the characteristics of the territorial units, it is possible to identify the existing model of livestock exploitation. In this model, farms are adjusted to livestock production, in which work is restricted to the owner or manager, who is responsible for hiring day laborers in the area. This system also involves a significant percentage of family labor.

Commercialization of Aceitico and Venturosa's livestock production is carried out through directly negotiation and animals are sold live. The herd is transported by the buyer to Puerto Carreño (Vichada) and Puerto López and Villavicencio (Meta) mainly. The standing cattle costs between COP 750,000 and COP 1,000,000, and the sale is made at the farm to the wholesaler, who goes to the place to buy it at any time of the year. A day's wage in the area of direct influence is COP 35,000.

Nine surveys or case studies were carried out in the territorial units and conducted a bovine inventory for farms in Venturosa and Aceitico. In this inventory, more than 5,300 ha were surveyed, which are used for a cattle population of 1,101 heads, showing underutilization mainly due to the investment costs required to increase the number of heads per farm. Only one farm was reported to have meat and milk production, since the cattle are generally used to supply the meat markets. The gross value of the production of live cattle (without discounting costs) is estimated at more than one billion. Parallel to cattle farming is the raising of smaller species such as poultry and pigs, as well as fishing in the Meta River and in the canals adjacent to the settlement. Muco, Caño Juriepe, and Meta rivers are places for the supply and provisioning of these ecosystem services and their fishing is used for self-consumption and sometimes for commercialization, especially during the months of August and October, because it is the season for submersion. The drop in water levels leads to fish migrations and gives turtles the possibility of laying their eggs on the beaches of rivers and streams, also allowing the capture of ornamental fish between November and May.

#### *4.1.1.5 Bushmeat consumption in rural communities*

Bushmeat is of fundamental importance for local livelihoods, as it is associated with cultural traditions, income generation and food security of communities (Gómez, 2016). At the regional level, bushmeat is consumed and marketed in commercial chains and destined for restaurants (Gómez, 2016).

In the area of direct influence, this practice was identified as having been carried out by peasants, settlers and indigenous people in rural areas, hunting especially in their own herds, in water sources or in the savannahs. Bushmeat is intended for home consumption due to the variability of flavors of this meat from

animals such as deer, wild pigs, turtles, and capybaras. In general, forestry companies are prohibited from practicing within planted areas, as there has been an increase in sightings in planted forests of animals such as deer, hares and other species, which in many places in Colombia are on the verge of extinction.

The consumption of bush meat is a common activity, involving mainly parents and children, and is carried out using carbines and arrows to access other sources of protein, and as a means of recreation.

#### *4.1.1.6 Agriculture and consumption of local products in Venturosa and Aceitico*

To achieve an approximation of the areas and volumes of production, surveys were conducted with nine owners, and socioeconomic characterization factors applied in the process of collecting primary and municipal information.

The agricultural production model in Venturosa and Aceitico is based on traditional farming methods for mainly self-consumption, using family labour. It is estimated that in the area of direct influence there is a variety of self-consumption crops such as cassava, corn, banana, rice, watermelon, orange, pineapple, papaya, lettuce and tomato to complement the family diet. In the properties identified in the case studies, 17.6 ha are used for planting and 159 tons of food are produced, with cassava and banana being the main products with 95 and 55 tons respectively.

The communities of Venturosa and Aceitico have allocated land especially for livestock and to a lesser extent for planting for self-consumption, due to, among other things, the low quality and management of soils, scarce use of seed banks, high transport costs and difficult access to marketing chains both in rural areas and at the municipal level.

Parallel to land use in agricultural activities, the farms surveyed stated that up to 13.75 ha are set aside in forest conservation areas, mainly on the banks of water sources, with species such as *Caraipa llanorum*, considered endemic to the Orinoco and Vichada river basins, a highly appreciated species for its wood.

#### *4.1.1.7 Commercial activity and services in Venturosa and Aceitico*

There are 13 commercial establishments in the settlements, where retail trade is carried out through shops that supply the communities with everyday items and are managed by family members. In particular, there are initiatives in hotels, restaurants, entertainment venues and butcher shops.

Of the total number of establishments, it was found that the Venturosa has 10 establishments. This situation is marked by the proximity of FFC facilities that, in addition to generating employment in the region, consume goods and services, as well as the arrival of families from Venezuela, Casanare, and Cumaribo, attracted by the employment and study alternatives for children (21 people arrived in 2017). The opposite is true of Aceitico, since its population dynamics have been impacted by people moving away from the area.

Purchase and sale activities are conducted in small stores or commercial units. These have high costs for transporting goods by river in the winter or summer season, which they are forced to transfer to the consumer, making prices significantly higher than the market prices in Puerto Carreño. This situation

creates conflicts in the community, which must resort to the markets in the capital and to the boat traders who move along the Meta River, selling their products at more equitable prices for the final consumer, especially housewives.

Similarly, within the transport infrastructure there are three docks on the Meta River, which are in poor condition. The arrival of boats is exacerbating the deterioration of the riverbank.

#### *4.1.1.8 Labor market in Venturosa and Aceitico*

In the territorial units, the work is organized around the tasks of livestock farming, agriculture and to a lesser extent fishing and own businesses. The men who are part of these communities are commonly engaged in economic activities related to:

1. planting maize in the Meta River valley;
2. working in the reforestation companies;
3. working as employees at the school;
4. working as employees on livestock farms;
5. fishing; and
6. producing cheese for sale in the community or in Puerto Carreño.

The day's wage at the Aceitico is COP 25,000 a day. Women in this territorial unit work as housewives (90%) and the remaining 10% work as employees at the school or with the company Nutricodes, which provides food for the school's boarding students.

In the Venturosa, it is mostly men who are involved in livestock, fishing, work in forestry companies and in their own businesses such as shops or commercial and service establishments. Women, on the other hand, support their husbands at home or in formal jobs in the Orinoquia Forestry Company where there are approximately 10 women working. Men are mainly responsible for livestock work, providing their services for a daily wage, which is paid in amounts ranging from COP 25,000 to COP 35,000 per working day, this being an informal job that does not represent continuity over time.

In Aceitico, it is estimated that 42% of the population (66 people) is of working age (between 18 and 65), while in Venturosa this figure is higher, with 84 people of working age (see Table 34). The majority of this labour force has received a primary education and in Venturosa some people are validating their secondary education.

*Table 34: Total working-age population*

| *Inspección de Policía* | Number of people aged 18 to 65 |
|---|---|
| Aceitico | 66 |
| Venturosa | 84 |

| | |
|---|---|
| *Inspección de Policía* | Number of people aged 18 to 65 |
| Total | 150 |

(Source: *Álvarez-Cortés et al., 2017)*

During the meetings in the territorial units, concern was expressed about access to information about the calls for both professional and untrained labor, and people also stated that the plantations could generate an increase in inward migration that would increase the population in the production stages. However, they considered that this situation would be beneficial, since currently there is a need for new initiatives and undertakings that could improve the supply of activities, as well as goods and services at the rural level.

### 4.1.2 Interactions between Communities and Community Groups (CM1.1)

Currently there is no interaction or formal agreements between the actors in the project's area of influence. However, these may occur in the long term.

According to the information collected in the field, the community of Venturosa is in talks with the Puerto Carreño Municipal Government to resolve the completion of the construction of a water well that benefits the entire community and that was left unfinished.

### 4.1.3 High Conservation Values (CM1.2)

Sites of high conservation value in Colombia are generally related to indigenous communities and collective territories; although in the municipality of Puerto Carreño there are six indigenous reserves declared by the Ministry of Interior, in the project area no indigenous reserves have yet been declared. Therefore, there are no high conservation values related with indigenous community in the first instance area.

On the other hand, Venturosa cemetery was identified as a High Social Value area for the La Venturosa community (

Figure *31*). Therefore, FFC registered the cemetery as a special interest area (ASI) with the reference number ASI-001 which is be described in section 5.1.2.

*Figure 31: High Conservation Values - Cemetery*

### 4.1.4 Without-Project Scenario: Community (CM1.3)

In the scenario without the project, the main economic activity in the area would be limited to cattle ranching, an activity that does not generate enough employment opportunities or profits for the community given the remoteness of the villages to the urban area of Puerto Carreño. In this sense, the opportunities for improving the community's living conditions would be few, as would the opportunities for economic growth.

When economic opportunities are limited, the population tends to move to more prosperous places and this generates more economic and housing instability, triggering "the fragmentation of the home, the loss of cultural identity, a serious impact on the quality of life, low access to the labor market and, in general, the precarious economic conditions to which displaced persons are subjected when they settle in urban centers" (Botón-Gómez *et al.,* 2013).

Employment opportunities in the area are mostly informal. This "causes a high level of non-compliance with the minimum wage standard and for this reason the income received by rural inhabitants is very low" (Fedesarrollo, 2017). Jobs are not offered in good working conditions: workers are usually hired without being affiliated to any social security system. They are short term and intermittent jobs, in which there is no defined and constant minimum wage, but workers are paid by the day, generating economic instability in families. This type of work generates a deterioration in people's health.

According to Fedesarrollo (2017), "the predominant form of employment in the rural sector is self-employment, which accounts for just over half of employment in these areas (about 51%), followed by the positions of private employee (18%) and day laborer (12%)", which means that half of rural workers are not linked to the labor security system, i.e. they may be receiving medical care under the subsidized regime, but are not contributing to the pension system, nor do they have job security.

Additionally, educational conditions are reduced for the young population of the area, preventing the formation of human capital and motivating the displacement of the young population to areas with better educational and work opportunities.

## 4.2 Net Positive Community Impacts

### 4.2.1 Expected Community Impacts (CM2.1)

The baseline study conducted in 2017 identified the impacts of the project. The technique used for this purpose was a dream map, through which the communities visualized the future of their population in 30 years considering the benefits that the project brings to the territory.

The evaluation of the positive and negative impacts resulting from the community's project activities is based on the Sustainable Livelihoods Approach (SLA) recommended by the Biodiversity and Social Impact Assessment.

*Table 35: Expected community impacts*

| | |
|---|---|
| Community Group | Venturosa/Aceitico |
| Impact(s) | Increased employment opportunities |
| Type of Benefit/Cost/Risk | Predicted/Direct/Benefit |
| Change in Well-being | New employment opportunities with social benefits.<br>Dynamization of the economy.<br>Greater employment opportunities for women. |

| | |
|---|---|
| Community Group | Venturosa/Aceitico |
| Impact(s) | Increased perception/recognition of the value of forest resources |
| Type of Benefit/Cost/Risk | Predicted/Direct/Benefit |
| Change in Well-being | The project provides workshops about the protection of the territory's natural resources, especially the forests.<br><br>It also provides trainings on grassland fire control. |

| | |
|---|---|
| Community Group | Venturosa/Aceitico |
| Impact(s) | Technical capacity building |
| Type of Benefit/Cost/Risk | Predicted/Direct/Benefit |
| Change in Well-being | Improving skills and know-how in plantation management. |

| | |
|---|---|
| Community Group | Workers |

| | |
|---|---|
| Impact(s) | Improved forest management skills and knowledge |
| Type of Benefit/Cost/Risk | Predicted/Direct/Benefit |
| Change in Well-being | Training according to the activities performed by the worker. |

| | |
|---|---|
| Community Group | Workers |
| Impact(s) | Employability |
| Type of Benefit/Cost/Risk | Predicted/Direct/Benefit |
| Change in Well-being | Formal employment relationship. |

### 4.2.2 Negative Community Impact Mitigation (CM2.2)

At the beginning, the communities perceived the establishment of the plantations as negative for the grassland and plain landscape that predominates in this area of the country. They were concerned about potential adverse impacts on fauna and flora related to the commercial species planted by FFC . However, over time, communities have identified the presence and recurrence of a larger population of fauna in the plantation area compared to previous years.

As a mitigation measure for possible negative effects on fauna, the project carries out management and relocation of fauna found inside the plantation areas and those that represent a risk for the workers.

The community did not identify any impact that could be related to their well-being. There are no high conservation value attributes related to the community in the project area.

### 4.2.3 Net Positive Community Well-Being (CM2.3, GL1.4)

As noted in previous sections (see Section 4.1), living conditions in rural areas are more complex than in urban areas. This scenario becomes much more vulnerable when it comes to territories with difficult access to the population center of the municipality, since support from local government becomes intermittent and fundamental rights such as health and education are violated.

Due to the lack of opportunities in these areas, the population, especially young people, is beginning to move to the cities, leaving behind the activities of the countryside. In this sense, it is important and necessary to generate strategies and new opportunities in these territories.

These forest carbon projects generate positive changes in the community, offering them alternatives for subsistence and improving their level of attachment to the territory. Project activities provide new opportunities for economic support to the community. In this way, the net impact of the project is positive for local communities.

#### 4.2.4 High Conservation Values Protected (CM2.4)

There is no high conservation value associated with the community.

### 4.3 Other Stakeholder Impacts

#### 4.3.1 Impacts on Other Stakeholders (CM3.1)

The local government of Puerto Carreño

The project activities can help to ensure that governmental and non-governmental entities in the municipality pay greater attention and give priority to improving the socio-economic conditions of the villages in the vicinity of the project. In addition to generating potential partnerships for the development of community projects that benefit the communities.

CORPORINOQUIA

The positive impacts on this actor can be indirect and long term, taking into account that the project promotes the care of natural resources and therefore seeks synergies with other entities to initiate research aimed at monitoring wildlife. Therefore, it can be considered that these activities will contribute in some way to the fulfillment of the corporation's mission.

#### 4.3.2 Mitigation of Negative Impacts on Other Stakeholders (CM3.2)

No negative impacts related to other stakeholders have been identified.

#### 4.3.3 Net Impacts on Other Stakeholders (CM3.3)

No negative impacts related to project activities on other stakeholders have been identified and, therefore, there are no impacts on expected welfare. However, there is still a need to monitor the unplanned negative impacts through the communication mechanism.

### 4.4 Community Impact Monitoring

#### 4.4.1 Community Monitoring Plan (CM4.1, CM4.2, GL1.4, GL2.2, GL2.3, GL2.5)

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 36) presented in the monitoring plan will be evaluated at least every five years. In addition, a yearly monitoring frequency is established for each indicator; 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.

*Table 36: Indicators used for assessing the social impact – workers*

| Target | Indicator | Source of verification | Monitoring frequency |
|---|---|---|---|
| Increase job opportunities | By 2020, 50% of the workers employed are from the local territory | Human management reports | Each verification |
| Develop labor skills in workers | By 2020, 100% of the workers received technical training for the development of their work within the FFC | Human management reports | Each verification |
| Labor conditions | By 2020, 100% of FFC workers are trained in risk management | Human management reports | Each verification |
| Occupational safety | By 2020, the accident rate has decreased in relation to the year the project started in 2016 | Human management reports | Each verification |

The main steps proposed in the evaluation are:

1. To collect the information according to the indicators described in the table.
2. To design an execution plan for the activities described in FFC's social management plan.
3. To design means of verification according to the specific case of each indicator (interview-survey).
4. To design the relevant formats for recording information.
5. To systematize the results obtained and evaluate the social contribution of the project by differentiating the benefits and the costs and risks (negative impacts) If necessary, develop a plan to mitigate the negative impacts identified during indicator monitoring.
6. To develop a dissemination plan for the surveillance plan for validation with the community.
7. To report back and verify results with the above-mentioned subgroups of stakeholders

### 4.4.2 Monitoring Plan Dissemination (CM4.3)

To disseminate the monitoring plan with the community, local consultations and briefings will be held to present and validate the plan, and at subsequent meetings the results related to the project's impacts will be presented. In addition, the means already described in Section 2.3.2 and 2.3.5 will be used.

## 4.5 Optional Criterion: Exceptional Community Benefits

The project does not seek to be validated at the Gold Level for exceptional community benefits.

# 5 BIODIVERSITY

## 5.1 Without-Project Biodiversity Scenario

### 5.1.1 Existing Conditions (B1.1)

***Flora***

To obtain an overview of the flora species potentially present in the project area, secondary information was consulted. The project area has an influence on the Meta and Bita river basins, which are characterized by extensive gallery forest ecosystems along the water bodies, alternating with mosaics of savannas, floodable alluvial savannas, pyrophytic savannas, and rocky outcrops of the Guiana Shield (Romero *et al.,* 2017).

According to Trujillo *et al.* (2016), the flora species richness of the Meta and Bita basins accounts for 1,727 species, distributed in 148 families and 667 genera. From the total of the species, 44% correspond to the Meta basin, and 26% to the Bita basin, with 30% of the species shared in both basins (Trujillo *et al.,* 2016).

Other studies (Castro, 2010; Universidad Distrital Francisco José de Caldas, 2017) reported similar findings in terms of number of species in the Puerto Carreño Municipality. Castro (2010) reports a total of 1,010 species, distributed across 129 families, with the Fabaceae, Rubiaceae, Myrtaceae, and Melastomataceae as the most representative ones. In the catalog of Plants and Lichens of Colombia, the reports mentioned a total of 1,166 species grouped into 115 families, with Poaceae, Fabaceae, Melastomataceae, Cyperaceae, and Rubiaceae as the most representative.

Table 37 shows the species of flora reported for the Meta and Bita basin with the most critical conservation status, according to the IUCN, Resolution 0192 of 2014 of the Ministry of Environment and Sustainable Development (MADS), and the red book of plants in Colombia (*Libro rojo de plantas en Colombia*).

*Table 37: Species of flora reported under threat categories.*

| Family | Species | State of conservation | | |
|---|---|---|---|---|
| | | Red List of Threatened Species – IUCN | Red book of plants in Colombia (Cárdenas and Salinas, 2007) | Resolution 0192 – 2014 MADS |
| Annonaceae | *Oxandra espintana (*Spruce ex Benth) | - | CR | - |
| Arecaceae | *Syagrus orinocensis (*Spruce) | - | VU | - |
| Bignoniaceae | *Tabebula orinocensis* | - | DD | - |
| Burseaceae | *Protium unifoliolatum* | - | NT | - |

| | | | | |
|---|---|---|---|---|
| | *Tetragastris mucronata* | - | VU | - |
| Chrysobalanaceae | *Licania pyrifolia* | - | DD | - |
| | *Parinari pachyphylla* | - | - | EN |
| Dichapetalaceae | *Dichapetalum rugosum* | - | - | VU |
| | *Tapura acreana* | - | NT | - |
| Meliaceae | *Cedrela odorata L* | VU | - | EN |
| Myristicaceae | *Virola parvifolia* | VU | - | - |

***Fauna***

To analyze the potential composition of fauna in the region, a review of secondary information including studies, reports, and inventories was performed (Acevedo *et al.,* 2014; Trujillo *et al.,* 2016; Trujillo and Lasso, 2017; Mosquera-Guerra *et al.,* 2018). The focus was the biodiversity in the Vichada Department, with geographic distribution between the riparian forest in the Meta and Bita river basins.

As many as 368 bird species have been recorded in the Vichada Department (Acevedo *et al.,* 2014; Trujillo and Lasso, 2017). For Tuparro National Natural Park, a total of 174 species were registered in the ecosystems of gallery forest, savanna, and "*mata de monte*"[87] (Villarreal and Maldonado, 2007).

Regarding amphibians, a total of 67 species were reported for the Meta and Bita basins and 29 species for Vichada Department (Trujillo *et al.,* 2016; Trujillo and Lasso, 2017). For reptiles, a total of 127 species were reported for the Meta and Bita basins; nevertheless, the reports of the Meta basin included foothill areas, which increase the number of species over the 38 species recorded for the Bita basin (without foothills ecosystems; Trujillo *et al.,* 2016; Trujillo and Lasso, 2017).

In terms of mammals for the basins of Meta and Bita rivers, there are 117 estimated species, mostly represented by bat richness with 63 species (Trujillo *et al.,* 2016). Large and medium mammals account for 39 species, with terrestrial species like jaguar, armadillos, and lowland tapir, and aquatic species like otters, crocodiles and manatees as the most representative. These large and medium mammals are very important due to their function as indicators of ecosystem conservation.

Based on the information collected, the species exposed to some degree of threat are highlighted in Table 38.

*Table 38: Species of fauna reported under threat categories.*

| Trophic guild – behavior | Common name | Species | State of conservation | |
|---|---|---|---|---|
| | | | Red List of Threatened Species – UICN | Resolution 0192 of 2014 MADS |

[87] *Mata de monte* refers to forest islands within the savanna that have tree and shrub components that preserve their own ecological conditions (Arnovis and Chica, 2003). They are located on high, flood-free areas far from water sources. They are considered forest formers as they are not affected by fire and provide areas bird and bats to perch and deposit seeds, thus giving rise to a bush insipient that begins to grow and joins the others until they reach considerable dimensions of up to more than 1,000 ha (Trujillo et al., 2016).

| | | | | |
|---|---|---|---|---|
| Jaguar | Felidae | *Panthera onca* | NT | VU |
| Northern Long-nosed armadillo | Dasypodidae | *Dasypus sabanicola* | NT | - |
| Giant armadillo | Dasypodidae | *Priodontes maximus* | VU | EN |
| White-lipped peccary | Tayassuidae | *Tayassu pecari* | NT | - |
| Giant otter | Mustelidae | *Pteronura brasiliensis* | EN | EN |
| Neotropical otter | Mustelidae | *Lontra longicaudis* | NT | - |
| Lowland tapir | Tapiridae | *Tapirus terrestris* | VU | CR |
| Giant anteater | Myrmecophagidae | *Myrmecophaga tridactyla* | VU | VU |
| South American river turtle | Podocnemidae | *Podocnemis expansa* | CD | CR |
| Yellow-spotted river turtle | Podocnemidae | *Podocnemis unifilis* | VU | CR |
| Orinoco crocodile | Crocodylidae | *Crocodylus intermedius* | CR | CR |
| Orinoco goose | Anatidae | *Oressochen jubatus* | NT | - |
| Festive amazon | Psittacidae | *Amazona festiva* | NT | - |
| Great tinamou | Tinamidae | *Tinamus major* | NT | - |
| Blackish-grey antshrike | Thamnophilidae | *Thamnophilus nigrocinereus* | NT | - |
| Red-billed toucan | Ramphastidae | *Ramphastos tucanus* | VU | - |

***Threats to biodiversity***

For the Orinoquia region in general, the economic system is based on primary and secondary sectors (hunting, fishing, agriculture, and livestock), which means that the productive processes are sustained by the ecosystems (Coporinoquía, 2013). Livestock is the most common livelihood in the Vichada Department, involving approximately 135,000 head of cattle, of which 52% are in La Primavera municipality (Patiño et al., 2007).

While the Orinoquia region counts for 3.7% of the forest in Colombia, its deforestation rate is increasing (Coporinoquía, 2016). The level of ecosystem transformation and the environmental structure of the region have been increasing and changing considerably with the expansion of agro-industry (Coporinoquía, 2016). These activities have been developed without effective supervision from local governments and without the implementation of any planning instruments (Pacheco *et al.,* 2014; Corporinoquía, 2016). Moreover, the Regional Autonomous Corporation of the Orinoquia – Corporinoquia, the environmental authority in charge of doing surveillance and control over the ecosystems present in the Meta and Bita basins, faces challenges in operating in the Department due to financial constraints and the low capacity of staff to cover all of the territory (Pacheco *et al*., 2014).

Regarding the fauna and flora in the region, activities of logging, species trafficking, periodic burning, and loss of habitat has been decimating the abundance of species. Several species were included in threat categories, from vulnerable to endangered as determined by the red books and the CITES[88] listing (Corporinoquia, 2016). In addition, hunting in the Orinoquia region is not only a threat to mammals and reptiles but also to the flora, mostly because flooded areas are reduced in the summer, making it easier for hunters to move. Furthermore, during this period the vegetation is dryer and hunters use this to start fires to force animals out of their burrows, sometimes leading to uncontrollable fires that burn large parts of the savannas (Patiño *et al.,* 2007).

### 5.1.2 High Conservation Values (B1.2)

| High Conservation Value | **Wetland complex of Bita River Basin – Wetland of International Importance under Ramsar Convention** |
|---|---|
| Qualifying Attribute | The wetland complex of the Bita River Basin, with an area of 824,535.77 ha, was declared a RAMSAR site in 2018, becoming the largest such site in Colombia. The Bita River stretches 510 km and spans the municipalities of La Primavera and Puerto Carreño in Vichada Department. The Bita River conserves 95% of its natural coverage, which includes gallery forest alternated with mosaics of savannas, alluvial flooding savannas, and rocky outcrops (Decreto 1235 de 2018[89]). This results in habitat for several species of flora and fauna including jaguar (*Panthera onca)*, giant otter (*Pteronura brasiliensis*), and the South American tapir (*Tapirus terrestris*), among others, which are listed as Vulnerable (VU), Endangered (EN), or Near threatened (NT) according to the IUCN's conservation status.<br><br>The Bita River is also a supplier of ecosystem services, especially those related to food and water supply for human consumption, livestock, agriculture, and the agro-industry (2.5% of the territory is covered by forest plantations and crops). In addition, it has a cultural value for the local communities, who have developed socioeconomic dynamics in the region related to the river (Decreto 1235 de 2018; Trujillo and Lasso, 2017). |
| Focal Area | Bita River Basin (Figure 32) |

[88] Convention on International Trade in Endangered Species of Wild Fauna and Flora
[89] Supporting information: [Bibliography/Decreto 1235 de 2018].

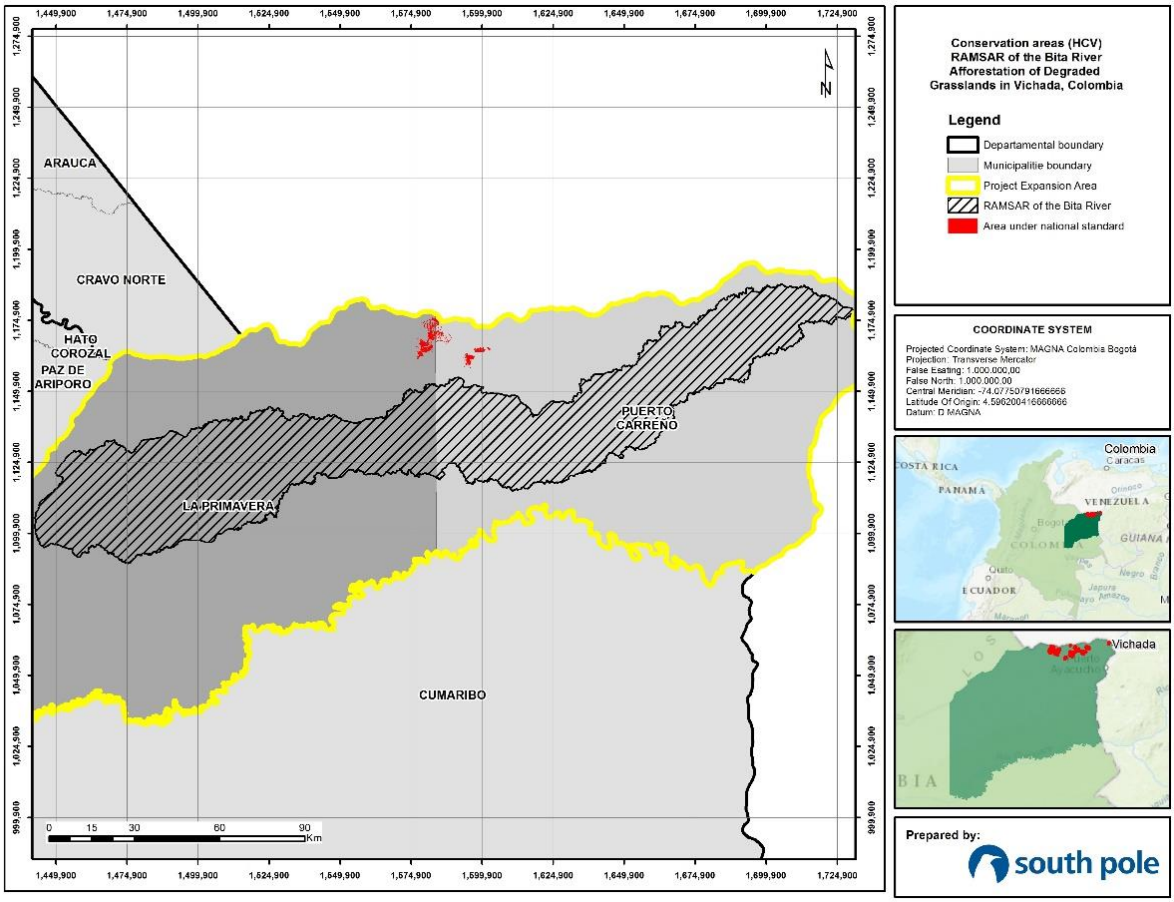
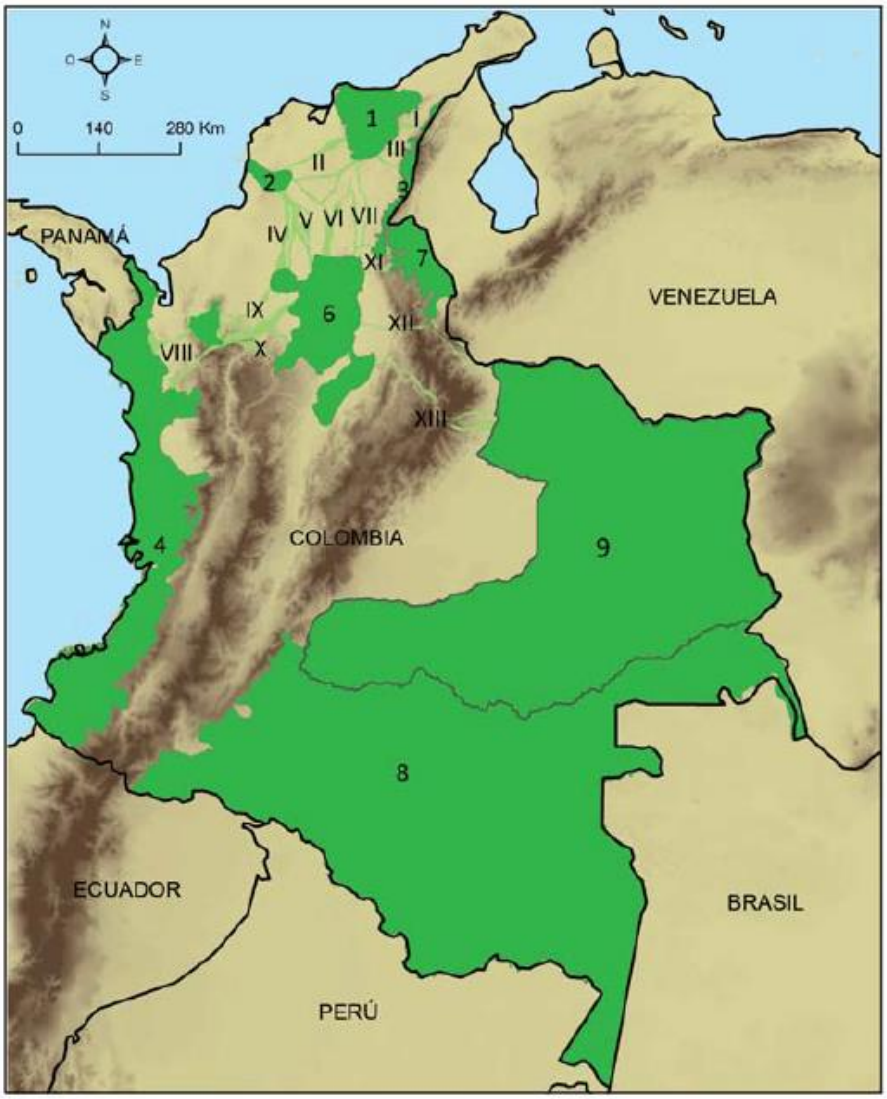



*Figure 32: Wetland complex of the Bita River Basin.*

| High Conservation Value | **Jaguar Conservation Unit – Orinoquia** |
|---|---|
| Qualifying Attribute | Jaguar conservation units for Colombia have been identified since 2002, and the entire project area is in unit 9 (Orinoquia; Figure 33). The units identified correspond to the location of the jaguar populations. The distribution of the species is determined by the potential habitat and prey availability (Medellín *et al.,* 2016). The population of jaguars in the Orinoquia is the second in importance for Colombia – the most important population in Vichada is the one found in the El Tuparro Natural National Park (Medellín *et al.,* 2016).<br><br>The gallery forest and savannas allow for connectivity between jaguar populations from the Amazon and the *Llanos Orientales* (Payán *et al*., 2009). |

| | |
|---|---|
| Focal Area | Fragments of forest area present in the project area. |




Corredores identificados

I. Sierra Nevada - Fonseca
II. Sierra Nevada - Montes de María
III Sierra Nevada - Perijá
IV. Montes de María - Paramillo
V. Montes de María - San Lucas
VI. El Copey - Mompox
VII. El Copey - Aguachica
VIII. Chocó Biogeográfico - Paramillo
IX. Paramillo - Ayapel
X. Paramillo - Segovia
XI. San Lucas - Catatumbo
XII. San Lucas - Tamá
XIII. San Lucas - Cocuy

Unidades de conservación del jaguar

1. Sierra Nevada de Santa Marta
2. Montes de María
3. Perijá
4. Chocó Biogeográfico
5. Paramillo
6. San Lucas
7. Catatumbo
8. Amazonia
9. Orinoquia

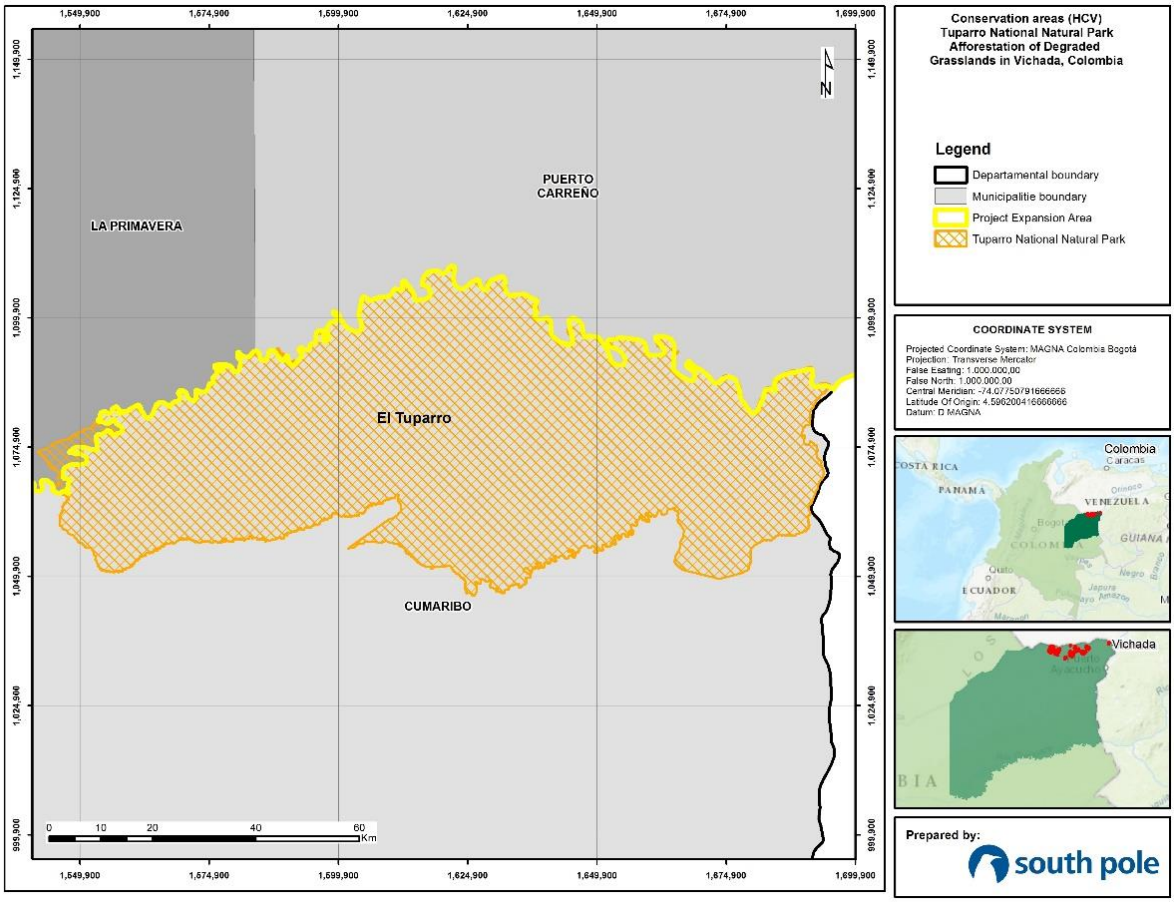



*Figure 33: Jaguar Conservation Units in Colombia (top) and Tuparro National Park (bottom)*
*(Source: Medellín et al., 2016; ESA, 2020)*

| High Conservation Value | **Native forest: *morichales* and riparian forest** |
|---|---|
| Qualifying Attribute | The *morichales* are homogeneous or heterogeneous communities of palms of the genus *Mauritia* and other species, and they are strongly associated with water courses (Pacheco *et al.,* 2014; Trujillo *et al.,* 2016).<br><br>*Morichales* and riparian forests provide ecological services by functioning as a biological corridor for fauna between savannas and forested areas. They provide of shelter, food, and water, especially in dry periods for fauna, and can also acts as carbon sinks and hydrological regulators (Trujillo and Mosquera-Guerra, 2016; Hernández-Valencia *et al.,* 2018). |

| | |
|---|---|
| | Food availability in these ecosystems through the year is very important for mammals and birds communities. Various studies have identified the presence of important endangered species like *Lontra longicaudis, Pteronura brasiliensis, Priodontes maximus, Puma concolor, Panthera onca, Tapirus terrestris,* and *Myrmecophaga trydactyla* (Trujillo and Mosquera-Guerra, 2016; Hernández-Valencia et al., 2018). |
| Focal Area | Native forest inside the project area (Figure 34). |

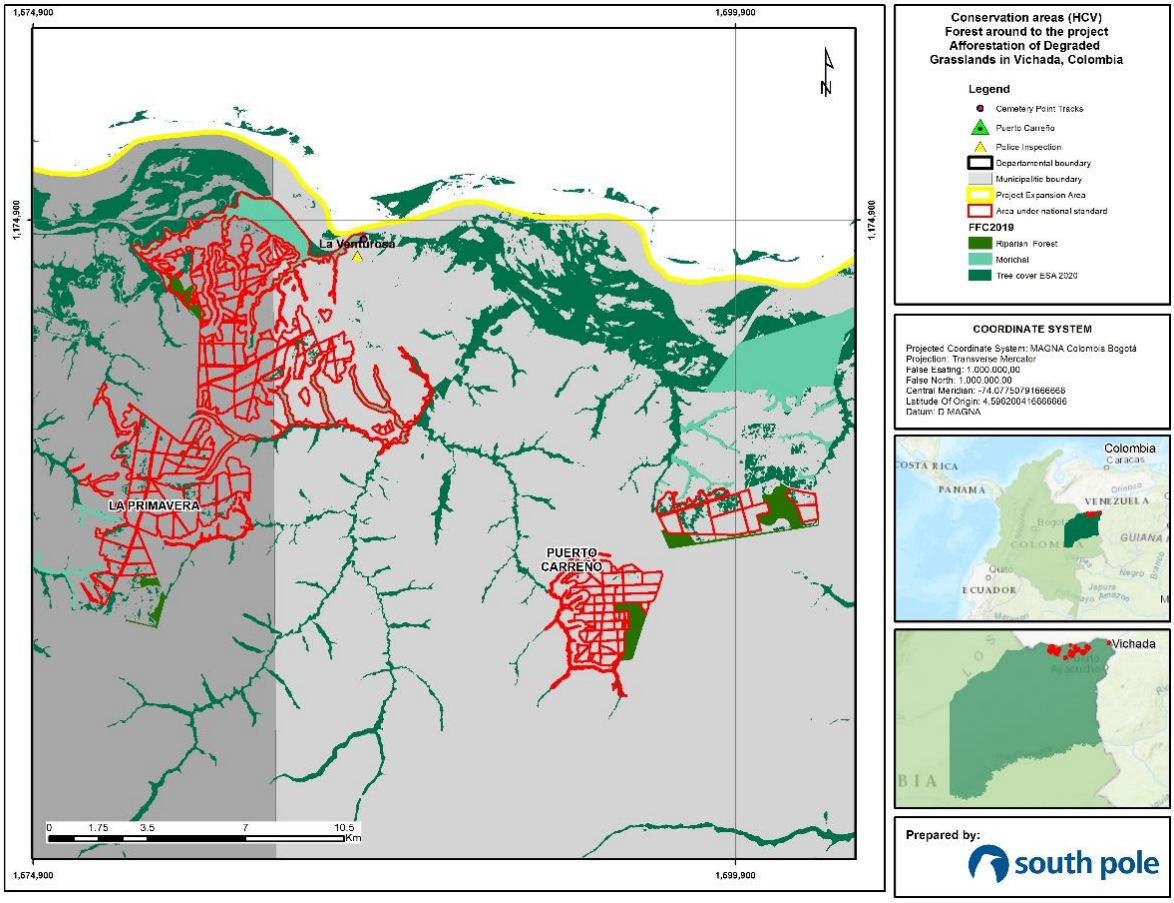



*Figure 34: Native Forest: morichales and riparian forest*

| | |
|---|---|
| High Conservation Value | **Venturosa cemetery (culturally significant area)** |
| Qualifying Attribute | This is the local cemetery where occasionally people are buried from the area of Venturosa. It has around 35 graves distributed in an area of approximately 0.5 hectares.<br>The area was previously abandoned and overgrown. The local committee and FFC have worked on the maintenance of this area to maintain the cemetery. To date, there is no record |

| | |
|---|---|
| | regarding the burials. However, FFC will try to collect information and generate a record, which will be filled up with the new burials. |
| Focal Area | The area that marks the cemetery. It is in the West District within the boundaries of an FFC property (N6° 08.715' W68° 47.069'), see Figure 35 |

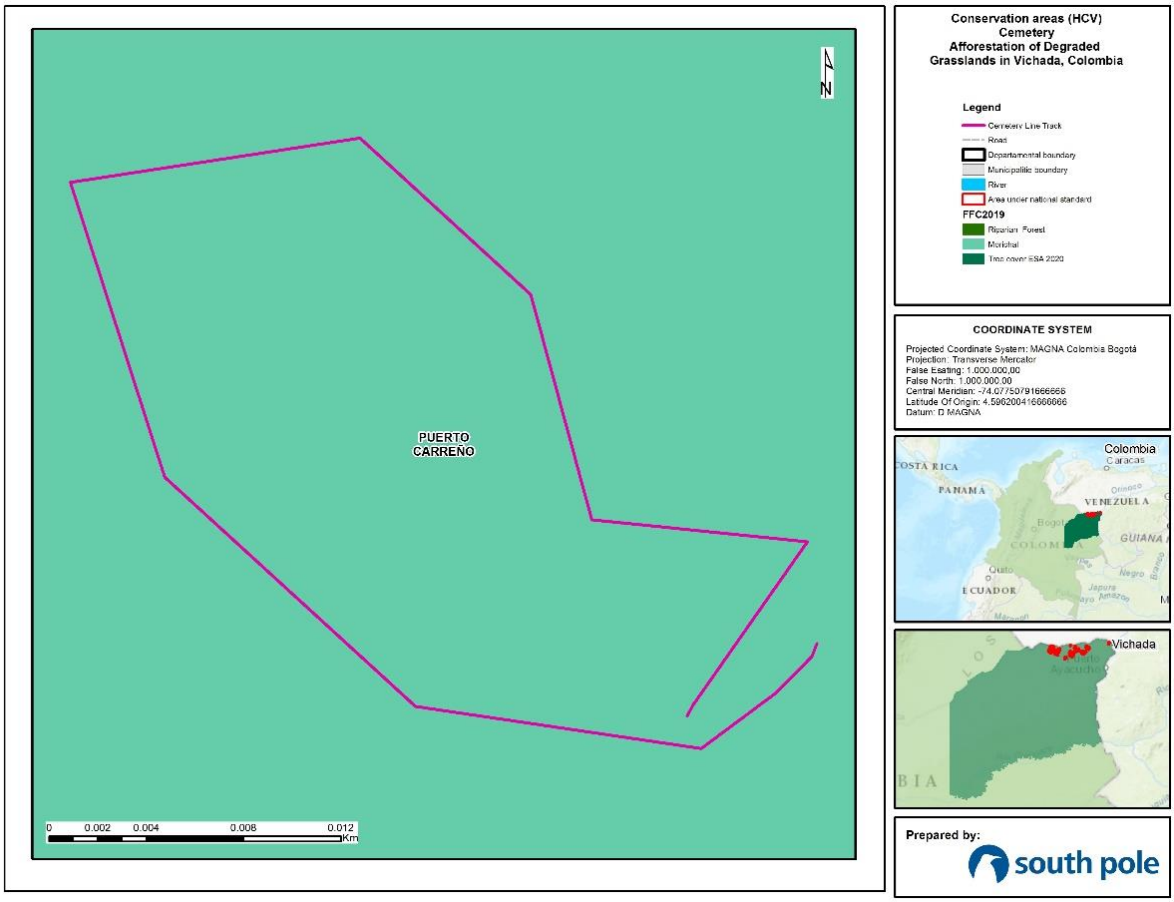



*Figure 35: Venturosa Cemetery*

### 5.1.3 Without-project Scenario: Biodiversity (B1.3)

Without the project it is likely that the community will continue the livestock activity. The low productivity (one cow for 7 ha of land) is generating the introduction of grasses that are replacing the natural species (Ramírez, 2018). Current livestock management practices include using regular, uncontrolled fires to encourage new grass growth, which is more palatable to the cattle. All this burning over many decades has resulted in the creation of a hard crust on the soil surface, which allows the rainfall to pond on the surface and then run off instead of infiltrating the soil. The runoff increases soil degradation and erosion. Additionally, this practice is implemented without any measures and fires can remove the native seeds and spread into areas with forest and native vegetation.

On the other hand, with the increasing number of livestock near natural ecosystems, conflicts between humans and predators increase, resulting in the retaliation of owners against predators (like the jaguar) affecting their herds (Payán *et al.,* 2009).

In general, under the without-project land use scenario, biodiversity in the Project Zone is affected by:

- a decrease in forest cover;
- increase in forest fragmentation; and
- expansion of livestock areas.

## 5.2 Net Positive Biodiversity Impacts

### 5.2.1 Expected Biodiversity Changes (B2.1)

| | |
|---|---|
| Biodiversity Element | **Connectivity** |
| Estimated Change | Positive |
| Justification of Change | The forest plantations are located in areas that promote connectivity between ecosystems; therefore, the importance of them and the protection of the native forest and *morichales* in the project will result in improvements for biodiversity and benefits for different ecosystems and protected areas like the Civil Society Reserves, El Tuparro National Park, and the Bita River – Ramsar Site (Pacheco *et al.,* 2014).<br>Although forest plantations cannot replace native forest ecosystems, they can provide shelter and transit zones for mammals, birds, and other species (Pardo *et al.,* 2018). As the plantations of the project are taking place in sites without previous forest cover, several species use these newly forested areas for mobilization, avoiding the open areas that can be more dangerous. Thus, cover vegetation generated by the plantations, might increase the connectivity of natural ecosystems and the recovery of ecological niches for endemic, vulnerable, or threatened species might be favored.<br><br>On the other hand, forest plantations allow for the establishment of natural vegetation in the surrounding areas (Quiceno, 2017). For example, in plantations more than five years old, it is more common to find birds and bats, which are important seed dispersers organisms (Casallas *et al.,* 2017) that increase pioneer vegetation. Therefore, the establishment of native species by seed dispersion and colonization promotes connectivity between forest areas and forest plantations (Quiceno, 2017). |

| | |
|---|---|
| Biodiversity Element | **Fauna and Flora** |
| Estimated Change | Positive |

| | |
|---|---|
| Justification of Change | The vegetation of the Vichada Department is strongly determined by the climate, soil conditions, and ecosystems types. Nearly 1,700 plant species have been recorded in the Orinoco region, with most of the species present in the gallery forest. Forty percent of the species are dispersed by animals; therefore, the relation between vegetation and fauna is crucial for the maintenance of ecosystems (Trujillo *et al.,* 2016)<br><br>The conservation of native vegetation and ecosystems near Puerto Carreño is of paramount importance due to the level of intervention of human activities that have transformed large parts of the landscape (Trujillo and Lasso, 2017). Different studies have shown the importance of the Orinoco region in terms of biodiversity, but this biodiversity is threatened by anthropic actions like cattle ranching and deforestation.<br><br>There are few conserved areas, and therefore, the protection of gallery forests, *morichales* can contribute not only to the protection of these ecosystems but also the protection of flora species that grow in them (Mosquera *et al.,* 2018) and fauna associated with them, like puma, jaguar, peccaries, and deer, among others (Trujillo and Lasso, 2017).<br><br>The project plantations are in degraded areas, which generates changes in the area in terms of increasing the forest cover. Although it was with exotic species, these newly forested areas allow wild fauna to use these “corridors” to travel between native forest fragments, enhancing ecosystem connectivity. Forest plantations can also help the seed dispersal process by providing perching areas for birds. In addition to connectivity, these forested areas offer shade and shelter to a variety of species (Dickie *et al.,* 2013).<br><br>On the other hand, the project properties included large areas of conservation. These areas were water bodies, riparian forest, wetlands, and *morichales.* They are key to supporting wildlife by providing habitat and food. In addition, the project contemplates clearing and controlling invasive vegetation to prevent competing with the native vegetation. |

| | |
|---|---|
| Biodiversity Element | **Fauna (endangered species)** |
| Estimated Change | Positive |
| Justification of Change | For the project area, a total of 16 species under IUCN-threatened categories have been identified (Trujillo and Lasso, 2017, Trujillo *et al.,* |

| | |
|---|---|
| | 2008). Some of the most important species are the jaguar (NT; in vulnerable (VU) status for the country[90]), the Lowland tapir (VU), the giant armadillo (VU) and the giant otter (EN). These species are found in the riparian forests and areas near water courses; therefore, the protection of the native ecosystems located in the project area promotes the conservation of these species. |

### 5.2.2 Mitigation Measures (B2.3)

Table 39 highlights the environmental management sheets developed by FFC to avoid negative impacts on biodiversity.

*Table 39: List of environmental management sheets[91]*

| Management Sheet | Objectives | Main Activities to be Implemented |
|---|---|---|
| MCA-01: Efficient use of water | Establish the necessary measures for the efficient use and conservation of water in the project.<br><br>Implement a drinking water treatment system for water consumption. | Hold a training workshop every six months for project members on the conservation and efficient use of water.<br><br>Install taps, toilets, and other accessories with water-saving and efficient use systems |
| MCA-02: Wastewater management | Establish the necessary measures for the adequate management of the wastewater generated in the project.<br><br>Implement a wastewater treatment system for each of the camps that are part of the project. | Implement a wastewater treatment system for each of the project camps.<br><br>Perform preventive maintenance of the wastewater treatment system. |
| MCA-03: Non-hazardous solid waste management | Establish environmental management measures to prevent and mitigate the impacts generated during the handling, storage, and transportation of non-hazardous solid waste produced by the project. | Carry out a training workshop for the members of the project on the integrated management of solid waste.<br><br>Build an adequate site for the temporary storage of non-hazardous waste. |
| MCA- 04: Hazardous solid waste management | Establish environmental management measures to prevent and mitigate the | Deliver empty agrochemical packaging to the responsible supplier. |

[90] Resolution 0192 of 2014 - MADS
[91] Supporting information: [Environmental_management_sheets]

| Management Sheet | Objectives | Main Activities to be Implemented |
|---|---|---|
| | impacts generated during the handling, storage, and transportation of hazardous solid waste produced by the project. | Wash agrochemical packaging three times.<br><br>Carry out a training workshop for project members on hazardous waste management.<br><br>Build an adequate site for temporary storage of hazardous waste.<br><br>Implement the solid waste management plan[92]. |
| MCA-05: Prevention and control of contamination by chemical inputs and fuels | Minimize the risks of pollution caused by the use of chemical and fuel inputs. | Conduct an annual training workshop for project members on the handling of agrochemicals and fuels.<br><br>Avoid storing large quantities of fuel.<br><br>Carry out the tanking, maintenance, and washing of machinery and equipment in the areas designated for these activities.<br><br>Implement the fuel management and contingency plan[93]. |
| MCB-01: Wildlife management | Preserve the functional and structural attributes of the ecosystems in the project's area of influence. | Conduct an annual training workshop for project members on wildlife management.<br><br>Transport injured animals to the Corporinoquia Wildlife Rehabilitation center. |
| MCB-02: Wild flora management | Preserve the functional and structural attributes of the ecosystems in the project's area of influence. | Protect forest, *morichales*, and wetland ecosystems.<br><br>To protect the ecotones between the savannas, gallery forests, and the *morichales.*<br><br>Maintain savannah corridors associated with planted areas that allow native fauna to migrate and access the resources needed to maintain their populations.<br><br>Hold an annual training workshop for project members on environmental zoning and other strategies for ecosystem conservation. |

[92] Supporting information: [Environmental_management_sheets/Anexo 24 – Plan de manejo de los residuos solidos]
[93] Supporting information: [Environmental_management_sheets/Anexo 22 – Plan de manejo y contingencia de combustibles]

| Management Sheet | Objectives | Main Activities to be Implemented |
|---|---|---|
| MCB-03: Integrated management of pests and diseases | Implement integrated pest and disease management as a strategy to minimize impacts on the region's fauna and flora. | Conduct an annual training workshop for project members on integrated pest and disease management.<br><br>Rotate the agrochemical products to be used in pest and disease control to avoid generating resistance in the pests.<br><br>Use low toxicity and high specificity insecticides as the last alternative for pest control. |
| MCB-04: Forest fire management | Conserve wildlife resources through fire prevention and care. | Conduct an annual training workshop for project members on the prevention and care of fires and uncontrolled burns.<br><br>Perform regular maintenance of firewalls.<br><br>Implement the forest fire contingency plan[94]. |

### 5.2.3 Net Positive Biodiversity Impacts (B2.2, GL1.4)

The without-project conditions would affect vegetation in natural ecosystems due to an increase in cattle ranching activities and deforestation processes. Based on this, the impact of the project will be positive due to the protection of the native ecosystems and the establishment of forest plantations in degraded areas. These actions promote positive conditions for biodiversity, habitat improvement, connectivity processes, and the protection of fauna and flora species.

Furthermore, the project areas will serve as key points between private protected areas, national parks, and the Bita river basin to assure connectivity. The protection of forest areas and the establishment of plantations will also increase seed dispersion, and thus, the movement of fauna across different ecosystems.

These positive impacts could include the endangered species in the area like jaguar, giant otter, giant armadillo, peccaries, and lowland tapir because the habitats suitable for them will be maintained and protected.

### 5.2.4 High Conservation Values Protected (B2.4)

The native ecosystems (rivers, riparian forest, and *morichales*) within the project properties have been delimited and will be protected. Additionally, according to Resolution 500.41-15-1753 of 2015 of Corporinoquia, plantation activities will not be carried out in a buffer zone of 100 m from forest and rivers (see section 2.1.5.1).

[94] Supporting information: [Environmental_management_sheets/Anexo 23 – Plan de contingencia para incendios forestales]

To avoid the colonization of the exotic species planted, conservation practices will be implemented: periodic control burnings in the fire belt and the removal of exotic vegetation from natural forest (see section 5.2.6).

In addition, FFC has a system of forest guards who consistently tour the project area on motorcycles to save and prevent actions that could be carried out by people entering the land without authorization to hunt or fish and make uncontrolled fires.

### 5.2.5 Species Used (B2.5)

*Table 40: Species used in the project activity*

| Family | Species | Description |
|---|---|---|
| Mimosaceae | *Acacia mangium* | *Acacia mangium* is a fast-growing legume and an exotic species from Australia and Asia. The species is adapted to variable environmental conditions (Reyes *et al.,* 2018). *Acacia mangium* has been used widely in tropical countries for restoration of degraded lands (Castellanos and León, 2011) due to its tolerance to low pH's and hydric stress (Reyes *et al.,* 2018) and the atmospheric fixation of nitrogen in the soil (Torres and Del Valle, 2007). |
| Myrtaceae | *Eucalyptus pellita* | *Eucalyptus pellita* is a tree species with excellent characteristics of growth and quality (Castro and Sánchez, 2010). Additionally, the species has a high density which is important for charcoal and firewood production (Da Silva Guimaraes *et al.,* 2010). *Eucalyptus pellita* is the species that reaches the highest volume per unit area in Colombian Orinoquia (Chocontá *et al.,* 2017) where is widely planted, although in order to increase the volume the addition of fertilizers is required.<br><br>*Eucalyptus pellita* has a high water consumtion rate, nevertheless, the rainfall reported in the area of the project is higher than the amount of water needed for the plantations, so it is unlikely that negative impacts are generated. |

### 5.2.6 Invasive Species (B2.5)

Although, one of the species used in this project (*Acacia mangium*) have been listed globally as invasive[95], the conservation practices that will be implemented in the project will limit the colonization of these species. This is aligned with the FSC certification, as it also requires a mandatory procedure for controlling the spread of this individuals.

[95] Any of the species used in the Project activity are included in the Global Invasive Species Database, ISSG: http://www.iucngisd.org/gisd/

The project proponent has in place a specific procedure for eliminating invasive species out of the planted compartments96. Such procedure indicates the steps, frequency, and responsible roles for identifying the presence of this species, determining the means of removal and actual elimination on site.

An illustrative diagram is presented in the next figure:

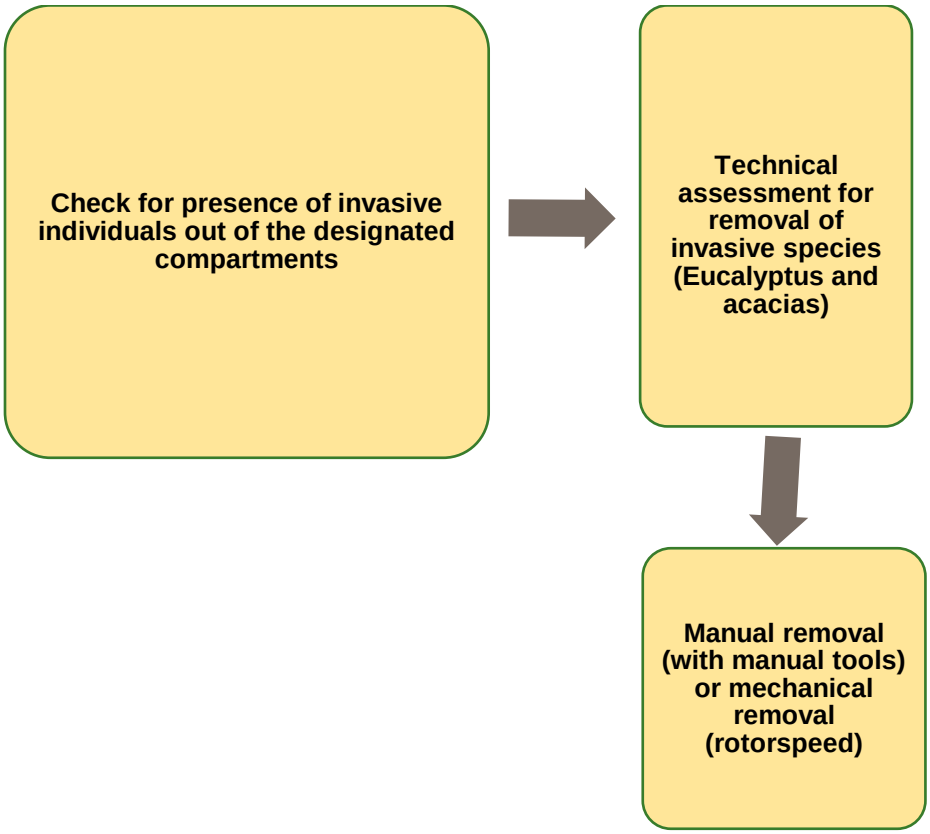



*Figure 36. Diagram for identifying, evaluating and removing invasive species individuals*

The operations supervisor is responsible for identifying, determining the methods and actual elimination of invasive species individuals out of the planting compartments. The procedure also includes the raise of Corrective Action Requests[97,98] (*Solicitud de Acción Correctiva SAC*) to point out areas where invasive species have been identified. Such requests indicate specific locations and present pictures of the actions carried out and the before-after situation.

The fire belt and periodic control burnings will limit the establishment of invasive vegetation and the exotic vegetation will be removed from the natural forests.[99]

### 5.2.7 Impacts of Non-native Species (B2.6)

The project contemplates plantations of two non-native species: *Acacia mangium* and *Eucalyptus pellita.*

[96] Supporting information: [Invasive_species_removal\1400-012-01S Invasive species elimination procedure]
[97] Supporting information: [Invasive_species_removal\SAC – invasive species removals]
[98] Supporting information: [Invasive_species_removal\SAC M2 - 2020 – preservation area - invasive species removals]
[99] Supporting information: [0900-001-02E_Plantation_Management_Plan]. Pages 15 and 16

| | |
|---|---|
| Species | *Acacia mangium* |
| Justification of Use | *Acacia mangium* is a species used in areas that were affected by productive conditions or after mining activities due to its remarkable adaptation characteristics to poor soil conditions. This species grows quickly and is highly adaptable to acidic soils, low precipitation, and high temperatures and radiation (Quevedo, 2018). When compared with native species, the main outstanding factors are the growth rate and adaptability. The acacia has the potential[100] to grow up to 28-35 m3/ha/yr with technical management and silviculture. There are no native species that can grow close to that rate. In the same line, in Colombia, out of the 540,430 ha of forest commercial plantations[101], *Acacia mangium* has 66,340 ha, Pinus has 175,429 ha, Eucalyptus has 96,880 ha. That means, is one of the main planted species in the country.<br><br>Regarding the adaptability, several matching sites evaluations were performed, considering rainfall, temperature, soils, genetics, pest, and disease and as a result, A*cacia mangium* had promising results compared to Indonesia and Brazil locations.<br><br>Such adaptability and MAI performance were the main factors for prefer this species above native ones. |
| Potential Adverse Effect | The use of *Acacia mangium* will not have any significant negative effect because the plantations are not taking place in natural areas. Although the species is categorized as invasive[102], the company has in place an Invasive Species Management plan (See section 5.2.6) that describes the actions and methods to controls its possible spread through non-target compartments. In addition, as the project is FSC certified, this certification obligates the holders to prevent and control possible spread of non-native species. |

| | |
|---|---|
| Species | *Eucalyptus pellita* |
| Justification of Use | *Eucalyptus pellita* is a species widely planted in the Orinoquia region in Colombia due to its outstanding characteristics of stem straightness and physical properties of the wood. Additionally, the species presents a low number of knots and is very resilient; therefore, it is important for construction, fence posts, corral |

[100] Supporting documents: [Species_selection\1010-002-02E Species characteristics for Vichada]
[101] Supporting documents: [Species_selection\Forestry statistical report 2020]
[102] http://www.iucngisd.org/gisd/speciesname/Acacia+mangium

| | |
|---|---|
| | posts, and live fences, and can be used in silvopastoral systems (Castro and Sánchez, 2010).<br>When compared with native species, the main outstanding factors are the growth rate and adaptability. *Eucalypus pellita* has the potential[103] to grow up to 44 m3/ha/yr with technical management and silviculture. There are no native species that can grow close to that rate. In the same line, in Colombia, out of the 540,430 ha of forest commercial plantations[104], *Acacia mangium* has 66,340 ha, Pinus has 175,429 ha, Eucalyptus has 96,880 ha. That means, eucalyptus is one of the main planted genera in the country.<br>With regard the adaptability, several matching sites evaluations were performed, considering rainfall, temperature, soils, genetics, pest, and disease and as a result, the *Acacia mangium* had promising results compared to Indonesia and Brazil locations.<br>Such adaptability and MAI performance were the main factors for prefer this species above native ones. |
| Potential Adverse Effect | The plantations of *Eucalyptus pellita* will not have significant negative effects, although it has a high-water consumption rate, the rainfall reported in the project area is higher than the amount of water needed for the plantations, so it is unlikely that negative impacts regarding water consumption will be generated. On the other hand, a potential adverse effect might me the undesired spread to non-targeted areas. For preventing this, the company has in place an Invasive Species Management plan (See section 5.2.6) that describes the actions and methods to controls its possible spread out of the compartments. In addition, as the project is FSC certified, this certification obliges the holders to prevent and control the possible spread of non-native species. |

### 5.2.8 GMO Exclusion (B2.7)

No GMOs are used in the project activities. All seeds used in each nucleus come from certified companies from Colombia[105].

### 5.2.9 Inputs Justification (B2.8)

| **Name** | **Abotek fertilizer (NPK 14-4-23)** |
|---|---|
| Justification of Use | Soils in Vichada are weathered and have an acidic pH and low fertility and moisture retention. Therefore, the establishment of the plantations |

[103] Supporting documents: [Species_selection\1010-002-02E Species characteristics for Vichada]
[104] Supporting documents: [Species_selection\Forestry statistical report 2020]
[105] Supporting information: [ICA_records/Seeds]

| | |
|---|---|
| | requires the implementation of granular fertilizers, especially for the development of the plants in their early stages, as they require macro elements (N, P, K) for growth and strength. In these case Abotek fertilizers are combination of N 14% P 4% and K 23%. The high concentration of K is necessary for the production stages. |
| Potential Adverse Effect | When using fertilizers, it is important to establish the optimum composition, nutrient concentrations, and the type of materials used in production, as certain components can alter the biochemical characteristics of soil and water, accelerate the process of eutrophication in aquatic systems and negatively affect the crop production.<br><br>Therefore, the usage of fertilizers in amounts other than the recommended could lead to accumulation and the concentration of minerals, causing soil compaction and degradation in the long-term. This would generate a limitation in the root development and plant growth (Massah and Azadegan, 2016). In addition, it is important to ensure good methodologies for the application to ensure that the fertilizer is not leaching or being washed away. |

| **Name** | **Rafos fertilizer (NPK 12-24-12)** |
|---|---|
| Justification of Use | Soils in Vichada are weathered and have low fertility, an acidic pH, and low moisture retention; therefore, the establishment of the plantations required the implementation of granular fertilizers, especially for the development of plants in their early stages. This gives them the necessary macro elements (N, P, K) for growth and protection against water shortages. Rafos fertilizer is a combination of N 12%, P 24%, K 12%. The high concentration of P is necessary in the early stages to promote root growth and plant development. |
| Potential Adverse Effect | When using fertilizers, is important to establish the optimum composition, nutrient concentrations, and types of materials used in their production, as certain components can alter the biochemical characteristics of soil and water, accelerate the process of eutrophication in aquatic systems, and negatively affect crop production.<br><br>Therefore, the use of fertilizers in amounts other amounts different than the recommended could lead to accumulation and concentration of minerals, causing compaction of soils and degradation in the long-term. This would generate a limitation in the root development and plant growth (Massah and Azadegan, 2016). In addition, it is important to ensure good application methodologies are used to ensure that the fertilizer is not leaching or being washed away. |

| Name | Roundup 747 (Gliphosate) |
|---|---|
| Justification of Use | The use of herbicide in plantations for weed control is required in the initial years to eliminate plants that could compete with the growth of the plantation. If weed control is not applied, the consequence might be the failure of the plantation, since the weeds in the region grow faster than the trees in their initial stages and are very aggressive. |
| Potential Adverse Effect | The use of agrochemicals for weed control can generate soil and water contamination through infiltration. The use of this product should be reduced as much as possible and only used in the first steps of growth.<br><br>Non-target plants adjacent to the plantations may be exposed to the herbicide, affecting various traits like flowering patterns and root development (Dupont *et al.,* 2018). Therefore, it is important to apply herbicide in the dry season with low winds to prevent it from spreading into nearby cultivated fields and grazing land. In addition, water courses or drainage areas should not be exposed to Roundup. |

#### 5.2.10 Waste Products (B2.9)

For handling chemical products, recommendations of the technical data should be followed, including the security and safety standards.[106] The main procedures determined by FFC for the work of handling, mixing, and applying the inputs are.

- those responsible for handling pesticides should wear protective equipment to avoid poisoning and other health effects;
- the chemicals are identified and stored, preserving their original labels. The respective safety data sheets will be available in the field;
- the packages and containers of chemicals will be disposed as hazardous waste and will be delivered for their final disposal; therefore, they will not be reused;
- the packages and chemical containers should not be reused for any purpose; and
- the washing and maintenance of machinery, tools, and containers is forbidden in areas close to natural drainages or water sources.

### 5.3 Offsite Biodiversity Impacts

#### 5.3.1 Negative Offsite Biodiversity Impacts (B3.1) and Mitigation Measures (B3.2)

Due to the use of possible invasive species and the implementation of chemical fertilizers and herbicides for the plantations, negative offsite biodiversity impacts have been identified; therefore, the implementation of management measures required. For the case of invasive species, a leakage belt control the dispersal

[106] Supporting information: [Resource Efficiency & Pollution Prevention]

of individuals outside the plantations. On the other hand, for the use of chemical fertilizers and herbicides, mitigation measures were established for the proper application of herbicide (see section 5.2.9).

| Negative Offsite Impact | Mitigation Measure(s) |
|---|---|
| Invasive species can colonize natural areas and displace the native vegetation. | Setting up a fire belt along with a periodic control burning will limit the establishment of invasive vegetation and it will be removed from the natural forests manually. |
| The use of chemical fertilizers and herbicides can lead to water and soil contamination. | Deliver empty agrochemical packaging to the responsible supplier.<br><br>Carry out a training workshop for project members on hazardous waste management.<br><br>Conduct an annual training workshop for project members on the handling and implementation of agrochemicals. |

### 5.3.2 Net Offsite Biodiversity Benefits (B3.3)

Considering the management measures described for the project area, the assessment of biodiversity and net offsite impacts will be positive when compared to the without-project assessment.

In the areas outside the project zone, activities of 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 fires in the savannah. These activities prevent the formation of forest and reduce the forest fragments that make the movement of fauna difficult. Moreover, in the areas outside the project zone, hunting activities can take place.

Rather, by providing protection to natural areas and generating forest cover on degraded lands, the wildlife in the area will be positively impacted due to improved movement and connectivity across different landscapes, and the provision of food, shelter, and refuge to several species. Furthermore, endangered species could benefit from the protection of key areas in terms of prey and food availability.

## 5.4 Biodiversity Impact Monitoring

### 5.4.1 Biodiversity Monitoring Plan (B4.1, B4.2, GL1.4, GL3.4)

#### *5.4.1.1 Flora monitoring*

To monitor the impact of the project on natural vegetation, it will be necessary to characterize the composition, structure, and general state of the vegetation in the area and the cover extension. To achieve this, three phases are proposed: the collection of secondary information, field trips to collect primary information, and a phase of information processing.

The effectiveness of the measures taken to maintain or enhance High Conservation Values will be monitored through the permanence of forest cover, connectivity in the conservation areas, and presence of endangered or endemic species.

The following variables are foreseen to be monitored during the project:

| Variables to be monitored | Frequency | Sampling method | Areas to be monitored | Unit |
|---|---|---|---|---|
| Quality of gallery forests | At least every 5 years | Forest inventory through temporal sample plots in gallery forest cover, measuring seedlings, saplings, and poles | Project conservation areas | Species richness index |
| Quality of *morichales* | At least every 5 years | Forest inventory through temporal sample plots in *morichales* cover, measuring seedlings, saplings, and poles | Project conservation areas | Species richness index |
| Presence of threatened or endangered species | At least every 5 years | Field verification of presence/absence in the forest inventory | Project conservation areas | No. of species and detections |

#### 5.4.1.2 Fauna monitoring

To measure the impact of activities on fauna biodiversity, an assessment of the fauna species present in the area must be done. This assessment is key to measuring the loss of biodiversity and the status of conservation in the area (Trujillo and Lasso, 2017). To monitor the species, it is necessary to use focal species as indicators of conservation status due to the complexity of monitoring all aspects of biodiversity. Felids for example are one of the most used focal species because they are keystone and indicator species. As an indicator species, they are susceptible to disappearing from habitats impacted by human activities (Payán and Soto, 2012).

Due to the complexity of the number and characteristics of the species present in the project area, two groups of fauna species will be monitored. The top predators are going to be allocated in one group and the endangered terrestrial species are going to be in another.

In selecting the focal species (Table 41) for the project it was necessary to take into account the following attributes:

- **classification of species as contributors to conservation**: the selection of focal species took into account their ecological attributes, with the aim of contributing to the process of determining conservation strategies;
- **distribution of species**: refers to biogeographic endemism, in this case, the Orinoquia region;
- **threat categories**: according to the IUCN and Resolution 0192 of 2014, taking into account the revision of the potential fauna in the region, the threatened species are those present in the IUCN red list and/or in Resolution 0192 of 2014; and
- **trophic guilds and behavior**: the selection of specific trophic guilds and behaviors allows to grouped fauna in a more representative way than species individually.

*Table 41: Focal species for the project.*

| Trophic guild – behavior | Common name | Species | State of conservation | |
|---|---|---|---|---|
| | | | Red List of Threatened Species – UICN | Resolution 0192 of 2014 MADS |
| Predators | Jaguar | *Panthera onca* | NT | VU |
| | Puma | *Puma concolor* | LC | NT |
| Endangered terrestrial species | Lowland tapir | *Tapirus terrestris* | VU | CR |
| | Giant anteater | *Myrmecophaga tridactyla* | VU | VU |

It is recommended that monitoring should have multiple long-term sampling in order to reduce the possibility of non-detection of some species of interest. The following are the different alternatives that can be used to monitor the fauna in the project:

**Phototrapy**

Camera traps are a cost-effective tool for the large-scale monitoring of medium and large vertebrates, particularly for cryptic or low-density species (Buyaskas *et al.,* 2020). The use of photo traps will produce data to evaluate species richness, and thus, areas of high conservation value. For each of the stations, data will be recorded in a location format with GPS in geographic coordinates.

**Counting tracks and sightings on trails**

For the records of the species of interest (including amphibians, reptiles, mammals, and birds), an adaptation of the linear transect methodology can be implemented (Angulo, 2006) and used to search for direct and indirect records of species such as sightings, footprints, feces, shelters, bones, and vocalizations. The method consists of free walking paths in different covers, trails, or roads.

**Interviews and Community Monitoring**

The use of community cartography is the implementation of various qualitative tools, taking into account historical and social data. Social Cartography or community cartography has been used in several studies to diagnose different problems related to geography, the management of natural resources, education, and land delimitation, among others (Lopéz, 2012).

Finally, all the species should be identified based on specialized literature (Eisenberg, Reid, Redford, & Bonner, 1989; Emmons, 1987; Emmons & Feer, 1997; D. E. Wilson & Reeder, 2007) for classification and updated nomenclature, according to systematics and known taxonomy.

*Table 42: Variables to monitor*

| Variables to be monitored | Frequency | Sampling method | Areas to be monitored | Unit |
|---|---|---|---|---|
| Predator species | At least every verification | Camera traps, sightings on trails, interviews with local communities | Project area | No. of camera traps installed; no. of sightings on trails; no. of reports in the interviews |
| Endangered terrestrial species | At least every verification | Camera traps, sightings on trails, interviews with local communities | Project area | No. of camera traps installed; no. of sightings on trails; no. of reports in the interviews |

### 5.4.2 Biodiversity Monitoring Plan Dissemination (B4.3)

Monitoring Plans and all documents and information about the results of the monitoring and verification of this project will be published on the VERRA platforms, as usual.

Additionally, the project owners will prepare summaries of the monitoring plan and results to be communicated to the communities and other stakeholders. Please refer to section 2.3.2 to see more details on project document dissemination with communities and workers.

## 5.5 Optional Criterion: Exceptional Biodiversity Benefits

The project does not seek to be validated to the Gold Level for climate change adaptation benefits.

### 5.5.1 High Biodiversity Conservation Priority Status (GL3.1)

The project does not seek to be validated to the Gold Level for climate change adaptation benefits.

### 5.5.2 Trigger Species Population Trends (GL3.2, GL3.3)

The project does not seek to be validated to the Gold Level for climate change adaptation benefits.

## APPENDICES

### a. Appendix 1: Bibliography

Acevedo – Charry, O., Pinto-Gómez, A., Rangel – Ch, O. (2014). Las aves de la Orinoquia Colombiana: Una versión de sus registros. Col. Div. Biótica XIV: Aves de la Orinoquia.

Alcaldía de Puerto Carreño. (2016). Plan de Desarrollo Municipal: Puerto Carreño Somos Todos *2016-2019*. Available in: http://www.puertocarreno-vichada.gov.co/Transparencia/InformesYRendiciondeCuentas/PLAN%20DE%20DESARROLLO%20PUERTO%20CARRE%C3%91O%20SOMOS%20TODOS%202016%20-%202019.pdf

Adan, J. S. (2010). *Evaluación contextual de la ganadería bovina en el departamento de Vichada*. Universidad de los Llanos, Facultad De Ciencias Agropecuarias y Recursos Naturales. Available in: http://bibliotecadigital.agronet.gov.co/bitstream/11348/3942/1/041.pdf

Arias, J. (2004). Ganadería, paisaje, territorio y región. Una historia ecológica y social de la Orinoquía colombiana. Bogotá: Instituto de Investigación de Recursos Biológicos Alexander von Humboldt

Álvarez-Cortés, C., Martínez-Chamorro, M. & Aguirre, L. (2017). Estudio Línea Base Socioeconómica para las primeras zonas de plantación de Forestal de la Orinoquía. 103 pp

Angulo, A. (2006). Técnicas de inventario y monitoreo para los anfibios de la región tropical andina. Panamericana Ed., Bogotá, Colombia.

Arnovis, A. and Chica, M. (2003). Mántidos de la Orinoquia colombiana: Contribución al conocimiento de su diversidad genérica y algunos aspectos bioecológicos (Insecta:Mantodea). Revista Colombiana de Entomología 29(2): 127-136.

Buyaskas, M., Evans, B., Mortelliti, A. (2020). Assessing the effectiveness of attractants to increase camera trap detections of North American Mammals. Mammalian Biology. Springer ed.

Botón-Gómez, S. L., M.I. Botero-Ospina, and J.C. Rincón-Torres (2013). El caso del desplazamiento forzado en Colombia: un análisis municipal a partir de regresiones cuantílicas. *Equidad y Desarrollo,* (19), 77-96. https://doi.org/10.19052/ed.2309

Cárdenas and Salinas. 2007. Libro rojo de plantas de Colombia. Volumen 4. Especies maderables amenazadas. Serie de libros rojos de especies amenazadas de Colombia. Bogotá, Colombia. Instituto Amazónico de Investigaciones Científicas SINCHI – Ministerio de Ambiente, Vivienda y Desarrollo Territorial. 232pp.

Cardozo, A.M., Cubides, J., Zárate, A. and Melo L (2009). Memoria explicativa de las planchas 162, 162 BIS, 182 y 182 BIS. Puerto Carreño, Vichada. Instituto Colombiano de Geología y Minería – Ingeominas. 107pp

Casallas, D., Roa, N., Rojas, R. (2017). Seed dispersal by Bats over successional gradients in the Colombian Orinoquia (San Martin, Meta, Colombia). Acta biol Colombiana. Vol 22. N.3. pp. 348-358.

Castellanos – Barliza, J and León – Peláez, J. (2011). Descomposición de hojarasca y liberación de nutrientes en plantaciones de *Acacia mangium* (Mimosaceae) establecidas en suelos degradados de Colombia. Revista de Biología Tropical. Vol. 59. N 1. San José.

Castro – Lima, Francisco. (2010). Avance del conocimiento de la flora del Andén Orinoqués en el departamento de Vichada, Colombia. Orinoquia (online). 2010. Vol.14, suppl.1, pp.58-67. ISSN 0121-3709.

Castro, D. and Sánchez, G. (2010). In vitro Clonal Propagation of *Eucalyptus pellita* F. Muell from Plus Trees. Temas Agrarios – Vol. 15: (1) Enero – Junio 2010 (34 – 43).

Chocontá, A., Pinzón, O., Nieto, V. (2017). Susceptibility and prevalence of *Eucalyptus pellita* F. Muell. To the cancer caused by *Chrysoporthe cubensis* (Bruner) Gryzenhout & M. J. Wingf. at the Colombian Orinoquia. Revista Mexicana de Ciencias Forestales. Vol 8. No. 42.

Corporación Autónoma Regional de la Orinoquia. (2012). Informe ejecutivo de la gestión ambiental *del Vichada*. Available in: http://www.corporinoquia.gov.co/files/Agenda%20Vichada/Informe_de_Puerto.pdf

DANE. (2016). *Encuesta Nacional Agropecuaria*. Available: https://www.dane.gov.co/index.php/comunicados-y-boletines/agropecuario/encuesta-nacional-agropecuaria#cosechas-de-algodon

Da Silva Guimaraes, L., Titon, M., Lau, D., Novaes Rosse, L., Soares Oliveira, L., Gonzalves Rosado, C., Ornelas Christo, G., Couto Alfenas, A. (2010). *Eucalyptus pellita* as a source of resistance to rust, Ceratocystis wilt and leaf blight. Brazilian Society of Plant Breeding. Crop Breeding and Applied Biotechnology 10: 124 – 131.

Dickie, I., Bennett, B., Burrows, L., Nuñez, M., Peltzer, D., Porté, A., Richardson, D., Rejmánek, M., Rundel, P., van Wilgen, B. 2013. Conflicting values: ecosystem services and invasive tree management. Biol Invasions (2014) 16:705-719. DOI: 10.1007/s10530-013-0609-6.

Dupont, Y.L., Strandberg, B., Damgaard, C. (2018). Effects of herbicide and nitrogen fertilizer on non-target plant reproduction and indirect effects on pollination in *Tanacetum vulgare* (Asteraceae). Agriculture, Ecosystems and Environment. 262: 76-82.

Finagro. (2019). Créditos agropecuarios por línea. Available in: https://www.finagro.com.co/estad%C3%ADsticas/estad%C3%ADsticas

Furumo, P. R., & Mitchell, T. (2017). Caracterización de la expansión de la palma de aceite para uso comercial en América Latina: cambio en el uso del suelo y comercialización (Carlos Arenas, trad.). Palmas, 38(2), 27-48.

Gómez J. 2016. Carne de monte y medios de vida: Un recorrido por las diferentes regiones de Colombia. Available in: https:// ciforcolombia.exposure.co/ad27836d9fe48deb9a531120033cca39

Hernández-Valencia, I., González-Boscán, V., Zamora-Ledezma, E., Carrillo-Carrillo, V., Zamora-Figueroa, A. (2018). Environmental Impacts of the Oil Industry on the *Mauritia Flexuosa* Swamp Palm Groves (Morichales) in Venezuela., In: Oil Contaminations: Impacts and offsets: Emilio Potter and Alyssa Vega (eds). Nova Science Publisher Inc. Pp.33-72.

Lopéz, Gómez, C. (2012). Cartografía Social: Instrumento de gestión social e indicador ambiental. Universidad Nacional de Colombia. Departamento de Geociencias y Medio ambiente. Medellín, Colombia.

Massah, Jafar., Azadegan, Behzad. (2016). Effect of Chemical Fertilizers on Soil Compaction and Degradation. Agricultural Mechanization in Asia, Africa, and Latin America. Vol 47. No. 1.

Medellín, J., de la Torre, A., Zarza, H. (2016). El jaguar en el siglo XXI. La perspectiva continental. Colección Ediciones Cientificas Universitarias. Horizontes y Paradigmas en Ciencia y Técnologia). ISBN: 978-607-16-3535-8.

Mosquera-Guerra, F., Trujillo, F., Diaz-Pulido, A., Mantilla-Meluk, H. (2018). Diversidad, abundancia relativa y patrones de actividad de los mamíferos medianos y grandes, asociados a los bosques riparios del río Bita, Vichada, Colombia. Biota Colombiana 19 (1) – 2018.

ONU. (2019). Misión de la ONU en Colombia. La ONU condena el anuncio de rearme de un grupo de excombatientes de las FARC-EP. Availabe in: https://news.un.org/es/story/2019/08/1461301

Pacheco, M., Peñuela, L., Solano, C. (2014). Manejo forestal sostenible en plantaciones en la Cuenca del río Bita, Vichada, Colombia. Proyecto "Fortalecimiento institucional y de política para incrementar la conservación de la biodiversidad en predios privados en Colombia". Grupo Colombiano Interinstitucional de Herramientas de Conservación Privada.

Pardo, E., Campbell, M., Edwards, W., Clements, R., Laurance, W. (2018). Terrestrial mammal responses to oil palm dominated landscapes in Colombia. *PLOS One*.

Patiño, O., Berman, E., Villaraga, A., Rodríguez, A., Rodríguez, J., Ramírez, R., Alvarado, B. (2007). Línea Base para la Planeación del Manejo Parque Nacional Natural El Tuparro. Ministerío de Ambiente, Vivienda y Desarrollo Territorial.

Payán Garrido, E., Ruiz García, M., Franco, C. (2009). Distribución de jaguares y el conflicto por depredación como amenaza para su conservación, en la Orinoquia Colombiana. Instituto de Investigación de Recursos Biológicos Alexander von Humboldt, Bogotá, pp. 103 – 109.

Payán, E., Soto, C. (2012). Los Felinos de Colombia. Ministerio de Ambiente y Desarrollo Sostenible, Instituto de Investigaciones de Recursos Biológicos Alexander von Humboldt y Panthera Colombia. 48 pp.

Quevedo, Padilla, J. (2018). Vulnerabilidad de los ecosistemas llaneros frente a la invasión de la especie introducida *Acacia mangium.* Pontificia Universidad Javeriana, Facultad de estudios ambientales y rurales.

Quiceno – Mena, Dayana. (2017). Efecto de las plantaciones de *Acacia mangium* Willd. y *Schizolobium parahyba* (Vell) S.F. Blake sobre la trayectoria sucesional de la vegetación, en áreas de explotación

minera a cielo abierto. Universidad Nacional de Colombia. Tesis de investigación presentada como requisito parcial para optar al título de Magister en Ciencias – Biología.

Ramírez, J. 2018. La ganadería hace un milagro en la altillanura de Vichada. Revista Dinero. Ganadería 4/12/2018. Available in: https://www.dinero.com/edicion-impresa/caratula/articulo/ganaderia-en-vichada-para-exportacion/257184

Reyes, M., Carmona, G., Fernandez, M.E. (2018). Physiological and exploitation aspects of *Acacia mangium* Willd. A review. Revista Colombiana de Ciencias Hortícolas – Vol. 12 – No. 1 – pp.244-253, enero – abril.

Romero, M., F, Trujillo., C, Lasso., O, Campo. (2017). Área de estudio. Pp.29 – 45. In: Trujillo, F & C, A, Lasso. Biodiversidad del río Bita, Vichada, Colombia. Serie editorial Fauna Silvestre Neotropical. Instituto de Investigación de Recursos Biológicos Alexander von Humboldt (IAvH). Bogotá, D.C. Colombia.

Torres, D., Del Valle, J. (2007). Growth and yield modelling of *Acacia mangium* in Colombia. New Forests 34: 293-305. Springer.

Trujillo, F., Antelo, R., Usma, S. (2016). Biodiversidad de la cuenca baja y media del río Meta. Fundación Omacha, Fundación Palmarito, WWF. Bogotá 336 pag.

Trujillo F. y C.A. Lasso. (2017). Biodiversidad del río Bita, Vichada, Colombia. Serie Editorial Fauna Silvestre Neotropical. Instituto de Investigación de Recursos Biológicos Alexander von Humboldt (IAvH). Bogotá, Colombia.

Trujillo, F., Mosquera-Guerra, F. (2016). Caracterización, uso y manejo de la mastofauna asociada a los morichales de los llanos orientales colombianos. Capítulo 7. Pp. 191-219. En: Lasso, C. A., G. Colonnello y M. Moraes R. (Editores), XIV. Morichales, cananguchales y otros palmares inundables de Suramérica. Parte II: Colombia, Venezuela, Brasil, Perú, Bolivia, Paraguay, Uruguay y Argentina. Serie Editorial Recursos Hidrobiológicos y Pesqueros Continentales de Colombia. Instituto de Investigación de Recursos Biológicos Alexander von Humboldt (IAvH). Bogotá, D. C., Colombia.

Trujillo, F., Portocarrero, M., Gómez, C. (2008). Plan de manejo y conservación de especies amenazadas en la Reserva de Biósfera El Tuparro: Delfines de río, Manatíes, Nutrias, Jaguares y Tortugas del género Podocnemis. Proyecto Pijiwi Orinoko (Fundación Omacha – Fundación Horizonte Verde), Forest Conservation Agreement, Bogotá, Colombia.

Universidad Distrital Francisco José De Caldas, G. D. (2017). Estudio de caracterización ecológica rápida de la biodiversidad, en los predios de forestal de la Orinoquia, mediante el levantamiento de información florística y faunística para la revisión del componente biológico. Bogotá.

Universidad Nacional de Colombia (2018). Diagnóstico Departamento de Vichada. Available in: http://orinoquia.unal.edu.co/fileadmin/user_upload/Diagnostico_Departamento__Vichada.pdf

UPRA. (2017). SIPRA Planificación nacional. Available in: https://sipra.upra.gov.co/

Valoración Económica Ambiental. 2017. Estudio Técnico – Medidas de Manejo Ambiental – Proyecto Forestal de la Orinoquía. 597pp.

Villarreal – Leal, H. and Maldonado – Ocampo, J. (2007). Caracterización biológica del Parque Nacional Natural El Tuparro (Sector noreste), Vichada, Colombia. Instituto de Investigación de Recursos Biológicos Alexander von Humboldt. Bogotá D.C, Colombia. 292 pag.

### b. Appendix 2: List of forest activity reference documents

| Document name | Code[107] | Content |
|---|---|---|
| Silvicultural Plan | 0900-000-01E | Strategic, technical and procedural elements to achieve the forest management objectives; tree quality standards during the different plantation phases |
| Planning and Technical Plan | 0800-000-01E | Framework to ensure alignment between operations personnel, investigators, and all related personnel to achieve the management objectives |
| Forestry - Implementation | X0920-004-01S | Description of forestry activities and objectives |
| Plantation Management Plan | 0900-001-02E | A working document detailing the processes of harvesting, transport, logistics, and wood processing to meet the objectives of forest management. |
| Planting with machines | 0920-005-01S | Specifications for carrying out tractor planting activities |
| Technical specification | 0920-003-01S | Land preparation, first pass, and second pass |
| Technical specification | 0920-008-01S | Pruning in *Acacia mangium* |
| Technical specification | 0920-001-01S | Application of herbicides |
| Technical specification | 0920-007-01S | Manual fertilizer application |
| Technical specification | 0920-012-01S | Row herbicide application by bag |
| Technical specification | 0940-004-02S | Ant control |
| Protection (Procedures and emergency plans) | 0710-001-03S | Fire protection guidelines, procedures, recommendations, and responsible persons |
| Road Assessment Procedure | 0850-003-01S | Evaluate each segment of roadway on FFC properties for the current status and future management recommendations |

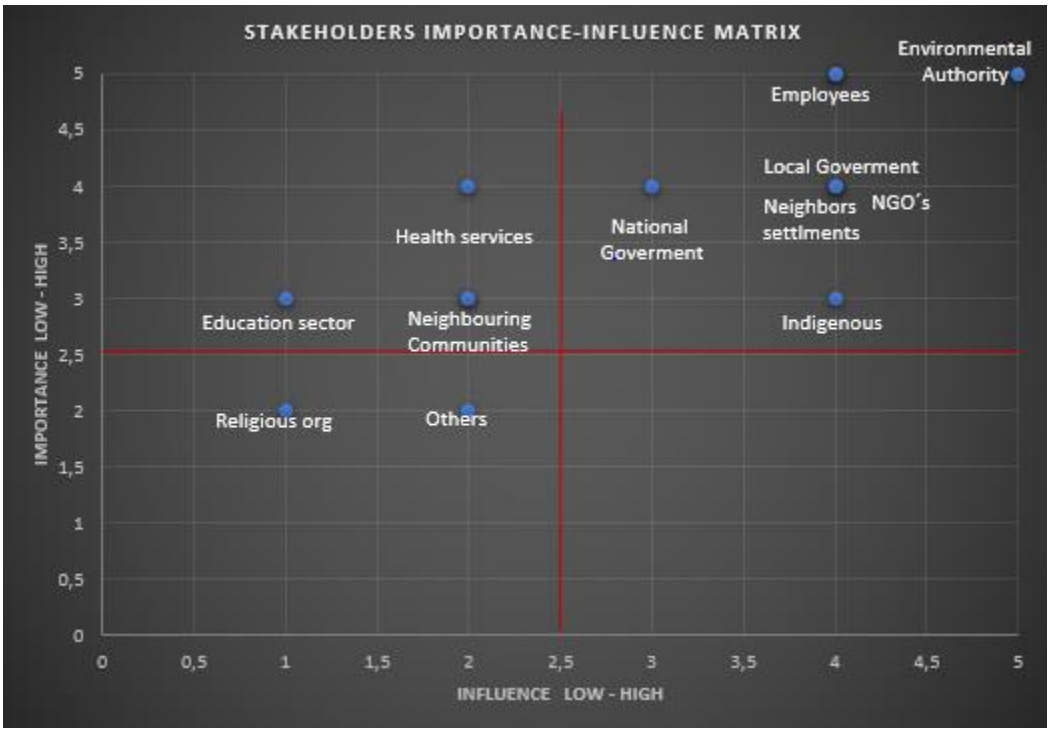
[107] Supporting information: [Plantations_documents]

**c. Appendix 3: Main characteristics of the silvicultural activities described in Appendix 2.**

| Activity | Description |
|---|---|
| Nursery | The nursery's goal is to produce high-quality seedlings at a reasonable cost. The quality is determined if the seedlings are healthy, come from genetically improved seed, have a good root-shoot ratio, are free of diseases, and have high vigor generated from the process of rustification. The Plant Quality Index (PQI) was created, taking into consideration these and other variables. FFC has its own nursery with the capacity to produce 5 million seedlings per year. Initially, genetic material from a local supplier was used and then seeds were imported. Now, the intent is to collect seeds from the plus trees themselves. The Jiffy system is used as substrate. There is a genetic improvement plan, focused on improving productivity ($m^3$/ha), among other factors. |
| Plantation planning | The plantation is planned by considering factors like the environment, the harvest and transport of the product, fire risk, and slope of the land. All designs respect sensitive environmental areas such as lowlands, wetlands, and areas of high value natural forest. |
| Site preparation | Once the lots have been identified in accordance with the planning, strips are opened by a tractor with discs: the recommended tractor size is 100 hp, with a strip width from 1.0 to 1.2 m and a depth of 25 cm. The orientation of the lines is done with a GPS system. The distance between rows is 3.2 m. |
| Plantation establishment | The spacing for the lots of acacia and eucalyptus measure 3.2 m x 2.4 m, for a total of 1,333 trees/ha. Mechanical planting is carried out using a tractor with a mounted and calibrated planter. The Jiffy capsule should be 3-5 cm deep. Manual planting is done with a wooden hole in the middle of the strips drawn in the ground. The corresponding personal protection elements are used, and environmental considerations are complied with. Survival of 100% of the seedlings must be guaranteed 30 days after planting. |
| Weed control | The objective is to maintain an area around the seedling of at minimum 1 m in diameter free of weeds for the first three months. Herbicides are applied before the establishment of the plantation (3-7 days). Between the streets of the plantation, herbicide is applied mechanically, according to the growth in the sites, with the maximum when the weeds are 30 cm high. It is also applied manually according to established schedules and the need of the site. Glyphosate is applied, and the corresponding personal protection elements are used, and environmental considerations are complied with. |
| Pruning | For acacia, a corrective pruning is performed when it reaches an age of 7-8 months and up to 65% of its adult height. The branches are cut flush with the shaft without damaging the bark of the tree, preferably in the dry season of the year. If the latter is |

| | |
|---|---|
| | not possible, healing should be applied to avoid attacks by microorganisms. Cutting tools such as scissors or saws are used depending on the diameter of the branch. |
| Fertilization | Macro and micronutrients are applied in doses that vary according to soil conditions. Granulated fertilizers are used in minimum doses of 60 kg of each macronutrient per ha. Fertilization takes place during planting, directly in the holes made by the mechanized planting. In the case of manual planting, it takes place near the hole, taking care that there is no direct contact between the product and the roots. A second fertilization is done approximately 6-10 months after planting and another in the second year, if necessary. The fertilization effectiveness is monitored through foliar analysis. It can be done manually or mechanized. |
| Harvest | Mechanized harvesting will be done with machinery, as determined by the slope of the land. A forwarder is used for lots with slopes of 0-18%, while a grapple skidder is used uphill on slopes between 19-36% and downhill on slopes of 37-47%. In the exceptional cases of slopes above 48%, overhead cables will be used. Soil moisture, susceptibility to erosion, rockiness and terrain, among other factors, are also considered in the planning. The final shift at which the clear cut is made is after seven years. |
| Phytosanitary control | The predominant types of ants in the area have been identified as *Atta spp.* and *Acromirmex spp.* After the identification, the incidence of the ant is measured, the anthill is registered and measured, and controls are applied according to the size. Chemical baits, biological baits, insecticides in powder, and nebulized liquids are applied. Based on the nuptial flight schedule, mechanical control and manual collection are also carried out. |
| Fire control | The objective is always to prevent fires. Firebreaks between 10 and 50 m are elaborated after a year. Green grass will be kept as short as possible using tractors with disc plows (harrows) and weed cutters (“roto-speed”). They are planned by zones (districts), considering the available personnel (including contractors), access roads, water supply points, and complementary equipment. In some cases, fire extinguishers are used. Trucks are available to supply 4000 liters of water, pumps, "*bakkie sakkies*" (motor pumps with integrated tanks and hoses), tractors, vans, fire swatters, elevated water tanks, radios, and watchtowers. |
| Road plan | This includes road planning, design, operations, and maintenance according to harvesting methods, environmental and topographical characteristics of the area, and harvest cycles. Minimum curve radii of 15 m and maximum stand distances of 1.2 km are employed, with a maximum extraction distance of 600 m. Digital models of the MDT terrain are used for planning. |

### d. Appendix 4: Stakeholder importance and influence matrix



### e. Appendix 5: Indigenous community influence map