AMAZON PARTNER 01

Prepared by Infrapar Sustainability Ltda to Amazon Partners, LLC.

Project Title	*Amazon Partners 1*
Version	*1*
Date of Issue	*19th April 2023*
Project Location	*State of Acre, Brazil*
Project Proponent(s)	*Amazon Partners, LLC.* *jay@amazonpartners.us* *Address: 109 East 17th Street, Suite 450, Cheyenne Wyoming, 82001, United States of America.* +1-310-993-9952
Prepared By	*Infrapar Sustainability Ltda.*
Validation Body	*Aster Global Environmental Solutions, Inc.*
Project Lifetime	*December 1st ,2022 – November 30th, 2051; 30-year lifetime*
GHG Accounting Period	*December 1st ,2022 – November 30th, 2051*
History of CCB Status	*First Validation*
Gold Level Criteria	*Benefits of Adapting to Climate Change; Impacts of Climate Change; Necessary and projected adaptation measures. Positive net well-being of the community; Community Monitoring Plan; Exceptional Community Benefits. Statute of High Priority for Biodiversity Conservation; Measures Necessary and Designed to Adapt. Preserving biodiversity and supporting sustainable activities. With regard to communities, we can highlight Support for technical, commercial and organizational strengthening for the sustainable extraction of forest products, such as Brazil nuts and*

	latex. Technical training, together with government agencies and local NGOs, in the use of sustainable soil management techniques, mainly in combating the use of fire to clean areas. Young people and women will receive special attention from the Project. Activities to promote entrepreneurship, with training and engagement with companies, NGOs and other organizations. With regard to biodiversity, the Monitoring Programs to be developed will indicate the necessary measures for the preservation of key species and populations of endangered species.
Expected Verification Schedule	*Expected to start on December 30,2023*

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1 Summary of Project Benefits

1.1 Unique Project Benefits

Outcome or Impact Estimated by the End of Project Lifetime	Section Reference
1) Support the strengthening of non-timber extractivism	5.1.12
2) Support the strengthening of native latex extractivism	5.1.12
3) Support the strengthening of the Brazil nut production chain	5.1.12
4) Offer techniques for repairing fields without the use of fire	5.1.12
5) Offer training to young people and women in rural entrepreneurship	5.1.12

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	Not applicable	-
	Net estimated emission reductions in the project area, measured against the without-project scenario	1,085,761 tCO2eq	5.1.18
Forest[1] cover	For REDD[2] projects: Estimated number of hectares of reduced forest loss in the project	35.005,05 ha	5

[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 conversion of forests to non-forest land and/or reduce the degradation of forest land where forest biomass is lost (*VCS Program Definitions*)

Category	Metric	Estimated by the End of Project Lifetime	Section Reference
	area measured against the without-project scenario		
	For ARR[3] projects: Estimated number of hectares of forest cover increased in the project area measured against the without-project scenario	Not applicable	-
Improved land management	Number of hectares of existing production forest land in which IFM[4] practices are expected to occurred 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 occurred 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 resulting from training provided as part of project activities.	Jaraguá: 25 Santa Rosa: 30 Senegal: 26	7.2.1
	Number of female community members who are expected to have improved skills and/or knowledge resulting from training as part of project activities	Jaraguá: 15 Santa Rosa: 15 Senegal: 15	7.2.1

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

[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 D efinitions*)

Category	Metric	Estimated by the End of Project Lifetime	Section Reference
Employment	Total number of people expected to be employed in project activities,[5] expressed as number of full-time employees[6]	not applicable	-
	Number of women expected to be employed as a result of project activities, expressed as number of full-time employees	not applicable	-
Livelihoods	Total number of people expected to have improved livelihoods[7] or income generated as a result of project activities	Jaraguá: 15 Santa Rosa: 15 Senegal: 15	7.2.1
	Number of women expected to have improved livelihoods or income generated as a result of project activities	Jaraguá: 15 Santa Rosa: 15 Senegal: 15	7.2.1
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	not applicable	-
	Number of women for whom health services are expected to improve as a result of project activities, measured against the without-project scenario	not applicable	-
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	Jaraguá: 15 Santa Rosa: 15 Senegal: 15	7.2.1

[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.

Category	Metric	Estimated by the End of Project Lifetime	Section Reference
	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	Jaraguá: 15 Santa Rosa: 15 Senegal: 15	7.2.1
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	Jaraguá: 15 Santa Rosa: 15 Senegal: 15	7.2.1
	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	Jaraguá: 15 Santa Rosa: 15 Senegal: 15	7.2.1
Well-being	Total number of community members whose well-being[8] is expected to improve as a result of project activities	Jaraguá: 100 Santa Rosa: 124 Senegal: 104	7.2.1
	Number of women whose well-being is expected to improve as a result of project activities	Jaraguá: 15 Santa Rosa: 15 Senegal: 15	
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	Jaraguá: 13.099.21 Santa Rosa: 9.957.97 Senegal: 32.292.11	6.1.3
	Expected number of globally Critically Endangered or Endangered species[10] benefiting from reduced threats as a result of project	1 ichthyofauna species 7 birds 10 mammals	8

[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

Category	Metric	Estimated by the End of Project Lifetime	Section Reference
	activities,[11] measured against the without-project scenario	8 trees	

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

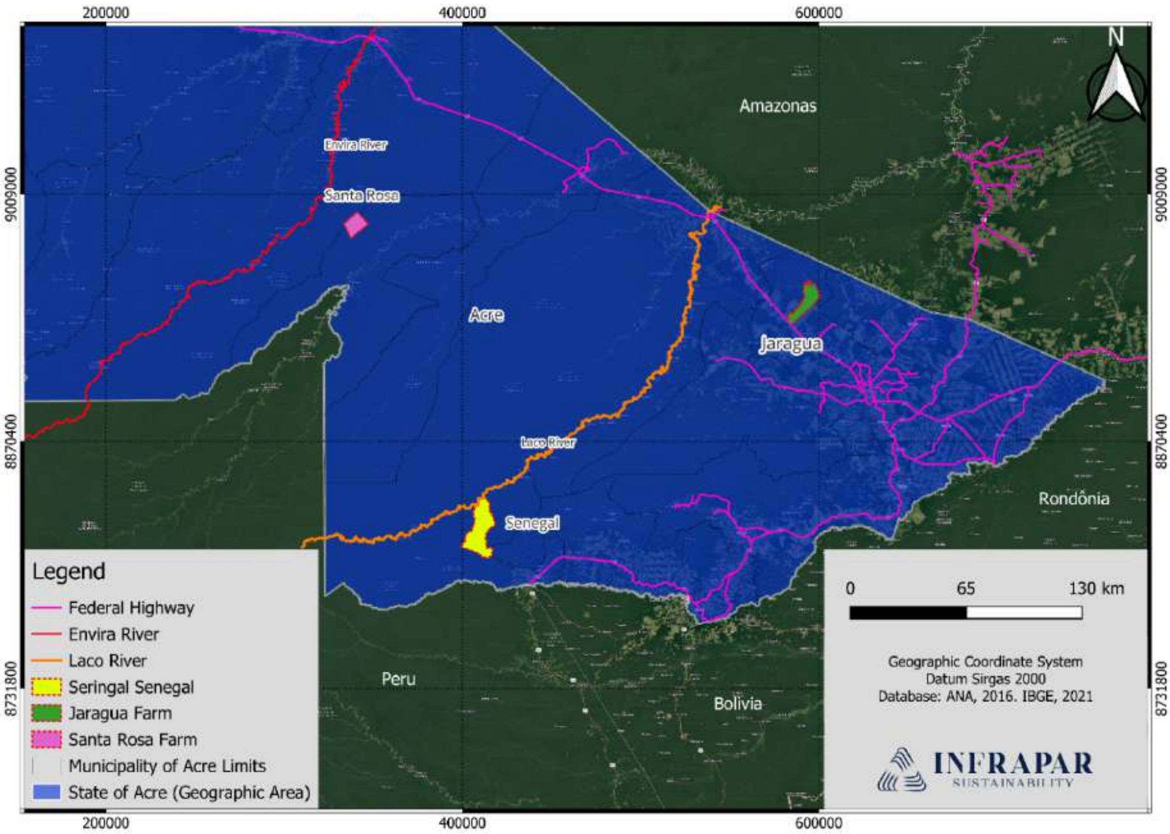
2 VCS Program General Information

2.1 Project Goals, Design and Long- Term Viability

2.1.1 Summary Description of the Project (G1.2)

The Project Amazon Partner 1 is located in the geographic region of the state of Acre, in the North of Brazil and comprises 03 private properties titled in these documents as Jaraguá, Santa Rosa and Senegal, as can be seen in figure below.

Figure 1 - Location of the three properties inside the Geographic Area.



The three properties have a total area of 58.488,117 hectares and correspond to the total project area of 55.357,001 hectares.

The project estimate is that GHG emissions in the atmosphere will be reduced and removed on average 36,191 tCO2eq annually over 30 years, totaling 1,085,761 tCO2eq at the end of the project.

The reductions and removals of GHG emissions will be achieved through actions foreseen in this project and whose ultimate objective is to prevent deforestation and promote forest conservation, generating various benefits for the climate, biodiversity, and the community.

2.1.2 Project Scale

Project Scale	
Project	
Large Project	X

2.1.3 Project Proponent (G1.1)

Organization name	Amazon Partners, LLC
Contact person	Jay Rogers
Title	Chief Executive Officer (CEO)
Address	Address: 109 E. 17th Street, Suite 450, Cheyenne, WY 82001 – United States of America
Telephone	+1-310-993-9952
Email	jay@amazonpartners.us

2.1.4 Other Entities Involved in the Project

Organization name	Infrapar Sustainability Ltda.
Role in the project	Technical consultancy for baseline determination, additionality demonstration, calculations.
Contact person	Breno Figueiredo
Title	Climate Economist
Address	Avenida Paulista 2439 / 14º floor, Cerqueira Cesar, São Paulo/SP – Brazil - Zip Code: 01311-936
Telephone	+55 (11) 99680-8688

2.1.5 Grouped Project

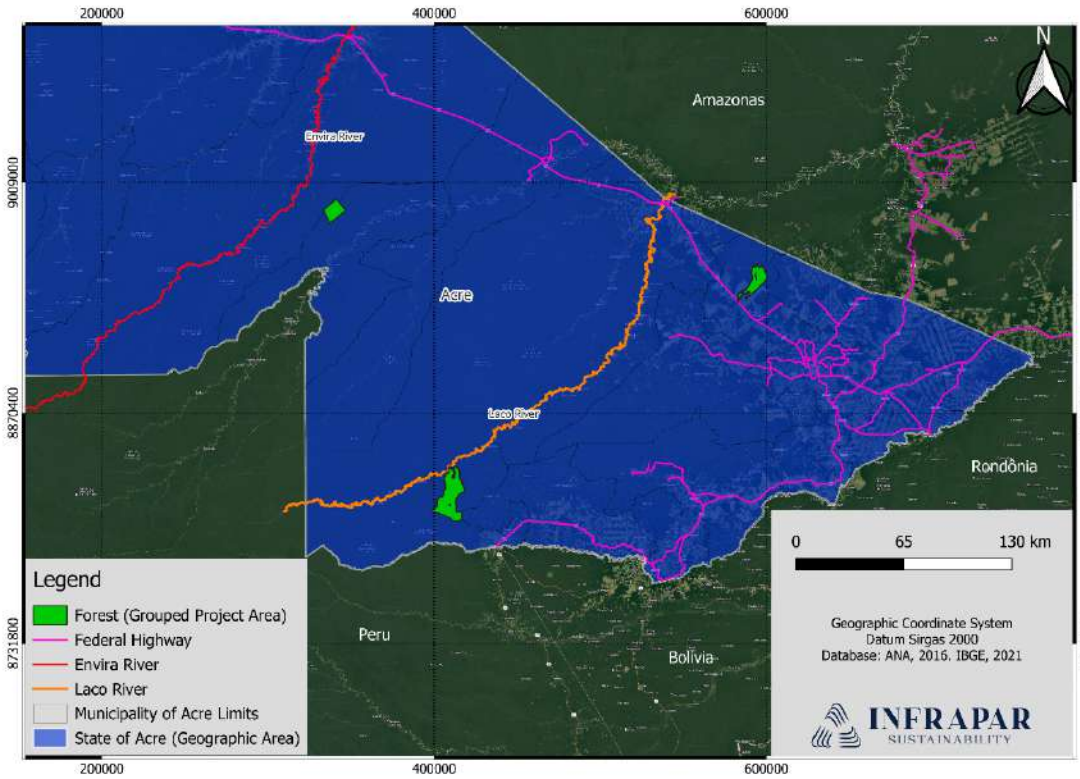
As this is a grouped REDD+CCB project, its total area is calculated as the sum of the three individual properties forested land only as shown in the figures above. The next table summarizes as follows.

Table 1 - Summary of the Total Grouped Project Area.

	Jaraguá	Santa Rosa	Senegal	Grouped
Property Area (ha)	15.687,52	9.957,97	32.842,01	58.488,117
Anthropized + Water Area (ha)	2.588,31	0,00	549,90	3.138,21
Project Area (Only Forests) (ha)	13.099,21	9.957,97	32.292,11	55.357,001
Project Area (Only Forests) (%)	84%	100%	98%	95%

The next image shows the location of the 3 properties in the Geographic Area of Acre.

Figure 2 - Map Location of the Grouped Project Area in the Geographic area of Acre.



Source: ANA,2016. IBGE, 2021.

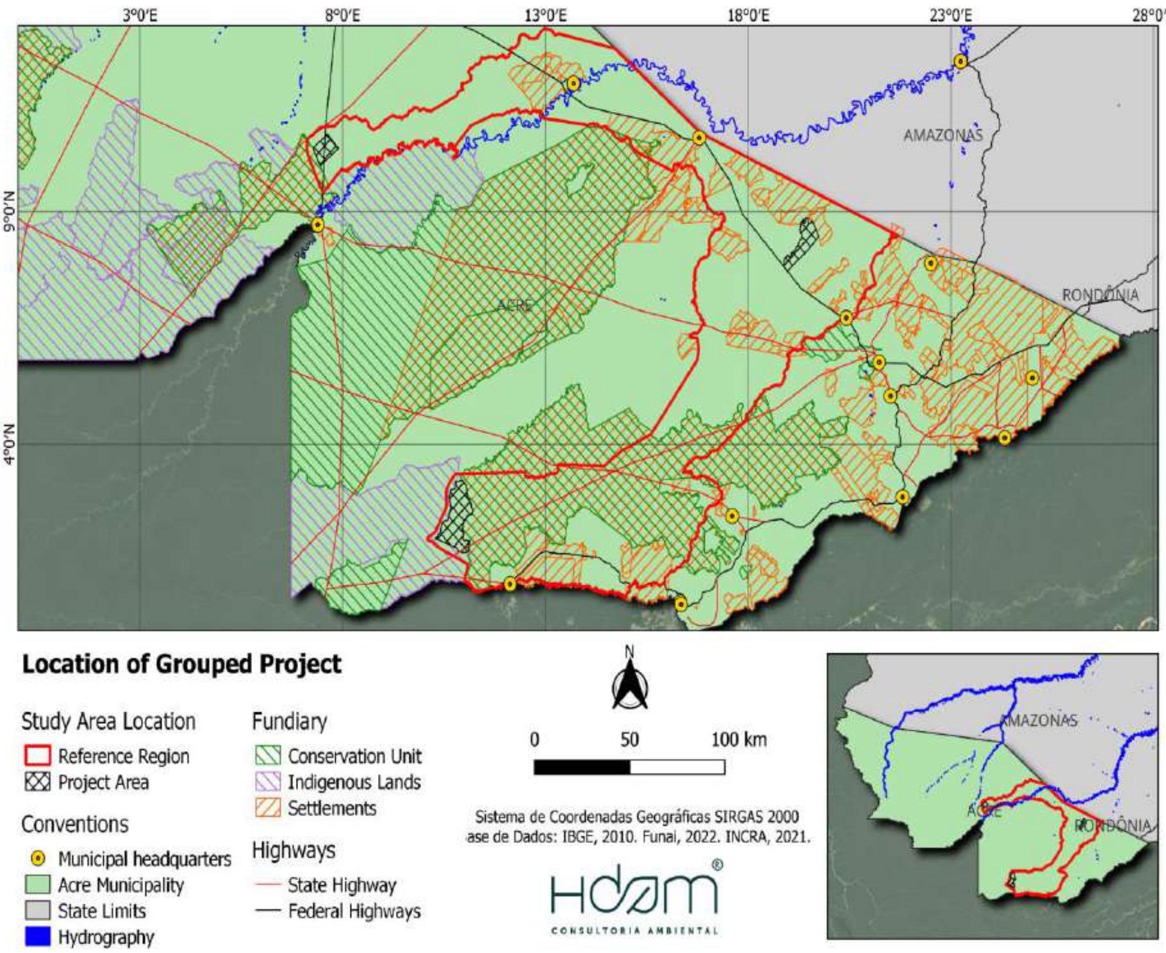
Therefore, the total area of the grouped project is 55.357,001hectares.

2.1.6 Physical Parameters (G1.3)

2.1.6.1 General Location

The Santa Rosa, Jaraguá, and Senegal farms grouped project is located in the southern region of the state of Acre. The Santa Rosa farm is located at coordinates -9.05429°S latitude and -70.44614°W longitude, Jaraguá has central coordinates of -9.4959°S latitude and -68.1282°W longitude, and Senegal corresponds to -10.6558°S latitude and -69.8192°W longitude. The surrounding area of the project's reference region is characterized by the presence of several Conservation Units (of Integral Protection and Sustainable Use), Indigenous Lands Demarcated by FUNAI, and Settlement Projects resulting from Agrarian Reform (INCRA). The properties area comprises the total area of the Santa Rosa, Jaraguá, and Senegal properties, totaling 58.488,117 hectares. Meanwhile, the project's effective area comprises 55.357,001 hectares. Access roads to the farms are through local roads, State Highways in the case of the Senegal and Santa Rosa farms, or Federal Highways in the case of Santa Rosa and Jaraguá.

Figure 3 - Location map of the grouped project.



Source: IBGE, 2010. Funai, 2022. INCRA, 2021.

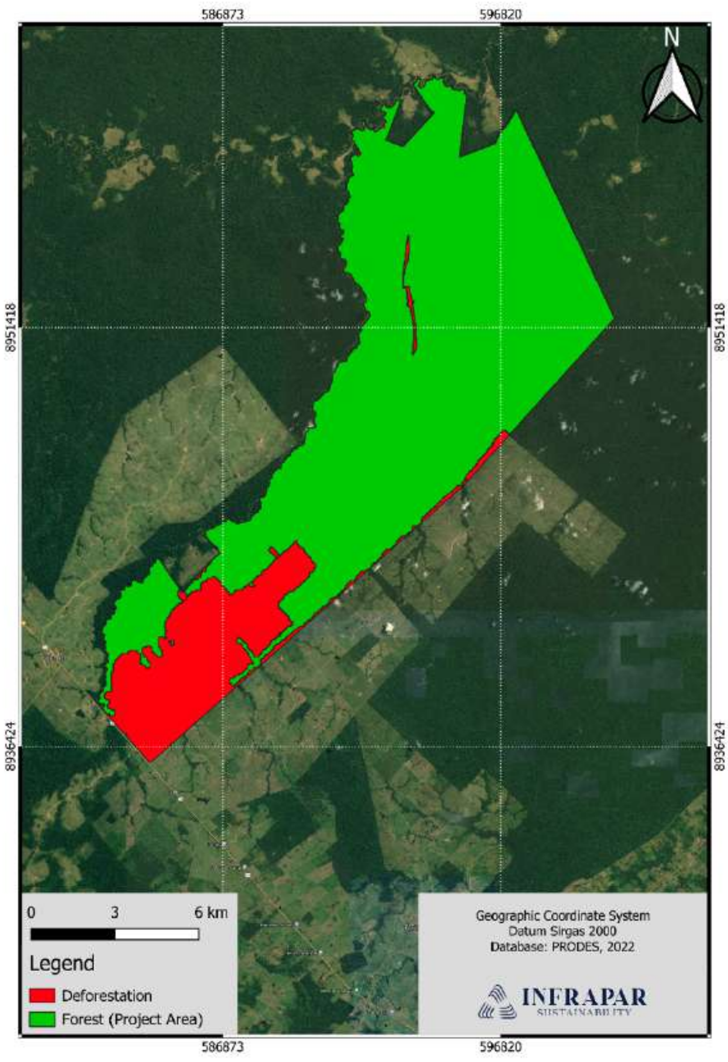
2.1.6.2 Project Area

The Project area was calculated using the total area of the property discounted the deforested area. In the following topics, the representation of the project area and the anthropized area are showed.

2.1.6.2.1 Jaraguá Farm

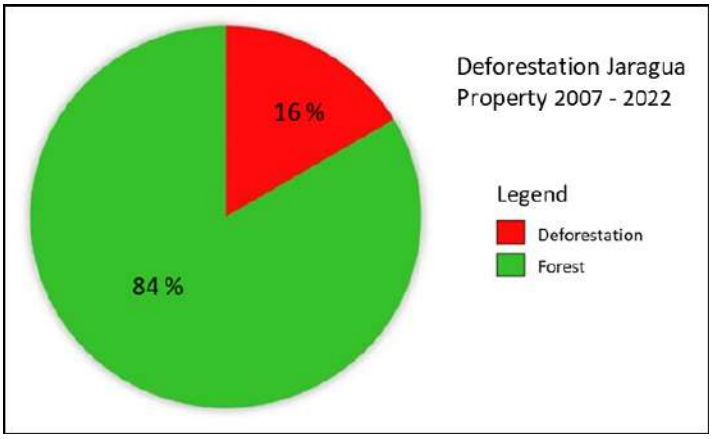
The Jaraguá farm has 84 % of its area covered by forests and 16 % by anthropic areas that can be seen in the figure below.

Figure 4 - REDD+CCB Project Area of the Jaraguá Farm.



Source: PRODES, 2022

Figure 5 - percentage of deforestation in the area of the Jaraguá farm.

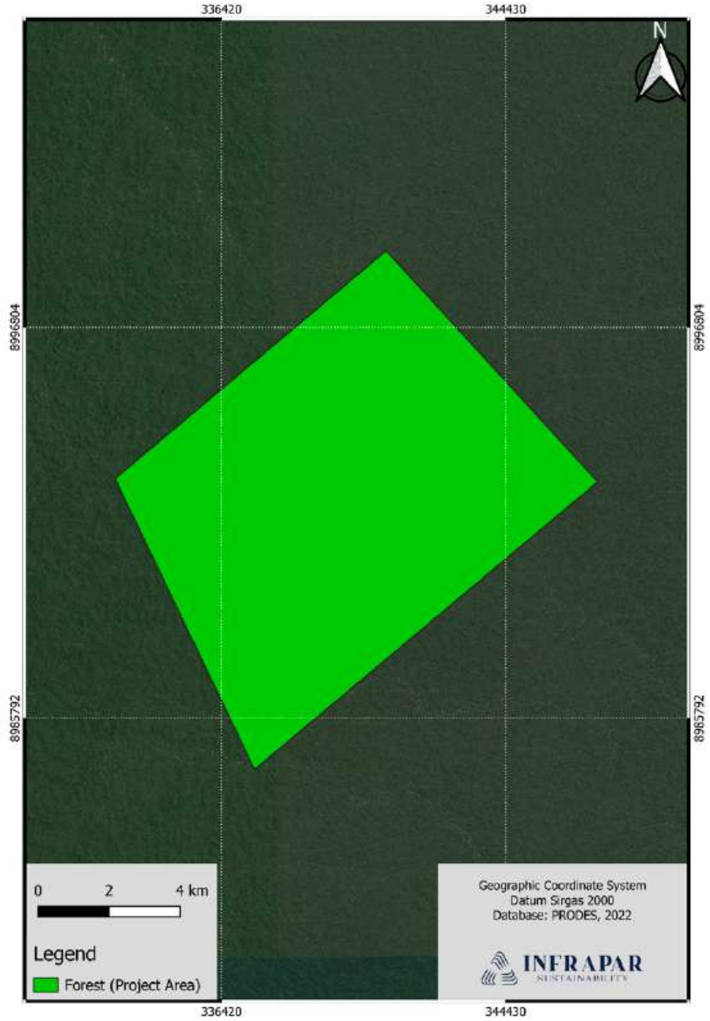


Source: PRODES, 2022

2.1.6.2.2 Santa Rosa Farm

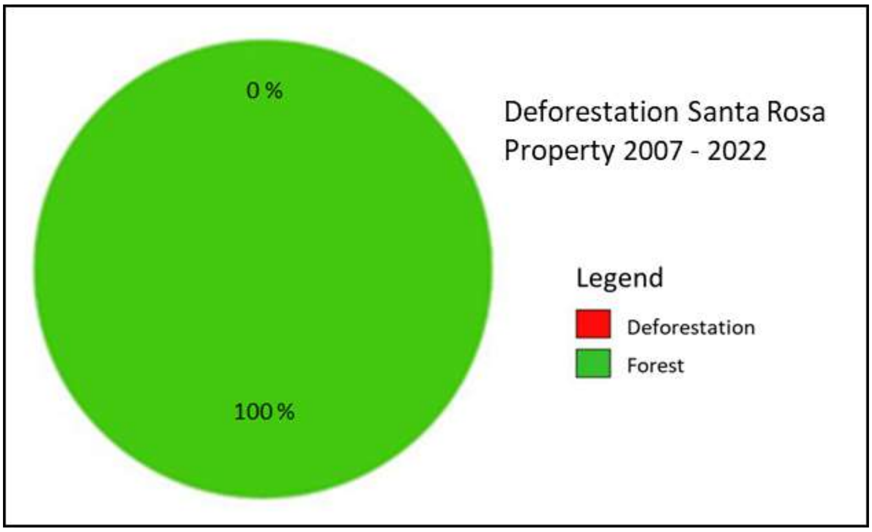
The Santa Rosa farm has 100 % of its area covered by forests, which means the project area corresponds to 100% of the property area.

Figure 6 - REDD+CCB Project Area of the Santa Rosa Farm.



Source: PRODES, 2022

Figure 7 - Percentage of deforestation in the Santa Rosa Farm.

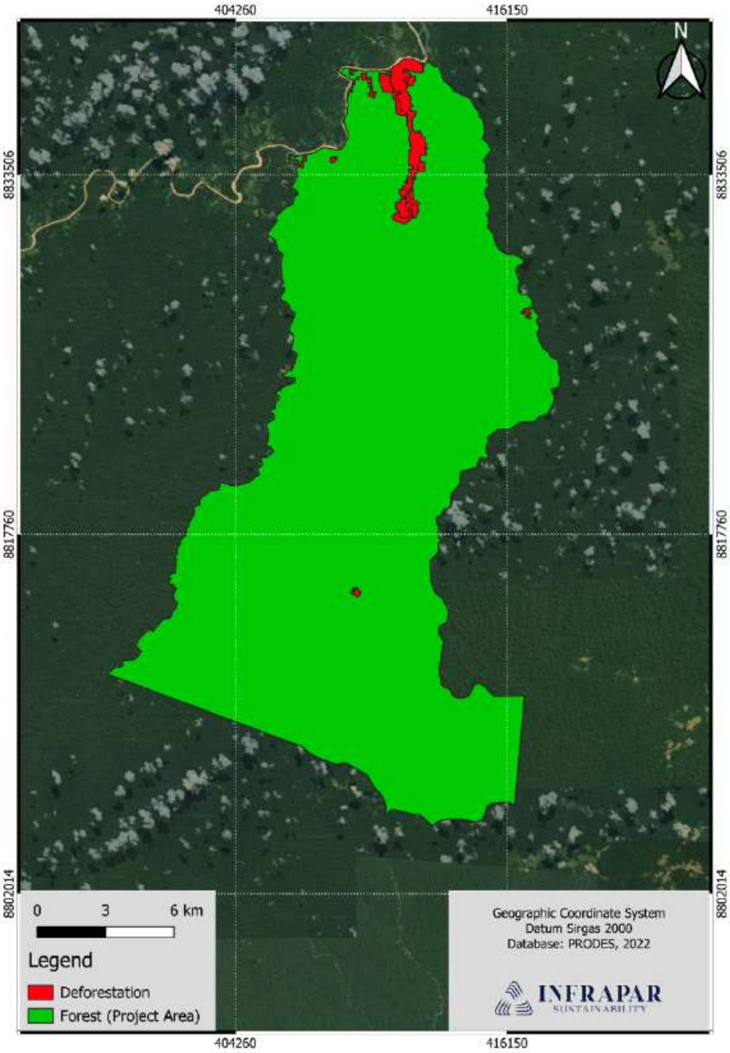


Source: PRODES, 2022

2.1.6.2.3 Senegal Farm

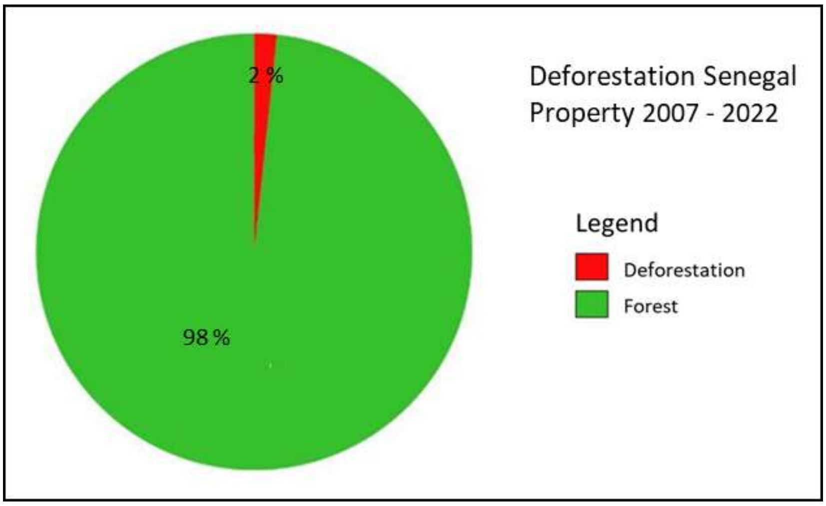
The Senegal Farm has 98% of its area covered by forests and 2% are anthropic areas, which means the project area corresponds to 98% of the property area.

Figure 8 - REDD+CCB Project Area of the Senegal Farm.



Source: PRODES, 2022

Figure 9 - Percentage of deforestation in the Senegal Farm.



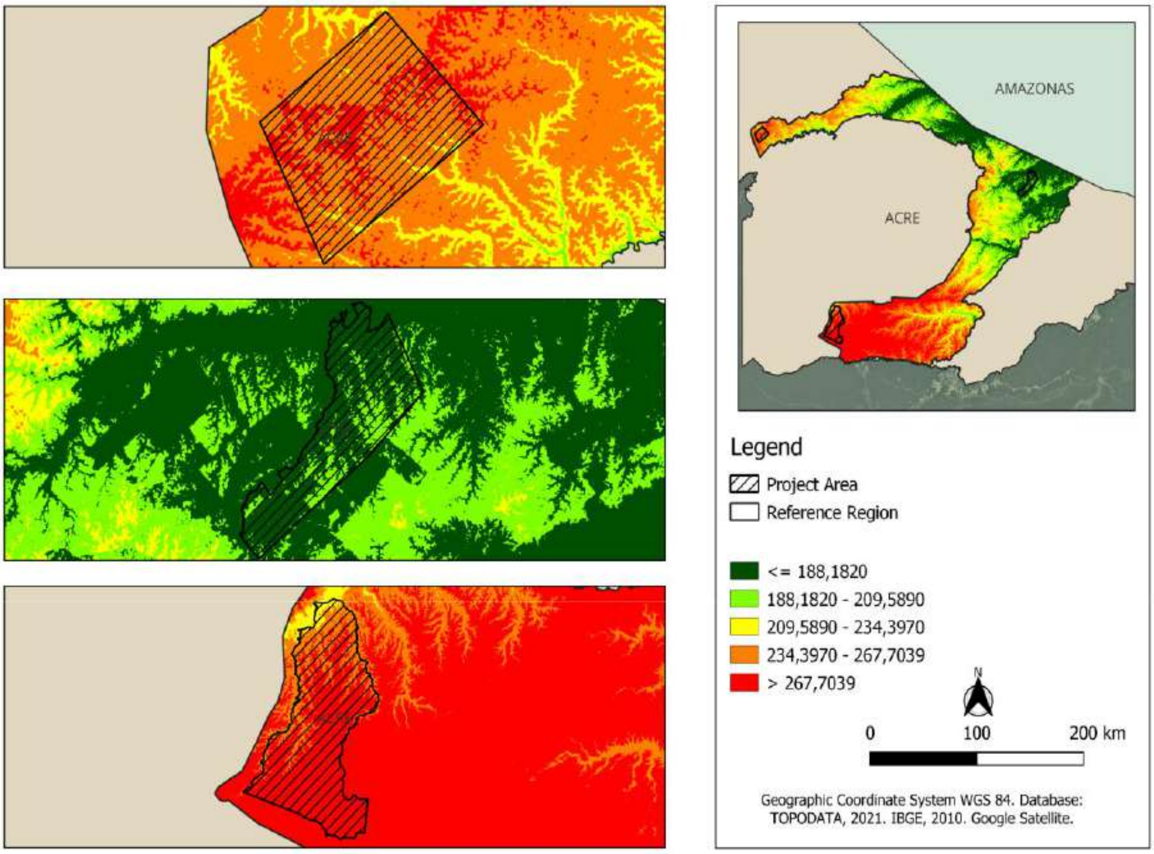
Source: PRODES, 2022.

2.1.6.3 Topography

According to Cavalcante (2006) the altitudes in the depressions ranged from 130 to 440 m (in the Juruá-Iaco Depression). Tectonics seem to play an important role in the area. The Tabular Surface of Cruzeiro do Sul predominates tabular reliefs with gentle slopes, with the exception of some stretches, such as its western border, where the slopes are more accentuated. It has an average altitude between 150 and 270 m and dendritic to subparallel drainage patterns (associated with tectonic structures). The Jaquirana, Moa, Juruá-Mirim and Rio Branco ranges are found in the Residual Plateau of Serra do Divisor, comprising the highest altitudes in Western Amazonia (between 270 and 750 m), intensely dissected by current drainage. The dendritic and parallel pattern reveals strong structural control.

The study areas have altitudes between 189 and 268 m, varying according to the region in which they are located, so the properties in Senegal and Santa Rosa are the areas where they are located at higher altitudes with variations from 209 to 268 m, Jaraguá , in turn, at an altitude of 188 to 209 m.

Figure 10 - Characterization of the altitude referring to the Grouped Project.



Source: TOPODATA, 2021. IBGE, 2010.

2.1.6.4 Pedology

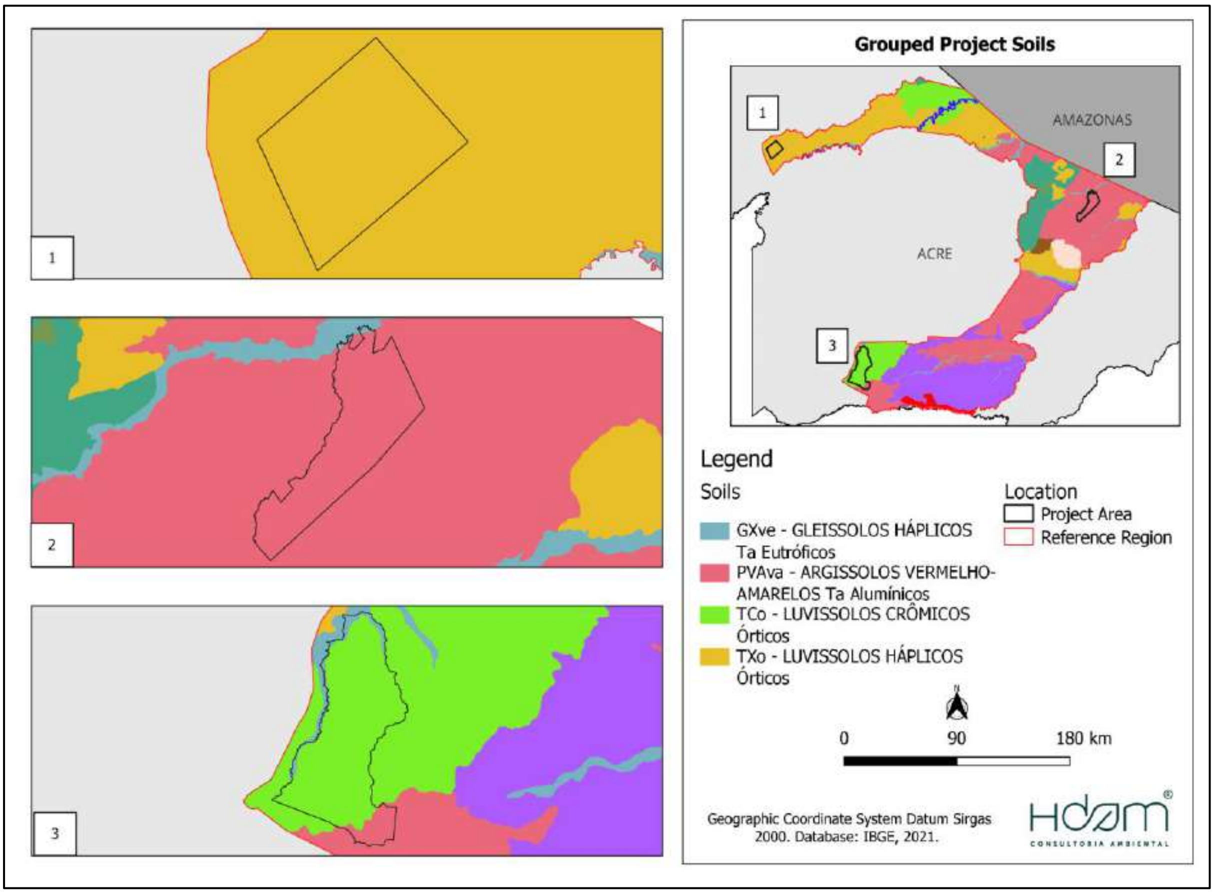
The soils of the state of Acre were formed from sedimentary deposits, with Cenozoic Age (the oldest sediments are between 65 and 23.5 million years old), from the Solimões Formation (BRASIL, 1976, 1977; ACRE, 2000), which they occupy more than 70% of the territory of Acre (CAVALCANTE, 2006). According to Passos (2000) the Solimões Formation presents several lithologies, predominantly claystones, occasionally with carbonized material (peat and lignite), sparse concentrations of pyrite and a large amount of fossils of vertebrates and invertebrates. In addition to siltstones, silt-clay limestones, ferruginous sandstones, polymic conglomerates and areas with predominance of sandy sediments. In this context, the project zones according to (IBGE, 2005; CALVACANTE, 2006; PAPA, 2017; NASCIMENTO, 2020) compete with the following typologies:

Jaraguá (Bujari): Red Yellow Argisol, Gleisol;

Santa Rosa (Santa Rosa do Purus): holds the Haplic Luvisol class;

Senegal (Assis Brasil): Red Yellow Argisol, Gleisol and Luvisol.

Figure 11 – Characterization of soil aspects related to the Grouped Project.



Source: IBGE, 2021.

2.1.6.5 Geology

The characteristics of the soil presented in the State of Acre have formation from sedimentary rocks resulting from physical and chemical weathering processes. According to Cavalcante (2006), in the State of Acre, the most important geotectonic unit is the so-called Acre Basin, composed of Cenozoic soils, but it is important to emphasize that there are different geological structures along the Basin due to the slow process of geological formation, where for the region further west of the state there are also remnants of Mesozoic soils and even from the Precambrian period.

According to IBGE (2005) the geological formations of Acre are organized as follows: a) Jamari Complex, b) Formosa Formation c) Serenito República, d) Serra do Divisor Formation, e) Rio Azul Formation, f) Moa Formation , g) Ramon Formation, h) Solimões Formation, i) Cruzeiro do Sul Formation, j) Pleistocene Detritus-Lateritic Cover, k) Pleistocene Terraces, l) Holocene Terraces and m) Holocene Alluvial.

The Reference Region and Area of this project have a predominance of sedimentary formations where, according to Nascimento (2019) and IBGE (2005), for the municipalities where the Properties of Jaraguá (Bujari), Santa Rosa (Santa Rosa do Purus) and Senegal (Assis Brasil) the geological formations recorded were:

● Holocene Alluvium (QHa): The most recent formation formed by coarse to conglomerate deposits, representing channel residuals; sandy relative to epelitic point bar representing those of overflow;

● Lower Solimões Formation (TNsi): Formed around 5.3 million years ago, it is characterized by predominantly pelitic sedimentary rocks, highly fossiliferous in the form of claystones with intercalations of siltstones, fine sandstones, limestone and carbonaceous material (lignite), micaceous, of fluvial or fluviolacustrine origin;

● Upper Solimões Formation (TNss): Compact sandstones from meandering fluvial environment that stand out in the relief forming sharp ridges;

● Pleistocene Terraces (QPt): Formed around 1.75 million years ago and is characterized by deposits of ancient river terraces and terraced ramps, consisting of clays, silts and sand, sometimes massive, with reddish colors.

Figure 12 - Characterization of the geological aspects related to the Grouped Project.

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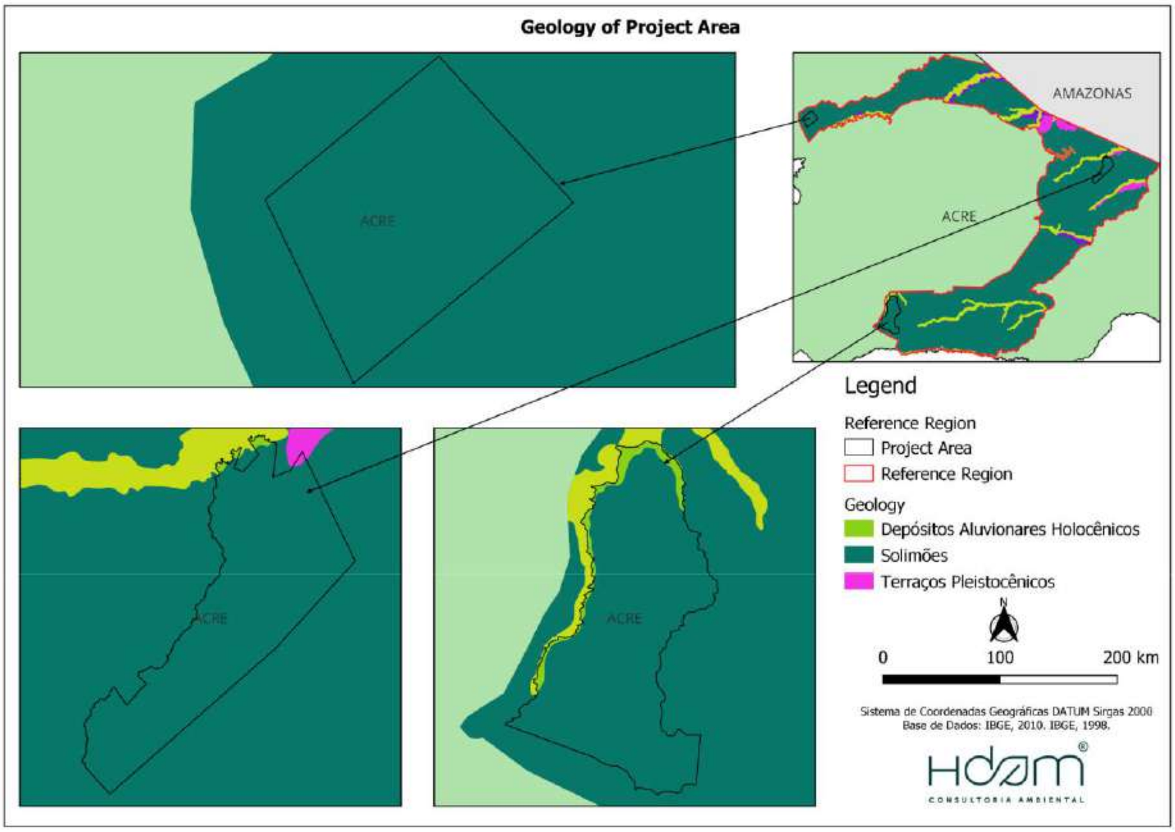
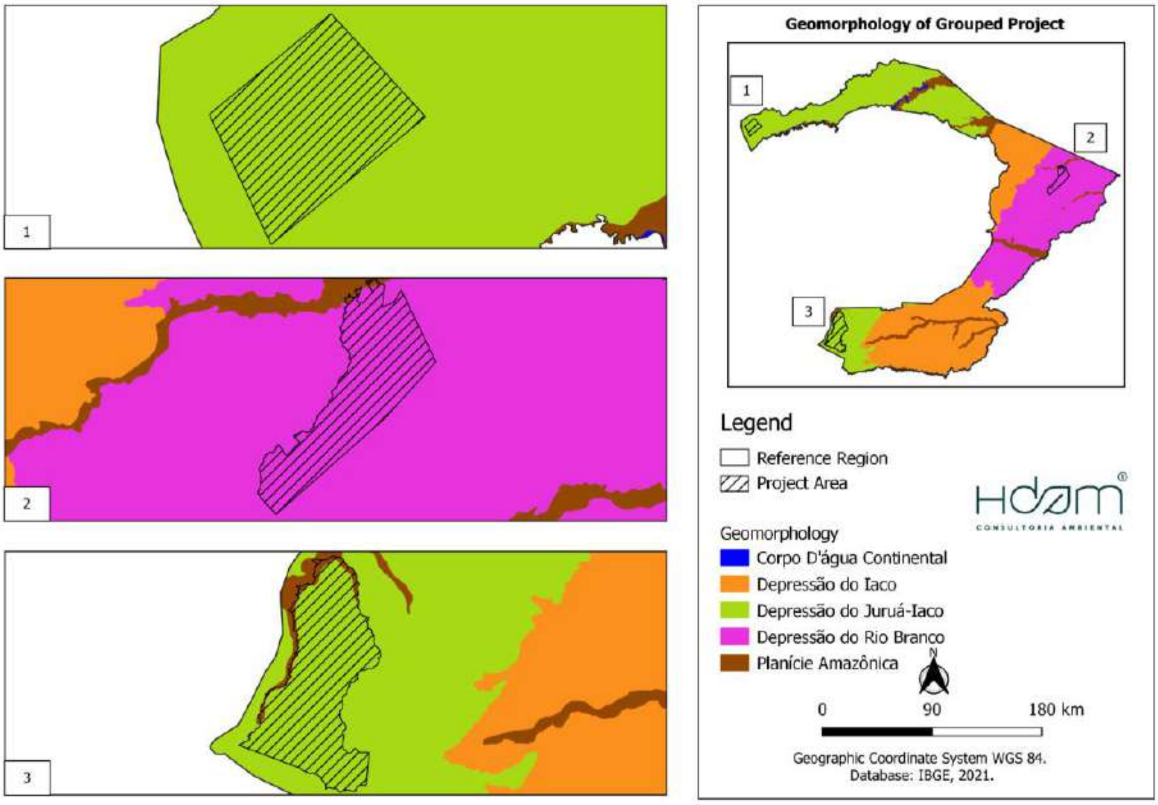


Source: IBGE, 2021.

2.1.6.6 Geomorphology

According to Cavalcante (2006) nine geomorphological units are registered for the State of Acre, namely: a) Amazon Plain, b) Endimari-Abunã Depression, c) Iaco-Acre Depression, d) Rio Branco Depression, e) Juruá-Iaco Depression, f) Tarauacá-Itaquaí Depression, g) Marginal Depression at Serra do Divisor, h) Tabular Surface of Cruzeiro do Sul and Residual Plateaus of Serra do Divisor For the Project Zone and for the Based on data from IBGE (2005), the following geomorphological units were identified: Amazonian plain where according to Cavalcante (2006) it is formed by suspended sediments and construction of plains and terraces, characterized by several levels of terraces and recent floodplains. The other geomorphological units found were: Iaco-Acre Depression (with an altitude of 440 m) and Rio Branco Depression, which together with the Residual Plateau of Serra do Divisor has one of the highest altitudes in Western Amazonia (between 270 and 750 m).

Figure 13 - Characterization of the geomorphological aspects of the Grouped Project.



Source: IBGE, 2021.

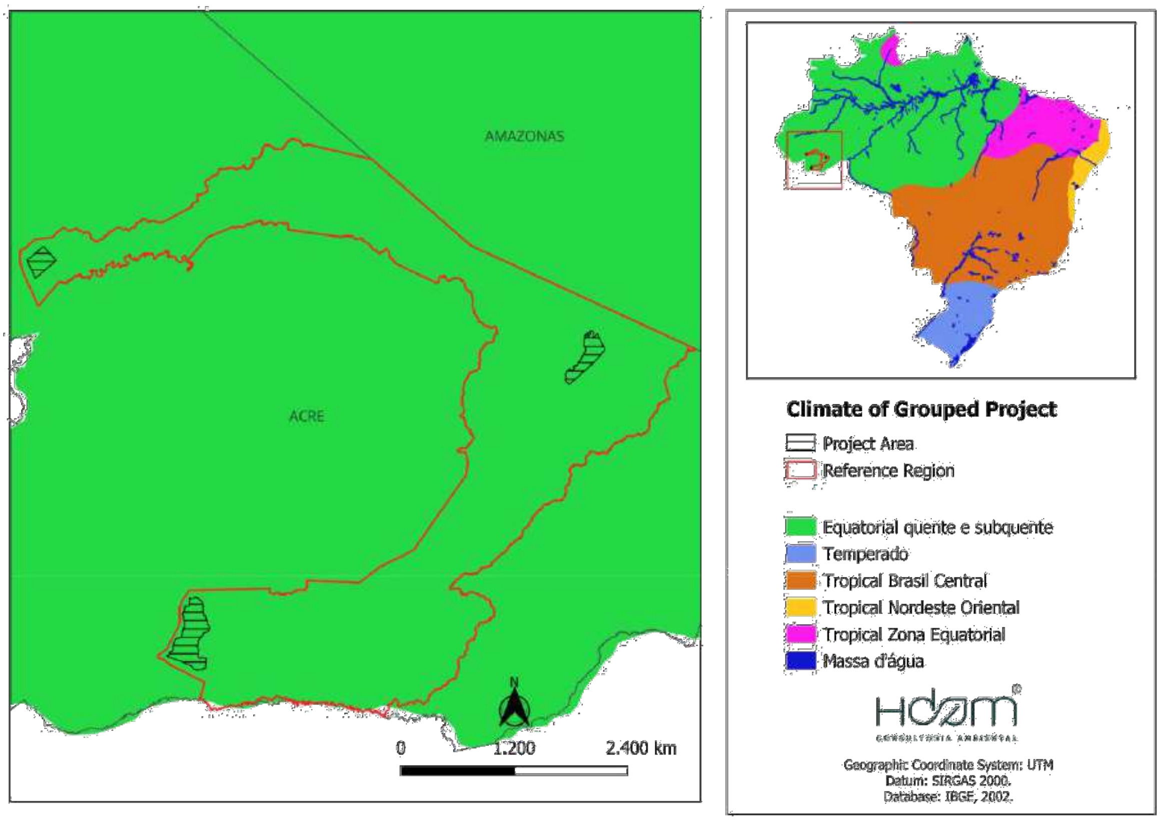
2.1.6.7 Climate

IBGE considers five zonal climates for the Brazilian territory: Equatorial, Tropical Equatorial Zone, Tropical Northeast East, Tropical Brazil Central and Temperate. The project is located in the State of Acre, which has an equatorial climate.

The climate of the State of Acre is characterized by high temperatures and a high concentration of humidity, thus being defined as a humid equatorial climate (ACRE, 2017). Present in the Intertropical Convergence Zone (ITCZ), the climate is controlled by the action of winds and low equatorial pressures and because it is located in the western part of the Amazon, the state suffers interference from the Continental Equatorial Mass (mEc) and also by the Atlantic Polar Mass (mPa) which acts in the interior of the Amazon channeling cold air and causing the phenomenon known as “friagem” which can reach values around 10ºC (ALVARÃES et al., 2013).

Nimer (1979) highlights the influence of temperature and humidity on climate diversity, using dynamic climatology and the rhythm of air masses. So that for the Region where the project is located, it is classified as Equatorial Warm and Subwarm climate type (Figure x), with daily average temperature above 18ºC in all months, and with humidity distribution ranging from super humid and subdry.

Figure 14 - Climatic aspects related to the area of the Grouped Project.



Source: IBGE, 2002.

The average annual temperature observed for these regions varies between 24.5°C and 32°C, where the periods with maximum temperatures are between the months of September and December, registering variations from 29.7° to 32°C. For the coldest period, which occurs in the months of June to August, the annual minimum temperatures vary between 17.5°C and 19°C.

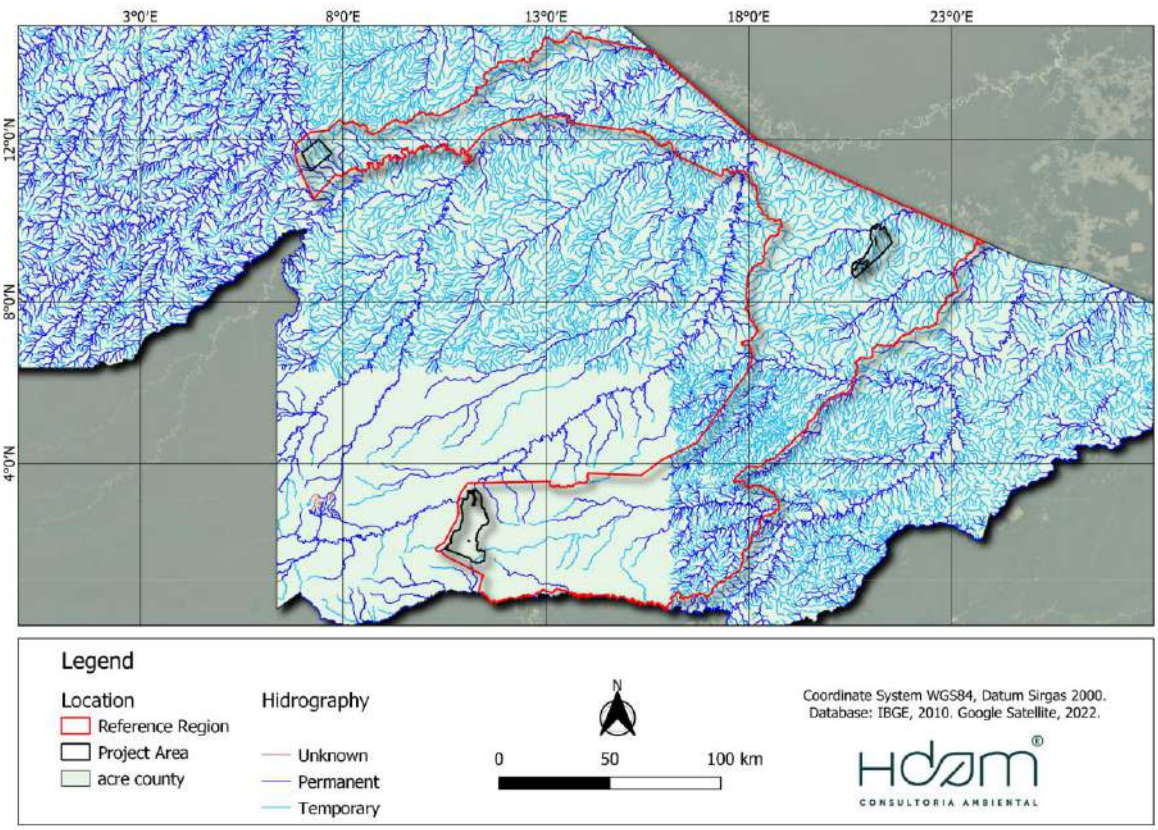
About the precipitation regime, the state of Acre is characterized by a rainy period that lasts seven months (from October to April), the months from December to March are the rainiest and can reach up to 2000mm/year, the municipality of Santa Rosa Purus, where the project area is located, has the highest rainfall, recording 2,000±529 mm/year and Brasiléia, recording 1588±20mm/year (ACRE, 2018).

2.1.6.8 Hydrography

The Reference Region and the Project Area are located in the Purus River Basin and the Acre River Basin, which have their sources in the Republic of Peru.

The Purus River Basin has an approximate area of 63,000 km² in length, passing through the Peruvian departments of Ucayali and Madre de Dios, in addition to the Brazilian territories in the state of Acre to the state of Amazonas (SILVA; SILVA 2019), it is an important navigation route in the state of Acre where in many areas access is exclusively via waterway, for example to the municipality of Santa Rosa do Purus. According to Acre (2012), on the banks of this important watershed there is a high number of original communities and settlements with emphasis on extractivism and agropastoral activities.

Figure 15 - Aspects of Hydrography related to the Grouped Project.



Source: IBGE, 2010.

The Acre River basin constitutes a hydrographic network composed of voluminous and sinuous waters flowing from the southwest to the northeast of the state (ACRE, 2012). Composed of five micro-basins: Trinational (Brazil, Peru, Bolivia), State (Acre, Amazonas), Xapuri, Riozinho do Rôla and Porto Acre (DUARTE, 2011). Among its main tributaries, the Acre River stands out with an extension of approximately 1,200 and 3,792 km² (ACRE, 2017; CPMR, 2021) crossing the territorial limits of ten municipalities, including Assis Brasil, Brasiléia, and Bujari present in the Reference Zone of this project

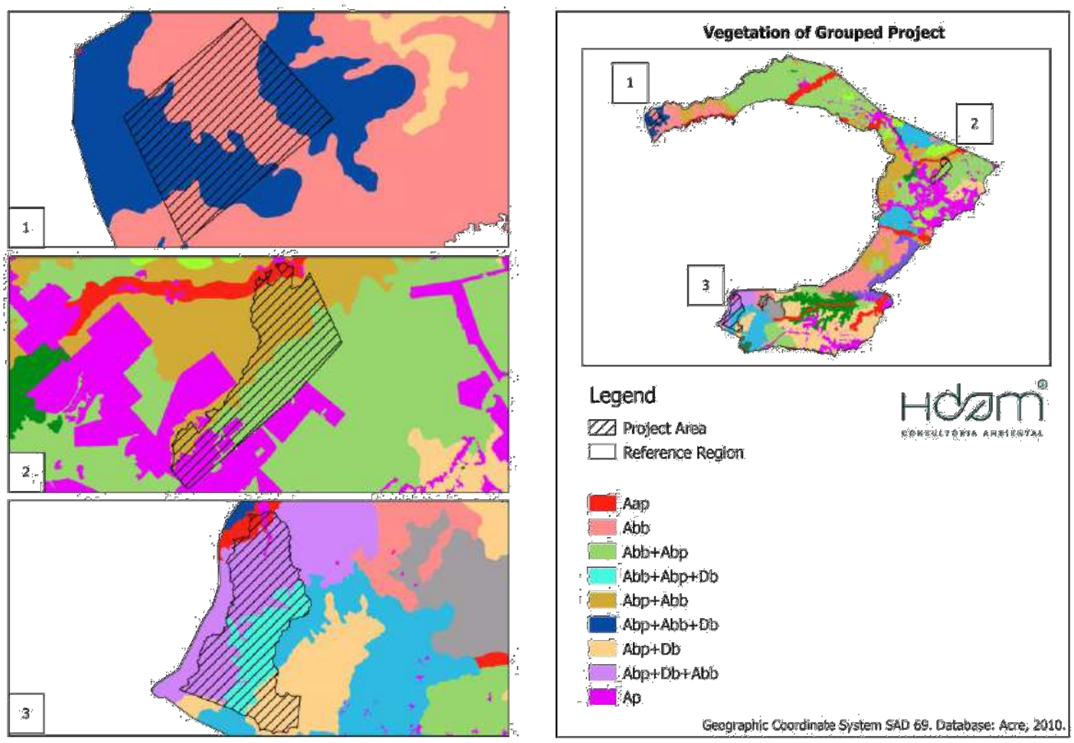
2.1.6.9 Types of Forest

According to the Ecological Economic Zoning of the State of Acre (ACRE, 2006), open tropical forests represent about 99.15% of the state's vegetation, with emphasis on the wide occurrence of Open Tropical Forests with Bamboo and Palm trees. For this project, it is observed that for the areas of the Reference Region (RR) and for the Project Area (AP) this vegetation occurs in more than 90% of its extension, in order to guarantee the environmental preservation and the maintenance of the biodiversity local.

The Open Ombrophylous Vegetation according to Acre (2000) is characterized by presenting its coverage by open forest where there is a great concentration of species of palm trees, bamboos and lianas. This type of vegetation was considered for many years as a type of transition between the Amazon Forest and extra-Amazonian areas (IBGE, 2012).

According to the IBGE Vegetation Manual (2012), this vegetation is characterized by being present in regions between 4° north latitude and 16° south latitude, at altitudes ranging from 5 to 100m, where climate gradients are characterized for presenting more than 60 dry days. It also stands out for having four floristic faciations: lianas, palm trees, bamboos and sororoca (Phenakospermum guianensis) that differentiate it from the ecological physiognomy of the Dense Ombrophylous Forest.

Figure 16 - Characterization of the Vegetation classes referring to the Grouped Project.



Source: Acre, 2010.

In the state, forests with bamboo occur especially in the eastern region, but it is recorded that approximately 75% of native forests in the state have bamboo as the main or secondary floristic element present in their understory (SILVA, 2019; ACRE, 2006). Among the most common species, the woody bamboos of the genus Guadua stand out, occupying more than 160,000 km² in the southwest of the Brazilian Amazon (Acre and Amazonas), in addition to almost all of the central Amazon of Peru (Madre de Dios and Ucayali) and to the north of the Bolivian Amazon (Pando) (CARVALHO et al., 2013).

The most common palm species for this typology are: Astrocaryum murumuru Mart (Murumuru), Astrocaryum sp. (tucuma), Attalea excelsa Mart Ex Spreng. (urucuri), Euterpe Oleraceae Mart (açaí), Bactris sp. (maharaja), Guilielma macrocarpa Hub. (peach palm), A. wallissii Huber (jaci), Maximiliana regia Mart. (inajá) and Phytelephas macrocarpa R. ep. (jarina).

2.1.7 Social Parameters (G1.3)

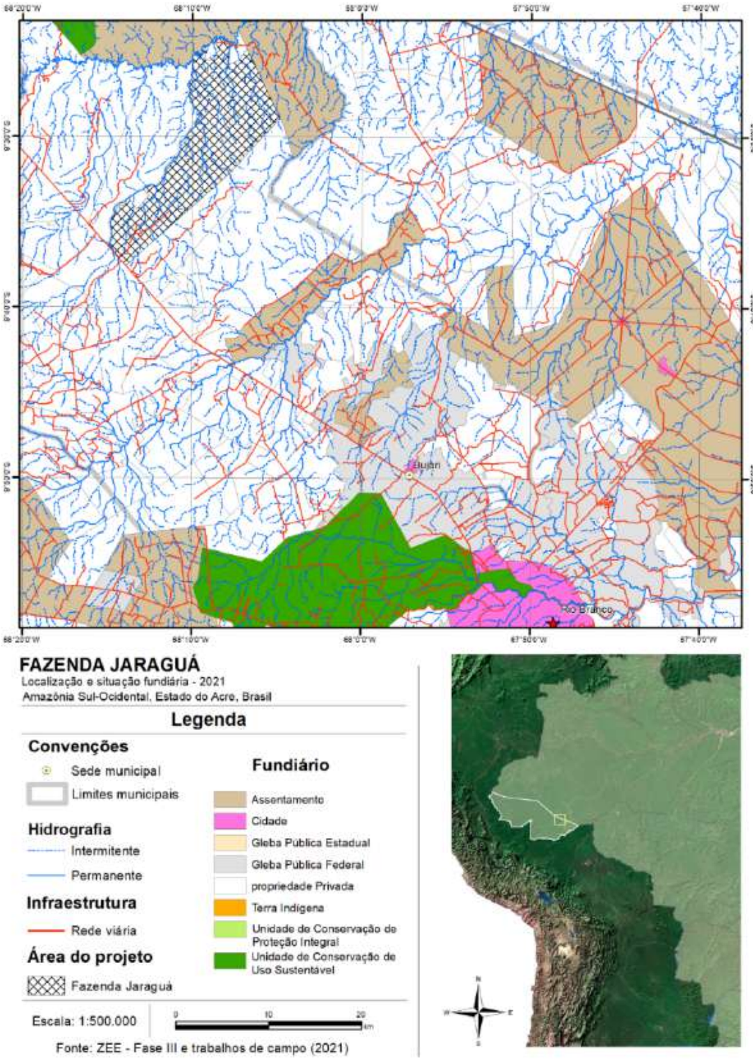
The Information is being presented in section 7.1 Without – Project Community Scenario

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

2.1.8.1 Jaraguá Farm

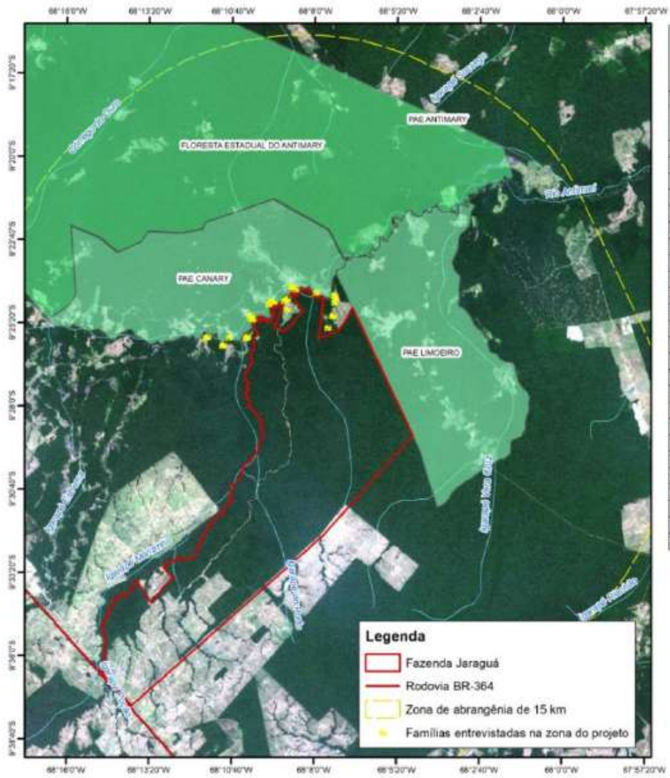
The Project Zone Map below includes the Project Area and the identified communities.

Figure 17 - Geographical location of the Jaraguá Farm Project Area.

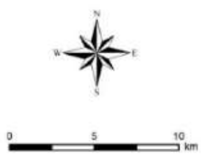


Source: ZEE – Fase III and Field Works

Figure 18 - Location of families around the project.

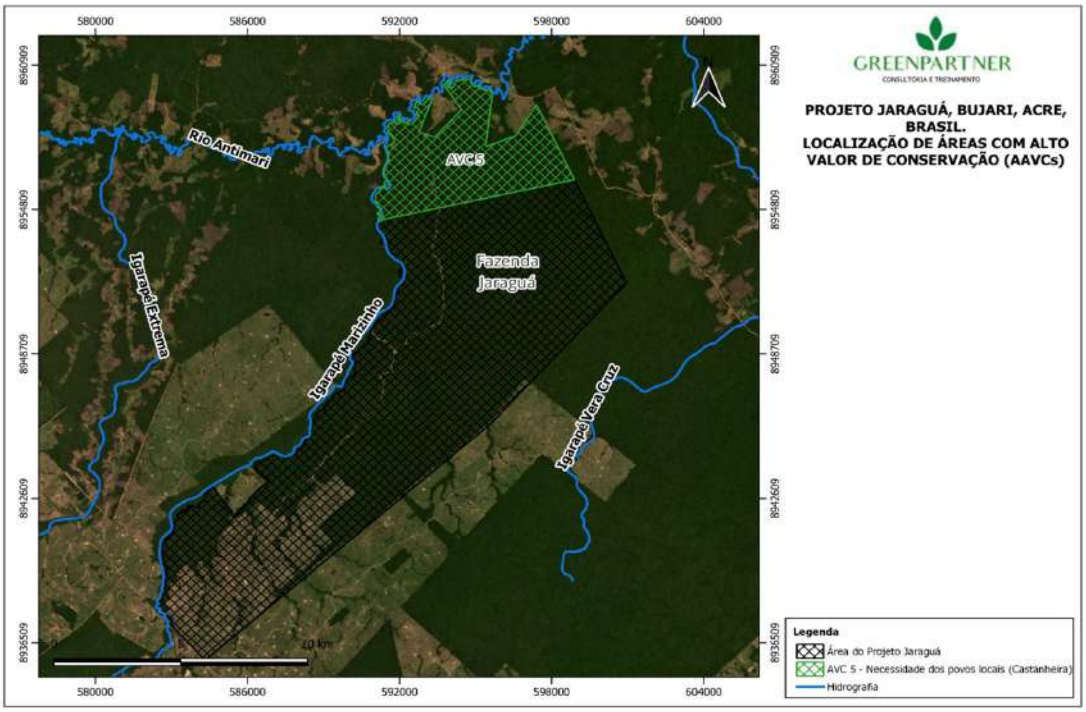


CATRAIA / GREENPARTNER		DIAGNÓSTICO SOCIOECONÔMICO - TABULAÇÃO DE DADOS PROJETO JARAGUÁ	
N.	Nome do(a) Morador(a)	Coordenadas UTM (m)	
		Coord. X	Coord. Y
1	Cleilson da Silva Cavalcante	595273	8960146
2	Raimundo (professor)	594042	8960353
3	Ana Alicia de Souza	596211	8958784
4	Francisco Silva Souza	593542	8959140
5	Maria Ferreira de Souza	595931	8958066
6	Pelônia Ferreira de Souza	596255	8958788
7	Silas Barbera	590127	8957496
8	Maricélio Azevedo Vasconcelos	589764	8957080
9	Antônio Marazona	591404	8958644
10	Eliane de Souza Leitão	591413	8958801
11	Valdecir da Silva Gomes	593797	8960501
12	Antônio Sinésio Rodrigues	592457	8959455
13	Marinaldo Azevedo Vasconcelos	588852	8957539
14	Adriana Azevedo Vasconcelos	589715	8957003
15	Thais Gomes Pinto	588766	8957521
16	Josefa Tavares de Souza	591504	8958567
17	Francisca Ferreira da Silva	593859	8960505
18	Tayná Miranda Araújo	596338	8959991
19	Jonathan Silva Barroso	591186	8957552
20	Genildo Ferreira Cavalcante	588820	8957513
21	Ivanilde de Oliveira Candeia da Cruz	596359	8959808
22	Valdecir Silva de Souza	592594	8959648
23	Gelmir Souza Cruz	596349	8959548
24	Antônio Valcimar da Silva Gomes	592756	8959606
25	Raimunda Nonata Fernandes da Silva	591131	8957476



Source: Project teams elaboration.

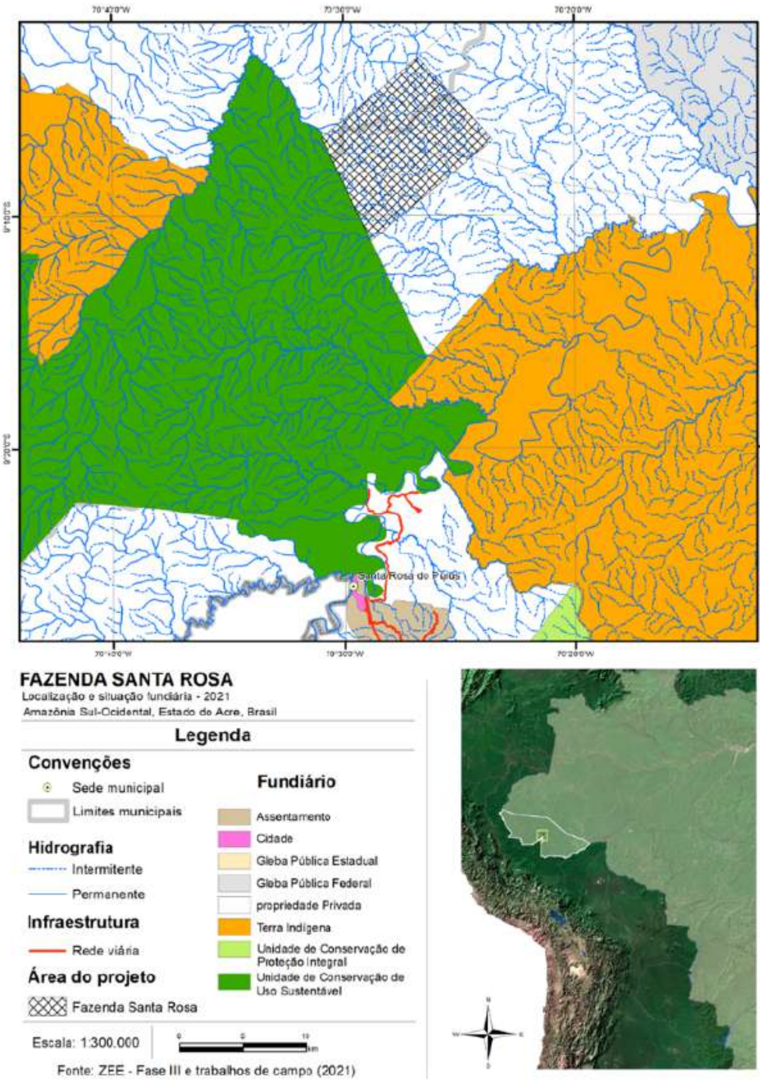
Figure 19 - Geographical location of the attribute High Conservation Value Brazil nut. Being AVC (in Portuguese on the map area marked in green on the map).



Source: Project teams' elaboration.

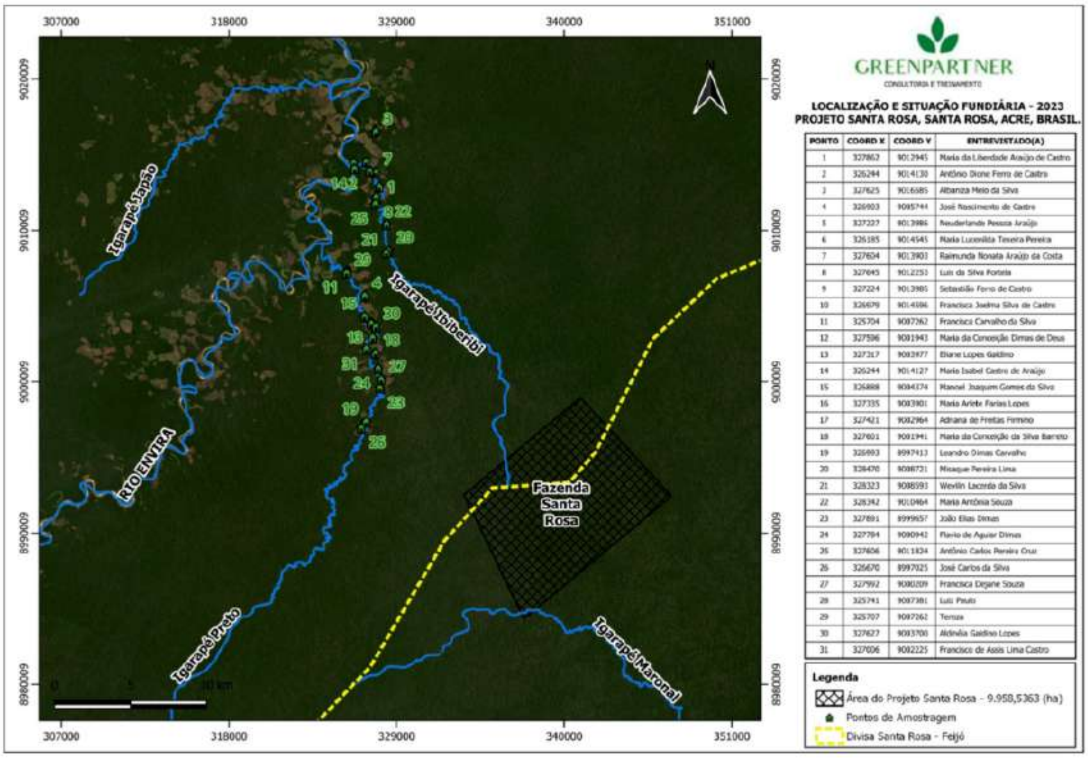
2.1.8.2 Santa Rosa Farm

Figure 20 - Geographical location of the Santa Rosa Farm Project Area.



Source: ZEE – Fase III and Field Works.

Figure 21 - Location of families around the project.

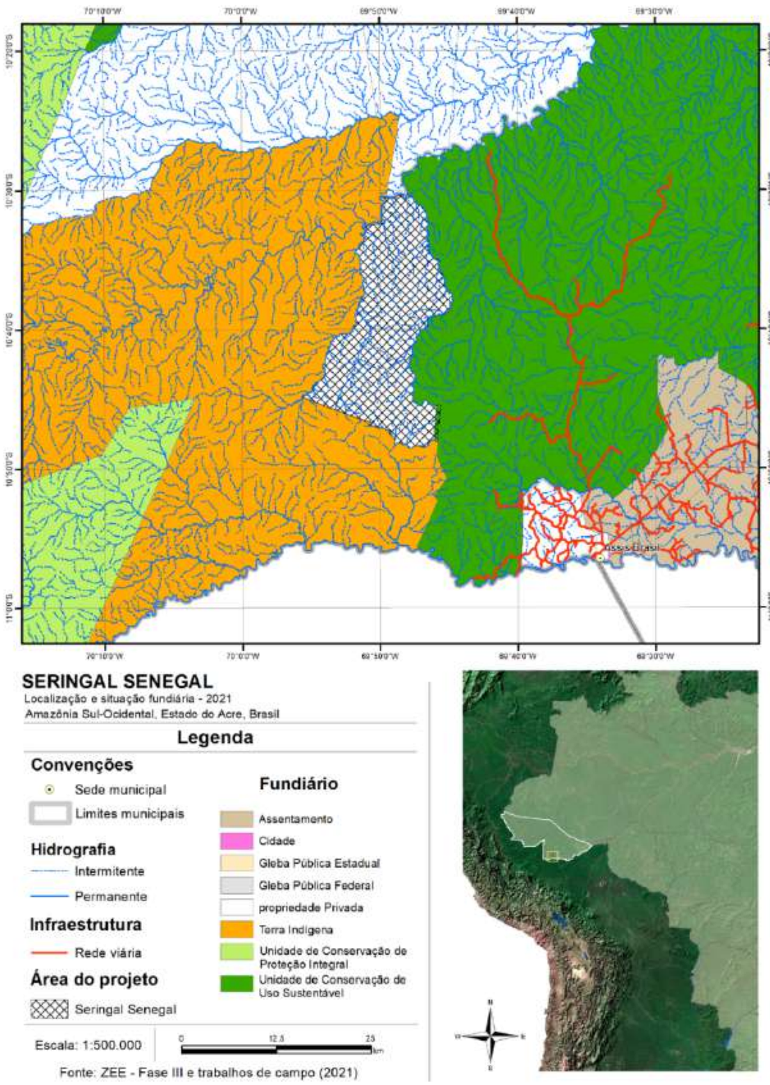


Source: Project teams elaboration.

In order to identify High Conservation Value Areas, the families were consulted using a map containing the location of the Ibiberibe and Preto Igarapés, the project area and the location of the families. As a result, respondents stated that they do not use resources within the project area, due to the long distance and difficult access. They informed that the resources they need are extracted within their own areas. Therefore, no evidence was identified that points to the existence of social HCVs within the Project Area Santa Rosa. In the Project Zone, no attributes classified as High Conservation Values were identified.

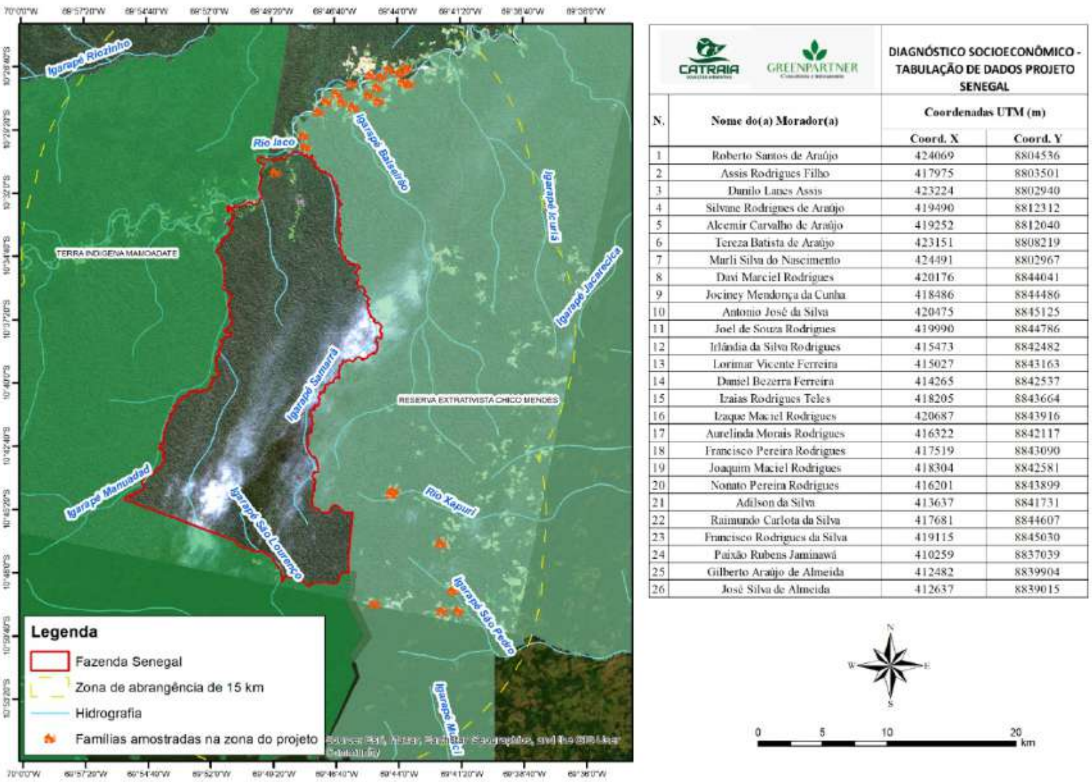
2.1.8.3 Senegal Farm

Figure 22 - Geographical location of the Senegal Farm Project Area.



Source: ZEE – Fase III and Field Works (2021).

Figure 23 - Location of families around the project.



N.	Nome do(a) Morador(a)	Coordenadas UTM (m)	
		Coord. X	Coord. Y
1	Roberto Santos de Araújo	424069	8804536
2	Assis Rodrigues Filho	417975	8803501
3	Danilo Lanes Assis	423224	8802940
4	Silvane Rodrigues de Araújo	419490	8812312
5	Alcemir Carvalho de Araújo	419252	8812040
6	Tereza Batista de Araújo	423151	8808219
7	Marli Silva do Nascimento	424491	8802967
8	Davi Marciel Rodrigues	420176	8844041
9	Jociney Mendonça da Cunha	418486	8844486
10	Antonio José da Silva	420475	8845125
11	Joel de Souza Rodrigues	419990	8844786
12	Irlândia da Silva Rodrigues	415473	8842482
13	Lorimar Vicente Ferreira	415027	8843163
14	Daniel Bezerra Ferreira	414265	8842537
15	Izaias Rodrigues Teles	418205	8843664
16	Izaque Maciel Rodrigues	420687	8843916
17	Aurelinda Morais Rodrigues	416322	8842117
18	Francisco Pereira Rodrigues	417519	8843090
19	Joaquim Maciel Rodrigues	418304	8842581
20	Nonato Pereira Rodrigues	416201	8843899
21	Adilson da Silva	413637	8841731
22	Raimundo Carlota da Silva	417681	8844607
23	Francisco Rodrigues da Silva	419115	8845030
24	Paixão Rubens Jaminawá	410259	8837039
25	Gilberto Araújo de Almeida	412482	8839904
26	José Silva de Almeida	412637	8839015

Source: Project teams elaboration.

In order to identify High Conservation Values Areas, the families were consulted using a map containing the location of the Project Area, the Laco River watershed and the location of the families. The surveys showed that there is at least one indigenous family living within the Project Area, identified as Paixão Rubens Jaminawá. He reported during the interview that he has lived in the place for approximately 6 years and owns an area of approximately 100 hectares. For family subsistence, among others, he practices hunting and fishing in the Project Area.

Also, according to the Territorial and Environmental Management Plan Jaminawa and Manchineri (2016), for the Mamoadate Indigenous Land, the area of Senegal Farm, former Petropolis Farm, is an area used by the indigenous people for a long time, having already demonstrated the need to incorporate this area into the Mamoadade Indigenous Land. In the Ethnomapping of the Mamoadate Indigenous Land, (2016), it is reported that both the Jaminawas and the Manchineri peoples use the area of the Senegal Farm for planting swiddens, fishing, hunting and extractivism.

No agreements were identified between the farm owner and the indigenous people regarding the recognition of ownership or land use rights in Senegal. The situation identified was not discussed further with the representatives of Indigenous Land Mamoadate or with FUNAI. In view of this, it is recommended to build formal dialogues with FUNAI and indigenous communities, in order to collect data to assess the existence of HCV types 5 and 6 within the Project Area.

2.1.9 Stakeholder Identification Process (G1.5)

The criteria for identifying social actors considered (i) human occupation in the surroundings of the project, a radius of 15 km being preliminarily established; (ii) and the socio-productive and cultural profile of small farmers and extractivists with recognized symbiosis and relative dependence on natural resources; iii) families in a situation of socioeconomic vulnerability. For this purpose, consultations and surveys of socioeconomic data were carried out, making it possible to identify the beneficiaries of the project.

In the first analysis, the identification of communities started from the analysis of satellite images of the location of the geographic area of the project, assessing the existence of human occupation in and around its surroundings, as future beneficiaries of the project.

In the second phase, the field investigation was carried out, the delimitation of the coverage area, the engagement, and data collection.

In all areas of the project, 82 families were identified in the project zone.

In Jaraguá Farm, 25 families were identified in the project area.

In Santa Rosa Farm, 31 families were identified in the project area.

In Senegal Farm, 26 families were identified in the project area, including an indigenous family whose home is located within the Project Area.

Culturally appropriate engagement occurred in conjunction with social, economic, and cultural data collection; and identifying possible impacts and benefits generated by internal (projects) and external vectors. In the engagement, the team was careful to use understandable and locally recognized language during the explanations, accompanied by a location map and guiding text on the project's design and objectives.

From the requirements requested, below are the lists of all communities, community groups and other project stakeholders:

2.1.9.1 Jaraguá Farm Stakeholders Identified

Table 2 - Jaraguá Communities

COMMUNITIES	
Community Name	**Location**
Placement of Barro Alto	Rio Antimary – PAE Canary
Placement of Mapinguari	Rio Antimary – PAE Canary
Placement of Centrinho	Rio Antimary – PAE Canary
Placement of Poção	Igarapé Marizinho
Community PAE Canary	Rio Antimary – PAE Canary
Location Morada Nova	Rio Antimary
Placement of Extrema 03	Rio Antimary
Apuí - PAE Canary	Rio Antimary – PAE Canary
Seringal Mapinguari	Rio Antimary
Placement of Volta Grande	Rio Antimary
Extrema 3	Rio Antimary
Placement of Boa Vista	Rio Antimary – PAE Limoeiro
Location PAE Canary	Rio Antimary – PAE Canary

Source: Field Data Collections

Table 3 - Jaraguá Stakeholders

STAKEHOLDERS			
Stakeholder Name	**Rights**	**Interests**	**Relevance to the project**
Antimary River communities	Beneficiaries of benefit sharing.	Receive project investments: training, improvement of production processes and increase in family income.	High. Important for the conservation of ecosystems.
Association of Project Producers of Agroextractivist Settlement Canary	Beneficiaries of benefit sharing.	Receive project investments: training, improvement of production processes and increase in family income.	High. Partner in the execution of project actions.
Secretary of Environment and Infrastructure (Municipal and State)	None.	Contribute to conservation practices and compliance with environmental legislation.	High. Partners in the implementation of socioenvironmental actions.
Production Secretariat (Municipal and State) and National Rural Learning Service (SENAR)	None.	Contribute to the dissemination of sustainable practices by offering training.	Average. Partners in the implementation of actions to improve agroextractive production.
Secretary of Education (Municipal and State)	None.	Apply socio-environmental actions in an interdisciplinary way in the local school.	High. Development of environmental education actions with children and young people.
National Institute of Colonization and Agrarian Reform (INCRA)	None.	Apply actions together with two federal settlements, which the area is bordering.	Average. Partner in the implementation of socio-environmental actions.

Source: Field Data Collections

2.1.9.2 Santa Rosa Farm Stakeholdres Identified

Table 4 - Santa Rosa Communities

COMMUNITIES	
Community Name	**Location**
Community São José	Igarapé Novo Japão (Ibiberibe)
Seringal Novo Japão	Igarapé Preto
Vila Alves (Seringal)	Igarapé Preto
Colônia Três estrelas	Igarapé Preto
Vila Alves	Igarapé Preto
Colônia Terra Alta	Igarapé Preto
São José Loc. Porto Rico	Igarapé Novo Japão (Ibiberibe)
Nova Esperança	Igarapé Novo Japão (Ibiberibe)
Colônia Três Estrelas	Igarapé Preto
Localidade Ananá	Igarapé Preto

Source: Field Data Collection

Table 5 - Santa Rosa Stakeholders

STAKEHOLDERS			
Stakeholder Name	**Rights**	**Interests**	**Relevance to the project**
Family from Igarapés Ibiberibe and Preto	Beneficiaries of benefit sharing.	Receive project investments: training, improvement of production processes and increase in family income.	High. Important for the conservation of ecosystems.
Secretary of Environment and Infrastructure (Municipal and State)	None.	Contribute to conservation practices and compliance with environmental legislation.	High. Partners in the implementation of socioenvironmental actions.
Production Secretariat (Municipal and State) and National Rural Learning Service (SENAR)	None.	Contribute to the dissemination of sustainable practices by offering training.	Average. Partners in the implementation of actions to improve agroextractive production.
Secretary of Education (Municipal and State)	None.	Apply socio-environmental actions in an interdisciplinary way in the local school.	High. Development of environmental education actions with children and young people.
Chico Mendes Institute for Biodiversity Conservation (ICMBIO)	Ensure compliance with the rules of the buffer zone of Flona Santa Rosa do Purus.	Maintain or improve protective measures in the buffer zone.	Average. Partner in the implementation of protection actions.

Source: Field Data Collection

2.1.9.3 Senegal Stakeholders Identified

Table 6 - Senegal Communities

COMMUNITIES	
Community Name	**Location**
Colônia São Raimundo	Ramal Recife
Colônia Vitória	Ramal Recife
Colocação Monte	Ramal Recife
Colocação Fronteira	Center
Colocação Bom Futuro	Seringal São Francisco
Colocação São Salvador	Seringal São Francisco
Colônia São Sebastião	Bank of Rio Iaco
Colônia Água Boa	Bank of Rio Iaco
Colônia São Rafael	Bank of Rio Iaco
Colônia São Pedro	Bank of Rio Iaco
Colônia Fé em Deus	Bank of Rio Iaco
Colônia Laranjal I	Bank of Igarapé Balseirão
Colônia Laranjal II	Bank of Rio Iaco
Fazenda Brasil	Bank of Rio Iaco
Colônia Nova Esperança	Bank of Rio Iaco
Colônia São Francisco	Bank of Rio Iaco
Colônia Santa Maria	Bank of Rio Iaco
Fazenda Senegal	Bank of Rio Iaco
Colônia São José	Bank of Rio Iaco
Colocação Samarã	Bank of Rio Iaco

Source: Field Data Collection

Table 7 - Senegal Stakeholders

STAKEHOLDERS			
Stakeholder Name	**Rights**	**Interests**	**Relevance to the project**
Iaco River Family and Recife Branch	Beneficiaries of benefit sharing.	Receive project investments: training, improvement of production processes and increase in family income.	High. Important for the conservation of ecosystems.
Secretary of Environment and Infrastructure (Municipal and State)	None.	Contribute to conservation practices and compliance with environmental legislation.	High. Partners in the implementation of socioenvironmental actions.
Production Secretariat (Municipal and State) and National Rural Learning Service (SENAR)	None.	Contribute to the dissemination of sustainable practices by offering training.	Average. Partners in the implementation of actions to improve agroextractive production.
Secretary of Education (Municipal and State)	None.	Apply socio-environmental actions in an interdisciplinary way in the local school.	High. Development of environmental education actions with children and young people.
Chico Mendes Institute for Biodiversity Conservation (ICMBIO)	Ensure compliance with the rules of the buffer zone of Resex Chico Mendes.	Maintain or improve protective measures in the buffer zone.	Average. Partner in the implementation of protection actions.
National Indian Foundation and representatives of TI Mamoadate	Possibility of overlapping the project area with areas of common use by indigenous communities of the IL, according to the Plan of Territorial and Environmental Management and Ethnomapping Jaminawa and Manchineri.	Apply studies to identify possible rights of ownership or use of land involving areas of Senegal Farm.	High. Resolution of possible pending land or formalization of agreement for benefit sharing.

Source: Field Data Collection

2.1.10 Stakeholder Descriptions (G1.6, G1.13)

This information is being presented in items 5.1.9 Stakeholder Identification and item 7.1 Without – Project Community Scenario.

2.1.11 Sectoral Scope and Project Type

It is a grouped project. The Project applies to the sectoral scope VCS 14 - Agriculture, Forestry and Other Soil Uses (AFOLU). With the characteristics of a REDD+ initiative (Reduction of Emissions from Deforestation and Forest Degradation), following the Project Cycle of Methodology VM0015 for Avoiding Unplanned Deforestation, Methodology v1.1. It is important, therefore, that the AMAZON PARTNERS 1 be added to the methodological efforts foreseen in the Climate, Community & Biodiversity Program (CCB) – so that the Verified Carbon Units (VCU) eligible for validation of the methodological quality of the project are also valued considering the methodological efforts validated by the Climate, Community & Biodiversity Program.

2.1.12 Project Activities and Theory of Change (G1.8)

Table 8 - Activities and impacts expected during the project (community) in Jaraguá Farm

Activity description	Expected climate, community, and/or biodiversity			Relevance to project's objectives
	Outputs (short term)	Outcomes (medium term)	Impacts (long term)	
Support the strengthening of the Brazil nut production chain	Formalization of partnership to offer technical assistance and market access	Offer of continued technical assistance and implementation of processing infrastructure	Production, commercialization and generation of family income	Strengthening family income from sustainable forest activity
Offer techniques for preparing fields without the use of fire	Formalization of partnership to offer rural technical assistance	Ongoing technical assistance offer	Reduction in the use of fire in land preparation for clearing	Reduction of greenhouse gas emissions in the project area; land use practices with a lower degree of degradation

Provide training to youth and women in rural entrepreneurship	Formalization of partnership to offer training	Offering training to young people and women	Success stories of rural entrepreneurship, with productive engagement of young people and women	Reduction of socioeconomic vulnerability of marginalized groups

Table 9 - Activities and impacts expected during the project (Community) in Santa Rosa Farm

Activity description	Expected climate, community, and/or biodiversity			Relevance to project's objectives
	Outputs (short term)	Outcomes (medium term)	Impacts (long term)	
Support the strengthening of non-timber extractivism	Formalization of partnership to offer technical assistance and market access	Offer of continued technical assistance and implementation of processing infrastructure	Production, commercialization and generation of family income	Strengthening family income from sustainable forest activity
Offer techniques for preparing fields without the use of fire	Formalization of partnership to offer rural technical assistance	Ongoing technical assistance offer	Reduction in the use of fire in land preparation for clearing	Reduction of greenhouse gas emissions in the project area; land use practices with a lower degree of degradation
Provide training to youth and women in rural entrepreneurship	Formalization of partnership to offer training	Offering training to young people and women	Success stories of rural entrepreneurship, with productive engagement of young people and women	Reduction of socioeconomic vulnerability of marginalized groups

Table 10 - Activities and impacts expected during the project (Community) in Senegal

Activity description	Expected climate, community, and/or biodiversity			Relevance to project's objectives
	Outputs (short term)	Outcomes (medium term)	Impacts (long term)	
Support the strengthening of latex extraction	Formalization of partnership to offer technical assistance and market access	Offer of continued technical assistance and implementation of processing infrastructure	Production, commercialization and generation of family income	Strengthening family income from sustainable forest activity
Offer techniques for preparing fields without the use of fire	Formalization of partnership to offer rural technical assistance	Ongoing technical assistance offer	Reduction in the use of fire in land preparation for clearing	Reduction of greenhouse gas emissions in the project area; land use practices with a lower degree of degradation
Provide training to youth and women in rural entrepreneurship	Formalization of partnership to offer training	Offering training to young people and women	Success stories of rural entrepreneurship, with productive engagement of young people and women	Reduction of socioeconomic vulnerability of marginalized groups

2.1.13 Sustainable Development

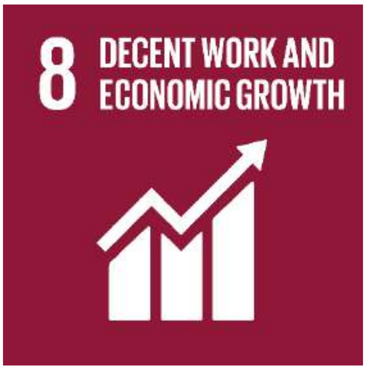
Several properties of natural systems, in particular biodiversity, are essential for the flows of ecosystem services that have always benefited humanity, providing water and food security, identity and protection of cultural values and ensuring economic, social and human development (BPBES, 2018). In a scenario towards sustainable development, biodiversity will be decisive for the mitigation and adaptation of climate change and should provide new mechanisms for generating income and well-being. On the other hand, in a scenario of the current model of economic development (business as usual), in which we continue to develop based on the burning of fossil fuels, in addition to not taking measures to adapt to climate change, the decline of natural life support systems will be inevitable and will imply the acceleration in climate change and negative impacts on our society.

The loss of biodiversity generates a global environmental impact as it crosses the geographical boundaries of countries requiring "international, regional and global cooperation between States, intergovernmental organizations and the non-governmental sector for the conservation of biological diversity and sustainable use of its components" (CBD, 1992). According to the Red List of the International Union for Conservation of Nature (IUCN), more than 31,000 species are in the process of extinction, representing 27% of the species cataloged (41% of amphibians, 25% of mammals, 34% coniferous, 14% of birds, 30% of sharks, 33% of coral reefs, 27% of crustaceans).

AMAZON PARTNERS 1 in this regard, is completely in line with many of the sustainable development goals pushed forward by de United Nations, especially numbers 8, 13, 14 and 15, which respectively preach for decent work and economic growth, urgent climate action, protection of life below water and protection of life on land. Besides biodiversity loss prevention, the project taps into deforestation reduction, being a REDD+ project that shall retain CO2 as a carbon sink, avoiding future spikes of deforestation in the area which the farm is located, as well as providing possible new solutions towards economic growth and betterment of living conditions in some places. It also is in a region where economic development is closely tied to deforestation, single crop production, cattle farming and a series of other activities that aren´t sustainable. Projects like this can work as an alternative in which the landowner protects the environment, local biodiversity (including flora and fauna) and is compensated financially for his efforts in keeping the native forest up and well. This type of project also helps in the long run, as a way of achieving Brazil’s nationally determined contribution of achieving net-zero carbon emission until 2050.

Table 11 - Sustainable Development Goals and proposed AUD project activities.

Sustainable Development Goals	**Project Activities**
	All project activities are open and stimulated for the participation of all the residents of the acting communities, especially women, youth and marginalized people.

	Through actions that encourage sustainable financial alternatives, such as preventing deforestation and conserving natural resources, the project aims to promote a new way of socioeconomic development that does not run through the most common activities in the region, such as crop growth or cattle farming. With this type of approach, the project can generate revenue while also protecting a native area.
	Through actions that encourage the decrease in exploitation of natural resources and the recovery of degraded areas, the project promotes the conservation of natural resources, coupled with socioeconomic development. For this, some of the main components of the Project are related to the promotion of scientific research focused on the efficient use of natural resources, seeking greater integration among the parties involved in the project and focusing on sustainable business chains, generating income and well-being for local communities and making the use of natural resources available more responsible and conscious. It's also evident that the project works in favor of a greener financial alternative, being able to generate revenue while protecting and not deforesting a native area.
	All activities undertaken by the project aim to take action to combat climate change and its impacts through the reduction of deforestation in the project area and consequently reducing the emission of greenhouse gases, contributing directly to the Brazilian goal of reducing emissions and achieving the goal to be net-zero until 2050. The project has the potential to reduce 1.085,76 $MtCO_2e$ year.

	Through actions that encourage the prevention of deforestation the Amazon REDD+ project will deliver positive impact in terms of biodiversity protection. It is important to protect the natural waterways and springs and thus not damage the natural ecosystem of the different rivers in the region. Alterations on the water PH, level of riverside vegetation and even water levels, caused by deforestation, can affect drastically the below water biodiversity. Thus, the project aims to also prevent the extinction of different types of species by keeping the native flora intact from deforestation actors.
	Through actions that encourage the prevention of deforestation the AMAZON PARTNERS 01 project will deliver positive impact in terms of biodiversity protection. Preventing deforestation of the natural flora is the best way to conserve native species and their habitats. According to the Red List of the International Union for Conservation of Nature (IUCN), more than 31,000 species are in the process of extinction, representing 27% of the species cataloged. By fighting against deforestation, the project works to help keep alive regional endangered species by keeping up the original forest cover of the region and not disturbing the ecosystem that inhabits the farm. .

2.1.14 Implementation Schedule (G1.9)

Date	Milestone(s) in the project's development and implementation
September 29, 2022	Signature of the Contract between the Bidder, the Developer and the Owner of the areas called Jaraguá and Santa Rosa to carry out the research and start the works that will lead to the preservation of the environment.
October 1, 2022	Signing of the Contract between the Bidder, the Developer and the Owner of the area known as Senegal to carry out the research and start the works that will lead to the preservation of the environment.
October 1, 2022	Beginning of the preliminary data collection stage for setting up the feasibility study.

November 30, 2022	The results of the feasibility study showed that the project was viable.
December 01, 2022	Start of baseline field collection.
February 06, 2023	Beginning of the forest inventory on the Jaraguá property to collect data to determine the carbon stock and data on biodiversity.
February 15, 2023	Beginning of the collection of primary data on the local fauna and biodiversity on the 3 properties simultaneously.
February 16, 2023	Beginning of studies, projections and modeling related to the CCB Climate theme.
February 19, 2023	Start of the socioeconomic diagnosis, consultation of interests and presentation of the project to the interested parties in the 3 properties simultaneously.
March 06, 2023	Beginning of the forest inventory on the Santa Rosa property to collect data to determine the carbon stock and data on biodiversity.
March 08, 2023	Beginning of the forest inventory on the Senegal property to collect data to determine the carbon stock and data on biodiversity.
April 19, 2023	Finalization of the PDD.
June 26, 2023	Beginning of the validation stage to be carried out by an auditor certified by Verra.
December 30, 2023	Beginning of the 1st verification stage to be carried out by an auditor certified by Verra.
December 30, 2024	End of GHG accounting period.

2.1.15 Project Start Date

VCS Standard v4.4. states that "the project start date of an AFOLU project is the date on which activities that led to the generation of GHG emission reductions or removals are implemented". In that regard, the project start date is September 29rst, 2022. The sequence of events with respect to the project start date and subsequent follow-up agreements is as follows:

September 29, 2022: An Agreement for Research and Assignment of Carbon Credit Rights was signed between the owner of “Jaraguá and Santa Rosa Farms”, the company Amazon Partners, LLC, LLC and Infrapar Sustentabilidade Ltda, understanding that they are joint efforts in the Program of Carbon Credits in the “Jaraguá and Santa Rosa Farms”.

October 1, 2022: A research and assignment of Carbon Credits Rights Agreement was signed between the “Senegal Farm” landowner, the company Amazon Partners, LLC. and Infrapar Sustainability Ltda., understanding that they’re joint efforts in the Carbon Credits Program on the “Senegal Farm”.

November 30, 2022: The results of the feasibility study showed that the project was viable.

On April 13, 2023, an agreement for the assignment of rights was signed between the owner “ Jaraguá e Santa Rosa Farms”, the company Amazon Partner LLC., the company Amazon Partners, LLC and Infrapar Sustainability Ltda, where the company Amazon Partner LLC assigned and transferred to the company Amazon Partners1 LLC its rights and obligations provided for in the AGREEMENT, with the company Amazon Partners 1 LLC being subrogated in all clauses and conditions of the AGREEMENT, obliging it to faithfully comply with the stipulations agreed therein. Nothing else changes in the rights of the other parties

Since the initial agreements were signed in 2022, the chosen start date was December 1rst, 2022, when evidence already showed the project was viable and the studies could start.

2.1.16 Benefits Assessment and Crediting Period (G1.9)

The Project crediting period is 30 years, starting December 01, 2022 and ending November 30, 2051.

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

There is no difference.

2.1.18 Estimated GHG Emission Reductions or Removals

Year	Estimated GHG emission reductions or removals (tCO_2e)
2023	43.869
2024	57.080
2025	57.080

2026	69.650
2027	69.650
2028	112.361
2029	112.361
2030	138.128
2031	146.916
2032	177.408
2033	219.646
2034	237.669
2035	266.712
2036	317.593
2037	352.748
2038	370.517
2039	402.306
2040	444.065
2041	519.268
2042	585.062
2043	623.205
2044	671.511
2045	753.628
2046	783.931
2047	858.618

2048	873.071
2049	899.392
2050	963.263
2051	1.085.761
Total estimated ERs	1.085.761
Total number of crediting years	30
Average annual ERs	36.192.03

2.1.19 Risks to the Project (G1.10)

2.1.19.1 Jaragua

Identify Risk	Potential impact of risk on climate, community and/or biodiversity benefits	Actions needed and designed to mitigate the risk
Destruction of social HCV – Brazil nut by deforestation and/or forest fire	Destructuring of the source of family income	Implement a social, economic and environmental monitoring system with community participation to assess the conservation status of the attribute, production and income generation.
		Promote training with surrounding communities to fight forest fires
		Implement asset surveillance
Preventing communities from accessing Brazil nut collection areas	Destructuring of the source of family income	Sign a documented agreement ensuring the right to use
Forest fire	Destruction of primary forests	Implement satellite monitoring system
		Implement asset surveillance

		Promote training with surrounding communities to fight forest fires
Lack of resources to implement activities	Deforestation due to expansion of agricultural activity in the project area	Ensure the sale of carbon credits
		Seek alternative funding sources and formalize partnerships with public, private and multilateral agencies
Increased occurrence of hot spots/forest fires due to anthropic action in the surroundings	Reduction of forest cover and increase in greenhouse gas emissions.	Offer training and technical assistance and mechanized cultivation for setting up gardens without the use of fire
		Promote environmental education campaigns in surrounding communities.
		Establish partnerships with public institutions to implement preventive actions for environmental monitoring and inspection.
Lack of community engagement	Prevalence of agricultural activity with degrading effect on the environment	Raising awareness of the transformation through the exchange of experiences with success stories in the Amazon
	Prevalence of the condition of socioeconomic vulnerability among young people and women	Maintain active communication and feedback channels to assess the degree of engagement and the need for new stimulating actions
		Keep the community confident in the project by fulfilling actions, deadlines and agreements.
		Perform annual monitoring to assess the effectiveness of actions and implement corrective measures/improvements

Lack of interest from community members, public bodies and institutions in establishing collaboration agreements with the Santa Rosa REDD+ Project.	The project area is inserted in a region surrounded by protection areas, but like most protected areas in the Amazon, it suffers from insufficient administration and patrolling. The biggest risks of the project come from external anthropic actions such as predatory hunting and fishing, illegal logging, fires and the advance of settlement areas and the expansion of agriculture and livestock..	Establishment of agreements for the sustainable use of natural resources with communities and residents close to the project;
	The protection of natural resources and maintenance of the project is closely related to the strengthening of inspection actions, environmental education and technical assistance disseminated in the surrounding communities and in cities close to the project..	Intensification and support for inspection actions, together with the bodies and institutions responsible for combating predatory hunting and fishing, illegal logging, burning, mining and prospecting and other activities harmful to the environment and the maintenance of natural resources.
		Support for scientific research activities both on biodiversity and on land use by the community, with specialized technical assistance.

2.1.19.2 Senegal

Identify Risk	Potential impact of risk on climate, community and/or biodiversity benefits	Actions needed and designed to mitigate the risk
Disrespect for the right to tenure and use the land of the indigenous communities of the Mamoadate IL	land conflict	Sign a documented agreement ensuring the right to tenure and use the land
	Compromise of subsistence and disruption of places of special social, economic and cultural significance	
Forest fire	Destruction of primary forests	Implement single monitoring systemImplement satellite monitoring systemsatellite
		Implement asset surveillance
		Promote training with surrounding communities to fight forest fires
Lack of resources to implement activities	Deforestation due to expansion of agricultural activity in the project area	Ensure the sale of carbon credits
		Seek alternative funding sources and formalize partnerships with public, private and multilateral agencies

Increased occurrence of hot spots/forest fires due to anthropic action in the surroundings	Reduction of forest cover and increase in greenhouse gas emissions.	Offer training and technical assistance and mechanized cultivation for setting up gardens without the use of fire
		Promote environmental education campaigns in surrounding communities
		Establish partnerships with public institutions to implement preventive environmental monitoring and inspection actions
Lack of community engagement	Prevalence of agricultural activity with a degrading effect on the environment	Raise awareness of the transformation through the exchange of experience with success stories in the Amazon
	Prevalence of socioeconomic vulnerability among young people and women Maintain active communication and feedback channels to assess the degree of engagement and need for new stimulating actions Keep the community confident in the project with the fulfillment of actions, deadlines and agreements.	Maintain active communication and feedback channels to assess the degree of engagement and the need for new stimulating actions
		Keep the community confident in the project with the fulfillment of actions, deadlines and agreements.
		Conduct annual monitoring to evaluate the effectiveness of actions and implement measures
Lack of interest of community members, public agencies and institutions in establishing collaboration agreements with the Santa Rosa REDD+ Project.	The project area is inserted in a region surrounded by protected areas, but like most Amazonian protected areas suffers from insufficient administration and patrolling. The greatest risks of the project come from external anthropogenic actions such as predatory hunting and fishing, illegal logging, burning and the advance of settlement areas and the expansion of agriculture and livestock.	Establishment of agreements for the sustainable use of natural resources with the communities and residents close to the project;
	The project area is inserted in a region surrounded by protected areas, but like most Amazonian protected areas suffers from insufficient administration and patrolling. The greatest risks of the project come from external anthropogenic actions such as predatory hunting and fishing, illegal logging, burning and the advance of settlement areas and the expansion of agriculture and livestock.	Intensification and support for enforcement actions, together with the agencies and institutions responsible for combating predatory hunting and fishing, illegal logging, burning, mining and mining and other activities harmful to the environment and the maintenance of natural resources.
		Support scientific research activities both on biodiversity and on land use by community members, with specialized technical assistance.

2.1.19.3 Santa Rosa

Identify Risk	Potential impact of risk on climate, community and/or biodiversity benefits	Actions needed and designed to mitigate the risk
Land invasion	Deforestation of primary forests and land conflicts	Implement satellite monitoring system
		Implement heritage surveillance
		Monitor the increase in illegal occupations in the Ibiberibe River basin
Forest fire	Destruction of primary forests	Implement satellite monitoring system
		Implement asset surveillance
		Promote training with surrounding communities to fight forest fires
Lack of resources to implement activities	Deforestation due to expansion of agricultural activity in the project area	Ensure the sale of carbon credits
		Seek alternative funding sources and formalize partnerships with public, private and multilateral agencies
Increased occurrence of hot spots/forest fires due to anthropic action in the surroundings	Reduction of forest cover and increase in greenhouse gas emissions.	Offer training and technical assistance and mechanized cultivation for setting up gardens without the use of fire
		Promote environmental education campaigns in surrounding communities
		Establish partnerships with public institutions to implement preventive actions for environmental monitoring and inspection.
Lack of community engagement	Prevalence of agricultural activity with degrading effect on the environment	Raising awareness of the transformation through the exchange of experiences with success stories in the Amazon

		Maintain active communication and feedback channels to assess the degree of engagement and the need for new stimulating actions
	Prevalence of the condition of socioeconomic vulnerability among young people and women	Keep the community confident in the project by fulfilling actions, deadlines and agreements.
		Perform annual monitoring to assess the effectiveness of actions and implement corrective measures/improvements
Lack of interest from community members, public bodies and institutions in establishing collaboration agreements with the Santa Rosa REDD+ Project.	The project area is inserted in a region surrounded by protection areas, but like most protected areas in the Amazon, it suffers from insufficient administration and patrolling. The project's greatest risks come from external anthropic actions such as predatory hunting and fishing, illegal logging, fires and the advance of settlement areas and the expansion of agriculture and livestock.	Establishment of agreements for the sustainable use of natural resources with communities and residents close to the project;
	The protection of natural resources and maintenance of the project is closely related to the strengthening of inspection actions, environmental education and technical assistance disseminated in the surrounding communities and in cities close to the project.	Intensification and support for inspection actions, together with the bodies and institutions responsible for combating predatory hunting and fishing, illegal logging, burning, mining and prospecting and other activities harmful to the environment and the maintenance of natural resources.
		I support scientific research activities both on biodiversity and on land use by the community, with specialized technical assistance.

2.1.20 Benefit Permanence (G1.11)

Benefit	Strategy	Property

Strengthening the nut production chain	- Promote the group's engagement in the national and international market network. - Stimulate associativism and efficient management of production and commercialization. - Stimulate the verticalization of production with insertion in different market segments. - Mediate the formalization of government partnerships and funding agencies to consolidate the initiative.	Jaraguá
Strengthening latex extraction		Senegal
Strengthening non-timber extractivism		Santa Rosa
Field preparation techniques without the use of fire	Training of local multipliers	Jaraguá, Santa Rosa e Senegal
Training young people and women in rural entrepreneurship	Promote institutional arrangements that ensure the sustainability of small rural businesses, such as SENAR and SEBRAE	Jaraguá, Santa Rosa e Senegal
	Mediate the formalization of partnerships with governmental and non-governmental organizations for access to public policies aimed at young people and women	Jaraguá, Santa Rosa e Senegal

2.1.21 Financial Sustainability (G1.12)

The financial sustainability of the Amazon Partners 1 Project is based, mainly but not only, on the number of years until the cash flow of the Project reaches its break-even point, and also on the guarantee of the financing necessary to implement and operate the Project until it reaches the situation in which the cash flow carried out ensures the continuity of the Project.

The break-even point of the Cash Flow of the Grouped Project of the three areas is reached in the second year of operation of the Project, which also presents a Payback of two years. The complete economic and financial analysis model, projected year after year based on inventories of emissions and market conditions, was made available on a reserved basis, because it contains sensitive and exclusive information owned by the Project Proponent, its Implementing Partner, and other associates.

The Amazon Partners 1 Project was also fully funded with the Project Proposer's own resources, in such a way that the resources necessary for the implementation and continuity of the planned activities until the cash flow ensures permanence throughout.

2.1.22 Grouped Projects

2.1.22.1 Eligibility criteria for grouped projects

For the inclusion of new project activity instances, the following set of eligibility criteria must be met:

- Be contemplated in the same region of the project (State of Acre, Brazil)

- Contribute to the addition of GHG emission reductions in the grouped project

- Contribute to the improvement of the SDG indicators contained in the PDD and/or add others

- Have similar environmental, social, and economic characteristics that allow the same analyses, filters and calculations to be carried out

- Adopt and apply activities and methodologies in accordance with the specifications presented in the Project description

- Are subject to the same community and biodiversity no project baseline scenario determined for the project

- Are subject to the baseline scenario given in the project description for project activities within the geographic region.

- Include the same processes for stakeholder engagement described in the project description and respect for rights to lands, territories, and resources, including free, prior and informed consent.

- Be monitored under similar monitoring and process elements of other instances of project activity.

2.1.22.2 Scalability Limits for the Grouped Projects

The scalability limit for the project will be addressed from the design and planning phase to the execution and monitoring stages, considering each project area. This approach seeks to minimize risks to benefits for climate, community, and biodiversity. Design and planning: the participation of local organizations in the design and planning of activities will seek to identify the best time to carry them out, avoiding conflicts with local agendas according to productive practices and activities. In addition, it will be important to identify the capacity of local labor and people engaged in carrying out the activity, avoiding logistical and operational problems for its execution. Execution and monitoring: during the execution of activities, it will be important to monitor the engagement of the local population, expectations, and the occurrence of possible non-conformities that the carrying out of activities may generate in the locations, in order to minimize these impacts and ensure that they are not repeated in future activities.

2.1.22.3 Risk Mitigation Approach for Grouped Projects

The project scalability limits described above will be observed during the monitoring of activities in each project area, ensuring an integrated view of the project regarding compliance with the limits.

If the scalability limit is exceeded in any activity in any project area, the other similar activities designed, planned, or being implemented in any project area will be reviewed, as a mitigating measure of risks to benefits for climate, community, and biodiversity.

Likewise, if the scalability limit is exceeded in any community organization or project partner, the other activities designed, planned, or being implemented in any project area with the same stakeholders will be reviewed as a risk mitigation measure to benefits for climate, community and biodiversity.

Therefore, the adaptive management of the project schedule should be aware of this possibility, incorporating necessary changes so that the scalability limit is not exceeded again.

2.2 Without – Project Land Use Scenario and Additionality

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

This analysis was conducted based on VCS VM0015 version 1.1 methodology, addressing agents, drivers, and underlying causes of deforestation. Since the baseline scenario is the same as the conditions existing prior to the project initiation, details are presented in Section Baseline Scenario (Climate).

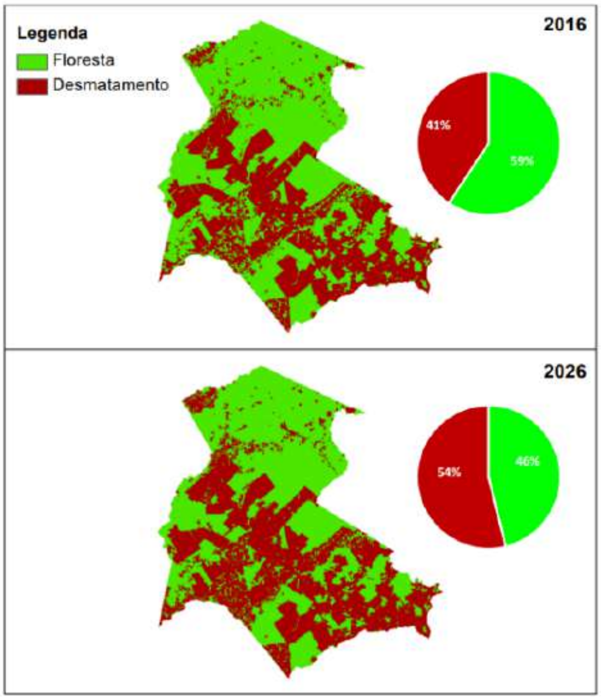
2.2.2 Most- Likely Scenario Justification (G2.1)

2.2.2.1 Jaraguá Farm

The Reference Region, which includes the Fazenda Jaraguá Project Area, presented a historical average deforestation rate of 4,842.81ha/year between 2010 and 2021 (see Project Boundary). A land use study (Acre, 2018) in the municipality of Bujari, that includes the reference region, illustrates what can occur in the area in the absence of the project activity.

The projection of deforestation for the 2016-2026 period shows the evolution of deforestation can increase by up to 13%. The impacts resulting from the maintenance of current deforestation patterns are significant, representing an increase in the deforested area in the municipality of the order of 39,960 ha. According to the PPCDQm (Acre, 2018), Bujari would reduce its vegetation cover from the current 59% to 46%.

Figure 24 - Projection of deforestation at Bujari municipality, where Jaraguá Farm project area is located, 2016-2026.



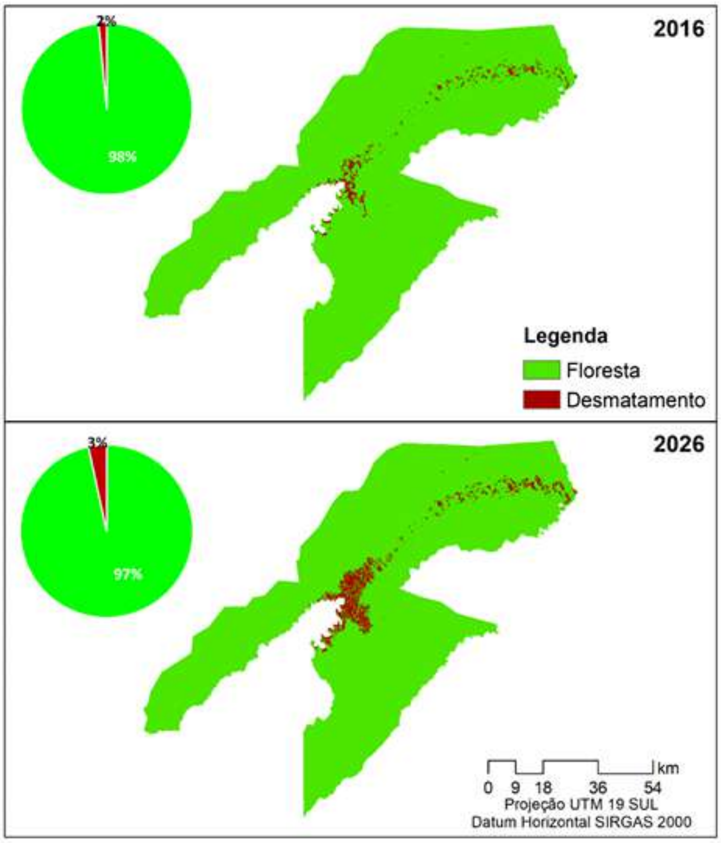
Source: Acre 2018

2.2.2.2 Santa Farm

The Reference Region, which includes Santa Rosa Farm project area, presented a historical average deforestation rate of 1,164.05 ha/year between 2010 and 2021 (see Project Boundary). A land use study (Acre, 2018) in the municipality of Santa Rosa do Purus, that includes the reference region, illustrates what can occur in the area in the absence of the project activity.

The projection of deforestation for the 2016-2026 period shows the evolution of deforestation can increase by up to 1%. The impacts resulting from the maintenance of current deforestation patterns are significant, representing an increase in the deforested area in the municipality of the order of 11,483 ha. According to the land use study (Acre, 2018), Santa Rosa do Purus would reduce its vegetation cover from the current 98% to 97%.

Figure 25 - Projection of deforestation at Santa Rosa do Purus municipality, where Santa Rosa Farm project area is located, 2016-2026.



Source: Acre 2018

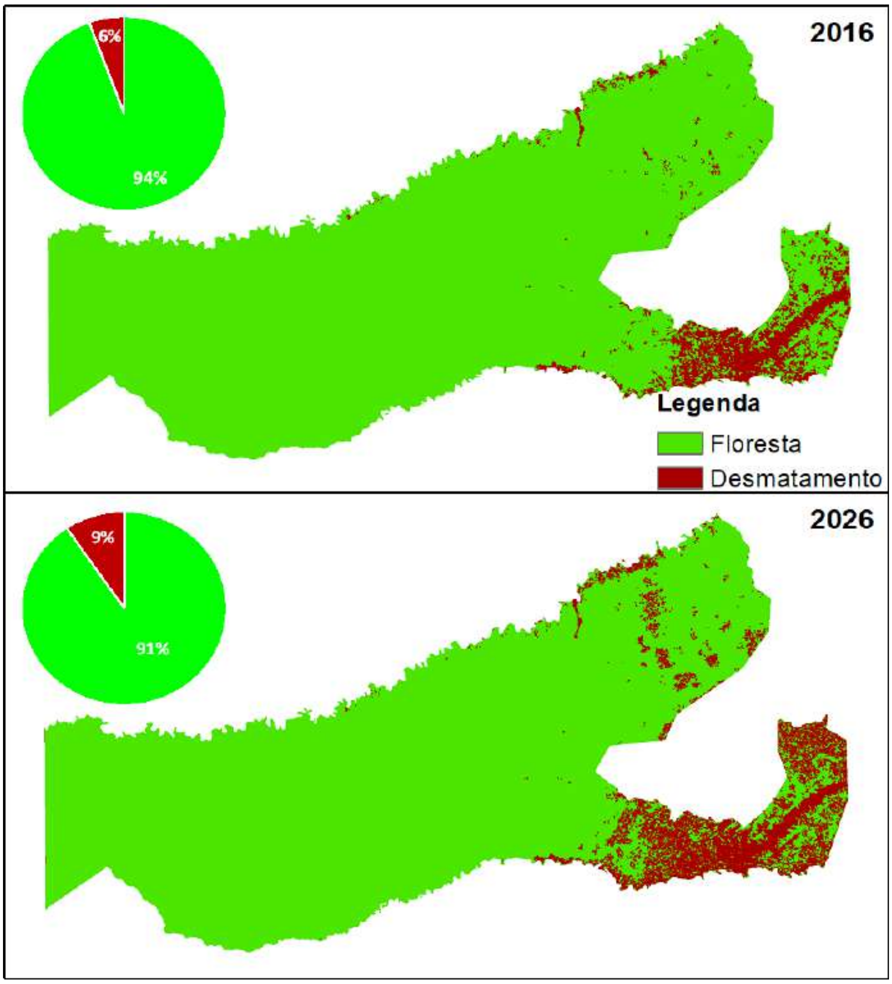
2.2.2.3 Senegal Farm

The Reference Region, which includes Senegal Farm project area, presented a historical average deforestation rate of 3,682.08 ha/year between 2010 and 2021 (see Project Boundary).

A land use study (Acre, 2018) in the municipality of Assis Brasil, that includes the reference region, illustrates what can occur in the area in the absence of the project activity.

The projection of deforestation for the 2016-2026 period shows the evolution of deforestation can increase by up to 3%. The impacts resulting from the maintenance of current deforestation patterns are significant, representing an increase in the deforested area in the municipality of the order of 4,682 ha. According to the land use study (Acre, 2018), Assis Brazil would reduce its vegetation cover from the current 94% to 91%.

Figure 26 - Projection of deforestation at Assis Brazil municipality, where Senegal Farm project area is located, 2016-2026.



Source: Acre 2018

2.2.3 Community and Biodiversity Additionality (G2.2)

This PDD presents relevant information about the pressure in which the areas objects of the Project are inserted. Pressure for deforestation, for the construction of infrastructure, especially roads and for the lack of engagement and territorial integration between communities, protected areas and settlements.

The private areas - Jaraguá, Santa Rosa and Senegal, are inserted in a mosaic of protected areas. Both Extractives Reserves, State Parks, National Forests and settlements are subject to special protection rules and regulations. However, what we see in the field is that the absence of integrated territorial planning for sustainable development and, more precisely, the deficiency in technical assistance for small producers (such as the settlers and extractivists of RESEX Chico Mendes, for example), have led to processes of deforestation and occupation of land with productive chains that degrade forests, such as extensive cattle raising.

It is also important to highlight that the State of Acre has promoted the creation of important tools that support the control and fight against deforestation - the PPCQQMs. Each of the municipalities that are part of this Project has a specific document. They indicate the future drivers of deforestation in the areas.

This Project proposes that the areas play the role of catalysts for territorial development, engaging communities, and stakeholders to protect the areas and to develop productive activities with sustainability, such as the collection of Brazil nuts in the Jaraguá area, for example.

With this, the proposal to improve the quality of life of the communities and protect biodiversity (also based on the monitoring plans to be implemented), will reinforce the role of these areas as important elements of protection of the Amazon Forest, being able to serve as a model for other initiatives.

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

Not applicable.

2.3 Stakeholder Engagement

2.3.1 Stakeholder Access to Project Documents (G3.1)

All information about the project was made available during the community consultation and engagement process. During the engagement, the team was careful to use understandable and locally recognized language during the explanations, accompanied by a location map and guiding text on the conception and objectives of the project.

During the interviews, relevant information about the objectives and location of the project was presented. For this, a newsletter was used and distributed with related themes, such as greenhouse gas emissions, carbon sequestration and the carbon credit market.

During the interviews, residents were asked about their perception of the project and what it could contribute to positively impact the wellbeing conditions of the community.

The access to project documentation by social actors will be ensured through direct dissemination in the community in print or digital media and availability on Verra's website.

Also, the access to project documentation by social actors will be ensured through direct dissemination in the community through print or digital; by availability on the certifier's website; or even in social networks, if applicable.

In the lifetime project, annual meetings will be held in loco with social actors to publicize and explain project activities with local communities; annual meetings will also be held with stakeholders comprised of government organizations.

Figure 27 - Stakeholder Jaraguá Farm.

Figure 28 - Stakeholder Jaraguá Farm

Figure 29 - Stakeholder Senegal Farm.

2.3.2 Dissemination of Summary Project Documents (G3.1)

To ensure the effective participation of the community and stakeholders in decision-making throughout the project, a Social Communication Program will be implemented. The Program will be made effective through face-to-face consultations and the provision of dialogue channels (telephone, cell phone and e-mail).

The communication strategy will be based on local cultural identity and values with the aim of ensuring communities and stakeholders access to correct and understandable information and qualified participation during consultation and decision-making processes on the aspects that may influence their lives and their material and immaterial assets.

Annual meetings will be held in loco with the social stakeholders and communities to disseminate and explain the activities of the project. Annual meetings will also be held with stakeholders composed of government and NGO organizations.

2.3.3 Informational Meetings with Stakeholders (G3.1)

Culturally appropriate engagement occurred in the social, economic, and cultural information gathering stage; and in the identification of the impacts and benefits possible to be generated by internal vectors (projects) and external. In the engagement, the technical team was careful to use in the approach an understandable language recognized locally during the explanations, accompanied by a location map and guiding text about the design and objectives of the project.

In total, for the project area, 82 families were interviewed.

As said before, in the installation of the Project the proposal is that annual meetings will be held in loco with the social actors to disseminate and explain the activities of the project will also be held with stakeholders composed of government organizations, NGOs and others relevant stakeholders in the region.

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

Information about the project was made available during the community consultation and engagement process. In the engagement, the team was careful to use in the approach an understandable language recognized locally during the explanations, accompanied by a location map and guiding text about the design and objectives of the project.

During the interviews, relevant information about the objectives and location of the project was presented. For this, a newsletter was used and distributed with information on themes related to greenhouse gas emissions, carbon sequestration and carbon credit market.

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

To carry out this work, the following methodological tools were applied:

•Delimitation of the study area: collection and analysis of primary data and use of satellite images.

•Socioeconomic data collection: a semi-structured questionnaire with open and closed questions.

•Culturally appropriate engagement: oral explanations with locally recognized language, with the aid of printed material: project explanatory pamphlet and geographical map with the location of the project area, families, rivers and streams; survey of perception about the project and its contributions in investments of interest to the community.

•Elaboration of reports: according to the guidelines for the elaboration of the Community Climate and Biodiversity Standards.

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

The audit dates and processes will be communicated to the community leaders identified in each of the areas. Members of the technical team that prepared the documents will be present to support the processes.

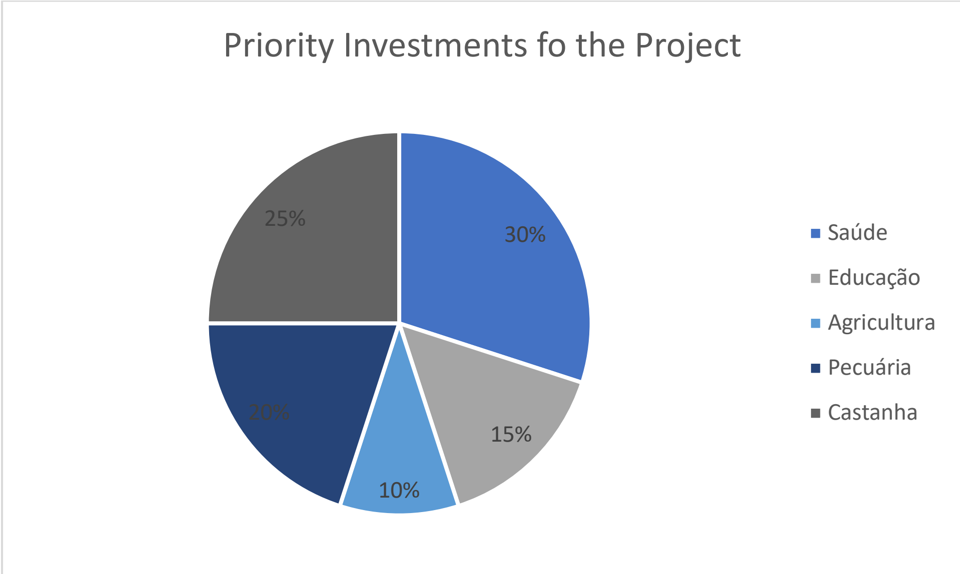
2.3.7 Stakeholder Consultations (G3.4)

In order to meet exactly the needs of the interested parties and consequently guide the design of the project, the residents were consulted during the interviews about their perception of the project and what it could contribute to positively impact the conditions of well-being of the community.

All groups from the three areas pointed out common issues related to health and education. Other types of issues were raised by each stakeholder group.

Figure 30 - Stakeholder Consultations in Jaraguá Farm.

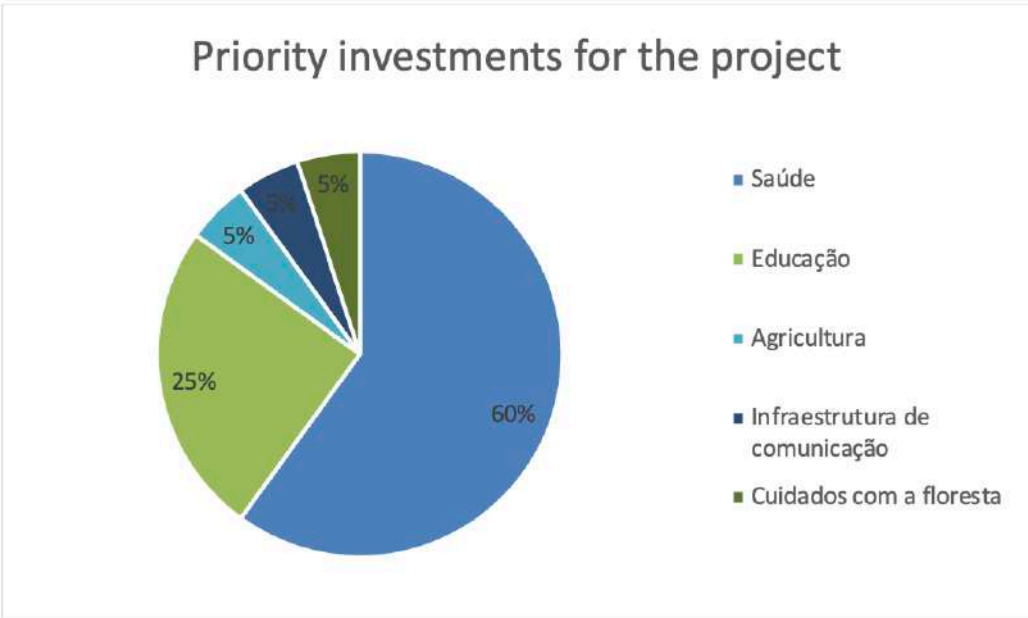
Legend: Saúde (Health), Educação (Education),Agricultura (Agriculture), Pecuária (Livestock) and Castanha (Brazil Nuts).



Source: Self Elaboration

Figure 31 - Stakeholder Consultations in Santa Rosa Farm.

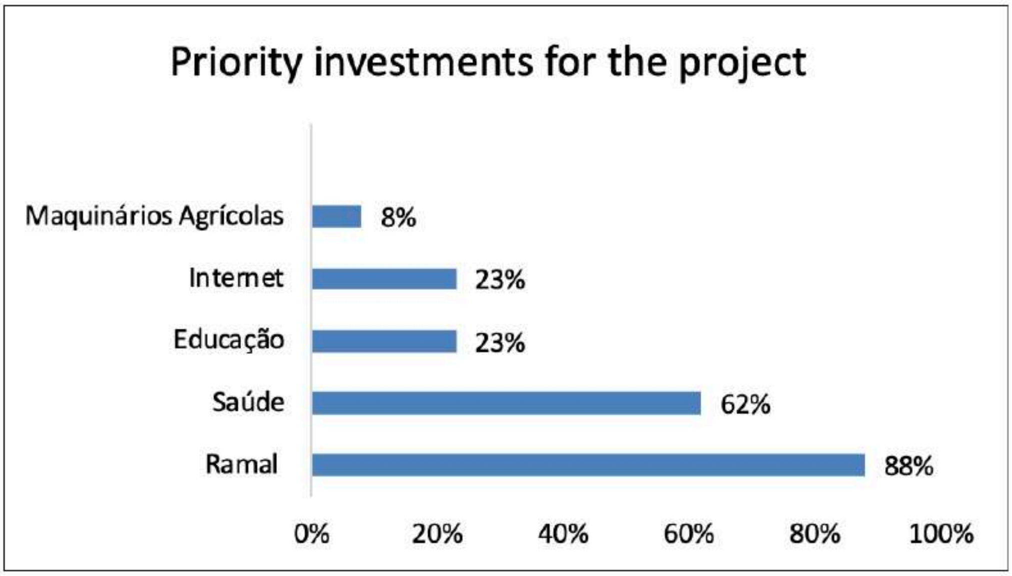
Legend: Saúde (Health), Educação (Education),Agricultura (Agriculture), Infraestrutura de Comunicação (Communication Infraestructure), and Cuidados com a Floresta (Forest Care)



Source: Self Elaboration

Figure 32 - Stakeholder Consultations in Senegal Farm.

Legend: Maquinários Agrícola (Agricultural Machinery), Internet, Educação (Education), Saúde (Health), and Ramal (internal roads).



Source: Self Elaboration

2.3.8 Continued Consultation and Adaptive Management (G3.4)

As proposed, the Project should compose a Territorial Management Group that will be formed by representatives of the various communities and stakeholders. The activities will be communicated via the Territorial Information Platform (digitally, by smartphone and by radio).

The Management and Communication Plan will be developed and finalized at the installation of the Project.

There will be annual meetings to monitor and manage activities with the participation of representatives.

2.3.9 Stakeholder Consultation Channels (G3.5)

To ensure the effective participation of the community and stakeholders in decision-making throughout the project, a Social Communication Program will be implemented. The Program will be carried out through face-to-face consultations and the availability of dialogue channels (telephone, cell phone and e-mail).

The communication strategy will be based on local cultural identity and values with the aim of ensuring that communities and stakeholders have access to correct and comprehensible information and qualified participation during consultation and decision-making processes on aspects that may influence their lives. and its tangible and intangible assets.

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

This Process will be carried out by the Territorial Management Group - TMG. The TMG should develop and present the rules for composition (ensuring diversity of people, gender and region) and functioning (culturally appropriate).

2.3.11 Anti-Discrimination Assurance (G3.7)

Amazon Partners, LLC and the Project Manager are committed to the highest universal standards of commitment and respect for human beings in their individuality, with no type of discrimination or harassment being conceivable. The Commitment materializes in the Code of Ethics and in the Declaration of Commitment to the protection of human rights. The documents are prepared and will be presented and discussed with the stakeholders in the installation of the Project.

Also based on the 1988 Constitution of the Federative Republic of Brazil, with special attention to Article 5 of the aforementioned legal diploma, which provides for individual rights and duties and establishes that everyone is equal under Brazilian law. Therefore, no prejudice or discrimination against people is accepted, whether due to race, color, nationality, origin, religion, gender, sexual orientation, social class, marital status, age, physical disability, or other personal characteristics.

2.3.12 Feedback and Grievance Redress Procedure (G3.8)

The processes will be taken to the Territorial Management Group for analysis, discussion and referrals.

Communication channels for feedback and status of claims redress cases will be disclosed in meetings, consultations, events and project activities with communities and Stakeholders, through a documented procedure, containing, but not limited to, communication channels, measures taken, deadlines, feedback, process flow, responsibility, and transparency.

The procedure will be guided by the following lines:

2.3.12.1 Objective

Define a system for handling complaints and repairing damages of any nature resulting from the execution of the project.

2.3.12.2 Definition

Complaint: act or effect of opposing through arguments, protest or claiming something that is considered right or fair by the applicant.

Damage: material (i) is the loss that occurs in the person's assets, that is, loss of goods or things that have economic value; moral (ii) is the violation of someone's honor or image, which results from an offense to personality rights (intimacy, privacy, honor and image); aesthetic damage (iii) constitutes an injury to someone's health or physical integrity, which results in embarrassment.

Third party: person, group, community, or legal entity that has suffered damage.

2.3.12.3 General Conditions

The identification of a claim or demand for damage repair will occur upon receipt through the social communication channels or during the monitoring activities of the project's social impacts. Damages must be compensated or mitigated fairly and according to the particularities of each case, in compliance with current legislation. Cases of damage claims and compensation will be subject to a specific investigation procedure to assess the situation and support applicable measures.

2.3.12.4 Identification and Assessment of the need for compensation

The claim or damage is characterized by events caused or resulting from the activity implemented or due to the execution of the project. The need for compensation is the result of objective proof of the negative event. Once the claim or damage is proven, an action plan must be prepared and implemented, predicting each work step, deadline, and responsibilities. The plan should result in a repair report.

2.3.12.5 Ways of conflict resolution

Friendly resolution attempt: The project manager will listen to all complaints and try to friendly negotiate a mutually beneficial and satisfactory solution with the parties involved. The entire procedure will be documented, analyzed with the attention it deserves.

Mediation conducted by a neutral party: if it is not possible to resolve the conflict friendly, a neutral party to the project will be summoned to mediate the demand in order to resolve it. Depending on the nature of the conflict, government agencies may be brought into mediation, such as IBAMA, INCRA, IMAC, etc.

Court or Arbitration: If the neutral third party (mediator) is unable to resolve the conflict, the claim will be directed to the Central Forum of the District of São Paulo, State of São Paulo, or to the Local District, depending on the type of conflict, with attention to legal requirements of a forum other than the elected one above.

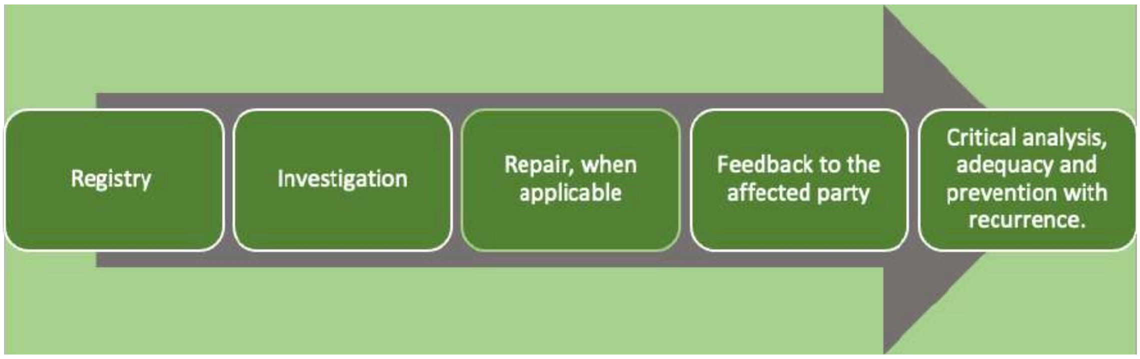
2.3.12.6 Follow-up and response in friendly Negotiation or Mediation

Feedback to the affected party on the status of the redress process must be carried out to ensure trust and transparency of the resolution process. The feedback must be documented and through official project channels. Every process will be monitored and evaluated to verify the implementation and effectiveness of the actions taken until its closure to verify the need for adequacy of the repair measure.

2.3.12.7 Responsabilities

Damages caused will be evaluated and approved by the Project Management or mediator, after hearing and analyzing the Legal Area.

Figure 33 - Process Flow.



Source: Self Elaboration

2.3.12.8 Registration

The records generated, such as meeting minutes, reports, action plans will be archived for a period of 05 years, being kept back-up in the cloud indefinitely. The occurrences, as well as all measures applied and feedback to the affected parties, must be recorded on the Complaint Registration Form.

2.3.12.9 Changes And Revisions Of The Document, If Applicable

Changes to documents can be proposed by any collaborator, and the person responsible for the area to which the change refers must make these proposed changes. The amended document must go through the normal approval flow after the amendment.

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

See the entire procedure in the previous item (Feedback and Grievance Redress Procedure).

2.3.14 Worker Training (G3.9)

"Currently, much is said about social projects, that is, projects that propose to solve society's problems. However, community participation in projects of this nature is not always objective and, when it is, it is not always achieved satisfactorily. A social project does not solve a problem forever. For it to be resolved, people must continue to act even after its closure. At that moment, the consultants will no longer be in the community and the residents will have to guarantee the sustainability of the actions. Therefore, it is important to value dialogue, common language, training, collective thinking. A usual project often requires technical solutions, and the beneficiary just wants the problem to end, no matter how. A social project, in turn, is like a diet: it guarantees weight loss within a certain period, but after its end, if due care is not taken, the extra kilos return and thus cancel all the initial effort." (Carvalho, 2006).

The author further claims that "a project is normally conceived from a vision of opportunity, either to improve a reality or to solve a problem. In the case of participatory social projects, it is recommended that all conception, planning, execution, and evaluation be carried out with the participation of stakeholders and local communities."

Based on this principle, this Project will develop a Work and Social Participation Policy, defining opportunities for inclusion of people from the communities involved, especially young people and women. A Training Program should also be prepared, allowing the qualification of the people involved in the activities.

2.3.15 Community Employment Opportunities (G3.10)

The principles of participation will be described in the Work and Social Participation Policy to be developed. The proposal is that community members can participate in various activities and should be trained to do so, including monitoring programs (see monitoring - communities and biodiversity).

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

The Project Proponent undertakes to respect all labor rights provided for in Brazilian legislation.

The Constitution of the Federative Republic of Brazil of 1998, the fundamental and supreme law of Brazil, provided that the subordinate worker will be, for the Constitutional purposes of protection of Article 7, the one who maintains an employment relationship, especially, but not limited to, the following items:

Item IV, which establishes minimum wage, fixed by law and nationally unified, capable of meeting basic vital needs such as housing, food, education, health, leisure, clothing, hygiene, transportation and social security;

Item IX provides that the remuneration of night workers will be higher than that of day workers;

Item XIII provides duration of normal work not exceeding eight hours a day and forty-four hours a week;

The item XV provides paid weekly rest, preferably on Sundays;

Item XVII that provides the right to paid annual vacation;

Item XVIII that provides for maternity leave, without prejudice to employment and salary, with a duration of 120 days;

Item XXII, which establishes that are the rights of urban and rural workers, in addition to others aimed at improving their social condition, the reduction of risks inherent to work, through health, hygiene and safety standards.

Decree-Law No. 5.452, of May 1, 1943, is the Consolidation of Labor Laws, a law at the national level, which deals specifically with the norms that regulate individual and collective labor relations. This law was created with the aim of unifying all existing labor legislation in Brazil

The Consolidation of Labor Laws is one of the oldest legal systems in Brazilian history. The set of laws that spanned the century, regimes and governments, from the creation of the law to the present day. Its creation marks different important periods in the history of Brazil.

The main subjects dealt with in the Consolidation of Labor Laws are: (i) provided for the registration of the Worker, through an Employment Card; (ii) provided for individual employment contracts; (iii) provided for the determination of working hours; (iv) established special job categories; (v) established rest periods; provided for the right to annual leave; (vi) predicted occupational medicine; (vii) established protection of women's work; (viii) provided for the existence and organization of trade unions for each category of work; (ix) predicted the existence and organization of trade unions for each category of work; (x) provided for the existence of Collective Agreements, and (xi) provided for and regulated the Labor Court and Labor Judicial Process.

2.3.17 Occupational Safety Assessment (G3.12)

This item will also be developed within the scope of the Work and Social Participation Policy and must contain, at least, the measures required by legislation for work safety.

2.4 Management Capacity

2.4.1 Project Governance Structures (G4.1)

The existing governance in the project elaboration phase is composed of the structure formed between the proponent, the project developer, the companies outsourced by the developer for primary data collection and the landowner.

After registering the Verra project, the proponent will hire the company to implement the project and carry out the monitoring actions.

2.4.1.1 Actors Responsibility

2.4.1.1.1 Bidder

- Guarantee the financial health of the project in all its stages, being the elaboration, installation and follow-up

- Hiring validation and verification auditors

2.4.1.1.2 Developer

- Coordination of subcontracted teams for data collection to subsidize the PDD and who carried out work in the field and/or remotely

- General coordination of socioeconomic diagnosis and environmental surveys for the implementation of the PDD

- Alignment of expectations with stakeholders

- Baseline, carbon stock and additionality studies

- Accompaniment of international auditors in the validation and verification stages

- General coordination of the implementation phase and execution of the monitoring actions provided for in the PDD.

2.4.1.1.3 Supplier Teams

- Carrying out a forest inventory to estimate the biomass stock in the three properties

- Collection of socioeconomic data and environmental and biodiversity surveys

- Weather forecasting and modeling

- Execution of monitoring and social engagements in the project installation phase

2.4.1.1.4 Owner's

- Ensure access and security of field teams

- Ensures Free, Prior and Informed Consent and receives project profit sharing

2.4.1.2 Governance Proposal

Finally, it is important that the implementation of the Project is done in a transparent and participatory way, involving all stakeholders.

The Project governance to be established is a fundamental part of the process. A participative, inclusive, and transparent management process should be established. In addition, project management should indicate best practices and technologies for the management of social and environmental indicators related to the protection of areas and the social and economic development of territories.

The creation of a Territorial Management Group - TMG is recommended. The Territorial Management Group will be empowered by the project to function as a representation entity for the municipalities and communities involved.

The TMG will be organized and implemented at the beginning of the project, as the proposal is that the activities be carried out in a collaborative, interactive and participatory way. An internal regulation will be developed on the scope and form of participation of the TMG within the scope of the project. The TMG will have a deliberative role in monitoring and supervising all the actions developed within the scope of this Project.

One of the first actions that the Project will carry out is the mapping of all communities and organizations, however small, that are related to the promotion of sustainable development in the territory.

Knowing the scenarios and their actors well is a structuring component of a project like this. This knowledge includes mapping each key actor directly or indirectly involved in socio-environmentally structuring activities, that is, in addition to carrying out a survey related to this, also carrying out geospatialization, to understand where they are, how they act and what interfaces are present. In this sense, it is also necessary to characterize each public policy, project, program, and business developed by local actors, whether private or public.

From the installation of participatory governance in the Project it is expected that:

1. The establishment of Territorial Hubs or Territorial Digital Empowerment Centers – CEDTs in the municipalities covered by the project.

2. That people be trained by the Project's management to develop actions in the municipalities covered by the Project, mainly in communities surrounding the areas.

3. Training of members of local organizations in organizational strengthening, technological innovation, etc.

4. In-depth knowledge of the social actors in the areas surrounding the Project.

5. Activities, results and impacts achieved by the Project communicated in the partners' social media and in communication vehicles.

6. System for monitoring multidimensional aspects of the territory implemented to identify territorial strengths and vulnerabilities and indicate ways to mitigate impacts. The project will serve as a catalyst that will allow advances in quality of life to be achieved by the communities themselves.

7. Digital transformation implemented and welcomed by communities in their various interfaces: personal and professional lives.

Finally, a system for Structured Knowledge of the Territory - SKT will also be set up. The SKT is a stage of field actions integrated with the remote management of data collection and content classification, which will later be used in subsequent stages of the work. The SKT will be essential for documenting expectations, mapping demands and other information that will be essential for the implementation of the Project activities described below:

“Florestas do Acre“System for Monitoring Territorial Development. The “Forests of Acre System” will be an instrument to be developed by the Project in a collaborative process with the Territorial Management Group, with the aim of visualizing, in an integrated way, the entire territory worked and evaluating its conditions based on the dimensions of human security. There are six dimensions defined by the UN: economic security, health security, environmental security, personal security, community security and political security. However, for the creation of “Forests of Acre System “, and due to the obvious importance related to the climate crisis, the Project opted to add two more dimensions as a way of emphasizing critical and current issues: the climate dimension and the dimension inclusion and digital empowerment, both fundamental elements and pillars of Revolution 4.0.

The combination of these layers will allow to portray the territory, in a systemic and contextualized way, and to use the territorial approach for the chain of actions. The data will be monitored by the TMG, but the idea is that communities and all interested parties have access to information so that they can, in an interactive and concrete way, participate in the territorial transformation.

Territorial Information Platform - TIP “Florestas do Acre“. All information collected and processed according to the methods, metrics and tools developed and applied will be systematically organized on a Platform with storage systems, for remote access by different stakeholders in the territory. A "blend" of low-cost technology solutions will be proposed and used to produce such deliverables. The Project will use the social technologies developed for this Project, to expand and make territorial monitoring conditions cheaper, with lower costs and always using the technology elements already present in the territories in monitored enterprises, treating the key actors of the anchor areas - Jaraguá, Santa Rosa and Senegal, as members of the same team. The territorial diagnosis will use its own methodology already tested and validated in other territories, with the aim of obtaining and systematizing data in order to portray the geographic space, that is, to gather a set of information that adds a geo-systematized database with several layers , such as: production chains, social organizations, types of companies and enterprises, local public policies for territorial development, engagement of actors - especially rural producers, logistics, health, local social and environmental committees and councils, local infrastructure, among others.

The objective of the Acre Forests Project is to take a step forward in recognizing the territory as sustainable and biosafe for residents and visitors, making digital technologies already incorporated into the daily lives and in the culture of the communities in the territory, instruments for the expansion the use of methodologies and for the expansion and maintenance of a sustainable territory - allowing for even greater precision and diversification of metrics for measuring sustainable development in the coming years and consequent protection of forests.

The low-cost "smartphones" already present in the lives of community members will be able to act as mobile data collection and delivery terminals that already have a known and assimilated interface -

especially the instant messaging application provided by Facebook, Inc. called WhatsApp, but also some others that the Project will point out. These mobile devices will not leave the territory at the end of the Project, on the contrary, they are instruments of the community culture that has already formed a perennial link between the territorial space and the interactions that it may have with the outside world, such as product sales markets sustainability, instruments of regional, national, and international public policies, etc.

The Project's proposal for monitoring the territory, added to the information obtained by the municipalities involved and the Territorial Management Group, over the years, aims to build a legacy of capturing data and sending information with multiple purposes, using digital tools already incorporated into the daily lives of communities, and which will thus facilitate the continuity and improvement of practices worked on in local productions and which contribute to the sustainable development of the territory.

The results of the analysis of the data will be consolidated in a Digital Report that will summarize the information to be made available in a "Dashboard" on the Territorial Information Platform (TIP) and made available to the actors and interested parties. In addition, it will serve as a source of information for municipalities to develop plans, resource applications and public policies.

2.4.2 Required Technical Skills (G4.2)

For the implementation of the project, Infrapar Sustainability Ltd. acts as a Project Management Office (PMO), to ensure the quality of the services performed and the materials produced in all stages of the project and produces the consolidation of data approved by its Quality Assurance process, preparing the final studies and writing the Project Design Documentation (PDD) based on its models and studies, counting on a highly qualified multidisciplinary team with decades of experience. The Infrapar Sustainability Ltd. team together with its business partners brings together all the technical skills necessary for the successful implementation of the project, such as in-depth knowledge of the methods related to Verra's VCS and CCB standards, application of territorial management and community engagement with stakeholders, carrying out forest and wildlife inventories, monitoring of biodiversity, realization of projections and modeling necessary for calculation of carbon stocks in soil and forest, application of GIS, socioeconomic and cultural diagnoses, among others.

2.4.3 Management Team Experience: Infrapar Sustainability (G4.2)

The experience of the project management team is led by Infrapar Sustainability Ltda, a company founded and directed by engineer Marco Antônio Fujihara and economist Breno Figueiredo, who have accumulated around 40 (forty) years of professional experience, with outstanding work in Sustainable Finance and Active participation in the main Brazilian and international forums related to the development and regulation of Credit Markets for Payments for Environmental Services.

Ágatha Ribeiro

College Student, attending the first year of Business Administration at LaSalle University, was an intern in Administration Technique of Infrapar Research Ltda and later infrapar Sustainability Ltda. where she was hired to work in the ESG Project Development and Carbon Credits teams -as well as in the formulation of content and support to the communities of service provision and employees of the online platform of the companies of the Infrapar Capital Partners initiative. As a high school student she developed her first Business Plan for a start-up as a school work with praise, which brought her closer to the Incubators and Accelerators market in the venture capital industry. She also developed work initially for venture building projects of Ivisix Ventures Ltda still as an intern, before joining Infrapar companies permanently until hiring, where she specializes more and more every day in the areas of Climate Economics, ESG Investing, Impact Investing and Regulatory Economics. You can learn more about Agatha Ribeiro on her LinkedIn page at Ágatha Ribeiro | LinkedIn.

Aline Tristão Bernardes

Aline holds a Bachelor's degree in Biological Sciences from the Federal University of Juiz de Fora, with a Master's degree in Ecology, Conservation and Wildlife Management from the Federal University of Minas Gerais. He has been working for thirty-five years as project manager related to territorial management and environmental conservation, with intense performance in integrated actions of sustainability, relationship and engagement with stakeholders, strategic social investment, conflict management, crises and critical relationships. The professional trajectory begins with participation in the creation and development of projects in Brazilian non-governmental organizations, such as the Biodiversits Foundation (Belo Horizonte, MG) and the Terra Institute (Aimorés, MG). She served as Director of Protected Areas of the Minas Gerais Department of Environment and the Forestry Institute of the State of Minas Gerais. Developed studies and projects related to the management of protected areas and environmental funds for financing protected areas and biodiversity in Latin America for the World Bank, Program of Development Units of the United Nations, GTZ and Non-Governmental organizations in the United States and Brazil, such as W Alton Jones Foundation and Brazilian Biodiversity Fund –FUNBIO. She worked for five years as project manager of Integrated Territory Management -GIT at Instituto Bioatlântica -IBIO before being selected as Executive Director of FSC Brazil in 2015, where she remained until December 2020. In 2021, hired by IBÁ, participated in the creation and structuring of the organization that represents the forest certification scheme -PEFC in Brazil. In addition, since 2021, it has supported Soleum in the development and implementation of the sustainability strategy –corporate and territorial. Aline is senior consultant at Infrapar Sustanability. You can know more about Aline at Aline Tristão Bernardes | LinkedIn.

André Dias

André is a Forestry Engineer from the University of São Paulo and has skills mainly in managing social and environmental projects in the Amazon and Cerrado, knowledge of forest management and exploitation of reduced impact, risk management in socio-environmental projects and search for synergy and collective construction. He was an Independent Consultant at IABS (Brazilian Institute of Sustainability Development), Conservation Manager at WWF Brazil where he was part of the risk management team responsible for developing institutional policies to strengthen risk management in conservation projects and protocol development. Carried out the management of conservation projects -PMO (design and implementation of the project management office in WWF Brazil with a portfolio of 80 projects and budget of R$ 40 million). He was lead auditor in the forest certification process by Imaflora, Operational Manager at the Tropical Forest Institute and participated in the Agroforestry Program-Health and Joy Project where he provided technical assistance and forest extension to riverside communities in the Tapajós River basin in the Amazon. Currently, André is the consultant specialist in environmental sustainability issues for the development of SDE REDD+ (Reduction of Emissions from Deforestation and Forest Degradation) projects at Infrapar Sustainability LTDA. You can know more about André at Andre Dias I Linkedin.

Breno Figueiredo

Climate Economist, lecturer and professor in the areas of Climate Economics, ESG Investing, Impact Investing and Regulatory Economics, holds a degree in Economic Sciences (1983-1987) from the Faculty of Economics and Administration (FEA) of the Federal University of Rio de Janeiro (UFRJ), holds an MBA in Corporate Finance from the Graduate School of Economics (EPGE) of the Getúlio Vargas Foundation (1995-1996), an MBA in Industrial Organization from the Institute of Industrial Economics (IEI) of UFRJ (1998-1999) and a Post-Bachelor's degree in Logistics and Transportation from the Business School of the University of Miami(2007). He was professor of economic regulation at EPGE/FGV from 1996 to 2001. He was also a certified member of the Project Management Institute (PMI) in 2010/2011. Since 2016 he is interested in the studies and applications of the new area of Sustainable Finance (Green Finance or Green Finance), dedicating himself from 2018, in full, to consulting services and structuring investment projects with the application of methods, metrics and tools of the area of Climate Economics, ESG Investing, Impact Investing and Regulatory Economics. In 2009 he founded the research house called Infrapar Research Ltda, since 2018 fully specialized in Climate Economics, and today also, part of the Infrapar Capital Partners initiative, of which he was the first associated company. Breno Figueiredo is the Chief Economist of the economic research, investment analysis, economic and financial modeling and product development team in Sustainable Finance and Climate Economics that provides support for the different legal vehicles of Infrapar Capital Partners, its clients, partners, investors and funders. He is responsible for Infrapar Capital Partners' initiatives with the United Nations Global Compact and the Verra Standards. In 2020 he formulated for the PSA Soja Brasil project of the Tropical Forest Alliance (arm of the World Economic Forum), an experimental methodology for pricing carbon credits entitled PSA Productivity Princing proposed an algorithm that linked the price of Carbon Credits with agricultural productivity and the potential for avoided deforestation. Also in 2020 formulated for the Brazilian Federation of Banks -FEBRABAN, proposal for climate risk modeling for the credit and investment portfolios of Brazilian banks. In 2021, he was responsible for the economic and financial modeling of the Environmental Services Development Company of the State of Acre (CDSA) and the updating of the values and records of the Company's Judicial Carbon portfolio in the VERRA and IHS Markit records. That same year he worked on the PES Digital project for the optimization of technologies for the lower-cost alternative technologies, based on digital solutions, for measuring GHG emission reductions. by the Tropical Forest Alliance. In the same year, as a venture builder he worked at the foundation of Ecofix Securities S.A. -start-up specialized in solutions for origination of carbon credits in the soil in areas of agricultural production and pastures - service provider for national sustainable agriculture, today, part of the Infrapar Capital Partners initiative. In 2022, as an expert in Regulatory Economics, he worked for the World Economic Forum in the construction of a market proposition for the regulation of the Brazilian Law on Payments of Environmental Services, as a contribution to the efforts of the Brazil, Climate, Forestry and Agriculture Coalition. Also participated in the preparation and signed the Brazilian contributions by ANEFAC - National Association of Finance, Administration and Accounting Executives for the first regulations of metrics accounting in ESG-Environmental, Social and Governance in the international accounting systems of companies, currently under preparation in the International Standard Sustainable Board-ISSB. In 2022 it also structured Infrapar Sustainability Ltd. Arm of the company Infrapar Capital Partners dedicated to the origination, registration and negotiation of Environmental Service Payment Credits (nod. -CCB Program of the Verra Standards). It is also at the forefront of the implementation of the Tykyra Scientific-Technological Institute, which was founded in 2023 for the structuring of lines of research, consulting and professional training focused on methodological and technological development -which contribute to the responsible use resources of the planet's natural infrastructure, adding the value of natural capital to the value of financial capital, for the consolidation of the Sustainable Development Goals. Since 2009, through his venture building company, economist Breno Figueiredo has already originated, provided mentoring and support for the structuring of a dozen new companies and venture projects, disinvesting their equity interests in five of them -with the rest still counting on equity interests of Ivisix Ventures Ltda. - conducted by their respective teams of each company invested. Until starting his own business in the venture capital industry Breno Figueiredo built a solid career as an executive in state, government and investment funds. After joining the federal statal through its Trainee Program in 1987, Breno Figueiredo began his career in the holding company of Eletrobrás Centrais Elétricas Brasileiras S.A. as a econometrist of the Department of Economic Studies. He was Division Manager of the Accounting Department, Manager of 3 (three) different Departments [(i) Credits, (ii) Investments and (iii) Economic-Financial Planning], until becoming Controller in the Corporate and Financial C-Level Team of the company from 1996 to 2001 -a function that accumulated with the mission of implementing the ERP System -Enterprise Resources Planning companies between 1998-2000. In 2002 he assumed the position of DAS-6 in the Federal Government, at the head of the Superintendence of Economic Regulation of the National Land Transport Agency (ANTT) in the mandate of implementation of the regulatory agency, between 2002-2008. In 2009 he founded his own research house, and through it was soon hired to act as Senior Advisor of Investment Funds of GP Investments, in the period 2011-2013. Through the research house also provided support the activities of Promon Intelligens, URBEM Institute, Bio-Atlantic Institute and A.T.Kearney Brazil between the years 2014-2018. He was a member of the Boards of Directors of Eletrosul, CHESF, Eletroacre Energy Company, Amazon Energy Company, and carrier to carrier EletroNET in the telecommunications area (companies of the Eletrobrás Group), as well as Companies' Fiscal Council of the Center for Research in Electric Energy (CEPEL) and the Electric Power Transmission Company (CTEEP) of the Colombian group ISA. You can learn more about economist Breno Figueiredo on his Linkedin page at Breno Figueiredo | LinkedIn.

Juliana Figueiredo

Juliana holds a bachelor's degree in Business Administration from IBMEC-RJ. With expertise in Business, Business Management, Marketing and Related Support Services. She began her professional career at the University by becoming a Contract and Operations Consultant at Ibmec Jr. Adiante, worked on projects of consolidation and expansion of Closet Bobags,marketplace for sale and rental of luxury bags and accessories, where she was responsible for the curatorship of the platform, assisting in the purchase and evaluation of products and potential customers, later worked on the expansion of the office to the city of São Paulo -in projects with geographically distributed teams. In 2018 it decided to undertake and take the risks of putting up her own business through Ivisix Ventures Ltd., acting since the structuring of the companies that are part of the Infrapar Capital Partners initiative focused focused on the management of the value of the planet's natural infrastructure, through responsible investments in agroforestry system, sustainable agriculture, sustainable infrastructure and unique financial products with ballast in natural capital assets and carbon credits or other payments for environmental services, with companies invested in research, technology, marketing, venture building and ESG Investing. With all her entrepreneurship initiatives focused on the ESG solutions market, Juliana has been dedicating herself full time in her expertise in the area of Climate Economics, ESG Investing,Impact Investing and Regulatory Economics, working in projects and structuring of businesses related tothe markets that make extensive use of these expertises. You can learn more about administrator Juliana Figueiredo on her LinkedIn page at Juliana Figueiredo | LinkedIn.

Lucas Barbosa

Graduated in Chemical Engineering from the Fluminense Federal University in 2017, Lucas had the opportunity to live in Germany for 18 months during his graduation through the Science without Borders program. German Language Learning, Study of Process Engineering at Hochschule Offenburg and conducting an internship in the area of Microbiology and Biochemistry were the main activities. At the conclusion of his graduation, he dissected on the theme of Eco indicators, a work in which co2 emissions per ton of production of the compound 1 –Tetradecene were calculated. After returning from abroad and his graduation, he continued teaching private classes in Chemistry, physics and mathematics as he did since 2005, to finally begin his career in the industry in the area of sanitary paper manufacturing in the

Charter in Anápolis, Goiás. His performance was mainly in the area of process engineering based on the Lean Manufacturing philosophy focusing mainly on the parameterization of paper machines, standardization, operational training, cost reduction and waste and increased productivity. After 3 1/2 years in the Manufacturing Charter, Lucas was called to work at Suzano, empress unit,in a machine similar to that he worked in the Manufacturing Charter, but with more responsibilities and assignments. At Suzano, Lucas can further expand his knowledge of the paper making process and learn new ways of working in a multinational company. In August 2022, after a total career change, he began his current experience and partnership working with Victor Naoum, being his right-hand man in his company Naoum Ambiental (Environmental Licensing). Over the next 4 months he learned more about management tools, carbon market and self-discipline when working for the first time exclusively in the home office scheme. You can know more about Lucas at Lucas Barbosa | LinkedIn.

Marco Antônio Fujihara

Fujihara is one of the most well-known and respected names in the area of Environmental Sustainability in Brazil and abroad. He is a forest manager, lecturer and teacher in the areas of Environmental Sustainability and Corporate Governance. With extensive experience in the forestry sector currently developing projects to qualify companies in the Kyoto parameters recommended by the energy and steel forest-based sectors and pulp and paper. etc. Evaluates projects in the area of natural resource economy for the World Bank and ITTO -International Tropical Timber Forest Products Organization. He was coordinator of Mercosur, Superintendent of the Brazilian Society of Forests, Coordinator of Natural Resources of Bracelpa: National Association of Pulp and Paper Manufacturers, and Director of Renewable Natural Resources of IBAMA in Brasilia and worked professionally in several Companies. Has coursed extension courses in Economics at the University of Agriculture and Forestry Business, Policy and Strategy on Climate Change at Harvard University. Finally Director of Sustainability of PricewaterhouseCoopers in Brazil with operations in Latin America. And he is currently director of the Totum institute and Key Associates with a specific focus on Sustainability and Carbon Finance Business. And co-manager of the Brazil Sustainability Fund in the BNDES Clean Development Program. He also serves as an advisor to FIESP (f Environment Council), S.O.S. Mata Atlântica, ICLEI, Ethos and CPFL Energia, as well as an iPCC/LULUCF reviewer. Key Associados is a management consultancy specialized in sustainability management. Its products include a range of services from the implementation of ISO management to the structuring of business models focused on strategies, finance and technologies. You can learn more from engineer Marco Fujihara on his LinkedIn page at Marco Antonio Fujihara | LinkedIn.

Mariana Naoum

Mariana is a lawyer, graduated in law from Candido Mendes University, specialist in Maritime Law from the Maritime Law Academy and knowledge in the English language, possessing Certificate in English

Proficiency issued by VGC International College in Vancouver, Canada. Mariana has 9 years of experience in the legal area applied to business, maritime, civil, administrative and financial law, beginning her immersion in the area of law since the beginning of graduation, began her career integrating the team of a law firm, and then expanded her knowledge working in the public and private spheres. At Infrapar, Mariana has active operations, leading international contract negotiations following the strictest compliance rules worldwide. It also operates on a day-to-day basis in Land Analysis adopting strict criteria for evaluation and implementation of internal protocols ensuring transparency and efficiency in the process of analysis and regularization. Mariana actively participated in the structuring and creation of a Multi strategy Equity Investment Fund, totally focused on ESG Investing. In recent years, she has been putting all her efforts into specialization in the area of ESG Investing and Climate Regulation. Mariana is managing partner of Infrapar Capital Partners initiative and responsible for the legal area of the Infrapar Research Ltda, Infrapar Sustainability Ltda. You can know more about Mariana at Mariana Naoum | LinkedIn.

Pedro Ferros

Pedro is a third-year student of the International Relations course at the Federal University of São Paulo. He worked for a brief period at the end of 2021 in the internal sales area of PGL, a foreign trade and cargo transport logistics company. He has participated in several MUN's and debates in high school and, after graduation, and is constantly searching for ways and methods to carry forward the culture of debate, dialogue and simulations. Currently Pedro works at Infrapar with reading, archiving and compiling bibliographies related to climate, biodiversity, climate change and international agreements. In addition, he produces bibliographic reviews, articles and helps produce the documents for carbon credit certification. You can know more about Pedro at Pedro Ferros | LinkedIn

Victor Naoum

Victor Naoum has a degree in Environmental and Sanitary Engineering from Estácio de Sá-UNESA University and graduated in Environmental Management from the Plínio Leite University Center -UNIPLI, has 12 years of experience with performances in the environmental market, passing through different companies throughout this period, being currently CEO of Naoum Ambiental, which is an Environmental Advisory and Engineering company focused on the preparation of studies and projects for various market segments, as well as their approval through environmental licensing at the municipal, state and federal levels. Victor uses his experience to generate sustainable solutions to the projects and enterprises of his clients, bringing the necessary balance to ensure environmental protection, economic viability and social responsibility, following the principles of ESG -Environnmental, Social and Corporate Governance always acting in an ethical and transparent way with its customers, respecting its team of employees and market competitors. Victor is Managing Partners of Infrapar Research Ltda and Infrapar

Sustainability Ltd. You can know more About Victor at Victor Naoum | LinkedInLtda and Infrapar Sustainability Ltd. You can know more About Victor at Victor Naoum | LinkedIn.

2.4.4 Project Management Partnerships: Infrapar Suppliers (G4.2)

Infrapar Sustainability Ltda with the participation of other experienced partner teams that played important roles in the data collection phase and preparation that were necessary for the assembly of the PDD. Below, general data of the partner teams:

2.4.4.1 HDOM Consultoria Ambiental Ltda

Francisco Higuch is Forest Engineer, Dr. in dynamics of Amazonian tropical forests. Executive Director of Hdom Consultoria.

Jessé Burlamaque, Geographer, Master of Science in Tropical Forests. Specialist in Remote Sensing, Geoprocessing and Modeling of the dynamics of use, land use change and forestry (LULUCF).

Valdiek da Silva Menezes, Forest Engineer, PhD student, Master in Tropical Forest Sciences. Specialist in Remote Sensing, Geoprocessing and Modeling of the dynamics of use, land use change and forestry (LULUCF).

Luciana Loureiro, Geographer. Specialist in Remote Sensing, Geoprocessing and Modeling of the dynamics of use, land use change and forestry (LULUCF).

Kamilla Limongi, Graduating in forest engineering. Federal University of Amazonas.

2.4.4.2 Catraia Soluções Ambientais Ltda.

Camylle Carvalho Ferreira do Nascimento

Graduated in Biological Sciences from the Federal University of Acre, and volunteer at the Laboratory of Mammal Ecology for one year. He worked in the monitoring of ICMBio's Biodiversity, having carried out surveys of woody plants, frugivorous butterflies, mammals, and game birds during my work at ICMBio. In addition, I am currently doing a postgraduate degree in Management, Auditing and Environmental Expertise to broaden my knowledge and skills in the area.

Catherine Cristina Clear

Forestry Engineer from the Federal University of Acre holds a master's degree in Forest Sciences from the Federal University of Espírito Santos. He has experience in environmental and forestry consulting projects with emphasis on the following areas and activities: sustainable forest management, structuring of the technical processes of the Forest Concession in the state of Acre, participation in a technical team to review the Management Plan of a conservation unit, participatory workshops with traditional communities in Acre, environmental analysis through geoprocessing techniques and environmental licensing of small rural properties.

Douglas da Silva Menezes

Degree in Biological Sciences. He works in fish parasite, with screening, assembly of slides and identification and research in aquatic entomology, where I work on the application of protocols, collection of benthic macroinvertebrates and identification. He has experience in entomology, collection, assembly, and identification of insects. Has experience in preparation of technical report and skills in the field area where he participates in several research projects, extension: internships during graduation in the areas of entomology, parasitology of fish, fungi and others. He is currently working with aquatic and semi-aquatic heteropterans to investigate their composition and abundance in streams of the Acre River basin.

Edson Vanda Pereira dos Santos

Sociologist, graduated from the Federal University of Acre, Specialist in Higher Education Methodology from the Barão do Rio Branco College and master's in development, Agriculture and Society from the Federal Rural University of Rio de Janeiro (UFRRJ). He has 25 years of experience in socio-environmental management of community and business forestry enterprises, working with government institutions, traditional and indigenous communities of the Amazon, companies in the forestry sector and non-governmental organizations. He has been a forest management certification auditor for 12 years; Lead Auditor accredited by SCS Global Service for FSC and CERFLOR certification systems; is an auditor of CCB/VCS Standard carbon projects; for this service, we highlight the experience in the role of auditor in the certification process of the Paiter-Suruí carbon project, Sete de Setembro MT/RO Indigenous Land.

Felipe Ferreira de Oliveira Júnior

Graduated in Forest Engineering from the Federal University of Acre (UFAC), Occupational Safety Engineer. He has a postgraduate degree in the areas of: Agriculture and Agribusiness; Teaching in Environmental Education; environmental and sanitary health surveillance. He has been working since 2016 developing activities such as: Research in the production of bamboo seedlings (Embrapa), socio-environmental technician in the National Forest Inventory, agroforestry technical assistance for cooperatives, associations, and indigenous communities (SEMAPI), consultant for productive increase of the timber and furniture sectors (SENAI), among others.

Fernando Silva Ferron

Graduated in Degree in Biological Sciences from UFAC, I also have technical training in Agriculture. He works in Herpetology in the premises of the Federal University of Acre in the laboratory and in the field.

Giovana de Almeida Calacina

Undergraduate student of the Biological Sciences course at UFAC, PIBIC and works in Ornithology at the Laboratory of Ornithology UFAC.

Hendryk Zegarra de Freitas

Graduating in Biological Sciences, main area of activity being Herpetology, experience in the area guaranteed by the volunteer internship at the Laboratory of Herpetology of the Federal University of Acre.

João Vitor Chaves dos Santos

Biologist graduated from the Federal University of Rondônia (UNIR). I work with environmental consulting and Environmental Monitoring. He participated as a monitor of the discipline’s animal behavior and conservation biology. Worked with Monitoring in Br-319 In the modules of INPA (National Institute of Research of Amazonas).

Luana Alencar de Lima

Biologist, Master in Ecology and Management of Natural Resources. She is a senior ringer with the necessary authorizations from the National Center for Research and Conservation of Wild Birds – CEMAVE/ICMBio. He has experience in the capture and handling of birds with mist nets, identification, taxidermy and scientific research in wild birds and birdwatcher. He works in environmental consulting with survey and monitoring of fauna - with emphasis on avifauna, coordination / logistics in field activities, training and courses with traditional communities and technical reporting of projects. She participates as a volunteer in the Monitora/ICMBio Program in Conservation Units. She is a collaborating researcher at the Laboratory of Ornithology of the Federal University of Acre, responsible for the maintenance and organization of the scientific collection and database; and experience in nature photography - fauna and flora.

Luiz Henrique Medeiros Borges

Biologist, PhD in Ecology, Master in Ecology and Management of Natural Resources. Specialist in monitoring fauna and biodiversity, experience in field activities and logistics in isolated locations in the South-Western Amazon. He has five years of experience in working with traditional communities, mainly in the coordination of biodiversity monitoring activities, together with the ARPA program, and collaboration in the Integration of Protected Areas of the Amazon Biome program in 2018, in addition to familiarity with the A2.0 program and conducting dialogue with the community members of the Chandless PE about monitoring initiatives.

Rair de Sousa Green

Biologist, Master in Ecology and Management of Natural Resources, PhD student in Animal Health. He has experience in work in the areas of Mastozoology and Monitoring of fauna and biodiversity. With know-how in scientific research activities and environmental education. Participation in biodiversity inventories and experience in projects with traditional communities in Conservation Units of the State of Acre.

Ronaldo Souza da Silva

Biologist, Master in Ecology and Management of Natural Resources (UFAC) and PhD student in Zoology at the Federal University of Pará. He has experience around Ecology, with emphasis on Ecology of fish communities associated with aquatic macrophytes in lakes and ecology of fish on river beaches. He is currently part of the team of the Laboratory of Ichthyology and Aquatic Ecology of UFAC and the Laboratory of Ecology and Conservation of UFPA (LABECO).

Tallysson Pablo Cavalcante Amorim

Graduating during Degree in Biological Sciences, active in the area of Mastozoology, with emphasis on Felidae. Experience in behavior of felids in captivity.

Uéslei Marques de Oliveira

Graduated and bachelor's degree from Centro Universitário São Lucas (2018). He has experience in vertebrate ecology and zoology with emphasis on ornithology. Currently work as a wildlife observation tour guide, focusing on Amazonian birds. Previously from 2019 to 2022 and worked as an Environmental Analyst at UHE Jirau, where worked in wildlife rescue, ichthyofauna and apifauna. Rescue in suction and adduction tube, includes wagon, stoplog, FAR filter and embarked rescue.

Wilker Nazareno da Silva e Silva Junior

Forest Engineer, was coordinator of forest inventory by the Brazilian Forest Service, served as manager of Federal Conservation Unit - Arapixi Extractive Reserve and Chico Mendes Extractive Reserve (ICMBio). He has experience in the elaboration and development of projects aimed at sociobiodiversity and community strengthening, forest inventory work, installation of permanent plots and geoprocessing.

Wirven Lima da Fonseca

Biologist, Master in Ecology and Management of Natural Resources and PhD student of the Network of Biodiversity and Biotechnology of the Legal Amazon (BIONORTE Network). He has experience in Zoology, with emphasis on Herpetology (amphibians and reptiles). Participates in the Research Group (CNPq) Zoo-Ecology of Vertebrates of the Federal University of Acre (UFAC) Campus Floresta in Cruzeiro do Sul, participating in projects on herpetofaunas inventories and on natural history and bio-ecology of snakes and amphibians, in the region of Alto Juruá.

2.4.4.3 Tecman Tecnologia e Manejo Florestal Ltda

Fábio Thaines

Forest Engineer graduated from the Federal University of Mato Grosso, 1999, Specialist in Forest Management, currently at TECMAN, Rio Branco-AC, since 2007, concentrating management of environmental projects and preparation of plans and technical studies.

Igor Agapejev de Andrade

Forest Engineer, Specialist in geoprocessing and forest inventory, graduated from the Federal University of Paraná, 2004 and current by TECMAN, Rio Branco-AC, since 2006, adding experiences in geoprocessing and forest inventory in the Amazon, as well as relationship with communities, rural producers, in participatory methodologies in the areas of Community Forest Management

Martin Acosta Oliveira

Biologist, graduated from the Federal University of Acre, 2016, Master in Ecology and Management of Natural Resources / UFAC / 2019. He has extensive experience in forest inventory, collection and herborization of botanical material.

Adriano da Silva Lima

Parabotanical Technician since 2011, Rio Branco-AC. He has extensive experience in forest inventory, collection and herborization of botanical material.

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

The project is funded by proponent Amazon Partners, LLC, which can maintain the financial health of the project throughout its life. Documents proving this financial health are confidential but may be presented to the audit team under a confidentiality agreement.

2.4.6 Avoidance of Corruption and Other Unethical Behavior

Amazon Partners, LLC has a Code of Ethics and Conduct common to the entire Economic Group to which it belongs. Documents of this nature guide employees in the fight and denunciation of all forms of corruption, especially when their objective is the control of information, also defining prohibited acts in the corporate environment, the maintenance of any involvement with irregular or corrupt practices. The documents of the Code of Ethics and Conduct are annexed to this report.

2.4.7 Commercially Sensitive Information (Rules 3.5.13 – 3.5.14)

The Project has Commercially Sensitive Information that is understood by the **Financial Viability** of the project as well as the financial return that the project offers. This information is referenced in the Financial Health of Implementing Organization(s) (G4.3) item of this document. This Commercially Sensitive Information is available for access by the VVB and Verra at any time.

2.5 Legal Status and Property Rights (G5.1)

2.5.1 Statuary and Customary Property Rights (G5.1)

In Brazil, there are major failures in the records of private properties, especially in the regions of the Amazon Biome. The simple verification of property registrations does not mitigate the risks associated with the lack of land regularity.

To mitigate the risks associated with failures in the registration of private properties in Brazil, data were collected from different registration systems, collection of fees and taxes, collection of documents in notaries and promoted cartographic and georeferencing analyses.

It was also verified, through cartographic analyzes and georeferencing studies of private properties, that the properties do not overlap with the perimeter of Conservation Units, Indigenous Lands, Slave Lands, Land Settlements or any other form of land use by some governmental agency on behalf of the Brazilian State.

All areas are private property maintained and managed by the owners, who hold the real property right over it. This was proven through all the evidential documentation presented previously by the owner of each property, being able to exercise all the powers provided for in Brazilian legislation before the property, such as use, enjoy, dispose and retake. Thus, with the support of the legislation and through a Carbon Credit Research and Assignment Agreement concluded with the landowners, the project is legal and valid from the perspective of Brazilian Civil Law.

The private property called Jaraguá where the project was developed is located in the rural area of the municipality of Bujari, approximately 39 km from the municipality's headquarters in the Brazilian Amazon

Region. The access route to the Jaraguá property is accessed via the BR 364 from the capital of Acre, Rio Branco (about 64 km to the access extension of the property).

The private property called Santa Rosa where the project was developed is located on the left bank of the Purus River, Rural Zone (part of the Nossa Senhora Aparecida farm), in the municipalities of Feijó and Santa Rosa do Purus, State of Acre. The property is accessible through the Purus River and its tributaries, approximately 30 km straight from the Santa Rosa municipal head office in the State of Acre, in the Brazilian Amazon Region.

The private property called Senegal where the project was developed is located in the rural area of the municipality of Assis Brasil – approximately 230 km from the capital of the State of Acre, in the Brazilian Amazon Region. The access route to the Senegal property starts via the Icuriã Road Extension, following the Icuriã Road Extension for about 70 km to the end point of the road. From this stretch onwards, one must access by navigation the Igarapé Icuriá to its mouth on the Iaco River, where you must head downstream for about another 29 km until you reach the height of your affluent called Igarapé Riozinho, following from this stretch onwards in the upstream direction for about another 36 km until you reach the geographical coordinate point 10°24'4.70"S and 69°45'50.75"O, that marks the beginning of Senegal ownership.

2.5.2 Recognition of Property Rights (G5.1)

The Project respected all the geographical limits, the delimitations of the area and, and the rights of the landowner, everything was done with the authorization of the owners. A Carbon Credit Research and Assignment Agreement was signed with the landowners, providing for all the execution time needs and studies to be carried out, the percentage of carbon credits originated due to the landowners, also in this same contract the owners authorized the start of the project, was aware of the execution time of the carbon credit generation project, authorized entry to the property for on-site studies, among other aspects.

Furthermore, at the opportune moment of the field studies, a separate document was signed by the landowners, once again, a Term of Authorization for Entry into Private Property containing the names and functions of each of the professionals who would be entering the property.

A contractual assignment agreement was signed between the “Jaraguá Farm” and "Santa Rosa Farm" landowner, the company Amazon Partner LLC., the company Amazon Partners 1 LLC and Infrapar Sustainability Ltda, where the company Amazon Partner LLC assigned and transferred to the company Amazon Partners 1 LLC its rights and obligations set forth in the AGREEMENT, when the company Amazon Partners, LL will be subrogated to all clauses and conditions of the AGREEMENT, obliging itself to faithfully comply with the stipulations agreed therein. Nothing else changes in the rights of the other parties.

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

No people or communities were found living within the Jaraguá and Santa Rosa areas. However, the surveys showed that there is at least one indigenous family living within the Project Area Senegal, identified as Paixão Rubens Jaminawá. He reported during the interview that he has lived in the place for approximately 6 years and has possession of an area of approximately 100 hectares. He said he has no document of possession. The family consists of five people, three women and two men. For family subsistence, he practices hunting and fishing, the cultivation of cassava and the raising of pigs and chickens.

According to the Jaminawa and Manchineri Territorial and Environmental Management Plan (2016), for the Mamo date Indigenous Land, the area of the Senegal Area, formerly the Petrópolis Farm, is an area used by the indigenous people for a long time, having already demonstrated the need to incorporate this area into the Mamo date Indigenous Land. In the Ethnomapping of the Mamo date Indigenous Land, (2016), it is reported that both the Jaminawas and Manchineris peoples use the Senegal Seringal area for the implantation of swiddens, fishing, hunting and extractivism.

No agreements were identified between the owner of the farm and the indigenous people regarding the recognition of the right to own or use the land in Senegal. The situation identified was not deepened with the representations of the Mamo date Indigenous Land or with FUNAI. In view of this, it is recommended to build formal dialogues with FUNAI and indigenous communities, in order to collect data, prepare a situational map and formalize the process of Prior Free and Informed Consent.

2.5.4 Property Rights Protection (G5.3)

The Project does not foresee any type of relocation of people. On the contrary, all activities value respect for property rights, communities, culture, and subsistence.

2.5.5 Illegal Activity Identification (G5.4)

No illegal activity was identified that could affect the impacts of the project. A control will be carried out in each monitoring to ensure that all activities always take place in compliance with the law and the project.

2.5.6 Ongoing Disputes (G5.5)

No ongoing or unresolved land disputes or conflicts over land, territory and resource rights were identified.

Eventual potential disputes that could occur in the future were detected in the Senegal Farm, where some indigenous people live from the Mamoadate Indigenous Land community, although they were interviewed and declared to be aware that Senegal is a private property.

Also in Senegal Farm, another possible dispute that may occur in the future is about an overlap of approximately 300 hectares in the Senegal Farm, which is an Extractive Reserve called Chico Mendes. There is no record of the actual size of the overlap as it is not georeferenced and is not included in any registry such as INCRA (National Institute of Colonization and Agrarian Reform) and CAR (Rural Environmental Registry). The monitoring channels that will be used will monitor the progress of the issue and all measures to adapt the project will be taken.

2.5.7 National and Local Laws (G5.6)

The entire project was supported by the legal framework, above all by the 1998 Constitution of the Republic of Brazil, especially Article 225, which stipulates the right of all to an ecologically balanced environment, being an asset for common use by the people and essential to the quality of life, which we must, together with the public power and the community, preserve and defend it.

Also, as a guideline for the Project, the right to property was considered and respected, in this way the Constitution of the Federative Republic of Brazil of 1988, in article 5, item XXII and XXIII, provides for individual rights and guarantees, enshrines the right to property as well as its social function. Undisputed is the social and economic relevance that a REDD+CCB Project like this has.

A set of federal laws allow mitigating risks of changes in governments, combined with independence between the three powers of the Brazilian state, Judiciary, Legislative and Executive. The Projetct is in line with all legal framework.

The Federal Decree No. 6.321/200, which provides for actions related to the prevention, monitoring and control of deforestation in the Amazon Biome. his Decree was also published to amend and add provisions to Decree No. 3179/1999, which deals with sanctions applied to conduct and activities harmful to the environment.

The Federal Law No. 12.187/2009, which establishes the National Climate Change Policy – PNMC and establishes its principles, objectives, guidelines and instruments. The Federal Law made official Brazil's voluntary commitment to the United Nations Framework Convention on Climate Change to reduce greenhouse gas emissions.

The Federal Law No. 12.651/2012 is the new National Forest Code which provides for the protection of native vegetation. This Law establishes norms for the protection of vegetation, Permanent Preservation areas and Legal Reserve areas, it also deals with forest exploitation, the supply of forest raw materials, control of the origin of forest products and the control and prevention of fires. and also provides for economic and financial instruments to achieve its objectives.

The Federal Law No. 14.119/2021 establishes the National Payment Policy for Environmental Services – PNPSA, defining concepts, objectives, guidelines, actions and criteria for the implementation of the National Payment Policy for Environmental Services (PNPSA). The Law also establishes the National

Registry of Payment for Environmental Services (CNPSA) and the Federal Program for Payment for Environmental Services (PFPSA), dealing with payment contracts for environmental services. In its article 2, item II, letter C, the law specifically talks about carbon sequestration as a fundamental service for maintaining the stability of ecosystem processes.

Furthermore, in accordance to Article 2 of Law 14.119/21, the objectives of the PNPSA are between guiding the actions of the public authorities, civil society organizations and private agents in relation to the payment for environmental services, in order to maintain, recover or improve ecosystem services throughout the national territory; stimulate the conservation of ecosystems, water resources, soil, biodiversity, genetic heritage and associated traditional knowledge; economic, social and cultural value of ecosystem services; prevent the loss of native vegetation, fragmentation of habitats, desertification and other processes of degradation of native ecosystems and foster systemic conservation of the landscape; encourage measures to ensure water security in regions subject to water scarcity for human consumption and desertification processes; contribute to climate regulation and the reduction of emissions from deforestation and forest degradation; recognize individual or collective initiatives that favor the maintenance, recovery or improvement of ecosystem services, through monetary or non-monetary retribution, provision of services or other form of reward, such as the supply of products or equipment; stimulate the development and execution of voluntary private projects providing and paying for environmental services, involving initiatives of companies, Civil Society Organizations of Public Interest (OSCIP) and other non-governmental organizations; stimulate scientific research on the evaluation of ecosystem services and the development of methodologies for the execution, monitoring, verification and certification of payment projects for environmental services; ensure transparency of information relating to the provision of environmental services, allowing the participation of society; establish data and information management mechanisms necessary for the implementation and monitoring of actions for the full implementation of environmental services; encourage the private sector to incorporate the measurement of the losses or gains of ecosystem services in the production chains linked to their business; encourage the creation of an environmental services market; sustainable development.

In this sense, a mechanism is established that aims to harden the caput of Article 225 of the Federal Constitution of 1988, mentioned at the beginning of this chapter, which guarantees everyone the right to the ecologically balanced environment. The PNPSA is directly linked to paragraph I of §1 of the afore mentioned device, according to which it is up to the Public Power to "preserve and restore the essential ecological processes and provide ecological management of species and ecosystems". It is emphasized that the innovation of Law No. 12.651/2012 (New Forest Code) was probably the prediction of the PSA institute, only that the necessary regulation was lacking, a problem that was solved with Law No. 14.119/2021.

The National Commission for REDD+ (CONAREDD+), established by Decree No. 8.576, of November 26, 2015, currently governed by Decree No. 10.144 of November 28, 2019, is responsible for coordinating, monitoring, monitoring and revising the National Strategy for REDD+ and for coordinating the preparation of requirements for access to payments for results of REDD+ policies and actions in Brazil and is formed by the following ministries: i) Environment; (ii) Economy; iii) Foreign Relations; iv) Agriculture, Livestock and Supply; v) Science, Technology and Communications; vi) a representative of state environmental agencies; and vii) a representative of Brazilian organized civil society, represented by the Executive Secretary of the Brazilian Climate Change Forum.

At the State level, in 2010, the State of Acre passed a law establishing the Environmental Services Incentive System (SISA) of the Environmental Services Incentives Program (ISA Carbono) and other Environmental Services and Ecosystem Products programs of the State (Law No. 2.308/2010), which will be detailed in item 5.4 of this Report. It also signed a memorandum of understanding with the Governments of California/Usa and Chiapas/Mexico to discuss the basis of a possible commercial credit for REDD initiatives, which opened the door to new economic opportunities in the environmental services sector.

Although Brazil does not have a complete consolidated legal framework on the regulation of the carbon credits market specifically, several initiatives at the national level are being highlighted and Brazil is moving towards achieving its national regulation.

In this regard, it is important to highlight the Bills that are being processed by the Brazilian Legislative Power with the aim of regulating the carbon credit market, such as:

Law Project (bill) No 4.028/2021 which provides for general guidelines for regulating the carbon market in Brazil.

Law Project (bill) No 528/2021 that aims to regulate the Brazilian Emissions Reduction Market determined by the National Policy on Climate Change - Law No. 12.187, of December 29, 2009.

Moreover, on July 13, 2022, Brazil and Japan signed the first bilateral agreement to promote the regulated carbon market between the two countries. This partnership was signed between the Ministry of Agriculture, Livestock and Supply (MAPA), the Brazilian Agricultural Research Corporation (EMBRAPA) and the Japanese International Cooperation Agency (JICA). On behalf of both countries, the bodies signed a cooperation agreement to exchange and improve sustainable agriculture techniques and agricultural efficiency.

With the provisions of Article 6 of the Paris Agreement and the shift towards the creation and evolution of a global mechanism for buying and selling carbon credits, there is also a shift in partnerships and bilateral agreements that seek to help countries to fulfill their Nationally Determined Contribution (NDCs), with Latin American countries being strong candidates for these measures, since in terms of commitments to a net-zero future, the region is second only to the European Union, with 209 cities and 5 regions different efforts to achieve this goal.

Thus, partnerships such as the one signed between Brazil and Japan demonstrate another step in the journey towards a more sustainable economy. Due to the Japanese experience with three successful bids domestically, Tokyo being the largest with limited domestic jurisdiction and the first of its kind. The exchange of information and techniques used in Japan to create its various carbon pricing mechanisms, in addition to Japan's history of promoting sustainable development projects in partner countries, may be part of the kick needed for Brazil to move in a more sustainable way. more agile and take advantage of its privileged position.

2.5.8 Approvals (G5.7)

The project was developed on private properties and complied with all norms and legal aspects for entering private property and all laws and regulations dealing with forest protection on private properties.

Bearing in mind that all areas are private properties and Brazil still does not have its own legislation that regulates Carbon Credit Generation Projects, therefore, no licenses issued by the competent authorities are required, either at the Municipal, State or Federal levels.

Given that, in this scenario, all approvals for the project to materialize were given by the landowners, through contracts and terms of authorizations expressed and duly signed.

2.5.9 Project Ownership (G5.8)

Project ownership is defined in accordance with VCS Standard v.4.4., item 3.7.1 – number 6: "An enforceable and irrevocable agreement with the holder of the statutory, property or contractual right in the land, vegetation or conservational or management process that generates GHG emission reductions or removals which vests project ownership in the project proponent". Land ownership is attributed to Mr. Sérgio Sebastião de Barros, through land tenure for the Santa Rosa Farm property, according to Brazilian available documentation, issued by the Registry of Sena Madureira City, State of Acre. In the Jaraguá Farm, land ownership is still attributed to Mr. Sérgio Sebastião de Barros, through land tenure for the Jaraguá Farm property, according to Brazilian available documentation, issued by the Registry of Bujari City, State of Acre, and in the Senegal property, land ownership is attributed to Mr. Jorgenei da Silva Ribeiro, through land tenure for the Senegal property, according to Brazilian available documentation, issued by the Registry of Sena Madureira City, State of Acre. Proof of right is defined by agreements signed between Amazon Partners, LLC. Infrapar Sustainability Ltda., and the landowner, as described in Section 1.8. The documents are available for consultation during validation and verification. A Due Diligence report on ownership is available in Appendix 8, prepared by the legal team of Vieira Rezende, which conclusion is: "it is our opinion that the property has a valid registry with the proper Real Estate Registry Office showing the rightful landowner".

2.5.10 Management of Double Counting Risk (G5.9)

Amazon Partners 1 does not consider financially viable credits originating outside of the Verra Standards for marketing on voluntary marketplaces. By this criterion, the Project for other GHG Programs is not considered eligible. The Grouped Project is in the State of Acre, where State Law No. 2.308 of October 22, 2010, mentioned in item 5.5.7, instituted the System of Incentives for Environmental Services (SISA) that covers a Jurisdictional Program of Credits of Emission Reductions, based on the Acre Carbon Standard (ACS). In the same region, policies, and instruments for the future implementation of the ART/Trees Standards are being developed. However, the Grouped Project, as well as the three areas that integrate it, have not so far benefited from any credit from the Jurisdictional Programs.

2.5.11 Emissions Trading Programs and Other Binding Limits

Brazil does not have a national, legally binding limit on greenhouse gas (GHG) emissions, nor does it possess, or is affiliated with, a compliance emissions trading program that accepts REDD+ and CCB credits.

2.5.12 Other Forms of Environmental Credit

The Grouped Project is in the State of Acre where State Law No. 2.308 of October 22, 2010, mentioned in item 5.5.7, instituted the System of Incentives for Environmental Services (SISA) that covers a Jurisdictional Program of Credits of Emission Reductions, based on the Acre Carbon Standard (ACS). In the same region, policies, and instruments for the future implementation of the ART/Trees Standards are being developed. However, the Grouped Project, as well as the three areas that integrate it, have not so far benefited from any credit from the Jurisdictional Programs

2.5.13 Participation under Other GHG Programs

As reported in this text, the Grouped Project and none of its areas are registered or other records in other GHG Programs.

2.5.14 Projects Rejected by Other GHG Programs

The Project has not been rejected by any other GHG programs.

2.5.15 Double Counting (G5.9)

Double accounting of credits generated from this project can be avoided, as the project will be registered with Verra following VCS and CCB rules, where all credits generated can be tracked. It can also be monitored by the recently implemented *Sistema Nacional de Redução de Emissões de Gases do Efeito Estufa* (SINARE), which works as a single digital central for the register of emissions, carbon removals and GHG emissions compensations, including transactions and the retiring of carbon credits. It also is kept in check by the national commission for REDD+, instituted by decree no 10.144 in 2019, being responsible for coordinating, monitoring, and revising the national strategy for REDD+, while also coordinating the elaboration of the requisites for the access to payments for results from measures and actions related to REDD+ in the country.

3 Climate

3.1 Application of Methodology

3.1.1 Title and Reference of Methodology

VM0015 Methodology for Avoided Unplanned Deforestation, v1.1: This methodology estimates greenhouse gas emissions from areas where unplanned deforestation is taking place and quantifies the emission reductions achieved by curbing deforestation. The methodology provides a comprehensive set of tools for analyzing both frontier and mosaic deforestation patterns to establish the baseline deforestation rate, monitor emission reductions and assess leakage.

VT0001 Tool for the demonstration and assessment of additionality in VCD Agriculture, Forestry and other land use (AFOLU) Project Activities, V3.0: The tool provides a stepwise approach to demonstrate and assess additionality for AFOLU project activities.

VCS AFOLU Non-Permanence Risk Tool Version 3.1: This tool provides the procedures for conducting the non-permanence risk analysis and buffer determination required for Agriculture Forestry and Other Land Use (AFOLU) projects. The tool sets out the requirements for project proponents, implementing partners and validation/verification bodies to assess risk and determine the appropriate risk rating.

Climate, Community & Biodiversity Standards (CCB) v3 and VCS v4.4.

3.1.2 Applicability of Methodology

The VCS methodology, VM0015, includes unplanned deforestation and has no geographical restrictions and can be applied globally. In this case, they may include any type of forest and activities such as forest management, biomass for energy, coal production, agriculture and pasture. All these activities can be considered if the deforestation category is not planned, according to the latest guidelines of VCS AFOLU.

Table 12 - Conditions of applicability of VM0015 methodology and how the project meets them.

Conditions of applicability	How the project meets the conditions
Baseline activities may include planned or unplanned logging for timber, fuel-wood collection, charcoal production, agricultural and grazing activities if the category is unplanned deforestation according to the most recent VCS AFOLU requirements.	Baseline activities include future planned forest management, grazing activities and unplanned deforestation.
Project activities may include one or a combination of the eligible categories defined in the description of the scope of the methodology (table 1 and figure 2).	Project activities include forest protection without forest management and forest protection with forest management (Table 1: Project Activity A and B; Figure 2-B)
The project area can include different types of forest, such as, but not limited to, old-growth forest, degraded forest, secondary forests, planted forests and agro-forestry systems meeting the definition of “forest”.	The project area predominantly includes four types of old-growth forest: Open Forest with Palms plus Dense Forest plus Bamboo open Forest, Open Forest with Palms plus Dense Forest, Open Forest with Bamboo plus Open Forest with Palms plus Dense Forest, Open Forest with Palms in Alluvial area.
At project commencement, the project area shall include only land qualifying as “forest” for a minimum of 10 years prior to the project start date.	The project area only includes forested areas. The forests in the project area are old-growth tropical forests and have been present for more than 10 years.
The project area can include forested wetlands (such as bottomland forests, floodplain forests, mangrove forests) as long as they do not grow on peat. Peat shall be defined as organic soils with at least 65% organic matter and a minimum thickness of 50 cm. If the project area includes a forested wetlands growing on peat (e.g. peat swamp forests), this methodology is not applicable.	The project area does not include forests in wetlands, such as floodplain forest or mangrove forest. The project area is composed of soils that do not fall under the definition of peatlands.

3.1.3 Project Boundary

3.1.3.1 Step 1. Definition on Boundaries (VM 0015)

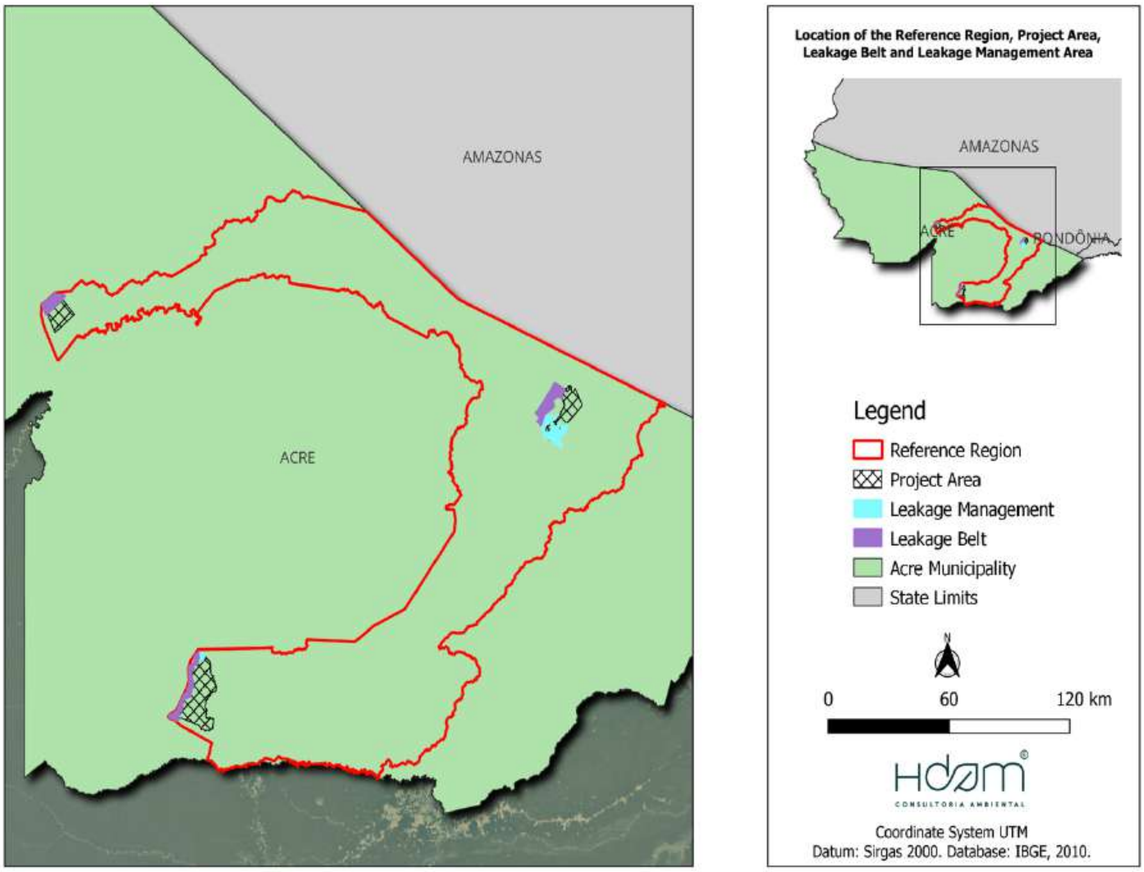
3.1.3.1.1 Step 1.1 Spatial Boundaries

3.1.3.1.1.1 Step 1.1.1 Reference Region

The project activity instances reference region-RR was defined based on spatial data that indicate the historical deforestation trend, based on the modus operandi of land use in the Amazon described in the literature (Soares-Filho et al. 2006), geospatial databases from the Rural Environmental Registry (CAR, 2022), official geographic boundaries (IBGE, 2021), certified rural properties (INCRA), conservation units (MMA, 2021), indigenous lands (FUNAI, 2021), vegetation map (ACRE, 2010) and watersheds limits.

The reference regions delimitations meet the "Forest/vegetation classes", "Elevation", "Slope", and "Rainfall" criteria within the "Landscape configuration and ecological conditions" of VM0015/page 19. Its also accomplished socio-economic and cultural conditions and agents and drivers of deforestation criteria. These criteria are essential for defining the reference region, as they allow the selection of an area that is representative of the natural environment of the project region.

Figure 34 - Location of the Reference Region, Project Area, Leakage Belt, and Leakage Management Area



3.1.3.1.1.1.1 Deforestation agents and drivers

The modus operandi of land use in the Amazon is characterized by a chain of events that result in unsustainable circumstances. The standard follows the following chronological order: accessibility by opening branches and rural roads; selective logging of the most valuable species; suppression of the remaining vegetation for the implantation of agricultural cultures; depletion of macro and micronutrients available in soils; sale or abandonment of the land (SOARES-FILHO et al. 2006).

Groups of agents: The agents conducting deforestation vary between different parts of the region and also with respect to time, as well as cultural and commercial factors. In general, large and medium farmers respond for the vast majority of deforestation activity, but small farmers can act as important forces in the places where they are located. For the Reference Region of this project, occupations are recorded along the main access roads found, such as: roads, rivers and branches;

Infrastructure drivers: For the region where the project is located, the main drivers of observed deforestation are the influence of highways such as BR 317 and BR 364 and unofficial roads (branches), proximity to urban centers and navigable stretches of rivers. It was possible to verify the relationship between the location of access roads and the location of the sources of rivers and streams, where most access roads are located in higher portions of the landscape, coinciding with the sources of rivers and streams.

3.1.3.1.1.1.2 Landscape configuration and ecological conditions

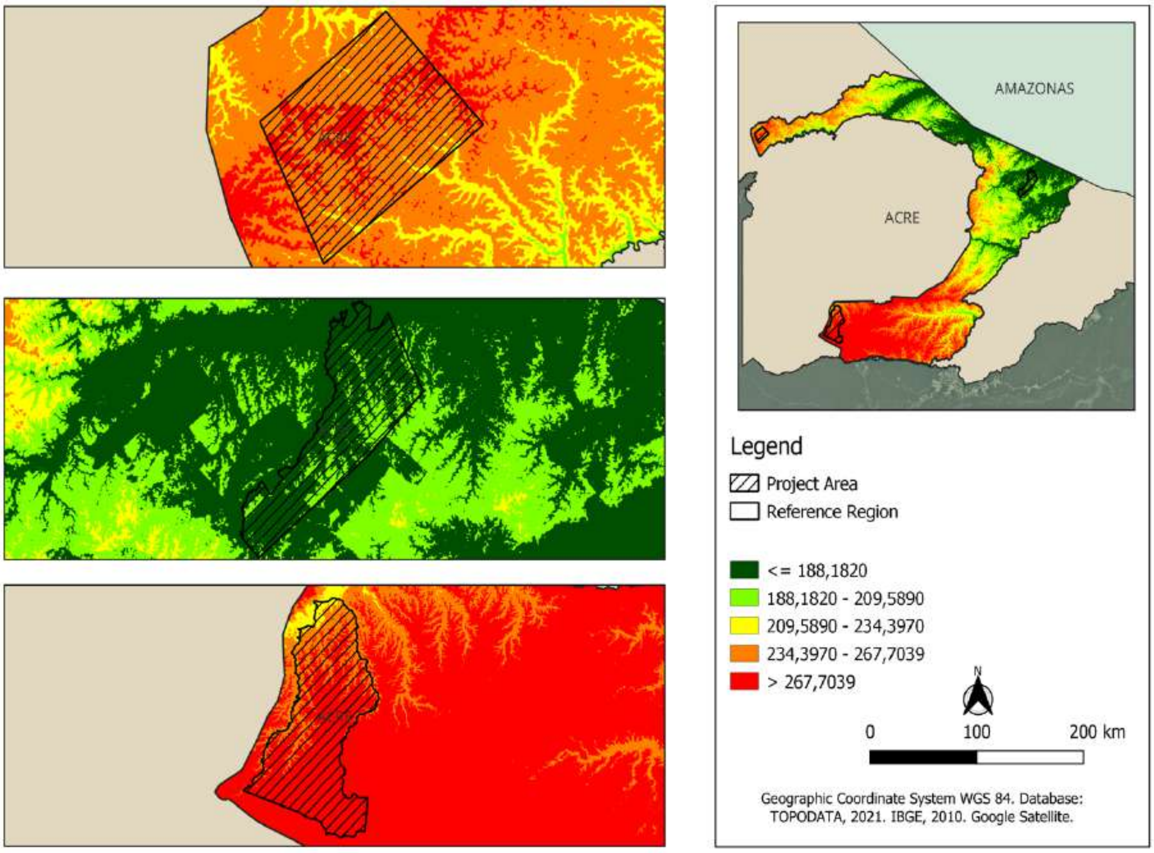
3.1.3.1.1.1.2.1 Vegetation

The project area has characteristics similar to those of the reference region in several aspects. Regarding vegetation, the largest vegetation class found in the reference region is also present in the project area, covering a significant part of its extension. In addition to having an average annual precipitation within the same precipitation range of the reference region, which is important for the establishment and development of vegetation.

3.1.3.1.1.1.2.2 **Altitude**

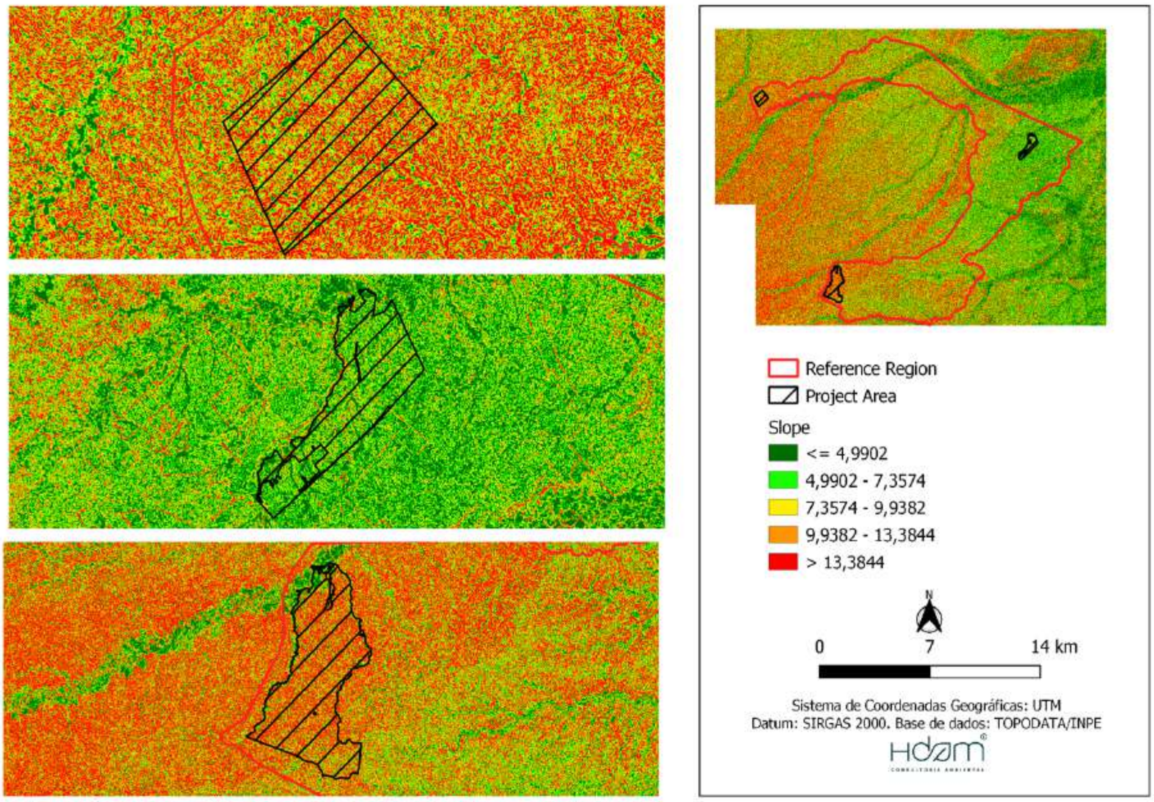
The project area also presents an elevation within the range identified in the reference region, as well as the slope of the area is fully within the slope variation of the reference region, which indicates that the topography of the land is very similar to that of the surrounding region.

Figure 35 - Altitude characterization referring to the Grouped Project



3.1.3.1.1.1.2.3 **Slope**

Figure 36 - Slope Aspects in the Reference Region and for the Grouped Project Area.



3.1.3.1.1.1.2.4 Climate

To understand the climate of a given location, it is necessary to consider the influence of elements and climatic factors. In the project area there is a climate of high temperatures and high concentration of humidity. The climate in the project area is characterized as hot Equatorial, according to IBGE. The hot equatorial climate has average temperatures above 18°C in all months of the year. However, the Equatorial climate is not homogeneous, it presents variations in its climatic subtypes. The project area subtype is wet with 1 to 3 dry months.

The average annual temperature observed for these regions varies between 24.5oC and 32oC, where the periods with maximum temperatures are between the months of September and December, registering variations from 29.7o to 32°C. For the coldest period, which occurs from June to August, the annual minimum temperatures range from 17.5oC to 19°C.

3.1.3.1.1.1.3 Socio economic and cultural conditions

3.1.3.1.1.1.3.1 Jaraguá

The legal status of project area is private property that is present throughout reference region.

The main land use category in the reference region are standing forest, agriculture and pasture, same categories presents in the project area.

Project area is governed by the same policies, legislation and regulations that apply in the reference region. Reference region is under two subnational governments (Acre and Amazonas), mainly in Acre State, where project area is located.

3.1.3.1.1.1.3.2 Santa Rosa

The legal status of project area is private property that is present throughout reference region.

The main land use category in the reference region are standing forest, agriculture and pasture, the project area is fully covered by standing forest.

Project area is governed by the same policies, legislation and regulations that apply in the reference region. Reference region is under only one subnational government State of Acre, where project area is located.

3.1.3.1.1.1.3.3 Senegal

The legal status of project area is private property that is also present in reference region, mainly in the south border.

The main land use category in the reference region are standing forest, agriculture and pasture, the project area is almost full covered by standing forest.

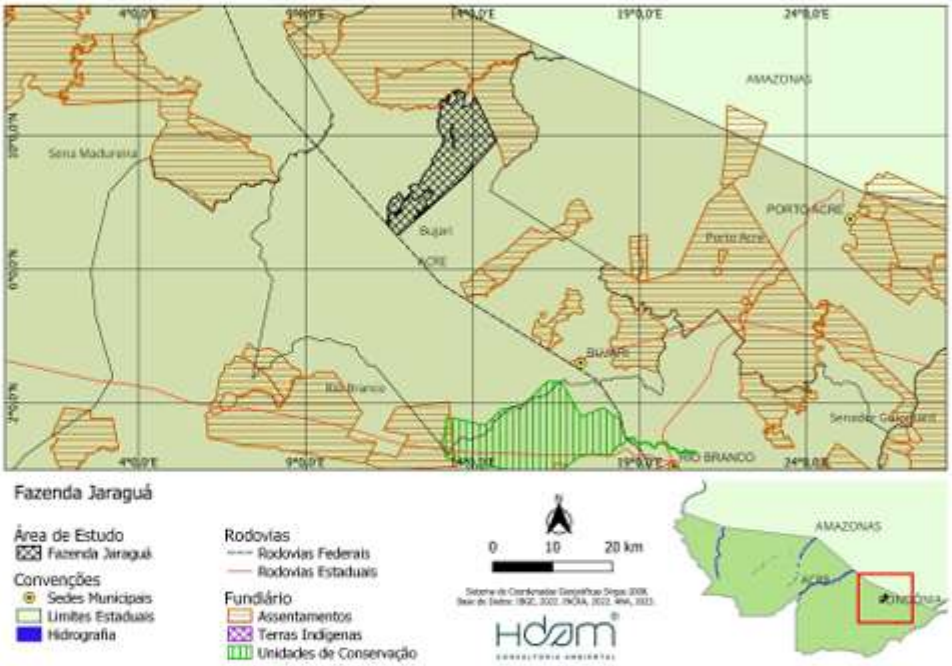
Project area is governed by the same policies, legislation and regulations that apply in the reference region. Reference region is under only one subnational governments (State of Acre), where project area is located. There also indigenous territories, Extractive Reserves ans rural settlement projects in the reference region.

3.1.3.1.1.2 Step 1.1.2 Project Area

3.1.3.1.1.2.1 Jaraguá Farm

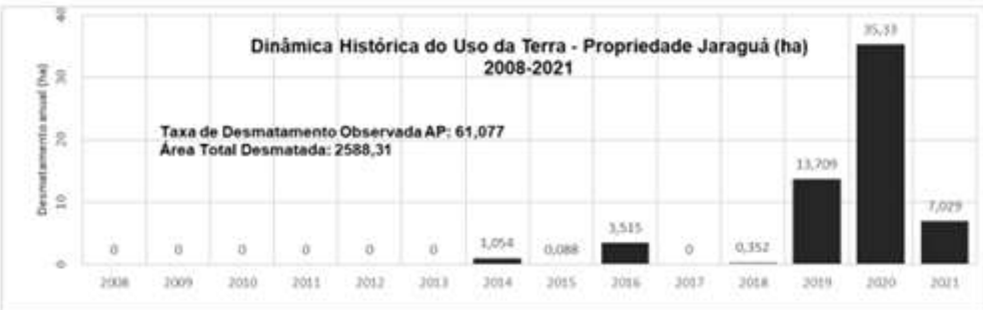
The Jaraguá Farm is in the Municipality of Bujari, in the State of Acre, and is approximately 35 linear km from the municipal town. The property has about 15.687,52 hectares of total area. The center coordinates are -9.4959°S Latitude and -68.1282°W Longitude. To the north, the study area borders the Limoeiro and Canary Extractive Settlement Projects (PAE).

Figure 37 - Physical boundaries of Jaraguá Farm.



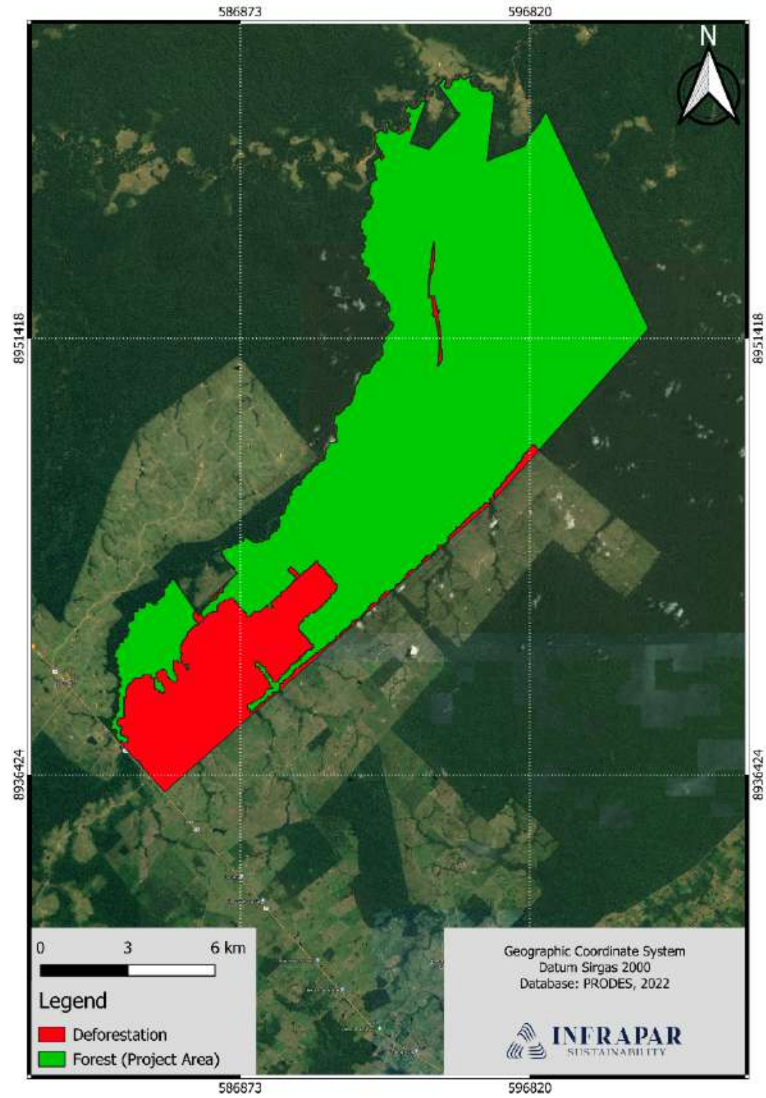
In regards of the dynamics of land, deforestation does not show a definite trend, however, in recent years there has been a considerable increase in deforestation.

Figure 38 - Jaraguá Farm area deforestation dynamic.



Source: PRODES (2022).

Figure 39 - Jaraguá Farm deforestation map.

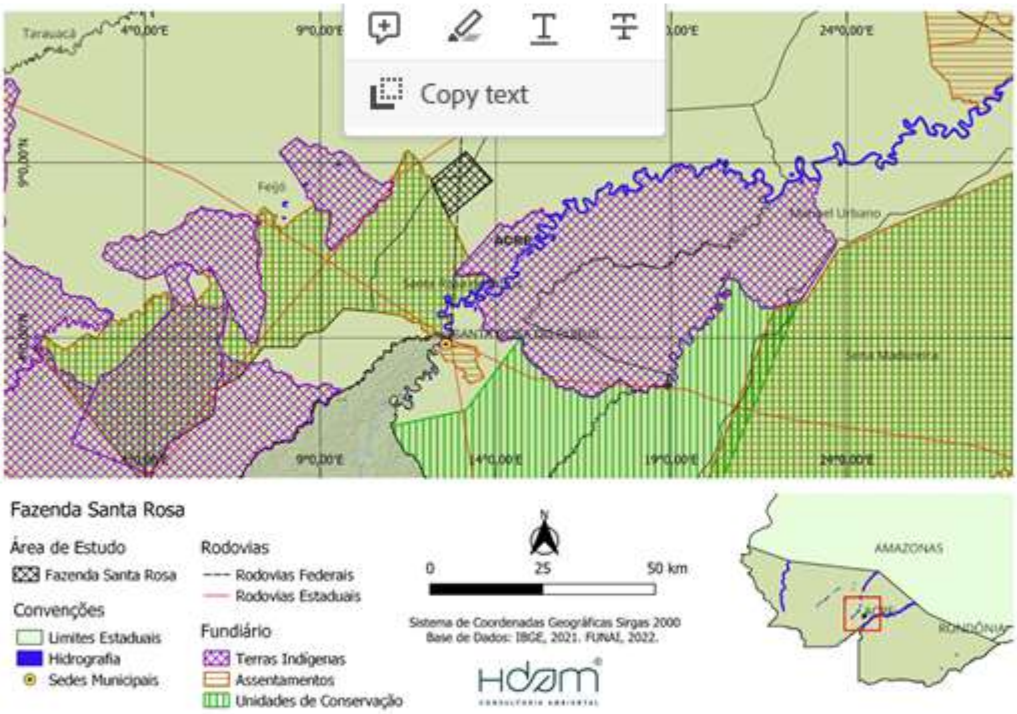


Source: PRODES (2022).

3.1.3.1.1.2.2 Santa Rosa Farm

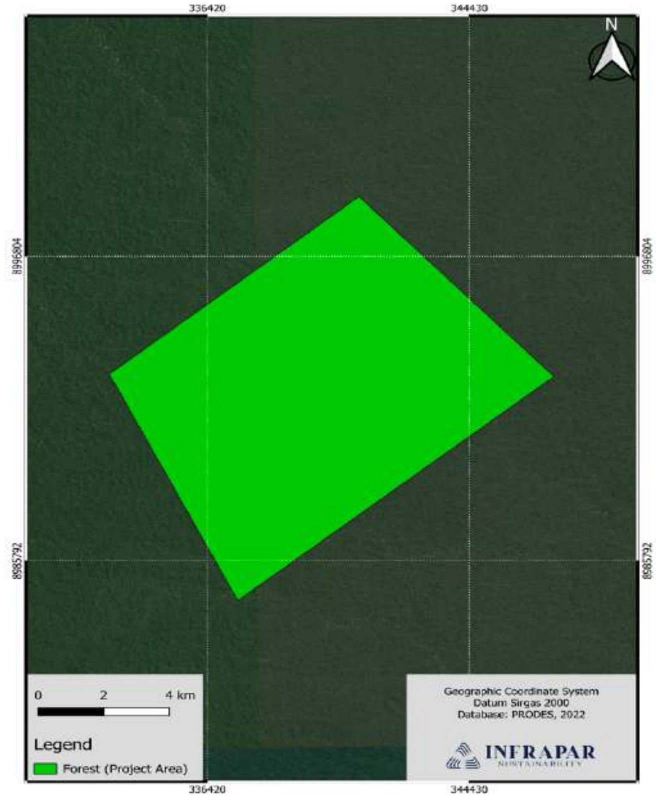
Santa Rosa Farm is located in the municipality of Santa Rosa do Purus, in the State of Acre, and is approximately 28 linear km away from the municipal town. The property has central coordinates -9.05429°S latitude and -70.44614°W longitude. The study area has a total area of 9.957,97 hectares and the Purus National Forest Conservation Unit is located to the west, and to the southwest is the Alto Rio Purus Indigenous Land area.

Figure 40 - Physical boundaries of Santa Rosa Farm.



There was no deforestation in the project area in the historical data series for the area.

Figure 41 - Santa Rosa Farm deforestation map.



Source: PRODES (2022).

3.1.3.1.1.2.3 Senegal Farm

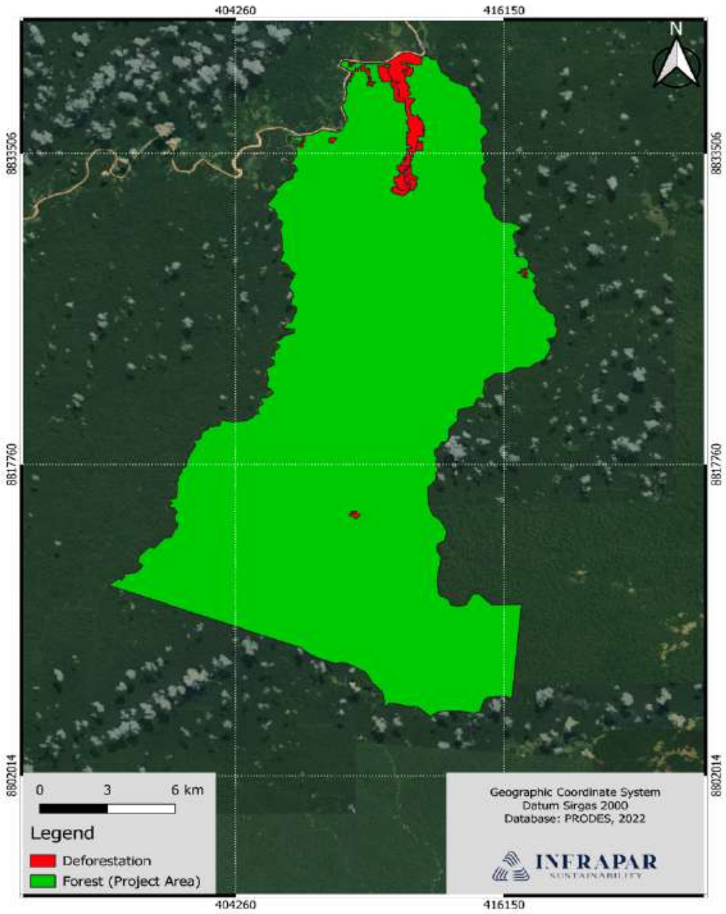
The Senegal Farm is in the municipality of Assis Brazil, in the state of Acre. It is about 27,688 km away from the municipal town. It has a total area of 32.842,012 ha, and its central coordinates correspond to -10.6558°S latitude and -69.8192°W. To the east of the project area is the Chico Mendes Extractive Reserve, and to the west of the project area are two Indigenous Lands, the Mamo date Indigenous Land and the Cabeceira do Rio Acre Indigenous Land.

Deforestation trends does not show a definite trend, however, in recent years there has been a considerable increase in deforestation.

Figure 42 - Senegal Farm area deforestation dynamic.

Source:PRODES(2022).

Figure 43 - Senegal Farm deforestation map.



Source: PRODES (2022).

3.1.3.1.1.3 Step 1.1.3 Leakage Belt

The Leakage belt refers to the adjacent or nearby area where baseline activities are likely to be impacted by project activities, “pushing” deforestation out of the project area. To define the limits of the leakage belt, two approaches can be adopted based on VM0015: opportunity cost analysis (Option I) or mobility analysis (Option II).

For this project the Opportunity Cost Analysis (Option I) cannot be applied due to lack of data, been necessary to have access to relevant information, such as:

-Average selling price per ton in the region.

-Location of the most important points of sale in the region;

-Average local production cost and average transportation cost per kilometer for a ton of product, to perform a proper opportunity cost analysis.

In addition, data obtained through literature and official bodies may not be consistent and do not always reflect the reality of the region. Much of the deforestation carried out in the region tends to be illegal, which can make obtaining accurate and reliable data even more difficult.

Although much of the deforested area is converted into new areas for agriculture and livestock, studies on production costs indicate that profit is not the main driver of deforestation in the region. In addition, livestock is often used in the region as a means of promoting land ownership. Culturally, areas with standing forests are seen as areas that need to be "cleaned", that is, by cutting down the forest the property is valued (Saraiva 2021).

For this study, the Mobility Analysis (Option II) was the most appropriate alternative, as it makes use of a multicriteria GIS analysis to assess the potential mobility of deforestation agents. For this, the algebra method is applied through a weighted superposition to determine the most probable regions of leakage, using the reference region as geographic limits.

The parameters were classified into three groups and the criteria had a weight of 40%, 30% and 30%, respectively. The following parameters and criteria were defined:

Project Distance (km):

- 0-5km: within project range
- 5-10km: medium range
- >10km: outside the scope of the project

Road Distance (km):

- 0-2km: next
- 2-4km: relatively close
- >4km: far

Hydrography Distance (km):

● 0-2km: next

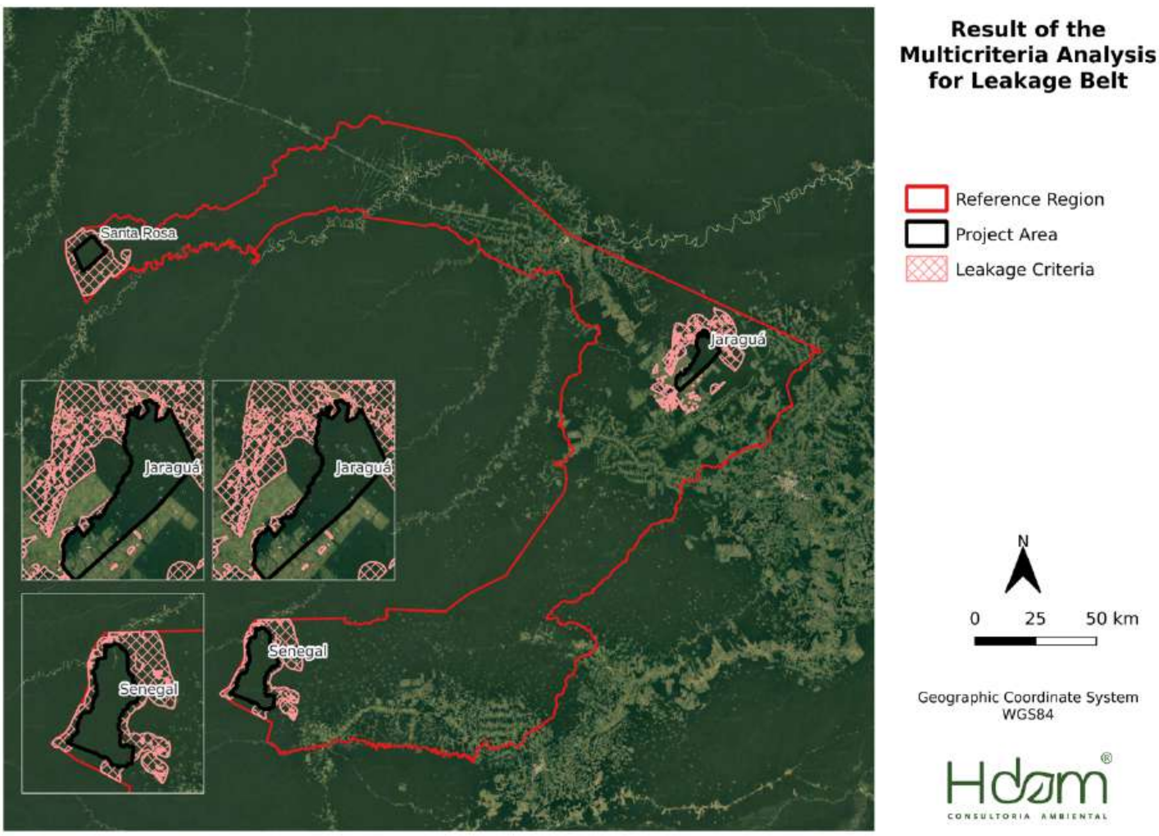
● 2-3km: relatively close

● >3km: far

With the multicriteria analysis of the mobility of potential deforestation agents, it was possible to identify the most likely regions of leakage. The multicriteria analysis allowed the evaluation of alternatives based on multiple criteria, considering the relative importance of each one.

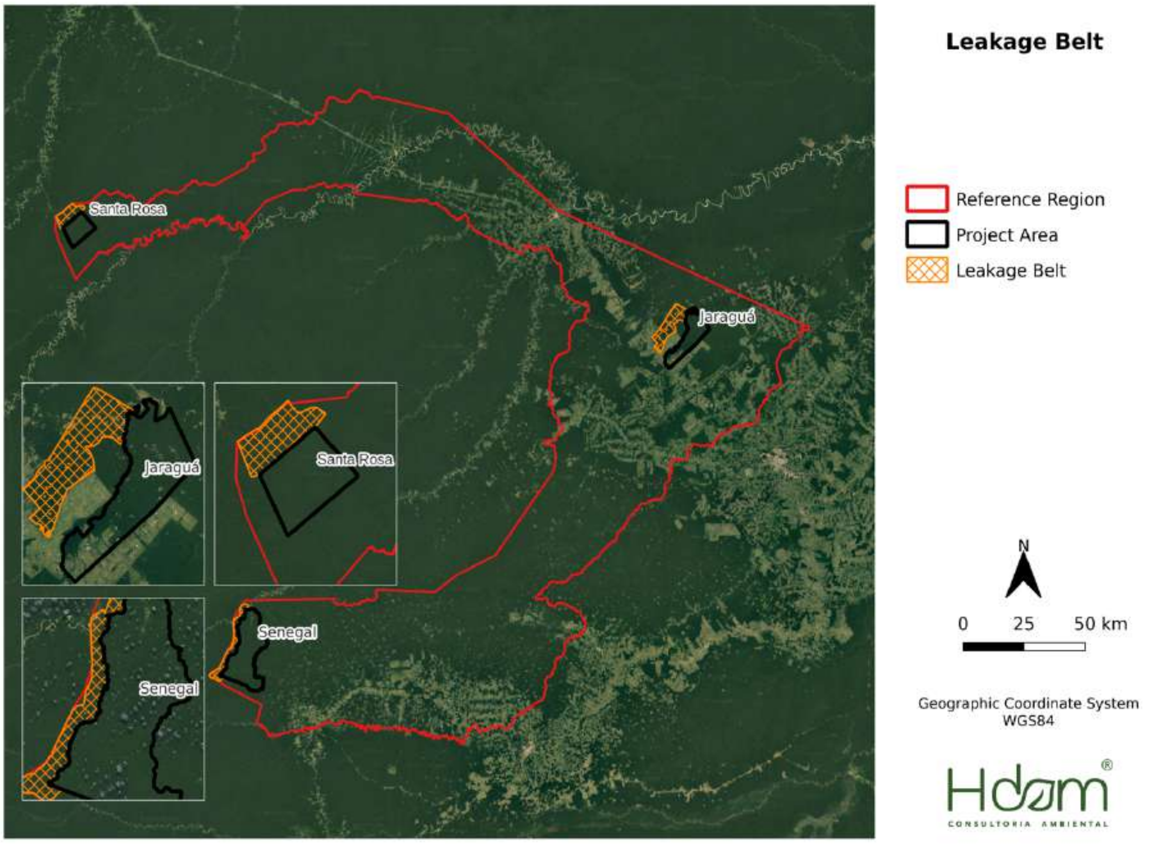
In this case, the criteria used were related to the mobility of deforestation agents, such as distance from roads and the presence of navigable rivers. Based on these criteria, it was possible to identify the regions that presented greater ease of access for deforestation agents, as well as the areas that presented greater vulnerability in relation to deforestation.

Figure 44 - Result of the multicriteria analysis of the mobility of potential deforestation agents.



Based on the adopted criteria, the analysis indicated that the most suitable areas to compose the leakage belt are those close to the project and along the road. However, due to monitoring logistics, areas close to the project were prioritized. The choice of these areas was based on the possibility of accessibility for carrying out the monitoring, which is important to guarantee the effectiveness of the carbon project. Including other more distant areas could increase costs and reduce monitoring efficiency. The multicriteria analysis resulted in the following polygons for the Leak Belt.

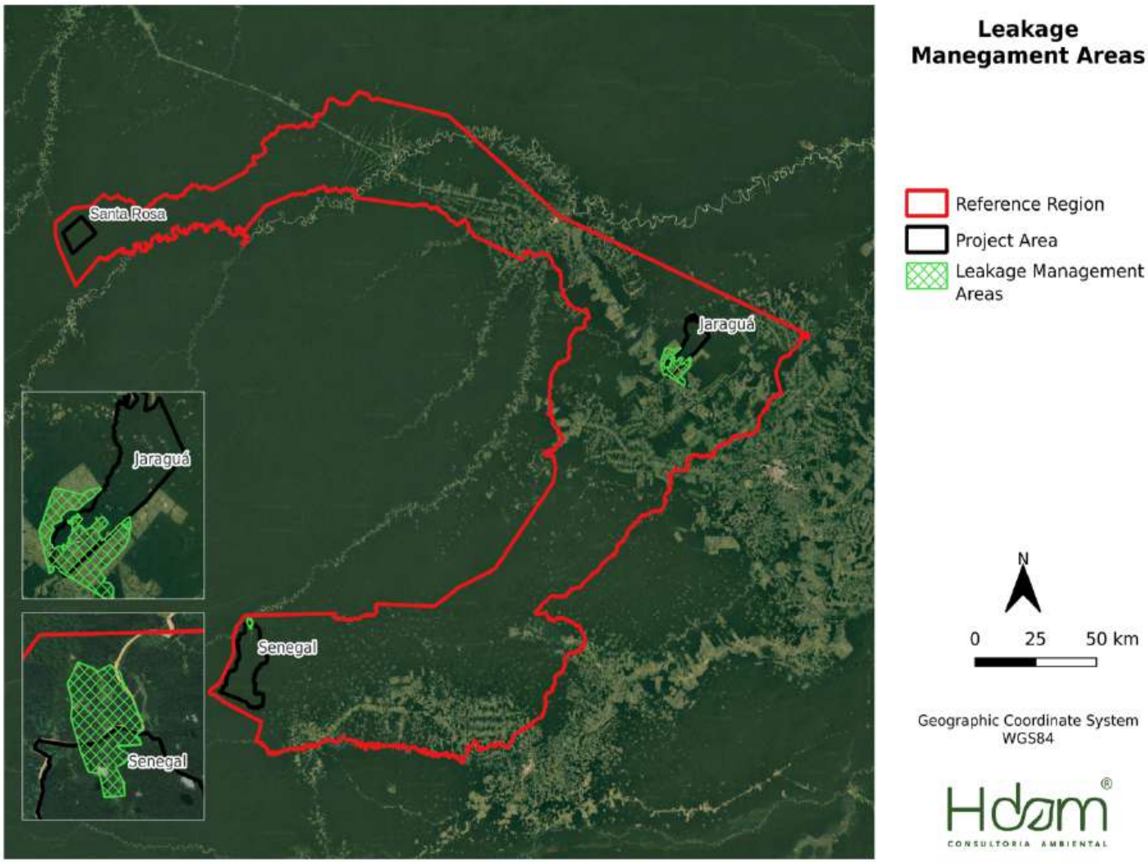
Figure 45 - Leak Belt polygons for the project.



3.1.3.1.1.4 Step 1.1.4 Leakage Management Area

Leakage management areas are the areas where activities aimed at reducing the risk of leakage caused by the displacement of activities will take place. According to VM0015, these areas must be non-forested at the beginning of the project. Areas were selected within the project properties or in the leakage belt that are not forested and where the project activities are intended to be concentrated.

Figure 46 - Leak management region polygons.



3.1.3.1.1.5 Step 1.1.5 Forest

The definition of forest that will be used for measuring deforestation during the project crediting period is FAO 2010, the same definition of forest present in ENREDD+ (Brazil's National REDD+ Strategy, MMA 216):

Forest: an area larger than 0,5ha covered by trees taller than 5m and with over 10% of canopy cover, or with trees capable of reaching these parameters in situ, land areas that are predominantly under agricultural or urban use do not qualify as forests (FAO, 2010).

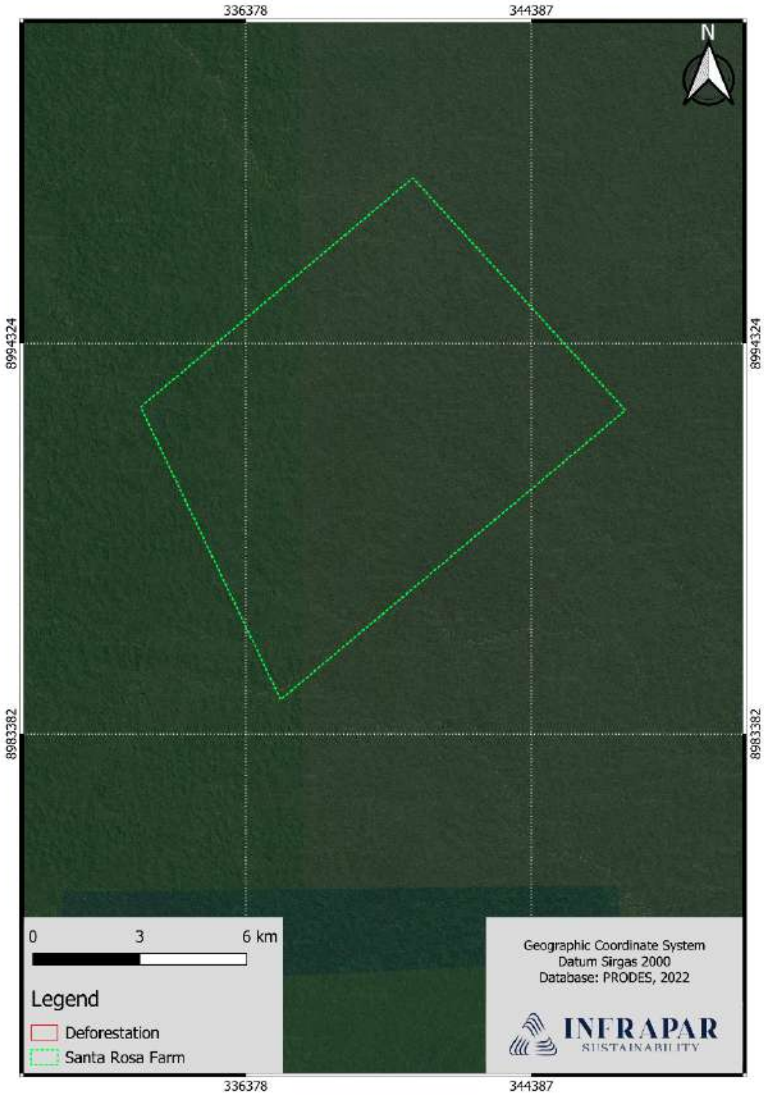
3.1.3.1.1.5.1 Jaraguá

Figure 47 - Jaraguá Farm Forest cover map.

Source: PRODES, 2022.

3.1.3.1.1.5.2 Santa Rosa

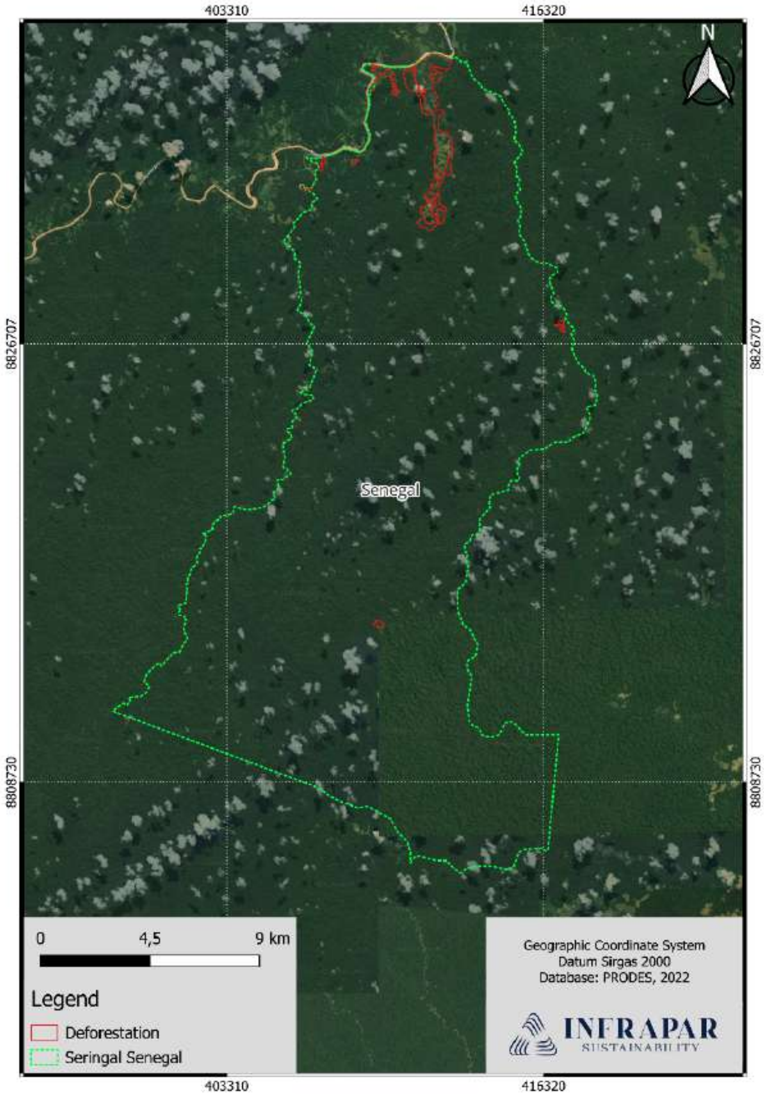
Figure 48 – Santa Rosa Farm Forest cover map.



Source: PRODES, 2022.

3.1.3.1.1.5.3 Senegal

Figure 49 - Senegal Farm Forest cover map.



Source: PRODES, 2022.

3.1.3.1.2 Step 1.2 Temporal Boundaries

3.1.3.1.2.1 Step 1.2.1 Starting date and end of the historical reference period:

The historical reference period is to the years 2010 to 2021, considering the data availability of PRODES Digital to produce analysis of historical land use and land cover (see Step 2.1)

3.1.3.1.2.2 Step 1.2.2 Staring date

The starting date is December 1st, 2022.

3.1.3.1.2.3 Step 1.2.3 Staring date and end of the first fixed baseline period

The fixed baseline period is 10 years (methodology VM0015page 26) and the end date of the first fixed baseline period is December 1st, 2032.

3.1.3.1.2.4 Step 1.2.4 Monitoring Period

The monitoring period is one year.

3.1.3.1.3 Step 1.3 Carbon Pools

Table 13 - (Table 3 on VM 0015). Carbon pools included or excluded within the boundary of the proposed AUD project activity.

Carbon pools	Included / TBD[1]/ Excluded	Justification / Explanation of choice
Above-ground	Tree: Included	Carbon stock change in this pool is always significant
	Non-tree: excluded	Final land cover is not perennial crop. Carbon stock in this pool is likely to be relatively small in the baseline compared to the project scenario.
Below-ground	included	Recommended according to VM0015
Dead wood	excluded	Excluded by conservatism, since carbon stock in this pool is likely to be relatively small in the baseline compared to the project scenario.
Harvested wood products	excluded	Excluded by conservatism. Removal of timber is not associated with significantly more carbon stored in long-term wood products in the baseline case compared to the project scenario.
Litter	excluded	Excluded by conservatism.
Soil organic carbon[+]	excluded	Not to be measured in conversions to pasture grasses and perennial crop according to VCS Program Update of May 24th, 2010.

3.1.3.1.4 Step 1.4 Source of GHG Emissions

Table 14 - Table 4 on VM0015). Sources and GHG included or excluded within the boundary of the proposed AUD project activity.

Source		Gas	Included?	Justification/Explanation
Baseline	Biomass burning	CO_2	Excluded	Counted as carbon stock change
		CH_4	Excluded	Non CO_2 emissions can conservatively be omitted (VM0015)
		N_2O	Excluded	Considered insignificant according to VCS Program Update of May 24th, 2010
		Other	N.A	
	Livestock emissions	CO_2	Excluded	Not a significant source
		CH_4	Excluded	The project does not include livestock activities
		N_2O	Excluded	The project does not include livestock activities
		Other	N.A	No other GHG source was analyzed
Project	Biomass burning	CO_2	Excluded	Counted as carbon stock change
		CH_4	Excluded	Non CO_2 emissions can conservatively be omitted (VM0015)
		N_2O	Excluded	Considered insignificant according to VCS Program Update of May 24th, 2010
		Other	N.A	No other GHG source was analyzed
	Livestock emissions	CO_2	Excluded	Not a significant source
		CH_4	Excluded	The project does not include livestock activities
		N_2O	Excluded	The project does not include livestock activities
		Other	N.A	No other GHG source was analyzed

The approach we are adopting is conservative, which is why we decided to omit data on emissions of gases other than CO2 as established in the methodology. This decision was based on the results of the national inventory of greenhouse gas emissions by federative unit, which pointed out that in Acre State the largest sources of non-CO2 gases represent rates below or equal to 20% (MCTIC, 2022). For example, agriculture represents 20% of gas emissions in Acre State, while energy represents only 4%. Therefore, we chose to emphasize CO2 emissions, which are responsible for the majority of GHG emission worldwide.

3.1.4 Baseline Scenario

3.1.4.1 Step 2 Analysis of historical land-use and land-cover change (VM0015)

3.1.4.1.1 Step 2.1 Collection of appropriate data sources

To carry out land use and land cover classes mapping, data from the PRODES Digital program were used, available in raster format for AP, RR, LK. The images used in Farms Jaragua, Santa Rosa and Senegal date from the period 2011 to 2021 and correspond to the following orbits/points of the Landsat 8 satellite, -8.674 Latitude and -71.082 Longitude, -10.119 Latitude and -68.305 Longitude, -10.119 Latitude and -69.850 Longitude. Their orbits/points are also respectively: Santa Rosa 4/66, Jaraguá 2/67 and Senegal 3/67.

Table 15 - (Table 5 of VM0015). Data used for historical LU/LC change analysis at Jaraguá, Santa Rosa and Senegal Farms.

Vector (Satellite or airplane)	**Sensor**	**Resolution**		**Coverage**	**Acquisition date**	**Scene or point identifier**	
		Spatial	Spectral	(km^2)	(DD/MM/YY)	Path / Latitude	Row / Longitude
Landsat 8	OLI	30 meters	0.43 - 1.390 µm	170x183	15/04/2023	2, 3, 4	66, 67
CBERS 4	IRS-2	40 meters	0.45 - 0.68 µm	131	15/04/2023	180, 181, 182	110, 111, 112

3.1.4.1.2 Step 2.2 Definition of classes of land-use and land-cover

The LU/LC classes used in this project are presented in the next table , per project area, established as "Forest" and "Deforestation", following the previously described methodological procedures. It is important to highlight that there was no stratification of land occupation classes, being considered homogeneous carbon stocks. The description of each class and the existing area before the start of the project are also presented in the table.

● Forest (157.8079,457 ha): remaining forest area belonging to different types of open area vegetation and dense rainforest.

● Deforestation (629.314,438 ha): Originally tropical forest areas that have been converted to other land uses such as pastures, agriculture, and secondary vegetation areas.

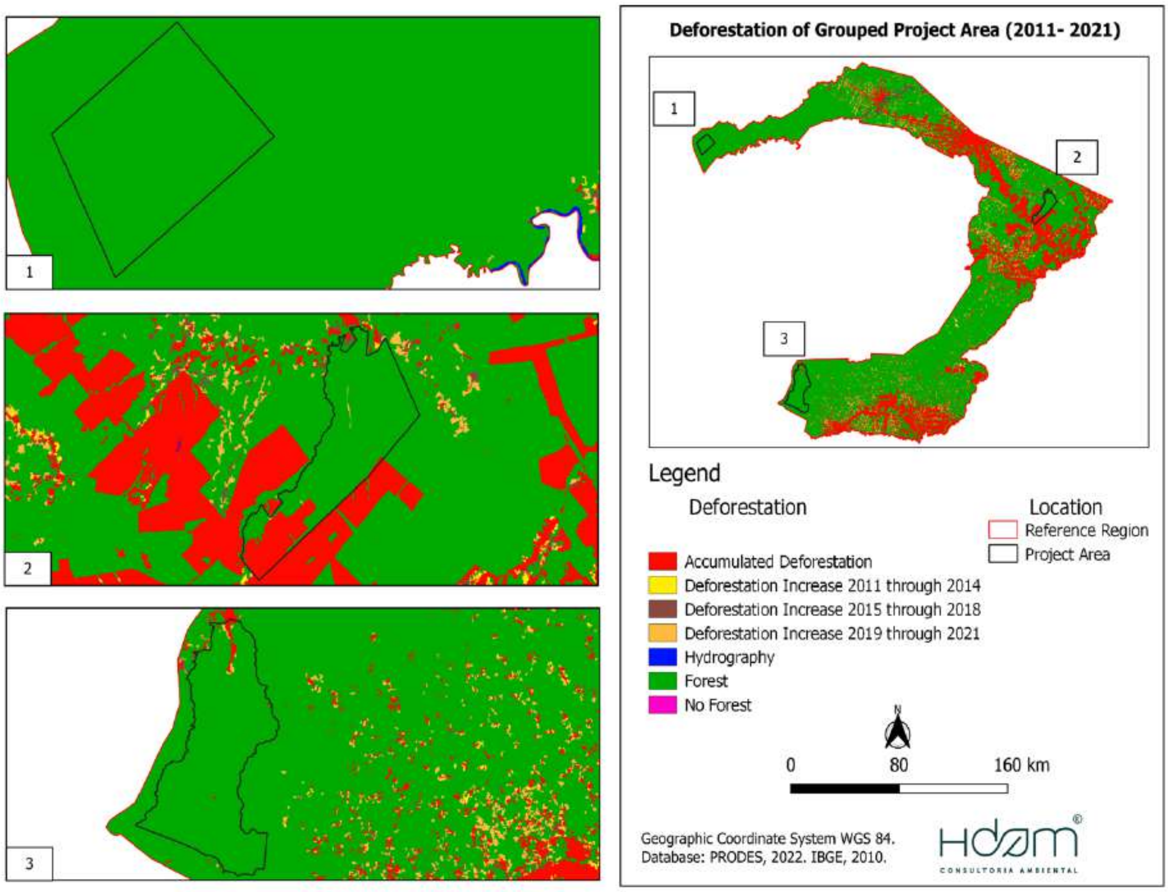
1 RR: Reference Region; PA: Project Area; LK: Leakage Belt; LM: Areas of Leakage Management.

2 LG: Logging. FW = Fuel-wood collection; CP = Charcoal Production (yes/no)

Table 16 - (Table 6 VM 0015). List of all land use and land cover classes existing at the Jaragua, Santa Rosa and Senegal Farms project start date within the reference region.

Class Identifier		Trend in Carbon stock[1]	Presence in[2]	Baseline activity[3]			Description (including criteria for unambiguous boundary definition)
ID$_{cl}$	Name			LG	FW	CP	
1	Forest	Decreasing	RR, PA, LK	Yes	no	no	Intact primary forest.
2	Deforestation	Increasing	RR	no	no	no	Intact primary forest.

Figure 50 - Land Use and Land Cover Map and Deforestation for the sub-period analyzed.



3.1.4.1.3 Step 2.3 Definition of categories of land-use and land-cover change

Para este Projeto REDD +, foi projetada a transição entre duas categorias de mudanças no uso do solo, como a mudança de áreas com cobertura florestal para áreas de vegetação antropizada (desmatamento) (Tabela 5).

Table 17 - (Table 7.b VM0015). List of land-use and land-cover change categories Jaraguá, Santa Rosa and Senegal Farms.

ID	Name	Trend in Carbon stock	Presence in	Activity in the baseline case			Name	Trend in Carbon stock	Presence in	Activity in the project case		
				LG	FW	CP				LG	FW	CP
I1/F1	Forest	Decreasing	RR, PA, LK	Yes	no	No	Forest	Constant	RR, PA, LK	no	no	no
I2/F2	Deforestation	Increasing	RR, PA, LK	no	no	No	Deforestation	Constant	No	no	no	no

3.1.4.1.4 Step 2.4 Analysis of historical land-use and land-cover change

For the project, data from the PRODES platform (Project for Monitoring Deforestation in the Legal Amazon by Satellite) were used during the period from 2011 to 2021.

PRODES is a project by INPE (National Institute for Space Research) that performs satellite monitoring of clear-cut deforestation in the Legal Amazon, where since 1988 annual deforestation rates have been produced in the region, which are used by the Brazilian government for the establishment of public policies. PRODES mapping is based on images from the LANDSAT 8/OLI, CBERS 4 and IRS-2 satellite, to record and quantify deforested areas greater than 6.25 hectares.

The PRODES estimates are in accordance with the methodological requirements, enabling a more careful and reliable approach (KINTISH, 2007). This system has shown to be of great importance for actions and planning of public policies in the Brazilian Amazon. Recent results, based on analyzes carried out with independent specialists, indicate a precision level close to 95% (INPE, 2023).

3.1.4.1.4.1 Step 2.4.1 Pre – processing

The choice of images consists of selecting those with the lowest incidence of clouds, adequate radiometric quality, and images with acquisition closer to the dry season in the Amazon, since most deforestation occurs within the dry season.

3.1.4.1.4.2 Step 2.4.2 Interpretation and classification

(1) Post-classification change detection was used: where two LU/LC maps were performed for two different times, (2011) at the beginning and (2021) at the final year of project analysis.

The methodology used in the maps is based on visually interpreting the images by delimiting the polygons directly on the TerraAmazon system screen. Approximately 600 images from Landsat, Cbers, UK2-DMC or Resourcesat satellites are stored for each year of work. Every past image base is also already generated by the system and in cases of high cloud coverage, images from other satellites (or dates) can be used to compose the scene.

The identification of deforestation is done through the photointerpretation of the Landsat image (or similar satellite) through the delimitation of the new polygons directly on the computer screen, considering only the portion of the image that supposedly still has forest cover. Clearcut deforestation polygons (complete removal of forest cover) whose area exceeds 6.25 ha are identified. The identification of the class alteration pattern is based on three main elements of photointerpretation: tonality, texture, and context.

3.1.4.1.4.3 Step 2.4.3 Post – processing

The classification result in raster format was transformed into vector format for evaluating the area and the existing classes through the Qis Software 3.28.4.

3.1.4.1.5 Step 2.5 Map accuracy assessment

PRODES estimates are considered reliable by national and international scientists (KINTISH, 2007). Recent results, based on analyzes carried out with independent specialists, indicate a precision level close to 95%.

3.1.4.1.6 Results in change history analysis in Land-Use and Land-Cover

Based on data obtained in the previous steps, a historical analysis of land cover in the period from 2011 to 2021 was carried out for the Reference Region of this present project.

The subtraction map for the observed period (2011 to 2021) resulted in a deforested area of approximately 156,897.97 ha. The table below demonstrates the changes that occurred between classes from Forest to Deforestation, with a decrease in carbon stocks.

Table 18 - Potential land-use and land-cover change matrix in the Reference Region between 2011 and 2021 (Table 7a of methodology VM0015, page 32).

	Initial LU/LC class			
	IDcl	**I1**	**I2**	**In**
Final LU/LC class	F1	1,02982444	373,638194	374,668019
	F2	246,435989	0,64045655	247,076446
	Fn	247,465813	374,278651	621,744464

3.1.4.2 Step 3 Analysis of agents, drivers and underlying causes of deforestation and thein likely future development (VM 0015)

We present an analysis of the agents of deforestation and deforestation drivers considering the reference regions of each Project area of this grouped project. This analysis is based on secondary data produced considering the municipalities of the State of Acre (Acre 2018). A grouped view of the project areas was used to develop the analysis of the underlying causes of deforestation and the chain of events leading to deforestation.

3.1.4.2.1 Step 3.1 Identification of agents of deforestation

3.1.4.2.1.1 Jaraguá Farm

- Name: private properties for cattle ranching

- Description: The establishment of pasture areas is historically preceded by illegal logging. The wood is sold, and the profit is invested in the deforestation of the area. This dynamic is carried out by the landowner or by land grabbers, and the final use can be cattle ranching or simply valuing the property to sell it, creating a circle of clearing and land grabbing in the region.

- Population size: Bujari is the 18th least populous municipality in the state, with a population of 10,572 inhabitants according to 2021 estimates by the Brazilian Institute of Geography and Statistics (IBGE), with approximately 1% of the state population. Economic warming comes from public service (44.0%) and agricultural activity (38.7%); services and commerce activities (14.7%) and small industries (2.6%) account for a lower percentage (IBGE, 2019). The productive activities of the municipality are based on agriculture and livestock, in relation to the distribution of cattle herd, Bujari occupies the 6th position in relation to the other municipalities of the State, with 7.6% (309,017 heads).

- Statistics: In the municipality of Bujari, the land categories that predominate are the private areas (43%), discriminated areas (union lands, 36%), protected areas (12%) and rural settlement (9%), (ACRE, 2018). The area of the municipality is represented 89% by private areas and discriminated areas (union lands). In Bujari, the discriminated areas and private properties have the greatest contribution to the total deforestation of the municipality.

Deforestation rates in different land categories vary according to their description. Deforestation in settlement projects represents 32%, while in the discriminated areas this average is 48%, in private properties is on average 46% and in conservation units the average is around 9%.

Analyzing the dynamics of deforestation in Bujari from 2001 to 2016, it is evident that in the last decade the region has undergone an intensive process of deforestation, but that, nevertheless, it has maintained a pattern in relation to the deforestation rate. The municipality had an average of 2,186 ha of deforested area per year and a total of 34,983 ha, in the period from 2001 to 2016, being one of the highest deforestation rates compared to that of other municipalities in the region in which it is located.

3.1.4.2.1.2 Santa Rosa

-Name: smallholders alongside main rivers in the reference region and rural settlements projects

-Description: as observed in Jaraguá Farm reference region, the dynamic of clearing for cattle ranching, small scale agriculture and land grabbing also occurred, in much lesser extent. In the north face of reference region small scale agriculture drives deforestation alongside the road BR 364. There are rural settlements projects near Municipality of Santa Rosa do Purus, in the south face of reference region influencing deforestation for small scale agriculture.

-Population size: Santa Rosa do Purus is the least populous municipality in the state, with a population of 6,893 inhabitants according to 2021 estimates by the Brazilian Institute of Geography and Statistics (IBGE). The GDP of the municipality is about R$ 84.1 million, the least in the State of Acre, with 66.7%

coming from public administration, 15.2% from services, 15.3% from agriculture and 2.9% from industry.

-Statistics: The Santa Rosa Farm is in the Municipality of Santa Rosa do Purus, administrative region of Purus that presents the lowest occurrence of deforestation, contributing with only 11,4% of total deforestation in Acre State. The deforestation process is related to the situation of land ownership. In the case of Santa Rosa do Purus, the predominance of Conservation Units and Indigenous Lands, which together cover 68% of the municipality area, together with the low level of accessibility and low population density, contributed to the low rate of deforestation, about 2% (until 2016 (Acre, 2018). The predominant land use in the municipality is forest (98%), pastures (0.6%) and secondary vegetation (0.5%). The deforested area, which totalized about 8,000 ha in 2016, is predominantly occupied with pastures (30%), having rural settlements as the most deforested areas, although it occupies only about 1% of the area of the territory.

3.1.4.2.1.3 Senegal

-Name: smallholders in rural settlement projects and private properties alongside the road in the south of reference region.

-Description: The causes of deforestation in rural settlement projects are related to slash and burn agriculture for small-scale agriculture and livestock. This practice is justified by residents due to the lack of effectiveness of rural technical assistance to improve agricultural production in the region.

-Population size: The population of the municipality of Assis Brazil is 7,649 inhabitants and registered an increase of 25.91% in relation to that registered in 2010, positioning itself as the 21st most populous in the state of Acre. It has an HDI of 0.588 and showed an increase of 38.35%. About the Gross Domestic Product (GDP) for the municipality, the value of R$ 96,920.33 was recorded for the year 2020. The public administration has a significant participation contributing with 62%, followed by the sectors: agriculture (17.20%); services (17.32%) and industries (3.49%).

-Statistics: In Assis Brazil municipality, where Senegal Farm is located, the land categories that have the highest rate of deforestation are rural settlements (33%); areas without discriminatory study (25%), collected areas (23%) and conservation units (14%). Rural settlement projects of and the areas without a detailed study contribute to 58% of the deforestation in the municipality. Rural settlements has 71% of their areas already deforested. Private properties have a different profile than other municipalities, with one of the lowest deforested rates (1%), along with indigenous lands (0.4%). The land tenure categories presents are: areas without discriminatory study (2%), rural settlement projects (2%), collected areas (5%), private areas (7%), protected areas (37%) and indigenous lands (47%).

3.1.4.2.2 Step 3.2 Identification of Deforestation drivers

3.1.4.2.2.1 Jaragua Farm

- access to forest: The reference region is crossed by the BR 364 highway, the main road that crosses the State of Acre from East to West and provides direct access to Jaraguá Farm. Easy access, while facilitating and allowing the transportation of products from the property, can also provide the occurrence of forest fires and illegal logging, requiring constant monitoring of the property. It was found that about 56% of all deforestation in the area of the municipality of Bujari in the reference region is located within a radius of 1,000 m from the road network, which demonstrates the influence of accessibility on the dynamics of deforestation, or that is, the greater the density of roads, the greater the percentage of deforestation (Acre 2018).

- proximity to markets: The Jaraguá Farm and reference region is very close (25km) to Rio Branco, Acre capital. This proximity facilitates access to the market in the most populous region of the state, while adding value to the property. Rural landowners in this region seek economic opportunities that enhance proximity to the consumer market, bringing greater pressure to the remaining forest. The project seeks exactly to add value to the remaining forest to compete with other land uses.

3.1.4.2.2.2 Santa Rosa Farm

-proximity to existing rural settlements: although rural settlements occupy only 1% of the municipality's territory, this land category has 29% of its area deforested for small-scale agriculture.

-access to forest: The Purus River and adjacent properties are the main driver of deforestation in the reference region, combining with roads (BR 364) where rural properties are present in the north face of the reference region. There is an unofficial road being built to connect Santa Rosa do Purus with Manuel Urbano municipality, which will contribute to strengthen land grabbing in the region, along the Purus River.

3.1.4.2.2.3 Senegal Farm

-access to forest: The road network in the municipality of Assis Brazil is fundamental for the flow of production, as well as for the displacement of the population. In this way, the deforestation that occurred within a radius of 500m and 1,000 m away from the interurban roads was quantified, where it was possible to verify that in the radius of 500 m concentrates 42% of all the deforestation incident in the municipality area, while in the radius from 1,000 m, increases to 63%. These results demonstrate the important concentration of deforestation along the road network. The density of access roads in Assis Brazil, for the most part, is interconnected with the BR 317 Highway, which is located in the eastern part of the municipality, allowing access from the city of Brasilia to Peru and Bolivia to the south.

3.1.4.2.3 Step 3.3 Identification of Underlying causes of deforestation

Regarding the underlying causes of deforestation, despite the efforts of public policies aimed at controlling deforestation, the State of Acre is also subject to the interference of economic dynamics and public policies that act in the opposite direction (Acre 2018).

According to the Economic Ecological Zoning of Acre, rural settlements are responsible for 38% of the deforested areas in the state, followed by private property with 33%. Protected areas contribute to 11% of deforested areas.

These data illustrate that one of the underlying causes is land use policies and their enforcement. Added to this are the challenges with land regularization and land disputes, which are quite common in the Amazon region and also in the state of Acre, reinforcing the cycle of opening new areas as a factor of land appropriation and valuation.

The fragility of command-and-control actions to ensure the application of legal protection provisions, such as the Forestry Code, make it difficult to combat deforestation.

The difficulty in promoting and validating economic alternatives in the face of illegal logging and cattle raising also represent underlying causes of deforestation, strongly influencing the decision-making of deforestation agents.

In the reference regions of this project, the rural population lives in poor conditions, making them vulnerable to decision-making that involves the deforestation of the land they occupy or even to compose labor to support the family in livestock and logging activities.

3.1.4.2.4 Step 3.4 Analysis of the chain of events leading to deforestation

It can be observed that the deforestation vectors identified in the reference regions are potentiated by adjacent causes of deforestation present in the Acre landscape.

Access to the forest, either through the extensive presence of rivers in the region, or through consolidated or clandestine roads, makes logging possible as the first economic activity. The lack of command-and-control actions to guarantee the protection of forest resources encourages the conversion of the forest to other economic uses, mainly livestock. This cycle is reinforced in regions with greater access to markets and by the difficulty in promoting and consolidating alternative economic activities in the region. In this context, rural settlement projects reproduce this forest conversion dynamic, directing the landscape towards a scenario of deforestation.

3.1.4.2.5 Step 3.5 Conclusion

By establishing the relationship between deforestation agents, deforestation drivers and the main underlying causes of deforestation in the project's reference regions, the evidence found is conclusive about the future trend of deforestation in the project's geographical region. This analysis reinforces the trend of the presence of deforestation in the landscape with a growing increase in its rates in recent years, reinforcing the importance of establishing alternative mechanisms that value the maintenance of standing forest in the State of Acre.

3.1.4.3 Step 4 Projection of Future Deforestation (VM 0015)

3.1.4.3.1 Step 4.1 Projection of the quantity of future deforestation

The Reference Region is not divided into strata, since the characteristics of agents, vectors and causes of deforestation are uniform throughout its extension.

3.1.4.3.1.1 Step 4.1.1 Selection of the baseline approach

Based on VM0015, the choice of a projection approach depends on the specific conditions of the project, the availability of data and the level of uncertainty involved. According to the three possibilities proposed by the methodology of VM0015 of the VERRA standard, the approach of modeling the rate of deforestation was adopted, approach “c”.

3.1.4.3.1.2 Step 4.1.2 Quantitative projection of future deforestation

3.1.4.3.1.2.1 Projection of the annual areas of baseline deforestation in the Reference Region

For the projection of future deforestation, the entire historical period of the project (2011-2021) was considered, with annual maps of deforestation projected between 2011 and 2021. The calculated deforestation rate was 9.04%, showing high occurrence. This result indicates that the projection of deforestation occurred in regions with a high risk of deforestation. It was later calculated and spatialized through a map of the areas with the highest risk of deforestation in the analyzed Reference Region. For the historical period it was projected until the year 2051.

3.1.4.3.1.2.2 Projection of the annual areas of baseline deforestation in the Project Area and Leakage Belt

As explained earlier, the “c”: Modeling approach, which uses the historical rate, was chosen to predict future deforestation and project baseline annual deforestation areas in the region in question. To calculate the annual deforestation area in the baseline of year "n" in the reference region, the equation of methodology VM0015 version 1.1 was used.

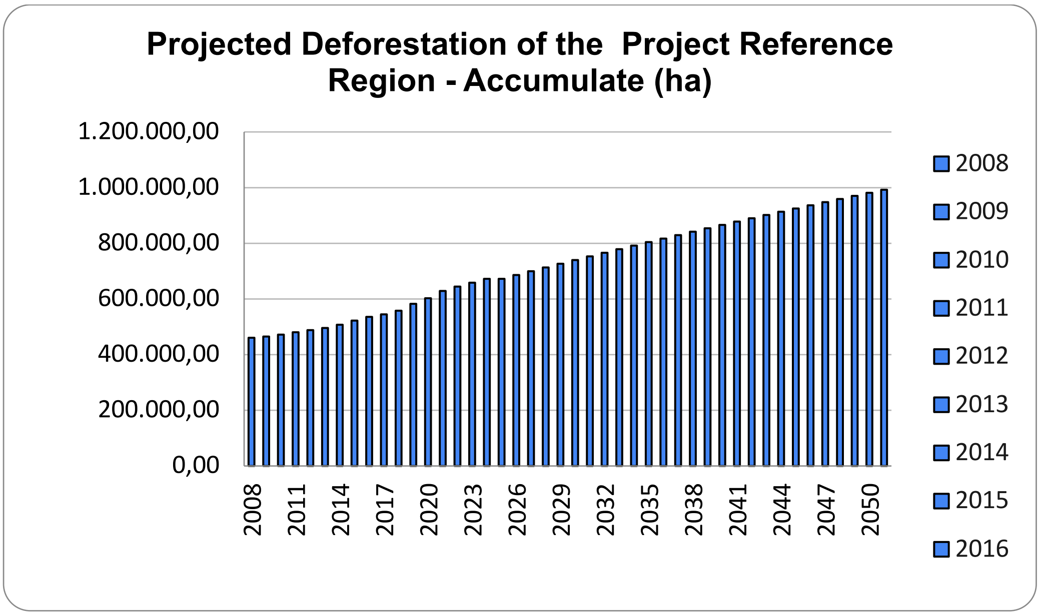
3.1.4.3.1.2.2.1 Summary of the quantitative projection of future deforestation

Deforestation projections for the period from 2022 to 2051 are available in the 3 tables below referring to the Reference Region, Project Area and Leakage Belt. According to the tables presented, a total increase of 981,418.37 hectares of deforestation is expected during the period, which represents an annual average of 33,437.73 hectares.

Table 19 - Annual areas of baseline deforestation in the Reference Region until 2051 (Table 9.a of methodology VM0015, page 49)

Project year *t*	**Stratum *i* in the reference region**		**Total**	
	1	*I_RR*	annual	cumulative
	ABSLRR_i,t	***ABSLRR_i,t***	***ABSLRR_t***	***ABSLRR***
	ha	ha	ha	ha
2022	618.207,13	618.207,13	618.207,13	644.398,78
2023	13.990,35	13.990,35	13.990,35	658.389,13
2024	13.864,76	13.864,76	13.864,76	672.253,89
2025	13.740,64	13.740,64	13.740,64	685.994,53
2026	13.617,59	13.617,59	13.617,59	699.612,12
2027	13.495,15	13.495,15	13.495,15	713.107,27
2028	13.375,16	13.375,16	13.375,16	726.482,43
2029	13.255,98	13.255,98	13.255,98	739.738,41
2030	13.136,91	13.136,91	13.136,91	752.875,32
2031	13.016,81	13.016,81	13.016,81	765.892,13
2032	12.904,20	12.904,20	12.904,20	778.796,33
2033	12.786,83	12.786,83	12.786,83	791.583,16
2034	12.673,30	12.673,30	12.673,30	804.256,46
2035	12.558,82	12.558,82	12.558,82	816.815,28
2036	12.447,23	12.447,23	12.447,23	829.262,51
2037	12.334,40	12.334,40	12.334,40	841.596,91
2038	12.225,76	12.225,76	12.225,76	853.822,67
2039	12.105,70	12.105,70	12.105,70	865.928,38
2040	12.005,43	12.005,43	12.005,43	877.933,81
2041	11.900,79	11.900,79	11.900,79	889.834,60
2042	11.794,46	11.794,46	11.794,46	901.629,06
2043	11.687,59	11.687,59	11.687,59	913.316,64
2044	11.584,63	11.584,63	11.584,63	924.901,27
2045	11.480,88	11.480,88	11.480,88	936.382,15
2046	11.374,69	11.374,69	11.374,69	947.756,84
2047	11.274,95	11.274,95	11.274,95	959.031,79
2048	11.173,81	11.173,81	11.173,81	970.205,61
2049	11.074,82	11.074,82	11.074,82	981.280,42
2050	10.975,87	10.975,87	10.975,87	992.256,29
2051	10.876,13	10.876,13	10.876,13	1.003.132,42

Figure 51 - Cumulative deforestation until 2051 in the Reference Region.



In the Project Area, the projected increment of deforestation was 3,379.6 ha between 2022 and 2051, with an average of 112.65 ha per year.

Table 20 - Annual areas of baseline deforestation in the Project Area until 2051 (Table 9.b of methodology VM0015, page 49)

Project year *t*	Stratum *i* of the reference region in the project area		Total	
	1	*IRR*	annual	cumulative
	ABSLPAi,t	***ABSLPAi,t***	***ABSLPAt***	***ABSLPA***
	ha	ha	ha	ha
2022	145,89	145,89	145,89	145,89
2023	43,77	43,77	43,77	189,65
2024	0,00	0,00	0,00	189,65
2025	41,33	41,33	41,33	230,99
2026	0,00	0,00	0,00	230,99
2027	139,40	139,40	139,40	370,39
2028	0,00	0,00	0,00	370,39
2029	83,48	83,48	83,48	453,87
2030	28,37	28,37	28,37	482,24
2031	98,07	98,07	98,07	580,30
2032	135,35	135,35	135,35	715,65
2033	57,54	57,54	57,54	773,19
2034	92,39	92,39	92,39	865,59
2035	161,29	161,29	161,29	1.026,87
2036	111,03	111,03	111,03	1.137,91
2037	55,92	55,92	55,92	1.193,83

2038	99,69	99,69	99,69	1.293,52
2039	130,49	130,49	130,49	1.424,00
2040	21,88	21,88	21,88	1.445,89
2041	211,53	211,53	211,53	1.657,42
2042	203,43	203,43	203,43	1.860,85
2043	117,52	117,52	117,52	1.978,37
2044	148,31	148,31	148,31	2.126,68
2045	251,25	251,25	251,25	2.377,93
2046	92,40	92,40	92,40	2.470,33
2047	226,94	226,94	226,94	2.697,26
2048	43,77	43,77	43,77	2.741,03
2049	79,43	79,43	79,43	2.820,45
2050	192,08	192,08	192,08	3.012,54
2051	367,15	367,15	367,15	3.379,68

Table 21 - Annual areas of baseline deforestation in the Leakage Belt until 2051 (Table 9.c of methodology VM0015, page 50).

Project year *t*	**Stratum *i* of the reference region in the leakage belt**		**Total**	
	1	***IRR***	**annual**	**cumulative**
	$ABSLLK_{i,t}$	***$ABSLLK_{i,t}$***	***$ABSLLK_t$***	***ABSLLK***
	ha	**ha**	**ha**	**ha**
2022	172,66	172,66	172,66	1.757,96
2023	21,07	21,07	21,07	1.779,03
2024	94,83	94,83	94,83	1.873,86
2025	0,00	0,00	0,00	1.873,86
2026	116,71	116,71	116,71	1.990,57
2027	102,93	102,93	102,93	2.093,50
2028	96,45	96,45	96,45	2.189,95
2029	23,50	23,50	23,50	2.213,46
2030	209,92	209,92	209,92	2.423,38
2031	154,00	154,00	154,00	2.577,37
2032	206,68	206,68	206,68	2.784,05
2033	61,60	61,60	61,60	2.845,65
2034	192,09	192,09	192,09	3.037,74
2035	166,96	166,96	166,96	3.204,70
2036	166,15	166,15	166,15	3.370,85
2037	149,94	149,94	149,94	3.520,79
2038	204,25	204,25	204,25	3.725,04
2039	144,27	144,27	144,27	3.869,31

2040	106,99	106,99	106,99	3.976,30
2041	107,80	107,80	107,80	4.084,10
2042	273,14	273,14	273,14	4.357,24
2043	151,56	151,56	151,56	4.508,80
2044	324,20	324,20	324,20	4.833,00
2045	315,28	315,28	315,28	5.148,28
2046	241,53	241,53	241,53	5.389,81
2047	294,21	294,21	294,21	5.684,02
2048	260,98	260,98	260,98	5.945,00
2049	256,11	256,11	256,11	6.201,12
2050	220,45	220,45	220,45	6.421,57
2051	343,65	343,65	343,65	6.765,22

3.1.4.3.2 Step 4.2 Projection of the location of future deforestation

At this stage, a deforestation prognostic model was processed, which projected the future location of areas with probabilities of deforestation and changes in land use and cover for the years 2022 to 2051. execution of the LUCC model, in this case a deforestation simulation model (SOARES-FILHO, 1998; SOARES-FILHO et al., 2009; GAMA, 2022).

3.1.4.3.2.1 Step 4.2.1 Preparation of factor maps

Based on the previous steps, the variables that may have an impact on the occurrence of deforestation in the region in question were identified. The following table shows the 7 variables that were considered as variable factors in the deforestation risk model.

Table 22 - List of variables, maps and factor maps (Table 10 of methodology VM0015, page 53)

Factor Map		**Source**	**Variable represented**		**Meaning of the categories or pixel value**		**Other Maps and Variables used to create the Factor Map**		**Algorithm or Equation used**
ID	**File Name**		**Unit**	**Description**	**Range**	**Meaning**	**ID**	**File Name**	
1	unidades_conservacao100	MMA	probability	Empirical probability for conservation units	0	Probability variation	1	ucs_mma	QGIS

2	rodovias_distance	IBGE + vetorização	meters	Euclidean distance of deforestation increment cells within the historical period	0	Distance variation	2	trecho_rodoviario_ibge	QGIS
3	hidrografia_distance	IBGE	meters	Euclidean distance of deforestation increment cells within the historical period	0	Distance variation	3	drenagem_ibge, massa_agua_ibge	QGIS
4	altitides100	TOPODATA	meters	Average elevation per pixel of 100 x 100 meters	0	Elevation Variation	4	topodata	-
5	declividade100	TOPODATA	meters	Average elevation per pixel of 100 x 100 meters	0	Slope Variation	5	topodata	-
6	assentamentos	INCRA	probability	Empirical probability for conservation units	0	Probability variation	6	assentamentos_AC	QGIS
7	mudanca_uso	PRODES	meters	Euclidean distance	0	Distance variation	7	PRODES	QGIS

3.1.4.3.2.2 Step 4.2.2 Preparation of deforestation risk map

In the models of risks - probabilities of deforestation, elements are inserted as input for the simulation of the LUCC (Land Use and Cover Change) model, such as the variables referring to the objects (roads, settlements and hydrography), transition matrix (which calculates the gross rates and quantity of cells (pixel matrix) that modified the model between the years 2011 and 2021.

3.1.4.3.2.2.1 In addition to the transition matrix, the input data inserted in this model are the observed map referring to 2011, and the file with the evidence weights, which represent the effect of a spatial variable on land use and land cover change in this region. This model is intended to calibrate, execute (generate future scenarios) and validate the deforestation simulation model, described in the following steps:

3.1.4.3.2.2.2 Calibration

Model calibration consists of verifying the independence between the categorical and continuous variables used in the deforestation simulation model. For the correlation analysis between the maps, DINAMICA EGO generates the values referring to the Crammer index and Join Information Uncertainty, resulting from the analysis of all the variables observed in the execution of the model.

According to Bonham-Carter (1994), values lower than 0.5 in these indexes indicate a significant association between pairs of variables, if this value exceeds, one of the variables must be excluded from the model, or both combined in a single information plan to avoid obliquity in the model. At this stage, two indices exceed the value of 0.5, referring to the settlement variable, in transition 1-3 (forest to deforestation), they were subtracted from the analysis.

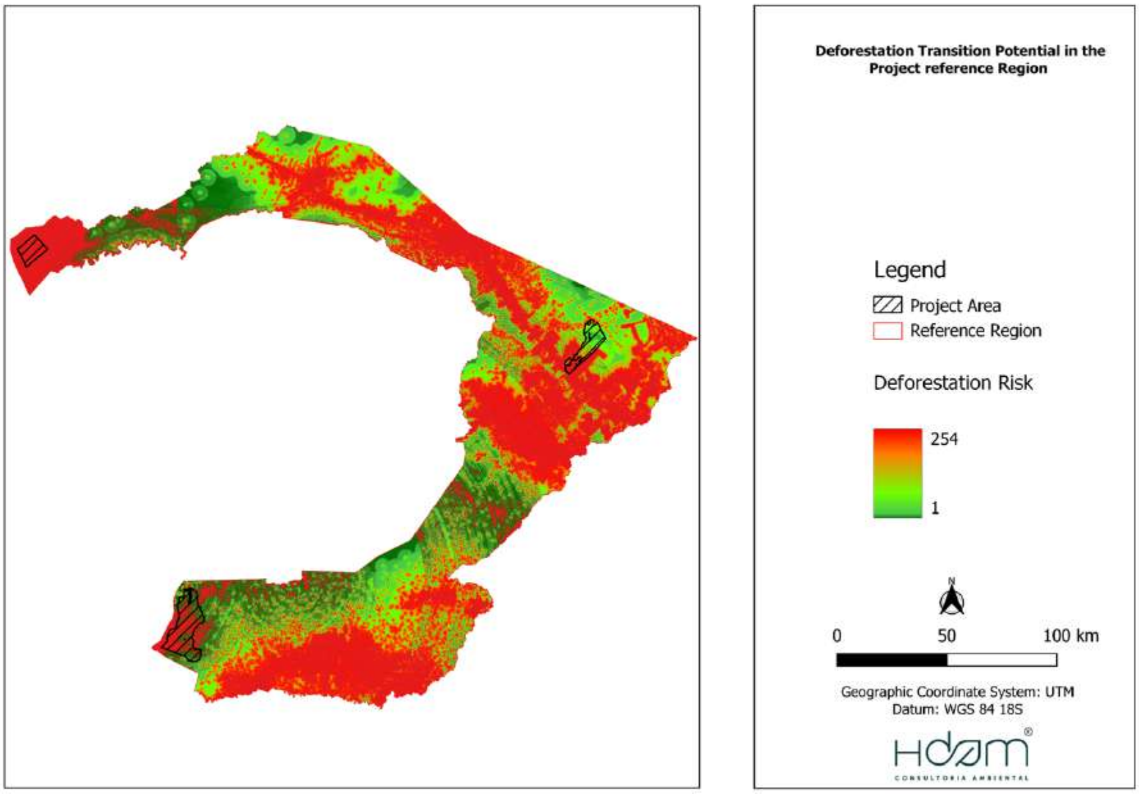
3.1.4.3.2.2.3 Validation

The validation stage comprises the comparison of the already calibrated mathematical model, considering the variables with correlation with deforestation, with a set of real data. In this phase, a simulated land use and occupation map corresponding to a historical period is generated. Next, a comparison procedure is performed between the simulated map and the observed map of land use and occupation, referring to the same period. This process allows evaluating the accuracy of the model and adjusting it, if necessary, to make it more accurate in representing the dynamics of land use and occupation in the region. At this stage, the deforestation forecast model obtained assertiveness of 76% in the 1x1 window, 92% in the 5x5 window and 98% in the 11x11 window.

3.1.4.3.2.2.4 Scenarios

In the scenario projection stage, the deforestation rates that will occur in a future time horizon were estimated, considering some relevant assumptions. Within the scope of this REDD+ Project, the projection period comprises the time interval between 2022 and 2051, and the assumption adopted is that the annual rate of deforestation observed between 2011 and 2021 will follow the same pattern. This approach makes it possible to assess the magnitude of deforestation and the effectiveness of the actions proposed by the project in reducing deforestation rates in the region.

Figure 52 - Transition potential map for the occurrence of deforestation in the Reference Region.



3.1.4.3.2.3 Step 4.2.3 Selection of the most accurate deforestation risk map

Not applicable.

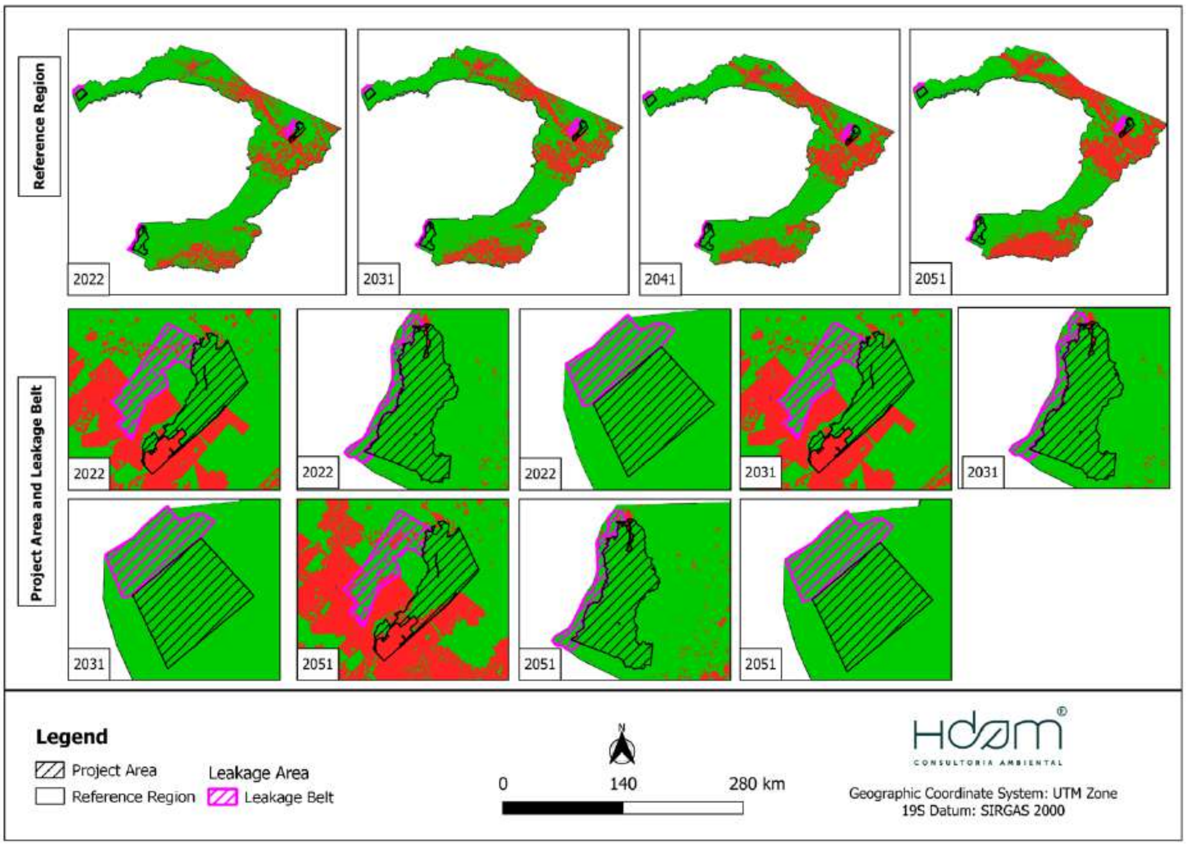
3.1.4.3.2.4 Step 4.2.4 Mapping of the location of future deforestation

To project future deforestation in the region, annual maps of deforestation between 2022 and 2051 were used, considering the entire historical period of the project (2011-2021). The deforestation rate for the historical period was extrapolated up to the year 2051, taking into account the trends observed over the period and the stability of the variables that affect deforestation in the region. In order to identify the areas with the highest risk of deforestation and guide preventive and control actions, the spatial allocation of deforestation was carried out based on the combination of auxiliary variables obtained in the model calibration stage. Spatial analysis and geoprocessing techniques were used for this allocation, allowing a precise approach in identifying the most vulnerable areas.

In this process, several masks were used, first a Euclidean distance map was generated from the main access routes, such as roads and navigable rivers. Then, this distance map was scaled between data 0 and 1 using fuzzy logic. Values close to 1 were those located close to access roads and those close to zero, the most distant areas. Finally, an expansion or constraint mask was added by the deforestation risk map (transition potential maps) to estimate the effect of access roads on deforestation risk, among other variables.

The pre-existing deforestation distance variable was calculated dynamically in each iteration of the model, using the Dinamica Ego software. The results are shown in Figure 16, which illustrates deforestation in the reference areas, Project Area and Leakage Belt, as described in Tables 9b and 9c of methodology VM0015.

Figure 53 - Projection of land cover in the Reference Region, Project Area and Leakage Belt until the year 2051



3.1.5 Additionality

For the demonstration of additionality, the Verra Standards methodology requires the use of the VT001 Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities (Version 3.0 of 2012 - Sectoral Scope 14).

The objective of this Project Design topic is to demonstrate and evaluate the additionality of the Project, according to the methodology applied and the VT001 tool, considering the following: =

3.1.5.1 Step 1 - Identification of Alternatives

The identification of alternative land use scenarios for the activity of the proposed VCS AFOLU project serves to list alternative land use scenarios for the activity(s) that could be the Base Scenario, through the following sub-steps:

3.1.5.1.1 Sub-step 1a. Identify reliable alternative land use scenarios for the proposed VCS AFOLU project activity

In the absence of the Amazon Partners 1 Project, the traditional use of land around the Grouped Project should prevail, mainly covering Forest Management - certified or illegal - as well as the deforestation of the native forest for the extensive breeding of cattle.

In the Project area, the areas of Jaraguá Farm and even that of Seringal Senegal are conducive to Forest Management and extensive cattle breeding, while Santa Rosa, even with the most pronounced difficulties of logistical access, can receive the wood extraction activity. The two activities have higher profitability than Payments for Environmental Services (PSA) for the Reduction of Greenhouse Gas Emissions. (The scenarios should be viable for the project area, considering relevant national and/or sectoral policies and circumstances, such as historical land uses, practices and economic trends).

The areas of Jaraguá Farm and Seringal Senegal have already developed in part of their lands, Forest Management activities in the last decade. Also, it was verified in the Senegal property the intention of the continuity of the activity, through protocol in a Federal Government system called National System for Controlling the Origin of Forest Products (Sinaflor), still not approved and in phase of technical analysis. In both areas, extensive cattle breeding has also been partially practiced. The two economic activities, which have a legal basis for their execution in the State of Acre, may be contained with the hiring of the VCS AFOLU Project.

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

In table of this text are related the legal frameworks that regulate environmentally sustainable economic activities in the State of Acre, to which the following regulations can be added to support logging and herd farming around the Grouped Project:

Legislation	Description
Constitution of the Federative Republic of Brazil, October 5, 1988	As can be seen in its chapters II and III, the Federal Constitution encourages squatters to invade private lands, urban or rural, in search of claiming that they do not fulfill a social function, since they are not in productive use.
MMA Normative Instruction No. 05, of November 12, 2006	Provides for technical procedures for the preparation, presentation, execution and technical evaluation of Sustainable Forest Management Plans - PMFSs in primitive forests and their forms of succession in the Legal Amazon, and other provisions.
Resolution No. 406, of February 2, 2009	Establishes technical parameters to be adopted in the elaboration, presentation, technical evaluation and execution of a sustainable forest management plan-

	pmfs with logging purposes, for native forests and their forms of succession in the Amazon biome
Law No. 12.651, of May 25, 2012 (Forestry Code)	Forest Code that provides for the protection of native vegetation and defines the percentage of property area classified as a legal reserve to be preserved, varying according to the type of biome. According to art. 12, the percentage of Legal Reserve in forest areas that are inserted in the Legal Amazon is 80%, and it is possible to change the use of the soil in the excess legal reserve area (20%) such as for example for the practice of livestock, upon the environmental licensing process.

Despite the regulatory frameworks and certification standards available, illegal logging, as well as the burning of the native forest in the State of Acre, region of the areas of the Grouped Project are increasing, according to the data series below

For the State of Acre, the deforestation rate for 2022 was 847 Km², a reduction of 4.7% in rationing at the rate of 2021 that was 889 km2 (Figure 97). However, it is important to mention that since 2018 the rate follows an increasing trend, as well as throughout the Brazilian Amazon. In fact, the history of deforestation in the State of Acre reflects the trends of the entire region (see also Figure 97).

Figure 5454 - Annual rate of deforestation in the State of Acre.

Source: [TerraBrasilis (inpe.br)]

3.1.5.1.3 Sub-step 1c. Baseline scenario selection:

The VM0015 methodology selected for the calculation of the Baseline of the Amazon Partners 1 Project is justified in this text, being understood to be the combination of the methodologies of the VCS Program and the CCB Program of the Verra Standards, the best combination for the AFOLU Amazon Partners 1 Project.

3.1.5.2 Step 2 - Investment Analysis

The costs associated with the VCS AFOLU project have been broken down and are available for Validation and Verification, classified as sensitive commercial information - as well as the cash flow projections associated with the Grouped Project, where it is evident that there are no other financial benefits associated with the income originated by the VCS AFOLU Project. Thus, we proceeded to Step 4 (Common Practice Analysis) of the procedures established in the VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities (Version 3.0 of 2012 - Sectoral Scope 14).

Step 3 – Not applicable.

3.1.5.3 Step 4 - Common Practice Analysis

For the purpose of determining Additionality, the previous Steps of the VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities (Version 3.0 of 2012 - Sectorial Scope 14) are hereby supplemented with an analysis of the extent to which activities such as Forest Management and the burning of native forest areas have spread in the Clustered Project area - so that the commercially sensitive information presented in Step 2 is supplemented.

Despite the existence of political mechanisms named as i. Environmental Services Incentive System (SISA), ii. Tax on Circulation of Goods and Services (ICMS) Ecological and iii. Environmental Reserve Quota (CRA), we can conclude that no other activities similar to the project were identified in the state of Acre, as these cited mechanisms differ from the VCS AFOLU project in several points.

The data and parameters relevant to the reproduction of the analyses of the Additionality formulated here, are referenced to the different points of the text, where they can be obtained - in addition to being complemented by extensive bibliography attached.

3.1.6 Methodology Deviations

3.1.6.1 Ex ante estimation of actual carbon stock changes due to planned activities

No planned deforestation activity was foreseen for the scope of this project. The scope was planned to preserve the local flora and fauna and does not involve the suppression of native vegetation. It is important to remember that deforestation is an activity that can have environmental impacts, even in management plans.

3.1.6.2 Ex ante estimation of actual non-CO2 emissions from forest fires

Fire data were not applied in defining the baseline of the project due to the overestimation of outbreaks in all years of a historical series with this data, as well as the existence of gaps and inconsistencies in the information on heat spots. These limitations in data collection may affect the analysis and identification of possible impacts caused by fires in the project area.

3.2 Qualification of GHG Emission Reductions and Removals

3.2.1 Baseline Emission

3.2.1.1 Step 5 Definition of the Land-Use and Land-Over change component of the baseline

3.2.1.1.1 Step 5.1 Calculation of baseline activity data per forest class

The baseline annual deforestation maps of each future year were combined with the land use and land cover map of the current scenario (inical situation), in order to create a set of maps showing which pixels would be deforested and the results of the baseline projections showed deforestation of approximately 30,726 hectares in the project area between 2022 and 2051 and 30,387 hectares in the leakage belt.

Table 23 - Annual areas deforested per forest class icl within the project area in the baseline case (baseline activity data per forest class)

Area deforested per forest class *icl* within the project area			**Total baseline deforestation in the project area**	
IDicl>	**1**	***Icl***		
Name>	**Forest**		***ABSLPAt***	***ABSLPA***
			annual	**cumulative**
Project year *t*	**ha**	**ha**	**ha**	**ha**
2022	145,89	145,89	145,89	145,89
2023	43,77	43,77	43,77	189,65
2024	0,00	0,00	0,00	189,65
2025	41,33	41,33	41,33	230,99
2026	0,00	0,00	0,00	230,99
2027	139,40	139,40	139,40	370,39
2028	0,00	0,00	0,00	370,39
2029	83,48	83,48	83,48	453,87
2030	28,37	28,37	28,37	482,24
2031	98,07	98,07	98,07	580,30
2032	135,35	135,35	135,35	715,65
2033	57,54	57,54	57,54	773,19
2034	92,39	92,39	92,39	865,59
2035	161,29	161,29	161,29	1.026,87
2036	111,03	111,03	111,03	1.137,91
2037	55,92	55,92	55,92	1.193,83
2038	99,69	99,69	99,69	1.293,52
2039	130,49	130,49	130,49	1.424,00
2040	21,88	21,88	21,88	1.445,89

2041	211,53	211,53	211,53	1.657,42
2042	203,43	203,43	203,43	1.860,85
2043	117,52	117,52	117,52	1.978,37
2044	148,31	148,31	148,31	2.126,68
2045	251,25	251,25	251,25	2.377,93
2046	92,40	92,40	92,40	2.470,33
2047	226,94	226,94	226,94	2.697,26
2048	43,77	43,77	43,77	2.741,03
2049	79,43	79,43	79,43	2.820,45
2050	192,08	192,08	192,08	3.012,54
2051	367,15	367,15	367,15	3.379,68

Source: Self Elaboration

Table 24 - Annual areas deforested per forest class icl within the leakage belt area in the baseline case (baseline activity data per forest class)

Area deforested per forest class *icl* within the leakage belt area			**Total baseline deforestation in the leakage belt area**	
IDicl>	**1**	***Icl***		
Name>			***ABSLLKt***	***ABSLLK***
			annual	**cumulative**
Project year *t*	**ha**	**ha**	**ha**	**ha**
2022	172,66	172,66	172,66	1.757,96
2023	21,07	21,07	21,07	1.779,03
2024	94,83	94,83	94,83	1.873,86
2025	0,00	0,00	0,00	1.873,86
2026	116,71	116,71	116,71	1.990,57
2027	102,93	102,93	102,93	2.093,50
2028	96,45	96,45	96,45	2.189,95
2029	23,50	23,50	23,50	2.213,46
2030	209,92	209,92	209,92	2.423,38
2031	154,00	154,00	154,00	2.577,37
2032	206,68	206,68	206,68	2.784,05
2033	61,60	61,60	61,60	2.845,65
2034	192,09	192,09	192,09	3.037,74
2035	166,96	166,96	166,96	3.204,70
2036	166,15	166,15	166,15	3.370,85
2037	149,94	149,94	149,94	3.520,79
2038	204,25	204,25	204,25	3.725,04

2039	144,27	144,27	144,27	3.869,31
2040	106,99	106,99	106,99	3.976,30
2041	107,80	107,80	107,80	4.084,10
2042	273,14	273,14	273,14	4.357,24
2043	151,56	151,56	151,56	4.508,80
2044	324,20	324,20	324,20	4.833,00
2045	315,28	315,28	315,28	5.148,28
2046	241,53	241,53	241,53	5.389,81
2047	294,21	294,21	294,21	5.684,02
2048	260,98	260,98	260,98	5.945,00
2049	256,11	256,11	256,11	6.201,12
2050	220,45	220,45	220,45	6.421,57
2051	343,65	343,65	343,65	6.765,22

Source: Self Elaboration

3.2.1.1.2 Step 5.2 Calculation of baseline activity data per post-deforestation class

Method 1 available in methodology VM0015 was used to define the class that will replace the forest cover in the baseline of the project (anthropic vegetation in equilibrium). The table below shows the area of zone 1, which comprises the project area, leakage belt, leakage management areas and corresponding areas of each land use/land use change class after deforestation.

Table 25 - Zones of the reference region* encompassing different combinations of potential post-deforestation LU/LC classes

Zone		Name:		Total of all other LU/LC classes present in the Zone		Total area of each Zone	
		ID$_{fcl}$	1				
		Area	% of Zone	Area	% of Zone	Area	% of Zone
ID$_z$	Name	ha	%	ha	%	ha	%
1	Zone 1	855.295,81	100	278.461.221	32.557,30	855.295,81	100
Total area of each class *fcl*		855.295,81	100	278.461.221	32.557,30	855.295,81	100

Source: Self Elaboration

3.2.1.1.3 Step 5.3 Calculation of baseline activity data per LU/LC change category

Not applicable, the method 2 wasn't used.

Step 6 Estimation of baseline Carbon Stock Changes and non-CO2 emissions

3.2.1.1.4 Step 6.1 Estimation of baseline carbon stock changes

3.2.1.1.4.1 Step 6.1.1 Estimation of the average carbon stocks of each LU/LC class

The technical guidelines for carrying out the forest inventory are in accordance with Methodology for Avoided Unplanned Deforestation VM 0015 v1.1. Field measurements methods project activity instances were conducted to estimate carbon stock considered the use of sampling of part of the forest, considering the minimum required parameters, such as a 10% error at a 90% confidence level, for the carbon stock variable. Sample plots were arranged in clusters, distributed according to forest typologies present in project area.

We estimated biomass and forest carbon, with statistical analysis according to the sampling method used, in addition we analyzed phytosociological structure of the forest, including its diversity.

Table 26 - Estimation of the average carbon stocks of each LU/LC class

Project area	**Inicial Forest class *icl***					
	Name:					
	ID*icl*					
	Average carbon stock per hectare + 90% CI					
	Cab_{icl}		**Cbb_{icl}**		**$Ctot_{icl}$**	
	C stock	± 90% CI	*C stock*	± 90% CI	*C stock*	± 90% CI
	tCO$_2$e ha-1	tCO$_2$e ha-1	tCO$_2$e ha-1	tCO$_2$e ha-1	tCO$_2$e ha-1	tCO$_2$e ha-1
Jaraguá	262,93	239,08 286,79	38,99	35,45 42,53	302,19	274,77 329,61
Santa Rosa	298,55	269,07 -- 328,03	44,33	39,92 -- 48,75	343,19	309,26 -- 377,12
Senegal	307,71	280,59 -- 334,83	45,8	41,72 -- 49,88	353,84	322,60 -- 385,07

Source: Self Elaboration

3.2.1.1.4.2 Step 6.1.2 Calculation of carbon stock change factors

VM0015 says that the AFOLU Requirements require methodologies to consider stock degradation in above-ground biomass, below-ground biomass, litter, dead wood, and harvested wood products in the baseline case. This project does not apply because:

- The project baseline does not anticipate activities that lead to changes within the project area.

-Below-ground carbon stock depends on root biomass and litter dynamics. In a mature forest, without anthropic intervention, the death of trees is balanced by the recruitment of new trees, thus the forest remains in a dynamic equilibrium, that is, degradation close to 0.

- The project does not foresee logging, therefore, without the export of nutrients and carbon.

In this methodology, standard linear functions are applied to account for the fall in the carbon stock in the initial forest classes (icl) and the increase in the carbon stock in the post-deforestation classes. This is done as follows.

3.2.1.1.4.3 Step 6.1.3 Calculation of baseline carbon stock changes

The project does not foresee activities that lead to the change of carbon stocks in the project area or in the land use belt, according to item Step 6.1.2, therefore this item is not applicable.

3.2.1.1.5 Step 6.2 Baseline non-CO2 emissions from forest fires

3.2.2 Project Emissions

3.2.2.1 The non-CO2 emissions were disregarded, as fires will not be used to cut down the forest.

3.2.2.2 Step 7 Ex Ante estimation of actual carbon stock changes an non-CO2 emission in the project area

3.2.2.2.1 Step 7.1 Ex ante estimation of actual carbon stock changes

3.2.2.2.1.1 Step 7.1.1 Ex ante estimation of actual carbon stock changes due to planned activities

No planned deforestation activity was foreseen for the scope of this project.

3.2.2.2.1.2 Step 7.1.2 Ex Ante estimation of carbon stock changes due to unavoidable unplanned deforestation within the project area

Despite all the mitigation measures adopted in this project, it is possible that some unplanned deforestation may occur in the project area. As a conservative assumption, equation 16 of VM0015 was used, where an Effectiveness Index (IE) of 0.95 was adopted. This estimated value is used to multiply the baseline projections by the factor (1 - IE) and the result should be considered ex ante estimated emissions from unplanned deforestation in the project area.

$$\Delta CUDdPAt = \Delta CBSLt * (1 - IE)$$

Where:

ΔCUDdPAt: Actual ex ante total change in carbon stock due to unplanned and unavoided deforestation in year t in the project area; tCO_2-e;

ΔCBSLt: Total change from baseline carbon stock in year t in the project area; tCO_2-e;

IE Ex ante estimated efficacy index %

t 1, 2, 3 … *T,* a year of the proposed project crediting period; dimensionless

3.2.2.2.1.3 Step 7.1.3 Ex Ante estimated net actual carbon stock changes in the project area

Table 27 - Ex ante estimated net carbon stock change in the Project Area under the Project scenario (Table 27 of VM0015 methodology).

Project Year t	Total ex ante carbon stock decrease due to planned activities		Total *ex ante* carbon stock increase due to planned activities		Total *ex ante* carbon stock decrease due to unavoided unplanned deforestation		Total *ex ante* net carbon stock change		Total ex ante estimated actual non-CO_2 emissions from forest fires in the project area	
	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
	$\Delta CPAdPA_t$	$\Delta CPAdPA$	$\Delta CPAiPA_t$	$\Delta CPAiPA$	$\Delta CUDdPA_t$	$\Delta CUDdPA$	$\Delta CPSPA_t$	$\Delta CPSPA$	$\Delta EBBPSPA_t$	$\Delta EBBPSPA$
	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2022	0	0	0	0	2.437,19	2.437,19	2.437,19	2.437,19	0,00	0,00
2023	0	0	0	0	731,15	3.168,34	731,15	3.168,34	0,00	0,00
2024	0	0	0	0	0,00	3.168,34	0,00	3.168,34	0,00	0,00
2025	0	0	0	0	690,51	3.858,85	690,51	3.858,85	0,00	0,00
2026	0	0	0	0	0,00	3.858,85	0,00	3.858,85	0,00	0,00
2027	0	0	0	0	2.328,85	6.187,70	2.328,85	6.187,70	0,00	0,00
2028	0	0	0	0	0,00	6.187,70	0,00	6.187,70	0,00	0,00
2029	0	0	0	0	1.394,60	7.582,30	1.394,60	7.582,30	0,00	0,00
2030	0	0	0	0	473,92	8.056,22	473,92	8.056,22	0,00	0,00
2031	0	0	0	0	1.638,31	9.694,53	1.638,31	9.694,53	0,00	0,00
2032	0	0	0	0	2.261,12	11.955,65	2.261,12	11.955,65	0,00	0,00
2033	0	0	0	0	961,33	12.916,98	961,33	12.916,98	0,00	0,00
2034	0	0	0	0	1.543,52	14.460,50	1.543,52	14.460,50	0,00	0,00
2035	0	0	0	0	2.694,43	17.154,92	2.694,43	17.154,92	0,00	0,00
2036	0	0	0	0	1.854,93	19.009,86	1.854,93	19.009,86	0,00	0,00
2037	0	0	0	0	934,25	19.944,11	934,25	19.944,11	0,00	0,00
2038	0	0	0	0	1.665,39	21.609,50	1.665,39	21.609,50	0,00	0,00
2039	0	0	0	0	2.179,90	23.789,39	2.179,90	23.789,39	0,00	0,00
2040	0	0	0	0	365,58	24.154,97	365,58	24.154,97	0,00	0,00
2041	0	0	0	0	3.533,87	27.688,84	3.533,87	27.688,84	0,00	0,00
2042	0	0	0	0	3.398,48	31.087,33	3.398,48	31.087,33	0,00	0,00
2043	0	0	0	0	1.963,29	33.050,62	1.963,29	33.050,62	0,00	0,00
2044	0	0	0	0	2.477,73	35.528,35	2.477,73	35.528,35	0,00	0,00
2045	0	0	0	0	4.197,33	39.725,68	4.197,33	39.725,68	0,00	0,00
2046	0	0	0	0	1.543,57	41.269,25	1.543,57	41.269,25	0,00	0,00
2047	0	0	0	0	3.791,21	45.060,46	3.791,21	45.060,46	0,00	0,00
2048	0	0	0	0	731,15	45.791,61	731,15	45.791,61	0,00	0,00
2049	0	0	0	0	1.326,89	47.118,50	1.326,89	47.118,50	0,00	0,00
2050	0	0	0	0	3.208,96	50.327,46	3.208,96	50.327,46	0,00	0,00
2051	0	0	0	0	6.133,52	56.460,98	6.133,52	56.460,98	0,00	0,00

3.2.2.2.2 Step 7.2 Ex Ante estimation of actual non-CO2 emission from forest fires (if forest fires are in the baseline)

Non-CO2 emissions from forest fires were not accounted for the baseline scenario.

3.2.2.2.3 Step 7.3 Total Ex Ante estimations for the project area

Table - Total ex ante estimated actual net carbon stock changes and emissions of non-CO2 gasses in the project are. (Table 29. of VM0015 methodology).

Project Year *t*	Total ex ante carbon stock decrease due to planned activities		Total *ex ante* carbon stock increase due to planned activities		Total *ex ante* carbon stock decrease due to unavoided unplanned deforestation		Total *ex ante* net carbon stock change		Total ex ante estimated actual non-CO_2 emissions from forest fires in the project area	
	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
	$\Delta CPAdPA_t$	$\Delta CPAdPA$	$\Delta CPAiPA_t$	$\Delta CPAiPA$	$\Delta CUDdPA_t$	$\Delta CUDdPA$	$\Delta CPSPA_t$	$\Delta CPSPA$	$\Delta EBBPSPA_t$	$\Delta EBBPSPA$
	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2022	0	0	0	0	2.437,19	2.437,19	2.437,19	2.437,19	0,00	0,00
2023	0	0	0	0	731,15	3.168,34	731,15	3.168,34	0,00	0,00
2024	0	0	0	0	0,00	3.168,34	0,00	3.168,34	0,00	0,00
2025	0	0	0	0	690,51	3.858,85	690,51	3.858,85	0,00	0,00
2026	0	0	0	0	0,00	3.858,85	0,00	3.858,85	0,00	0,00
2027	0	0	0	0	2.328,85	6.187,70	2.328,85	6.187,70	0,00	0,00
2028	0	0	0	0	0,00	6.187,70	0,00	6.187,70	0,00	0,00
2029	0	0	0	0	1.394,60	7.582,30	1.394,60	7.582,30	0,00	0,00
2030	0	0	0	0	473,92	8.056,22	473,92	8.056,22	0,00	0,00
2031	0	0	0	0	1.638,31	9.694,53	1.638,31	9.694,53	0,00	0,00
2032	0	0	0	0	2.261,12	11.955,65	2.261,12	11.955,65	0,00	0,00
2033	0	0	0	0	961,33	12.916,98	961,33	12.916,98	0,00	0,00
2034	0	0	0	0	1.543,52	14.460,50	1.543,52	14.460,50	0,00	0,00
2035	0	0	0	0	2.694,43	17.154,92	2.694,43	17.154,92	0,00	0,00
2036	0	0	0	0	1.854,93	19.009,86	1.854,93	19.009,86	0,00	0,00
2037	0	0	0	0	934,25	19.944,11	934,25	19.944,11	0,00	0,00
2038	0	0	0	0	1.665,39	21.609,50	1.665,39	21.609,50	0,00	0,00
2039	0	0	0	0	2.179,90	23.789,39	2.179,90	23.789,39	0,00	0,00
2040	0	0	0	0	365,58	24.154,97	365,58	24.154,97	0,00	0,00
2041	0	0	0	0	3.533,87	27.688,84	3.533,87	27.688,84	0,00	0,00
2042	0	0	0	0	3.398,48	31.087,33	3.398,48	31.087,33	0,00	0,00
2043	0	0	0	0	1.963,29	33.050,62	1.963,29	33.050,62	0,00	0,00
2044	0	0	0	0	2.477,73	35.528,35	2.477,73	35.528,35	0,00	0,00
2045	0	0	0	0	4.197,33	39.725,68	4.197,33	39.725,68	0,00	0,00
2046	0	0	0	0	1.543,57	41.269,25	1.543,57	41.269,25	0,00	0,00
2047	0	0	0	0	3.791,21	45.060,46	3.791,21	45.060,46	0,00	0,00
2048	0	0	0	0	731,15	45.791,61	731,15	45.791,61	0,00	0,00
2049	0	0	0	0	1.326,89	47.118,50	1.326,89	47.118,50	0,00	0,00
2050	0	0	0	0	3.208,96	50.327,46	3.208,96	50.327,46	0,00	0,00
2051	0	0	0	0	6.133,52	56.460,98	6.133,52	56.460,98	0,00	0,00

3.2.3 Leakage

3.2.3.1 Step 8 Ex Ante estimation of Leakage

3.2.3.1.1 Step 8.1 Ex Ante estimation of the decrease in carbon stocks and increase in GHG Emissions due to leakage prevention measures

The leakage prevention activities that will be implemented in the project were carefully selected to ensure that there are no significant GHG emissions, as provided for in VM015. Activities such as Non-Wood Forest Management, low-carbon agriculture, pasture management and implementation of agroforestry will be carried out, which aim to improve soil quality, increase productivity and promote biodiversity conservation, without generating additional GHG emissions. Furthermore, these activities will be carried out in areas that have already been deforested, so as not to compromise the preservation of existing forests and to avoid reducing carbon stocks. Monitoring will be carried out regularly to ensure that no significant emissions occur and, if there is any change in the carbon stock, it will be duly accounted for and reported.

3.2.3.1.1.1 Step 8.1.1 Carbon stock changes due to activities implemented in leakage management areas

Not applicable.

3.2.3.1.1.2 Step 8.1.2 Ex Ante estimation of CH4 and N20 emissions from grazing animals intensification of livestock

Not applicable.

3.2.3.1.1.3 Step 8.1.3 Total Ex Ante estimated carbon stock changes and increases GHG emissions due to leakage prevention measures

Not applicable.

3.2.3.1.2 Step 8.2 Ex Ante estimation of the decrease in carbon stocks and increase in GHG emissions due to activity displacement leakage

Project implementation may displace activities that would promote deforestation within the project area outside the project boundary. If carbon stocks in the leakage belt area reduce more during project implementation than projected in the baseline case, this is an indication that leakage has occurred due to displacement of baseline activities. The ex-ante, activity displacement leakage can be estimated based on the anticipated combined effectiveness of the proposed leakage prevention and mitigation measures and project activities.

Considering the measures and activities that will be developed in this project, it is expected that there will be no reduction in stocks due to displacement of deforestation. However, it was conservatively considered a “Leakage Displacement Factor”. For the calculation of the ex-ante change in the actual carbon stock from unavoidable unplanned deforestation, a similar equation presented in Step 7.1.2 was used. Multiplying the estimated changes in the baseline carbon stock for the project area by one “Displacement Leakage Factor” (DLF), representing the percentage of deforestation that is expected to be displaced outside the project boundary. Starting with an index of 10% and decaying over the lifetime of the project.

Table 28 - Ex ante estimated leakage due to activity displacement

Project year *t*	Total *ex ante* estimated decrease in carbon stocks due to displaced deforestation		Total *ex ante* estimated increased in GHG emissions due to displaced forest fires	
	annual	cumulative	annual	cumulative
	ΔCADLKt	***ΔCADLK***	***EADLKt***	***EADLK***
	tCO2-e	tCO2-e	tCO2-e	tCO2-e
2022	0	0	4.874,38	4.874,38
2023	0	0	1.412,59	6.286,97
2024	0	0	0,00	6.286,97
2025	0	0	1.240,15	7.527,12
2026	0	0	0,00	7.527,12
2027	0	0	3.865,89	11.393,01
2028	0	0	0,00	11.393,01
2029	0	0	2.125,37	13.518,38
2030	0	0	690,02	14.208,40
2031	0	0	2.273,97	16.482,38
2032	0	0	2.984,68	19.467,06
2033	0	0	1.203,59	20.670,64
2034	0	0	1.827,52	22.498,17
2035	0	0	3.006,98	25.505,15
2036	0	0	1.943,97	27.449,12
2037	0	0	915,56	28.364,68
2038	0	0	1.518,83	29.883,52
2039	0	0	1.839,83	31.723,35
2040	0	0	283,69	32.007,04
2041	0	0	2.501,98	34.509,02
2042	0	0	2.175,03	36.684,05
2043	0	0	1.123,00	37.807,05
2044	0	0	1.248,78	39.055,83
2045	0	0	1.830,04	40.885,87
2046	0	0	568,03	41.453,90
2047	0	0	1.137,36	42.591,26
2048	0	0	169,63	42.760,89
2049	0	0	217,61	42.978,50
2050	0	0	308,06	43.286,56
2051	0	0	171,74	43.458,30

Source: Self Elaboration

3.2.3.1.3 Step 8.3 Ex Ante estimation of total leakage

Table 29 - Ex ante estimated total leakage

Project year *t*	Total *ex ante* GHG		Total *ex ante* increase		Total *ex ante* decrease		Carbon stock decrease		Total net carbon		Total net increase	
	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
	EgLK t	***EgLK***	***EADLK t***	***EADLK***	***ΔCADLK t***	***ΔCADLK***	***ΔCLPMLK t***	***ΔCLPMLK***	***ΔCLK t***	***ΔCLK***	***ELK t***	***ELK***
	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2022,0	0,0	0,0	0,0	0,0	2437,2	2437,2	0,0	0,0	4874,4	4874,4	0,0	0,0
2023,0	0,0	0,0	0,0	0,0	731,2	3168,3	0,0	0,0	1412,6	6287,0	0,0	0,0
2024,0	0,0	0,0	0,0	0,0	0,0	3168,3	0,0	0,0	0,0	6287,0	0,0	0,0
2025,0	0,0	0,0	0,0	0,0	690,5	3858,9	0,0	0,0	1240,2	7527,1	0,0	0,0
2026,0	0,0	0,0	0,0	0,0	0,0	3858,9	0,0	0,0	0,0	7527,1	0,0	0,0
2027,0	0,0	0,0	0,0	0,0	2328,8	6187,7	0,0	0,0	3865,9	11393,0	0,0	0,0
2028,0	0,0	0,0	0,0	0,0	0,0	6187,7	0,0	0,0	0,0	11393,0	0,0	0,0
2029,0	0,0	0,0	0,0	0,0	1394,6	7582,3	0,0	0,0	2125,4	13518,4	0,0	0,0
2030,0	0,0	0,0	0,0	0,0	473,9	8056,2	0,0	0,0	690,0	14208,4	0,0	0,0
2031,0	0,0	0,0	0,0	0,0	1638,3	9694,5	0,0	0,0	2274,0	16482,4	0,0	0,0
2032,0	0,0	0,0	0,0	0,0	2261,1	11955,6	0,0	0,0	2984,7	19467,1	0,0	0,0
2033,0	0,0	0,0	0,0	0,0	961,3	12917,0	0,0	0,0	1203,6	20670,6	0,0	0,0
2034,0	0,0	0,0	0,0	0,0	1543,5	14460,5	0,0	0,0	1827,5	22498,2	0,0	0,0
2035,0	0,0	0,0	0,0	0,0	2694,4	17154,9	0,0	0,0	3007,0	25505,1	0,0	0,0
2036,0	0,0	0,0	0,0	0,0	1854,9	19009,9	0,0	0,0	1944,0	27449,1	0,0	0,0
2037,0	0,0	0,0	0,0	0,0	934,2	19944,1	0,0	0,0	915,6	28364,7	0,0	0,0
2038,0	0,0	0,0	0,0	0,0	1665,4	21609,5	0,0	0,0	1518,8	29883,5	0,0	0,0
2039,0	0,0	0,0	0,0	0,0	2179,9	23789,4	0,0	0,0	1839,8	31723,4	0,0	0,0
2040,0	0,0	0,0	0,0	0,0	365,6	24155,0	0,0	0,0	283,7	32007,0	0,0	0,0
2041,0	0,0	0,0	0,0	0,0	3533,9	27688,8	0,0	0,0	2502,0	34509,0	0,0	0,0
2042,0	0,0	0,0	0,0	0,0	3398,5	31087,3	0,0	0,0	2175,0	36684,1	0,0	0,0
2043,0	0,0	0,0	0,0	0,0	1963,3	33050,6	0,0	0,0	1123,0	37807,1	0,0	0,0
2044,0	0,0	0,0	0,0	0,0	2477,7	35528,3	0,0	0,0	1248,8	39055,8	0,0	0,0
2045,0	0,0	0,0	0,0	0,0	4197,3	39725,7	0,0	0,0	1830,0	40885,9	0,0	0,0
2046,0	0,0	0,0	0,0	0,0	1543,6	41269,2	0,0	0,0	568,0	41453,9	0,0	0,0
2047,0	0,0	0,0	0,0	0,0	3791,2	45060,5	0,0	0,0	1137,4	42591,3	0,0	0,0
2048,0	0,0	0,0	0,0	0,0	731,2	45791,6	0,0	0,0	169,6	42760,9	0,0	0,0
2049,0	0,0	0,0	0,0	0,0	1326,9	47118,5	0,0	0,0	217,6	42978,5	0,0	0,0
2050,0	0,0	0,0	0,0	0,0	3209,0	50327,5	0,0	0,0	308,1	43286,6	0,0	0,0
2051,0	0,0	0,0	0,0	0,0	6133,5	56461,0	0,0	0,0	171,7	43458,3	0,0	0,0

Source: Self Elaboration

3.2.4 Net GHG Emission Reductions and Removals

3.2.4.1 Step 9 Ex Ante Total net anthropogenic GHG Emission

3.2.4.1.1 Step 9.1 Significance assessment

Not applied because the tool indicated by Verra to evaluate the "Tool for testing significance of GHG emissions in A/R CDM project activities", to determine the significance of each of the ex ante calculated carbon stock changes and GHG emissions is inactive (https://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-am-tool-04-v1.pdf/history_view).

3.2.4.1.2 Step 9.2 Calculation of ex ante estimates of total not GHG emission reductions

The net reduction of anthropogenic GHG emissions of the proposed AUD project activity is calculated according to equation 19 of VM0015.

The net reduction in anthropogenic GHG emissions of the AUD project activity was calculated using the following formula:

REDDt = (CBSLPAt + EBBBSLPAt) – (CPSPAt + EBBPSPAt) – (CLKt + ELKt)

3.2.4.1.3 Step 9.3 Calculation of Ex-ante verified Carbon Units (VCUs)

Equation 20 was used to estimate the number of VCUs. Using the "AFOLU Non-Permanence Risk Tool v3.2", the probable natural and human-induced risks to climate benefits were verified. The Non-Permanence Risk analysis using the aforementioned tool generated a buffer of 20%.

VCUt = □REDDt – VBCt (20)

Table 30 - (Table 36.VM0015) Ex ante estimated net anthropogenic GHG emission reductions (REDDt) and Verified Carbon Units (VCUt).

Project Year *t*	Baseline carbon stock changes		Baseline GHG emissions		*Ex ante* project carbon stock changes		*Ex ante* project GHG emissions		*Ex ante* leakage carbon stock changes		*Ex ante* leakage GHG emissions		Ex ante net anthropogenic GHG emissions reductions		*Ex ante* VCUs tradable		*Ex ante* buffer credits	
	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
	$\Delta CBSLPA_t$	$\Delta CBSLPA$	$EBBBSLPA_t$	$EBBBSLPA$	$\Delta CPSPA_t$	$\Delta CPSPA$	$EBBPSPA_t$	$EBBPSPA$	ΔCLK_t	ΔCLK	ELK_t	ELK	$\Delta REDD_t$	$\Delta REDD$	VCU_t	VCU	VBC_t	VBC
	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2022	48.744	48.744	0	0	0	0	0	0	4.874	4.874	0	0	43.869	43.869	34.121	34.121	9.749	9.749
2023	14.623	63.367	0	0	0	0	0	0	1.413	6.287	0	0	13.211	57.080	10.286	44.407	2.925	12.673
2024	0	63.367	0	0	0	0	0	0	0	6.287	0	0	0	57.080	0	44.407	0	12.673
2025	13.810	77.177	0	0	0	0	0	0	1.240	7.527	0	0	12.570	69.650	9.808	54.215	2.762	15.435
2026	0	77.177	0	0	0	0	0	0	0	7.527	0	0	0	69.650	0	54.215	0	15.435
2027	46.577	123.754	0	0	0	0	0	0	3.866	11.393	0	0	42.711	112.361	33.396	87.610	9.315	24.751
2028	0	123.754	0	0	0	0	0	0	0	11.393	0	0	0	112.361	0	87.610	0	24.751
2029	27.892	151.646	0	0	0	0	0	0	2.125	13.518	0	0	25.767	138.128	20.188	107.798	5.578	30.329
2030	9.478	161.124	0	0	0	0	0	0	690	14.208	0	0	8.788	146.916	6.893	114.691	1.896	32.225
2031	32.766	193.891	0	0	0	0	0	0	2.274	16.482	0	0	30.492	177.408	23.939	138.630	6.553	38.778
2032	45.222	239.113	0	0	0	0	0	0	2.985	19.467	0	0	42.238	219.646	33.193	171.823	9.044	47.823
2033	19.227	258.340	0	0	0	0	0	0	1.204	20.671	0	0	18.023	237.669	14.178	186.001	3.845	51.668
2034	30.870	289.210	0	0	0	0	0	0	1.828	22.498	0	0	29.043	266.712	22.869	208.870	6.174	57.842
2035	53.889	343.098	0	0	0	0	0	0	3.007	25.505	0	0	50.882	317.593	40.104	248.974	10.778	68.620
2036	37.099	380.197	0	0	0	0	0	0	1.944	27.449	0	0	35.155	352.748	27.735	276.709	7.420	76.039
2037	18.685	398.882	0	0	0	0	0	0	916	28.365	0	0	17.769	370.517	14.032	290.741	3.737	79.776
2038	33.308	432.190	0	0	0	0	0	0	1.519	29.884	0	0	31.789	402.306	25.127	315.868	6.662	86.438
2039	43.598	475.788	0	0	0	0	0	0	1.840	31.723	0	0	41.758	444.065	33.039	348.907	8.720	95.158
2040	7.312	483.099	0	0	0	0	0	0	284	32.007	0	0	7.028	451.092	5.566	354.473	1.462	96.620
2041	70.677	553.777	0	0	0	0	0	0	2.502	34.509	0	0	68.175	519.268	54.040	408.512	14.135	110.755
2042	67.970	621.747	0	0	0	0	0	0	2.175	36.684	0	0	65.795	585.062	52.201	460.713	13.594	124.349
2043	39.266	661.012	0	0	0	0	0	0	1.123	37.807	0	0	38.143	623.205	30.290	491.003	7.853	132.202
2044	49.555	710.567	0	0	0	0	0	0	1.249	39.056	0	0	48.306	671.511	38.395	529.398	9.911	142.113
2045	83.947	794.514	0	0	0	0	0	0	1.830	40.886	0	0	82.117	753.628	65.327	594.725	16.789	158.903
2046	30.871	825.385	0	0	0	0	0	0	568	41.454	0	0	30.303	783.931	24.129	618.854	6.174	165.077
2047	75.824	901.209	0	0	0	0	0	0	1.137	42.591	0	0	74.687	858.618	59.522	678.376	15.165	180.242
2048	14.623	915.832	0	0	0	0	0	0	170	42.761	0	0	14.453	873.071	11.529	689.905	2.925	183.166
2049	26.538	942.370	0	0	0	0	0	0	218	42.979	0	0	26.320	899.392	21.013	710.918	5.308	188.474
2050	64.179	1.006.549	0	0	0	0	0	0	308	43.287	0	0	63.871	963.263	51.035	761.953	12.836	201.310
2051	122.670	1.129.220	0	0	0	0	0	0	172	43.458	0	0	122.499	1.085.761	97.965	859.917	24.534	225.844

Source: Self Elaboration

3.3 Monitoring

3.3.1 Data and Parameters Available at Validation

Data/Parameter	Ctot
Data Unit	tCO22ha-1
Description	The average carbon stock per hectare across all carbon pools in the forestry class used in the baseline scenario.
Source of data	This estimate is obtained through the application of allometric equations, expansion factors previously published in the scientific literature and data collected in the field.
Value applied	
Justification of choice of data or description of measurement methods and procedures applied	Aboveground and belowground biomass estimates were made using data from forest inventory and allometric equations performed in areas similar to Project area
Purpose of data	alculation of baseline emissions leak calculation Determining the baseline scenario Calculation of project emissions
Comments	See the documents: -Forest Carbon Inventory Report

Data/Parameter	DBH
Data Unit	cm
Description	Diameter at breast height (130 cm) for each tree with DBH equal to or greater than 10 cm in each portion of the forest inventory
Source of data	Field data collected during the forest inventory
Value applied	Available in table with field data

Justification of choice of data or description of measurement methods and procedures applied	This requirement is required by the VCS Methodology VM0015 and consists of collecting forest inventory data in several spatially distributed plots, and the collection must have been carried out less than 10 years ago.
Purpose of data	- Determining the baseline scenario - Calculation of baseline emissions - Calculation of project emissions - Leak calculation
Comments	Key variable for stock and stock loss estimates

Data/Parameter	B= biomass equation
Data Unit	Kg (peso)
Description	Equação para estimar biomassa a partir do DBH
Source of data	Citar artigo para a biomassa
Value applied	B=equação da biomassa
Justification of choice of data or description of measurement methods and procedures applied	This is an equation developed specifically for forests that have characteristics similar to those found in the reference region.
Purpose of data	- Determining the baseline scenario - Calculation of baseline emissions - Calculation of project emissions - Leak calculation
Comments	-

Data/Parameter	CF
Data Unit	t
Description	Carbon contained in dry biomass
Source of data	Cite article for biomass
Value applied	485

Justification of choice of data or description of measurement methods and procedures applied	This value was obtained through research in the scientific literature.
Purpose of data	- Determining the baseline scenario - Calculation of baseline emissions - Calculation of project emissions - Leak calculation
Comments	-

Data/Parameter	44/12
Data Unit	tCO2e
Description	Conversion factor from mass of carbon to mass of CO2e
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 AFOLU
Value applied	44/12
Justification of choice of data or description of measurement methods and procedures applied	default IPCC value
Purpose of data	- Determining the baseline scenario - Calculation of baseline emissions - Calculation of project emissions - Leak calculation
Comments	-

3.3.2 Data and Parameters Monitored

Climate	
Data/Parameter	**ABSLPAicl,t**
Data Unit	Hectare (ha)

Description	Areas of forest cover converted into areas without forest cover within the Project area
Source of data	Remote sensing images along with GPS data collected in the field
Description of measurement methods and procedures to be applied	For monitoring the forest cover in the project area, the satellite image analysis method will be used. In the event of unavailability of data from the PRODES system, automatic classification and visual interpretation of images from other optical sensors or SAR data will be used for monitoring.
Frequency of monitoring/recording	Yearly
Value applied	Average annual deforestation in the project area during the crediting period: 0 ha.
Monitoring equipment	Remote sensing images obtained through a digital processing program will be used, in addition to a geographic information system and a navigation GPS.
QA/QC procedures to be applied	In the QA/QC process, images with a spatial resolution of 30 m or greater will be used and the minimum mapping unit will be 1 ha. The classifications obtained will be evaluated through data collected in the field, using GPS navigation. A minimum accuracy of 90% is required on the land use and land cover classification map.
Purpose of Data	Estimates of project emissions
Calculation method	In the case of detection of unplanned deforestation areas, the Forest Coverage Benchmark Map will be updated using map algebra.
Comments	PRODES: http://www.dpi.inpe.br/prodesdigital/prodes.php

Data/Parameter	**ΔCabBSLLKt**
Data Unit	Hectare (ha)
Description	Changes in the total carbon stock in the leakage belt
Source of data	Calculated
Description of measurement methods and procedures to be applied	-Creation of a list of leak prevention activities; -Confection of a map showing the areas of interventions and the type of interventions; -Identification of areas where preventive activities impact the carbon stock; -The existing non-forest classes in these areas will be identified in the case of the baseline; - Determination of carbon stocks in the identified classes; -Changes in carbon stock in the leakage management areas in the project scenario will be reported using Table 30.b of Methodology VM0015; - Changes in the net carbon stock caused by the prevention measures during the fixed baseline period and optionally in the project crediting period will be calculated; - The results of the estimates will be informed in Table 30.c of Methodology VM0015.
Frequency of monitoring/recording	Determined according to the activity
Value applied	Not applied
Monitoring equipment	Determined according to the activity
QA/QC procedures to be applied	Determined according to the activity
Purpose of Data	Leakage estimates
Calculation method	Determined according to the activity
Comments	Not applied

Data/Parameter	**Frequency of surveillance and patrol operations**
Data Unit	Number of operations per year
Description	Record of the number of surveillance operations carried out in the project area and leakage belt during the monitoring period
Source of data	Asset Inspection Reports.
Description of measurement methods and procedures to be applied	To be defined
Frequency of monitoring/recording	To be defined
Value applied	Not applicable
Monitoring equipment	Not applicable
QA/QC procedures to be applied	To be defined
Purpose of Data	Leakage estimates
Calculation method	Not applicable
Comments	Asset Monitoring Reports will be implemented at from the validation of the Project.

Data/Parameter	**Monitoring of forest cover by high-resolution satellite imagery**
Data Unit	Number of operations per year
Description	Land use and land cover monitoring reports will be presented through high resolution satellite images
Source of data	Monitoring reports

Description of measurement methods and procedures to be applied	Forest cover monitoring data in the Project area and leakage belt will be collected through analysis of high-resolution satellite images. The images of the analyzed periods will be classified automatically, and through visual interpretation. in order to identify changes in land use in the monitored area.
Frequency of monitoring/recording	To be defined
Value applied	Not applicable
Monitoring equipment	High resolution remote sensing images will be used, processed in a data cloud and in a digital processing program, geographic information system and a navigation GPS.
QA/QC procedures to be applied	Special resolution images of 3,125 m and 5 m will be used, with GSD (Soil Sampling Distance) greater than 4.5 m and 6.5 m, respectively, and the minimum mapping unit will be 1 ha. The validation and evaluation of the classifications will be carried out through data collected in the field, with the aid of GPS navigation. A minimum accuracy of 80% is required on the land use and land cover classification map.
Calculation method	In the case of detection of unplanned deforestation areas, the Forest Coverage Benchmark Map will be updated using map algebra.

Comments	High resolution images to complement the official deforestation information obtained by PRODES (INPE), with the main objective of improving the heritage surveillance process in the Project Area. Since the complementary images have better spatial, temporal and radiometric resolution.

Communities and Other Actors	
Data/Parameter	**Number of courses and training**
Data Unit	Number per year
Description	Number of courses and training carried out
Source of data	Monitoring Report and Activity Report
Description of measurement methods and procedures to be applied	Questionnaires and attendance list applied to participants
Frequency of monitoring/recording	Annual
Value applied	Not applicable
Monitoring equipment	Not applicable
QA/QC procedures to be applied	The validation of the information present in the preliminary version of the Project Monitoring Report will be carried out together with the proponents before the official publication of the report.
Calculation method	Not applicable
Comments	-

Data/Parameter	**Number of producers benefited by the REDD+ Project**
Data Unit	Number of families involved with the project
Description	Number of families participating in REDD+ Project activities receiving technical follow-up after the training phase
Source of data	Activity reports and interviews
Description of measurement methods and procedures to be applied	Reports generated by the technical manager appointed to advise the associations participating in the Project's social activities
Frequency of monitoring/recording	Yearly
Value applied	Not applicable
Monitoring equipment	Not applicable
QA/QC procedures to be applied	The validation of the information present in the preliminary version of the Project Monitoring Report will be carried out together with the proponents before the official publication of the report.
Calculation method	Not applicable
Comments	-

Data/Parameter	**Number of persons trained**
Data Unit	Number per year
Description	Number of people trained per year
Source of data	Monitoring Report and Activity Report
Description of measurement methods and procedures to be applied	Structured interviews and supporting documents (attendance list)
Frequency of monitoring/recording	Yearly
Value applied	Not applicable
Monitoring equipment	Not applicable

QA/QC procedures to be applied	The validation of the information present in the preliminary version of the Project Monitoring Report will be carried out together with the proponents before the official publication of the report.
Calculation method	Not applicable
Comments	-

Data/Parameter	**Gross revenue from new activities implemented after the beginning of training courses and technical assistance**
Data Unit	Reais (R$)
Description	Additional income generated for participants through new activities, agricultural and/or extractive activities fostered by the Project
Source of data	Monitoring Report and Activity Report
Description of measurement methods and procedures to be applied	Structured interviews with families directly involved with the Project.
Frequency of monitoring/recording	Every 3 years (10 reports during the project).
Value applied	Not applicable
Monitoring equipment	Not applicable
QA/QC procedures to be applied	The validation of the information present in the preliminary version of the Project Monitoring Report will be carried out together with the proponents before the official publication of the report.
Calculation method	Not applicable
Comments	The first evaluation will be 3 years after the Project validation.

Data/Parameter	**Number of productive chains implemented and/or encouraged by the Project**

Data Unit	Number of products promoted by the project
Description	List of new productive chains implemented by the producers involved in the project.
Source of data	Monitoring Report and Activity Report
Description of measurement methods and procedures to be applied	Reports generated by the technical manager appointed to advise the associations participating in the Project's social activities
Frequency of monitoring/recording	Yearly
Value applied	Not applicable
Monitoring equipment	Not applicable
QA/QC procedures to be applied	Será realizada a validação das informações presentes na versão preliminar do Relatório de Acompanhamento do Projeto em conjunto com os proponentes antes da publicação oficial do relatório.
Calculation method	Not applicable
Comments	-

Data/Parameter	**Frequency of publication of Activity Reports**
Data Unit	Verification number/event
Description	Time gap between publications and evaluations of activity reports.
Source of data	Monitoring Report and Activity Report
Description of measurement methods and procedures to be applied	Structured interviews and questionnaires
Frequency of monitoring/recording	Yearly
Value applied	Not applicable
Monitoring equipment	Not applicable

QA/QC procedures to be applied	Evaluation of data compiled and systematized in a meeting with stakeholders to support the planning of future activities.
Calculation method	Not applicable
Comments	-

Biodiversity	
Data/Parameter	**Number of animals species monitored**
Data Unit	Number
Description	Number of fauna species monitored
Source of data	Field Data and Fauna Monitoring Report
Description of measurement methods and procedures to be applied	To be defined
Frequency of monitoring/recording	Once every 2 years
Value applied	Not applicable
Monitoring equipment	Not applicable
QA/QC procedures to be applied	To be defined
Calculation method	Not applicable
Comments	-

Data/Parameter	**Diversity of the vegetal community in permanent plots**
Data Unit	Not applicable
Description	Variety of species found in the plant community within the permanent plots
Source of data	Field Data and Forest Monitoring/Inventory Report

Description of measurement methods and procedures to be applied	To be defined
Frequency of monitoring/recording	Once every 2 years
Value applied	Not applicable
Monitoring equipment	Not applicable
QA/QC procedures to be applied	To be defined
Calculation method	Not applicable
Comments	-

Data/Parameter	**Status of relevant species in the IUCN Red List of Endangered Species**
Data Unit	Not applicable
Description	Ongoing monitoring of species relevant to the Project in relation to their status on the IUCN List of Threatened Species, with emphasis on species referred to as Critically Endangered (CR) or Endangered (E).
Source of data	Field Data and Fauna and Flora Monitoring Report
Description of measurement methods and procedures to be applied	Systematization and comparison of data and information collected in fauna surveys and ethnozoological interviews with the IUCN Official List, available at: http://www.iucnredlist.org As well as the Brazilian list of endangered species
Frequency of monitoring/recording	Once every 2 years
Value applied	Not applicable
Monitoring equipment	Not applicable
QA/QC procedures to be applied	Comparison of different sources of information (empirical research and traditional knowledge)

Calculation method	Not applicable
Comments	-

Data/Parameter	**Use of chemical pesticide, biological control agent or other types of inputs**
Data Unit	Number
Description	Monitoring the type of inputs used in project activities, making sure they are not chemical pesticides, biological control agents or other types of inputs.
Source of data	Field Data and Agricultural Reporting
Description of measurement methods and procedures to be applied	To be defined
Frequency of monitoring/recording	Yearly
Value applied	0
Monitoring equipment	Not applicable
QA/QC procedures to be applied	To be defined
Calculation method	To be defined
Comments	-

3.3.3 Monitoring Plan

The ex post methodology, which will be implemented soon after the start of the project, consists of two fundamental tasks:

- Regular monitoring of changes in carbon stocks and greenhouse gas (GHG) emissions during the established reference period;

- Monitoring of the main parameters of the baseline, in order to assess the need to revise the baseline at the end of the established period.

3.3.3.1 TASK 1: Monitoring of Carbon Stock Changes and GHG Emissions for Periodical Verifications

According to VM0015, there are three main monitoring tasks:

● Monitoring of actual changes in carbon stocks and GHG emissions in the project area;

● leak monitoring; and

● Ex post calculation of the net reduction of anthropogenic GHG emissions.

In each task were included: Technical description of tasks, data to be collected, overview of data collection procedures, quality control and assurance procedures, data archiving, and, organization and responsibilities of the parties involved in all of the above . In order to allow a transparent comparison between ex ante and ex post estimates, use the same formats and tables presented in Part 2 of the methodology.

3.3.3.1.1 Task 1.1 Monitoring of actual carbon stock changes and GHG emissions within the Project Area

3.3.3.1.1.1 Technical description of the monitoring tasks

Within the scope of the project, changes in carbon stocks and GHG emissions will be monitored through the analysis of avoided unplanned deforestation. The team responsible for the project will develop actions to monitor REDD+ activities, which aim to prevent unplanned deforestation, using remote sensing to verify forest cover areas, in addition to carrying out field verifications in the project area.

Changes in carbon stock due to conversion of forested to non-forested areas by unplanned and planned deforestation will be monitored. Likewise, changes in carbon stock due to uncontrolled forest fires and other catastrophic events will be monitored and discounted against the Project scenario where they are significant.

All records and maps generated during project implementation will be maintained and made available to VCS verifiers during verification, in order to prove that the planned activities were actually carried out.

3.3.3.1.1.2 Data to be collected

Parameter	Description	Unit	Source	Frequency
ABSLPAt	Baseline annual deforestation area in the Project Area in year t	ha (hectare)	Qualified and scientifically recognized sources	Yearly

ΔCUDdPAt	Total change in actual carbon stock due to unavoidable unplanned deforestation in year t in the Project Area	tCO2e	Calculated through the detected areas of forest loss in the Project Area and the average carbon stock	Yearly
AUFPAicl,t	Areas affected by forest fires in the icl class where carbon stock recovery occurs in the year	ha (hectare)	Adequate sources of detection of forest fires and the scars caused for identification and classification of affected areas	Whenever forest fires occur
ΔCUFdPAt	Total reduction in carbon stock due to unplanned (and planned - when applicable) forest fires in year t in the Project Area	tCO2e	Calculated through the affected areas in the Project Area and the average carbon stock	Whenever forest fires occur
ACPAicl,t	Analysis Area within the Project Area affected by catastrophic events in the icl class in year t	ha (hectare)	High resolution satellite images and qualified and scientifically recognized sources	Whenever a catastrophic event occurs (including wildfires)
ΔCUCdPAt	Total reduction in carbon stock due to catastrophic events in year t in the Project Area	tCO2e	Calculated through the affected areas in the Project Area and the average carbon stock	Whenever a catastrophic event occurs (including wildfires)

3.3.3.1.1.3 Overview of data collection procedures

3.3.3.1.1.3.1 Monitoring of land use and land cover change within the Project Area

The Project provides for continuous monitoring of deforestation, both planned and unplanned, in the Project Area. This monitoring will be carried out by mapping the forest cover, using qualified and scientifically recognized sources, such as PRODES and DETER, developed by the National Institute for Space Research, in addition to MapBiomas, created by a collaborative network of NGOs, universities and startups from technology. The selection of the methodology used will undergo a rigorous evaluation, aiming to meet the requirements of data quality and accuracy.

To ensure greater flexibility in the deforestation monitoring process, different classification and visual interpretation techniques will be adopted, including complementary mapping using alternative images and sensors, as well as data collection in the field.

Once the deforestation data are obtained, they will be compared with the baseline scenario, allowing estimating the greenhouse gas emissions avoided in the monitored period. For this, the differences between expected deforestation and actual deforestation will be considered. This comparison will be fundamental to evaluate the effectiveness of the actions implemented by the Project.

Finally, it is important to highlight that all data collected during monitoring will be preserved and will be available for verification by the competent bodies, in order to demonstrate the proper execution of Project activities.

3.3.3.1.1.3.2 Monitoring of carbon stock changes and non-CO2 emissions

Monitoring changes in carbon stock due to deforestation in the Project Area will be carried out by multiplying the deforested areas identified in year t by the initial average values of carbon stock in the forestry class. The result of this multiplication will be subtracted from the estimated carbon stock for the Reference Region in a post-deforestation scenario. This calculation will provide the net amount of carbon stock that has been reduced in year t. If there is a significant reduction in the carbon stock due to deforestation in the Project Area, this reduction will be presented in the verification processes using Table 29 of VM0015.

With regard to the monitoring of gas emissions other than CO2, these will be monitored through photo-interpretation of high-resolution images and other adequate sources of detection of forest fires and resulting scars, in order to identify and classify the affected areas . To verify vegetation damage and recovery over time, analyzes of the normalized difference vegetation index (NDVI) will be carried out. When necessary, there will be field verification of the affected areas. If there are forest areas affected, the reduction in the carbon stock caused by forest fires will be evaluated by multiplying the mapped area of forest loss by the average forest carbon stock. If there is a significant reduction in the carbon stock, this reduction will be reported in the verification processes using Tables 25e, 25f and 25g of methodology VM0015.

To make the deforestation mapping process more flexible, different classification techniques and visual interpretation may be used throughout the Project, including complementary mapping with alternative images and sensors, as well as data collected in the field. The choice of monitoring methodology will undergo a careful evaluation, in order to meet data quality and accuracy requirements.

3.3.3.1.1.3.3 Monitoring of natural disturbances and other catastrophic events

Carbon stock reduction and increase in GHG emissions, as well as significant carbon stock reduction caused by natural disturbances or catastrophic events will be tracked, monitored and reported similarly to non-CO2 emissions in the Project Area. Therefore, if there is a significant decrease in the carbon stock due to natural disturbances or catastrophic events, this reduction will be reported in the verification processes using Tables 25e, 25f and 25g of VM0015.

3.3.3.1.1.4 Quality control and quality assurance procedures

To ensure the accuracy and quality of the analyzes carried out, the quality control and assurance procedures described in methodology VM0015 version 1.1 will be applied, which will be applicable regardless of the type of data used in the monitoring. The evaluation of general accuracy and the kappa index will be obtained from a confusion matrix generated by a geographic information system, using at least 100 random points distributed over the analyzed area. Validation will be performed using high spatial resolution satellite images and/or data collected in the field. The minimum mapping accuracy for each class or category in the land use and land cover map is required to be 80%.

In addition to the accuracy process, when necessary, field verifications will be carried out in areas where there is conversion of forest areas, whether due to unplanned deforestation, uncontrolled forest fires or other catastrophic events. These field checks will serve to ensure the accuracy of the data obtained from the analyses.

3.3.3.1.1.5 Data archiving

The executor will store all Project data and reports in digital files throughout the duration of the Project. All documents relating to Project monitoring will be made available to auditors at each verification event.

3.3.3.1.1.6 Organization and responsibilities of the parties involved in all of the above

All procedures described are the responsibility of the project proponent.

3.3.3.1.1.6.1 Task 1.2 Monitoring of Leakage

Leakage monitoring by the Project involves two main scopes, which are:

I. changes in carbon stocks and GHG emissions associated with leakage prevention activities, and

II. changes in carbon stocks and GHG emissions associated with leakage from displacement activities.

The procedures applied to this monitoring plan include the

which is developed and applied within the perspective of the project, therefore, within the scope ii) monitoring of changes in GHG emissions derived from biomass burning was not contemplated, as it was not considered in the baseline.

The details on the monitoring of the two scopes are presented below.

3.3.3.1.1.7 Technical description of the monitoring tasks

Although no stock reduction is foreseen in leakage prevention activities, should they prove necessary during Project implementation, the ex-ante changes in carbon stock and GHG emissions associated with these activities will be estimated according to step 8 of VM0015. If results are relevant, they will be monitored and data will be made available to verifiers at each verification event using Tables 30b, 30c, 31, 32 and 33 of M0015 version 1.1.

Changes in carbon stock and GHG emissions associated with leakage from displacement activities will be monitored using the same technique applied in monitoring changes in carbon stock due to conversion of forested areas to non-forested areas by unplanned deforestation in the Project Area .

3.3.3.1.1.8 Data to be collected

Parameter	Description	Unit	Source	Frequency
ΔBSLLKt	Baseline annual deforestation area in the Leaket Belt in year t	ha (hectare)	Qualified and scientifically recognized sources	Annual
ΔCLPMLKt	Reduction in real carbon stock due to leakage prevention activities in the Leaket Belt in year t	tCO2e	Follow-up report of project activities that were implemented and other records related to leakage prevention activities	Whenever it occurs
ΔCADLKt	Areas of planned deforestation in the icl forest class in year t in the Project Area	tCO2e	Calculated using the detected areas of forest loss in the Leakage Belt, the average carbon stock and the estimated loss in baseline carbon stock for the Leakage Belt	Annual
EgLKt	Emissions from grazing animals in areas in leakage management in year t	tCO2e	Existing records on the practice of grazing	Whenever it occurs

3.3.3.1.1.9 Overview of data collection procedures

3.3.3.1.1.9.1 Changes in carbon stocks and GHG emissions associated with leakage prevention activities

Monitoring, considering data collection procedures, will consider the following activities:

● List of leak prevention activities;

● Mapping of intervention areas and the type of intervention;

● Mapping of areas where prevention activities

leaks have an impact on the carbon stock;

● Identification of existing non-forest classes in these areas in the

baseline case;

● Estimation of carbon stocks in the identified classes using

secondary data (literature);

● Reporting of changes in carbon stock in the areas of

leakage management under the project scenario using the

Table 30b of VM0015;

● Calculation of net changes in carbon stock caused by

leakage prevention measures during the fixed period of the line

baseline and project crediting period;

● Report of the results in Table 30c of the approved VM0015.

3.3.3.1.1.9.2 Changes in carbon stock and GHG emissions associated with leakage due to displacement of activities

These will be monitored using the same methods applied to monitor the conversion of forested to non-forested areas by unplanned deforestation in the Project Area. If in the Leakage Belt there is a deforestation event larger than expected for the baseline scenario and it is attributed to agents of deforestation in the

Project Area, the carbon stock losses will be accounted for and reported using either Table 22c or Table 22c. 21c of VM0015.

3.3.3.1.1.9.3 Quality control and quality assurance procedures

Quality control and assurance in relation to the monitoring of changes in the carbon stock and GHG emissions associated with leakage prevention activities will be determined according to the activity, if implemented, already in relation to changes in the carbon stock and in the GHG emissions associated with leakage due to displacement of activities will be carried out through accuracy analysis, as indicated by VM0015.

Validation will be performed using high spatial resolution satellite images and/or data collected in the field. The minimum mapping accuracy for each class or category in the land use and land cover map must be 80%.

3.3.3.1.1.9.4 Data archiving

The executor will store all Project data and reports in digital files for the duration of the Project. All documents relating to Project monitoring will be made available to auditors at each verification event.

3.3.3.1.1.9.5 Organization and responsibilities of the parties involved in all of the above

All procedures described are the responsibility of the project proponent.

3.3.3.1.2 Monitoring of ex-post reductions in net anthropogenic GHG emissions

The ex-post calculation of net reductions in anthropogenic GHG emissions will be done in a similar way to the ex-ante calculation, differing only that the estimated ex-post changes in carbon stock and GHG emissions will be used in the case of the project scenario and leakage. Ex-post estimated net anthropogenic GHG emissions and the calculation of Verified Carbon Units (VCUt and VBCt) will be reported using the same table format used for the ex-ante assessment.

The details on monitoring are presented below.

3.3.3.1.2.1 Technical description of the monitoring tasks

The results will be represented using Table 36 of Methodology VM0015, accompanied by spatial data, such as deforestation maps (when available). A map showing the cumulative areas credited within the Project Area will be updated and presented to the VVB at each verification event.

3.3.3.1.2.2 Data to be collected

Parameter	Description	Unit	Source	Frequency

ΔREDD,t	Reductions in net GHG emissions attributable to Project AUD activities year t	tCO2e	Calculation by subtracting changes in the ex-post carbon stock from the baseline scenario	Annual
VCU,t	Number of Verified Carbon Units (VCUs) to be made available for sale in year t	tCO2e	Calculation by subtracting ex-post Project net GHG emission reductions from the buffer	Annual

3.3.3.1.2.3 Overview of data collection procedures

The calculation of the number of Verified Carbon Units (VCUs) to be produced by the Project's activities in year t will be done using Equations 19 and 20 of VM0015.

3.3.3.1.2.4 Quality control and quality assurance procedures

In order to ensure that the data is appropriate for the verification process and that the number of Verified Carbon Units is reliable, we will employ all tasks and tools listed in part 2 of Approved Methodology VM0015.

3.3.3.1.2.5 Data archiving

The executor will store all Project data and reports in digital files for the duration of the Project. All documents relating to Project monitoring will be made available to auditors at each verification event.

f) Organization and responsibilities of the parties involved in all of the above

All procedures described are the responsibility of the project proponent.

3.3.3.2 Revisiting the Baseline Projections for the Future Fixed Baseline Period

3.3.3.2.1 Update information on agents, drivers and underlying causes of deforestation

At the end of each 5-year fixed baseline period, the projected annual baseline deforestation areas for the reference region will be reviewed and eventually adjusted for the subsequent fixed baseline period and subjected to independent validation. Adjustments will be made using the methods described in part 2 of the methodology and using data obtained from monitoring LU/LC changes in the reference region during the previous fixed baseline period. in addition to statistical and spatial data, studies and information on agents, motivations and underlying causes of deforestation necessary to carry out Steps 2 and 3 of VM0015.

3.3.3.2.2 Adjustment of the land-use and land-cover change component of the baseline

Step 4 of Methodology VM0015 will be redone considering the period of the last 5 years and using updated variables on the agents, drivers and underlying causes of deforestation in the Reference Region. The area of annual deforestation and the location of deforestation in the baseline are the two main components to be revised.

The assumptions and hypotheses considered in modeling the dynamic component of future deforestation (population data) as well as the data used in the spatial projection (update of roads, location and distance of new deforestation) will be reviewed and updated.

3.3.3.2.3 Adjustment of the carbon component of the baseline

According to the results generated during the changes in the carbon stock monitoring processes throughout the Project, the spatial estimate of the carbon component can be revised in Methodology VM0015 version 1.1, Part 3, item 1.1.3. Thus, if there are more accurate estimates, from the use of techniques, such as LIDAR or SAR interferometric data, they will be applied in the baseline revisitation period.

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

The Climate Impacts Monitoring Plan will cover key issues for demonstrating the reduction of emissions from deforestation and degradation due to avoided unplanned deforestation, according to the applied methodology VM0015, and changes in the carbon stock over the life cycle of the project due to changes in land use within the Project Area and the Leakage Belt.

The monitoring plan, as well as the results obtained by monitoring the Project, will be made available to the public through a page on the official website, using playful and innovative methods such as dashboards and dynamic maps. Summary documents referring to the monitoring plan and results, as well as relevant information, will be made available to communities and interested parties through meetings, lectures and by physical means in the project area and nearby communities.

In addition, similarly to the plans for monitoring activities with communities and biodiversity, it will be necessary to draw up a Dissemination and Communication Plan to be established with the managers of the Territorial Information Platform.

3.4 Optional Criterion: Climate Change Adaptation Benefits

3.4.1 Regional Climate Change Scenarios (GL 1.1)

Duffy et. al, 2015, demonstrated that global climate change could increase the frequency of both droughts and extreme rainfall in the Amazon before the year 2050. According to the study, areas affected by extreme droughts in the western Amazon could triple by 2100 and simultaneously areas subject to extreme rainfall events will also grow after 2040.

The Amazonian summers (drought) will be elongated and the rainy seasons shorter, but even so we will be subject to more intense rains due to the greater evaporation of water from the oceans. These events, combined with persistent deforestation in the region, will cause massive tree deaths, wildfires and turn the region into a carbon emitter for the atmosphere.

According to the newspaper, A Gazeta, "those who live in Acre, however, have the distinct impression that the predictions of these scientists are delayed, since almost every year since 2005 the eastern region of the state has experienced events of this kind. Severe droughts occurred in 2005, 2010 and 2016. The city of Rio Branco declared a flood emergency for seven consecutive years (2009-2015). The flood that occurred in 2015 was the largest in history." To highlight the floods that also occurred in subsequent years, including in early 2023.

Some researchers (Salazar and others, 2007) made simulations using, among other variables, air temperature and humidity, precipitation, water in the soil, duration of dry and rainy periods, and concluded that the increase in global temperature may transform, by the year 2100, a large area located at the eastern and southern ends of the Amazon into a region climatically unsuitable for the existence of forests.

According to this forecast, the large trees of this region will not survive the most prolonged droughts and gradually the current native forest will be replaced by vegetation very similar to the "savannas" (similar to the Cerrado of Central Brazil). Depending on the intensity of the changes caused by global warming, it is estimated that between 30 and 60% of the Amazon's forest areas will turn into savannas.

Other studies (Huntingford and others, 2013) suggest a very different situation. The excess heat generated by global warming and the increase of CO2 in the atmosphere may stimulate the more vigorous growth of trees in the favorable period (rainfall) and the fixation of CO2, compensating for the losses of the prolongation of dry periods.

The proof of the theories proposed above will only happen with the passage of time, but the historical droughts that occurred in the Amazon in 2005 and 2010 were responsible for providing some answers. During the droughts of 2005 and 2010 there was a high mortality of trees and fires that reached more than 85,000 square kilometers of primary forests in the region. Another important finding was the finding that in the 2010 drought the forests of the Amazon emitted between 1 and 2% of the carbon they normally store (Duffy and others, 2015).

In the drought of 2005 about 30% of them were affected directly and indirectly and in 2010 it was almost 50%. As the recovery of large trees is slow (Saatchi and others, 2013), the short interval between droughts has been insufficient for their complete recovery, which can permanently alter the forest canopy and make forests drier and more flammable.

Acre, located on the southern edge of the Amazon biome, presents climatic conditions with very pronounced dry periods and the occurrence of severe droughts at short intervals may substantially transform its forests (including those preserved). One of the main effects will be the decrease in the richness of large tree species whose occurrence depends on abundant and well-distributed rainfall. The lack of rainfall will cause most of them to gradually disappear from the forests.

Another disadvantage is the fact that forests grow on predominantly clayey soils, a combination that in periods of drought causes a decrease in primary productivity and compromises the maintenance of ecosystem functions of forests. The incessant exploitation of forest resources (wood, for example) when the climatic conditions are unfavorable, and the forest is subject to environmental stress tends to potentiate degradation and makes it impossible to recover the exploited forests. Some researchers believe that the recurrence of these conditions may constitute a starting point for the transformation of forests into savannas.

The implementation of the Project in the three proposed areas will not only contribute as a barrier against deforestation and forest fires (including for neighboring protected areas) but will also develop sustainable activities with the commitment of non-deforestation.

Identify likely regional or sub-national climate change and climate variability scenarios and impacts and identify potential changes in the local land use scenario due to these climate change scenarios in the absence of the project.

3.4.2 Climate Change Impacts (GL 1.2)

As pointed out in item 6.11.2 above, the State of Acre has already, for more than a decade, been suffering from extreme weather events, such as droughts and floods.

These events have caused enormous problems and social, environmental, and economic losses, ranging from the increase in forest fires, the migration of communities due to the reduction of the productive potential of the areas where they produce; increased pressure on biodiversity for hunting and fishing activities beyond the ability of some species to recover their populations.

This situation may get worse if the predictions related to the pressure related to deforestation and forest fires that these areas, objects of this Project suffer. Many communities are anchored in these areas as a source of livelihood and, as they have unique ecosystems in their composition, such as bamboo forests, there will surely be a loss of unique species.

The Project, through the governance system to be implemented, systemic and territorial, should propose the creation of a local "climate authority" that will propose measures to face the impacts of climate change.

3.4.3 Measures Needed and Designed for Adaptation (GL 1.3)

The project will develop several activities with the aim of preserving biodiversity and supporting sustainable activities in the territory. Regarding communities, we can point out:

Support for technical, commercial, and organizational strengthening for the sustainable extraction of forest products, such as Brazil nuts and latex.

Technical training actions will also be developed, together with government agencies and local NGOs, in the use of sustainable soil management techniques, especially to combat the use of fire to clear areas.

Young people and women will receive special attention from the Project. Activities will be developed to promote entrepreneurship, with training and engagement with companies, NGOs, and other organizations.

Regarding biodiversity, the Monitoring Programs that will be developed will point out the necessary measures for the preservation of key species and populations of endangered species.

4 Community

4.1 Without - Project Community Scenario

The critical studies and analyses presented in this PDD aim to subsidize the management and certification process of the Project that includes Fazenda Jaraguá, Fazenda Santa Rosa and Senegal Farm. It contains relevant information that contributes to guide decision-making in achieving social, environmental, and economic benefits.

The identification and analysis of stakeholders and scenarios is inspired by the guidance manual prepared by Richards, M. and Panfil (2011), instituted Social and Biodiversity Impact Assessment (SBIA) Manual for REDD+ Projects: Part 1 – Core Guidance for Project Proponents. Climate, Community & Biodiversity Alliance, Forest Trends, Fauna & Flora International, and Rainforest Alliance, available in http://www.v-c-s.org/project/ccb-program/guidance/.

The information and analyzes presented here bring together data collected in the three areas. When necessary, data will be presented in a distinct and specific way for each area.

To carry out this work, the following methodological tools were applied:

1 Delimitation of the study area: collection and analysis of primary data and use of satellite images.

2 Socioeconomic data collection: a semi-structured questionnaire with open and closed questions.

3 Culturally appropriate engagement: oral explanations with locally recognized language, with the aid of printed material: project explanatory pamphlet and geographical map with the location of the project area, families, rivers, and streams; survey of perception about the project and its contributions in investments of interest to the community.

4 Elaboration: according to the guidelines for the elaboration of the Community Climate and Biodiversity Standards.

5 Identification of Stakeholders

The criteria used to identify the Stakeholders were:

1. human occupation in the vicinity of the projects, being preliminarily established a radius of 15 km.

2. Socio-productive and cultural profile of small farmers and extractivists with recognized symbiosis and relative dependence on natural resources.
3. Families in situations of socioeconomic vulnerability.

In the first phase, the identification of the communities occurred with the use of satellite images of the geographical area of the projects and its surroundings. In the second phase, the field investigation, the delimitation of the coverage area, the engagement and data collection were carried out.

- **I.** Twenty-five (25) families were identified in the project zone for Jaraguá Farm.
- **II.** Thirty-one (31) families were identified in the project zone for Santa Rosa Farm.
- **III.** Twenty-six (26) families were identified in the project zone for Senegal Farm.

Culturally appropriate engagement occurred in conjunction with the collection of social, economic, and cultural data; and in identifying the impacts and benefits that can be generated by internal (projects) and external vectors. In the engagement, the team was careful to use in the approach an understandable language recognized locally during the explanations, also using a location map and guiding text about the design and objectives of the project.

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

4.1.1.1 Jaraguá Farm

4.1.1.1.1 Social Parameters: Jaraguá Farm and Bujari Municipality

The Project Area Jaraguá Farm is in Lower Acre Administrative Region, on land of the Municipality of Bujari, State of Acre. Bujari has an area of 303,486.9 ha, occupying about 2% of Acre territory, 2017. It is bordered to the south by the Municipality of Rio Branco, to the east by the Municipality of Porto Acre, to the west with the Municipality of Sena Madureira and to the north by the State of Amazonas. The Municipality's headquarters is about 25 km from the capital, Rio Branco. Access occurs by land, through BR 364.

The Municipality of Bujari has an approximate population of 10,572 inhabitants (IBGE, 2021) and a population density of 2.79 inhabitants/km². The Municipal Human Development Index - MHDI is 0.589. The schooling rate (6 to 14 years) corresponds to 91.18%. The average infant mortality rate in the city is 12.45 per 1,000 live births.

In 2020, the average monthly wage was 1.5 Brazilian minimum wages. The proportion of employed persons in relation to the total population was 12.8%. In comparison with the other municipalities of the state, it occupied the positions 20 of 22. Compared to cities across the country, it ranked 4887 out of 5570. Considering households with monthly incomes of up to half a minimum wage per person, it had 44.6% of the population in these conditions, which placed it in position 17 of 22 among the cities of the state and in position 2194 of 5570 among the cities of Brazil.

As for socioeconomic indicators, Bujari's Gross Domestic Product (GDP) increased corresponds to R$ 17,640.841 (2021). The sectors that contributed the most to the increase in GDP were agriculture (47.7%), public administration (38.8%), services (10.8%) and industry (2.7%), being the municipality with the largest agricultural contribution in the State of Acre. The cattle herd of the Municipality corresponds to 309,017 head of cattle (IBGE, 2021).

Map of the Jaraguá Project Zone. The Project Zone Map (Figures 102 and 103) includes the Project Area and the identified communities considered to be beneficiaries of the benefit sharing.

Figure 55 - Geographical location of the Jaraguá Farm Project Area.

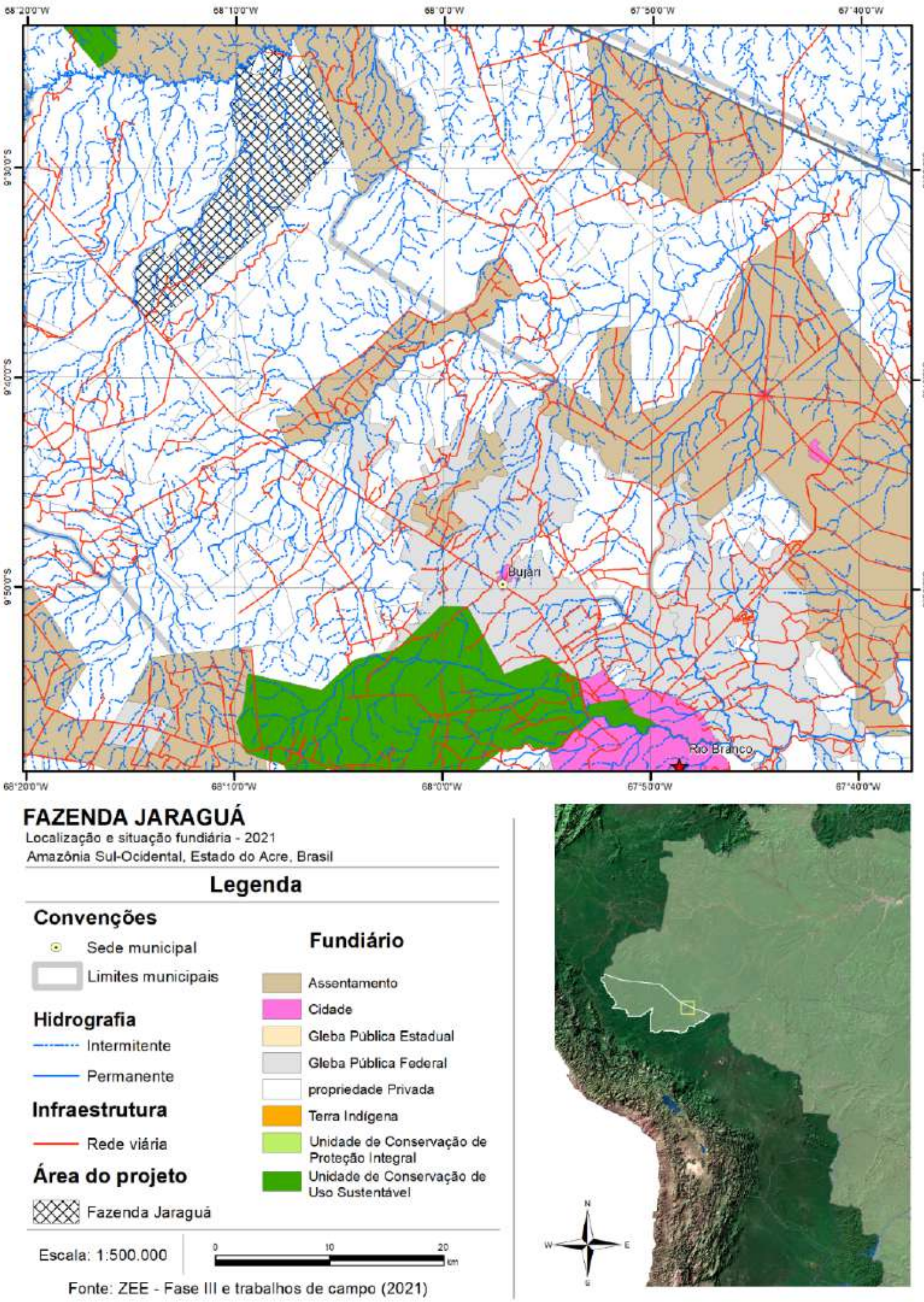
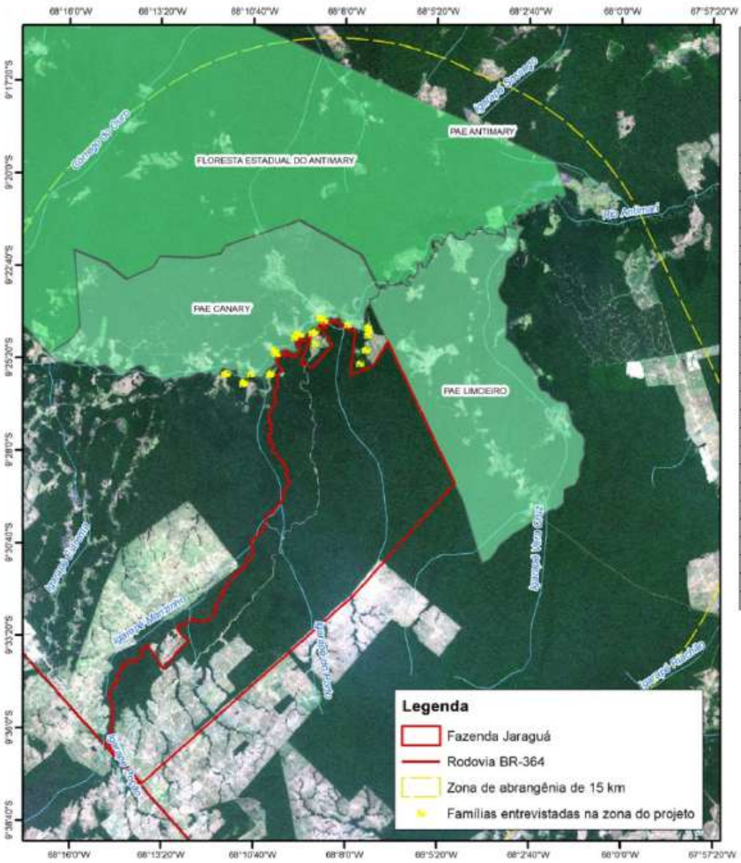
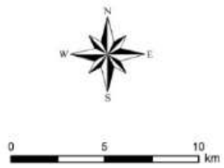


Figure 56 - Location of families around the project.



DIAGNÓSTICO SOCIOECONÔMICO - TABULAÇÃO DE DADOS PROJETO JARAGUÁ			
N.	Nome do(a) Morador(a)	Coordenadas UTM (m)	
		Coord. X	Coord. Y
1	Cleilson da Silva Cavalcante	595273	8960146
2	Raimundo (professor)	594042	8960353
3	Ana Alicia de Souza	596211	8958784
4	Francisco Silva Souza	593542	8959140
5	Maria Ferreira de Souza	595931	8958066
6	Pelônia Ferreira de Souza	596255	8958788
7	Silas Barbera	590127	8957496
8	Maricélio Azevedo Vasconcelos	589764	8957080
9	Antônio Marazona	591404	8958644
10	Eliane de Souza Leitão	591413	8958801
11	Valdecir da Silva Gomes	593797	8960501
12	Antônio Sinésio Rodrigues	592457	8959455
13	Marinaldo Azevedo Vasconcelos	588852	8957539
14	Adriana Azevedo Vasconcelos	589715	8957003
15	Thais Gomes Pinto	588766	8957521
16	Josefa Tavares de Souza	591504	8958567
17	Francisca Ferreira da Silva	593859	8960505
18	Tayná Miranda Araújo	596338	8959991
19	Jonathan Silva Barroso	591186	8957552
20	Genildo Ferreira Cavalcante	588820	8957513
21	Ivanilde de Oliveira Candeia da Cruz	596359	8959808
22	Valdecir Silva de Souza	592594	8959648
23	Gelmir Souza Cruz	596349	8959548
24	Antônio Valcimar da Silva Gomes	592756	8959606
25	Raimunda Nonata Fernandes da Silva	591131	8957476



4.1.1.1.2 Description of Stakeholders – Jaraguá Farm

1) Communities

The surveys showed the lack of community within the Project Area. In its surroundings, 25 families were identified, 24 of which were located on the banks of the Antiarmy River; and one (1) family located on the banks of the Marizinho Stream.

Table 31 - List of residents located in the Jaraguá project area.);

N.	Name of the Resident	Community	Location
1	Creilson da Silva Cavalcante	Placement ("Colocação") Barro Alto	Antimary River – PAE Canary

2	Raymond (teacher)	Mapinguari Placement	Antimary River – PAE Canary
3	Ana Alicia de Souza	Centrinho Placement	Antimary River – PAE Canary
4	Francisco Silva Souza	Poção Placement	Marizinho Creek
5	Maria Ferreira de Souza	Centrinho Placement	Center - Centrinho 1
6	Pelônia Ferreira de Souza	Centrinho Placement	Antimary River
7	Silas Barbera	Community PAE Canary	Antimary River – PAE Canary
8	Maricélio Azevedo Vasconcelos	Locality Morada Nova	Antimary River
9	Antonio Marazona	PAE Canary Community	Antimary River – PAE Canary
10	Eliane de Souza Leitão	-	Antimary River
11	João Batista Severino de Souza	-	
11	Valdecir da Silva Gomes	Community PAE Canary	Antimary River – PAE Canary
12	Antonio Sinésio Rodrigues	Community PAE Canary	Antimary River – PAE Canary
13	Marinaldo Azevedo Vasconcelos	Placement Extreme 03	Antimary River
14th	Adriana Azevedo Vasconcelos	Location Morada Nova	Antimary River
15th	Thais Gomes Pinto	Extreme Placement 03	Antimary River
16th	Josefa Tavares de Souza	Apuí - PAE Canary	Antimary River – PAE Canary
17	Francisca Ferreira da Silva	Seringal Mapinguari	Antimary River
18	Tayná Miranda Araujo	-	Antimary River
19	Jonathan Smith	Volta Grande Placement	Antimary River
20	Genildo Ferreira Cavalcante	Extreme 3	Antimary River

21	Ivanilde de Oliveira Candeia da Cruz	Community PAE Canary	Antimary River – PAE Canary
22	Valdecir Silva de Souza	Community PAE Canary	Antimary River – PAE Canary
23	Gelmir Souza Cruz	Boa Vista Placement	Antimary River – PAE Limoeiro
24	Antonio Valcimar da Silva Gomes	Location PAE Canary	Antimary River – PAE Canary
25	Raimunda Nonata Fernandes da Silva	Volta Grance Placement	Antimary River

(b) Stakeholders

The stakeholders were identified as means of consulting the communities and perception of relevance by the project team itself, and the relationship network consisting of different objectives or aspects of local life (public policy, socioeconomic projects, or land situation, for example) that constitute a lasting relationship between residents and government organizations, marketing network, NGOs, landowners, among others.

Table 32 - List of Stakeholders

Stakeholders	**Rights**	**Interest**	**Relevance**
Antimary River Communities	Beneficiaries of benefit-sharing	To receive investments from the project: training, improvement of production processes and increase of family income	HIGH plays an important role in the conservation of ecosystems
Association of Producers of the Agroextractive Settlement Projectta Canary	Beneficiaries of benefit-sharing	To receive investments from the project: training, improvement of production	HIGH

		processes and increase of family income	Partner in the execution of project activities
Antimary River Communities	Beneficiaries of benefit-sharing	To receive investments from the project: training, improvement of production processes and increase of family income	HIGH Plays an important role in the conservation of ecosystems
State and Municipal SEMA	None	To contribute to conservation practices and compliance with environmental legislation	HIGH partners in the implementation of socio-environmental activities
Department of Municipal/State Production and SENAR	None	To contribute to the diffusion of sustainable practices through the provision of training	Normal Partners in the implementation of actions to improve agroextractive production
Municipal and State Department of Education	None	To carry out socio-environmental actions in an interdisciplinary way in the local school	HIGH Development of environmental education actions with kids and young people

National Institute of Colonization and Agrarian Reform - INCRA	None	To carry out actions together because the project is limited to two federal settlements	Normal Partner in the implementation of socio-environmental activities

4.1.1.1.3 Original conditions of well-being

(c) Demographics

It is estimated that the community studied corresponds to a population of 100 people. Of the total, 49% are made up of women and 51% of men. The study of the age group shows that 51% of the population is composed of adults between 18-49 years; and 41% of children and young people.

Figure 57 - Distribution of the Population by Age Group

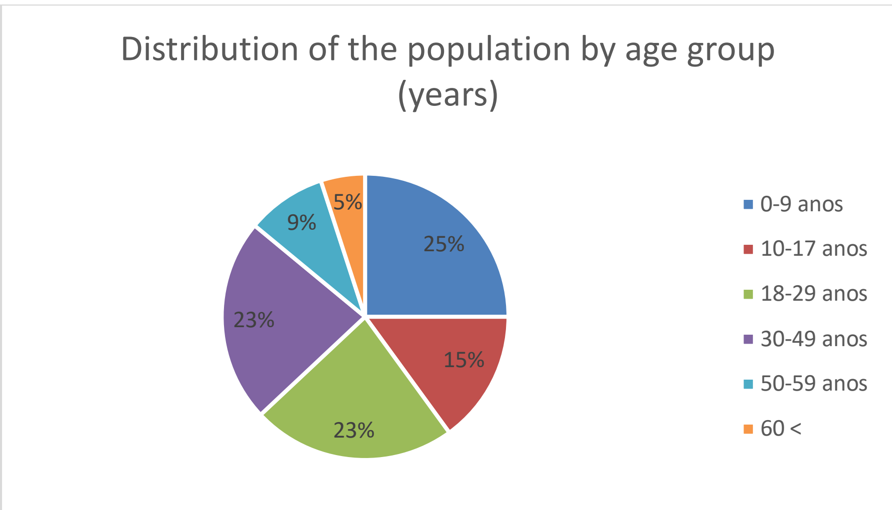
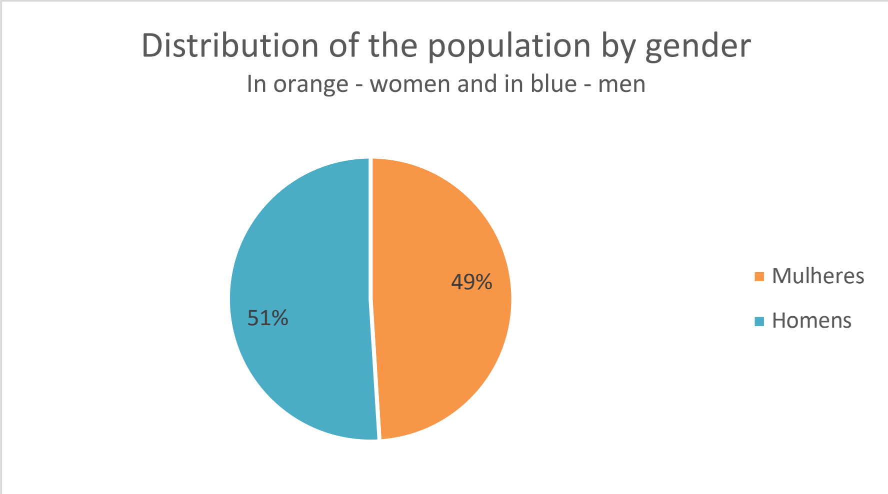


Figure 58 - Distribution of the Population by Age Group



2. Land Situation

According to data surveys, the residents interviewed have tenure rights guaranteed by legal documentation issued by the land authority (INCRA) or by registration with registration in a notary. According to interviewees, 47% live in the Canary Agroextractive Settlement Project; 5% in the Limoeiro Agroextractive Settlement Project; and 48% in private properties. Sizes vary between 80 and 400 hectares.

Figure 59 - Proof of ownership of the area they live in

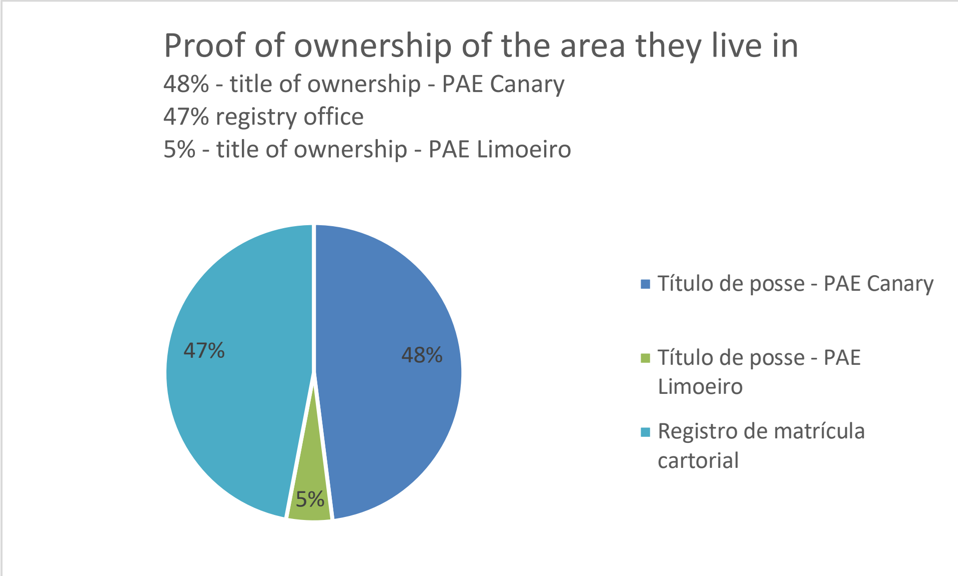
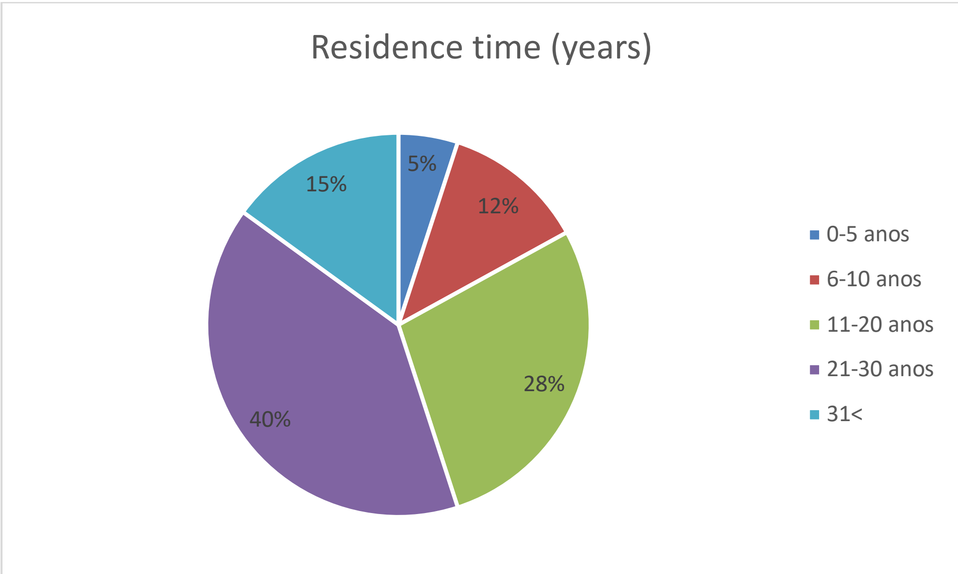


Figure 60 - Residence Time (Years)

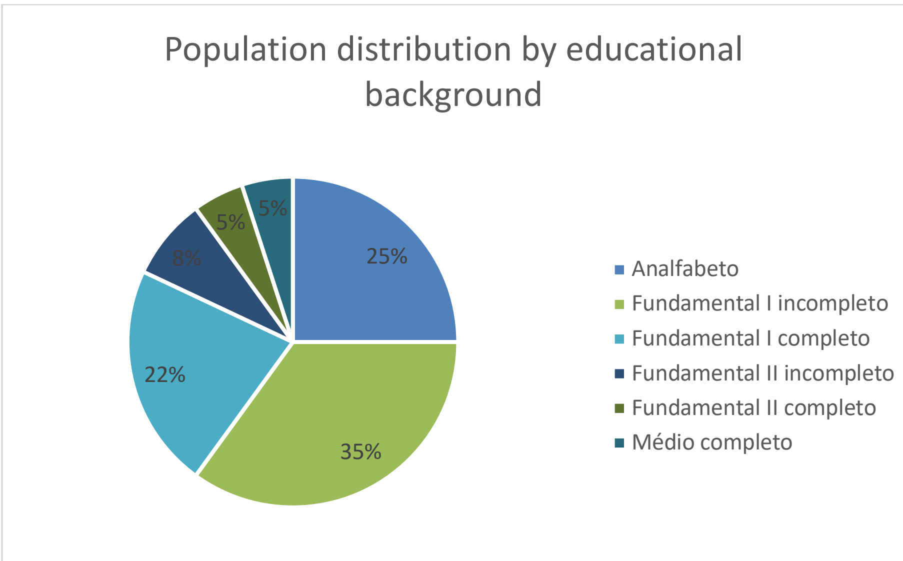


3. Educacional

Educational assistance is offered by the State Department of Education responsible for secondary education and by the Municipality of Bujari responsible for primary education. The Mapinguari School is the educational unit that serves the families. Educational rates show that 25% of the population is illiterate and 43% by people with incomplete primary education.

Figure 61 - Mapinguari School, located on the left bank of the Antimary River, PAE Canary (GreenParter/Catraia feb_2023)

Figure 62 - Population distribution by educational background



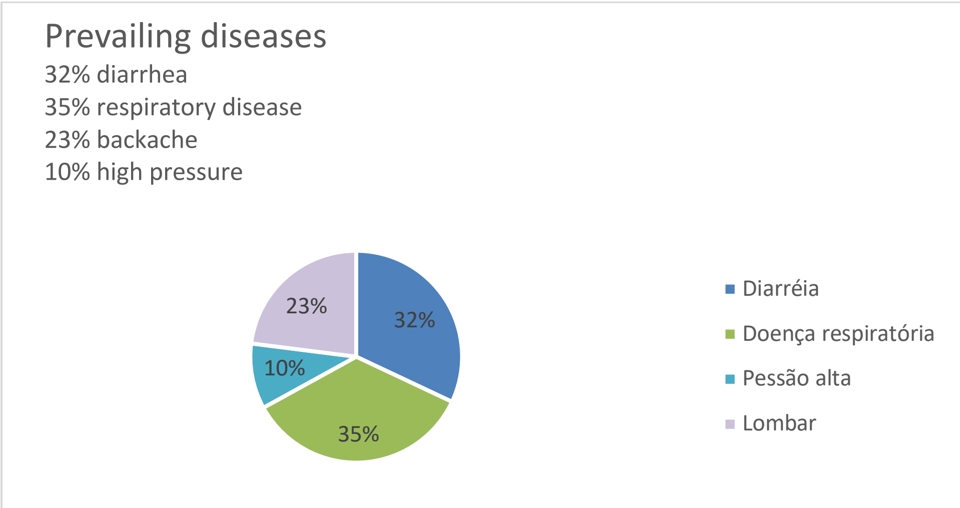
Among the problems faced by the school, highlight the lack of school meals, the difficulty of transportation in the summer period, since the government and not even the residents meet to clean the river.

4. Health

The lack of health care is the biggest reason for complaint from the residents of the Antimary River. There are no health centers and only one health agent that does not have the structure to provide adequate care, such as a vessel to transport the sick. In case of serious illness, they are forced to travel to the capital, Rio Branco.

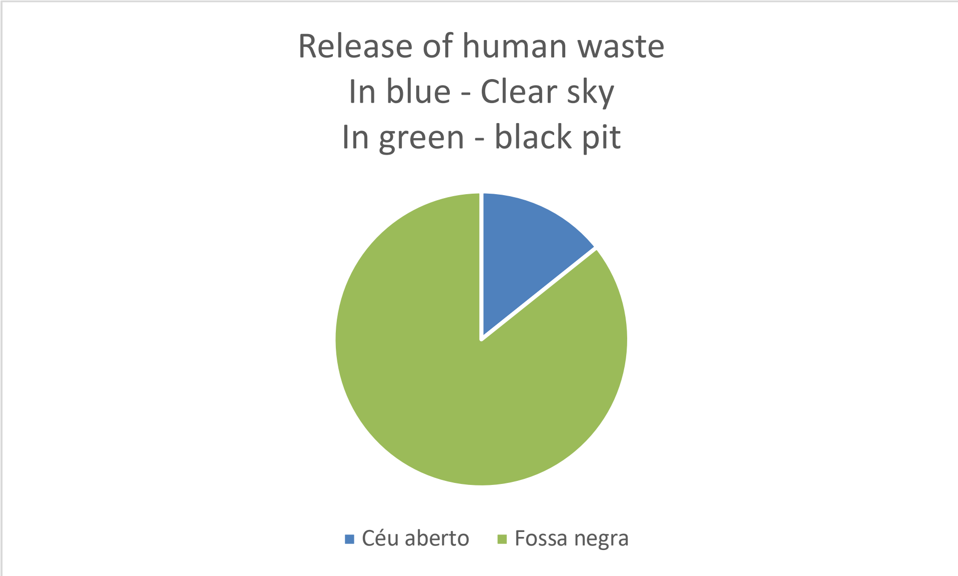
For the treatment of diseases, they use home remedies prepared based on plants and vegetable oils and industrial medicines. It is common to use medicinal essences, such as copaiba, honey, jatobá bark, quina-quina, cat's claw “unha de gato”), applied in the cure from respiratory diseases to malaria. The diseases that most affect the community are respiratory diseases and diarrhea. They consider that one of the biggest vectors of disease is the lack of water treatment.

Figure 63 - Prevailing Diseases



Domestic sewage is discharged on the land itself (65%), channeled into the forest (20%) and channeled into the river (15%). Residents reported that they deposit their feces in the open (20%) or in a black pit (50%); bathroom with 30% exhaustion. The garbage is burned (45%), buried (40%) and thrown into the bush (5%). About 80% of the families collect water in an artesian well and 20% in slopes and in the river itself.

Figure 64 - Release of humam waste



The diet of the families of Antimary is composed of products of the gardens themselves, such as flour, beans, cassava, watermelon, and banana by fish caught in nearby rivers and stream for meat of wild animals and domestic animals (chicken, pig and cattle). Families also purchase processed foods, such as coffee, sugar, oil, among others perform the collection of native fruits, such as Brazil nuts, açaí and patauá. Among the most hunted wild animals are: paca, armadillo, tapir, wild pig; among the most fished species are: branquinha, jundiá, pirarucu, surubim and piau.

Among the economic activities, cattle raising, agricultural production and Brazil nuts stand out. Cattle raising is the main source of family income, responsible for an internal trade in the region. According to the surveys, there are residents who own up to 300 head of cattle: and pasture areas ranging from 25 to 380 hectares. Part of the agricultural production is marketed, mainly, flour, watermelon, banana; and a part intended for family consumption.

A prominent extractive product is the collection of Brazil nuts. About 60% of the residents declared that in the harvest period (Dec-March) they move to the chestnut trees for collection, marketing the production with middlemen. Complains about the price of the 2023 harvest, on average of R$ 20.00 a can, very low compared to R$ 40.00 of 2022. They reported that they need support for production storage and verticalization of the production chain, to add value to the product.

Figure 65 - Chestnut production 2023 harvest

(GreenPartner/Catraia fev_2023)

Another source of income is services. In the community there are public workers, such as teachers and health agents. It is also common for residents to provide manual service, boat pilot, battery rental, among others. An important income originates from the transfer of income from social programs, such as the family allowance (Federal "Bolsa Família"), as well as pension and retirement.

The residents of Antimary depend to a large extent on local resources for subsistence. They collect wood, lianas, fruits, Brazil nuts. They go fishing in the lakes and creeks and the hunting of wild animals to maintain the diet.

Table 33 - Use of natural resources by communities

Extractivism	**Fishing Resources**	**Wildlife**	**Use of watercourses**
Collection of wood for construction of houses and social infrastructure (churches), production (corral, flour house, warehouse, fences) and construction of vessels.	Composition of the food diet	Composition of the food diet	Collection of water for human consumption and household chores.

Collection of native fruits (açaí, bacaba, cocoa and jatobá) for food purposes. Essences, seed, oils and resins for medicinal purposes. Collection of lianas for artisanal purposes, such as making brooms and baskets.			Means of displacement

Marginalized and/or vulnerable community groups. As identified in other communities, an important concern is the increase in the consumption of alcoholic beverages and narcotic drugs among young people in the communities, which often leads to cases of violence, robberies, and thefts. They defend the need for social work by making young people aware of the risks to health and their well-being in the community. They also report that many of the cases are related to lack of work and income, leaving many of the young people disillusioned about their future.

Condition of the woman. In the Antimary river region a patriarchal system prevails, despite losing strength in relation to the resignification of the role of women in society recognized as the head and maintainer of the family. No cases of violence against women were recorded. However, it is common for these situations to remain submerged, silent in the family and in the community. It was found the need to reinforce the importance of the role of women in the local rural family, recognizing and stimulating their protagonism; as well as campaigns to combat gender-based violence.

Historical, cultural, and religious aspects. The Antimary communities are rubber tappers and small farmers descended from the first groups of North easterners who occupied the Western Amazon in the second half of the 19th century. The narratives by MELO (2002) and CASTRO (1998) contribute significantly to understanding the genesis of the occupation of that part of the Amazon.

Several aspects were inherited and remain alive between generations, such as the social division, where each member contributes to the organization and maintenance of the home and the productive unit. Tasks are distributed by age group and gender, involving children, young people, adults, and seniors. From an early age, children already develop some activities. From the age of seven, adults give him some “obligations”. The girl helps her mother by taking care of her younger siblings, feeding domestic animals, carrying water, preparing food, and cleaning the house. The boy takes care of domestic animals, carries water, “begins” in the swidden, extractivism, hunting and fishing, learning that he acquires in the company of his father.

From the age of 12, the “boy” has his tasks more clearly defined, assuming responsibility for a portion of the swidden, taking care of the cattle and feeding the family, hunting, and fishing. At this age, the girl also has her obligations expanded, preparing the family's food in the periods when the mother is in the swidden, washing clothes and, in times of planting and harvesting, helping in the swidden. From the age of 15, a girl is already considered a woman and assumes the same responsibilities as her mother and may even get married (as happens most of the time). The boy, at this age, is already a man and works at the same pace and activities as his father, gaining his trust by selling agricultural and extractive products.

In adulthood, both men and women develop practically the same agro-extractive activities, except, in the case of women, felling and production of Brazil nuts. This picture demonstrates that women, since birth, are responsible for gradually taking on a high workload, even greater than that of men, since they are required to accumulate domestic “duties” (preparing food, cleaning the house, taking care of the children, sewing, washing clothes) with productive activities (hunting, fishing, work in the fields, taking care of domestic animals).

The elderly woman's participation takes place more at home, preparing food and taking care of the children while the other members work in the swiddens and extractivism. Men over 60 years of age, due to poor health due to the heavy work carried out during their lives, have a low contribution to productive activities. Generally, both men and women, as they receive retirement benefits, help cover part of the family's expenses.

As for the religious aspect, the community is composed of evangelicals and Catholics. It is common for *novenas* to take place in homes, but weekly meetings take place in churches and temples.

4.1.1.2 Santa Rosa Farm

4.1.1.2.1 Social Parameters: Santa Rosa Farm and Santa Rosa do Purus/Feijó Municipality

The project area is in the regional areas of Purus and Tarauacá-Envira, on land in the municipalities of Santa Rosa do Purus and Feijó, State of Acre. They are municipalities with distinct development dynamics, being Santa Rosa do Purus one of the most isolated municipalities in Acre, with fluvial access by the Purus River in good conditions during the winter period, and very precarious in the summer period due to the ebb and flow. In turn, Feijó is located on the banks of BR 364 about 365 km from the capital, Rio Branco-AC.

6 Municipality of Santa Rosa do Purus

The municipality of Santa Rosa do Purus is located in the central region of the State of Acre, bordering Peru. The headquarters of the municipality is on the right bank of the Purus River and distant 300 km from the capital Rio Branco in a straight line and 374 km by river from the municipality of Manuel Urbano, without access by land (Acre, 2010), being one of the most isolated municipalities in the state. The municipality occupies an area of approximately 6,140 km2, which represents about 3.7% of the territory of the State of Acre.

Santa Rosa has an approximate population of 6,893 inhabitants (IBGE, 2021) and a population density of 0.76 inhabitants per km². The MHDI is 0.517. The schooling rate (6 to 14 years) corresponds to 63.8%; GDP per capita of R$ 12,525.97. The average infant mortality rate in the city is 46.98 per 1,000 live births. Hospitalizations due to diarrhea are 9.5 per 1,000 inhabitants. Compared to all counties in the state, it ranks 1 out of 22 and 2 out of 22, respectively. When compared to cities across Brazil, these positions are 91 out of 5570 and 286 out of 5570, respectively.

As for work and income, in 2020, the average monthly wage was 2.4 minimum wages. The proportion of employed persons in relation to the total population was 3.9%. In comparison with the other municipalities of the state, it occupied positions 2 of 22. Compared to cities across the country, it ranked 646 out of 5570. Considering households with monthly incomes of up to half a minimum wage per person, it had 48.3% of the population in these conditions, which placed it in position 6 of 22 among the cities of the state and in position 1682 of 5570 among the cities of Brazil.

The sectors that contributed most to the increase in GDP are public administration (65%) and this sector concentrates the highest percentage of contribution to the municipality, agriculture (23%), services (9%) and industry (3%).

The cattle herd of Santa Rosa do Purus increased significantly in the period from 2000 to 2021, from 1,730 to 12,261 head of cattle, a growth of more than 400% in the period (IBGE, 2021).

(a) Municipality of Feijó

The municipality of Feijó is located in the central area of the State of Acre, on the banks of the Envira River. It is bordered to the north by the State of Amazonas, to the south by Peru, to the east by the municipalities of Manoel Urbano and Santa Rosa do Purus and to the west by the municipalities of Tarauacá and Jordão. This municipality, together with the municipalities of Tarauacá and Jordão, is part of the Regional Development Tarauacá-Envira. With an area of 2,796,380 ha, it represents 17.0% of the territory of Acre and is in the region of influence of BR 364, being cut by it in its Northeast sector (ACRE, 2021).

Feijó has an approximate population of 34,896 inhabitants (IBGE, 2022) and a population density of 1.16 inhabitants per km². The MHDI is 0.539. The schooling rate (6 to 14 years) corresponds to 82.9%; GDP per capita of R$ 11,263.93 (202). The average infant mortality rate in the city is 31.69 per 1,000 live births. Hospitalizations due to diarrhea are 0.2 per 1,000 inhabitants. Compared to all counties in the state, it ranks 2 out of 22 and 17 out of 22, respectively. When compared to cities throughout Brazil, these positions are 311 out of 5570 and 4284 out of 5570, respectively (IBGE, 2021).

As for work and income, in 2020, the average monthly wage was 1.6 minimum wages. The proportion of employed persons in relation to the total population was 5.9%. In comparison with the other municipalities of the state, it occupied the positions 16 of 22. Compared to cities across the country, it ranked 4400 out of 5570. Considering households with monthly incomes of up to half a minimum wage per person, it had 51% of the population in these conditions, which placed it in position 2 of 22 among the cities of the state and in position 1200 of 5570 among the cities of Brazil (IBGE, 2021)

As for socioeconomic indicators, the sectors that contribute the most to the Gross Domestic Product – GDP are public administration (56%), agriculture (21%), services (18%) and industry (4%). The cattle herd of Feijó increased significantly in the period from 2000 to 2021, from 36,700 to 169,400 head of cattle, a growth of more than 3,00% in the period (IBGE, 2021).

The property of Santa Rosa is located on a strip of land between the Purus River and Envira River watersheds (Figure 104). To access the area, it departs from Rio Branco-AC by land to the city of Feijó - AC; and from Feijó, follows the Envira River upstream entering its tributary Igarapé Preto (right bank); it is not possible to access the area by the Igarapé Preto and its tributaries due to the precarious navigability conditions; access to the area takes place through trails known by the last closest residents.

The project area is about 30 kilometres in a straight line from the city of Santa Rosa do Purus.

Map of the Santa Rosa Project Zone. The Project Zone Map (Figures 104 and 105) includes the Project Area and the identified communities considered to be beneficiaries of the benefit sharing.

Figure 66 - Geographical location of the Santa Rosa Farm Project Area.

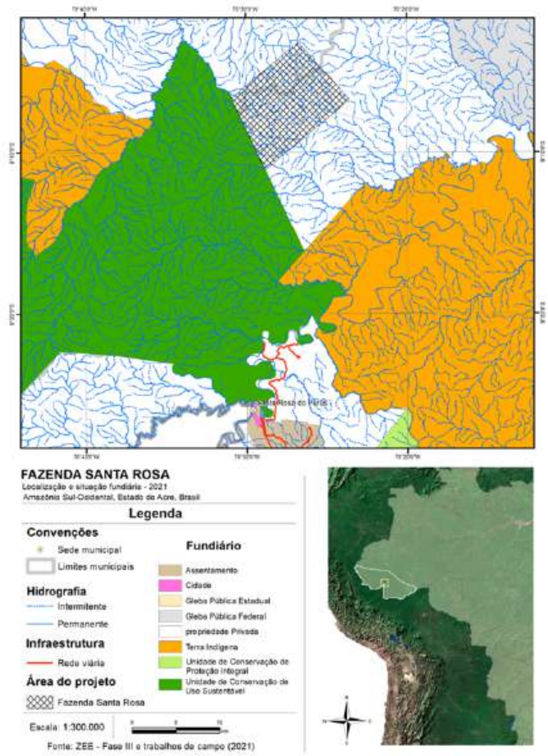
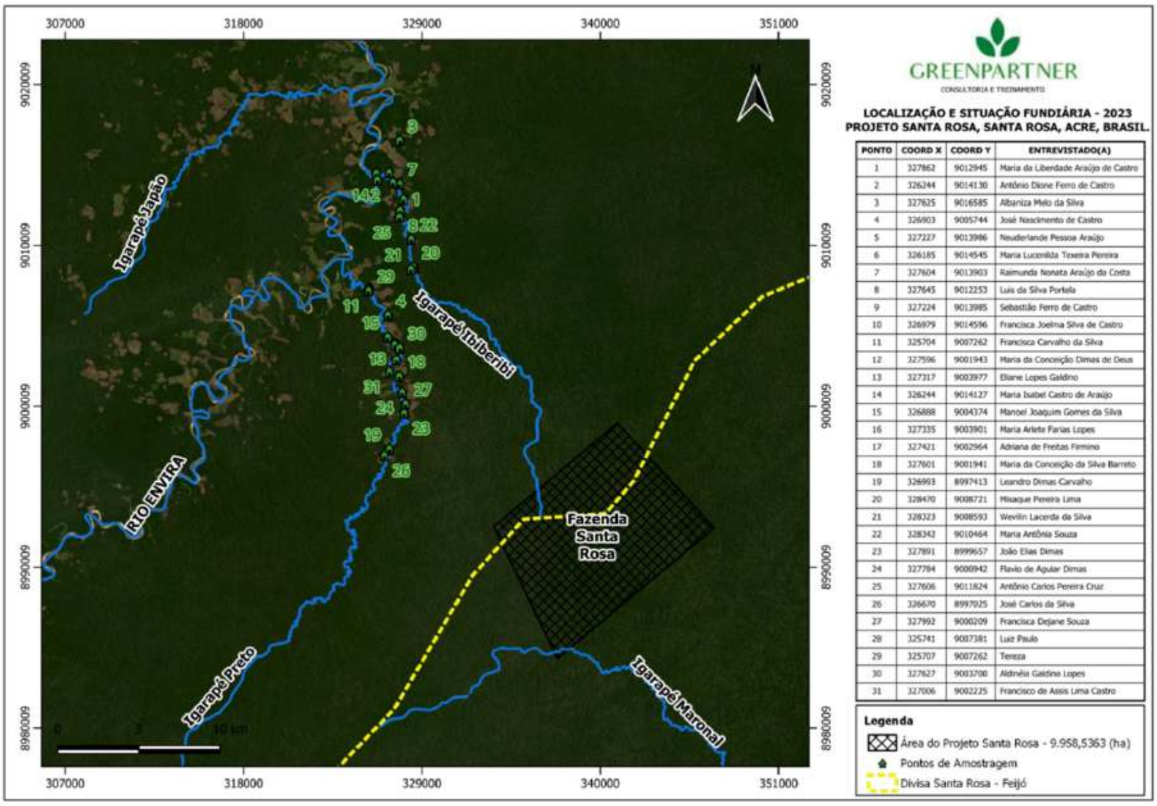


Figure 67 - Location of the families of Igarapé Ibiberibe and Igarape Preto.



4.1.1.2.2 Description of Stakeholders – Santa Rosa Farm

The criteria for identification of social actors considered

5. human occupation in the surroundings of the project, being preliminarily established a radius of 15 km;
6. and the socio-productive and cultural profile of small farmers and extractivists with recognized symbiosis and relative dependence on natural resources;
7. families in situations of socioeconomic vulnerability. With this objective, consultations and socio-economic data surveys were carried out, and 31 families included in the social engagement process were identified.

In the first analysis, the identification of the communities began from the analysis of satellite images of the location of the geographical area of the project, evaluating the existence of human occupation in and around them, as future beneficiaries of the project. As a result, families were identified along the trough of the Igarapé Ibiberibe and Igarapé Preto, which have tributaries with springs within the Project Area.

8. Communities

According to surveys, there is no human occupation within the Santa Rosa Farm Project Area. The identified communities are in the Project Zone (surrounding area), Ibiberibe Stream and Black Igarapé watershed, tributaries of the Envira River, Municipality of Feijó, Acre, Brazil.

At this stage, the families who live in Igarapé Preto were considered as the initial focus of the project. After the preliminary phase, a visit to the project area and its surroundings, it was identified, in addition to the families of the Igarapé Preto, the families that live in the Igarapé Ibiberibe. The micro-watersehd of the Igarapé Preto and Ibiberibe have their springs located around the Santa Rosa Project area, one of the criteria considered in the process of identifying beneficiaries.

Culturally appropriate engagement occurred in the social, economic, and cultural information gathering stage; and in the identification of the impacts and benefits possible to be generated by internal vectors (projects) and external. In the engagement, the team was careful to use in the approach an understandable language recognized locally during the explanations, accompanied by a location map and guiding text about the design and objectives of the project.

In the process, 31 families distributed along the Igarapé Preto (17) and Igarapé Ibiberibe (14) streams (Igarapés) were identified, as shown in the table below. No legally constituted community organizations or leaders recognized by the residents interviewed were identified.

Table 34 - List of residents located in the project area.

N.	Name of the Resident	Community	Location
1	Maria da Liberdade Araújo de Castro	Comunidade São José	Igarapé Novo Japão (Ibiberibe)
2	Antônio Dione Ferro de Castro	Comunidade São José	Igarapé Novo Japão (Ibiberibe)
3	Albaniza Melo da Silva	Comunidade São José	Igarapé Novo Japão (Ibiberibe)
4	José Nascimento de Castro	Comunidade São José	Igarapé Novo Japão (Ibiberibe)
5	Neuderlande Pessoa Araújo	Comunidade São José	Igarapé Novo Japão (Ibiberibe)

6	Maria Lucenilda Texeira Pereira	Comunidade São José	Igarapé Novo Japão (Ibiberibe)
7	Raimunda Nonata Araújo da Costa	Comunidade São José	Igarapé Novo Japão (Ibiberibe)
8	Luis da Silva Portela	Comunidade São José	Igarapé Novo Japão (Ibiberibe)
9	Sebastião Ferro de Castro	Comunidade São José	Igarapé Novo Japão (Ibiberibe)
10	Francisca Joelma Silva de Castro	Comunidade São José	Igarapé Novo Japão (Ibiberibe)
11	Francisca Carvalho da Silva	Seringal Novo Japão	Igarapé Preto
12	Maria da Conceição Dimas de Deus	Seringal Novo Japão	Igarapé Preto
13	Eliane Lopes Galdino	Seringal Novo Japão	Igarapé Preto
14	Maria Isabel Castro de Araújo	Seringal Novo Japão	Igarapé Preto
15	Manoel Joaquim Gomes da Silva	Seringal Novo Japão	Igarapé Preto
16	Maria Arlete Farias Lopes	Vila Alves (Seringal)	Igarapé Preto
17	Adriana de Freitas Firmino	Colônia Três estrelas	Igarapé Preto
18	Maria da Conceição da Silva Barreto	Vila Alves	Igarapé Preto
19	Leandro Dimas Carvalho	Colônia Terra Alta	Igarapé Preto
20	Misaque Pereira Lima	-	Igarapé Novo Japão (Ibiberibe)
21	Wevilin Lacerda da Silva	São José Loc. Porto Rico	Igarapé Novo Japão (Ibiberibe)

22	Maria Antônia Souza	Nova Esperança	Igarapé Novo Japão (Ibiberibe)
23	João Elias Dimas	-	Igarapé Preto
24	Flavio de Aguiar Dimas	Colônia Três Estrelas	Igarapé Preto
25	Antônio Carlos Pereira Cruz	Comunidade São José	Igarapé Novo Japão (Ibiberibe)
26	José Carlos da Silva	Localidade Ananá	Igarapé Preto
27	Francisca Dejane Souza	-	Igarapé Preto
28	Luiz Paulo - dono	-	Igarapé Preto
29	Tereza	-	Igarapé Preto
30	Aldinéia Galdino Lopes	-	Igarapé Preto
31	Francisco de Assis Lima Castro	-	Igarapé Preto

9. Stakeholders

The stakeholders were identified as a means of consulting the communities and perception of relevance by the project team itself, and the relationship network consisting of different objectives or aspects of local life (public policy, socioeconomic projects or land situation, for example) that constitute a lasting relationship between residents and government organizations, marketing network, NGOs, landowners, among others.

Table 35 - List of Stakeholders related to Fazenda Santa Rosa.

Interested Party	Rights	Interest	Relevance
Family of the Ibiberibe and Preto streams (Igarapés)	Beneficiaries of benefit-sharing	Receive investments from the project: training, improvement of production	HIGH plays an important role in the

		processes and increase of family income	conservation of ecosystems.
State and Municipal SEMA (Environmental Public Agency)	None	Contribute to conservation practices and compliance with environmental legislation	HGH partners in the implementation of socio-environmental actions
Department of Municipal/State Production and SENAR (training agency)	None	Contribute to the diffusion of sustainable practices through the provision of training	Normal partners in the implementation of actions to improve agro-extractive production
Municipal and State Department of Education	None	Carry out socio-environmental actions in an interdisciplinary way in the local school	High development of environmental education activities with kids and young people
Chico Mendes Institute for Biodiversity Conservation	Ensure compliance within the project with the rules of the buffer zone of the Santa Rosa do Purus National Forest	Maintain or improve protective measures in the buffer zone	Normal partner in the implementation of protection actions

4.1.1.2.3 Original conditions of well-being

10. Demographics

It is estimated that the population living in the Ibiberibe and Preto streams (Igarapés) reaches about 130 people. Of the total, 45% are made up of women and 55% of men. The study of the age group shows that 51% of the population is composed of adults between 18-49 years; and 41% of children and young people.

Figure 68 - Distribution of the population by age group (years)

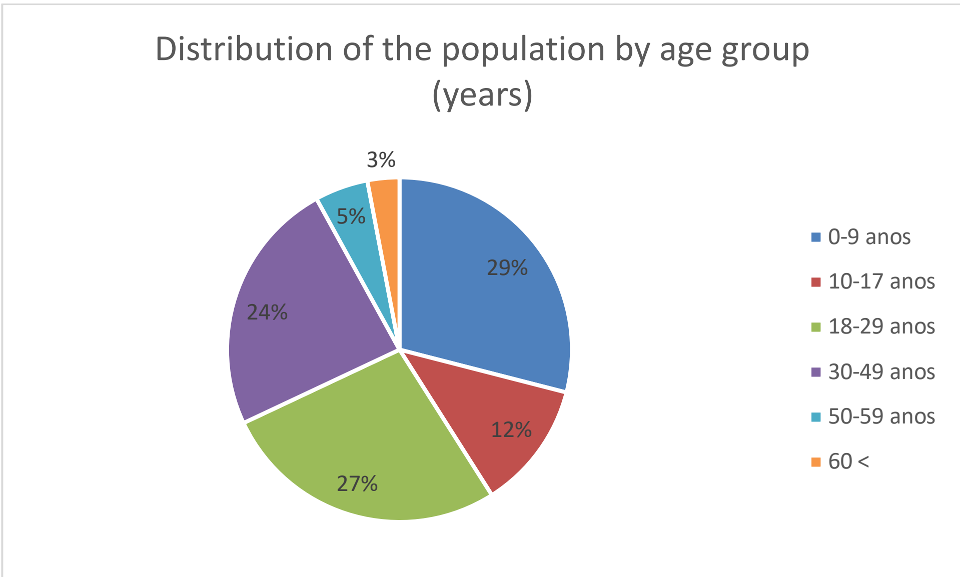


Figure 69 - Distribution of the population by gender

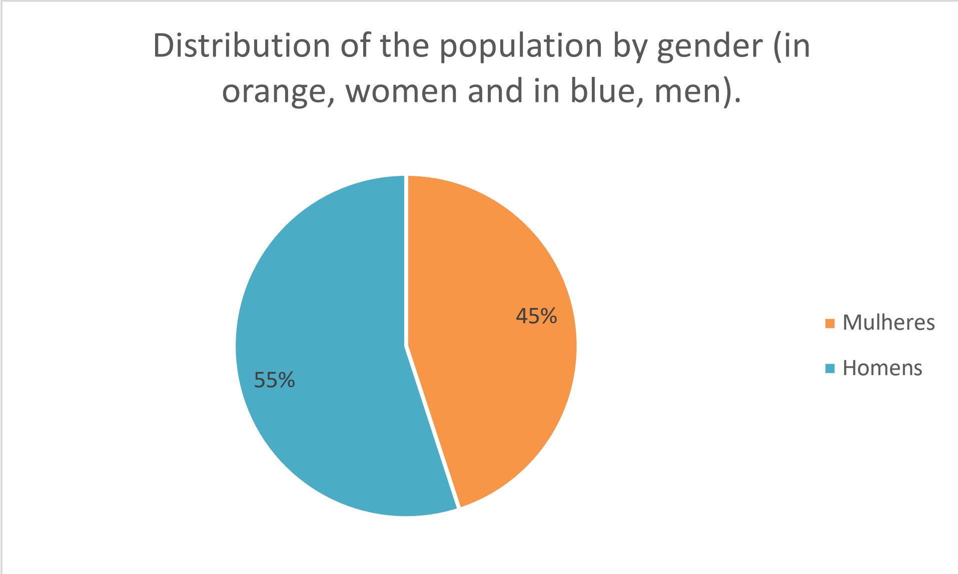


Figure 70 - Profile of families in the communities studied

Profile of families in the communities studied – Santa Rosa (GreenParter/Catraia fev 2023)

11. Land situation

The surveys showed that 37% of the families started to occupy the land in the last 5 years. In the Ibiberibe Igarapé and recent occupations have been identified. Residents reported that they began to allot the

Seringal Japão and that there was no prohibition. It was noticed that more and more families began to occupy the banks of the Ibiberibe Stream downstream – upstream.

The families do not have legal documentation proving the right of possession. About 65% of residents reported that they have the Rural Environmental Registry (CAR), a document they consider ensuring the right to the land, while 35% reported that they have a receipt for buying and selling. The size of the property ranges from 150 (50%) to 400 hectares.

Figure 71 - Residential Time (Years)

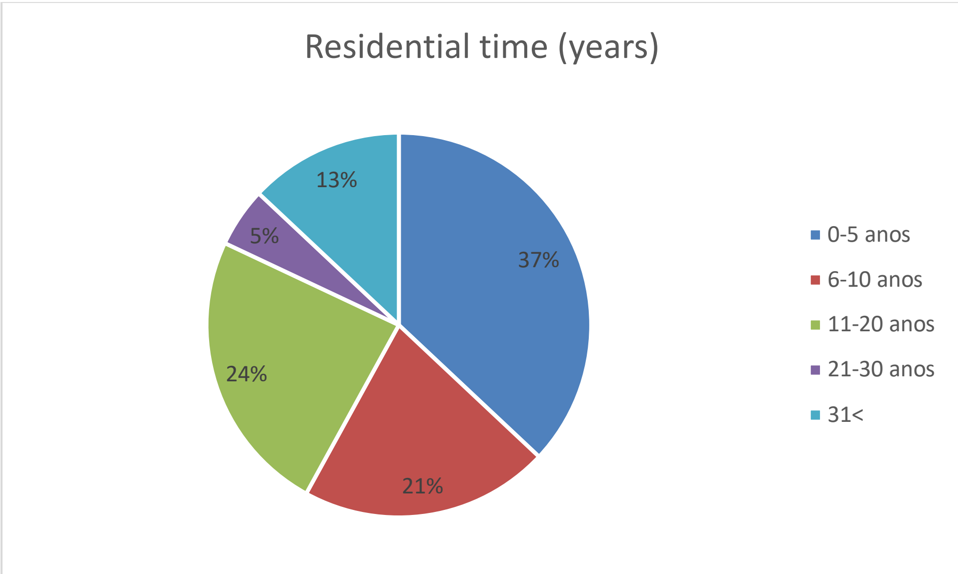


Figure 72 - Typical housing in consolidated areas

(1) Typical housing in consolidated areas and (2) house in an area of recent occupation in the Ibiberibe Stream (GreenParter/Catraia fev_2023)

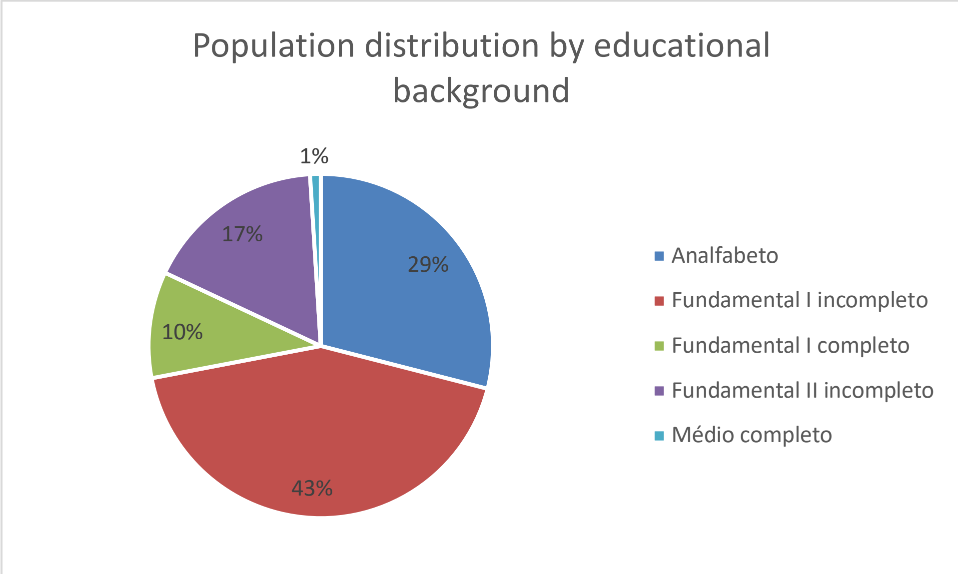
- Education

The educational service is carried out by the Municipality of Feijó, responsible for elementary education and the State Government, responsible for high school. The Pingo de Ouro School is the educational unit that serves families. Educational training rates show that 29% of the population is illiterate and 43% by people with incomplete elementary school.

Figure 73 - Pingo de Ouro School and Bank of Envira River

Pingo de Ouro School, located on the left bank of the Envira River; moment of data collection with the local teacher (GreenParter/Catraia fev_2023)

According to the families, the education offered is precarious, with a multigrade system that compromises quality. They also reported that there is a lack of teachers and that the school calendar is never met. Still, they consider the infrastructure very bad, since the school does not have internet, library, computers, among others.



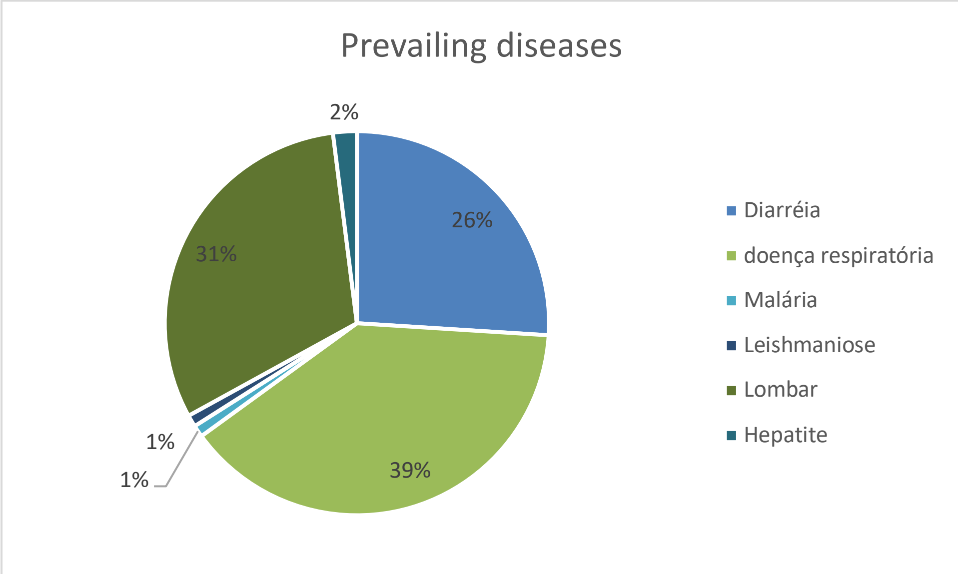
- Health

According to residents, health care is very precarious. There are no health centers and the two health agents do not have adequate conditions for the monitoring of families. In case of serious illness, they are forced to travel about a day and a half to the city of Feijó. They reported that there have already been care campaigns, where health teams about Envira doing care, but that it no longer happens.

For the treatment of diseases, they use home remedies prepared based on plants and vegetable oils and industrial medicines. Residents reported that, for respiratory diseases, they make lickers and infusions, they also use copaiba oil for throat inflammation, quina-quine is applied to cases of high fever.

Improving health care appears at the top of local priorities, with medical care and regular drug supply being claimed. Among the diseases that most affect families, respiratory diseases, back pain and diarrhea stand out. They consider that one of the biggest vectors of disease is the lack of water treatment.

Figure 74 - Prevailing Diseases



- Sanitation

Domestic sewage is discharged on the land itself (80%), channelled into the forest (10%) and channelled into the river (10%). Residents reported that they deposit their feces in the open (80%) or in a black pit (20%). Garbage is burned (80%), thrown into the bush (15%) or thrown into the river (5%).

Figure 75 - Destination of Domestic Sewage

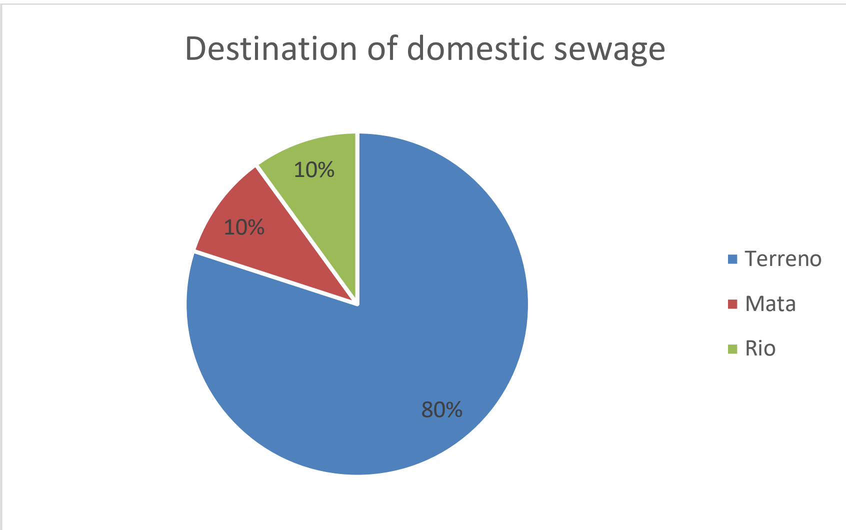
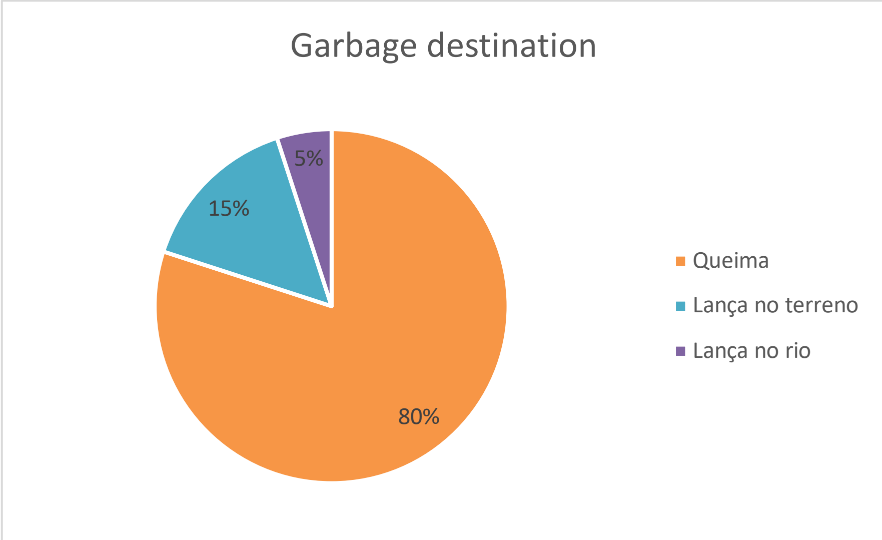


Figure 76 - Garbage Destination



- Eating habits

The diet is composed of products from the gardens themselves, such as flour, beans, cassava, watermelon and banana, by fish caught in nearby rivers and streams; for meat of wild animals and domestic animals (chicken, pig and cattle). Families also purchase processed foods, such as coffee, sugar, oil, among others; perform the collection of native fruits, such as açaí, bacaba, cocoa and jatobá seed. Among the most hunted wild animals are: paca, armadillo, tapir, wild pig; among the most fished species are: mocinha, mandi, curimatã, jundiá, peramutaba, surubim, bodó and piau.

(1) Weapon used in trap for slaughter of animals; (2) fishing net (GreenParter/Catraia fev_2023)

Economy and source of family income: livestock is the main economic activity of the communities, where 90% declare that they depend on it for the generation of family income. For the residents, cattle breeding is the most viable activity, considering the availability of pasture and cattle being a product of easy commercialization. A calf can be marketed up to R$ 2 thousand reais. There are breeders who have a roster of 120 animals.

Agricultural production is intended almost exclusively for domestic consumption and has no commercial importance. The production of flour, beans, corn, and bananas are maintained, as they make up the family diet. At certain times, families trade a small surplus of agricultural production with neighbours.

In addition to the cattle trade, family income is complemented by income transfer from social programs, such as the family allowance (Bolsa Família) (100%); manual services (15%); pension and retirement (10%). Logging and non-logging has virtually no economic ends, except for a resident who produces coal for commercial purposes. Wood, açaí, bacaba and cocoa are collected for domestic consumption. Only one resident stated that he develops artisanal fishing for commercial purposes.

In the gardens are planted corn, cassava and banana; cattle raising predominates as the main economic activity (GreenParter/Catraia fev_2023)

Furnace for coal production (GreenParter/Catraia fev_2023)

Customary use of natural resources: the families that live in the Ibiberibe and Preto streams, have built over time a symbiosis with the environment they live, understanding natural systems and taking from it everything they need for their subsistence. They collect wood and fruit; hunt animals; they fish, they collect water from local sources.

Wood is the main forest product collected, used for all purposes, such as construction of boats and houses (GreenParter/Catraia fev_2023)

Table 36 - Use of natural resources by communities.

Extractivism	Fishing Resources	WILDLIFE	Use of watercourses
CollectioN OF WOOD FOR CONSTRUCTION OF HOUSES AND SOCIAL INFRASTRUCTURE (CHURCHES), PRODUCTION (CORRAL, FLOUR HOUSE, WAREHOUSE, FENCES) AND CONSTRUCTION OF VESSELS. Collection of native fruits (açaí, bacaba, cocoa and jatobá) fOR FOOD PURPOSES. Essences, seed, OILS AND RESINS FOR MEDICINAL PURPOSES. Collection of LIANAS FOR ARTISANAL PURPOSES, SUCH AS MAKING BROOMS AND BASKETS.	Composition of the food diet	Composition of the food diet	Collection of water for human consumption anD HOUSEHOLD CHORES. Means of displacemENT

Marginalised and/or vulnerable community groups: According to the families, an important concern is the increase in the consumption of alcoholic beverages and narcotic drugs among young people in the communities, which often leads to cases of violence, robberies and thefts. They defend the need for social work by making young people aware of the risks to health and their well-being in the community. They also report that many of the cases are related to lack of work and income, leaving many of the young people disillusioned about their future.

Condition of the woman: It was observed that in rural areas a patriarchal system prevails, despite losing strength in relation to the resignification of the role of women in society recognized as the head and maintainer of the family. No cases of violence against women were recorded; however, it is common for these situations to remain submerged, silent in the family and in the community. It was found the need to reinforce the importance of the role of women in the local rural family, recognizing and stimulating their protagonism; as well as campaigns to combat gender-based violence.

Cultural and religious aspects: The communities living on the Igarapé Preto and Igarapé Ibiberibe are descendants of the first groups of North easterners who occupied the Western Amazon in the second half of the nineteenth century. Many of the ancestral traits still survive the intergenerational transformations and influences of the postmodern world.

In the communities, it was observed that families are constituted from unions between people from their own environment of experience. The formation of the family has interesting aspects. Women and men marry very early. Couples usually have three to six children. The constitution of the family is an act that always starts from man. When he accumulates knowledge about production, hunting, fishing, the manufacture of work instruments, the construction of housing, he seeks to start a family. When he finds a woman who interests him, he proceeds to court her from a distance awaiting reciprocity. If the procession succeeds, he chooses a place to live and builds his dwelling. From there he begins to plan the "theft" of his future wife, which usually happens in the dead of night. Due to the young age of the girl, a conflict is established between the boy and his "mother-in-law". The father hardly gets involved in the argument. Rare are the cases in which the mother brings her daughter back home.

According to conversations with residents, the religious aspect is present in the daily lives of families. Religious cults, novenas and healing rituals are common. They happen in specific places, such as churches, but also in homes, on weekends. The population is divided between the Catholic and evangelical currents.

Community organisation: No community organizations were identified in the studied communities. Residents reported that there has long been an association in Igarapé Preto, but no one came to fully function and ceased to exist. The grassroots organization recognized by residents is the Union of Rural

Workers of Feijó. Through the union, residents can access social and social security benefits, such as maternity pay, pensions and pensions.

4.1.1.3 Senegal Farm

4.1.1.3.1 Social Parameters: Senegal Farm and Assis Brazil Municipality

With a territorial area of 497,417.5 ha the municipality of Assis Brazil is in the west of the Brazilian Amazon, in the mesoregion of Vale do Acre, regional of Alto Acre. This region is well preserved and is 342 km from Rio Branco, on the triple border of Brazil, Bolivia and Peru, a region called MAP (Madre de Dios-PE, Acre – BR and Pando – BO). Strategic area for transcontinental integration, the Alto Acre Development Region, a border zone with Peru and Bolivia, connects with neighbouring countries through the Brazil-Peru Integration Bridge over the Acre River and the BR 317 Highway, its main access road.

The municipality is bathed by the Iaco River and Acre River, main tributaries of the Purus Basin. The Acre River Basin and the Purus Basin have their sources in Peruvian territory. The Purus Basin is shared with the Peruvian departments of Ucayali and Madre de Dios and the states of Acre and Amazonas. The Iaco River, the main tributary of the Watershed, has as main permanent streams, within the municipality of Assis Brasil, the Jacarecica, Icuriã, Balseirão, Samarra, Mamoadate and Abismo, which present better navigability conditions during the year.

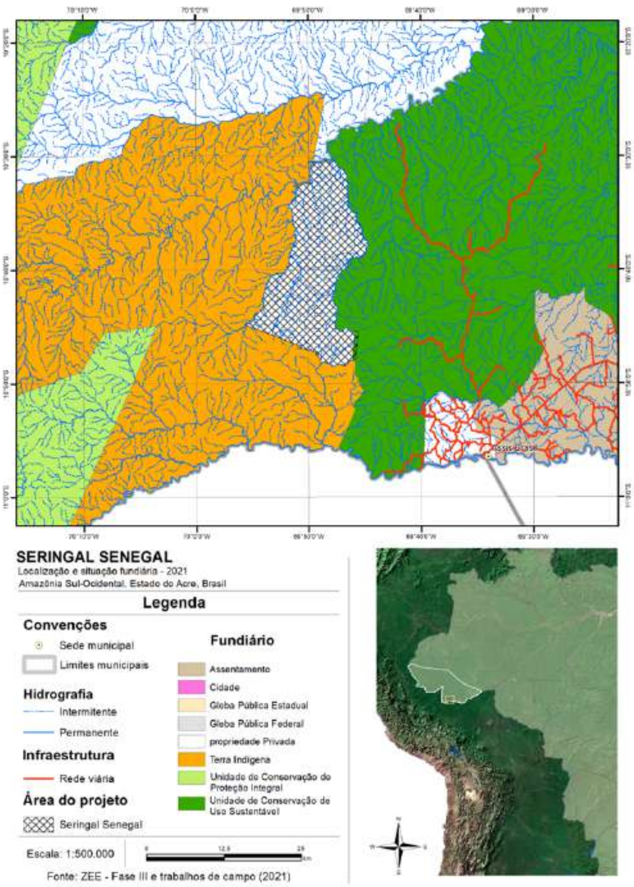
According to the IBGE (2021), the Municipality has about 7,649 inhabitants, which corresponds to a demographic density of 1.22 inhabitants / km². The MHDI is 0.588. It has a schooling rate of 85.1% among the age group of 6 to 14 years of age. The average infant mortality rate in the city is 13.95 per 1,000 live births. Hospitalizations due to diarrhea are 2.3 per 1,000 inhabitants. Compared to all counties in the state, it ranks 14 out of 22. When compared to cities across Brazil, these positions are 1875 out of 5570.

As for work and income, and in 2020, the average monthly wage was 2.4 minimum wages. The proportion of employed persons in relation to the total population was 6.1%. In comparison with the other municipalities of the state, it occupied positions 2 of 22. Compared to cities across the country, it ranked 646 out of 5570 and 4851 out of 5570, respectively. Considering households with monthly incomes of up to half a minimum wage per person, it had 47.1% of the population in these conditions, which placed it in position 10 of 22 among the cities of the state and in position 1869 of 5570 among the cities of Brazil.

The Gross Domestic Product (GDP) is equivalent to R$ 12. 864.39 (IBGE, 2020), with a share in the GDP of the State in the order of 5%. The sectors that contributed the most to GDP are public administration (53.6%), agriculture (27.5%), services (15.2%) and industry (3.6%) (ACRE, 2017). In livestock, it has a flock of 58,266 head of cattle.

The property of Senegal is in the municipality of Assis Brasil, on a strip of land in the Iaco River watershed (Figure 106). To access the area, it departs from Rio Branco-AC by land by BR-317 to the city of Assis Brasil-AC, in a stretch of approximately 342 km; from the city of Assis Brazil, it follows the Icuriã Branch within the Chico Mendes Resex to the left bank of the Iaco River, where the Farm is located.

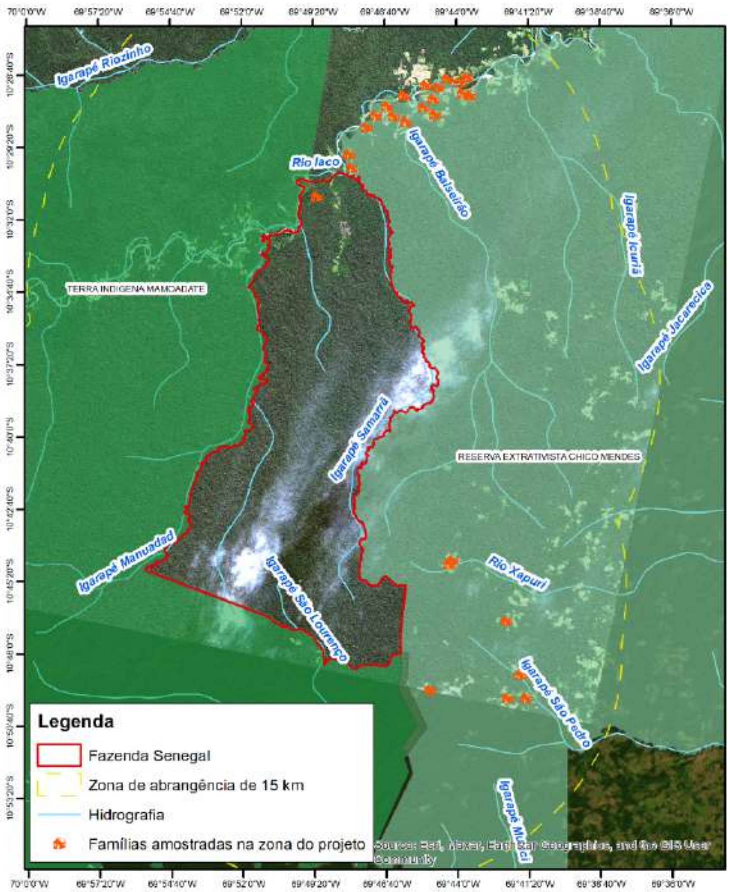
Figure 77 - Geographic location of the Senegal Farm Project Area.



4.1.1.3.2 Description of Stakeholders – Senegal Farm

The criteria for identification of social actors considered (i) human occupation in the surroundings of the project, being preliminarily established a radius of 15 km; (ii) and the socio-productive and cultural profile of small farmers and extractivists with recognized symbiosis and relative dependence on natural resources; iii) families in situations of socioeconomic vulnerability. With this objective, consultations and socio-economic data surveys were carried out, and 26 families included in the social engagement process were identified.

Figure 78 - Families located in and around the project Senegal.



CATRAIA · GREENPARTNER		DIAGNÓSTICO SOCIOECONÔMICO - TABULAÇÃO DE DADOS PROJETO SENEGAL	
N.	Nome do(a) Morador(a)	Coordenadas UTM (m)	
		Coord. X	Coord. Y
1	Roberto Santos de Araújo	424069	8804536
2	Assis Rodrigues Filho	417975	8803501
3	Danilo Lanes Assis	423224	8802940
4	Silvane Rodrigues de Araújo	419490	8812312
5	Alcemir Carvalho de Araújo	419252	8812040
6	Tereza Batista de Araújo	423151	8808219
7	Marli Silva do Nascimento	424491	8802967
8	Davi Marciel Rodrigues	420176	8844041
9	Jociney Mendonça da Cunha	418486	8844486
10	Antonio José da Silva	420475	8845125
11	Joel de Souza Rodrigues	419990	8844786
12	Irlândia da Silva Rodrigues	415473	8842482
13	Lorimar Vicente Ferreira	415027	8843163
14	Daniel Bezerra Ferreira	414265	8842537
15	Izaias Rodrigues Teles	418205	8843664
16	Izaque Maciel Rodrigues	420687	8843916
17	Aurelinda Morais Rodrigues	416322	8842117
18	Francisco Pereira Rodrigues	417519	8843090
19	Joaquim Maciel Rodrigues	418304	8842581
20	Nonato Pereira Rodrigues	416201	8843899
21	Adilson da Silva	413637	8841731
22	Raimundo Carlota da Silva	417681	8844607
23	Francisco Rodrigues da Silva	419115	8845030
24	Paixão Rubens Jaminawá	410259	8837039
25	Gilberto Araújo de Almeida	412482	8839904
26	José Silva de Almeida	412637	8839015

In the first analysis, the identification of the communities began from the analysis of satellite images of the location of the geographical area of the project, evaluating the existence of human occupation in and around them, as future beneficiaries of the project. As a result, families were identified along the Iaco River trough and in the Recife Branch.

Communities

Through satellite image analysis, the project area has been occupied by small dwellings on the bank of the Iaco River and on the bank of the Mamoadate Stream, and it is possible to identify areas of recent swiddens and abandoned swiddens, indicating occupation and land use. The research identified 26 families, including indigenous families whose home is within the Project Area.

The population around the Senegal Farm is composed of indigenous people from the Mamoadate and Cabeceiras do Rio Acre Indigenous Land, residents of Resex Chico Mendes and squatters in private areas located on the right bank of the Iaco River.

Culturally appropriate engagement occurred in the social, economic, and cultural information gathering stage and in the identification of the impacts and benefits possible to be generated by internal vectors (projects) and external. In the engagement, the team was careful to use in the approach an understandable language recognized locally during the explanations, accompanied by a location map and guiding text about the design and objectives of the project.

In the process, 26 families distributed along the banks of the Laco River and the Recife Branch were identified, as shown in the table below. No legally constituted community organizations or leaders recognized by the residents interviewed were identified.

Table 37 - List of residents located in the project area Senegal.

N.	Name of the Resident	Community	Location
1	Roberto Santos de Araújo	Colônia São Raimundo	Ramal Recife
2	Assis Rodrigues Filho	Colônia Vitória	Ramal Recife
3	Danilo Lanes Assis	Colocação Monte	Ramal Recife
4	Silvane Rodrigues de Araújo	Colocação Fronteira	
5	Alcemir Carvalho de Araújo	Colocação Fronteira	Centro
6	Tereza Batista de Araújo	Colocação Bom Futuro	Seringal São Francisco
7	Marli Silva do Nascimento	Colocação São Salvador	Seringal São Francisco
8	Davi Marciel Rodrigues	Colônia São Sebastião	Margem Rio Iaco
9	Jociney Mendonça da Cunha	Colônia Água Boa	Margem Rio Iaco
10	Antonio José da Silva	Colônia São Rafael	Margem Rio Iaco
11	Joel de Souza Rodrigues	Colônia São Pedro	Margem Rio Iaco
12	Irlândia da Silva Rodrigues		Margem Rio Iaco
13	Lorimar Vicente Ferreira		Margem Rio Iaco
14	Daniel Bezerra Ferreira		Margem Rio Iaco

15	Izaias Rodrigues Teles	Colônia Fé em Deus	Margem Rio Iaco
16	Izaque Maciel Rodrigues		Margem Rio Iaco
17	Aurelinda Morais Rodrigues		Margem Rio Iaco
18	Francisco Pereira Rodrigues	Colônia Laranjal I	Margem do Igarapé Balseirão
19	Joaquim Maciel Rodrigues	Colônia Laranjal II	Margem do Rio Iaco
20	Nonato Pereira Rodrigues	Fazenda Brasil	Margem do Rio Iaco
21	Adilson da Silva	Colônia Nova Esperança	Margem do Rio Iaco
22	Raimundo Carlota da Silva	Colônia São Francisco	Margem do Rio Iaco
23	Francisco Rodrigues da Silva	Colônia Santa Maria	Margem do Rio Iaco
24	Paixão Rubens Jaminawá	Fazenda Senegal	Margem do Rio Iaco
25	Gilberto Araújo de Almeida	Colônia São José	Margem do Rio Iaco
26	José Silva de Almeida	Colocação Samarã	Margem do Rio Iaco

The stakeholders were identified as a means of consulting the communities and perception of relevance by the project team itself, and the relationship network consisting of different objectives or aspects of local life (public policy, socioeconomic projects or land situation, for example) that constitute a lasting relationship between residents and government organizations, marketing network, NGOs, landowners, among others.

Table 38 - List of Stakeholders related to Senegal Farm.

Interested Party	Rights	Interest	Relevance
Family of the Iaco River and Recife Branch	Beneficiaries of benefit-sharing	Receive investments from the project: training, improvement	HIGH plays an important role in the

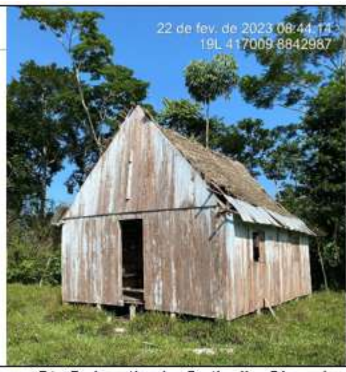
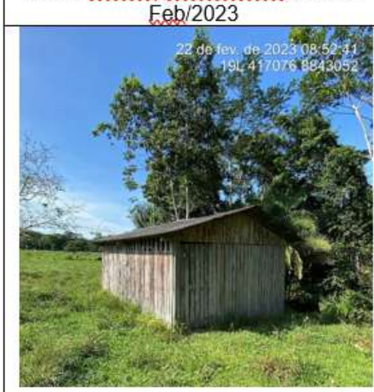
		of production processes and increase of family income	conservation of ecosystems;
State and Municipal SEMA (Environmental Agency)	None	Contribute to conservation practices and compliance with environmental legislation	HIGH partners in the implementation of socio-environmental actions
Department of Municipal/State Production and SENAR	None	Contribute to the diffusion of sustainable practices through the provision of training	Normal partners in the implementation of actions to improve agro-extractive production
Municipal and State Department of Education	None	Carry out socio-environmental actions in an interdisciplinary way in the local school	High development of environmental education activities with kids and young people
Chico Mendes Institute for Biodiversity Conservation	Enforce within the project the rules of the buffer zone of Resex Chico Mendes	Maintain or improve protective measures in the buffer zone	Normal partner in the implementation of protection actions
National Indigenous Foundation (FUNAI) and representatives of the Mamoadate Indigenous Land	Possible overlapping of the project area with areas of customary use of indigenous	Conduct studies to identify possible land tenure or use rights involving areas of the Senegal Farm	HIGH Resolution of possible land pendency or formalization of

	communities in the TI, according to the Territorial and Environmental Management Plan and Ethnomapping Jaminawa and Manchineri		agreement for benefit sharing, if applicable

4.1.1.3.3 Original Conditions of well-being

Communities: In the surroundings of the area comprised by the bank of the Iaco River, two communities were identified, the Santa Fe Community and the Icuriã Community, both formed mostly by residents of Resex Chico Mendes and by squatters of private properties on the right bank of the Iaco River. The Santa Fe Community has as its representative the Community Leader Francisco Rodrigues da Silva, popularly known as "Tereré". The infrastructures identified in the community were, the municipal school José Vileme de Araújo, the Catholic church São Sebastião, the rice peladeira, a headquarters for community meetings and a voadeira for transporting patients.

Figure 79 - Infrastructures of the Santa Fe Community.

	
José Vileme de Araújo Municipal Rural School, GreenParter/Catraia Feb/2023	St. Sebastian's Catholic Church, GreenParter/Catraia Feb/2023
	
Community Rice Peeler, GreenParter/Catraia Feb/2023	Community Meeting Space, GreenParter/Catraia Feb/2023

In the community of Icuriã, the infrastructures identified were, the Basic Health Unit Genézio Pereira da Silva, the Municipal School XVII of November and a public telephone used to maintain contact with the municipality of Assis Brasil.

Figure 80 - Infrastructures of the Santa Fe Community..

		
Rural Municipal School XVII de Novembro, GreenParner/Catraia Feb/2023	Icuriã Community Public Phone, GreenParner/Catraia Feb/2023	Basic Health Unit Genézio Pereira da Silva GreenParner/Catraia Feb/2023

In the area comprised by the Recife branch, no community infrastructure was identified, all the services that the population needs are performed in the municipality of Assis Brasil.

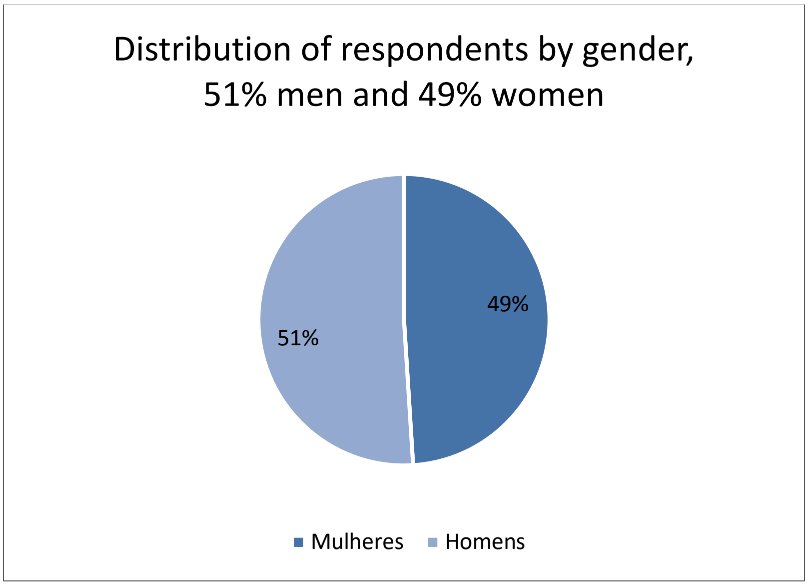
In addition to the surrounding areas, it was verified by satellite image and later confirmed in loco the existence of residents within the project area. These are located on the bank of the Iaco River and the Mamoadate Igarapé and are indigenous families of the Jaminawa and Manchineri ethnic groups that have houses, gardens and small animal farms for subsistence.

According to data from the Mamoadate Indigenous Land Ethnomapping (2016), the area of the Senegal Seringal, formerly the Petrópolis Seringal, has long been used by indigenous people as a hunting, fishing and extraction area.

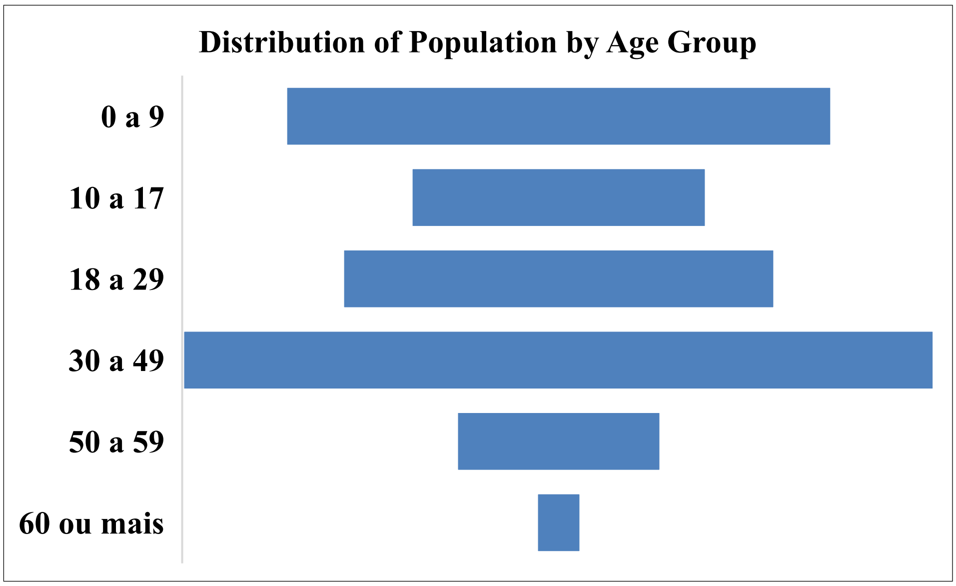
The Jaminawa and Manchineri Territorial and Environmental Management Plan for the Mamoadate Indigenous Land (2016), in turn, calls for the revision of the boundaries of the Mamoadate Indigenous Land including the area between the Samarrã and Mamoadate streams (Senegal), which is already traditionally occupied by the Jaminawás and Manchineris.

Demographics:

a) Population and gender: According to the surveys, 26 families were interviewed, 19 families from the bank of the Iaco River and 07 families from the Recife Branch, with an estimated population of 100 people. Regarding the distribution of the population by sex, the sample showed that men appear as the majority, totalling 51%, while women correspond to 49%.



The distribution according to age groups shows a predominance of the young and adult population, with 61% belonging to the age group of 18 to 59 years. The range between 0 and 17 years corresponds to 37% and the age group with 60 years or more represents only 2% of the total population. Similar results were found by Gomes 2018 in a study at Resex Chico Mendes, where the average age of respondents was 42 years.



Internal mobility and migration trend: The process of internal mobility occurs naturally within the family nuclei of RESEX Chico Mendes, the division of placements or the opening of new possessions is common as children marry and start a family. In the region of the Project it is common to find people with some degree of kinship, evidencing this process of mobility.

Another point observed is that in general, one of the reasons that lead children to disassociate themselves from their parents' areas is the fact that they are open to the insertion of new work techniques and inclusion of technological production systems.

The migration trend was observed in smaller numbers, and usually occurs on the part of young people in search of better opportunities for study and work in the city. According to Maciel et al., (2014), the lack of opportunities in the countryside is also one of the great challenges to be faced, justifying the evasion mainly of young people, who go to the cities in search of new perspectives of life, of a better-quality education, which, in many cases, is non-existent in the rural environment.

Consequently, the migration of the children of rural producers to the cities leaves family farmers in a difficult situation, since it perpetuates the lack of successors to take over rural family production. Causing difficulties to proceed to the transmission of the patrimony, imposing concern to the parents in relation to the fate of the family establishment.

Cavalcante Filho, et. al., (2021) showed that the rural family producer settled in RESEX Chico Mendes, still finds productive difficulties. These difficulties can be explained by the low rate of reproductive efficiency and low reproductive tension, which probably means the migration of family members from the countryside to salaried activities outside the family productive units.

Land use and subsistence system: the land use of most of the interviewees is related to subsistence agriculture and livestock, and extractivism is rarely practiced. The low incidence of extractive activities is mainly due to this region, where the interviews were conducted, and there is no occurrence of rubber and chestnut trees, when these occur are in low densities, making the collection practice unfeasible.

The extraction of non-timber products is practiced by only 1 interviewee, who collects latex in his own area. Last year, he sold 72 kg of Cernambi Virgin Pressed – CVP at R$ 12.00 kg to AMOPREAB. This price differs from that practiced in the market, because it is not yet cooperative and cannot receive subsidies from the latex chain.

Given the difficulties of commercialization and economic viability of the production of traditional extractivism and the decrease in the generation of income of families, the production of cattle began to be thought / worked as a complement of income and, in a few cases, as the main generator of income of the residents of RESEX Chico Mendes, especially for the characteristics of this product: ease of sale, in any quantity, with immediate payment and in kind (Maciel 2021).

Regarding livestock as a subsistence activity of the interviewees, pig farming stands out, practiced by 100% of the interviewees, cattle farming practiced by 92%, poultry farming by 85% and sheep farming by 62%.

In the last socioeconomic diagnosis of RESEX Chico Mendes, carried out by Maciel (2021) for the period 2018/2019, cattle accounted for most of the income generated among families, with 42% of total income. The trade-off between extractivism and cattle ranching is what leads residents to invest more in livestock than in extractive activities, such as the collection of chestnuts, the cultivation of açaí or the extraction of latex. The attractiveness of livestock can be demonstrated by the form of marketing because it is a product that does not need transportation and its payment is made in kind and in any locality that is found. (PONTES, 2015).

Regarding agricultural activities, 81% of respondents grow corn and cassava, 77% grow beans, 26% grow rice and only 19% grow bananas. In addition to these products, 1 interviewee is starting a coffee cultivation, through a project financed by the Municipality of Assis Brasil.

Most respondents, 98%, use agricultural production only for self-consumption, in particular for the feeding of small animals, such as cassava and corn, a fact that is justified by low productivity, lack of labour to expand the swiddens and especially by the difficulty of disposing of production for commercialization in the city.

The swidden is a form of land use traditionally related to subsistence, self-consumption, family farming and the rubber tree tradition, and the surplus is marketed to supplement income. Over time, structural and seasonal difficulties and competition with industrialized products have made it economically unfeasible to sell this surplus, such as rice, beans and corn, classic products of the so-called "white crop", precisely because of the ancestral form of "slash and burn" agriculture (Maciel, 2021).

As found, the average annual conversion area (capoeira or primary forest) of the interviewees is 2.6 hectares/year and the cleaning method of 100% of them is using fire because none has agricultural machinery or implements.

Data from the socioeconomic diagnosis of RESEX Chico Mendes, cited by Maciel, et. al (2021), reports that one of the strengths of family farming, agricultural production for self-consumption, only worsens over time, with a drop of 36% in the last 25 years, which may be a result of the pattern of urban consumption entering strongly in the rural environment. Following this trend, dependence on the market only tends to increase, in addition to the pressure for higher incomes.

Community infrastructure: when approached about the existence of schools in the community, 92% of the interviewees stated that there is a school and 61% stating that it belongs to the Municipal network. Although 31% of the interviewees indicated the existence of a state school, it was found in loco that the two existing schools in the community belong to the municipal network of Assis Brasil. These are, José Vileme de Araújo School in the Santa Fe community and XVII de Novembro School in the Icuriã community.

It is perceived that currently there is a greater effort so that everyone can at least be literate considering that access to schools was much more difficult a few decades ago, even because there are few schools and are distant from many families, as highlighted, the CNS (1992) existed throughout the Resex in the 1990s around 86 schools.

A point of emphasis is in relation to the conditions of the schools, as reported by the interviewees and verified by the visit to the site, the two schools of the community are in a precarious state of conservation, as detailed in the images. According to reports from the interviewees, the end of the 2022 school year took place in the home of a community, due to the terrible conditions that the schools are in.

Figure 81 - Infrastructures of the Santa Fe Community.


Regarding schooling, most of the interviewees, 43% have incomplete elementary education. Another 23% have completed elementary school, 16% have incomplete high school, 14% have completed high school, and 4% are illiterate. It is worth mentioning that although no person from the families interviewed has a complete or ongoing higher education level, the number of illiterate people is considered low. Eli (1995) points out that the population of the Chico Mendes reserve in the 1990s consisted of more than 90% illiterate. According to the results presented in the socioeconomic survey of Resex Chico Mendes 2021, education levels among the residents of the reserve show a significant increase.

Regarding the existence of a health center in the community, 58% of the interviewees reported that there is a municipal health center, 23% reported that there is a health unit under the responsibility of the State and 19% stated that there is no health center. When verified in loco, it was verified the existence of the Basic Health Unit Genézio Pereira Rodrigues managed by the Municipality of Assis Brasil.

Among the main complaints of the interviewees is the lack of medicines and professionals at the health center, and the community must travel to the city of Assis Brasil to get care and medication. Silva (2012) observes that health conditions in reserves end up being precarious because there are not most of the time, health posts, dental care and other services that are necessary for quality of life. The issue of public health within these communities needs to be thoroughly washed, as it characterizes a great deficiency in the political planning of the rulers.

The visit of the health agent in the houses was verified in 85% of the interviewees, but there are reports of challenges/difficulties due to the fact that the health agent is from the city of Assis Brasil, making the visits quickly, only to meet the demand, without giving due attention to the residents. In addition, there are complaints that in the winter period the number of visits decreases.

Regarding the diseases pointed out by the interviewees, the main ones are related to respiratory diseases (42%), low back pain (38%) and rheumatism (23%). There were also reports of leishmaniasis (4%), depression (12%) and other diseases such as hypertension and diabetes totalling 15%.

The increase in the occurrence of chronic diseases common to the urban environment, such as hypertension and diabetes, which are related to both inadequate nutrition and lack of physical activities, is extremely worrying. Such diseases can also become a problem when one thinks about the availability of labour for production.

As for the form of medication, 81% of respondents claimed to use industrialized drugs and only 19% use natural remedies. It is evident the change in the habit of the communities, because as the CNS (1992) points out, the treatment of most diseases was done using home remedies manufactured with herbs, leaves, tree bark and roots.

It is worth mentioning that of the 26 interviewees, only 3 use the project area to collect non-timber forest products for the production/use of medicines, with the main products collected being cat's claw (“unha de gato”) and copaiba oil.

As for sanitary sewage, it was found that 46% release the waste in the open, 39% in a septic tank and 15% in a black pit. In this case, the waste falls directly into the soil, infiltrating and increasing the risk of contamination of the water table and consequently the springs where the community itself performs the collection for consumption.

A municipal program benefited several residents with the construction of masonry bathrooms and septic tanks. However, one of the criteria to be a beneficiary of this program was that the resident's house was covered with zinc or tile, which made it impossible for several residents who own the house covered in straw.

It is worth mentioning that many families still use an open toilet and thus feces and urine are deposited near the places of water use, a case that can be considered a risk factor for the spread of worms, especially in children (SOUZA, 2012).

Regarding domestic sewage, most families (54%) release it in the open, draining through ditches to places far from the house, another 42% channel domestic sewage into a cesspool and 4% channel domestic sewage into the nearby forest.

Bernardes (2013) points out that the sanitation scenario in Brazil shows that the population still suffers from the deficit of sanitation services in different proportions depending on the type of service and the region. The North region is among the places with the greatest deficiency in access to basic sanitation services and when one thinks of rural areas, as is the case of the Extractive Reserves, the reality is even more precarious.

As for solid waste, 81% of the families declared that the garbage is burned, 8% throw it on the ground, 7% burn and bury it and 4% burn and throw it on the ground. The practice of burning waste is common in rural communities, due to the lack of selective collection, as well as because it is the destructive way that generates less work.

As for access to drinking water, 100% of families use water for consumption. The most common treatment method is clay filters and chlorine, which is distributed by the health agent.

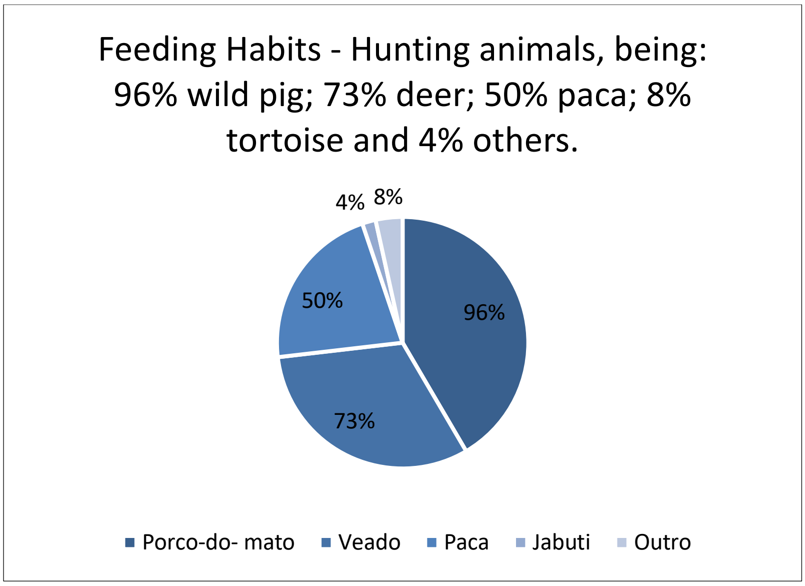
Job opportunity and income: regarding the composition of the source of income of the interviewees, 81% receive the aid of the Federal Government in the amount of R$ 600.00 and 42% of the interviewees do the service of day labourer. In the region, the only job opportunities are for cleaning pastures, capoeiras and swiddens, whose payments are made through daily rates ranging from R$ 80.00 to R$ 150.00.

Cavalcante Filho, et.al (2021) reports that more than half of the families settled in RESEX Chico Mendes have a standard of living below a minimum wage and, even more worryingly, about 10% of these families are below the poverty line. Another source of income for families is the raising of animals such as chicken, pig, sheep and cattle, which is most often sold to indigenous people in the region.

According to socioeconomic data from Resex Chico Mendes, Maciel et. al, (2021), reports that animal husbandry has become the activity that most generates income among rural producers due to the facilities of production, commercialization of their products and the increase in their price, in the recent period, totalling an evolution of 96.21%, in the last two periods analysed. Thus, cattle breeding presents an evolution of 280.21% in the last 25 years studied, becoming the largest source of income generation in the Chico Mendes RESEX.

Food security: a widely used definition, which refers to the World Food Summit, held in 1996, says that food security occurs when all people have physical and economic access to safe and nutritious food, in sufficient quantities to meet their food needs, providing an active and healthy life.

Most of the families interviewed have a diet based on wild animal meat, fish, beans, rice, vegetables, vegetables, swidden fruits and native fruits. Due to the abundance and appreciation of the residents, game meat is the main source of protein, with the bush pig and deer being the most appreciated by the interviewed public.



The consumption of fish also happens, mandim, piaba, pirapitinga and curimatã are the most cited by the interviewees. In general, most families own chickens, pigs and sheep in order to supplement the diet and even make an extra income from the sale of these.

From the gardens, they consume the cassava, rice, beans, corn and bananas.

Among the products collected in the forest, açaí, patauá, pupunha and buriti stand out. Due to its abundance, and with the collection occurring for much of the year, açaí and patauá are the wild fruits most consumed by families.

Cavalcante Filho et al., (2021) point out that even after 20 years of implementation of the Chico Mendes RESEX there are still high levels of food insecurity, a result of the increased dependence on goods purchased in the market and, especially, by the reduction in the level of self-consumption.

Cultural and religious diversity: as for religiosity, it was observed that the only church present in the region is Catholic. In the Santa Fe Community, there is the church of São Sebastião, which due to the non-realization of meetings due to the pandemic period, is with the precarious structure. Some interviewees reported that they are organizing to rebuild the church and resume meetings. Although there are reports of evangelical missionaries present in the region, mainly to the indigenous lands, no other religion with the presence of physical temples was found. Regarding cultural diversity, no activities performed by the interviewees were reported or identified. The only football field identified has not been used for a long time.

Social categories and self-designation: regarding self-denomination, 73% of respondents declared to be farmers, 12% declared to be cattle ranchers and 15% farmers and ranchers. This fact corroborates the information that the region surrounding the Senegal farm, occupied by residents of Resex Chico Mendes, does not have extractive assets, such as rubber and nuts.

Land situation: the land situation of about half of the Amazon is unknown. Because of this, the economic development and environmental management of the region become difficult, stimulating social conflicts, and harming the rights of local populations (BRITO; BARRETO, 2010).

Most respondents (65%) do not have a land tenure document, but guarantee to be the owners, these in general are residents of the Chico Mendes Extractive Reserve. Calegare and Higuchi (2013) show that the aspects common to the feeling of ownership of the place are linked to the fact that they have lived for years in these places, work to obtain food, have constituted a family and raised their children and, in some cases, have some document that attests to the ownership of the land. This is all what Almeida (2008) names as traditionally occupied land. On the other hand, the aspects common to the feeling of non-possession refer to the lack of documentation, little time of housing on the site or understanding of being a Union land.

Maciel, et al., (2021) report that there is still a clear situation of insecurity in land ownership among the extractives of RESEX Chico Mendes, since more than 60% do not have any document that ensures the ownership of the areas they live. This is extremely worrying, as more than two decades have passed without this situation being resolved. Regarding the size of the properties, they ranged from 200 to 1,800 hectares, and the lots of RESEX Chico Mendes have sizes ranging from 200 to 300 hectares.

Rights of access to and use of natural resources: most of the population interviewed does not use natural resources in the project area, due to the fact that it is already an area widely used by the indigenous people. Some residents report that during hunts in the vicinity of the Igarapé Samarrã sometimes happens that the animal runs to the rubber plantation and that is when they enter the area. Others use the hunting trails of the Indigenous to go hunting inside the Seringal. The residents of the Recife Branch report that after the opening of the branch that aimed at logging in the Senegal Seringal, the incidence of people from the city hunting in the area increased greatly, including reports of reduction of animals in the area.

As identified by satellite image and verified in loco, there are indigenous families living in the project area, more specifically the banks of the Iaco River. According to the Jaminawa and Manchineri Territorial and Environmental Management Plan (2016), for the Mamoadate Indigenous Land, the area of the Senegal Area, formerly the Petrópolis Farm, is an area used by the indigenous people for a long time, having already demonstrated the need to incorporate this area into the Mamoadade Indigenous Land.

In the Ethnomapping of the Mamoadate Indigenous Land, (2016), it is reported that both the Jaminawas and Manchineris peoples use the Senegal Seringal area for the implantation of swiddens, fishing, hunting and extractivism. No agreements were identified between the owner of the farm and the indigenous people or the people who use the project area, all the interviewees who use the area reported that they do it on their own.

Conflicts and impacts: no conflicts were reported between residents around the project and the owners of the area. Only one resident indicated the resistance on the part of the indigenous people to continue using the area for the implantation of swiddens, hunting, fishing, and extractive activities.

As for the impacts, two interviewees reported a deforestation of approximately 300 hectares carried out in the year 2021 in the project area. This deforestation was aimed at the formation of pasture for cattle breeding, however, after the deforestation there was an inspection by the competent bodies and the activity did not go ahead.

Community organization: the system of community organization that predominates in the majority of respondents (54%) is associations, through the Association of Residents and Producers of the Chico Mendes Extractive Reserve in Assis Brasil - AMOPREAB represented by President Wendel Araújo. 38% of the respondents are part of the Union of Rural Workers of Assis Brasil, whose representative is Mr. Jurandir Araújo and 27% of the interviewees have as reference the community leadership of the Santa Fe Community, Mr. Francisco Rodrigues da Silva.

In general, 100% of the interviewees who participate in some system of community organization evaluate as good the performance of the institution to which it is part, with no complaints regarding the performance of these in the communities.

Regarding the performance of governmental institutions, non-governmental or private initiative in the communities, 69% of the interviewees reported the performance of Energisa with the implementation of solar panels through the More Light for the Amazon program and 35% of the interviewees reported the performance of the city of Assis Brasil with the construction of drinking fountains for animals, donation of a voadeira to transport patients and implantation of a rice peladeira in the Santa Fe community.

Restrictions on local development: indicated by the vast majority of families living on the bank of the Iaco River, the improvement of the Icuriã Branch would be the first step towards local development. The branch, especially in the period of the Amazonian winter has been the main problem of the community, making it impossible mainly the flow of production and the locomotion of sick people to the municipality of Assis Brasil. In addition, the lack of state and municipal investments in technology to improve agricultural production, lack of investments in health, such as the functioning of the Basic Health Unit and availability of basic medicines, and lack of investments in education, especially regarding the physical structure of schools and lack of professionals, were mentioned.

With this, the effective sustainable development, with a social, economic and environmental focus becomes a challenge for this region, since the strengthening of traditional extractive activities is running up against the historical technological backwardness, still without effective public policies to overcome it.

Maciel, 2021 reports that such bottlenecks compromise the economic efficiency of sustainable productive activities, with direct impacts on the generation of employment and income among extractive families. The search for productive alternatives leads to changes in the typology of the activities developed, as is the case of cattle breeding.

4.1.2 Interactions between Communities and Community Groups (CM.1.1)

4.1.2.1 Jaraguá Farm

Community organization. Residents of PAE Canary created the Association of Extractive Producers of the Canary Settlement Project. They were motivated by the need to gain a voice in the search for access to rights, installation of electricity, housing construction, sanitation, health care and education. Through the association, they seek support in the elaboration and implementation of economic projects, maintaining a partnership with INCRA. maternity, pension, and retirement.

Table 39 - Community organization around the Project.

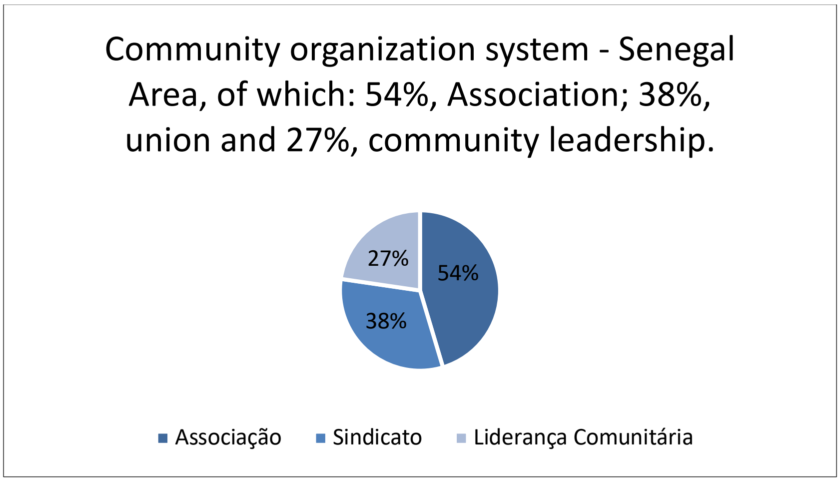
Organization	Representative	Contact
Association of Extractive Producers of the Canary Settlement Project	Antonio Valcimar da Silva Gomes	(68) 99919 - 1860

4.1.2.2 Santa Rosa Farm

No community organizations were identified in the studied communities. Residents reported that there has long been an association in Igarapé Preto, but no one came to fully function and ceased to exist. The grassroots organization recognized by residents is the Union of Rural Workers of Feijó. Through the union, residents can access social and social security benefits, such as maternity pay, pensions and pensions.

4.1.2.3 Senegal Farm

The system of community organization that predominates in most respondents (54%) is associations, through the Association of Residents and Producers of the Chico Mendes Extractive Reserve in Assis Brasil AMOPREAB represented by President Wendel Araújo. 38% of the respondents are part of the Union of Rural Workers of Assis Brasil, whose representative is Mr. Jurandir Araújo and 27% of the interviewees have as reference the community leadership of the Santa Fe Community, Mr. Francisco Rodrigues da Silva.



4.1.3 High conservation Values (CM1.2)

4.1.3.1 Jaraguá Social HCV

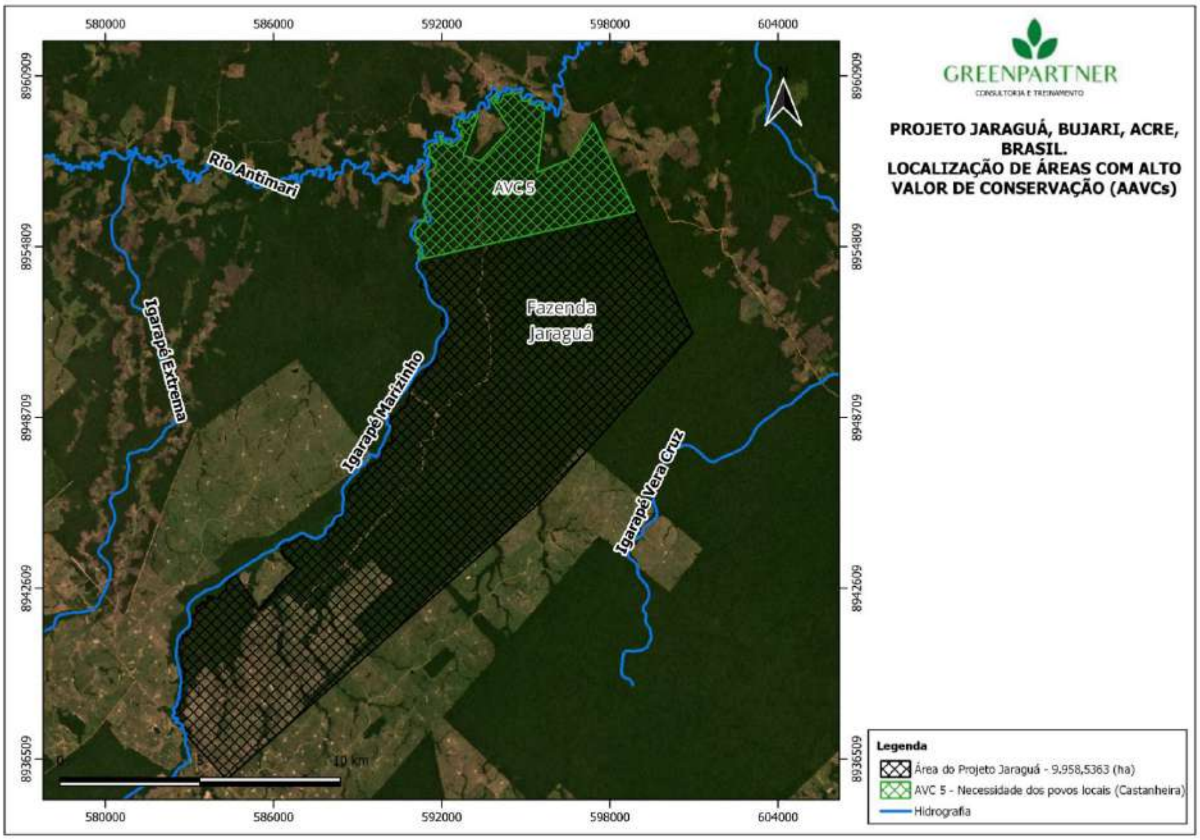
High Conservation Value	Brazil Nuts (Castanha do Brasil)
Qualifying Attribute	During the surveys it was found that three families carry out the traditional collection of Brazil nuts within the Project Area. When consulted, they informed that they had been collecting the product for many years, even before the owner of Fazenda Jaraguá acquired the property; reported that there was never a prohibition or disrespect for traditional law, and they even had a good relationship with the owner of the farm. They declared that there was a documenting agreement issued by the owner authorizing the collection, therefore with assured rights. During the consultation process, extractivists declared that they are economically dependent on the activity, considering it an important source of family income. Collections are carried out

	annually during the harvest period, which begins in December and ends in March. In analysis, it was found that it is a traditional community, with intergenerational cultural traits, descendants of the first residents who inhabited the region.
Focal Area	Basic Needs of Local People: Locations and resources critical to meeting the basic needs of local communities or indigenous peoples (for livelihoods, health, nutrition, water, etc.), identified through engagement with these communities or indigenous peoples. Based on information provided by residents (Table 81), the estimated geographic area of the HCV attribute – Brazil nut was identified, shown in Figure 109 below.

Table 40 - Residents who collect Brazil nuts in the Project Area.

N.	**Name of the Resident**	**Community**	**Location**
1	Pelônia Ferreira de Souza	Centrinho Placement	Antimary River
2	Gelmir Souza Cruz	Boa Vista Placement	Antimary River – PAE Limoeiro
3	Raimunda Nonata Fernandes da Silva	Volta Grande Placement	Antimary River

Figure 82 - Geographical location of the attribute HCV Brazil nut. Being AVC (in Portuguese on the map) – HCV – High Conservation Value (Area marked in green on the map).



4.1.3.2 Santa Rosa Social HCV

To identify High Conservation Value Areas, the families were consulted using a map containing the location of the Ibiberibe and Preto Igarapés, the project area and the location of the families. As a result, respondents stated that they do not use resources within the project area, due to the long distance and difficult access. They informed that the resources they need are extracted within their own areas. Therefore, no evidence was identified that points to the existence of social HCVs within the Project Area Santa Rosa. In the Project Zone, no attributes classified as High Conservation Values were identified.

4.1.3.3 Senegal Social HCV

In order to identify High Conservation Values Areas, the families were consulted using a map containing the location of the Project Area, the Iaco River watershed and the location of the families. The surveys showed that there is at least one indigenous family living within the Project Area, identified as Paixão Rubens Jaminawá. He reported during the interview that he has lived in the place for approximately 6 years and owns an area of approximately 100 hectares. For family subsistence, among others, he practices hunting and fishing in the Project Area.

Also, according to the Territorial and Environmental Management Plan Jaminawa and Manchineri (2016), for the Mamoadate Indigenous Land, the area of Senegal Farm, former Petropolis Farm, is an area used by the indigenous people for a long time, having already demonstrated the need to incorporate this area into the Mamoadade Indigenous Land. In the Ethnomapping of the Mamoadate Indigenous Land, (2016), it is reported that both the Jaminawas and the Manchineri peoples use the area of the Senegal Farm for planting swiddens, fishing, hunting and extractivism.

No agreements were identified between the farm owner and the indigenous people regarding the recognition of ownership or land use rights in Senegal. The situation identified was not discussed further with the representatives of Indigenous Land Mamoadate or with FUNAI. In view of this, it is recommended to build formal dialogues with FUNAI and indigenous communities, in order to collect data to assess the existence of HCV types 5 and 6 within the Project Area.

4.1.4 Without- Project Scenario: Community (CM1.3)

In general, in the absence of the Project (for the 3 Project's areas), the communities could be negatively impacted by the degradation of the areas due to deforestation and fires. The areas produce natural resources that are important sources of food and marketed products (such as nuts, game animals and fishes) from neighboring communities. The loss of these areas will have a major impact on the living conditions of these communities.

Furthermore, as proposed by this Project, Jaraguá, Santa Rosa and Senegal will play an important role as catalysts for territorial development. Thus, the non-implementation of the Project will imply a set of actions that may not happen to promote the integral development of the territory, with engagement of the communities.

4.2 Net Positive Community Impacts

4.2.1 Expected Community Impacts (CM2.1)

Table 41 - Summary of the expected benefits of the Project (Community for the 3 areas – Jaraguá, Santa Rosa and Senegal).

Estimated result or impact by the end of the project's useful life	
Expected benefits for the community	4. Support the strengthening of non-timber extractivism
	Offer techniques of *agriculture without the use of fire*

	Provide training to young people and women in rural entrepreneurship
	Provide training to young people and women in rural entrepreneurship

The tables below describe the categories, metrics, and estimated benefits during the project for each of the 3 areas specifically.

Table 42 - Categories, metrics, and estimated benefits during the project for Jaraguá Farm.

Category	**Metric**	**Estimation until the end of the project's useful life**
Training	Total number of community members who must have enhanced skills and/or knowledge resulting from the trainings provided as part of the project activities	25
	Number of female community members who have improved their skills and/or knowledge resulting from the training as part of project activities	15
Employment	Total number of people employed in project activities, expressed as number of full-time employees	Not applicable
Livelihood	Total number of people with improved livelihoods or income generated as a result of project activities	15
	Number of women with improved livelihoods or income generated as a result of project activities	15
Health	Total number of people for whom health services improved as a result of project activities, measured against the non-project scenario	Not applicable

	Number of women for whom health services improved as a result of project activities, measured against the non-project scenario	
Education	Total number of people for whom access to or quality of education has improved as a result of project activities, measured against the no-project scenario	Not applicable
	Number of women and girls for whom access to or quality of education has improved as a result of project activities, measured against the non-project scenario	
Water	Total number of people who experienced increased water quality and/or better access to drinking water as a result of project activities, measured against the no-project scenario	Not applicable
	Number of women who experienced increased water quality and/or better access to drinking water as a result of project activities, measured against the no-project scenario	
Wellness	Total number of community members whose well-being has improved as a result of project activities	100

Table 43 - Categories, metrics, and estimated benefits during the project for Santa Rosa Farm.

Category	**Metric**	**Estimation until the end of the project's useful life**

Training	Total number of community members who must have enhanced skills and/or knowledge resulting from the trainings provided as part of the Project activities	30
	Number of female community members who have improved their skills and/or knowledge resulting from the training as part of project activities	15
Employment	Total number of people employed in project activities, expressed as number of full-time employees	Not applicable
Livelihood	Total number of people with improved livelihoods or income generated as a result of project activities	15
	Number of women with improved livelihoods or income generated as a result of project activities	15
Health	Total number of people for whom health services improved as a result of project activities, measured against the non-project scenario	Not applicable
	Number of women for whom health services improved as a result of project activities, measured against the non-project scenario	
Education	Total number of people for whom access or quality of education improved as a result of project activities, measured against the non-project scenario	Not applicable
	Number of women and girls for whom access to or quality of education has improved as a result	

	of project activities, measured against the non-project scenario	
Water	Total number of people who experienced increased water quality and/or better access to drinking water as a result of project activities, measured against the no-project scenario	Not applicable
	Number of women who experienced increased water quality and/or better access to drinking water as a result of project activities, measured against the no-project scenario	
Wellness	Total number of community members whose well-being has improved as a result of project activities	124

Table 44 - Categories, metrics, and estimated benefits during the project for Senegal Farm.

Category	**Metric**	**Estimation until the end of the project's useful life**
Training	Total number of community members who must have enhanced skills and/or knowledge resulting from the trainings provided as part of the Project activities	26
	Number of women community members who have improved their skills and/or knowledge resulting from the training as part of project activities	15

Employment	Total number of people employed in project activities, expressed as number of full-time employees	Not applicable
Livelihood	Total number of people with improved livelihoods or income generated as a result of project activities	15
	Number of women with improved livelihoods or income generated as a result of project activities	15
Health	Total number of people for whom health services improved as a result of project activities, measured against the non-project scenario	Not applicable
	Number of women for whom health services improved as a result of project activities, measured against the non-project scenario	
Education	Total number of people for whom access or quality of education improved as a result of project activities, measured against the non-project scenario	Not applicable
	Number of women and girls for whom access to or quality of education has improved as a result of project activities, measured against the non-project scenario	
Water	Total number of people who experienced increased water quality and/or better access to drinking water as a result of project activities, measured against the no-project scenario	Not applicable

	Number of women who experienced increased water quality and/or better access to drinking water as a result of project activities, measured against the no-project scenario	
Wellness	Total number of community members whose well-being has improved as a result of project activities	104

4.2.2 Negative Community Impact Mitigation (CM2.2)

As identified in other communities, an important concern is the increase in consumption of alcoholic beverages and narcotic drugs among young people in the communities, which often leads to cases of violence, robberies, and thefts. The communities defend the need for social work, making young people aware of health risks and their well-being in the community. They also report that many of the cases are related to lack of work and income, leaving many young people disillusioned about their future.

The Project will promote structuring actions to consolidate the holistic relations of the communities with the areas of the Project.

4.2.3 Net Positive Community Well-Being (CM2.3, GL1.4)

In the Tables below are listed the activities and impacts expected during the project for the communities involved.

Table 45 - Activities and expected impacts during the Project for the 3 Areas.

Activity description	*Community*			*Relevance to the project objective*
	Impacts short term	Impacts Medium term	Impacts Long term	
Supporting the strengthening of non-timber and extrativism (especially, Brazil nuts for Jaraguá and latex for Senegal)	Formalization of partnership to offer technical assistance and market access	Offer of continuous technical assistance and implementation of processing infrastructure	Production, commercialization, and generation of family income	Strengthening family income through sustainable forestry activity
Offer techniques of agricultural fields without the use of fire	Formalization of partnership to offer rural	Provision of continued technical assistance	Reduction of the use of fire in the preparation of land for swiddens	Reduction of emission of gases of estufa effect in the project zone; land

	technical assistance			use practices in a lower degree of degradation
Provide training to youth and women in rural entrepreneurship	Formalization of partnership to offer training	Provision of training to young people and women	Success stories of rural entrepreneurship, with productive engagement of young people and women	Reducing the socioeconomic vulnerability of marginalized groups

4.2.4 High Conservation Values Protected (CM2.4)

On the contrary, the HCV indicated by the Project in the Jaraguá area will positively impact the communities that depend on the healthy forest for the collection of Brazil nuts. Project management will ensure and strengthen ties between extractivists and the landowner.

4.3 Other Stakeholder Impacts

4.3.1 Impacts on Other Stakeholders (CM3.1)

No negative impacts were identified that could affect stakeholders in the Jaraguá and Santa Rosa areas.

For the Senegal area, it is recommended to carry out in-depth studies regarding land use and/or tenure rights within the Project Area by communities of the Mamoadate Indigenous Land, in compliance with ILO Convention No. 169.

4.3.2 Mitigation of Negative Impacts on Other Stakeholders (CM3.2)

RISK	POTENTIAL IMPACT	MITIGATION ACTION
LACK OF COMMUNITY ENGAGEMENT	Prevalence of agricultural activity with degrading effect on the environment	Raise awareness of the transformation through the exchange of experience with success stories in the Amazon

	Prevalence of socioeconomic vulnerability among young people and women	Maintain active communication and feedback channels to assess the degree of engagement and need for new stimulating actions
		Keep the community confident in the project with the fulfillment of actions, deadlines, and agreements.

4.3.3 Net Impacts on Other Stakeholders (CM3.3)

The activities to be developed by the Project will require active and inclusive governance. The actions developed will serve as a model and will impact not only, but beyond, the areas of the Project.

The activities to be developed by the Project are in line with those proposed by public agency plans such as the Plan for the Prevention and Control of Deforestation, Burning and Forest Fires that were prepared for all municipalities in Acre and included consultation with local stakeholders. The Project proposes a participatory management model in which the interested parties will act together and in concert.

4.4 Community Impact Monitoring

4.4.1.1 Community Monitoring Plan (CM4.1, CM4.2, GL1.4, GL2.2, GL2.3, GL2.5)

Upon implementation, the Project must draw up a systemic Monitoring Program for the 3 areas together that includes at least the parameters indicated below.

Table 46 - Monitoring indicators (Community)

Indicators	Unit	Means of verification	Frequency
Number of trainings conducted	Quantity	Certificates and participation list; technical report of results	Annual
Numbers of trained people	Quantity	Certificates and participation list;	Annual

		technical report of results	
Numbers of empowered women	Quantity	Certificates and participation list; technical report of results	Annual
Numbers of qualified young people	Quantity	Certificates and participation list; technical report of results	Annual
Number of producers in promoted extractive value chains	Quantity	Technical assistance report and production and marketing	Annual
Number of extractive value chains fostered	Quantity	Technical assistance report and production and marketing	Annual
Number of producers with implemented practices of fireless swidden	Quantity	Technical assistance report and production and marketing	Annual
Number of hectares of garden without the use of fire	Quantity	Technical assistance report and production and marketing	Annual
Number of families benefited by the project	Quantity	Technical results report	Annual
Number of stakeholders engaged	Quantity	Minutes, attendance list and Technical report of results	Annual

4.4.1.2 Monitoring Plan Dissemination (CM4.3)

To ensure the effective participation of the community and stakeholders in decision-making throughout the project, a Social Communication Program will be implemented. The Program will be carried out through face-to-face consultations and the availability of dialogue channels (telephone, cell phone and e-mail).

The communication strategy will be based on local cultural identity and values with the aim of ensuring that communities and stakeholders have access to correct and comprehensible information and qualified participation during consultation and decision-making processes on aspects that may influence their lives and its tangible and intangible assets.

4.5 Optional Criterion: Exceptional Community Benefits

4.5.1.1 Exceptional Community Criteria (GL2.1)

The surveys showed that there is at least one indigenous family living within the Project Area of Senegal, identified as Paixão Rubens Jaminawá. He reported during the interview that he has lived in the place for approximately 6 years and has possession of an area of approximately 100 hectares. He said he has no document of possession. The family consists of five people, three women and two men. For family subsistence, he practices hunting and fishing, the cultivation of cassava and the raising of pigs and chickens. He stated that he had never suffered any kind of threat or discrimination from the owner of the Senegal Farm.

According to the Jaminawa and Manchineri Territorial and Environmental Management Plan (2016), for the Mamoadate Indigenous Land, the area of the Senegal Area, formerly the Petrópolis Farm, is an area used by the indigenous people for a long time, having already demonstrated the need to incorporate this area into the Mamoadade Indigenous Land. In the Ethnomapping of the Mamoadate Indigenous Land, (2016), it is reported that both the Jaminawas and Manchineris peoples use the Senegal Seringal area for the implantation of swiddens, fishing, hunting and extractivism.

No agreements were identified between the owner of the farm and the indigenous people regarding the recognition of the right to own or use the land in Senegal. The situation identified was not deepened with the representations of the Mamoadate IT or with FUNAI. Given this, it is recommended to build formal dialogues with FUNAI and indigenous communities, in order to collect data, prepare a situational map and formalize the agreement, including sharing of benefits generated by the project, if applicable.

4.5.1.2 Short-term and Long-term Community Benefits (GL2.2)

Activity description	*Community*	

	Impacts short term	Impacts Medium term	Impacts Long term	*Relevance to the project objective*
Support the strengthening of non-timber extrativism	Formalization of partnership to offer technical assistance and market access	Offer of continuous technical assistance and implementation of processing infrastructure	Production, commercialization, and generation of family income	Strengthening family income through sustainable forestry activity
Offer techniques of agricultural fields without the use of fire	Formalization of partnership to offer rural technical assistance	Provision of continued technical assistance	Reduction of the use of fire in the preparation of land for swiddens	Reduction of emission of gases of estufa effect in the project zone; land use practices in a lower degree of degradation
Provide training to youth and women in rural entrepreneurship	Formalization of partnership to offer training	Provision of training to young people and women	Success stories of rural entrepreneurship, with productive engagement of young people and women	Reducing the socioeconomic vulnerability of marginalized groups

4.5.1.3 Community Participation Risks (GL2.3)

RISK	POTENTIAL IMPACT	MITIGATION ACTION
LACK OF COMMUNITY ENGAGEMENT	Prevalence of agricultural activity with degrading effect on the environment	Raise awareness of the transformation through the exchange of experience with success stories in the Amazon
	Prevalence of socioeconomic vulnerability among young people and women	Maintain active communication and feedback channels to assess the degree of engagement and need for new stimulating actions
		Keep the community confident in the project with the fulfillment of actions, deadlines, and agreements.

4.5.1.4 Marginalized and/or Vulnerable Community Groups (GL2.4)

As identified in other communities, an important concern is the increase in the consumption of alcoholic beverages and narcotic drugs among young people in the communities, which often leads to cases of violence, robberies and thefts. They defend the need for social work by making young people aware of the risks to health and their well-being in the community. They also report that many of the cases are related to lack of work and income, leaving many of the young people disillusioned about their future.

4.5.1.5 Net Impacts on Women (GL2.5)

In the areas of the Project, a patriarchal system prevails, despite losing strength in relation to the re-signification of the role of women in society recognized as head and breadwinner of the family. No cases of violence against women were registered; however, it is common for these situations to remain submerged, silent in the family and community. There was a need to reinforce the importance of women's role in the local rural family, recognizing and encouraging their role; in addition to campaigns to combat gender violence.

4.5.1.6 Benefit Sharing Mechanisms (GL2.6)

Describe the design and implementation of the project's benefit sharing mechanism(s), demonstrating that smallholders/community members have fully and effectively participated in defining the decision-making process and the distribution mechanism for benefit sharing. Specify how the benefit sharing mechanism provides transparency regarding project funding and costs as well as benefit distribution.

4.5.1.7 Benefits, Costs, and Risks Communication (GL2.7)

Information about the project was made available during the community consultation and engagement process. In the engagement, the team was careful to use in the approach an understandable language recognized locally during the explanations, accompanied by a location map and guiding text about the design and objectives of the project.

During the interviews, relevant information about the objectives and location of the project was presented. For this, a newsletter was used and distributed those deals with related themes, such as greenhouse gas emissions, carbon sequestration and carbon credit market.

During the interviews, residents were consulted regarding their perception of the project and what it could contribute to positively impact the conditions of well-being in the community.

4.5.1.8 Governance and Implementation Structures (GL2.8)

Access to Project documentation by social actors will be ensured through direct dissemination in the community through print or digital; by availability on the certifier's website; or even in social networks, if applicable.

Annual meetings will be held in loco with the social actors to disseminate and explain the activities of the project with the communities. Annual meetings will also be held with stakeholders composed of government and non-government organizations.

A prior analysis must be carried out to assess the reputation of potential partner organizations in the implementation of the project, to verify whether there is involvement in any type of discrimination based on gender, race, religion, sexual orientation, and other habits. Organizations involved in discriminatory practices will not be eligible to participate in the project.

To ensure the effective participation of the community and stakeholders in decision-making throughout the project, a Social Communication Program will be implemented. The Program will be carried out through face-to-face consultations and the availability of dialogue channels (telephone, cell phone and e-mail).

The communication strategy will be based on local cultural identity and values with the aim of ensuring that communities and stakeholders have access to correct and understandable information and qualified participation during consultation and decision-making processes on aspects that may influence their lives. and its tangible and intangible assets.

The feedback strategy and measures to remedy complaints are defined in the Social Communication Program, determining the channels for receiving, the process for dealing with and giving feedback and the responsibilities in management and decision-making.

The communication channels for feedback and status of cases of redress of complaints will be disclosed in meetings, consultations, events and project activities with communities and Stakeholders.

4.5.1.9 Smallholders/Community Members Capacity Development (GL2.9)

Benefit	**Strategy**
Strengthening the chestnut production chain	Promote the group's engagement in the national and international market network.

	Stimulate associativism and efficient management of production and marketing.
	Stimulate the verticalization of production with insertion in different market segments.
	Mediate the formalization of government partnerships and funding incentives to consolidate the initiative.
Techniques of prepair of swidden without the use of fire	Training of local multipliers
Training of young people and women in rural entrepreneurship	Promote institutional arrangements that ensure the sustainability of small rural businesses, such as SENAR and SEBRAE
	Mediate the formalization of partnership with governmental and non-governmental organizations for access to public policies aimed at young people and women

5 Biodiversity

5.1 Without-Project Biodiversity Scenario

5.1.1 Existing Conditions (B1.1)

The Amazon biome has greater biodiversity and tropical forest territory, with more than 6,000,000 km², divided into nine South American countries and approximately 59% of the Amazon Forest is inserted in Brazil (Imazon, 2023) and due to its extensive area and coverage, the Amazon has several types of vegetation and forest formations (Braga, 1979). Even with its great biodiversity and ecological relevance, deforestation is a threat to the Amazon biome. According to Morays et al. (2017), negative anthropic actions in relation to the degradation of forested areas are directly linked toCO_2 emissions, and the main changes are high temperature and decline in precipitation, motivated by the burning of fossil fuels, deforestation and forest fires and industries.

To improve the preservation of biodiversity, it is possible to cover conservation not only in federal/state management areas, but also in private properties (Gallo et al., 2009). The REDD+ project (Reducing Emissions from Deforestation and Forest Degradation) is an important action in the conservation of fauna and flora, monitoring of biodiversity and carbon stock (Harvey et al., 2010) and combines the conservation of private and non-private properties. Thus, REDD+ is an important instrument for integrating public policies related to the protection of fauna and flora, with the objective of mitigating global climate change through the elimination and/or reduction of illegal deforestation, the recovery of ecosystems and the conservation of biodiversity linked to the development of a low-carbon forest economy in the Amazon.

Through all the territorial extension and richness of the Amazon, the fauna and flora are not homogeneous (Silva et al., 2005), because the region has a wide hydrographic network, in which the Amazon basin differs from the other regions of the country, where the large rivers influence the distribution of populations, acting as geographical barriers (Silva & Oren, 1996). Given this, endemism centers are formed, where these regions concentrate groups of species that have a restricted geographic distribution (Guilherme, 2016), these with their own diversity and evolutionary characteristics (Silva et al., 2005) and have importance for the biogeographic regionalization of species (Silva, 2011). The region that covers the Brazilian Amazonian southwest where the state of Acre and part of the territory of Amazonas is located is inserted in the center of endemism Inambari (Cracraft, 1985). This center of endemism, the Inambari, encompasses one of the greatest biodiversity of the Amazon because it has characteristic elements of the Amazon plain and species typical of altitude of the Andes Mountain range (Cracraft, 1985).

Despite the possibility of further deforestation from the Forest Code, most deforestation in the Amazon is still illegal in nature. Thus, in addition to the loss of biodiversity, there is no economic gain and, if it is an illegal trade or activity, there is no guarantee that social benefits will be considered in these activities.

It is noteworthy that not all deforestation or forest degradation is directly related to the action of human at the place of occurrence. There are some phenomena or climatic events that can cause the destruction of the forest. Some of them are considered related to climate change occurring on the planet due to GHG emissions. The long droughts that occurred in 2005 and 2010 are known to be events related to climate change (LEWIS et al., 2011). According to Phillips et al. (2009), the 2005 drought emitted 0.78 to 1.04 Pg of carbon in the atmosphere due to tree mortality.

Both by the occupation of natural habitats and by changes in land use and human action, we are observing species loss in a very significant way in terrestrial ecosystems and oceans (International

Platform on Biodiversity and Ecosystem Services – IPBS, 2019). Brazil is home to about 15% of the planet's species in a wide variety of habitats. This biodiversity is in six large continental biomes – Amazon, Atlantic Forest, Caatinga, Cerrado, Pampa and Pantanal. The country also has six large hydrographic basins – Amazônica, Tocantins-Araguaia, Parnaíba, São Francisco, Paraíba do Sul and Paraná-Paraguay, and more than 8,000 kilometers of coastline. The balance in the functioning of ecosystems depends on a high number of plant and animal species.

Several properties of natural systems, in particular biodiversity, are essential for the flows of ecosystem services that have always benefited humanity, providing water and food security, identity and protection of cultural values and ensuring economic, social, and human development (BPBES, 2018). In a scenario towards sustainable development, biodiversity will be decisive for the mitigation and adaptation of climate change and should provide new mechanisms for generating income and well-being. On the other hand, in a scenario of the current model of economic development (business as usual), in which we continue to develop based on the burning of fossil fuels, in addition to not taking measures to adapt to climate change, the decline of natural life support systems will be inevitable and will imply the acceleration in climate change and negative impacts on our society.

The loss of biodiversity generates a global environmental impact as it crosses the geographical boundaries of countries requiring "international, regional and global cooperation between States, intergovernmental organizations and the non-governmental sector for the conservation of biological diversity and sustainable use of its components" (CBD, 1992). According to the Red List of the International Union for Conservation of Nature (IUCN), more than 31,000 species are in the process of extinction, representing 27% of the species cataloged (41% of amphibians, 25% of mammals, 34% coniferous, 14% of birds, 30% of sharks, 33% of coral reefs, 27% of crustaceans).

The Preamble to the CBD emphasizes the moral consideration due to living beings inserted in the planetary macro ecosystem by advocating conservation in favor of life and by inspiring awareness by the "intrinsic value of biological diversity and ecological, genetic, social, economic, scientific, educational, cultural, recreational and aesthetic values of biological diversity and its components" (CBD, 1992). Thus, the Convention ratify the biocentric view of the environment by attributing and recognizing the dignity of natural elements from the valued perspective of legal and ethical importance (RESENDE, 2016).

Challenges to contain the loss of biodiversity require the appropriation and practice of consciousness of the value of this natural element at various levels of action, directing human to continue with the evolutionary journey towards homo ecologicus, being one that "recognizes codependence with nature, has a propensity to develop a planetary, cosmic, universal consciousness and cultivates a fundamental respect for Mother Earth" (RIBEIRO, 2011). These arguments add in the ethical formulation of Hans Jonas (2006) the recognition of the intrinsic importance of nature, which deserves and must be preserved so that future generations of it can enjoy. Consequently, biodiversity integrates this ethical-conservationist perspective regarding human admitting that it is not the only living species to inhabit the biosphere. Therefore, a being who participates and has the responsibility to keep it whole in favor of other lives and for those that are yet to come.

To the conservation, restoration, and sustainable use of biodiversity to be carried out, actions must be scaled to broader levels in order to improve the state of biodiversity in a larger dimension and ensure human well-being (SECRETARIAT OF THE CONVENTION ON BIOLOGICAL DIVERSITY, 2010). It is considered that this is the path conducive to the development of transnational environmental governance in this area, that is, to carry out the strategy of conservation and sustainable use of biodiversity in alliance with the assumptions of solidarity and collective responsibility in a management with the participation of different social actors and at the transnational level. In this sense, the ARPA Program and its effects are analyzed in the Cape Orange National Park, a protected area in the Amazon Forest (BERTOLDI, M. R.; DAMASCENO, A. T. M. A., 2020).

It is noteworthy that the Amazon Forest occupies a good part of the Brazilian territory and exerts fundamental importance for international environmental security by concentrating a large part of the existing species on the planet. And, as mentioned, when thinking about a global environmental regime, the Amazon gains prominence for being a space conducive to international cooperation for the conservation and sustainable use of biodiversity. This is because the Amazon biome has a significant biological and socio-environmental value for the world, it houses a great diversity of species of the flora, fauna, and traditional knowledge of local communities, which can influence the maintenance of the environmental balance of the Planet (BERTOLDI, M. R.; DAMASCENO, A. T. M. A., 2020).

Anthropic activities have intensified over time, causing forest degradation processes, which are the main impact factor for biodiversity loss: deforestation and its main causes such as livestock, sojiculture and fires. According to Castro (2005), there are multiple reasons for deforestation in the Amazon, so it is necessary to understand the complexity of social actors and interests about a space of conflict and tension. To this end, it is enough to pay reference to the geopolitical dynamics of the region, present in the phases of occupational incentive, implementation of developmental policies and construction of major works (hydroelectric, railways, highways, etc.) that resulted in the felling of vegetation to make room for enterprises and activities incompatible with the characteristics of the region.

In response to this situation, REDD+ projects have as their main objective to reduce greenhouse gas emissions associated with deforestation and forest degradation in developing countries, contributing to the mitigation of climate change. Reducing Emissions from Deforestation and Degradation (REDD) favors biodiversity through the long-term preservation of forest-based plant and animal species that would otherwise be removed from the project area by deforestation, hunting, and other similar threats.

5.1.1.1 Biodiversity of Jaraguá, Santa Rosa and Senegal

Biodiversity surveys were carried out in the three areas worked on by the project: Jaraguá Santa Rosa and Senegal. Fauna and vegetation survey studies were developed with the objective of characterizing the biodiversity of the project area and its surroundings, based on the systematization of studies and surveys of primary and secondary data, according to the indicators and methodological references set forth in the CCB Program Standard - Climate, Community and Biodiversity. The surveys carried out aimed to:

I - Characterization of the biodiversity in the project area and surroundings, based on the systematization of studies and surveys already carried out in the area and surroundings.

I.1. The characterization of the fauna included, at least, the following topics:

• Fauna classification (identification, characterization, and quantification of faunal groups – Herpetofauna, Avifauna, Mastofauna) through secondary data and field survey; for the Entomofauna and Ichthyofauna groups, data were based on secondary research data.

• Faunistic composition (a list of species containing family, scientific name, popular name, and origin - native or exotic) was prepared. Indicated when it is an endemic or migratory species, and if it is using the studied area for feeding or nesting. Pointed out the species likely to occur in the area and those with confirmed occurrence.

• Fauna species under special attention indicated (the list of species of probable occurrence and confirmed occurrence was compared to the IUCN, CITES, IBAMA lists or local/regional lists, if applicable, to identify endangered, rare and/or endangered species endemic).

• Biogeography (indicated whether the occurring species exist in natural patterns of distribution and abundance).

• Pointed out the pressures and threats on fauna, the importance and representativeness of faunal groups for conservation and knowledge gaps, identifying the need for future surveys related to the theme.

• Identified “High Conservation Values (HCV)” related to the biodiversity of the local fauna.

• Identified the existence or not of invasive species, according to the Global Database of Invasive Species. If applicable, indicated the identified invasive species.

• Demonstrated whether the project includes sites with high priority for biodiversity conservation, by meeting vulnerability and/or uniqueness criteria.

• Indicated the possible impacts of climate change on the faunal groups studied at the local and regional level, describing the potential changes that may occur for both levels in scenarios with and without the project.

• The characterization relied, whenever possible, on the production of specific thematic maps for the project area and surroundings.

II - Conducted a preliminary assessment of the project impacts, positive and negative, especially on the fauna of the project area and surroundings:

• Using appropriate methodologies to estimate changes in biodiversity, including estimation of predicted and actual, positive, and negative, direct and indirect impacts resulting from project activities in the with-project scenario in the project zone and over the project period. Such an estimate was based on clearly defined and defensible assumptions. The evaluation of positive and negative impacts follows the matrix method, indicated for this type of activities by Sánchez (2020) or the methods developed by Richards and Panfil (2011), Richards (2011) and Pitman (2011) to assessment of impacts on biodiversity related to changes in forest cover and vegetation.

• Demonstrate that the project's net impacts on biodiversity in the project zone are positive compared to biodiversity conditions in the no-project land use scenario.

• Describe the necessary measures adopted to mitigate negative impacts on biodiversity and any necessary measures adopted for the maintenance or improvement of high conservation value attributes - HCV consistent with the precautionary principle.

• Demonstrate that no high conservation value attributes are negatively affected by the project.

• Identify all species used by the project and show that no known invasive species will be introduced into any project-affected area and that the population of any invasive species will not increase because of the project.

• Describe possible adverse effects of non-native species used by the project on the region's environment, including impacts on native species and introduction or facilitation of diseases. Justify any use of non-native species instead of native species.

• Describe the possible adverse effects of fertilizers, chemical pesticides, biological control agents and other inputs used in the project and justify their use.

• Describe the process of identifying, classifying, and managing all waste resulting from project activities.

III - Impacts on biodiversity outside the project area:

• Identify potential negative impacts on biodiversity that project activities may cause outside the project zone.

• Describe the necessary measures taken to mitigate negative impacts on biodiversity outside the project zone.

• Assess potential unmitigated negative impacts on biodiversity outside the project zone and compare these to the project's benefits on biodiversity within the project zone. Justify and demonstrate that the net effect of the project on biodiversity is positive.

IV - Elaborate Environmental Monitoring Programs for the biodiversity to be implemented in the project area and surroundings:

• The Programs must have the following objectives: (i) verify the real impacts of the project; (ii) compare actual impacts with predictions made in the preliminary impact assessment; (iii) detect unforeseen changes related to project activities; (iv) draw attention to the need to act if the negative impacts exceed the expected limits.

• The Programs must establish indicators and the method for monitoring them, based on the environmental characterization and preliminary assessment of impacts and other documents that may be made available by the coordination. The Programs must identify and describe, at least, the following items, listed in the form of a table: (i) area to be monitored (ii) variable to be monitored; (iii) indicator used; (iv) source verification; (v) verification frequency; (vi) responsible; (vii) observations/procedure after verification.

• Develop a monitoring plan to estimate the effectiveness of measures taken to maintain or enhance all High Conservation Value – HCV attributes related to globally, regionally, or nationally significant biodiversity present in the project zone.

V - Describe the future environmental scenario for the fauna, if the project had NOT been implemented (“business as usual” scenario), highlighting the benefits that the presence and activities of the project could provide:

• The fauna in a scenario without the project, based on the environmental characterization, in terms of maintenance of biological diversity, threats to biodiversity due to deforestation, scientific research, among others.

• The description should highlight the benefits that could be generated by the presence of the project and the implementation of its activities compared to this scenario, based on the positive impacts identified in the preliminary assessment of the project's impacts.

• Describe how the land use scenario in the absence of the project would affect biodiversity conditions in the project zone.

VI - Describe the future environmental scenario for the biodiversity, if the project had NOT been implemented ("business as usual" scenario), highlighting the benefits that the presence and activities of the project could provide:

• Demonstrate that the project zone includes a high priority area for conservation - HCV of biodiversity that meets the vulnerability or uniqueness criteria defined below, identifying the “trigger” species that cause the area to meet any of the qualifying conditions and providing evidence that the qualifying conditions are met.

• Describe recent population trends of each of the trigger species in the project zone at the start of the project and describe the most likely changes in the land use scenario in the absence of the project.

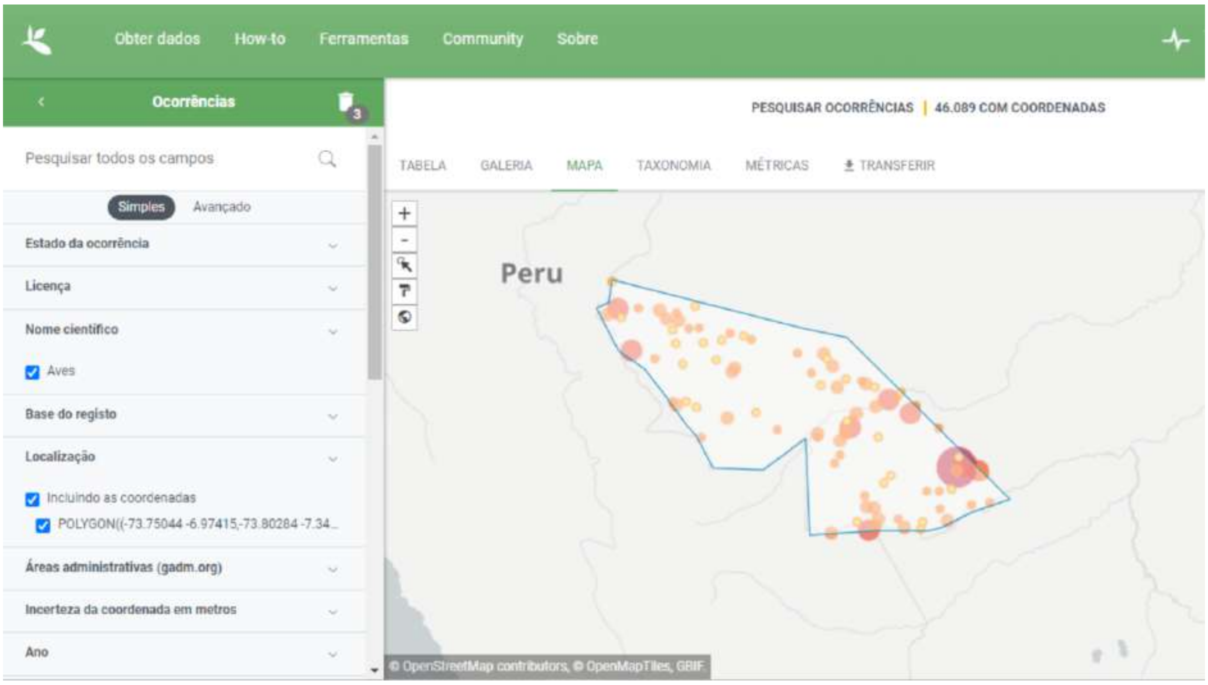
• Describe the measures needed and taken to maintain or improve population conditions for each trigger species in the project zone and reduce threats to them based on the causal model that identifies threats to trigger species and activities to manage them.

• Include indicators of the population trend of each trigger species and/or the threats to them in the monitoring plan and demonstrate the effectiveness of the necessary and adopted measures to maintain or improve the population conditions of the trigger species.

5.1.1.2 Methodologies developed in the surveys

The survey and systematization of secondary data on the biodiversity of the fauna groups (Entomofauna, Ichthyofauna, Herpetofauna, Avifauna and Mastofauna), was conducted by the team of specialist biologists, using information in an academic-scientific production database: scientific articles and reports, dissertations and theses, technical reports, and environmental impact studies. For this, SciELO – Scientific Electronic, Library Online will be used as a base; Capes periodicals; Web of Science; Scopus and Google Scholar). To obtain more robust data related to the location of species records and complement the list by systematized secondary database, the technical team carried out research in the Global Biodiversity Information Facility (GBIF; Figure 114).

Figure 83 - Main source of scientific data for obtaining secondary data, Acre, GBIF, 2023.



To survey the literature and records of each species of faunal groups, a standard buffer of 50,000 km² was used, or a circle of 120km² in radius, covering the study areas and not extrapolating local hydrographic basins. This adopted pattern takes place considering that Amazonian rivers are the main responsible for restricting the occurrence of a large part of the wild fauna. In the case of research and published articles, we used the base location of data collection as a reference, in the case on an increasing scale: watershed>municipality or district>state>watershed. The use of this criterion allows specialist technicians to initiate searches specifically in the area in question, since the objective of the study is to list the presence of different organisms with the most varied forms of life, area of occurrence and distribution, behavior, functional attributes etc., which affects the presence of the species under study or not.

Primary data was compiled by filed surveys for fauna and vegetation.

The fauna survey was carried out in one stage, covering the seasonal rainy season, in 10 days, in which three days of displacement and seven consecutive days of data collection in the field were used. The field sampling methods for the faunal groups were carried out in the following sequence: Herpetofauna, Avifauna and Mastofauna, are described in each section of the specific fauna.

Vegetation surveys used methodologies adopted for forest inventories, which are characterized by sampling of large tracts of forest, and due to this characteristic, the sampling was in clusters, as presented by Péllico Netto and Brena (1997). According to the authors, this type of sampling is a variation of two-stage sampling, where the second stage is systematically organized within the first stage. This method is a process that can offer greater advantages in accuracy and costs, when compared to simple random sampling, when the inventoried population is extensive, and the variable of interest presents great and even reasonable homogeneity. The sampling intensity adopted was based on regional experiences, considering inventories in large areas of forests (ACRE, 1992).

The sampling effort proved adequate for the inventory carried out, considering the method applied and its formulations (PÉLLICO NETTO E BRENA, 1997), since the calculated n value was 4.91 primary units, compared to 5 launched units. The quantity was able to capture the variability of the inventoried forest, keeping the sampling error within the minimum required parameter, thus being in accordance with the provisions of Annex 3 of document VM00015.

Tables below show the information on the sampling effort of the forest inventory for the 3 areas.

Table 47 - Base data from the diagnostic forest inventory, Fazenda Jaraguá, Bujari, Acre.

Parameters	**Values**
Total Area Inventoryed	13.266,28 ha
Plot area	1.256,6371 m²
n (Number of conglomerates)	5 conglomerates
M (Number of Subunits)	5 subunits
N Total of plots	21.113,94 plots
T of *Student* (t):	1,711
Permissible error =	10,0%
Probability	90,0%

Table 48 - Base data from the diagnostic forest inventory, Fazenda Santa Rosa, Santa Rosa do Purus, Acre.

Parameters	Values
Total Area Inventoryed	9.956,23 ha
Plot area	1.256,6371 m²
n (Number of conglomerates)	6 conglomerates
M (Number of Subunits)	5 subunits
N Total of plots	15.845,83 plots
T of Student (t):	1,699
Permissible error =	10,0%
Probability	90,0%

Table 49 - Base data from the diagnostic forest inventory, Fazenda Senegal, Assis Brasil, Acre

Parameters	**Values**
Total Area	32.854,88 ha
Forest area (IFD)	32.460,62 ha
Sampling area	6,283 ha
Sample intensity	0,019%

Nº of conglomerates	10
Nº of Plots (1.256,54 m²)	50

5.1.1.3 Data Analysis

Lists of species and relative abundances

Species lists were generated from information collected through methods of collecting secondary data and sampling primary data in the field, using the data of the registered species for an evaluation of the population parameters and the community of each faunal and vegetation group. For each group of fauna, the indices of richness, absolute abundance and frequency of records were calculated from field records, weighted by their respective sampling method. The List Frequency Index calculation was used exclusively for the avifauna group.

Diversity Index

To predict the total number of species, present in the region of the Projects which could be detected using the sampling methods, the First Order Jack-knife non-parametric richness estimator was used, generated from 1000 randomizations (Heltshe, 1983).

Shannon-Wiener (H'), dominance (K) and Pielou (E) indices of diversity were used to assess community structure. The calculation of the total diversity and the seasons were performed using the Shannon-Wiener Diversity Index and the Pielou Equitability Index (Krebs, 1999). Equitability (or equity) is used to measure the uniformity, or homogeneity, of species abundance distribution in the community. The dominant species and the respective dominance values obtained for each sampling station were identified, obtained through the Berger-Parker index. This index is basically calculated by dividing the number of individuals of the most abundant species by the total number of individuals in the season, that is, the percentage of the most abundant species (Magurran, 2004).

Below are the results obtained for fauna and vegetation in the field surveys for the three worked areas.

5.1.1.4 Jaraguá Farm, Bujari, Acre

5.1.1.4.1 Entomofauna

Scientific information involving studies on the Entomofauna in the Amazon allows the affirmation that these communities are of great importance for Science (Arias & Penny, 1979). The realization of these studies provides efficient information about Biology and even about the aspects involving Zoonoses (diseases transmitted by animals in humans) associated with the biological group (Silva & Carneiro, 1986).

To have a better understanding of the knowledge about the biodiversity of these organisms, it is important that studies are carried out, whether in the format of secondary data collection or in the field. Studies in entomology contribute to an in-depth insight into the importance of how important insects are in our day. In the Amazon, the realization of these studies allows a conscious analysis of the relationship of these organisms with the environment (Marques et al., 2017).

Studies involving entomology associated with diseases within the Amazon show that the occurrence and biodiversity of insects is quite intense in the most isolated areas of this locality. Some of these studies clearly state how necessary it is to carry out new studies in the Amazon, and this is due to the economic and public health importance that these organisms have. In the Amazon region, studies that emphasize the need to understand more about the Entomofauna grow more and more and are carried out by different researchers from the country and the world. However, to be known more about these organisms, it is important to collect data that can present how these species interact with the environment (Menezes, 2006).

Thus, the need for studies in Acre focused on the area of entomology, may undoubtedly provide a more in-depth view on the understanding of the record of these species in this part of the Amazon.

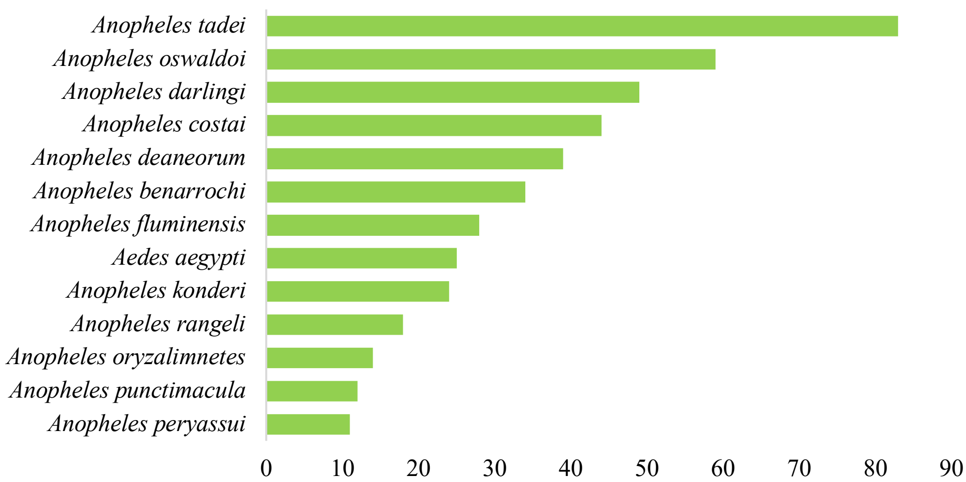
Secondary data collection was standardized for all fauna groups studied in this project. In addition to the GBIF database, it was performed in the form of an association using the Boolean operator and the Health Sciences Descriptors (DECS) and their counterparts in the Medical Subject Headings (MeSH): "Medical Entomofauna in Acre" and "Use of Insects in Zoonotic Studies". The search included literature in English, Spanish and Portuguese where the target group and environment (i.e., culicidae, dipterans, medical importance, entomofauna, Amazon rainforest) was applied as a search parameter, and some characteristics associated with the group and different keywords (for example: zoonoses; public health; vectors).

The online databases consulted, in the period of March 2023, were: Latin American and Caribbean Health Sciences Information (LILACS), Scientific Electronic Library Online (SciELO), Database in Medical Biology and Medical Entomology and Medical Literature Analysis and Retrieval System Online (MEDLINE), considering that studies focusing on Medical Entomology are published in a journal with a scope focused on medicine.

After the survey in the databases on dipterans in the state of Acre, a total of 36 species was found, within 8 genera (Appendix 6), of these records the species that presented the highest number of occurrences were Anopheles tadei, Anopheles *oswaldoi* and *Anopheles darlingi* as shown in (Figure 117). Insects belonging to the subfamily Anophelinae are more important in the transmission of parasites of the genus *Plasmodium*, which causes malaria endemic disease in the Amazon region (Cdc, 2022).

For the Jaraguá farm there was only a single record of *Aedes aegypti*, this individual has a wide distribution in urban areas, being the vector responsible for the transmission of the dengue virus throughout the territory of Acre, as well as other diseases transmitted by these animals, such as Zika and Chikungunya (Brazil, 2020).

Figure 84 - Occurrence of Culicidae species in the state of Acre.



The rarefied richness of Acre showed that the number of occurrences was insufficient to represent the community of dipteran species in Fazenda Jaraguá, because both the rarefied curve of genus and species did not present stabilization, therefore, the insufficiency of data show how relevant it is to conduct studies in these areas (Figure 118 and Figure 119). In addition, the richness observed for Acre was 36 species and the estimated 59 species, while Shannon diversity observed was 16.50 and 17.52 estimated and Simpson diversity 12.07 and 12.34 the estimated Table.

Figure 85 - Sample sufficiency of Genera recorded in the survey of Entomofauna, Fazenda Jaraguá, Bujari, Acre, 2023.

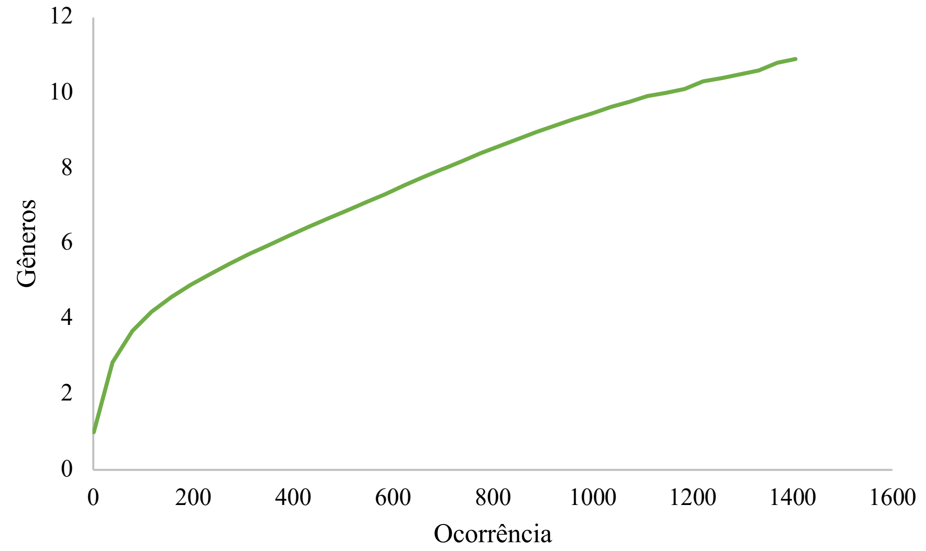


Figure 86 - Sample sufficiency of species recorded in the survey of Entomofauna, Fazenda Jaraguá, Bujari, Acre, 2023.

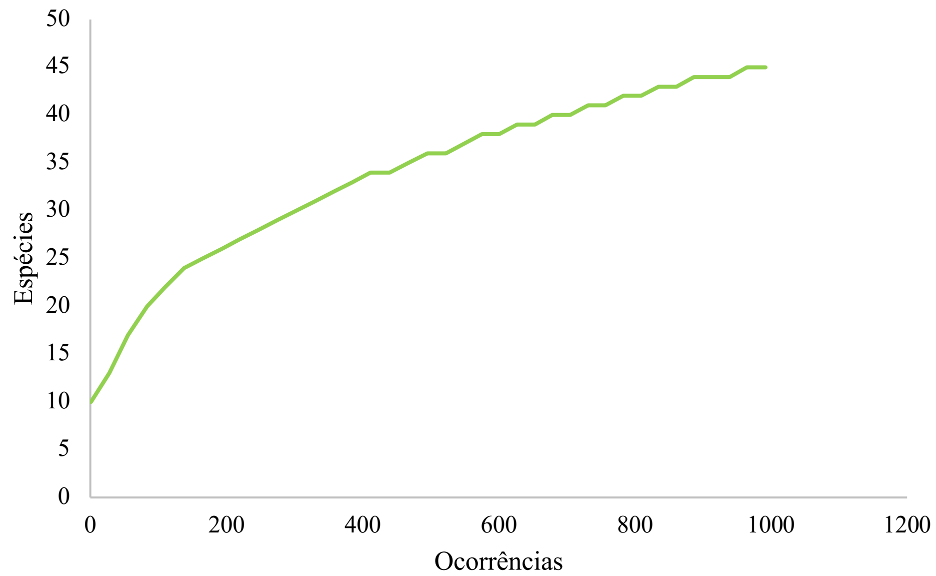


Table 50 - Diversity indices in the entomofauna survey, Fazenda Jaraguá, Bujari, Acre, 2023.

Indexes	Observed	Estimated
Richness (S)	36,00	59,95
Shannon-Wiener diversity (H')	16,50	17,52
Simpson diversity	12,07	12,34

Studies conducted with dipterans throughout the state of Acre are scarce, therefore, both the number of species and the occurrences of this region are insufficient for the knowledge of the regional pool of these species. In addition, the secondary data were not sufficient, since there was only one record for the area, which reinforces the need for sampling on the farm using alternative methods, to meet the lack of data from the unsampled areas.

The survey involving the study area showed that it is necessary to carry out in-depth studies in these areas, because, to know the endangered species of these areas, a technical study such as this one is important.

In this search for secondary data some of the records that were found in the entomological surveys, have an evident medical importance according to the records of the Surveillance and Entomology Service of the State of Acre. However, especially within the rubber plantations the absence of these studies reveals the need to go to the field so that new species of insects that cause diseases and other arboviruses are known.

In Acre, the location where this technical study took place, it is perceived in the scientific literature that the record of investigative studies on medical or general Entomofauna is still below what could exist.

It is important to carry out scientific studies that could present more relevant indices that correspond to the existing demand in the region, aiming at an in-depth view of these groups (Ribeiro et al., 2019; Madeira et al., 2020)

Teles (2015) in his study conducted in the Upper Purus River, region of the state of Acre, noted that the prevalence of Leishmaniasis cases in some municipalities characterized a great concern for the health authorities of the state. In addition, this study identified the correlation of increased sandfly mosquito fauna and considerable cases of Leishmania in isolated regions of urban areas.

Therefore, by relating the occurrence of these organisms with the records of diseases that are caused by insects, it becomes clear the understanding that technical studies compromised in scientific research are determinant for further investigation of these organisms.

Every year, several entomology studies in Acre are conducted and published, however, most of them strive to propose new approaches with a focus on agriculture, since the state of Acre has grown considerably in the agricultural sector forgetting the environmental aspect and zoonoses (Mendonça et al., 2003).

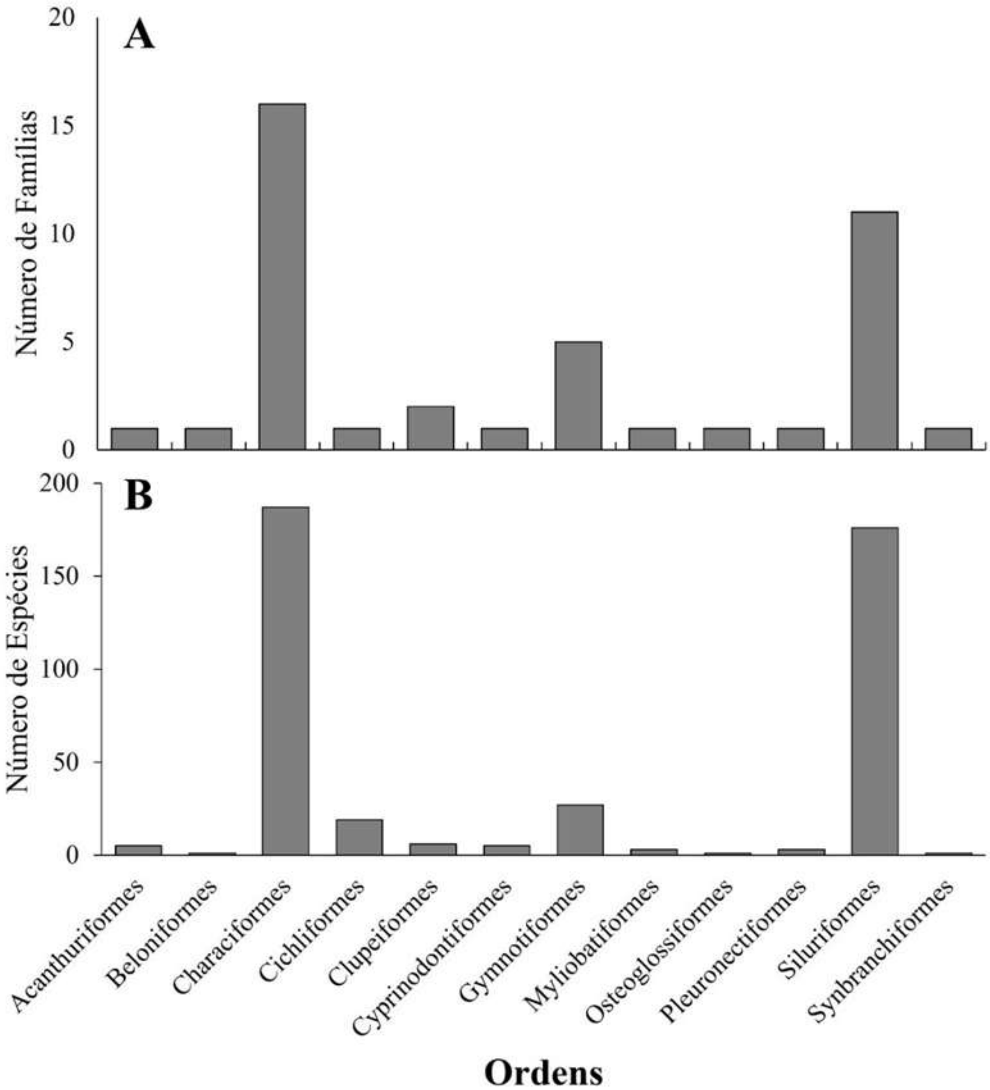
In Acre, species of the family Culicidae have important epidemiological prominence since they can transmit pathogens to humans and literature describes these organisms as potential causes of diseases such as arboviruses and other human health problems in the state.

In addition, it is noted that there are other genera such as *Coquillettidia, Haemagogus, Mansonia, Psorophora and Sabethes* and that are also related to the transmission of etiological agents of various diseases such as encephalitis, wild yellow fever, among other arboviruses. However, for these genera to be better understood, field studies and especially in these areas are essential.

5.1.1.4.2 Ichthyofauna

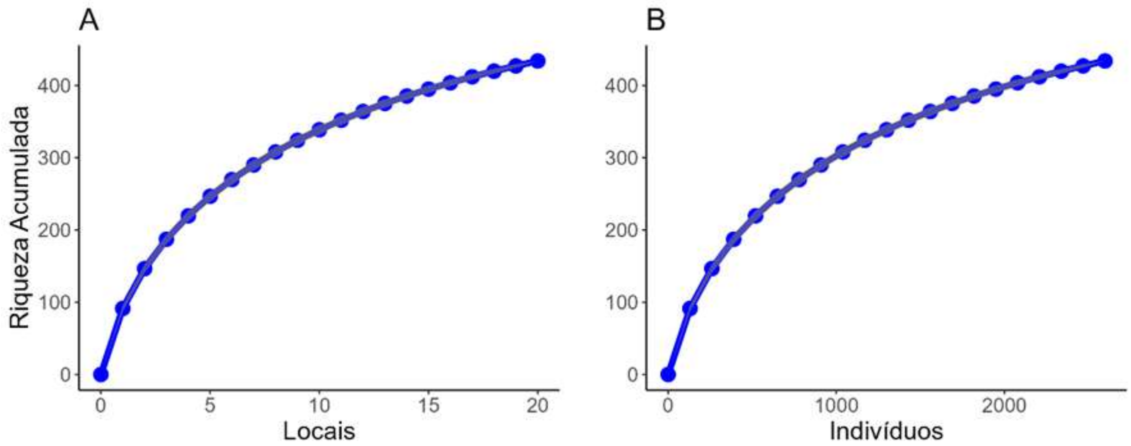
The survey for the ichthyofauna resulted in 2.598 occurrences, belonging to 434 species, 197 genera, 42 families and distributed in 12 orders (Appendix 6). Among the orders, the ones with the highest number of occurrences were the Characiformes, with 1.149 occurrences, followed by Siluriformes (n = 740) and Cichliformes with 214 occurrences. In relation to the Families, Characiformes presented the highest number (n = 16), followed by Siluriformes (n = 11) and Gymnotiformes with 5 families. For species richness, Characiformes presented the highest number of species with 187, followed by Siluriformes (n = 176) and Gymnotiformes with 27 species. We highlight that for fish the popular names vary by regions, and commonly we can find the same popular name for several different species, we can highlight the Characiformes: piabas, traíra, tambaqui, matrinchã, dourado, curimatá, piranha, peixe-borboleta, piau, peixe-cachorro. Siluriformes: bagres, mandi, cascudos, candiru. Gymnotiformes: sarapó, poraquê. Acanthuriformes: Hake. Belonidae: peixe-agulha. Cichliformes: acará, tucunaré, joaninhas. Myliobatiformes: rays. Pleuronectiformes: linguado. We emphasize that popular names of fish vary from locality to locality, in addition a popular name, in its great majority, is used for different species of fish.

Figure 87 - Richness of Ichthyofauna recorded in the survey of the Jaraguá Farm, Bujari, Acre, 2023. A - Orders, families, and occurrences of fish; B - Orders, number of species and occurrences of fish.



The species accumulation curve showed that the number of occurrences is not enough to represent the fish community in the Jaraguá area, either evaluated by locations figure or based on the number of individuals, in this case the number of occurrences Figure. The non-stabilization of the curve reflects which subsampled the region is, requiring extensive studies in a short period of time to remove the temporal bias that the data may indicate.

Figure 88 - Sampling sufficiency observed during the survey of the ichthyofauna in Fazenda Jaraguá, Bujari, Acre, 2023. A – secondary sampling sites; B – registered wealth.



The diversity analysis indicated that the area of the Jaraguá Farm presents a high value of total Shannon Diversity (H' = 4.99), ranging from 0.69 (Grid4) to 4.19 (Grid3). The Pielou Equitable Value ranged from 0.953 (Grid3) to 0.987 (Grid6; Table 3). We also observed that the place with the highest richness (Grid3) presented the highest value of Shannon Diversity (H' = 4.28) and Dominance (D = 0.983; Table 92).

Table 51 - Diversity indices obtained in the survey of the Ichthyofauna at Fazenda Jaraguá, Bujari, Acre, 2023.

Local	Richness	Shannon	Simpson	Pielou
Grid1	2	0.693	0.500	1.000
Grid2	1	0.000	0.000	-
Grid3	7	1.689	0.773	0.868
Grid4	7	1.946	0.857	1.000
Grid5	99	4.481	0.987	0.975
Grid6	1	0.000	0.000	-
Grid7	36	3.532	0.969	0.986
Grid8	96	4.360	0.984	0.955
Grid9	62	3.959	0.978	0.959

Grid10	21	2.940	0.942	0.966
Grid11	114	4.482	0.986	0.946
Grid12	154	4.532	0.984	0.900
Grid13	25	3.088	0.947	0.959
Grid14	9	2.197	0.889	1.000
Grid15	31	3.412	0.966	0.994
Grid16	176	4.868	0.990	0.942
Grid17	43	3.718	0.974	0.988
Grid18	98	4.275	0.982	0.932
Grid19	75	3.967	0.973	0.919

This great diversity found in the aquatic environments of the state of Acre reflects how great is the biodiversity of the ichthyofauna of the western Amazon. This diversity is distributed in the most diverse environments, being concentrated mainly in rivers, lakes and streams. This great diversity is represented mainly by the orders of the Characiformes (represented by the lambaris, piabas, curimba, dourado, piranha), Siluriformes (represented by bagres/peixe-gato/mandi) and Cichliformes (represented by acarás, joaninhas, tucunarés). This pattern found in the region follows that described for the fish fauna of the Neotropical region (Lowe-McConnel, 1999; Reis et al., 2016; Duarte et al., 2010).

This great diversity found is mainly driven by the *terra firme* streams, which usually has a forest cover that provides allochthonous resources for the maintenance of the ecosystem (Montag et., 2019). The presence of riparian vegetation is critical for the maintenance of aquatic communities (Arantes et al., 2018). However, this community is directly at risk, mainly from conversion to pasture, opening of roads and expansion of cities (Lujan et al., 2013; Arantes et al., 2018). These activities can lead to increases in similarity and decrease in spatial rotation of species, caused by a reduction in structural complexity and habitat diversity, resulting in biotic homogenization (Hewitt et al., 2005; Petsch, 2016). The destruction of the headwaters of the rivers that serve as nurseries for many species, degradation of the riparian forest preventing the entry of allochthonous matter, on which many species are dependent and energy flow between communities throughout the system are the causes of local extinctions that lead to increased similarity between fish communities (Lujan et al., 2013; Haddad et al., 2015; Arantes et al., 2018). In addition, the forest around aquatic ecosystems is a key factor for maintaining local biodiversity, since it provides food resources such as insects, which will feed the species dependent on this resource and that will indirectly feed the piscivorous and carnivorous species, maintaining the flow of energy within the chain (Barbosa et al., 2018).

5.1.1.4.2.1 Ichthyofauna Results

The Amazon basin is the largest watershed in the world, draining an area of about 7 million square km², of which more than 5 million are in Brazilian territory (Val, 2019), housing the most extensive tropical forest ecosystems, representing 40% of the global tropical area (Aragão et al., 2014; Weng et al., 2018) and thus comprises the whole set of water resources that together are converging on the Amazon River. This watershed is structured by a great diversity of water bodies of various sizes, in which we can mention the rivers and lakes, with countless small streams called in this region as “igarapés” (Brito Júnior & Estácio, 2013; Beltrão et al., 2019).

Among Amazonian aquatic ecosystems, streams are important components of the Amazon drainage system and are home to great fish diversity (Beighley & Gummadi, 2011; Beltrão et al., 2019). The ichthys diversity found in “terra firme” streams are composed mainly of small species belonging to various orders, such as Characiformes, Siluriformes, Ciclhiformes, Gymnotiformes and Cyprinodontiformes, the first two being the dominant ones (Sabino & Zuanon, 1998; Lowe-McConnell, 1999; Dutra et al., 2020). It is estimated that approximately half of Amazonian fish species inhabit small bedside streams (Junk & Piedade, 2004), with high levels of endemism in these water bodies (Frederico et al., 2018). It is important to emphasize that these fish are mostly dependent on the surrounding vegetation, because they provide allochthonous material such as flowers, fruits, leaves, and insects (Goulding, 1980; Lowe-McConnell, 1999; Roa-Fuentes & Casatti, 2017).

The presence of riparian forest acts directly in maintaining the diversity of stream fish, as it modifies the physical and chemical structure of the environment (Roa-Fuentes & Casatti, 2017). The roots of the trees make the soil firmer and prevent sliding within the stream causing water to be highly transparent (Goulding, 1997). Another important factor generated by riparian vegetation that is linked to the physical structural complexity of the habitat is the presence of wood from the branches that fall from the trees, where the fish use as a food resource and refuge (Brejão et al., 2013; Montag et al., 2019; Benone et al., 2020).

The high diversity in Amazonian streams drives all regional diversity, making the Amazon basin the most biodiverse on the planet, such as approximately 4,000 species (Jezequel et al., 2020), but it is estimated that this diversity can reach more than 10,000 species (Reis et al., 2016). However, much of this diversity is still unexplored. However, they may be in great danger because of anthropogenic actions, such as pasture, agriculture, city expansion, illegal mining (Leitão et al., 2018), causing many communities to be extinct even before they are discovered. In relation to unexplored areas, it is believed that these communities may decline even before they are discovered, since part of the progress is associated with the conversion of the forest into usable areas.

In this context, it is of paramount importance to understand and know how the structures of aquatic community's work in the Amazon region, especially the western region where information and fauna are still totally undersampled, resulting in large gaps in knowledge and both for the knowledge of new species and for the distribution pattern.

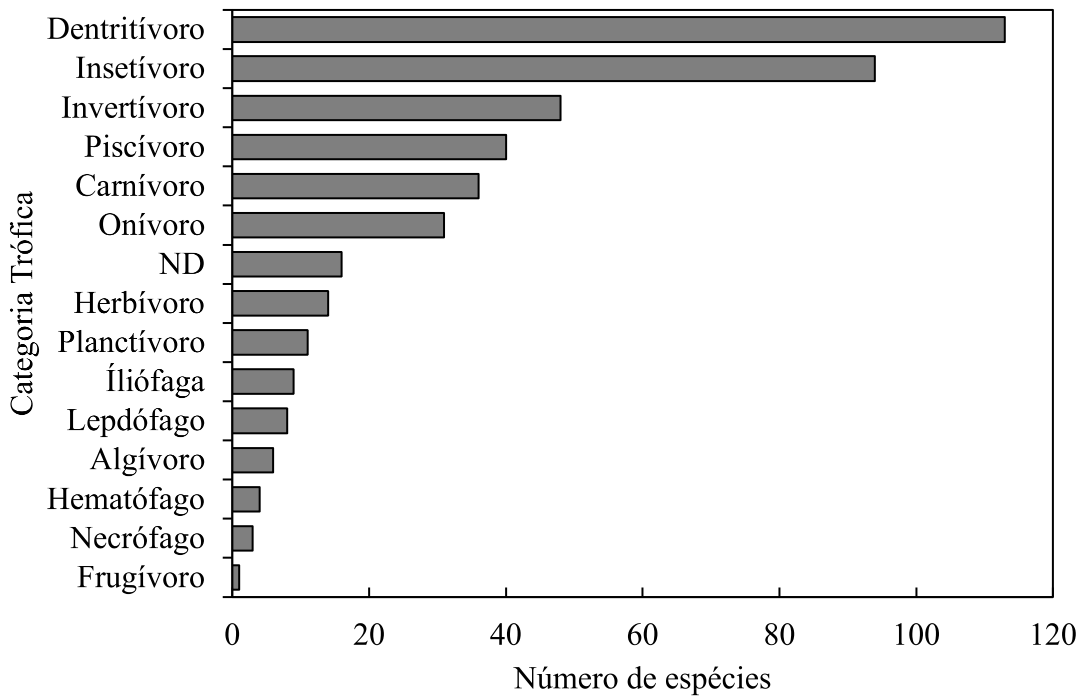
The collection of secondary data was standardized for all groups of fauna in this study. In addition to the GBIF database, the survey was directed to the most diverse aquatic ecosystems located in the region of the state of Acre, such as: lakes, streams, and rivers. The search included literature in English, Spanish and Portuguese applying as a search criterion the target group and the environment (i.e., fish from streams, fish from lakes, fish from rivers, ichthyofauna, streams, river, lake), and some characteristics referring to the group "fish" and different keywords (for example, analysis of intestinal content; community diet; trophic structure of the community; food ecology; trophic interactions. In addition, we use our own stored or published databases.

In addition, an extensive search was carried out in the online data repositories on the occurrence record of fish species in Brazil, such as SpeciesLink (2023) stands out for aggregating information on records of occurrences of species while Fishbase (Froese & Pauly, 2023) and Catalog of Fishes (Fricke et al., 2023) for providing information on taxonomy, distribution and life history of species in Brazil and the world. Other important databases have been published (Jézéquel et al., 2020; Dagosta & De Pinna, 2021; Tonella et al., 2022) or made available by Brazilian portals (https://portaldabiodiversidade.icmbio.gov.br/portal/). Data that presented the information of location (latitude and longitude), date, location, team of collectors and deposited collection were prioritized.

The spreadsheet data underwent an extensive filtering and exclusion of some occurrences following some criteria, such as: occurrences without geographic coordinates, species that do not present proven geographic distribution for the region, as well as species that present endemic occurrence for other spatially distant watershed. In addition, all species were evaluated for taxonomic status to verify whether the species are still valid.

The species were classified into 14 trophic categories, and the most representative category was detritivores with 113 species, followed by Insectivore (94 species), Insectivore (48 species) and Piscivore with 40 species (Figure 119). For some species it was not possible to classify because their data are not available in the literature, so we classified it as ND – Not Defined.

Figure 89 - Trophic structure of the fish that occur in the surrounding area of the Jaraguá Farm.



Trophic dynamics play a key role in maintaining communities, as it involves interactions between living things in an ecosystem. Unfortunately, with the increasing destruction of habitats, these interactions are being directly affected. Among the most important habitats for aquatic ecosystems are forests, which are considered a key factor for the maintenance of local and regional biodiversity. According to studies conducted by Lowe-McConnell (1999), the trophic chain in streams is influenced by the complexity of the vegetation of the banks, availability of food and availability of shelter for the different fish that make up the trophic chain. In addition, the presence of top-of-the-chain predators, such as some species of catfish (bagres) (e.g., *Phractocephalus hemiliopterus*), piranhas (*Pygocentrus nattereri*) and traíras (*Hoplias malabaricus*), can also affect the structure and dynamics of the trophic chain.

From the verification of the species in the International Union for the Conservation of Nature and Natural Resources - IUCN program, it was found that some species were listed in three categories: LC - Least Concern/Safe or Little Concern with 82 species, NT - Near Threatened/, for *the species Panaque cochliodon* and DD - Data Deficient/Insufficient Data for 16 species (Appendix 6). In addition, only the “arraia” species *Paratrygon aiereba* was classified as CR - Critically Endangered in the Red Book of Brazilian Fauna Threatened with Extinction of the ICMBio.

The destruction of the natural habitat of the species implies population reduction and in more severe cases in the local and regional extinction, making more worrying species that are endemic, as is the case of the species cará *Apistograma acrensis* and the limpa-vidro *Corydoras acrensis* which are endemic to the Acre River watershed. In addition, in the current senary we already come across species that are threatened, such as the arraia *Paratrygon aiereba* which is listed as Critically Endangered in ICMBio's Book of Endangered Species. One of the main threats to *P. aiereba* is ornamental fishing, although its capture is illegal in Brazil, countries such as Colombia and Peru are known to export this species to the ornamental fish trade. (Araújo et al., 2018). Demographic studies of *P. aiereba* have shown that its population is in rapid decline and may soon decline by more than 80%. (Araújo et al., 2018). Given this, more research and local conservation initiatives are urgently needed not only for this species, but for many that today are considered almost threatened as the *cascudo Panaque cochliodon* or little concern.

The western region of the Amazon, which is located at Fazenda Jaraguá, is home to a great diversity of fish, and much of this diversity is considered important for commercialization and subsistence. Species such as the mapará (*Hypophthalmus edentatus*, *Hypophthalmus marginatus*), the Curimatã (*Prochilodus nigricans*), the filhote (*Brachyplatystoma filamentosum*), the Surubim (*Pseudoplatystoma punctifer*) and Pacu (*Mylossoma duriventre*), which are highly valued economically and generate financial transactions in the region.

The region that is around the Jaraguá Farm is widely explored because it is an area close to urban centers and the BR – 364, resulting in a greater loss of forest cover, which directly affects the fish community. For aquatic biota, the forest is very important, as they play a key role in maintaining aquatic biodiversity and the survival of fish. This is because forests regulate the microclimate, maintain water quality, and provide shelter and food for fish (Roa-Fuentes & Casatti, 2017). In addition, fishing is an important activity for many riverine communities, which depend on natural resources for their livelihoods.

Another important factor is the potential for aquariophilia of ornamental species. The Amazon is home to several species of ornamental fish, mainly small characidae that have a flashy colored pattern, such as the maconheirinhas (*Moenkhausia oligoleps,* and *Hyphessobrycon bentosi*), the peixe-borboleta (*Carnegiella strigata*), among others. Studies show that the conservation of these species is important not only for their commercial value, but also for their ecological relevance, since many of them are important for maintaining the balance of aquatic ecosystems (Tribuzy-Neto et al., 2020).

5.1.1.4.3 Herpetofauna

Amphibians and reptiles have great ecological importance in the maintenance and balance of ecosystems, as they perform essential ecological functions in their habitats (Bernarde et al., 2012; Mesquita et al., 2018). Amphibians are excellent bioindicators of environmental quality due to several characteristics related to their biology (Ramos & Gasparini, 2004). However, the role of reptiles as good bioindicators is not yet well defined (Bertoluci et al., 2009), although lizards are considered good models for ecological studies because they are animals sensitive to environmental changes of anthropic origin (Pianka & Vitt, 2003; Camargo et al., 2010).

To date, 409 species of amphibians (383 anurans, 21 caecilians and 5 salamanders) and 385 species of reptiles (189 snakes, 165 lizards, 26 turtles, 19 amphishunids and 5 alligators) are known in the Brazilian Amazon (Prudente, 2017; Avila-Pires, 2022; Hoogmoed, 2023). Inventories carried out with these groups in this biome are important because they contribute to the identification of priority areas for conservation and preservation of species (Bernarde et al., 2011; Ferreira et al., 2017; Moraes et al., 2017; Fonseca et al., 2019; Freitas et al., 2020).

The state of Acre is in the extreme west of Brazil, in the southwest of the Brazilian Amazon, a region characterized by a great diversity of taxonomic groups (Souza et al., 2003). In the state are known so far 156 species of amphibians and 155 reptiles, however, despite this great richness there are regions still poorly sampled or even unsampled (Fonseca et al., 2022), since their herpetofauna is less studied when compared to the Central, Southern and Eastern Amazon regions (Avila-Pires et al., 2007).

Considering the threats caused by environmental impacts in the Amazon, the importance of amphibians and reptiles for the maintenance and balance of the environment and as bioindicators of environmental quality is of great importance. This report provides relevant information on the survey of the herpetofauna at the Jaraguá Farm, in the municipality of Bujari, Acre, Brazil, where REDD+ actions will be implemented.

The collection of secondary data was standardized for all groups of fauna in this project. In addition to the GBIF database, the survey and systematization of secondary data on the biodiversity of Herpetofauna in the study area and surroundings, was carried out through information in a database of academic-scientific production: scientific articles and reports, dissertations and theses, technical reports, and environmental impact studies. In addition, surveys were carried out in the field, through time-limited search - day and night (PLTD AND PLTN). It consisted of moving on foot, slowly in a transect, looking for visually exposed amphibians and reptiles. The search effort covered all visually accessible micro-habitats. In this method it is possible to obtain more accurate information about the activity of the animal and its location in the habitat. This method differs from the active search because the researcher goes through transects and does not turn the environment, looking only for visually exposed animals (Bernarde et al., 2017). The activities were initiated in the morning (05:30h to 10:30h) and in the night period (18:00h to 21:00h), totaling eight hours daily of search.

During the PLTD (Figure 117 A - PLTD) and PLTN (Figure 117 A – PLTN) all the observed species were recorded in a field booklet. When possible, amphibian and reptile species were photographed with a digital camera to aid in identification. Some specimens were captured manually (amphibians and lizards, and non-venomous snakes) for identification at the lowest possible taxonomic level and then released. The species were identified in the field using the photographic guides, keys and descriptions present in literature (e.g., Avila-Pires, 1995; Souza, 2009; Bernarde et al., 2011; 2013; 2017; Fonseca et al., 2019; Freitas et al., 2020). The nomenclature used for the species follows that proposed by Segalla et al. (2021) for amphibians and Costa et al. (2021) for reptiles.

Figure 90 - Biologist specialized in herpetofauna during the survey of herpetofauna, Fazenda Jaraguá, Bujari, Acre, 2023. A - PLTD (daytime); B - PLTN (night).

Photos: Catraia Environmental Solutions Collection.

During the PLT, anuran amphibian species in vocalization activity were recorded, estimating the number of vocalizing specimens (Heyer et al., 1994).

Specimens of amphibians and reptiles observed after or before PLTD and PLTN were recorded in the study area. The species recorded during occasional encounters were not used in the data analysis of this report, however, they were used to complement the list of species of the herpetofauna of the property (Martins & Oliveira, 1998).

5.1.1.4.3.1 Herpetofauna Results

A total of 190 amphibian and reptile species were recorded using primary and secondary data (Appendix 6). A total of 189 species were recorded through secondary data for the farm, being 99 species of amphibians (3 orders and 15 families) and 90 of reptiles (three orders, three suborders and 22 families. Among the amphibians, the most representative families in relation to species were Hylidae (39), followed by Leptodactylidae (15) and Craugastoridae (9), Aromobatidae and Microhylidae, both with 7 species. Regarding reptiles, the most representative families were Dipsadidae (32species; Snakes), followed by Colubridae (11; Snakes), Gymnophthalmidae (6; Sauria) and Dactyloidae (5; Sauria).

A total of 56 specimens belonging to 25 species of amphibians (18 species) and reptiles (seven species) were recorded in the Jaraguá farm, distributed in three orders and two suborders. The most specious amphibian family was Hylidae (10 species), followed by Leptodactylidae (three). Regarding reptiles, the most specious family was Teiidae with two species, and the others only one species.

Figure 91 - Richness of families of the orders Anura, Squamata (suborders Lizards and Snakes) and Crocodylia, recorded in the survey of the herpetofauna at Fazenda Jaraguá, Bujari, Acre, 2023

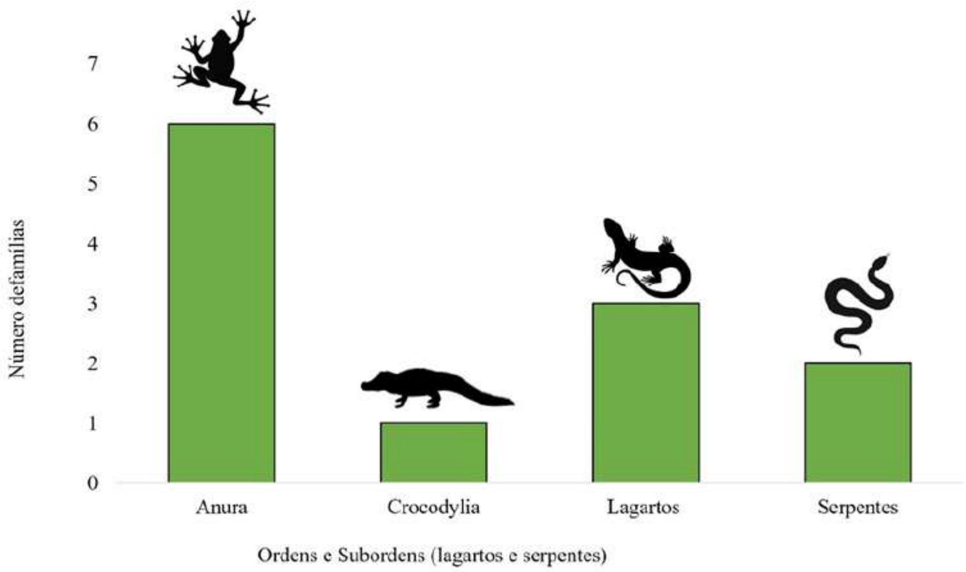
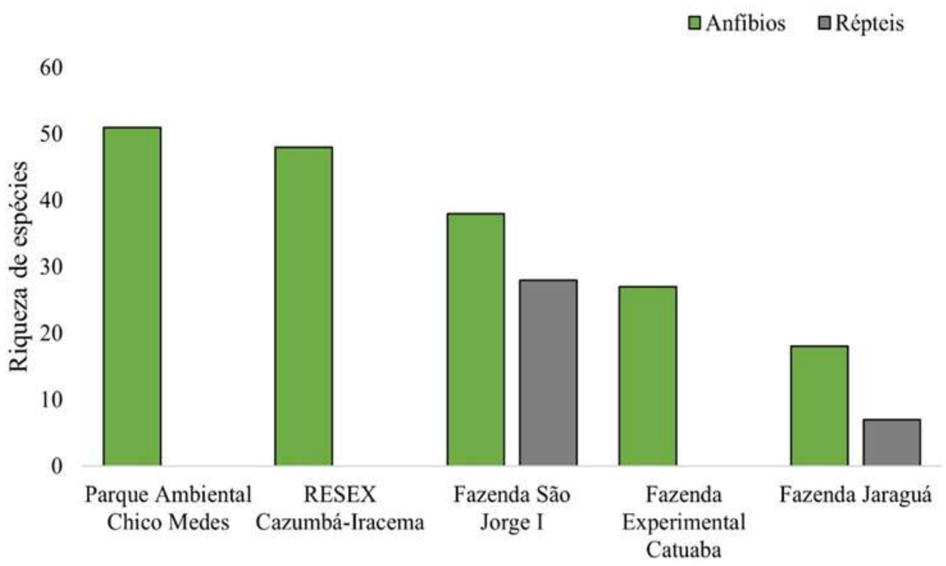


Figure 92 - Some amphibian species recorded at Jaraguá Farm, Bujari, 2023. A - Allobates femoralis; B - Rhinella marina; C - Dendrosophus nanus; D - Scinax ruber; E - Ameiva ameiva; F - Bothrops atrox.

Photos: Hendryk Freitas.

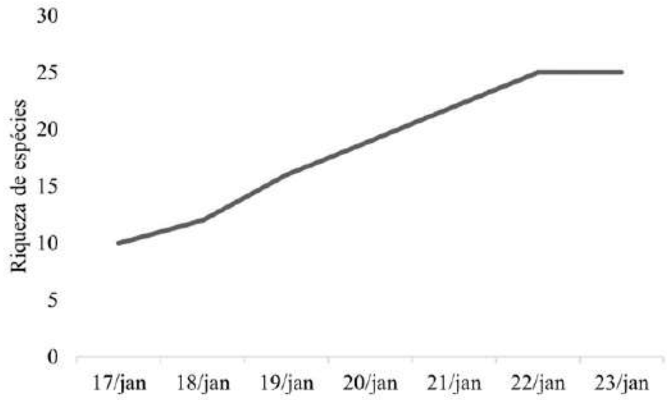
Compared to studies conducted near the farm property, the richness of amphibians registered in the project area is quite representative considering the short sampling period, corresponding to 47.3% of the wealth recorded at Fazenda São Jorge I (Miranda et al., 2014), 35.2% at Parque Ambiental Chico Mendes (Venâncio & Souza, 2016), 37.4% at RESEX do Cazumbá-Iracema (Diógenes, 2019) and 66.6% of the richness recorded at the Catuaba Experimental Farm by Souza et al. (2008). In relation to reptiles, richness is relatively low, corresponding to 24.9% of the wealth recorded at Fazenda São Jorge I (Miranda et al., 2014).

Figure 93 - Comparative graph of the lists of species of Amphibians and Reptiles recorded in studies near Fazenda Jaraguá, Bujari, Acre.



Twenty-five species of amphibians and reptiles were found in the area of the Jaraguá farm through the Time Limited Search method. To confirm whether the effort employed during the monitoring of the herpetofauna was sufficient to record the species in the study area, species accumulation curves were performed as a function of the sampling days. The species accumulation curve estimated a stabilization trend in an asymptote, however, based on the number of species recorded, the Jackknife 1 estimator estimated the possibility of 19 more species being recorded, indicating the need for a greater sampling effort in the area.

Figure 94 - Accumulation curve of species recorded during the survey of Herpetofauna at Fazenda Jaraguá, Bujari, Acre, 2023.



The richness (S = 25) and abundance (N = 56) of species recorded in the study area can be considered high even with the low sampling effort employed. In the Shannon-Weiner diversity analysis (H'), the results obtained demonstrate that the area presents a high species richness. The species *Rhinella marina* was the most dominant in the project area.

Table 52 - Diversity indices obtained in the herpetofauna survey at Fazenda Jaraguá, Bujari, Acre, 2023.

Abundance (N)	Richness (S)	Shannon-Wiener (H')	Equitable of Pielou (E)	Dominance (K)
56	25	2.8	0.88	0.08

According to the Red Book of Endangered Fauna (ICMBio, 2018) no species recorded through the collection of secondary data falls under any degree of threat of extinction. The rare snake *Siphlophis worontzowi* is known for the region where the project will be inserted. Regarding endemic species, two species are known only for the state of Acre, the amphibian *Allobates subfolionidificans* and the snake *Chlorosoma dunupyana.* The species *Chironius laurenti* registered on the property of the Jaraguá farm represents the first record for the region of lower Acre. No invasive species were recorded for the region of the project zone.

Many species recorded for the farm area have economic and hunting importance. Among them stands out the species *Podocnemis expansa*, popularly known as the Amazon tortoise. This species is the most studied among the freshwater Testudines that occur in the Amazon and the largest of the species, with females being able to reach more than 1 meter in length (Ferrara et al., 2017). Eggs of this species are quite targeted for consumption, in addition to adults being hunted for consumption and sale (Ferrara et al., 2017).

The amphibians *Hemiphractus scutatus and Bolitoglossa madeira*, recorded through secondary data for the municipality of Sena Madureira and Senador Guiomard, near the municipality of Bujari, are bioindicator species of environmental quality, since they are found only in well-preserved *terra firme* forest environments (Souza, 2009; Brcko et al., 2013).

5.1.1.4.4 Avifauna

According to Pacheco et al. (2021), there are 1,971 species of birds in the Brazilian territory, and it is estimated that the one in the Brazilian Amazon is home to approximately 1,300 species of birds (Marini & Garcia, 2005). In the state of Acre there is confirmation of 708 species (Guilherme, 2016). In the southwestern Brazilian Amazon, there are 23 species of birds that are considered endemic, and of these, 12 are recorded exclusively in Acre and southern Amazonas. Ahead of its importance for the planet's climate, ecological relevance and biodiversity, the Amazon has suffered numerous negative impacts ahead of some irregular activities, sharply reducing continuous forest extensions and loss of numerous species of fauna and flora as a result of road openings, illegal logging and fires by anthropic actions (Guilherme & Cintra, 2001).

Birds are excellent bioindicators of a healthy ecosystem, as they are in all biomes and occupy a wide variety of ecological niches. Therefore, they are used in the methods of qualitative and quantitative surveys that aim at environmental studies (Vielliard et al., 2010). The survey and monitoring of fauna promote information for science and fundamental to identify key factors for environmental policies, becoming essential to visualize changes in biodiversity and ensuring the realization of mitigatory and compensatory measures to possible impacts on terrestrial environments. Thus, this report presents information on the survey of the avifauna of the Jaraguá farm, in Bujari, obtained by secondary data through the scientific literature and portals for sharing scientific data available on the internet and primary data in the field.

The collection of secondary data was standardized for all fauna groups. In this project In addition to the GBIF database, the bibliographic survey of secondary information of avifauna in the area of study and surroundings was carried out by the scientific literature available for the region (for example Guilherme, 2016) and obtaining data on digital platforms such as Wiki Aves (www.wikiaves.com.br), eBird (www.ebird.org), Birds of the Word (www.birdsoftheworld.org) and iNaturalist (www.inaturalist.org).

In addition, field work, through active search with Mackinnon's list. The applicability of this method of estimating richness is widely indicated for carrying out inventories of fauna to obtain information on the richness and composition of species (Ribon, 2010) and one of the ways to make inventories comparable to each other (Santos, 2006). In addition to knowing the abundance and richness of the species represented in the area where the inventory of fauna is being carried out, it is a fundamental initial process to make them useful for actions of management strategies and conservation of wildlife (Silva, 2005).

Mackinnon's lists were made with sequentially enumerated lists, each composed of 10 species (standard number) and in this one cannot contain species already listed and, therefore, each species appears only once in the same list. After a list of 10 species is finished, a new list begins. However, in each new list will be inserted species already registered in previous lists, as long as they are not the same individuals registered. The application of this method will result in a Relative Abundance Index of bird species, here called List Frequency Index (LFI).

To perform the active search with applicability in the Mackinnon list, pre-existing transects and strategic points in the study area were used during the sampling days, in the morning (05:30 hours to 10:30 hours) and at night (18:00 hours to 21:00 hours), totaling eight hours/day. During the active daytime search (Figure 14), the specialist recorded in a field notebook all the species detected by audiovisual means. In the active daytime search, the visual record had the aid of binoculars for observing birds in flight or perched and a digital camera for the photographic records of the specimens. For the vocalization records, the species was recorded by the voluntary singing of the individual(s) or through the attraction by recordings of vocalizations (*playback*), stored in a digital device and compact sound player, to record the inconspicuous species. With this technique it is possible to attract the bird by artificial emission of vocalization, in which it is used to develop an efficient method, capable of attesting to the presence or absence of the species in the study area. This technique was applied with professional ethical conduct, aiming to avoid damage and stress to the bird and the ecosystem.

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Figure 95 - Biologist specialist in avifauna during the active daytime search during the survey of avifauna, Jaraguá Farm, Bujari, Acre, 2023.

Species not readily identified in the field were recorded or photographed and later identified and inserted into the field table. The species were identified with the aid of a field guide (Schulenberg et al., 2010) and in the data platforms of BirdNET and Merlin, applications that have AI that assists in the identification of the vocalizations of wild birds of the world. In addition, it was used as a database for species identification and relevant information on digital citizen science platforms such as Wiki Aves (www.wikiaves.com.br) and Birds of the Word – The Cornell Lab of Ornithology (www.birdsoftheworld.org) and scientific articles published on the latter platform.

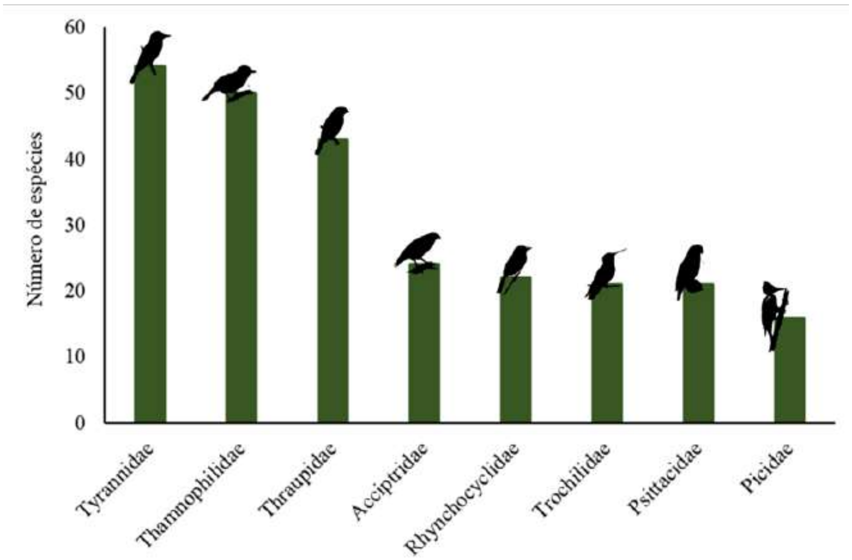
In the survey of the avifauna there were timely observations, that is, casual records that were made at times and places not defined as sampling points/transects. These casual observations aim to add species not recorded in the active search method, with the purpose of expanding and adding species to the area of the Jaraguá property, in Bujari, Acre. Bird species recorded during casual observations will not be used in the analysis of report data.

The taxonomic order and scientific nomenclature used is that recommended by the Brazilian Committee of Ornithological Records (Pacheco et al., 2021). For each species of bird recorded in this survey, basic information is presented on: environmental sensitivity and preference for habitats (Stotz et al., 1996); food guilds (Wilman et al., 2014); conservation status (ICMBio, 2022; IUCN, 2023); rare, unusual and punctually distributed birds (Stotz et al., 1996); species associated with the Inambari endemism center and/or restricted to the southwest of the Brazilian Amazon (Cracraft, 1985; William, 2016); birds that are specialists and/or associated with bamboo-dominated habitats of the genus *Guadua* (Kratter, 1997; William 2016); migratory birds (Guilherme, 2016; Somenzari et al., 2018); and game species targeted for subsistence hunting (Ojasti, 2000).

5.1.1.4.4.1 Avifauna Results

A total of 530 bird species belonging to 73 families and 26 taxonomic orders (Appendix 6) were recorded, totaling 26,655 specimens. 446 species were recorded in the secondary data collection methodology and 86 species during the active field search. Of the total number of species recorded, 236 species belong to the non-passerine taxa and 294 species belong to the order Passeriformes. Among the non-passerine species, the families with the highest number of species were Acciptridae (24 species), Trochilidade (21 species), Psittacidae (19 species) and Picidae (16 species); for Passeriformes, the most representative families were Tyrannidae (54 species), Thamnophilidae (50 species), Thraupidae (43 species) and Rhynchocyclidae (22 species).

Figure 96 - Representativeness of the species richness of the Family taxon recorded in the survey of avifauna, Jaraguá Farm, Bujari, Acre, 2023.



In this survey, the List Frequency Index (LFI) was calculated, which discloses the relative abundance of each species as a function of the conspicuity coefficient, through the number of eye and/or auditory contact and the total number of samples (Blondel et al., 1970). In this study, the number of contacts was obtained for each species registered at the Jaraguá property and divided by the total number of lists (28) during the period of the field avifauna survey. The values of List Frequency Index (Table 94) there are variations from 0.03 (1 contact) to 0.42 (12 contacts), with an average of 0.21, that is, approximately 6 contacts/species. What was observed is that 62% of the species are abundant in the area, that is, more generalists and a greater number of registered individuals, and the species with the lowest number of contacts (37%) are inserted in categories of discrete and/or inconspicuous ones, of difficult audiovisual contact.

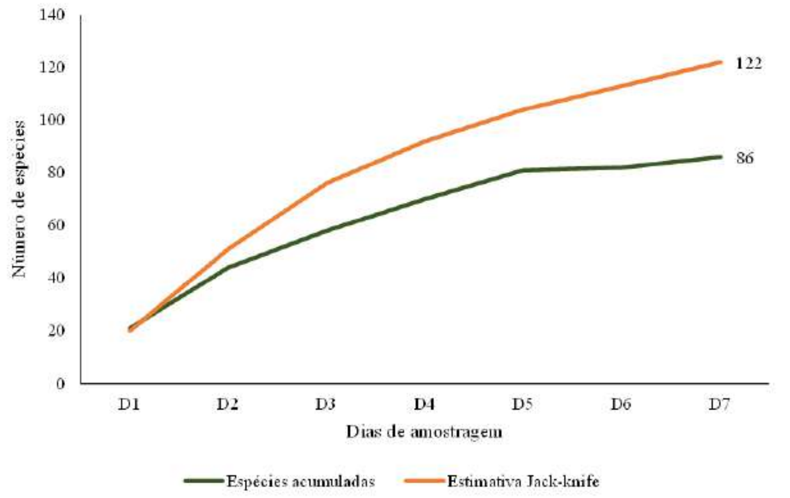
Table 53 - Frequency of contacts with bird species through the List Frequency Index using the Mackinnon list methodology in the survey of avifauna, Fazenda Jaraguá, Bujari, Acre, 2023.

Contacts	Average	Number of species per contact
1 a 4	0,03-0,14	62
5 a 8	0,17-0,28	12
10 a 12	0,35-0,42	7

Source: Self Elaboration

The sample sufficiency in the species accumulation curve at Fazenda Jaraguá presented the following information: the actual number observed was 86 species (Figure 124) and the non-parametric richness estimator presented a higher value than that observed in the field (Jack-knife 1 = 112 species). The actual richness observed did not reach levels of stability, mainly due to the number of days of field sampling. It is worth mentioning that in tropical regions it is not common to achieve stability in the cumulative curve of species (Santos, 2006), because it depends on the sampling effort employed and longer sampling days in the field.

Figure 97 - Sample sufficiency observed in the survey of avifauna, Fazenda Jaraguá, Bujari, Acre, 2023.



In the Shannon-Wiener diversity analysis (H'), the results showed that the area has a good number in relation to bird species richness (Table 95). Diversity indices may be high due to more days of field sampling on the bird community. In addition, and other characteristics influence the values of the indices, although regional climate instability and accessibility in some points have affected the sampling. These values of abundance and the richness (estimated and observed) of the birds in the area can be answered by the preservation of native vegetation on the Jaraguá property, where the area suffers deforestation pressure in its close surroundings, in addition to the influence of the parallel presence of the BR-364. Directly, the area serves as a refuge for fauna, especially the avifauna, since it is scientifically proven the negative points on the highways, such as the death of wild animals by collision in automobiles, where it is necessary to build and install passages (access roads) for the fauna.

Table 54 - Diversity indices in the survey of avifauna, Fazenda Jaraguá, Bujari, Acre, 2023.

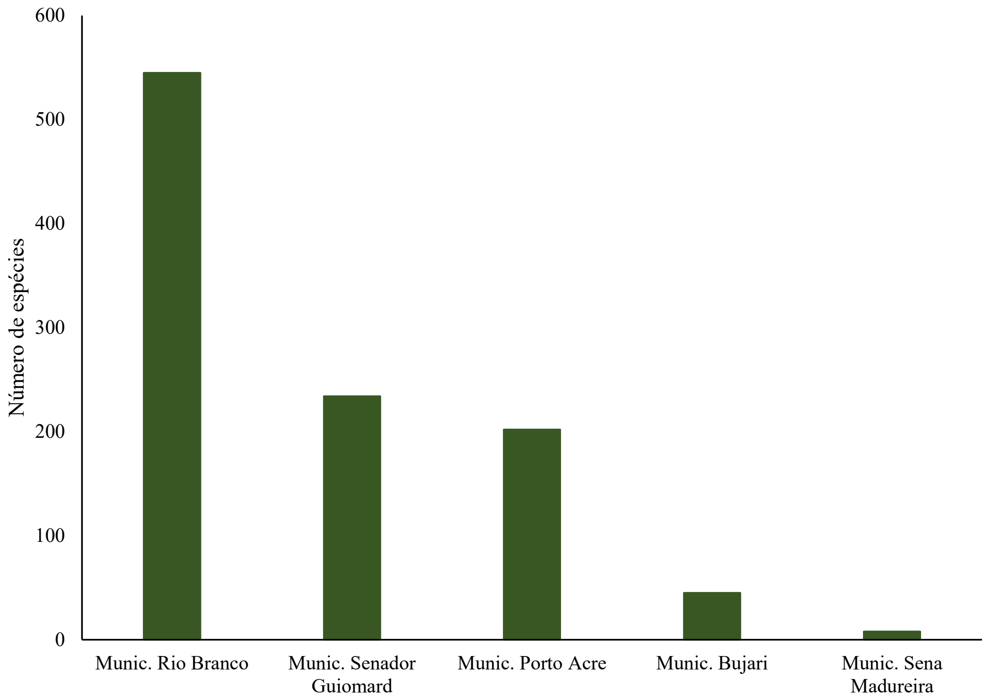
Abundance	Richness	Shannon-Wiener (H')	Equitable of Pielou (E)	Dominance (K)
209	86	4,09	0,93	0,02

Source: Self Elaboration

In total numbers on the survey of available scientific information and in the field about the avifauna in the area and around the Jaraguá Farm, it represents 77.6% of the species recorded for the state of Acre. The secondary data information acquired in the GBIF platform showed that 545 species of birds were recorded for the municipality of Rio Branco and for the municipality of Senador Guiomard, 234 records, in which these occurred in the Experimental Farm Catuaba, and 202 species in Porto Acre, punctually in the Humaitá Forest Reserve, both areas destined for research and managed by the Federal University of

Acre. These results are from people who practice *birdwatchig*, that is, people who observe wild birds in these regions in which they provide data from the records in national and/or international citizen science platforms, such as the eBird wildlife information application. Through these important data of species richness, this information shows that even with strong anthropogenic pressures, especially deforestation in the central and extreme eastern region of the state of Acre, it is possible to observe that protected areas to some degree, serve as a refuge for bird species, in addition to becoming barriers to control the advance of deforestation in the area.

Figure 98 - Representativeness of bird species richness among areas that were carried out secondary data collection in the eastern region of the state of Acre.



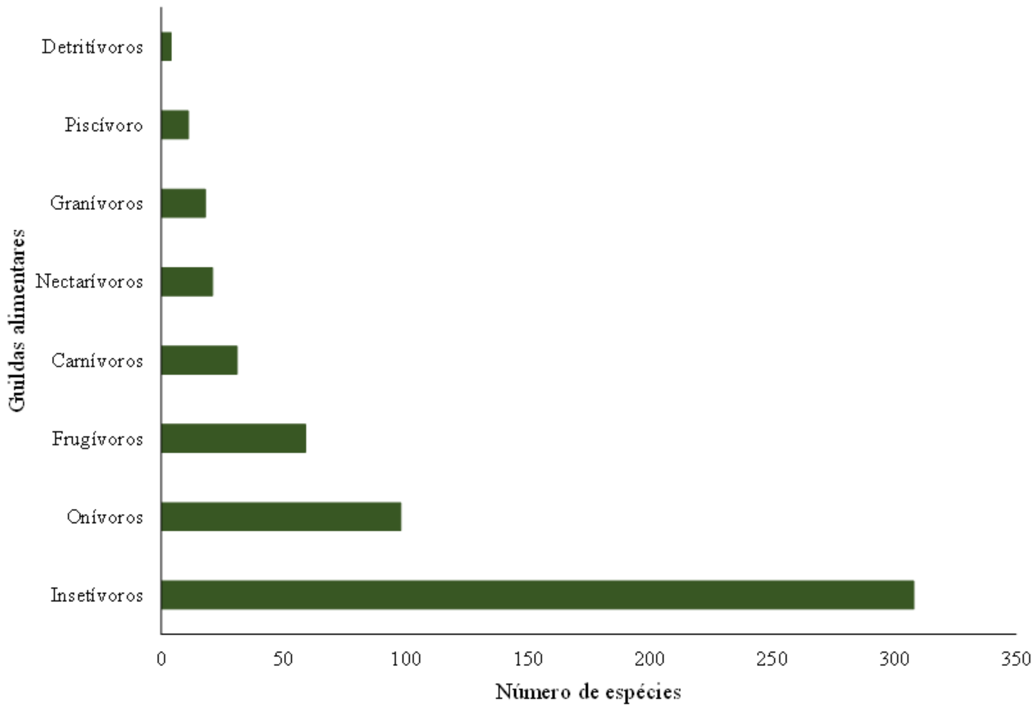
Source: Self Elaboratiobn

The bird species recorded in this field survey and secondary data were classified into the following food guilds: insectivores (n= 308 species), omnivores (n = 98 species), frugivores (n= 59 species), carnivores (n= 31 species), nectarivores (n= 21 species), granivores (n= 18 species), piscivorous (11 species) and dentritivores (n= 4 species).

The food guilds recorded in the surroundings and in the field are typical species of open environments, primary forest, and forest edges. The vegetation of the study area is composed of primary forest and areas in advanced stage of regeneration, both with characteristics of ombrophilous forest open with bamboo, and a characteristic of this habitat is the presence of birds specialized to this vegetation, usually the taminophilids (*chocas* and the like) that, in large majority are inserted in the insectivore food guilds.

The habitats dominated by bamboo of the genus *Guadua* have biotic and abiotic conditions favorable for the arrival and permanence of several species of insects that use the micro-habitat as the stems and internodes for reproduction, therefore, creating conditions with greater availability of food resources, benefiting the species of birds that have intimate association with these habitats. Insectivorous species are experts and abundant in forests and more open areas by having an improved field of view, allowing efficiency to forage by insects and other invertebrates (Terraube et al., 2016). The species included in the frugivorous and omnivorous food guilds are more resilient to generalist habitats (Guilherme & Cintra, 2001; Henriques et al., 2008), and adapted to look for food available for a limited time, such as trees with fruits and seeds (Alencar & Guilherme, 2020).

Figure 99 - Food guilds of the species recorded in the survey of avifauna, Fazenda Jaraguá, Bujari, Acre, 2023.



Source: Self Elaboration

In this survey, two databases were used to classify the conservation status of bird species: the Chico Mendes Institute for Biodiversity Conservation (ICMBio) and the International Union for Conservation of Nature (IUCN). Most of the species recorded have a conservation status of 'least concern' – ICMBio and IUCN, both with 534 species (Appendix 6); highlighted in the categories (Table 108): 'almost threatened' are the species Tinamus *guttatus* and *Spizaetus ornatus*; in the 'vulnerable category', the species *Tinamus tao* and *Harpia harpyja*.

Table 55 - Avifauna species included in endangered categories recorded in the avifauna survey in Fazenda Jaraguá, Bujari, Acre, 2023.

Legend: ICMBio = Chico Mendes Institute for Biodiversity Conservation; IUCN = International Union for Conservation of Nature

Species	Popular name	ICMBio	IUCN
Tinamus tao	azulona	VU	VU
Tinamus guttatus	inhambu-galinha	-	NT
Crypturellus strigulosus	inhambu-relógio	NT	-
Psophia leucoptera	jacamim-de-costas-brancas	-	NT
Agamia agami	garça-da-mata	-	VU
Sarcoramphus papa	urubu-rei	NT	-
Morphnus guianensis	uiraçu	VU	NT
Spizaetus ornatus	gavião-de-penacho	NT	NT
Harpia harpyja	gavião-real	VU	VU
Ibycter americanus	cancão	NT	-
Ara chloropterus	arara-vermelha	NT	-
Conothraupis speculigera	tiê-preto-e-branco	NT	-
Celeus torquatus	pica-pau-de-coleira	-	NT
Pionites leucogaster	marianinha-de-cabeça-amarela	-	VU
Primolius couloni	maracanã-de-cabeça-azul	-	VU
Formicarius rufifrons	pinto-do-mato-de-fronte-ruiva	-	NT
Syndactyla ucayalae	limpa-folha-de-bico-virado	-	NT
Cnipodectes superrufus	flautim-rufo	-	VU
Hemitriccus cohnhafti	maria-sebinha-do-acre	-	NT

Source: Self Elaboration

The results showed that, approximately, 97% of the species recorded in this survey of avifauna are not categorized as threatened, however, there are species that inhabit the region that is in a worrying category of 'almost threatened', such as the maria-sebinha-do-acre (*Hemitriccus cohnhafti*), a species recently described for science (Zimmer et al., 2013). Its first record was in the state of Acre, in 2009, until then unknown by researchers. The bird is one of the least known species of the Neotropical region, restricted to the southwest of the Amazon and to the habitats with a predominance of bamboo of the genus *Guadua*. The population size of the species is unknown, and its current records are limited in point localities. It is believed that the population is decreasing, since its entire territorial extension is estimated at 15,200 km² and is within the so-called 'Arc of Deforestation'. Consequently, the distribution of the species is being impacted because of habitat loss for livestock and forest fragmentation. With these potential risks and threats, in the future the species may be inserted in the 'vulnerable' category. Therefore, it is valid to implement and encourage conservation projects, so that forest areas are places of survival of inconspicuous species, rare and with little information about their natural history.

The Amazon is one of the biomes that houses one of the highest levels of endemism, and consequently, one of the largest in relation to the number of bird species in the country (Sick, 1997; Marini & Garcia, 2005) and the geographical distribution of birds recorded in Brazil is irregular, with some species classified as rare, unusual, or punctually distributed. In relation to the rare species (Appendix 6), during the survey of secondary information and field data, the red-fronted bush (Formicarius rufifrons), the hawk (Harpia harpyja), the uiraçu (Morphnus guianensis) and the spot-bellied woodcreeper (Hylexetastes stresemanni) were recorded.

Of the bird species, 23 are restricted to the Inambari endemism center (Appendix 6), in particular: the formigueiro-de-goeldi (*Akletos goeldii*), the cantado-galego (*Hypocnemis subflava*), the xodó tovacuçu (*Grallaria eludens*), barranqueiro-ferrugem-do-acre shreak (*Clibanornis watkinsorum*) and the ferreirinho-de-cara-branca (*Poecilotriccus albifacies*). This number of endemic species from the region of the project area covers the total value of endemisms of the southwest of the Amazon (Guilherme, 2016), showing, the high value of positive impact that the region has in relation to the diversity of birds and the conservation of fauna in general.

Figure 100 - Species of bird restrita to the center of endemism Inambari recorded in the survey of avifauna, Jaraguá Farm, Bujari, Acre, 2023. White-throated needle (Brachygalba albogularis).

Source: Field Team

Regarding the birds associated and/or specialists to the habitats dominated by bamboo of the genus *Guadua* in the southwest of the Amazon, 21 species were recorded, with emphasis on the maria-topetuda (*Lophotriccus eulophotes*), barranqueiro-de-topete (*Anabazenops dorsalis*), pica-pau-lindo (*Celeus spectabilis*) and the choquinha-ornada (*Epinecrophylla ornata*). These species are associated with bamboo-dominated habitats of the genus *Guadua* (Guilherme, 2016), regionally known as the 'tabocais'.

Thirty one (31) migratory species were recorded (Appendix 6), of these, nine are nearctic migrants (MN), which move from the Northern Hemisphere to the Neotropical region, such as the Voriire (Tyrannus tyrannus) and the yellow-legged sandpiper (*Tringa flavipes*); 16 species are southern migrants (MA), originating in the south of the South American continent: the scissors (*Tyrannus savannah*) and the Chintã bacurau (*Hydropsalis parvula)*); and six species are intratropical migrants (IM) that perform regional migration, that is, in the interior of the American continent, especially the hawk (*Elanoides forficatus*) and the northern star (*Sporophila bouvronides*). These species migrate from the region of origin to the Amazon due to changes in the climatic season, and the territory of Acre is an important route for their wintering season, as these birds use forest areas as a place of refuge, search for food resources, rest, nesting and, consequently, permanence of small populations in the region.

During the field sampling of the avifauna at the Jaraguá Farm, no new species were recorded for the region, and the same information was applied for the collection of secondary data. This can be explained by the vast sampling that the avifauna has in the region. This information comes from birdwatchers from various locations in Brazil and abroad and scientific research. In the eastern region of Acre is located the capital of the state of Acre, Rio Branco, gateway to the main region of the state and access to the other municipalities. Therefore, this 'central' region of the state has high sampling (77% of the bird species registered for Acre), but it is worth mentioning that even with these visitations and encouragement of research, it is not impossible that new species are registered in the surroundings and in the project area.

Hunting animals are those species that are usually hunted by riverine and/or isolated communities in the Amazon for the consumption of animal protein. A total of 37 species considered hunting (Appendix 6) were recorded, with emphasis on the taxonomic families with the highest number of records: Tinamidae (n = 12 species), with emphasis on the inhambu-chintã species (*Crypturellus tataupa*); Psittacity (n = 8 species), e.g., araracanga (Ara *macao*; Figure XXA); Columbidae (n = 6 species), such as the purple roller (*Columbina talpacoti*; Figure XXB), Ramphastidae (n = 2 species) as the white-rumped toucan (*Ramphastos tucanus*) and Cracidae (n = 3 species) represented by the spix-jacu (Penelope jacquacu).

Figure 101 - Species of hunting birds recorded in the survey of avifauna, Jaraguá Farm, Bujari, Acre, 2023. A – araracanga (Ara macao) in the nest; B - purple roller (Columbine talpacoti).

Source: Field Team

During this survey of the avifauna, rare and inconspicuous birds were recorded, such as the chicken inhambu (*Tinamus guttatus*), recorded with some frequency in the study area. In the IUCN Red List of Threatened Species, the Chicken Ham (*T. guttatus*) appears in the NT category, i.e., almost threatened with extinction. The justification of this species being inserted in this category is that the population is in continuous decline and the estimate of the number of individuals is from 200,000 to 500,000 in the world, in which, Amazon biome is the geographical distribution area. This decrease in the world's population is linked to poaching and consumption of animal protein, and especially, the rapid loss of habitat. According to estimates, in the next 20 years (three generations) there will be approximately a decrease in the population by 25% to 30% (Cabot et al., 2020). In this survey, species of economic and hunting interest were recorded, such as the species of the families Cracidade and Tinamidae. It is worth mentioning that the representatives of parrots (macaws and the like), ramphastidae (toucans and the like) and among others have hunting value and the meat of these birds causes an intense pressure resulting from predatory hunting or subsistence. All game bird species sensitive to environmental changes and hunting, therefore, are groups of wild animals important bioindicators of environmental quality and consequently, and the most threatened with extinction in South America.

Wild birds have rapid responses to habitat changes at various scales (Sick, 1997). Some bird species are considered more sensitive than other species (Stotz et al., 1996), and those with high sensitivity are considered and recommended as good indicators of environmental quality (Gardner et al., 2008). The area has several species of birds that are considered as bioindicators of environmental quality, highlighted: inhambu-anhangaí (*Crypturellus bartletti*), whitetail-billed rectum (*Phaethornis bourcieri*), hawk-catch-monkey (*Spizaetus tyrranus*), and among other species that need preserved habitats and are sensitive to intense environmental changes.

During the collection of secondary data and in the field in this study there are records of some invasive species, such as the “quero-quero” (*Vanellus chilensis*), the burrowing owl (*Athene cunicularia*; Figure 132), white-tailed hawk (*Geranoaetus albicaudatus*) and the zombie walker (*Anthus chii*). These species arrived in the region due to the deforestation of native vegetation cover to form open environments (for example, pastures), as these birds are adapted to these habitats. Although these species do not compete and interfere in the permanence of native birds, invasive species are indications of environmental imbalance due to intense anthropic actions in the environment. To contain the arrival of new invasive species, the suggestion is to carry out environmental education in the region, guiding to reduce deforestation and other anthropic actions, such as illegal opening of roads and forest fires.

Figure 102 - Invasive bird species recorded in the survey of avifauna, Jaraguá Farm, Bujari, Acre, 2023. Burrowing owl (Athene cunicularia).

Source: Field Team

5.1.1.4.5 Mastofauna

Mammals exhibit wide morphological and physiological diversity (Jones & Safi, 2011), and as a result play several key roles in the regulation and structuring of forest ecosystems (Wright, 2003). The different species can act in different ecological services, acting in the dispersal and predation of seeds (Stoner & Henry, 2005), with a direct impact on the carbon stock (Bello et al., 2015; Sobral et al., 2017) or as predators playing an important role in controlling herbivore populations (Terborgh, 2015).

Despite the important role played, especially in tropical forests (Jorge et al., 2013), mammal species are under constant threats, such as commercial and predatory hunting, habitat loss and degradation through deforestation and forest fires, as well as global climate change through the repetitive extreme events of drought and rainfall in recent years (Bogoni et al., 2020). Thus, the continuous reduction of the population of mammalian species over recent decades has a direct impact on ecosystem dynamics (IUCN, 2020).

Studies that evaluate parameters of terrestrial fauna communities are considered essential for assessing ecosystem health, especially in regions inserted in the context of high biological diversity such as Acre. Based on previous monitoring studies in areas of REDD+ (Reduction of Emissions from Deforestation and Forest Degradation and conservation, sustainable management and increase of carbon stocks), Botelho et al., (2018) cite that the state of Acre is considered of extreme importance for the conservation of mammals, since it has 86% of its area is occupied by forests (INPE, 2020), counting mainly that 46%

of the state's territory is protected by Natural Protected Areas - ANP. This reinforces the need for survey and monitoring studies of mammals in private areas.

Secondary data collection was standardized for all fauna groups for this project. In addition to the GBIF database, the survey and systematization of secondary data on the biodiversity of the Mastofauna in the study area and surroundings was carried out through information in a database of academic-scientific production: articles and scientific reports, dissertations and theses, technical reports, and environmental impact studies.

For sampling of diurnal and arboreal mammals, an active search census was performed at the sampling sites by an observer (Figure 133). The active search was carried out by going through the pre-existing trails, for the installation of camera traps. During this activity, active searches for direct and indirect records (traces such as fecal material, tracks, burrows, scratches and among others) were recorded for the listing of mammal species. The trails were covered at an average speed of 1.25 km / h, in the day (on average 5:30 hours to 10:30 hours) and night (18:00 hours to 21:00 hours), totaling eight hours/day. From this method, a total sampling effort of seven days was employed.

The species were identified following the taxonomic nomenclature proposed by (Abreu et al., 2022). To obtain a measure of species abundance, the Relative Abundance Index (IAR) will be used as a measure of species abundance in each area, since the IAR has a strong relationship with the actual abundance of the species.

Figure 103 - Biologist specialized in mastofauna during the active daytime search during the survey of mastofauna, Jaraguá Farm, Bujari, Acre, 2023.

Source: Field Team

All records of mammalian species performed outside the standard hours of the active search methodology and outside the points defined as standard for sampling are considered here to be occasional records. These records were used to assist in the composition of the species list, not being considered in the analysis of standardized data, since they were recorded were of the standard methodology. During this activity (active searches) were recorded both directly (visualization of the animal itself) and indirectly, trace materials such as: fecal material, tracks, burrows, scratches and among others, were noted for the listing of mammal species.

Based on the evaluation of local vegetation and logistical feasibility, to sample an area that allows obtaining data regarding the community of medium and large mammals, two traps were installed, sampling stations composed of a BUSHNELL TROPHY CAM HD trap, often used for mammal sampling (Tobler et al., 2008), tied to a tree approximately 40 cm from the ground. The traps were configured to operate 24 hours a day, with an interval of 30 seconds between photos/videos. Baits were not used in the sampling stations to avoid possible biases for some species.

The species were identified based on Emmons and Feer (1996), Eisenberg & Redford (1999); and Reis et al. (2006), the traces of the species were identified through field guides (Becker and Dalponte, 1991; Prist, 2020), the taxonomy of species follows that proposed by Abreu et al. (2022) and Quintela et al. (2020), the conservation status of the species was classified according to the categories used by the International Union for Conservation of Nature (IUCN) and the Red Book of Brazilian Fauna Threatened with Extinction (ICMBio, 2018). The species list was generated from the information collected through the sampling methods, and the richness and absolute abundance indices were generated from the field records, not considering the occasional records.

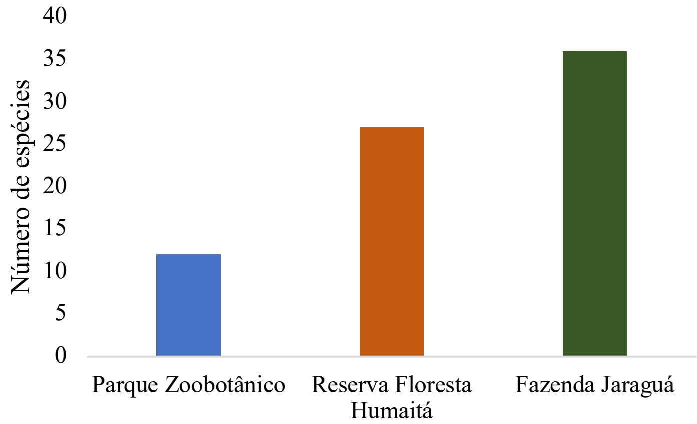
5.1.1.4.5.1 Mammals Results

A total of 164 mammalian records were obtained from searches on the platforms of scientific journals and biodiversity databases, including GBIF and SpeciesLink. A total of 34 species belonging to six orders and 22 families were recorded (Appendix 6). The most representative orders in terms of species richness were Primates (S=15) and Rodentia (S=8), a pattern that is also obsertionved in other regions of the southwestern Amazon (Borges et al., 2015; Oliveira & Calouro, 2020).

When compared with literature data, the estimated mammal species richness for the Jaraguá Farm region exceeds the richness of areas already studied (Figure 134). The Zoo Botanical Park of the Federal University of Acre, an urban forest fragment, for example, presents a list of 12 species of mammals (Borges et al., 2014). A forest fragment of 2000 ha, located in the municipality of Porto Acre, presents 27 species (Botelho et al., 2012).

Both areas are considered areas of environmental protection. Thus, the Jaraguá Farm presents around 17% of the mammal species of Acre, based on the Economic Ecological Zoning of Acre (Acre, 2010). These data are representative considering the compilation of information obtained by the database of available information.

Figure 104 - List of mammal species obtained through secondary data and bibliography for the area of the Jaraguá Farm and its surroudings



Source: Self Elaboration

The region around the Jaraguá Farm does not have Conservation Units or any Protected Areas in its limits, and the Antimary State Forest is the nearest UC, around 20 km away. The area is composed of a mixture of forested areas of other private properties and pastures, which emphasizes the importance of the farm in maintaining a large part of its forested area as a crucial source for mammalian fauna, considering the growing advance of deforestation in the eastern region of the state of Acre (ICMBio, 2019).

Ten (10) days of work were used, including the locomotion of the technical team from Rio Branco-Acre to the municipality of Bujari-Acre, to perform seven days of in situ field sampling to record the mammal species present in the area. A total of 25 mammal species were identified, and the most representative orders in terms of richness (S) were Primates (S=9) and Rodents (S=6) (as shown in Appendix 6). In addition, mammalian remains were often found in the study area, such as tracks, burrows, feces, and hair, as illustrated.

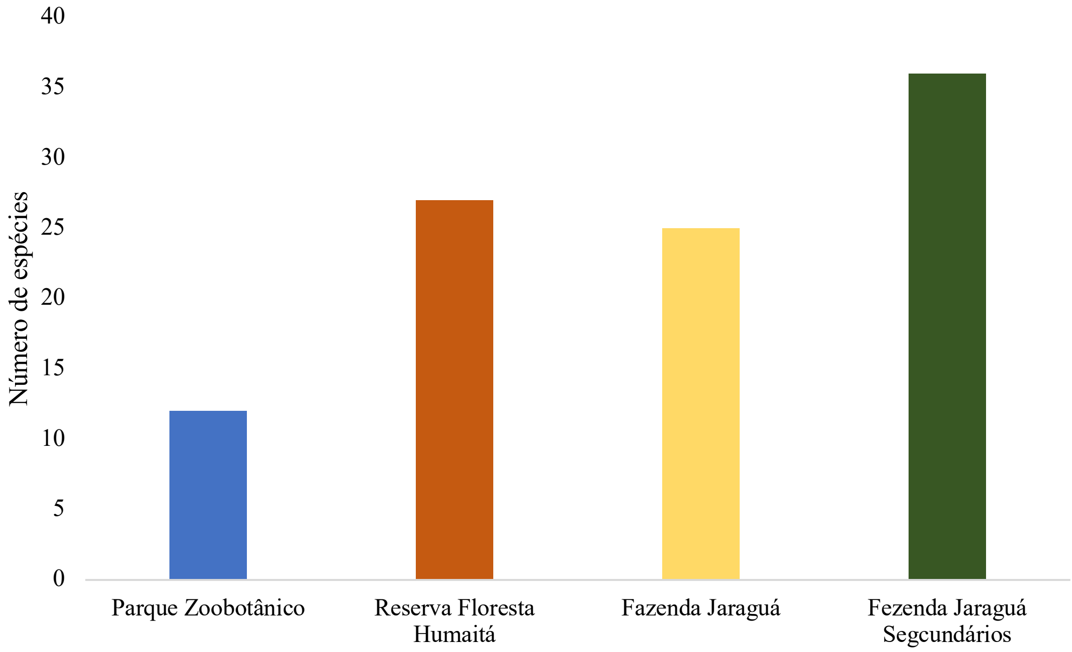
Figure 105 - Traces of some species found in the area of Jaraguá Farm, Bujari, 2023. A – Jaguar footprint (Panthera onca); B – Porcupine/cuandu hair (Coendou prehensilis).

Source: Field Team

The most representative orders in relation to richness (S) and abundance (N) were Primates (S=9), Rodentia (S=4) and Cingulata (Armadillos S=4) see Appendix 6. The wide representativeness of the primate group is a pattern already documented for the southwestern Amazon region and recorded in areas of the same watershed (Borges et al. 2015). The most abundant species were the Mustachea Monkey (*Saguinus imperator*; N= 27), the Squirrel Monkey (*Saimiri boliviensis*; N=10) and the Zogue-zog (*Callicebus cupreus*; N=10). Here we reinforce the importance for the registration of species that present high habitat requirements for their survival, the Jaguar (*Panthera onca*), the Red Jaguar (*Puma concolor*), the Tanning Armadillo (*Priodontes maximus*) and the Anta (*Tapirus terrestris*), both are species sensitive to anthropogenic changes, and hunting pressure, in addition to the Canastra Armadillo and the Anta occur at low densities.

In just seven days, 12% of the Acre Mastofauna was recorded (Reference Value ZEE, Acre, 2010), 208% of the species recorded in a Zoo and Botanical Park (Borges et al., 2014), 92% of the species recorded in the Humaitá Forest Reserve (Botelho et. al., 2012). The species richness recorded only in this campaign is quite representative for the region.

Figure 106 - Comparative graph of the list of mammal species recorded at the Jaraguá farm, through secondary data and primary data, in relation to other areas already sampled.



Source: Self Elaboration

During the sampling of the field data survey, 24 species of small, medium, and large mammals belonging to 16 families and 8 Orders were recorded. This number is significant if only the seven days of sampling are considered. The species most sighted in abundance (N) during the sense were *Saguinus imperator* (N=27). They are species with large distribution, *S. imperator* is a small primate that lives in both primary and secondary forest environments, that is, it is not as judicious in terms of habitat, sometimes observed in association with other species of small primates and have a diet rich in arthropods (Aquino et al., 2013). The second species was *Callicebus cupreus* (N=10) this small primate often observed in edge environments and has a diverse diet consuming leaf, bamboo shoots and some insects (Herrera & Heyman 2004).

To assess the structure of the mammalian community on a property, we used indices related to species richness and dominance, based on data collected during field sampling. The results showed a high richness and abundance of species recorded in the study area, considering the sampling effort (as shown in Table 110), indicating a diverse and balanced community. In addition, the lack of a dominant species was reflected by the evenness index, which was also high. Therefore, it can be concluded that the mammal community of Senegal property is structured and complete, with high diversity and balance between species.

Table 56 - Diversity indices in the survey of mastofauna, Jaraguá Farm, Bujari, Acre, 2023

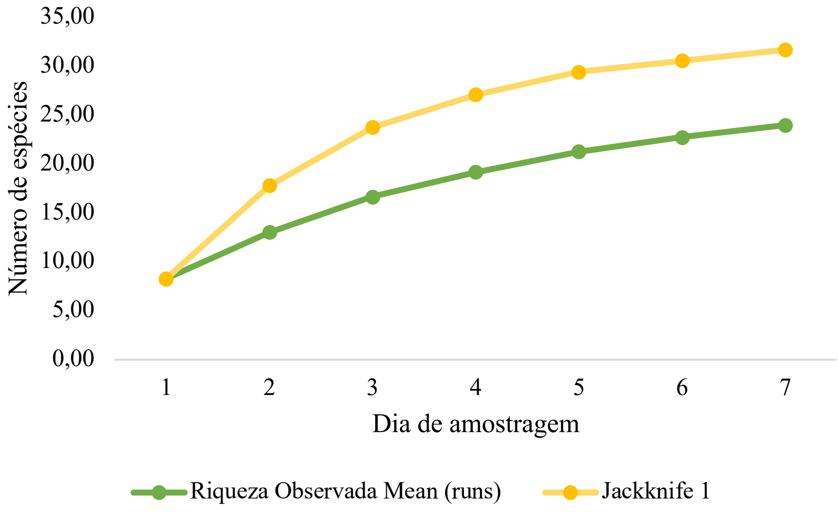
	Primary	Secondary
Richness (S)	24	34
Abundance (N)	114	164
Dominance (K)	0.03421	0.04819
Shannon-Wiener diversity (H')	3.53	3.72
Equitable Pielou (J)	0.8534	0.8981

Source: Sel Elaboration

According to MacArthur & MacArthur (1961), the hypothesis that addresses the influence of habitat complexity on diversity suggests that the presence and abundance of animal species depend on the structural components of vegetation. According to this hypothesis, habitat heterogeneity increases the availability of niches and, consequently, species diversity.

When we used the Jackknife 1 richness estimator, we noticed that, when increasing the effort in the field, the estimate of the richness of mammalian species in the Jaraguá Property reaches 32 (as shown in Figure 137). The species record curve does not show any sign of reaching an asymptote, that is, it has not yet achieved stability. This indicates that by increasing sampling, more species are expected to be recorded.

Figure 107 - Sample sufficiency observed in the survey of avifauna, Jaraguá Farm, Bujari, Acre, 2023.



Source: Self Elaboration

We highlight here the relevance of the record of species that have high habitat requirements for their survival, as well as species threatened with extinction, rare or restricted distribution. During the research, it was possible to record the presence of eight species that are classified as threatened with extinction, according to the criteria established by the Red List of the International Union for Conservation of Nature (IUCN; Table 111). They are listed as Near Threatened (NT) and Vulnerable (VU). The jaguar (1213 Panthera onca), the peccary (Tayassu pecari), Armadillo Canastra (Priodontes maximus), the tapir (Tapirus terrestris) and the primates Soim-preto (Callimico Goeldi) capuchin monkey (Cebus unicolor) and the guariba (Alouatta puruensis), both are species sensitive to anthropogenic changes, and hunting pressure, in addition to Tatu Canastra and Anta occur naturally at low densities (Aya-Cuero et al., 2017; Mayor et al., 2017; Desbiez et al., 2019; Oliveira & Calouro, 2019), which includes them in the list as vulnerable to extinction in the wild.

[12] Near threatened or near threatened (NT): The species is included in this category when, assessed by the classification criteria, it is close to being classified or is likely to be included in one of the threat categories ('Critically Endangered', 'Endangered' or 'Vulnerable') in the near future.

[13] Vulnerable or Vulnerable (VU): A species is Vulnerable when the best available evidence indicates that it faces a heightened risk of extinction in the wild in the very near future, unless the circumstances that threaten its survival and reproduction improve.

Table 57 - Species included in endangered categories recorded in the survey of the mammal fauna in Jaraguá Farm, Bujari, Acre, 2023.

Legend: VU – vulnerable; NT – almost threatened.

Order	Family	Species	Status
Carnivorous	Felidae	*Panthera onca*	NT
Artiodactyla	Tayassuidae	*Tayassu pecari*	VU
Cingulata	Dasypodidae	*Priodontes maximus*	VU
Perissodactyla	Tapiridae	*Tapirus terrestris*	VU
Primates	Callitrichidae	*Callimico goeldii*	VU
Primates	Cebidae	*Cebus unicolor*	VU

Source: Self Elaboration

One of the preponderant factors for the inclusion of Soim-preto in the list of threatened species is endemism (restricted distribution of the species to a certain biogeographic region). Naturally rare and with restricted distribution to the southwest of the Amazon, occurring at naturally low densities and sensitive to anthropogenic changes, the *Callimico goeldii* (Watsa et al., 2012), commonly known as Soim-preto is a species with a very strong habitat requirement: it prefers forest typologies with dense understory and with the occurrence of bamboo (Regh, 2006). The Black Soim occurs in flocks of up to 6 individuals and can form mixed flocks with other small primates such as Red Soim, Squirrel Monkey and Capuchin Monkey (Rehg, 2006; Watsa et al., 2012).

Peccaries (*Tayassu pecari*) are animals that require large areas of territory to roam and forage, playing a crucial role in seed dispersal and the maintenance of plant diversity. Their diet includes fruits and seeds, some of which are too large to be consumed by other animals and are then dispersed through feces. This process is important for the regeneration and survival of many plant species. The presence of peccaries in the forest can affect the composition and density of other animal species, including their predators, which use them as an important food source (Beck et al., 2010; Briceño-Mendez et al., 2016). However, habitat degradation and hunting pose significant threats to the survival of these animals and to the ecological balance of the forests where they live. Consequently, Peccaries are considered "vulnerable" to extinction by the International Union for Conservation of Nature (IUCN) (IUCN Red List, 2022).

The giant armadillo (*Priodontes maximus*) is currently classified as "vulnerable" on the IUCN Red List of Threatened Species, meaning the species faces a high risk of extinction in its natural habitat. In a study in Bolivia, Noss et al., (2004) evaluated the density and it was estimated at 5.77 to 6.28 individuals per 100 km2. The main threats to the survival of the giant armadillo are indiscriminate hunting, habitat loss due to agricultural expansion and road construction, as well as roadkills (Desbiez & Kluyber, 2013).

The jaguar (*Panthera onca*) is a top-of-the-chain predator, meaning it is at the top of the food chain and plays a key role in regulating the populations of its prey. As a predator, the jaguar contributes to the balance of ecosystems, maintaining control over the herbivore population and preventing overpopulation of these species. In addition, the jaguar plays an important role in maintaining biodiversity, as its presence is a sign that the ecosystem is healthy and in balance (Sollmann et al. 2008; Tobler et al. 2013). It is currently in the "Near Threatened" category (IUCN 2020).

The cairara monkey (*Cebus unicolor*) presents a wide use of the habitat, often opportunistic, feeds predominantly on fruits and seeds, but also preys on small vertebrates. Species of the families Arecaceae, Moraceae, Fabaceae and Sapotaceae are commonly consumed by the species (Boubli et al., 2012). In 2020 it joined the ICNU list in the 'vulnerable' category.

Habitat alteration and hunting pressure are the main factors that can affect the occurrence of several mammals in forest environments, with the Amazon Biome being the most affected by ethnic-cultural and economic issues (Endo et al., n.d.; Peres, 2010; Harrison et al., 2016; Ripple et al., 2016; Rebêlo et al., 2019; Silva et al., 2022).

The tapir (*Tapirus terrestres*) is a species of neotropical ointment that plays an important ecological role as a seed disperser. However, despite this important function, the tapir is also the most sensitive species to hunting pressure among the ungulates of the region (Bodmer et al., 1988; Tobler et al., 2014). Currently classified as "Vulnerable" by IUCN due to declining populations and persistent threats. It is important to emphasize the need for conservation measures and adequate management to ensure the survival of the species and the maintenance of its important ecological function.

Howler monkeys (*Alouatta puruensis*) have a predominantly folivorous diet, consuming mostly leaves and unripe fruits. They spend most of their lives in the treetops and are known for their loud and distinctive vocalization, which is used for communication between group members (Peres, 1997). In the Brazilian Amazon, primates (> 2 kg) are the preferred targets of indigenous and riverine populations, which makes the howler monkey a very targeted prey (Peres, 2000). It is currently in the IUCN "Vulnerable" category.

The paca (*Cuniculus paca*) is a neotropical rodent found in tropical forest areas of Central and South America, are nocturnal and solitary, feeding on a variety of plant materials such as fruits and leaves. They are considered seed dispersers of many plant species that make up their diet. (El Bizri et al., 2018), are also often hunted as a food source.

5.1.1.4.6 Vegetation

Data processing indicated the existence of 245 tree species distributed in 57 botanical families, with 1,141 individuals (Table 112). The Fabaceae family is the most abundant, with 13.06% of the identified species (n=32) representing 12.71% of the individuals surveyed (n=145), followed by Malvaceae (7.76% of the species and 9.73% of the individuals), Moraceae (7.76% of the species and 10.60% of the individuals), Sapotaceae (5.71% of the species and 4.56% of the individuals), Euphorbiaceae (4.90% of the species and 9.11% of the individuals) and Apocynaceae (3.67% of the species and 2.54% of the individuals). These 6 abundant families concentrate about 42.86% of all species in the survey (Figure 138). The composition of the forest is completed with the identification of 7 species of liana, 10 species of palm tree and 1 species of bamboo. The most abundant family is Arecaceae (palm tree) with 112 individuals sampled for 9 species.

Table 58 - Identification of species present in the forest inventory, with indication of scientific nomenclature, botanical family, and total frequency in the Jaraguá area.

n.	Popular name (portuguese)	Scientific name	Family	Total Frequency
1	Abiorana-preta	Chrysophyllum amazonicum	Sapotaceae	1
2	Abiorana-vermelha	Pouteria torta	Sapotaceae	2
3	Abiurana	Chrysophyllum sanguinolentum	Sapotaceae	4
4	Abiurana-de-quina	Pouteria caimito	Sapotaceae	11
5	Algodoeiro	Ochroma pyramidale	Malvaceae	1
6	Amarelão	Aspidosperma vargasii	Apocynaceae	6
7	Amargosa	Vatairea fusca	Fabaceae	1
8	Angelca-amarela	Drypetes variabilis	Putranjivaceae	10
9	Angelca-preta	Aptandra tubicina	Aptandraceae	4
10	Angico	Parkia nitida	Fabaceae	1
11	Apui	Ficus insipida	Moraceae	2
12	Apui-vermelho	Ficus sp.	Moraceae	1

n.	Popular name (portuguese)	Scientific name	Family	Total Frequency
13	Aquariquara	Minquartia guianensis	Coulaceae	1
14	Araçá	Eugenia sp.	Myrtaceae	4
15	Assacu	Hura creptans	Euphorbiaceae	1
16	Assa-peixe	Vernonia sp.	Asteraceae	1
17	Bacubichá	Micropholis sp.	Sapotaceae	6
18	Bacuri	Garcinia sp.	Clusiaceae	14
19	Bacuri-de-anta	Moronobea sp.	Clusiaceae	1
20	Bacuri-de-espinho	Garcinia madruno	Clusiaceae	3
21	Baginha	Stryphnodendron sp.	Fabaceae	1
22	Bálsamo	Myroxylon balsamum	Fabaceae	2
23	Bauhinia-falsa	Não identificado	Fabaceae	2
24	Botãozinho	Margaritaria nobilis	Phyllanthaceae	1
25	Botijão	Cavanillesia hylogeiton	Malvaceae	4
26	Breu-vermelho	Protium altissimum	Burseraceae	14
27	Burra-leiteira	Sapium marmieri	Euphorbiaceae	14
28	Buxixú	Miconia argyrophylla	Melastomataceae	4
29	Cabelo-de-cutia	Banara nitida	Salicaceae	5
30	Cacau	Theobroma cacao	Malvaceae	9
31	Cacauí	Theobroma speciosum	Malvaceae	4
32	Cagaça	Ecclinusa guianensis	Sapotaceae	1
33	Cajá	Spondias mombin	Anacardiaceae	1

n.	Popular name (portuguese)	Scientific name	Family	Total Frequency
34	Cajarana-do-mato	Spondias testudinis	Anacardiaceae	1
35	Cajuí	Anacardium giganteum	Anacardiaceae	1
36	Cajuzinho	Cathedra acuminata	Aptandraceae	1
37	Canela-de-jacamim	Amaioua guianensis	Rubiaceae	1
38	Canela-de-velho	Rinorea sp.	Violaceae	8
39	Capitiú	Siparuna guianensis	Siparunaceae	2
40	Capitiú-branco	Siparuna decipiens	Siparunaceae	1
41	Carapanaúba	Aspidosperma carapanauba	Apocynaceae	6
42	Caripé	Couepia sp.	Chrysobalanaceae	2
43	Caripé-branco	Licania lanceolata	Chrysobalanaceae	1
44	Cariperana	Licania micrantha	Chrysobalanaceae	3
45	Caripé-vermelho	Hirtella rodriguesii	Chrysobalanaceae	2
46	Casca-doce	Kutchubaea sp.	Rubiaceae	1
47	Castanha-de-porco	Glycydendron sp.	Euphorbiaceae	4
48	Castanharana	Eschweilera juruensis	Lecythidaceae	2
49	Castanheira	Bertholletia excelsa	Lecythidaceae	1
50	Castanhola	Caryodendron amazonicum	Euphorbiaceae	16
51	Catuaba-amarela	Qualea tessmannii	Vochysiaceae	1
52	Catuaba-preta	Qualea grandiflora	Vochysiaceae	4
53	Caucho	Castilla ulei	Moraceae	12
54	Cedro-branco	Cedrela fissilis	Meliaceae	1

n.	Popular name (portuguese)	Scientific name	Family	Total Frequency
55	Cedro-rosa	Cedrela odorata	Meliaceae	1
56	Cerejeira	Amburana acreana	Fabaceae	1
57	Cernambi-de-índio	Drypetes amazonica	Putranjivaceae	4
58	Cheiloclinium	Cheiloclinium	Celastraceae	2
59	Chichá-amarelo	Sterculia chicha	Malvaceae	6
60	Chichá-miúdo	Sterculia frondosa	Malvaceae	2
61	Coassú	Coccoloba mollis	Polygonaceae	12
62	Coité-de-paca	Couroupita guianensis	Lecythidaceae	3
63	Condurú	Duguetia sp.	Annonaceae	9
64	Corrimboque	Cariniana sp.	Lecythidaceae	1
65	Curticeiro	Neea madeirana	Nyctaginaceae	4
66	Embaúba	Cecropia ficifolia	Urticaceae	2
67	Embaúba-branca	Cecropia distachya	Urticaceae	11
68	Embaubão	Cecropia sciadophylla	Urticaceae	44
69	Embaubinha	Pourouma sp.	Urticaceae	2
70	Embirema	Couratari macrosperma	Lecythidaceae	3
71	Envira	Annona insignis	Anonaceae	1
72	Envira-cajú	Onychopetalum periquino	Anonaceae	3
73	Envira-fofa	Guatteria foliosa	Annonaceae	7
74	Envira-preta	Ephedranthus amazonicus	Anonaceae	6
75	Envira-sapotinha	Quararibea guianensis	Malvaceae	33

n.	Popular name (portuguese)	Scientific name	Family	Total Frequency
76	Envira-vassourinha	Oxandra xylopioides	Anonaceae	1
77	Espinheiro-preto	Senegalia polyphylla	Fabaceae	5
78	Falça-sorva	Batocarpus amazonicus	Moraceae	2
79	Farinha-seca	Celtis schippii	Cannabaceae	36
80	Fava-preta	Vatairea sp.	Fabaceae	4
81	Feijó	Cordia alliodora	Boraginaceae	1
82	Garapeira	Apuleia leiocarpa	Fabaceae	9
83	Goiabinha	Myrcia sp.	Myrtaceae	1
84	Grão-de-galo	Tabernaemontana sp.	Apocynaceae	4
85	Guariúba	Clarisia racemosa	Moraceae	12
86	Imbaubarana	Pourouma ovata	Urticaceae	1
87	Ingá	Inga sp.	Fabaceae	15
88	Ingá-branca	Inga thibaudiana	Fabaceae	13
89	Ingá-chata	Inga macrophylla	Fabaceae	2
90	Ingarana	Inga paraensis	Fabaceae	5
91	Ingá-seco	Zygia sp.	Fabaceae	1
92	Ingá-vermelha	Inga pezizifera	Fabaceae	1
93	Inharé	Brosimum lactescens	Moraceae	6
94	Inharé-mole	Brosimum guianense	Moraceae	6
95	Ipê-amarelo	Handroanthus serratifolius	Bignoniaceae	7
96	Itaúba	Mezilaurus itauba	Lauraceae	2

n.	Popular name (portuguese)	Scientific name	Family	Total Frequency
97	Itaubarana	Heisteria ovata	Olacaceae	6
98	Jaca-brava	Sorocea briquetii	Moraceae	16
99	Jacarandá	Dalbergia spruceana	Fabaceae	1
100	Jitó	Guarea sp.	Meliaceae	2
101	Jitó-branco	Guarea kunthiana	Meliaceae	1
102	Jitó-preto	Trichilia areolata	Meliaceae	2
103	João-mole	Neea floribunda	Nyctaginaceae	9
104	Jutaí	Hymenaea parvifolia	Fabaceae	3
105	Lacre	Vismia guianensis	Myristicaceae	2
106	Laranja-fedorenta	Leonia glycycarpa	Violaceae	7
107	Laranjinha	Casearia ulmifolia	Salicaceae	1
108	Limãozinho	Zanthoxylum rhoifolium	Rutaceae	1
109	Louro	Ocotea sp.	Lauraceae	7
110	Louro-chumbo	Licaria sp.	Lauraceae	7
111	Louro-preto	Ocotea longifolia	Lauraceae	2
112	Maçaranduba	Manilkara bidentata	Sapotaceae	1
113	Malva-peluda	Apeiba tibourbou	Malvaceae	13
114	Malvo-vermelho	Lucropis sp.	Malvaceae	1
115	Mamuí	Jacaratia spinosa	Caricaceae	7
116	Manga-de-anta	Diclinanona calycina	Annonaceae	3
117	Manichi	Brosimum acutifolium	Moraceae	2

n.	Popular name (portuguese)	Scientific name	Family	Total Frequency
118	Manitê	Brosimum alicastrum	Moraceae	1
119	Maparajuba	Pouteria sp.	Sapotaceae	6
120	Maraximbé	Trichilia pleeana	Meliaceae	4
121	Marfim	Rauvolfia praecox	Apocynaceae	2
122	Marfim-branco	Agonandra silvatica	Opiliaceae	5
123	Marfim-vermelho	Aspidosperma sp.	Apocynaceae	1
124	Maruparana	Simarouba amara	Simaroubaceae	3
125	Mataiba	Matayba sp.	Sapindaceae	1
126	Matamatá	Eschweilera sp.	Lecythidaceae	5
127	Matamatá-branco	Eschweilera coriacea	Lecythidaceae	3
128	Moiratinga	Maquira guianensis	Moraceae	2
129	Moiratinga-preta	Maquira sp.	Moraceae	3
130	Mororó-branco	Bauhinia acreana	Fabaceae	4
131	Mororó-vermelho	Bauhinia sp.2	Fabaceae	2
132	Morototó	Schefflera morototoni	Araliaceae	1
133	Mucurão	Gustavia sp.	Lecythidaceae	1
134	Muiracatiara	Astronium lecointei	Anacardiaceae	3
135	Mulungu	Erythrina falcata	Fabaceae	4
136	Munguba	Pachira sp.	Malvaceae	6
137	Murici-branco	Byrsonima crispa	Malpighiaceae	1
138	Mutamba	Guazuma ulmifolia	Malvaceae	9

n.	Popular name (portuguese)	Scientific name	Family	Total Frequency
139	NI 1	Allophyllus sp.	Sapindaceae	3
140	NI 11	Drypetes sp.	Euphorbiaceae	1
141	NI 12	Duroia sp.	Rubiaceae	1
142	NI 13	Faramea sp.	Rubiaceae	4
143	NI 14	Não identificado	Fabaceae	7
144	NI 15	Não identificado	Flacourtiaceae	2
145	NI 16	Não identificado	Não Identificado	3
146	NI 17	Heisteria barbata	Olacaceae	1
147	NI 18	Heisteria sp. 1	Olacaceae	5
148	NI 19	Heisteria sp. 2	Olacaceae	1
149	NI 2	Annona sp.	Anonaceae	6
150	NI 20	Hirtella sp. 2	Chrysobalanaceae	1
151	NI 22	Iryanthera sp.	Myristicaceae	20
152	NI 23	Iryanthera sp.1	Myristicaceae	1
153	NI 24	Licania sp.	Chrysobalanaceae	5
154	NI 25	Lonchocarpus sp.	Fabaceae	1
155	NI 27	Não identificado	Moraceae	3
156	NI 28	Não identificado	Polygonaceae	1
157	NI 29	Pouteria sp.	Sapotaceae	3
158	NI 3	Bauhinia sp.	Fabaceae	3
159	NI 30	Pouteria sp. 1	Sapotaceae	2

n.	Popular name (portuguese)	Scientific name	Family	Total Frequency
160	NI 31	Pouteria sp. 2	Sapotaceae	6
161	NI 32	Pouteria sp. 3	Sapotaceae	7
162	NI 34	Pouteria sp. 4	Sapotaceae	1
163	NI 35	Pradosia sp.	Sapotaceae	1
164	NI 36	Protium gallosum	Burseraceae	2
165	NI 37	Protium sp.	Burseraceae	2
166	NI 38	Randia armata	Rubiaceae	2
167	NI 39	Rhamnidium elaeocarpum	Rhamnaceae	1
168	NI 4	Casearia decandra	Salicaceae	4
169	NI 40	Não identificado	Rubiaceae	3
170	NI 41	Ryania sp	Salicaceae	4
171	NI 42	Siparuna sarmentosa	Siparunaceae	1
172	NI 43	Swartzia sp.	Fabaceae	5
173	NI 44	Talisia sp.	Sapindaceae	3
174	NI 45	Theobroma sp.	Malvaceae	2
175	NI 46	Trichilia sp.	Meliaceae	8
176	NI 47	Trichilia sp. 1	Meliaceae	4
177	NI 48	Virola sp.1	Myristicaceae	10
178	NI 49	Xylopia sp.1	Annonaceae	1
179	NI 5	Casearia grandifolia	Salicaceae	2
180	NI 6	Casearia sp.	Salicaceae	3

n.	Popular name (portuguese)	Scientific name	Family	Total Frequency
181	NI 7	Conceveiba guianensis	Euphorbiaceae	1
182	Orelha-de-burro	Pausandra trianae	Euphorbiaceae	10
183	Orelhinha	Enterolobium schomburgkii	Fabaceae	2
184	Pama	Naucleopsis caloneura	Moraceae	3
185	Pama-amarela	Pseudolmedia macrophylla	Moraceae	2
186	Pama-branca	Helicostylis tomentosa	Moraceae	2
187	Pama-caucho	Helicostylis scabra	Moraceae	2
188	Pama-mão-de-onça	Perebea mollis	Moraceae	5
189	Pama-preta	Pseudolmedia laevis	Moraceae	39
190	Pau-alho	Gallesia integrifolia	Phytolaccaceae	1
191	Pau-catinga	Capparidastrum sp.	Capparaceae	1
192	Pau-chiclete	Lacmellea sp.	Apocynaceae	1
193	Pau-de-formiga	Cordia nodosa	Boraginaceae	3
194	Pau-estalador	Rinoreocarpus ulei	Violaceae	4
195	Pau-ferrugem	Tapura guianense	Dichapetalaceae	5
196	Pau-pombo	Tapirira guianensis	Anacardiaceae	1
197	Pau-rosa	Prunus myrtifolia	Rosaceae	2
198	Pau-sangue	Pterocarpus rohrii	Fabaceae	8
199	Pente-de-macaco	Apeiba echinata	Malvaceae	3
200	Piaca	Diplotropis martiusii	Fabaceae	2
201	Pintadinho	Poeppigia procera	Fabaceae	6

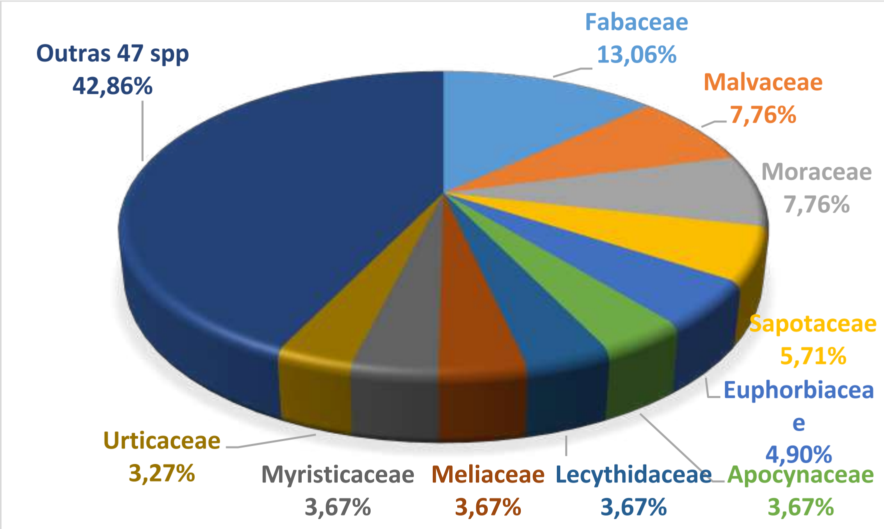
n.	Popular name (portuguese)	Scientific name	Family	Total Frequency
202	Pirarara	Metrodorea flavida	Rutaceae	5
203	Pitomba	Toulicia guianensis	Sapindaceae	7
204	Quaruba	Erisma sp.	Vochysiaceae	1
205	Quebra-faca	Hirtella sp. 1	Chrysobalanaceae	6
206	Quina	Quiina negrensis	Quiinaceae	1
207	Quina-quina-amarela	Geissospermum reticulatum	Apocynaceae	3
208	Quinarana	Geissospermum sericeum	Apocynaceae	3
209	Sabugueiro	Sambucus nigra	Adoxaceae	1
210	Samaúma-branca	Ceiba pentandra	Malvaceae	4
211	Sangue-de-boi	Iryanthera juruensis	Myristicaceae	12
212	Sapateiro	Tovomita sp.	Clusiaceae	1
213	Sapota	Matisia sp.	Malvaceae	1
214	Sapota-do-solimões	Matisia cordata	Malvaceae	3
215	Sapota-macho	Matisia bicolor	Malvaceae	2
216	Sapotinha	Matisia ochrocalyx	Malvaceae	3
217	Seringaí	Mabea speciosa	Euphorbiaceae	19
218	Seringarana	Sapium glandulosum	Euphorbiaceae	1
219	Seringueira	Hevea brasiliensis	Euphorbiaceae	12
220	Sernambí-de-índio	Nealchornea yapurensis	Euphorbiaceae	11
221	Sino	Lafoensia pacari	Lythraceae	1
222	Sucuuba	Himatanthus sucuuba	Apocynaceae	3

n.	Popular name (portuguese)	Scientific name	Family	Total Frequency
223	Tacacazeiro	Sterculia excelsa	Malvaceae	5
224	Tachi-de-igapó	Triplaris sp.	Polygonaceae	2
225	Tachi-preto	Tachigali sp.	Fabaceae	7
226	Tachi-vermelho	Tachigali sp.1	Fabaceae	8
227	Tamanqueiro	Alceis sp.	Rubiaceae	5
228	Tamarina	Dialium guianense	Fabaceae	18
229	Tanimbuca	Terminalia oblonga	Combretaceae	4
230	Taperibá	Spondias globosa	Anacardiaceae	6
231	Tapiá	Alchornea sp.	Euphorbiaceae	14
232	Tarumã	Vitex sp.	Lamiaceae	6
233	Tauari	Couratari sp. 1	Lecythidaceae	1
234	Torém-abacate	Pourouma minor	Urticaceae	11
235	Torém-de-lixa	Pourouma guianensis	Urticaceae	5
236	Trichilia-miúda	Trichilia micrantha	Meliaceae	1
237	Ucuúba-de-igapó	Virola pavonis	Myristicaceae	1
238	Ucuúba-mole	Virola mollissima	Myristicaceae	3
239	Ucuúba-preta	Virola sp.	Myristicaceae	5
240	Ucuúba-vermelha	Virola caducifolia	Myristicaceae	2
241	Urtiga	Urera caracasana	Urticaceae	11
242	Urucurana	Sloanea sp.	Elaeocarpaceae	12
243	Vassorinha-branca	Xylopia sp.	Annonaceae	3

n.	Popular name (portuguese)	Scientific name	Family	Total Frequency
244	Vela-branca	Casearia pitumba	Salicaceae	1
245	Violeta	Martiodendron elatum	Fabaceae	1
	Total			1.141

Source: Self Elaboration

Figure 108 - Distribution of botanical families and their representativeness in the sampled population.



Source: Self Elaboration

The phytosociological parameters of a forest population can support several actions in different fields of knowledge, such as recovery of degraded areas, production of seeds and seedlings, identification of endangered, rare, and endemic species, decision on management actions for conservation purposes, among others (BRITO et al., 2007).

The results of the phytosociological parameters are shown in Table 113, where the estimated total density was 363.19 individuals per hectare, equivalent to a total basal area of 1,623.898 m²/km². These values are close to those found in the Antimary State Forest, Bujari, Acre, whose total estimated density was 404 ind/ha and total basal area 1,983.82 m²/km² (TECMAN, 2012), while for Seringal Itatinga and Porto Central, in Manoel Urbano, Acre, the estimated total density was 311 ind/ha, amounting to 1,487.22 m²/km² of total basal area (TECMAN, 2020).

Among the 245 species identified, about 102 species (41.63%) had an absolute density (AD) equal to or greater than 1.00 ind/ha. The 11 most abundant species (DA ≥ 5.00 ind/ha) were Embaubão (14,006 ind/ha), Pama-preta (12,414 ind/ha), Farinha-seca (11,777 ind/ha), Envira sapotinha (10,504 ind/ha) /ha), NI 16 (6,685 ind/ha), Seringaí (6,366 ind/ha), NI 22 (6,366 ind/ha), Tamarina (6,048 ind/ha), Ingá (5,411 ind/ha), Jaca0brava (5.093 ind/ha) and Castanhola (5.093 ind/ha). These species represented approximately 23.64% of the absolute density of the inventoried population.

The species with the highest dominance (DO r ≥ 2.0%) represent approximately 21.49% of the total, where the Tamarina species is the most dominant with 3.95%, followed by Pau-alho (3.02%), Pama - preta (2.80%), Embaubão (2.59%), Caucho (2.54%), Garapeira (2.44%), Abiurana-de-quina (2.09%) and Farinha-seca (2 .06%). The species Pau-alho stands out in 2nd position due to its large diameter (DBH = 140 cm), since its density was low, 0.318 individual/ha. Other more dominant species indicate to be of large size, such as caucho, garapeira and abiurana-de-quina, since their density is approximately 1 ind/ha and even so, they are among the most dominant.

In the first positions of the Importance Value Index (IVI %), which characterizes the importance of each species in the studied forest (under the horizontal perspective), the species Pama-preta (8.11%), Farinha-seca (7.23%), Embaubão (7.08%), Tamarina (7.04%), Envira-sapotinha (5.24%), Caucho (5.11%), Garapeira (4.24%), Seringaí (4.12%) and Jaca-brava (4.04%). These species had an absolute density of approximately 72 individuals per hectare and an absolute dominance of 323.345 m²/km², representing for both parameters about 20% of the total number of individuals and basal area per km² sampled. The relative frequency (RF) calculated for these species was 12.48% representativeness in the sampled plots (Table 113). Species with higher IVI, at least theoretically, are better able to use the resources in their habitat.

The distribution of species according to the Importance Value Index (IVI) can be seen.

Table 59 - Phytosociological parameters for species occurring in the study area, where: Nº=number of individuals; AB=basal area; D=density; DO=dominance; FR=frequency; CVI=coverage value index; IVI=Importance value index; a=absolute values; r=relative

Nº	Popular Name	Nº	BA (m²)	D a (Ind/ha)	D r (%)	DO a (m²/km²)	DO r (%)	FR a (%)	FR r (%)	IVC (%)	IVI (%)
1	Pama-preta	39	1,429 m²	12,414	3,42%	45,491	2,80%	60,00%	1,89%	6,22%	8,11%

Nº	Popular Name	Nº	BA (m^2)	D a (Ind/ha)	D r (%)	DO a (m^2/km^2)	DO r (%)	FR a (%)	FR r (%)	IVC (%)	IVI (%)
2	Farinha-seca	36	1,050 m^2	11,459	3,16%	33,430	2,06%	64,00%	2,02%	5,21%	7,23%
3	Embaubão	44	1,321 m^2	14,006	3,86%	42,043	2,59%	20,00%	0,63%	6,45%	7,08%
4	Tamarina	18	2,014 m^2	5,730	1,58%	64,121	3,95%	48,00%	1,51%	5,53%	7,04%
5	Envira-sapotinha	33	0,492 m^2	10,504	2,89%	15,657	0,96%	44,00%	1,39%	3,86%	5,24%
6	Caucho	12	1,297 m^2	3,820	1,05%	41,271	2,54%	48,00%	1,51%	3,59%	5,11%
7	Garapeira	9	1,245 m^2	2,865	0,79%	39,628	2,44%	32,00%	1,01%	3,23%	4,24%
8	Seringaí	19	0,609 m^2	6,048	1,67%	19,390	1,19%	40,00%	1,26%	2,86%	4,12%
9	Jaca-brava	16	0,701 m^2	5,093	1,40%	22,316	1,37%	40,00%	1,26%	2,78%	4,04%
10	Castanhola	16	0,675 m^2	5,093	1,40%	21,497	1,32%	36,00%	1,13%	2,73%	3,86%
11	Guariúba	12	0,979 m^2	3,820	1,05%	31,171	1,92%	28,00%	0,88%	2,97%	3,85%
12	Abiurana-de-quina	11	1,068 m^2	3,501	0,96%	33,984	2,09%	24,00%	0,76%	3,06%	3,81%
13	NI 22	20	0,765 m^2	6,366	1,75%	24,357	1,50%	16,00%	0,50%	3,25%	3,76%
14	Breu-vermelho	14	0,679 m^2	4,456	1,23%	21,597	1,33%	32,00%	1,01%	2,56%	3,57%
15	Seringueira	12	0,626 m^2	3,820	1,05%	19,931	1,23%	36,00%	1,13%	2,28%	3,41%
16	Burra-leiteira	14	0,450 m^2	4,456	1,23%	14,329	0,88%	36,00%	1,13%	2,11%	3,24%
17	Pau-alho	1	1,541 m^2	0,318	0,09%	49,039	3,02%	4,00%	0,13%	3,11%	3,23%
18	Malva-peluda	13	0,516 m^2	4,138	1,14%	16,423	1,01%	32,00%	1,01%	2,15%	3,16%
19	Taperibá	6	0,928 m^2	1,910	0,53%	29,532	1,82%	20,00%	0,63%	2,34%	2,97%
20	Embaúba-branca	11	0,375 m^2	3,501	0,96%	11,939	0,74%	40,00%	1,26%	1,70%	2,96%
21	Tapiá	14	0,432 m^2	4,456	1,23%	13,766	0,85%	28,00%	0,88%	2,07%	2,96%
22	Coassú	12	0,478 m^2	3,820	1,05%	15,222	0,94%	28,00%	0,88%	1,99%	2,87%

Nº	Popular Name	Nº	BA (m²)	D a (Ind/ha)	D r (%)	DO a (m²/km²)	DO r (%)	FR a (%)	FR r (%)	IVC (%)	IVI (%)
23	Ingá	15	0,211 m²	4,775	1,31%	6,701	0,41%	36,00%	1,13%	1,73%	2,86%
24	Louro	7	0,693 m²	2,228	0,61%	22,071	1,36%	28,00%	0,88%	1,97%	2,86%
25	Pau-sangue	8	0,549 m²	2,546	0,70%	17,468	1,08%	32,00%	1,01%	1,78%	2,79%
26	Bacuri	14	0,245 m²	4,456	1,23%	7,794	0,48%	32,00%	1,01%	1,71%	2,72%
27	Mamuí	7	0,597 m²	2,228	0,61%	19,005	1,17%	28,00%	0,88%	1,78%	2,67%
28	Sangue-de-boi	12	0,163 m²	3,820	1,05%	5,173	0,32%	40,00%	1,26%	1,37%	2,63%
29	Chichá-amarelo	6	0,627 m²	1,910	0,53%	19,957	1,23%	24,00%	0,76%	1,75%	2,51%
30	Sernambí-de-índio	11	0,366 m²	3,501	0,96%	11,639	0,72%	24,00%	0,76%	1,68%	2,44%
31	Mutamba	9	0,324 m²	2,865	0,79%	10,319	0,64%	32,00%	1,01%	1,42%	2,43%
32	Urtiga	11	0,233 m²	3,501	0,96%	7,406	0,46%	32,00%	1,01%	1,42%	2,43%
33	Torém-abacate	11	0,392 m²	3,501	0,96%	12,467	0,77%	20,00%	0,63%	1,73%	2,36%
34	Ipê-amarelo	7	0,433 m²	2,228	0,61%	13,783	0,85%	28,00%	0,88%	1,46%	2,34%
35	Ingá-branca	13	0,297 m²	4,138	1,14%	9,443	0,58%	16,00%	0,50%	1,72%	2,23%
36	Matamatá	5	0,638 m²	1,592	0,44%	20,323	1,25%	16,00%	0,50%	1,69%	2,19%
37	Apui	2	0,866 m²	0,637	0,18%	27,564	1,70%	8,00%	0,25%	1,87%	2,12%
38	Marfim-branco	5	0,516 m²	1,592	0,44%	16,428	1,01%	20,00%	0,63%	1,45%	2,08%
39	João-mole	9	0,180 m²	2,865	0,79%	5,736	0,35%	28,00%	0,88%	1,14%	2,02%
40	Angelca-amarela	10	0,263 m²	3,183	0,88%	8,366	0,52%	20,00%	0,63%	1,39%	2,02%
41	Envira-fofa	7	0,394 m²	2,228	0,61%	12,548	0,77%	20,00%	0,63%	1,39%	2,02%
42	NI 16	3	0,040 m²	0,955	0,26%	1,279	0,08%	52,00%	1,64%	0,34%	1,98%
43	NI 48	10	0,232 m²	3,183	0,88%	7,374	0,45%	20,00%	0,63%	1,33%	1,96%

Nº	Popular Name	Nº	BA (m²)	D a (Ind/ha)	D r (%)	DO a (m²/km²)	DO r (%)	FR a (%)	FR r (%)	IVC (%)	IVI (%)
44	Inharé-mole	6	0,345 m²	1,910	0,53%	10,978	0,68%	24,00%	0,76%	1,20%	1,96%
45	Urucurana	12	0,264 m²	3,820	1,05%	8,390	0,52%	12,00%	0,38%	1,57%	1,95%
46	Inharé	6	0,465 m²	1,910	0,53%	14,802	0,91%	16,00%	0,50%	1,44%	1,94%
47	Condurú	9	0,124 m²	2,865	0,79%	3,936	0,24%	28,00%	0,88%	1,03%	1,91%
48	NI 46	8	0,162 m²	2,546	0,70%	5,169	0,32%	28,00%	0,88%	1,02%	1,90%
49	Tamanqueiro	5	0,342 m²	1,592	0,44%	10,886	0,67%	24,00%	0,76%	1,11%	1,87%
50	Pitomba	7	0,252 m²	2,228	0,61%	8,010	0,49%	24,00%	0,76%	1,11%	1,86%
51	NI 14	7	0,238 m²	2,228	0,61%	7,584	0,47%	24,00%	0,76%	1,08%	1,84%
52	Amarelão	6	0,281 m²	1,910	0,53%	8,956	0,55%	24,00%	0,76%	1,08%	1,83%
53	Pintadinho	6	0,267 m²	1,910	0,53%	8,514	0,52%	24,00%	0,76%	1,05%	1,81%
54	NI 32	7	0,351 m²	2,228	0,61%	11,184	0,69%	16,00%	0,50%	1,30%	1,81%
55	Manitê	1	0,810 m²	0,318	0,09%	25,776	1,59%	4,00%	0,13%	1,67%	1,80%
56	Tachi-preto	7	0,145 m²	2,228	0,61%	4,610	0,28%	28,00%	0,88%	0,90%	1,78%
57	Orelhinha	2	0,672 m²	0,637	0,18%	21,399	1,32%	8,00%	0,25%	1,49%	1,75%
58	Quebra-faca	6	0,428 m²	1,910	0,53%	13,632	0,84%	12,00%	0,38%	1,37%	1,74%
59	Munguba	6	0,349 m²	1,910	0,53%	11,124	0,69%	16,00%	0,50%	1,21%	1,72%
60	Coité-de-paca	3	0,546 m²	0,955	0,26%	17,379	1,07%	12,00%	0,38%	1,33%	1,71%
61	Carapanaúba	6	0,337 m²	1,910	0,53%	10,741	0,66%	16,00%	0,50%	1,19%	1,69%
62	Cacau	9	0,114 m²	2,865	0,79%	3,634	0,22%	20,00%	0,63%	1,01%	1,64%
63	Tacacazeiro	5	0,313 m²	1,592	0,44%	9,954	0,61%	16,00%	0,50%	1,05%	1,56%
64	Tanimbuca	4	0,288 m²	1,273	0,35%	9,152	0,56%	20,00%	0,63%	0,91%	1,54%

Nº	Popular Name	Nº	BA (m²)	D a (Ind/ha)	D r (%)	DO a (m²/km²)	DO r (%)	FR a (%)	FR r (%)	IVC (%)	IVI (%)
65	Envira-preta	6	0,192 m²	1,910	0,53%	6,096	0,38%	20,00%	0,63%	0,90%	1,53%
66	Canela-de-velho	8	0,093 m²	2,546	0,70%	2,949	0,18%	20,00%	0,63%	0,88%	1,51%
67	Orelha-de-burro	10	0,130 m²	3,183	0,88%	4,151	0,26%	12,00%	0,38%	1,13%	1,51%
68	Mulungu	4	0,394 m²	1,273	0,35%	12,545	0,77%	12,00%	0,38%	1,12%	1,50%
69	Pama-mão-de-onça	5	0,274 m²	1,592	0,44%	8,715	0,54%	16,00%	0,50%	0,97%	1,48%
70	Laranja-fedorenta	7	0,119 m²	2,228	0,61%	3,784	0,23%	20,00%	0,63%	0,85%	1,48%
71	Curticeiro	4	0,316 m²	1,273	0,35%	10,064	0,62%	16,00%	0,50%	0,97%	1,47%
72	Cabelo-de-cutia	5	0,269 m²	1,592	0,44%	8,549	0,53%	16,00%	0,50%	0,96%	1,47%
73	Bacubichá	6	0,085 m²	1,910	0,53%	2,720	0,17%	24,00%	0,76%	0,69%	1,45%
74	NI 31	6	0,143 m²	1,910	0,53%	4,559	0,28%	20,00%	0,63%	0,81%	1,44%
75	NI 2	6	0,266 m²	1,910	0,53%	8,454	0,52%	12,00%	0,38%	1,05%	1,42%
76	Itaubarana	6	0,133 m²	1,910	0,53%	4,248	0,26%	20,00%	0,63%	0,79%	1,42%
77	Botijão	4	0,286 m²	1,273	0,35%	9,091	0,56%	16,00%	0,50%	0,91%	1,41%
78	Tachi-vermelho	8	0,103 m²	2,546	0,70%	3,280	0,20%	16,00%	0,50%	0,90%	1,41%
79	Grão-de-galo	4	0,321 m²	1,273	0,35%	10,215	0,63%	12,00%	0,38%	0,98%	1,36%
80	Maparajuba	6	0,100 m²	1,910	0,53%	3,170	0,20%	20,00%	0,63%	0,72%	1,35%
81	NI 43	5	0,139 m²	1,592	0,44%	4,422	0,27%	20,00%	0,63%	0,71%	1,34%
82	Sucuuba	3	0,346 m²	0,955	0,26%	11,014	0,68%	12,00%	0,38%	0,94%	1,32%
83	Bálsamo	2	0,455 m²	0,637	0,18%	14,474	0,89%	8,00%	0,25%	1,07%	1,32%
84	Ucuúba-preta	5	0,318 m²	1,592	0,44%	10,132	0,62%	8,00%	0,25%	1,06%	1,31%
85	Castanha-de-porco	4	0,231 m²	1,273	0,35%	7,359	0,45%	16,00%	0,50%	0,80%	1,31%

Nº	Popular Name	Nº	BA (m²)	D a (Ind/ha)	D r (%)	DO a (m²/km²)	DO r (%)	FR a (%)	FR r (%)	IVC (%)	IVI (%)
86	Tarumã	6	0,181 m²	1,910	0,53%	5,765	0,36%	12,00%	0,38%	0,88%	1,26%
87	Espinheiro-preto	5	0,160 m²	1,592	0,44%	5,102	0,31%	16,00%	0,50%	0,75%	1,26%
88	Pente-de-macaco	3	0,238 m²	0,955	0,26%	7,567	0,47%	16,00%	0,50%	0,73%	1,23%
89	NI 24	5	0,186 m²	1,592	0,44%	5,935	0,37%	12,00%	0,38%	0,80%	1,18%
90	Catuaba-preta	4	0,295 m²	1,273	0,35%	9,401	0,58%	8,00%	0,25%	0,93%	1,18%
91	Louro-chumbo	7	0,097 m²	2,228	0,61%	3,078	0,19%	12,00%	0,38%	0,80%	1,18%
92	Torém-de-lixa	5	0,121 m²	1,592	0,44%	3,842	0,24%	16,00%	0,50%	0,67%	1,18%
93	Pau-ferrugem	5	0,099 m²	1,592	0,44%	3,147	0,19%	16,00%	0,50%	0,63%	1,14%
94	NI 18	5	0,148 m²	1,592	0,44%	4,711	0,29%	12,00%	0,38%	0,73%	1,11%
95	Vassorinha-branca	3	0,223 m²	0,955	0,26%	7,103	0,44%	12,00%	0,38%	0,70%	1,08%
96	Cernambi-de-índio	4	0,106 m²	1,273	0,35%	3,373	0,21%	16,00%	0,50%	0,56%	1,06%
97	Manga-de-anta	3	0,271 m²	0,955	0,26%	8,627	0,53%	8,00%	0,25%	0,79%	1,05%
98	Samaúma-branca	4	0,161 m²	1,273	0,35%	5,123	0,32%	12,00%	0,38%	0,67%	1,04%
99	Fava-preta	4	0,089 m²	1,273	0,35%	2,844	0,18%	16,00%	0,50%	0,53%	1,03%
100	Cacauí	4	0,088 m²	1,273	0,35%	2,813	0,17%	16,00%	0,50%	0,52%	1,03%
101	NI 47	4	0,149 m²	1,273	0,35%	4,742	0,29%	12,00%	0,38%	0,64%	1,02%
102	Jitó	2	0,291 m²	0,637	0,18%	9,263	0,57%	8,00%	0,25%	0,75%	1,00%
103	Jutaí	3	0,181 m²	0,955	0,26%	5,773	0,36%	12,00%	0,38%	0,62%	1,00%
104	Quinarana	3	0,244 m²	0,955	0,26%	7,779	0,48%	8,00%	0,25%	0,74%	0,99%

Nº	Popular Name	Nº	BA (m²)	Da (Ind/ha)	Dr (%)	DOa (m²/km²)	DOr (%)	FRa (%)	FRr (%)	IVC (%)	IVI (%)
105	Araçá	4	0,061 m²	1,273	0,35%	1,948	0,12%	16,00%	0,50%	0,47%	0,97%
106	Maruparana	3	0,168 m²	0,955	0,26%	5,355	0,33%	12,00%	0,38%	0,59%	0,97%
107	Pirarara	5	0,075 m²	1,592	0,44%	2,381	0,15%	12,00%	0,38%	0,58%	0,96%
108	NI 3	3	0,220 m²	0,955	0,26%	6,999	0,43%	8,00%	0,25%	0,69%	0,95%
109	Violeta	1	0,361 m²	0,318	0,09%	11,492	0,71%	4,00%	0,13%	0,80%	0,92%
110	Manichi	2	0,313 m²	0,637	0,18%	9,960	0,61%	4,00%	0,13%	0,79%	0,91%
111	Mororó-branco	4	0,069 m²	1,273	0,35%	2,198	0,14%	12,00%	0,38%	0,49%	0,86%
112	NI 41	4	0,069 m²	1,273	0,35%	2,182	0,13%	12,00%	0,38%	0,48%	0,86%
113	Angelca-preta	4	0,057 m²	1,273	0,35%	1,807	0,11%	12,00%	0,38%	0,46%	0,84%
114	Cariperana	3	0,101 m²	0,955	0,26%	3,208	0,20%	12,00%	0,38%	0,46%	0,84%
115	Buxixú	4	0,054 m²	1,273	0,35%	1,718	0,11%	12,00%	0,38%	0,46%	0,83%
116	NI 4	4	0,054 m²	1,273	0,35%	1,714	0,11%	12,00%	0,38%	0,46%	0,83%
117	NI 27	3	0,094 m²	0,955	0,26%	2,977	0,18%	12,00%	0,38%	0,45%	0,82%
118	NI 13	4	0,047 m²	1,273	0,35%	1,505	0,09%	12,00%	0,38%	0,44%	0,82%
119	Quina-quina-amarela	3	0,090 m²	0,955	0,26%	2,867	0,18%	12,00%	0,38%	0,44%	0,82%

Nº	Popular Name	Nº	BA (m²)	D a (Ind/ha)	D r (%)	DO a (m²/km²)	DO r (%)	FR a (%)	FR r (%)	IVC (%)	IVI (%)
120	Maraximbé	4	0,107 m²	1,273	0,35%	3,412	0,21%	8,00%	0,25%	0,56%	0,81%
121	Ucuúba-mole	3	0,086 m²	0,955	0,26%	2,735	0,17%	12,00%	0,38%	0,43%	0,81%
122	Matamatá-branco	3	0,147 m²	0,955	0,26%	4,668	0,29%	8,00%	0,25%	0,55%	0,80%
123	Muiracatiara	3	0,075 m²	0,955	0,26%	2,390	0,15%	12,00%	0,38%	0,41%	0,79%
124	NI 1	3	0,071 m²	0,955	0,26%	2,259	0,14%	12,00%	0,38%	0,40%	0,78%
125	Embirema	3	0,071 m²	0,955	0,26%	2,257	0,14%	12,00%	0,38%	0,40%	0,78%
126	Envira-cajú	3	0,067 m²	0,955	0,26%	2,133	0,13%	12,00%	0,38%	0,39%	0,77%
127	Pau-de-formiga	3	0,049 m²	0,955	0,26%	1,574	0,10%	12,00%	0,38%	0,36%	0,74%
128	NI 44	3	0,049 m²	0,955	0,26%	1,568	0,10%	12,00%	0,38%	0,36%	0,74%
129	Abiurana	4	0,066 m²	1,273	0,35%	2,112	0,13%	8,00%	0,25%	0,48%	0,73%
130	Moiratinga-preta	3	0,045 m²	0,955	0,26%	1,420	0,09%	12,00%	0,38%	0,35%	0,73%
131	Ingarana	5	0,084 m²	1,592	0,44%	2,661	0,16%	4,00%	0,13%	0,60%	0,73%
132	NI 37	2	0,153 m²	0,637	0,18%	4,870	0,30%	8,00%	0,25%	0,48%	0,73%
133	NI 15	2	0,143 m²	0,637	0,18%	4,537	0,28%	8,00%	0,25%	0,45%	0,71%
134	Pama	3	0,026 m²	0,955	0,26%	0,835	0,05%	12,00%	0,38%	0,31%	0,69%

Nº	Popular Name	Nº	BA (m^2)	D a (Ind/ha)	D r (%)	DO a (m^2/km^2)	DO r (%)	FR a (%)	FR r (%)	IVC (%)	IVI (%)
135	NI 6	3	0,086 m^2	0,955	0,26%	2,738	0,17%	8,00%	0,25%	0,43%	0,68%
136	Pau-estalador	4	0,088 m^2	1,273	0,35%	2,792	0,17%	4,00%	0,13%	0,52%	0,65%
137	Sapota-macho	2	0,111 m^2	0,637	0,18%	3,522	0,22%	8,00%	0,25%	0,39%	0,64%
138	Chichá-miúdo	2	0,108 m^2	0,637	0,18%	3,423	0,21%	8,00%	0,25%	0,39%	0,64%
139	Cajá	1	0,209 m^2	0,318	0,09%	6,648	0,41%	4,00%	0,13%	0,50%	0,62%
140	Bacuri-de-espinho	3	0,055 m^2	0,955	0,26%	1,738	0,11%	8,00%	0,25%	0,37%	0,62%
141	Marfim	2	0,099 m^2	0,637	0,18%	3,158	0,19%	8,00%	0,25%	0,37%	0,62%
142	Castanharana	2	0,028 m^2	0,637	0,18%	0,876	0,05%	12,00%	0,38%	0,23%	0,61%
143	Pau-rosa	2	0,090 m^2	0,637	0,18%	2,865	0,18%	8,00%	0,25%	0,35%	0,60%
144	Ingá-chata	2	0,090 m^2	0,637	0,18%	2,858	0,18%	8,00%	0,25%	0,35%	0,60%
145	Malvo-vermelho	1	0,194 m^2	0,318	0,09%	6,164	0,38%	4,00%	0,13%	0,47%	0,59%
146	Sapota-do-solimões	3	0,039 m^2	0,955	0,26%	1,229	0,08%	8,00%	0,25%	0,34%	0,59%
147	NI 29	3	0,038 m^2	0,955	0,26%	1,216	0,07%	8,00%	0,25%	0,34%	0,59%
148	NI 40	3	0,034 m^2	0,955	0,26%	1,074	0,07%	8,00%	0,25%	0,33%	0,58%
149	Capitiú	2	0,069 m^2	0,637	0,18%	2,190	0,13%	8,00%	0,25%	0,31%	0,56%

Nº	Popular Name	Nº	BA (m²)	D a (Ind/ha)	D r (%)	DO a (m²/km²)	DO r (%)	FR a (%)	FR r (%)	IVC (%)	IVI (%)
150	NI 30	2	0,063 m²	0,637	0,18%	2,000	0,12%	8,00%	0,25%	0,30%	0,55%
151	NI 5	2	0,063 m²	0,637	0,18%	1,994	0,12%	8,00%	0,25%	0,30%	0,55%
152	Falça-sorva	2	0,058 m²	0,637	0,18%	1,847	0,11%	8,00%	0,25%	0,29%	0,54%
153	Piaca	2	0,057 m²	0,637	0,18%	1,824	0,11%	8,00%	0,25%	0,29%	0,54%
154	Pama-branca	2	0,056 m²	0,637	0,18%	1,780	0,11%	8,00%	0,25%	0,28%	0,54%
155	Bauhinia-falsa	2	0,119 m²	0,637	0,18%	3,776	0,23%	4,00%	0,13%	0,41%	0,53%
156	Cedro-branco	1	0,163 m²	0,318	0,09%	5,180	0,32%	4,00%	0,13%	0,41%	0,53%
157	Apui-vermelho	1	0,096 m²	0,318	0,09%	3,063	0,19%	8,00%	0,25%	0,28%	0,53%
158	Embaúba	2	0,049 m²	0,637	0,18%	1,575	0,10%	8,00%	0,25%	0,27%	0,52%
159	Louro-preto	2	0,049 m²	0,637	0,18%	1,549	0,10%	8,00%	0,25%	0,27%	0,52%
160	Quaruba	1	0,157 m²	0,318	0,09%	5,000	0,31%	4,00%	0,13%	0,40%	0,52%
161	Pama-amarela	2	0,046 m²	0,637	0,18%	1,455	0,09%	8,00%	0,25%	0,26%	0,52%
162	Sino	1	0,154 m²	0,318	0,09%	4,894	0,30%	4,00%	0,13%	0,39%	0,52%
163	Ucuúba-vermelha	2	0,042 m²	0,637	0,18%	1,325	0,08%	8,00%	0,25%	0,26%	0,51%
164	Tachi-de-igapó	2	0,039 m²	0,637	0,18%	1,249	0,08%	8,00%	0,25%	0,25%	0,50%

Nº	Popular Name	Nº	BA (m²)	Da (Ind/ha)	Dr (%)	DOa (m²/km²)	DOr (%)	FRa (%)	FRr (%)	IVC (%)	IVI (%)
165	Itaúba	2	0,033 m²	0,637	0,18%	1,043	0,06%	8,00%	0,25%	0,24%	0,49%
166	Pama-caucho	2	0,033 m²	0,637	0,18%	1,042	0,06%	8,00%	0,25%	0,24%	0,49%
167	NI 38	2	0,029 m²	0,637	0,18%	0,914	0,06%	8,00%	0,25%	0,23%	0,48%
168	Lacre	2	0,029 m²	0,637	0,18%	0,910	0,06%	8,00%	0,25%	0,23%	0,48%
169	Jitó-preto	2	0,026 m²	0,637	0,18%	0,813	0,05%	8,00%	0,25%	0,23%	0,48%
170	Caripé	2	0,020 m²	0,637	0,18%	0,637	0,04%	8,00%	0,25%	0,21%	0,47%
171	Embaubinha	2	0,018 m²	0,637	0,18%	0,569	0,04%	8,00%	0,25%	0,21%	0,46%
172	Moiratinga	2	0,017 m²	0,637	0,18%	0,534	0,03%	8,00%	0,25%	0,21%	0,46%
173	NI 20	1	0,116 m²	0,318	0,09%	3,696	0,23%	4,00%	0,13%	0,32%	0,44%
174	Sapotinha	3	0,026 m²	0,955	0,26%	0,815	0,05%	4,00%	0,13%	0,31%	0,44%
175	Mororó-vermelho	2	0,063 m²	0,637	0,18%	2,004	0,12%	4,00%	0,13%	0,30%	0,42%
176	NI 12	1	0,104 m²	0,318	0,09%	3,321	0,20%	4,00%	0,13%	0,29%	0,42%
177	NI 36	2	0,052 m²	0,637	0,18%	1,643	0,10%	4,00%	0,13%	0,28%	0,40%
178	Caripé-vermelho	2	0,039 m²	0,637	0,18%	1,244	0,08%	4,00%	0,13%	0,25%	0,38%
179	Cerejeira	1	0,076 m²	0,318	0,09%	2,428	0,15%	4,00%	0,13%	0,24%	0,36%

Nº	Popular Name	Nº	BA (m²)	Da (Ind/ha)	Dr (%)	DOa (m²/km²)	DOr (%)	FRa (%)	FRr (%)	IVC (%)	IVI (%)
180	Assacu	1	0,075 m²	0,318	0,09%	2,393	0,15%	4,00%	0,13%	0,24%	0,36%
181	NI 7	1	0,074 m²	0,318	0,09%	2,344	0,14%	4,00%	0,13%	0,23%	0,36%
182	Morototó	1	0,067 m²	0,318	0,09%	2,121	0,13%	4,00%	0,13%	0,22%	0,34%
183	Cheiloclinium	2	0,021 m²	0,637	0,18%	0,657	0,04%	4,00%	0,13%	0,22%	0,34%
184	Abiorana-vermelha	2	0,020 m²	0,637	0,18%	0,637	0,04%	4,00%	0,13%	0,21%	0,34%
185	NI 45	2	0,018 m²	0,637	0,18%	0,572	0,04%	4,00%	0,13%	0,21%	0,34%
186	Pau-pombo	1	0,060 m²	0,318	0,09%	1,917	0,12%	4,00%	0,13%	0,21%	0,33%
187	Cajuzinho	1	0,056 m²	0,318	0,09%	1,787	0,11%	4,00%	0,13%	0,20%	0,32%
188	Murici-branco	1	0,055 m²	0,318	0,09%	1,745	0,11%	4,00%	0,13%	0,20%	0,32%
189	Bacuri-de-anta	1	0,051 m²	0,318	0,09%	1,621	0,10%	4,00%	0,13%	0,19%	0,31%
190	Catuaba-amarela	1	0,048 m²	0,318	0,09%	1,521	0,09%	4,00%	0,13%	0,18%	0,31%
191	Marfim-vermelho	1	0,046 m²	0,318	0,09%	1,475	0,09%	4,00%	0,13%	0,18%	0,30%
192	Cajarana-do-mato	1	0,044 m²	0,318	0,09%	1,402	0,09%	4,00%	0,13%	0,17%	0,30%
193	NI 35	1	0,044 m²	0,318	0,09%	1,387	0,09%	4,00%	0,13%	0,17%	0,30%
194	Cajuí	1	0,043 m²	0,318	0,09%	1,372	0,08%	4,00%	0,13%	0,17%	0,30%

Nº	Popular Name	Nº	BA (m²)	Da (Ind/ha)	Dr (%)	DOa (m²/km²)	DOr (%)	FRa (%)	FRr (%)	IVC (%)	IVI (%)
195	Algodoeiro	1	0,040 m²	0,318	0,09%	1,284	0,08%	4,00%	0,13%	0,17%	0,29%
196	Goiabinha	1	0,040 m²	0,318	0,09%	1,277	0,08%	4,00%	0,13%	0,17%	0,29%
197	NI 11	1	0,037 m²	0,318	0,09%	1,171	0,07%	4,00%	0,13%	0,16%	0,29%
198	Sabugueiro	1	0,036 m²	0,318	0,09%	1,140	0,07%	4,00%	0,13%	0,16%	0,28%
199	NI 28	1	0,035 m²	0,318	0,09%	1,100	0,07%	4,00%	0,13%	0,16%	0,28%
200	Botãozinho	1	0,034 m²	0,318	0,09%	1,070	0,07%	4,00%	0,13%	0,15%	0,28%
201	Sapota	1	0,033 m²	0,318	0,09%	1,054	0,06%	4,00%	0,13%	0,15%	0,28%
202	Pau-catinga	1	0,030 m²	0,318	0,09%	0,949	0,06%	4,00%	0,13%	0,15%	0,27%
203	NI 17	1	0,029 m²	0,318	0,09%	0,924	0,06%	4,00%	0,13%	0,14%	0,27%
204	Imbaubarana	1	0,027 m²	0,318	0,09%	0,864	0,05%	4,00%	0,13%	0,14%	0,27%
205	Canela-de-jacamim	1	0,026 m²	0,318	0,09%	0,837	0,05%	4,00%	0,13%	0,14%	0,27%
206	NI 25	1	0,026 m²	0,318	0,09%	0,823	0,05%	4,00%	0,13%	0,14%	0,26%
207	Jacarandá	1	0,026 m²	0,318	0,09%	0,814	0,05%	4,00%	0,13%	0,14%	0,26%
208	Sapateiro	1	0,022 m²	0,318	0,09%	0,696	0,04%	4,00%	0,13%	0,13%	0,26%
209	NI 42	1	0,021 m²	0,318	0,09%	0,674	0,04%	4,00%	0,13%	0,13%	0,26%

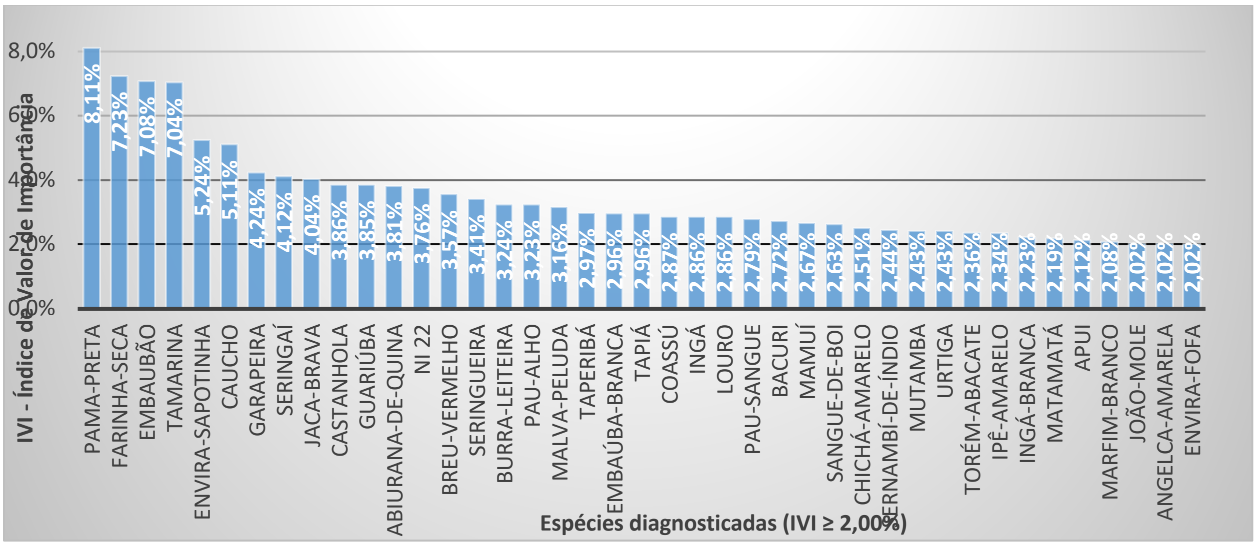
N°	Popular Name	N°	BA (m^2)	Da (Ind/ha)	Dr (%)	DOa (m^2/km^2)	DOr (%)	FRa (%)	FRr (%)	IVC (%)	IVI (%)
210	NI 34	1	0,019 m^2	0,318	0,09%	0,621	0,04%	4,00%	0,13%	0,13%	0,25%
211	NI 19	1	0,018 m^2	0,318	0,09%	0,574	0,04%	4,00%	0,13%	0,12%	0,25%
212	Seringarana	1	0,018 m^2	0,318	0,09%	0,572	0,04%	4,00%	0,13%	0,12%	0,25%
213	Maçaranduba	1	0,018 m^2	0,318	0,09%	0,560	0,03%	4,00%	0,13%	0,12%	0,25%
214	Limãozinho	1	0,017 m^2	0,318	0,09%	0,552	0,03%	4,00%	0,13%	0,12%	0,25%
215	Pau-chiclete	1	0,017 m^2	0,318	0,09%	0,548	0,03%	4,00%	0,13%	0,12%	0,25%
216	Capitiú-branco	1	0,017 m^2	0,318	0,09%	0,545	0,03%	4,00%	0,13%	0,12%	0,25%
217	Mucurão	1	0,017 m^2	0,318	0,09%	0,541	0,03%	4,00%	0,13%	0,12%	0,25%
218	Tauari	1	0,017 m^2	0,318	0,09%	0,531	0,03%	4,00%	0,13%	0,12%	0,25%
219	Angico	1	0,017 m^2	0,318	0,09%	0,527	0,03%	4,00%	0,13%	0,12%	0,25%
220	Envira-vassourinha	1	0,016 m^2	0,318	0,09%	0,495	0,03%	4,00%	0,13%	0,12%	0,24%
221	Aquariquara	1	0,015 m^2	0,318	0,09%	0,482	0,03%	4,00%	0,13%	0,12%	0,24%
222	Laranjinha	1	0,015 m^2	0,318	0,09%	0,479	0,03%	4,00%	0,13%	0,12%	0,24%
223	Cedro-rosa	1	0,015 m^2	0,318	0,09%	0,475	0,03%	4,00%	0,13%	0,12%	0,24%
224	NI 39	1	0,014 m^2	0,318	0,09%	0,458	0,03%	4,00%	0,13%	0,12%	0,24%

N°	Popular Name	N°	BA (m²)	D a (Ind/ha)	D r (%)	DO a (m²/km²)	DO r (%)	FR a (%)	FR r (%)	IVC (%)	IVI (%)
225	Ucuúba-de-igapó	1	0,014 m²	0,318	0,09%	0,458	0,03%	4,00%	0,13%	0,12%	0,24%
226	Castanheira	1	0,014 m²	0,318	0,09%	0,440	0,03%	4,00%	0,13%	0,11%	0,24%
227	NI 23	1	0,013 m²	0,318	0,09%	0,428	0,03%	4,00%	0,13%	0,11%	0,24%
228	Envira	1	0,013 m²	0,318	0,09%	0,401	0,02%	4,00%	0,13%	0,11%	0,24%
229	Amargosa	1	0,013 m²	0,318	0,09%	0,399	0,02%	4,00%	0,13%	0,11%	0,24%
230	Vela-branca	1	0,012 m²	0,318	0,09%	0,375	0,02%	4,00%	0,13%	0,11%	0,24%
231	Corrimboque	1	0,012 m²	0,318	0,09%	0,370	0,02%	4,00%	0,13%	0,11%	0,24%
232	Cagaça	1	0,011 m²	0,318	0,09%	0,366	0,02%	4,00%	0,13%	0,11%	0,24%
233	Caripé-branco	1	0,011 m²	0,318	0,09%	0,343	0,02%	4,00%	0,13%	0,11%	0,23%
234	Casca-doce	1	0,011 m²	0,318	0,09%	0,337	0,02%	4,00%	0,13%	0,11%	0,23%
235	Mataiba	1	0,010 m²	0,318	0,09%	0,330	0,02%	4,00%	0,13%	0,11%	0,23%
236	Ingá-vermelha	1	0,010 m²	0,318	0,09%	0,328	0,02%	4,00%	0,13%	0,11%	0,23%
237	Baginha	1	0,010 m²	0,318	0,09%	0,310	0,02%	4,00%	0,13%	0,11%	0,23%
238	NI 49	1	0,010 m²	0,318	0,09%	0,310	0,02%	4,00%	0,13%	0,11%	0,23%
239	Abiorana-preta	1	0,009 m²	0,318	0,09%	0,301	0,02%	4,00%	0,13%	0,11%	0,23%

N°	Popular Name	N°	BA (m²)	D a (Ind/ha)	D (%) r	DO a (m²/km²)	DO (%) r	FR (%) a	FR (%) r	IVC (%)	IVI (%)
240	Ingá-seco	1	0,009 m²	0,318	0,09%	0,293	0,02%	4,00%	0,13%	0,11%	0,23%
241	Jitó-branco	1	0,009 m²	0,318	0,09%	0,293	0,02%	4,00%	0,13%	0,11%	0,23%
242	Feijó	1	0,009 m²	0,318	0,09%	0,288	0,02%	4,00%	0,13%	0,11%	0,23%
243	Trichilia-miúda	1	0,009 m²	0,318	0,09%	0,283	0,02%	4,00%	0,13%	0,11%	0,23%
244	Assa-peixe	1	0,008 m²	0,318	0,09%	0,268	0,02%	4,00%	0,13%	0,10%	0,23%
245	Quina	1	0,008 m²	0,318	0,09%	0,268	0,02%	4,00%	0,13%	0,10%	0,23%
	Total	**1141**	**51,016 m²**	**363,19**	**100,00 %**	**1623,898**	**100,00 %**	**3172,00 %**	**100,00 %**	**200,00 %**	**300,00 %**

Source: Self Elaboration

Figure 109 - Distribution of inventoried species according to Importance Value Index (IVI).

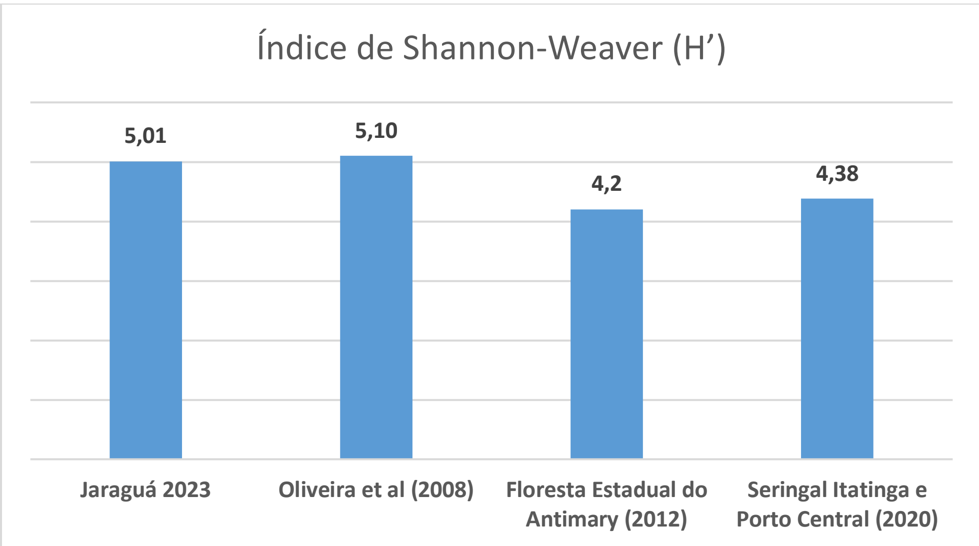


Diversity is composed of the variety of species and the number of individuals within each species and most of the time diversity studies are related to patterns of spatial and environmental variation. It is not correlated with the number of individuals per hectare of the population, but with a set of species and their number of representatives (CARVALHO, 2019).

The Shannon-Weaver Index (H') was used, which considers equal weight between rare and abundant species, providing an idea of the degree of uncertainty in predicting which species an individual drawn randomly from the population would belong to. The higher the value of H', the greater the floristic diversity of the population under study.

The Shannon-Weaver Index (H') for the inventory was 5.01, thus indicating that the forest is well diversified. Oliveira et al (2008) indicated the same situation being evaluated in the Manaus region, whose index obtained was H'=5.10 (Figure 163). Comparatively, the calculated index was higher in relation to the Antimary State Forest, near the Jaraguá area, where the index was 4.2 (TECMAN, 2012), as well as for an area located in Manoel Urbano, Seringal Itatinga and Porto Central, the index was 4.38 (TECMAN, 2020).

Figure 110 - Comparison of Shannon-Weaver indices in different forest areas.



According to the Ordinance of the Ministry of the Environment, nº 148, of June 7, 2022 (BRASIL, 2022), regarding the update of the National List of Endangered Species, in the project area there are 7 species categorized as Vulnerable (VU), as shown in the table below. Two species are Protected by Law, *Bertholletia excelsa* (Chestnut Tree/Castanheira), according to Decree 5.975/2006 and *Hevea brasiliensis* (Rubber Tree/Seringueira), according to Decree 5.975/2006 (Table 121).

Table 60 - List of species in Annex I of the National List of Endangered Species, Ordinance No. 148/2022 and Protected by law.

Scientific Name	Family	Popular Name Portuguese	Category
Amburana acreana	Fabaceae	Cerejeira	VU
Apuleia leiocarpa	Fabaceae	Garapeira	VU
Bertholletia excelsa	Lecythidaceae	Castanheira	VU/Protected
Cedrela fissilis	Meliaceae	Cedro-branco	VU
Cedrela odorata	Meliaceae	Cedro-rosa	VU
Hymenaea parvifolia	Fabaceae	Jutaí	VU
Mezilaurus itauba	Lauraceae	Itaúba	VU
Hevea brasiliensis	Euphorbiaceae	Seringueira	Protected

According to data contained in REFLORA (Plants of Brazil: Historical Rescue and Virtual Herbarium for the Knowledge and Conservation of Brazilian Flora) none of the species inventoried in the Jaraguá area are endemic to Acre.

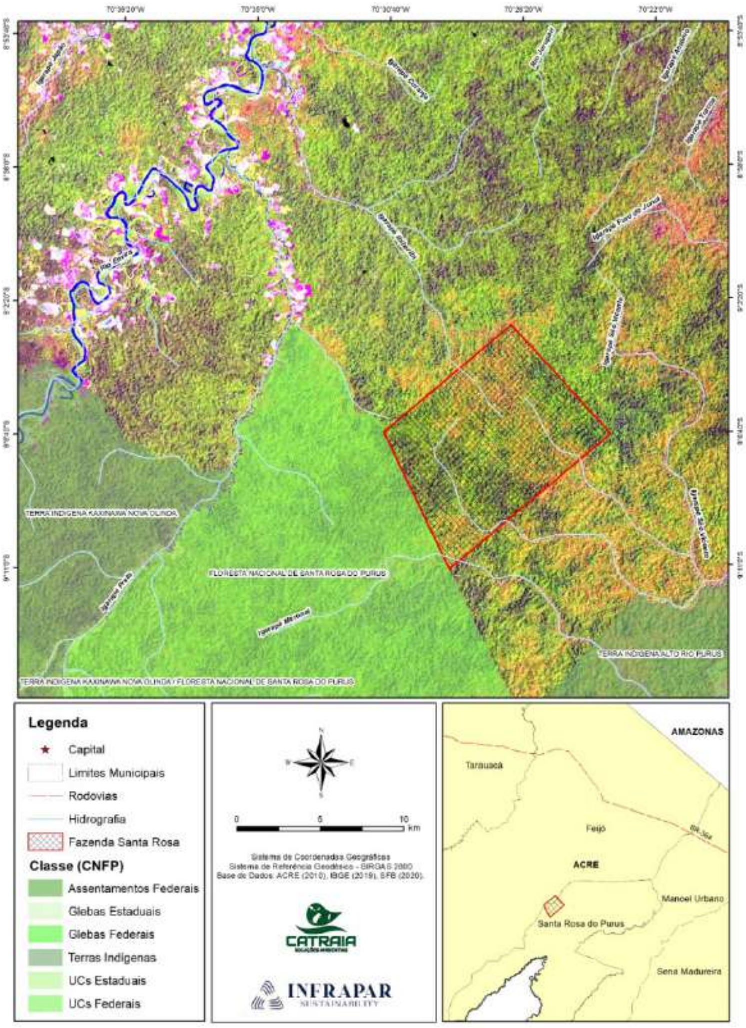
The species identified in the table above participate in the structure of the forest in different ways. Using the data from the phytosociological parameters presented above, it can be inferred that the species Apuleia leiocarpa (garapeira) and Hevea brasiliensis (rubber tree) participate more in the structure of the forest, are more important when compared to the other species, since their respective IVI were 4 .24% and 3.41%, occupying 7th and 15th position in importance value. The other species in Table 114 presented IVI below 1%, indicating, at least for the studied population, low participation in the structure of the forest.

5.1.1.5 Santa Rosa Farm, Santa Rosa dos Purus, Acre

The project area has attributes of high biological and ecological value that allow the maintenance of biodiversity species, a great diversity of natural landscapes, and the unique beauty of tropical forests. The richness and diversity of species is linked to the diversity of habitats and the abundance of food, a fundamental element to guarantee the stability of the animal populations that live there (Sampaio et al., 2010).

The survey was conducted at Santa Rosa Farm (09º06'59.7"S 70º27'27.6"W; Figure 164), which is located in the central region of the state of Acre, in the municipality of Santa Rosa do Purus, at the interfluvial between Purus River (East) and Envira River (West) and approximately 300 km from the Capital Rio Branco. The climate of the region is characterized as Am, according to the Köeppen classification. It is a humid tropical climate, with an average annual temperature between 26 and 27ºC, with a short-term dry season. The annual rainfall in the region is 2000mm and the average temperature is 25ºC. The dry and rainy seasons are well defined, with the dry season between June and September and the rainy season between October and May (D'Oliveira et al., 2013). The area is located near two conservation units, the Santa Rosa do Purus National Forest (which borders the southwestern region) and Chandless State Park, approximately 35 km away to the southeast of the area.

Figure 111 - General area of Santa Rosa Farm, Santa Rosa do Purus, Acre, Brazil. Property with incentive to the Carbon Credit Project. Map: Catraia Environmental Solutions, 2023. Legend – red line: territorial boundaries of the area of the property.



5.1.1.5.1 Entomofauna

Dealing with studies on Entomology in isolated areas of the Amazon, it is known that these are frequently performed. However, the group of insects has a biodiversity with great expressiveness and there is a need for studies focusing on this area.

The importance of going to the field and even conducting analyses that focus on the bibliographic review on these organisms, are essential so that data can be found on these species. In this way, the understanding about the relevance of Entomology in our days needs to be presented in a clearer way in our days.

The group of organisms involving the Entomofauna encompasses one of the greatest diversities that exist in the animal kingdom, thus confirming the need to conduct studies that can describe more about these species mainly in isolated areas of the Amazon (Marques et al., 2017).

It is known that the knowledge about Entomology associated with diseases within the Amazon has been important for the survey of the existing Biodiversity in this part of the Amazon (Menezes, 2006). In the Amazon region, studies that emphasize the need to understand more about the Entomofauna grow more and more and are carried out by different researchers from the country and the world.

In Acre, the location where this technical study took place, it is perceived in the scientific literature that the record of investigative studies on medical or general Entomofauna are still below what could exist, and the absence of information about these organisms is what reflects the need for studies in the most isolated regions of the Amazon (Ribeiro et al., 2019; Madeira et al., 2020)

Secondary data collection was standardized for all fauna groups (see topic 4.1.1 – Secondary data). In addition to the GBIF database, it was performed in the form of an association using the Boolean operator and the Health Sciences Descriptors (DECS) and their counterparts in the Medical Subject Headings (MeSH): "Medical Entomofauna in Acre" and "Use of Insects in Zoonotic Studies". The search included literature in English, Spanish and Portuguese where the target group and environment (i.e., culicidae, dipterans, medical importance, entomofauna, Amazon rainforest) was applied as a search parameter, and some characteristics associated with the group and different keywords (for example: zoonoses; public health; vectors).

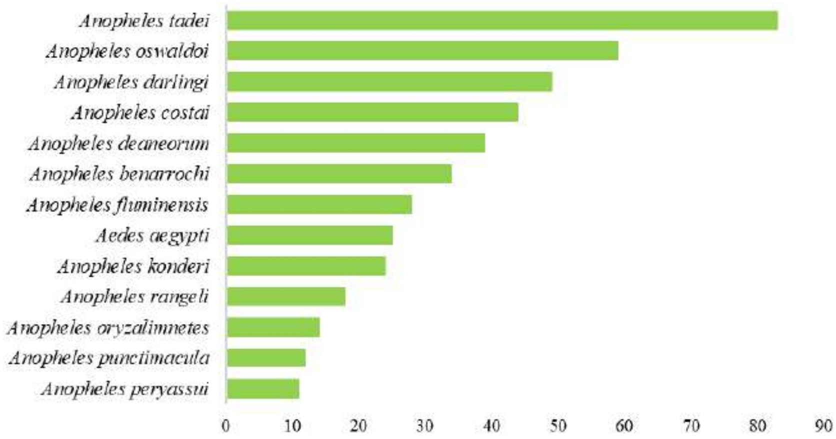
The online databases consulted, in the period of March 2023, were: Latin American and Caribbean Health Sciences Information (LILACS), Scientific Electronic Library Online (SciELO), Database in Medical Biology and Medical Entomology and Medical Literature Analysis and Retrieval System Online (MEDLINE), considering that studies focusing on Medical Entomology are published in a journal with a scope focused on medicine.

After the survey in the databases on dipterans in the state of Acre, a total of 36 species was found, within 8 genera, of these records the species that presented the highest number of occurrences were Anopheles tadei, Anopheles *oswaldoi and Anopheles darlingi*.

Insects belonging to the subfamily Anophelinae are more important in the transmission of parasites of the genus *Plasmodium*, which causes malaria, being one of the endemic species in the Amazon region and important for studies involving insects (Cdc, 2022).

Within the survey of secondary data on the records of species of the Santa Rosa Farm, there was only a single record of *Aedes aegypti.* In this study it could be found studies conducted in the Amazon, this individual has a wide distribution in urban areas, being the vector responsible for the transmission of the dengue virus throughout the territory of Acre, as well as other diseases transmitted by these vectors, such as Zika and Chikungunya (Brasil, 2020).

Figure 112 - Occurrence of Culicidae species in the state of Acre.



The rarefied richness showed that the number of occurrences of dipterans in the state of Acre is insufficient to represent the community of dipteran species, when compared to the area of Fazenda Santa Rosa, because the rarefied curve of genus when compared to the curve of species did not present stabilization when analyzed, as shown by the following figures. In addition, the richness observed for Acre was 36 species and the estimated 59 species, while Shannon diversity observed was 16.50 and 17.52 estimated and Simpson diversity 12.07 and 12.34 the estimated

Figure 113 -b - Sample sufficiency of Genera recorded in the survey of Entomofauna, Fazenda Santa Rosa, Santa Rosa do Purus, Acre, 2023.

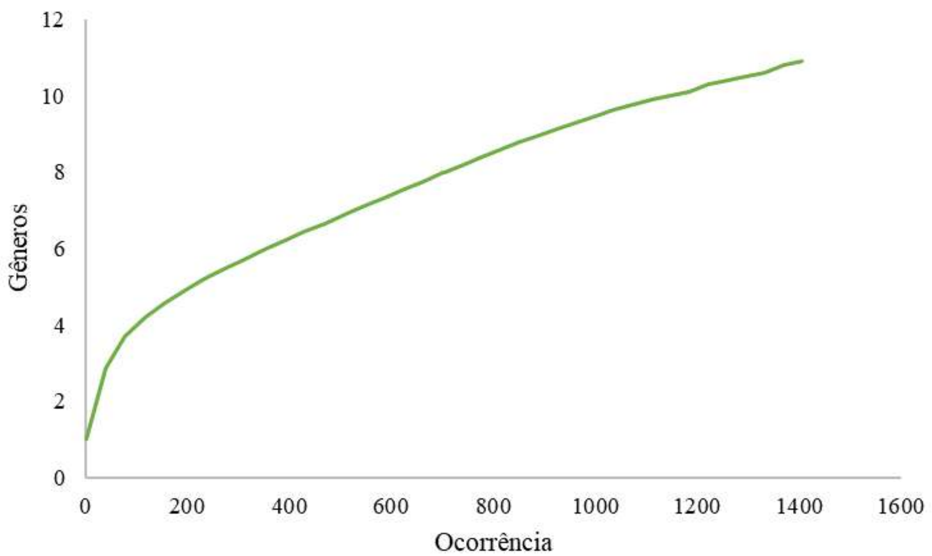


Figure 114 - Sample sufficiency of species recorded in the survey of Entomofauna, Fazenda Santa Rosa, Santa Rosa do Purus, Acre, 2023.

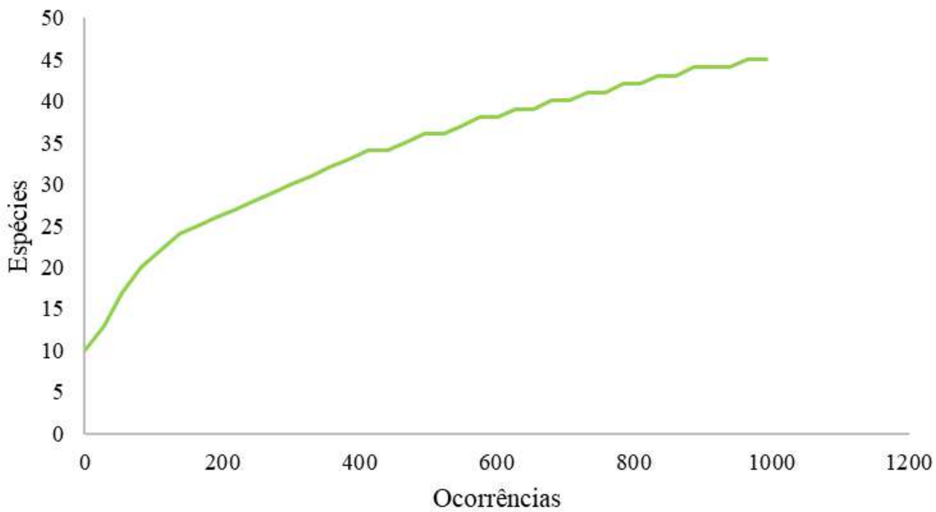


Table 61 - Diversity indices in the entomofauna survey, Fazenda Santa Rosa, Santa Rosa do Purus, Acre, 2023.

Indexes	Observed	Estimated
Species richness	36,00	59,95
Shannon Diversity	16,50	17,52
Diversity of Simpson	12,07	12,34

Source: Self Elaboration

Studies conducted with dipterans throughout the state of Acre are scarce, therefore, the number of species and occurrences of this region are insufficient for the knowledge of the regional pool of these species. Thus, the survey of secondary data did not present sample significance, since there was only one record for the area, which reinforces the need for sampling on the farm using alternative methods to meet the lack of unsampled data.

The study identified that there is not enough data on site to prove the existence of rare species or new records, however, because it is the Amazon, it is stated that studies in these areas can offer a better understanding of the biodiversity of the site.

In Acre, species of the culicidae family have important epidemiological prominence since they can transmit pathogens to humans and literature describes these organisms as potential causes of diseases such as arboviruses and other human health problems in the state.

In addition, it is noted that there are other genera such as *Coquillettidia, Haemagogus, Mansonia, Psorophora and Sabethes* and that are also related to the transmission of etiological agents of various diseases such as encephalitis, wild yellow fever, among other arboviruses, however, for these genera to be better understood, field studies and especially in these areas are essential.

Teles (2015) in his study conducted in the Upper Purus River, region of the state of Acre, noted that the prevalence of cases of Leishmaniasis in some municipalities characterized a great concern for the health authorities of the state, considering that this study identified the correlation between increased fauna of sandfly mosquitoes and considerable cases of Leishmania in isolated regions of urban areas.

Thus, by relating the occurrence of these organisms with the records of diseases that are caused by insects, it becomes clear the understanding that technical studies compromised in scientific investigation are determinant for it to be carefully investigated about the Entomofauna in the Amazon.

Every year, several entomology studies in Acre are carried out and published, however, most of them strive to propose new approaches with a focus on agriculture, since the state of Acre has grown considerably in the agricultural sector forgetting the aspect of the relationship between environment, biodiversity and zoonoses (Mendonça et al., 2003).

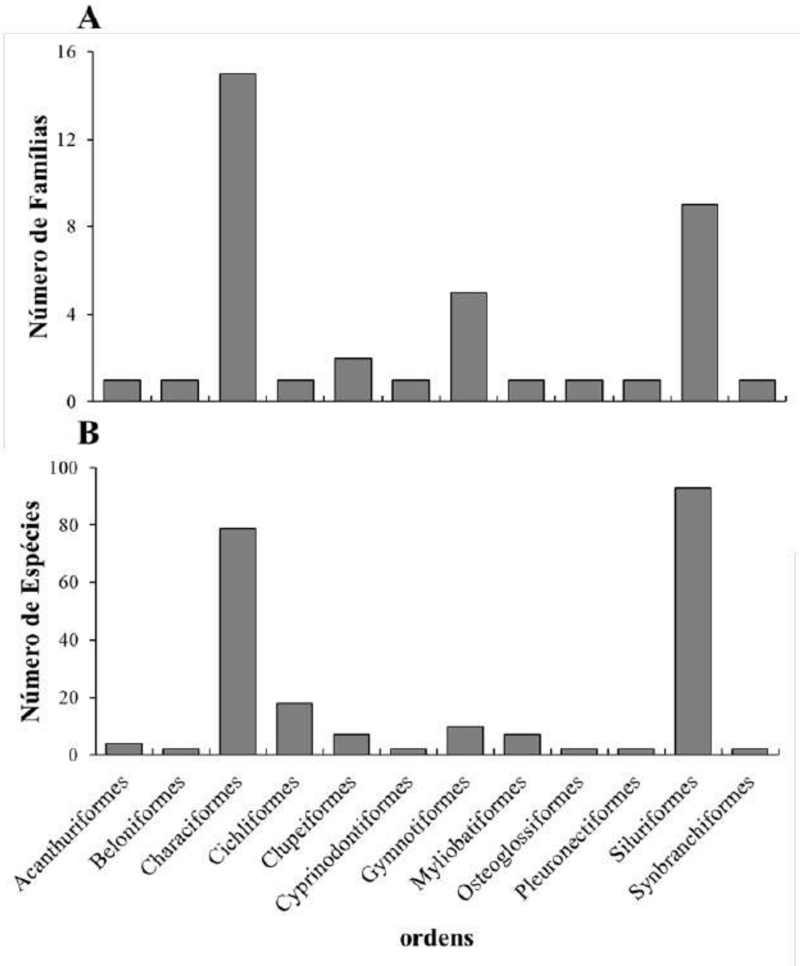
Thus, the need for field or systematic studies reviewed on the Entomofauna in Acre is something latent in our days, because through these studies it is possible to predict and understand the zoonotic potential existing under these biological communities, their damages as causes of problems for human health and the appropriation of data regarding the biodiversity of these organisms in Acre.

5.1.1.5.2 Ichthyofauna

From the quantification of the use of land cover within the buffer of 120km we found that the area surrounding the Santa Rosa farm presents a high percentage of forest cover (94,563%), and a low percentage of pasture (4,836%) and very low percentage of urbanized area, with only 0.020%. In addition, the entire area that corresponds to the limits of the Santa Rosa Farm presents a percentage of 100% of forest, being totally intact.

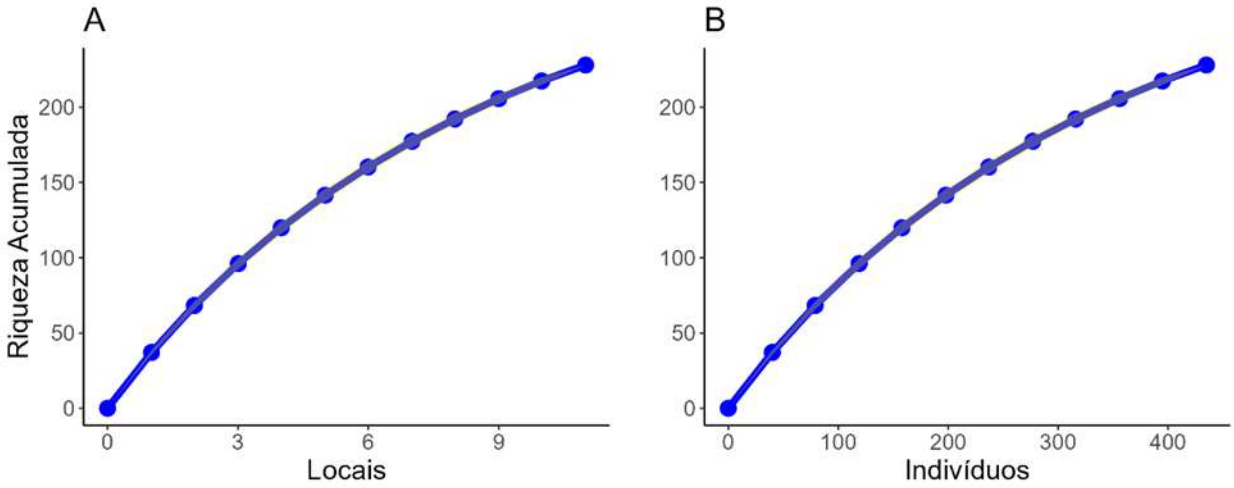
The survey resulted in 435 occurrences, belonging to 228 species, 149 genera, 39 families and distributed in 12 orders of fish. Among the orders, the ones with the highest number of occurrences were Siluriformes with 182 occurrences, followed by Characiformes (n = 154) and Myliobatirformes with 24 occurrences. In relation to the Families, Characiformes presented the highest number (n = 15), followed by siluriformes (n = 9) and Gymnotiformes with 4 families. For species richness, Siluriformes presented a higher number of species with 93, followed by Characiformes (n = 79) and Cichliformes with 18 species. We highlight that for fish the popular names vary by regions, and commonly we can find the same popular name for several different species, we can highlight the Characiformes: piabas, traíra, tambaqui, matrinchã, dourado, curimatá, piranha, peixe-borboleta, piau, peixe-cachorro. Siluriformes: bagre, mandi, cascudos, candiru. Gymnotiformes: sarapó, poraquê. Acanthuriformes: Hake. Belonidae: peixe-agulha. Cichliformes: acará, tucunaré, joaninha. Myliobatiformes: rays. Pleuronectiformes: linguado. We emphasize that popular names of fish vary from locality to locality, in addition a popular name, in its great majority, is used for different species of fish.

Figure 115 - Richness of Ichthyofauna recorded in the survey of Santa Rosa Farm, Santa Rosa do Purus, Acre, 2023. A - Orders, families and occurrences of fish; B - Orders, number of species and occurrences of fish.



The species accumulation curve showed that the number of occurrences is not enough to represent the fish community in the Santa Rosa area, either evaluated by locations (A) or based on the number of individuals, in this case the number of occurrences (B). The non-stabilization of the curve reflects which subsampled the region is, requiring extensive studies in a short period of time to remove the temporal bias that the data may indicate.

Figure 116 - Sampling sufficiency observed during the survey of the ichthyofauna in Santa Rosa Farm, Santa Rosa do Purus, Acre, 2023. A – secondary sampling sites; B – registered wealth.



The diversity analysis indicated that the area of Fazenda Santa Rosa presents a high value of total Shannon Diversity (H' = 5.25), ranging from 0.69 (Grid7) to 4.51 (Grid10). The Pielou Equitable Value ranged from 0.937 (Grid4) to 1.00 at Grid7, Grid8 and Grid9 locations (Table 2). We also observed that the site with the highest richness (Grid10) presented the highest value of Shannon Diversity (H' = 4.51) and Dominance (D = 0.989).

Table 62 - Diversity indices obtained in the survey of the Ichthyofauna at Fazenda Santa Rosa, Santa Rosa do Purus, Acre, 2023

Local	Richness	Simpson	Shannon	Pielou
Grid1	45	0.971	3.675	0.965
Grid2	6	0.816	1.748	0.976
Grid3	14	0.920	2.580	0.977
Grid4	43	0.961	3.523	0.937
Grid5	17	0.920	2.694	0.951
Grid6	52	0.980	3.944	0.998
Grid7	2	0.500	0.693	1.000

Grid8	37	0.973	3.611	1.000
Grid9	49	0.980	3.892	1.000
Grid10	92	0.989	4.510	0.997
Grid11	1	0	0	-

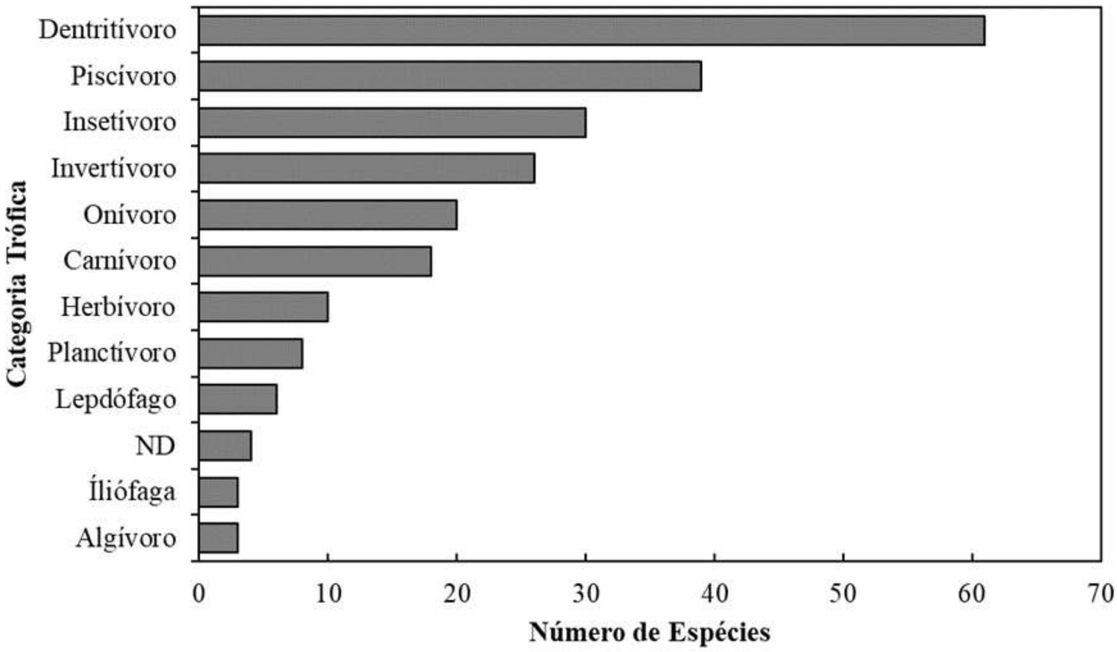
Source: Self Elaboration

We found that this portion of the Amazon that comprises two large basins, Juruá and Purus, presents an enormous diversity of fish, distributed in the most diverse environments, being concentrated mainly in rivers, lakes and streams. This great diversity is represented mainly by the orders of the Characiformes, represented by the lambaris, piabas, curimba, dourado, piranha, Siluriformes, represented by the bagre/mandi and Cichliformes, represented by the acará, joaninha and tucunaré (Reis et al., 2016; Tonella et al., 2022). This pattern found in the region follows that described for the fish fauna of the Neotropical region (Lowe-McConnel, 1999; Reis et al., 2003; Duarte et al., 2010; Reis et al., 2016).

This great diversity found is mainly driven by the *terra firme* streams, which usually has a forest cover that provides allochthonous resources for the maintenance of the ecosystem (Montag et., 2019). The presence of riparian vegetation is critical for the maintenance of aquatic communities (Arantes et al., 2018). However, this community is directly at risk, mainly from conversion to pasture, opening of roads and expansion of cities (Lujan et al., 2013; Arantes et al., 2018). These activities can lead to increases in similarity and decrease in spatial rotation of species, caused by a reduction in structural complexity and habitat diversity, resulting in biotic homogenization (Hewitt et al., 2005; Petsch, 2016). The destruction of the headwaters of the rivers that serve as nurseries for many species, degradation of the riparian forest preventing the entry of allochthonous matter, on which many species are dependent and energy flow between communities throughout the system are the causes of local extinctions that lead to increased similarity between fish communities (Lujan et al., 2013; Haddad et al., 2015; Arantes et al., 2018).

The species were classified into 11 trophic categories, and the most representative category was detritivorous with 61 species and 585 occurrences, followed by Piscivore (n = 39), Insectivorous (n = 30) and Invertivorous with 26 species. For some species it was not possible to classify because they are data not available in the literature, so we classified it as ND – Not Defined.

Figure 117 - Trophic structure of the fish that occur in the surrounding area at Fazenda Santa Rosa.



The trophic structure of fish is an important topic in aquatic ecology, as it is directly related to population dynamics, conservation, and management of fishery resources. The trophic dynamics are essential for the maintenance of communities through interactions, which in current times have been directly affected by habitat destruction. Among the most important habitats for aquatic ecosystems are forests, which are considered a key factor in maintaining local and regional biodiversity. These provide food resources such as insects, which will feed the species dependent on this resource and which will indirectly feed the piscivorous and carnivorous species, maintaining the flow of energy within the chain (Barbosa et al., 2018). Thus, fish play a key role in maintaining trophic structure in aquatic environments and the loss or alteration of this structure can negatively affect the biodiversity and productivity of these ecosystems.

From the verification of the species in the International Union for the Conservation of Nature and Natural Resources - IUCN program, it was found that some species were listed in three categories: LC - Least Concern/Safe or Little Concern with 55 species, NT - Near Threatened/Near Threatened, for the species *Panaque cochliodon* and DD - Data Deficient/Insufficient Data with four species. In addition, only the stingray species *Paratrygon aiereba* was classified as CR - Critically Endangered in the Red Book of Brazilian Fauna Threatened with Extinction of the ICMBio.

The destruction of the natural habitat of the species implies population reduction and in more severe cases in the local and regional extinction, making more worrying species that are endemic. In addition, in the current scenario we already come across species that are threatened, such as the stingray *Paratrygon aiereba* that is listed as Critically Endangered in the Book of Endangered Species of ICMBio. One of the main threats to *P. aiereba* is ornamental fishing, although its capture is illegal in Brazil, countries such as Colombia and Peru are known to export this species to the ornamental fish trade (Araújo et al., 2018). Demographic studies of *P. aiereba* have shown that its population is in rapid decline and may decrease by more than 80% soon (Araújo et al., 2018). Given this, more research and local conservation initiatives are urgently needed not only for this species, but for many that today are considered almost threatened (for example, the cascudo *Panaque cochliodon*) or species considered of little concern.

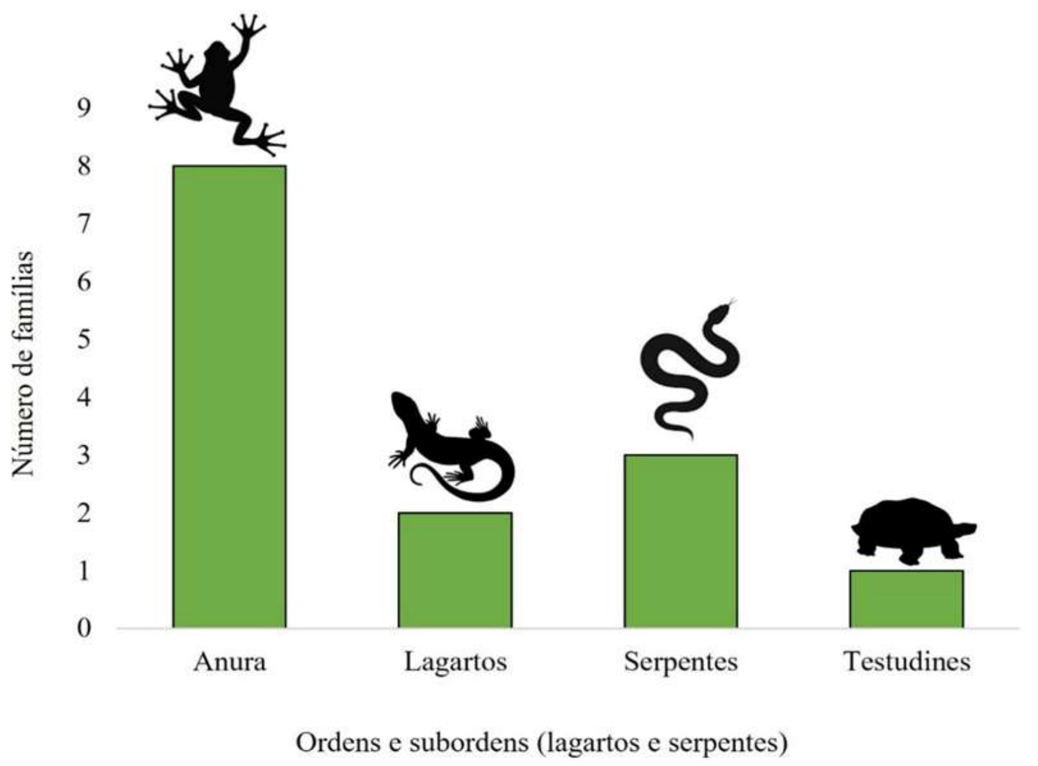
Many of the species found in the Santa Rosa Farm area are used for marketing and subsistence. Species such as mapará (Hypophthalmus edentatus, Hypophthalmus marginatus), Cutimatã (Prochilodus nigricans), filhote (Brachyplatystoma filamentosum), Surubim (Pseudoplatystoma punctifer) and Pacu (Mylossoma duriventre) are species of great economic interest, generating great movement in the local economy. Another interesting factor is that in breeding periods many species such as the mandi (Pimelodus blochii) migrate to the headwaters of rivers to reproduce, in a phenomenon called piracema. This period is considered essential for the maintenance of fish stocks, and fishing is prohibited in this period, except for subsistence and with specific fishing gear, such as fishing rod, ensuring one of the main sources of animal protein (Silva & Prazeres, 2019). Despite being prohibited fishing in this period, many people take advantage of the lack of supervision and carry out fishing in a predatory way, without caring about the future consequences, because the trend is the decrease of fish stocks and even the local extinction of species (Silva & Prazeres, 2019).

5.1.1.5.3 Herpetofauna

A total of 210 amphibian and reptile species were recorded using primary and secondary data. A total of 203 species were recorded for the surroundings of the farm, being 106 species of amphibians (two orders and 13 families) and 97 of reptiles (three orders, three suborders and 26 families. Among the amphibians, the most representative families were Hylidae (42 species), followed by Leptodactylidae (19) and Craugastoridae (11). Regarding reptiles, the most representative families were Dipsadidae (26 species; Snakes), followed by Colubridae (9; Snakes), Dactyloidae (8; Sauria), Gymnophthalmidae (7; Sauria), Teiidae (6; Sauria) and Elapidae (5; Snakes).

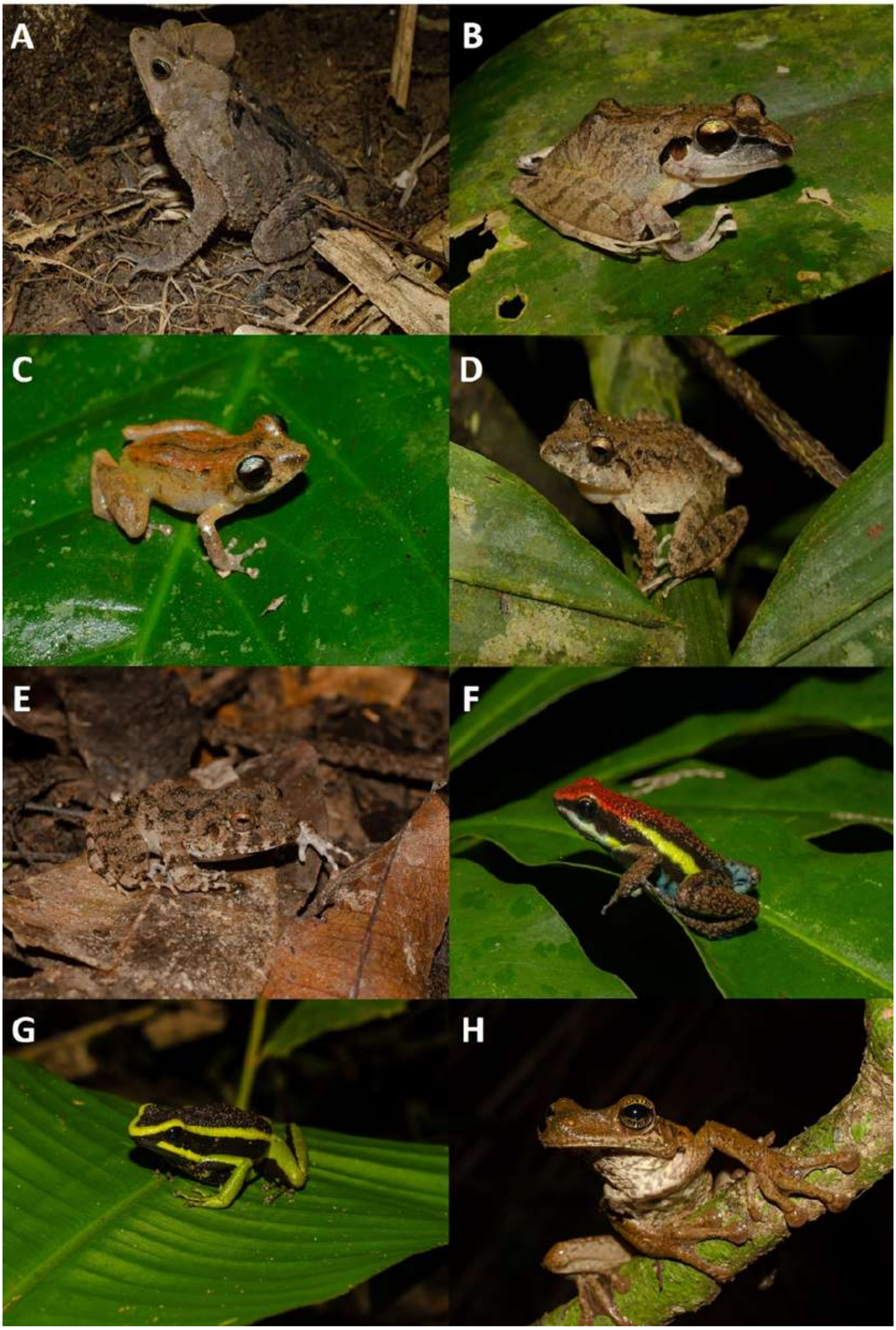
During the survey in the project area, 40 species of amphibians (34 species) and reptiles (6 species) belonging to two orders and two suborders were recorded. The families with the highest amphibian richness were Leptodactylidae and Craugastoridae, both with 9. In relation to the reptiles of the order Squamata, the suborder Serpentes was the most representative, with three families (one species each). The suborder Lagartos, was represented by two families (one species each). A turtle of the family Testudinidae has been recorded.

Figure 118 - Wealth of families of the orders Anura, Squamata (suborders Lizards and Snakes) and Testudines, recorded in the survey of the herpetofauna at Fazenda Santa Rosa, Santa Rosa do Purus, Acre, 2023.



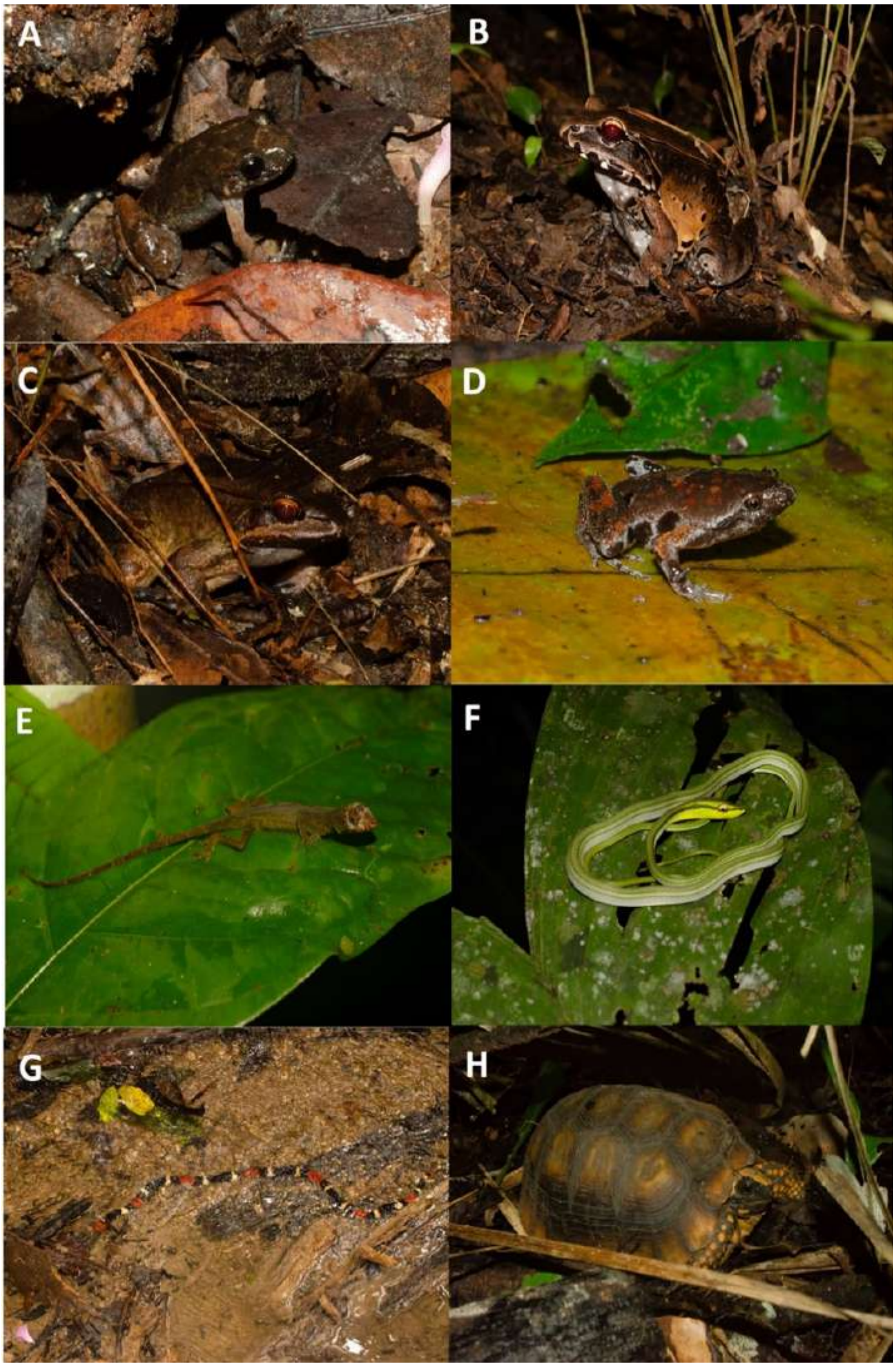
Source: Self Elaboration

Figure 119 - Some amphibian species recorded at Santa Rosa Farm, Santa Rosa do Purus, 2023. A - Rhinella margaritifera; B - Pristimantis conspicillatus; C - Pristimantis delius; D - Pristimantis fenestratus; E - Oreobates quixensis; F - Ameerega macero; G - Ameere



Source: Field Team

Figure 120 - Some species of amphibians and reptiles recorded at Fazenda Santa Rosa, Santa Rosa do Purus, 2023. A - Adenomera andreae; B - Leptodactylus pentadactylus; C - Leptodactylus rhodomystax; D - Chiasmocleis bassleri; E - Norops trachyderma; F - Xenoxybeli



Source: Field Team

The richness recorded around the project area through secondary data represents 67.9% of amphibian species and 62.1% of reptiles that occur in the state of Acre (Fonseca et al., 2022). In the case of the Amazon, the number of species is equivalent to 25.9% of amphibians and 25.1% of reptiles recorded in this biome (Prudente, 2017; Avila-Pires, 2022; Hoogmoed, 2023). The richness recorded in the Santa Rosa farm (in the field) represents 21.7% of amphibians and 3.8% of the reptile species that occur in the state of Acre (Fonseca et al., 2022).

Compared to studies conducted near the farm property, the richness of amphibians registered in the project area is quite representative considering the short sampling period, corresponding to 89.4% of the wealth recorded at Fazenda São Jorge I (Miranda et al., 2014), 70.8% at RESEX do Cazumbá-Iracema (Diógenes, 2019), 40.9% of RESEX Riozinho do Liberdade (Bernarde et al., 2011) and 33.3% of PES Chandless (Silva, 2015). In relation to reptiles, richness is relatively low, corresponding to 21.4% of the wealth recorded at Fazenda São Jorge I (Miranda et al., 2014), 7.5% of RESEX Riozinho do Liberdade (Bernarde et al., 2011) and 6.7% of PES Chandless (Silva, 2015).

Figure 121 - Comparative graph of the lists of species of Amphibians and Reptiles recorded in studies near Fazenda Santa Rosa, Santa Rosa do Purus, Acre

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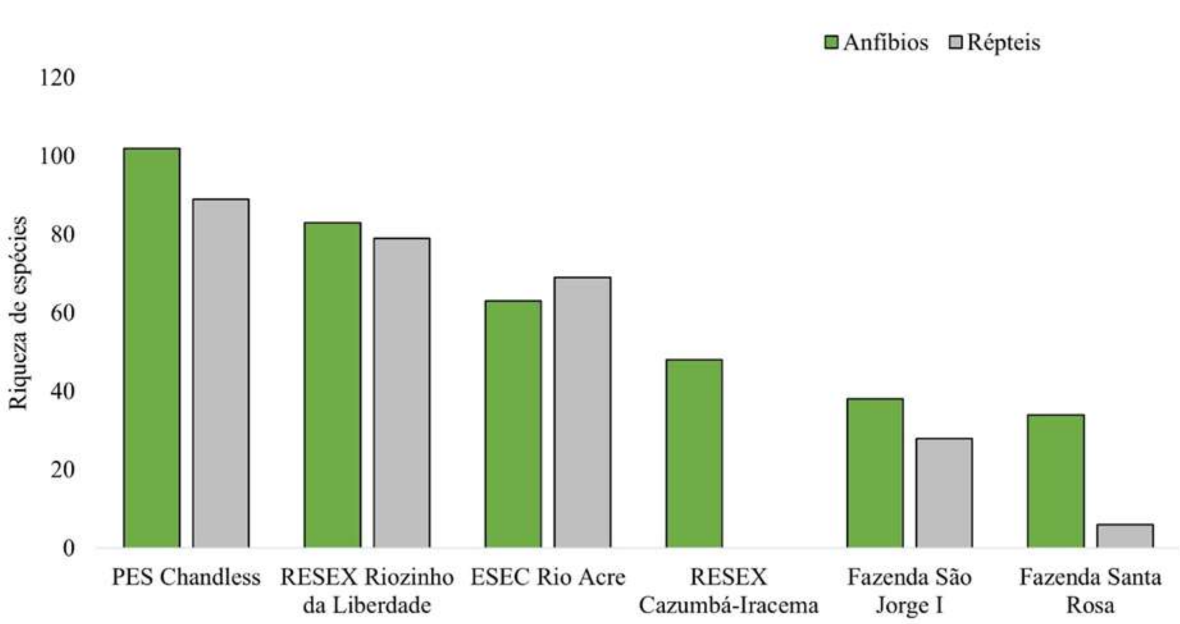
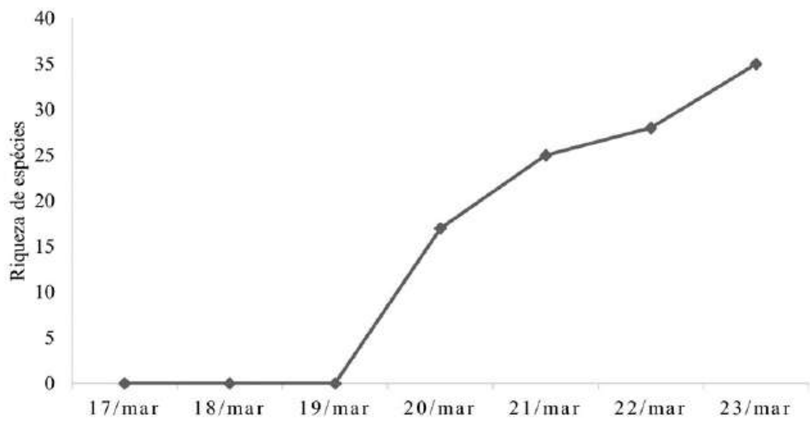


Source: Self Elaboration

Thirty-five species of amphibians and reptiles were found in the area of the Santa Rosa farm through the Time Limited Search method. To confirm whether the effort employed during the monitoring of the herpetofauna was sufficient to record the species in the study area, species accumulation curves were performed as a function of the sampling days. The species accumulation curve did not estimate a stabilization trend in an asymntote and, based on the number of species recorded, the Jackknife 1 estimator estimated the possibility of 26 more species being recorded, indicating the need for a greater sampling effort in the area.

Figure 122 - Accumulation curve of species recorded during the survey of Herpetofauna at Fazenda Santa Rosa, Santa Rosa do Purus, Acre, 2023.



Source: Self Elaboration

The richness (S = 35) and abundance (N = 134) of species recorded in the study area by the PLT method can be considered high even with the low sampling effort employed. In the Shannon-Weiner diversity analysis (H'), the results obtained demonstrate that the area has a high species richness. These values of wealth and abundance may be associated with the degree of preservation of the project area.

Table 63 – Diversity indices of the Herpetofauna survey at Fazenda Santa Rosa, Santa Rosa do Purus, Acre, 2023.

Abundance (N)	Richness (S)	Shannon-Wiener (H’)	Equitable Capacity of Pielou €	Dominance (K)
35	134	3.22	0.90	0.13

Source: Self Elaboration

According to the Red Book of Endangered Fauna (ICMBio, 2018) no species recorded through the collection of primary and secondary data fall under any degree of threat of extinction. Many species of amphibians and reptiles can be considered rare, for example, the snake Trilepida macrolepis (Nogueira et al., 2019) and the lizards, Exila nigropalmata and Stenocercus roseiventris (Ribeiro Jr & Amaral, 2016). In addition to these, the true coral Leptomicrurus narduccii is relatively rare in Brazil, with only a single record for the country, in Santa Rosa do Purus (Hoge & Romano, 1965; Nogueira et al., 2019).

Of the 210 species recorded only one species is known only for the state of Acre, the amphibian Allobates subfolionidificans. The amphibians Teratohyla midas and Allobates velocicantus were known only for the Alto Juruá region, in the state of Acre (Melo-Sampaio & Souza, 2015; Souza et al., 2020) and the species Adenomera simonstuarti known only for the municipality of Tarauacá (Carvalho et al., 2020). The records of these species for the farm area are the first for the Alto Purus region. No invasive species were recorded for the region of the project zone.

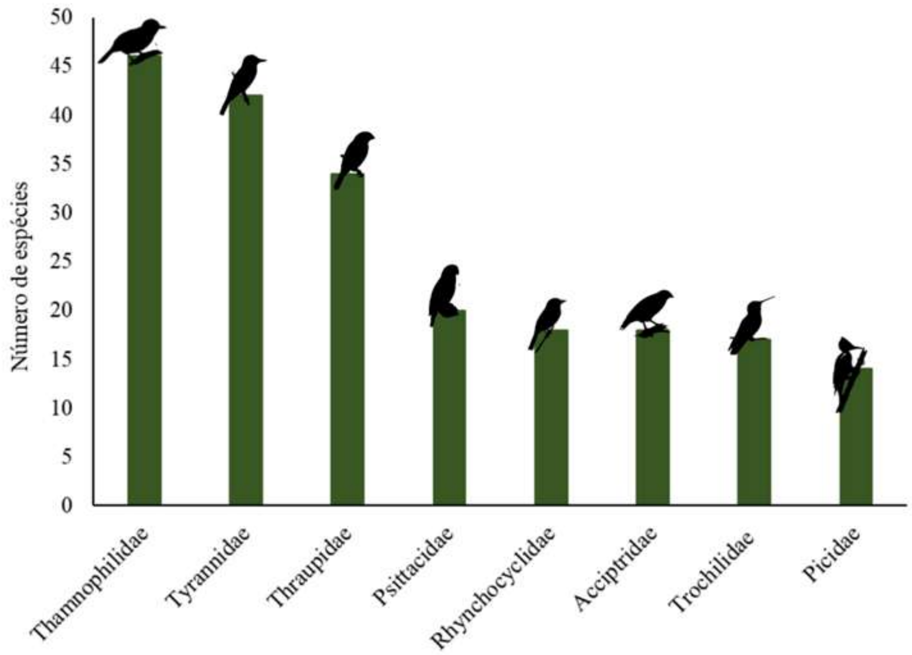
Some species of amphibians and reptiles recorded are used as food items by some indigenous peoples in the Amazon, for example, the amphibians *Boana boans* and *Leptodactylus pentadactylus* (Souza, 2009). Regarding reptiles, two species of alligators, *Caiman crocodilus* and *Paleosuchus trigonatus*, are hunted for subsistence in many areas along their geographic distribution, (Campos et al., 2013; Farias et al., 2013). Two species of turtles (*Chelonoidis denticulatus* and *Podocnemis unifilis*) are also hunted for subsistence by traditional populations.

The snakes of the family Elapidae (True Corals) and Viperidae (Jararaca, Papagaia, Surucucu-pico-de-jaca, Surucucu) recorded by primary and secondary data present medical importance for presenting the ability to inoculate venom in humans (Bernarde, 2014). These animals are bioindicators of environmental quality, since some species are recorded only in well-preserved terra firme forest environments and some have arboreal habits, for example, the species *Bothrops bilineatus smaragdinus*) (Bernarde, 2012).

5.1.1.5.4 Avifauna

A total of 483 bird species belonging to 70 families and 25 taxonomic orders were recorded, totalling 4,540 specimens. A total of 398 species were recorded in the secondary data collection methodology and 85 species during the active field search. Of the total number of species recorded, 236 species belong to the non-passerine taxa and 294 species belong to the order Passeriformes. Among the non-passerines, the families with the highest number of species. Were Psittacidae (20 species), Acciptridae (18 species), Trochilidae (17 species) and Picidae (14 species); for the Passeriformes, the most representative families (Figure 16) were, Tyrannidae (42 species), Thraupidae (34 species) and Rhynchocyclidae (18 species).

Figure 123 - Representativeness of the species richness of the Family taxon recorded in the survey of avifauna, Fazenda Santa Rosa, Santa Rosa do Purus, Acre, 2023.



Source: Self Elaboration

In this survey, the List Frequency Index (LF) was calculated, which discloses the relative abundance of each species as a function of the conspicuity coefficient, through the number of eye and/or auditory contact and the total number of samples (Blondel et al., 1970). In this study, the number of contacts was obtained for each species registered at the Santa Rosa property and divided by the total number of lists (18) in the period of the field avifauna survey. The values of List Frequency Index (Table 4) there are variations from 0.05 (1 contact) to 0.33 (6 contacts), with an average of 0.19, that is, approximately 3 contacts/species. What was observed is that 63% of the species are abundant in the area, that is, more generalists and a greater number of registered individuals, and the species with the lowest number of contacts (37%) are inserted in categories of discrete and/or inconspicuous ones, of difficult audiovisual contact.

Table 64 - Frequency of contacts with bird species through the List Frequency Index using the Mackinnon list methodology in the survey of avifauna, Fazenda Santa Rosa, Santa Rosa do Purus, Acre, 2023.

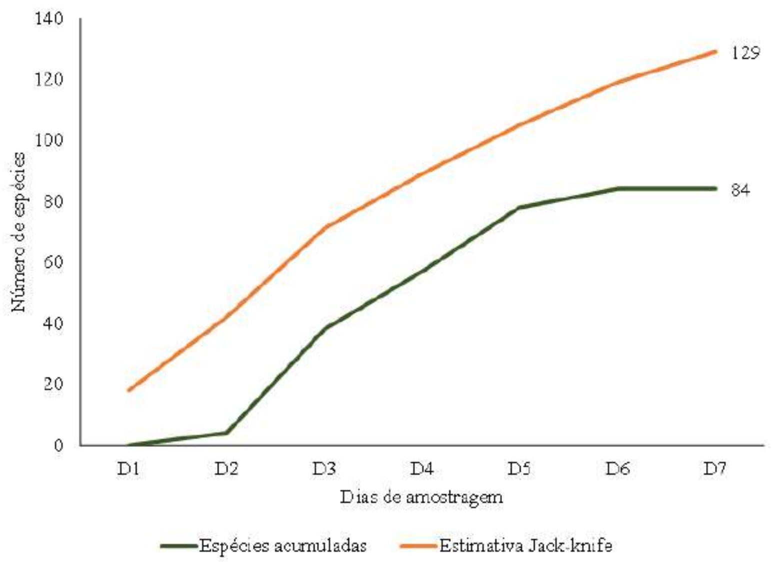
Contacts	Average	Number of species per contact
1 to 2	0,05-0,11	65

3 to 4	0,16-0,22	17
5 to 6	0,27-0,33	3

Source: Self Elaboration

The sample sufficiency in the species accumulation curve at Fazenda Santa Rosa presented the following information: the actual number observed was 85 species and the non-parametric richness estimator presented a higher value than that observed in the field (Jack-knife 1 = 129 species;. The real wealth observed did not reach levels of stability, mainly due to the number of days of sampling in the field and inclement weather. It is worth mentioning that in tropical regions it is not common to achieve stability in the cumulative curve of species (Santos, 2006), because it depends on the sampling effort employed and longer sampling days in the field.

Figure 124 - Sample sufficiency observed in the survey of avifauna, Fazenda Santa Rosa, Santa Rosa do Purus, Acre, 2023.



Source: Self Elaboration

In the Shannon-Wiener diversity analysis (H'), the results showed that the area has a richness of bird species, despite regional climatic instability and access in some places of the property affected the collection of information during sampling. These values of richness and abundance of birds in the area and surroundings can be answered by the preservation of native vegetation on the Santa Rosa property. It is worth mentioning that the region has been suffering anthropic pressures of high negative impact, such as the proposal to build an intermunicipal road in addition to the illegal deforestation of areas of preserved vegetation for the breeding and sale of large animals.

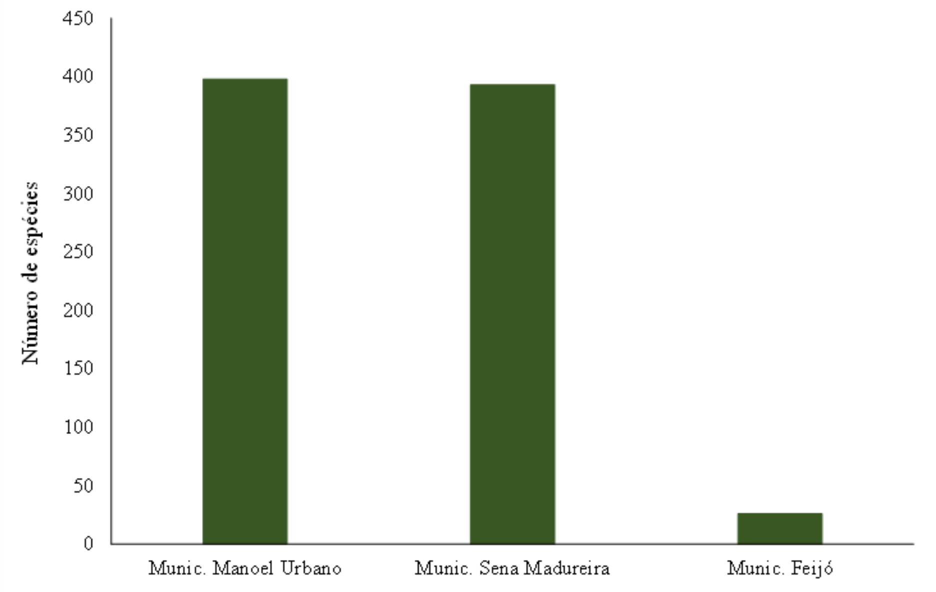
Table 65 – Diversity indices in the survey of avifauna, Fazenda Santa Rosa, Santa Rosa do Purus, Acre, 2023.

Diversity indices				
Abundance	**Richness**	**Shannon-Wiener (H')**	**Equitable Capacity of Pielou €**	**Dominance (K)**
156	85	4,26	0,96	0,01

Source: Self Elaboration

In total numbers on the survey of available scientific information and in the field about the avifauna in the area and surroundings of the Santa Rosa Farm, it represents 68.2% of the species recorded for the state of Acre. The secondary data information acquired in the GBIF platform showed that 398 species of birds were registered for the municipality of Manoel Urbano, in which these occurred in the Chandless State Park; 393 species in the territory of Sena Madureira, Acre, punctually in the Cazumbá-Iracema Extractive Reserve and 26 species of birds in the municipality of Feijó, Acre. These results are from people who practice *birdwatchig*, that is, people who observe wild birds in these regions in which they provide the data of the records in national and/or international citizen science platforms, such as the eBird wildlife information application.

Figure 125 - Representativeness of bird species richness among areas that were carried out secondary data collection in the western region of the state of Acre.

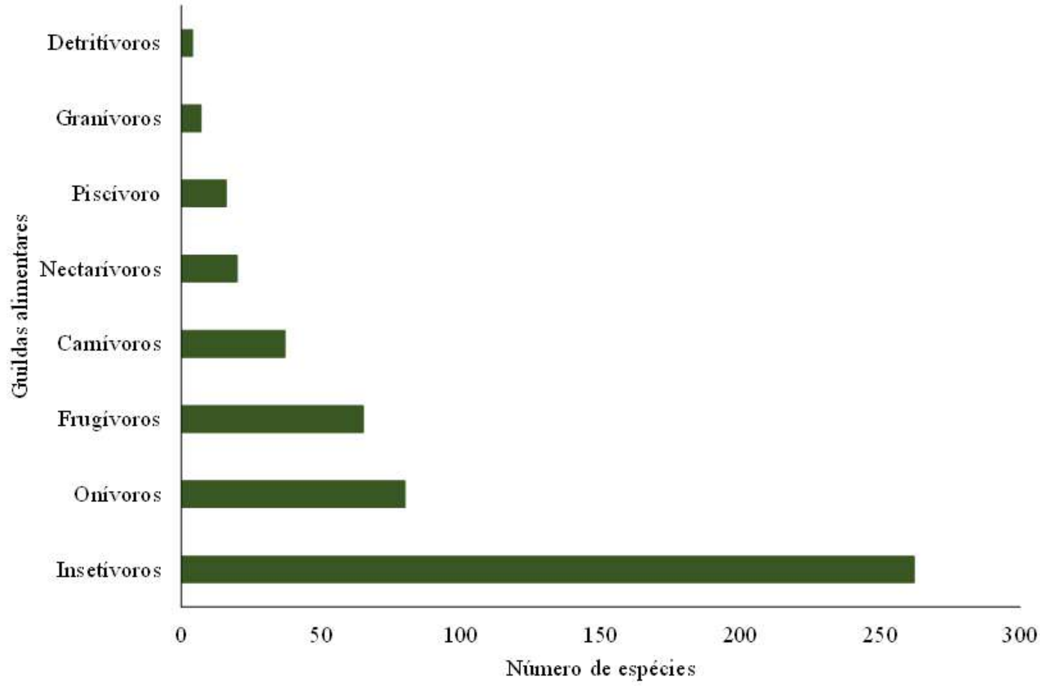


Source: Self Elaboration

The bird species recorded in this field survey and secondary data were classified into the following food guilds: insectivores (n= 262 species), omnivores (n = 80 species), frugivores (n= 65 species), carnivores (n= 37 species), nectarivores (n= 20 species), piscivorous (16 species), granivores (n= 7 species) and dentritivores (n= 4 species).

The food guilds recorded in the surroundings and in the field are typical species of open environments, primary forest and forest edges. The vegetation of the study area is composed of primary forest and areas in advanced stage of regeneration, both with characteristics of ombrophilous forest open with bamboo, and a characteristic of this habitat is the presence of birds specialized to this vegetation, usually the taminophilids (chocas and the like) that, in large majority are inserted in the insectivore food guilds. The habitats dominated by bamboo of the genus *Guadua* have biotic and abiotic conditions favorable for the arrival and permanence of several species of insects that use the micro-habitat as the stems and internodes for reproduction, therefore, creating conditions with greater availability of food resources, benefiting the species of birds that have intimate association with these habitats. Insectivorous species are experts and abundant in forests and more open areas by having an improved field of view, allowing efficiency to forage by insects and other invertebrates (Terraube et al., 2016). The species included in the frugivorous and omnivorous food guilds are more resilient to generalist habitats (Guilherme & Cintra, 2001; Henriques et al., 2008), and adapted to look for food available for a limited time, such as trees with fruits and seeds (Alencar & Guilherme, 2020).

Figure 126 – Food guilds of the species recorded in the survey of avifauna, Fazenda Santa Rosa, Santa Rosa do Purus, Acre, 2023.



Source: Self Elaboration

In this survey, two databases were used to classify the conservation status of bird species: the Chico Mendes Institute for Biodiversity Conservation (ICMBio) and the International Union for Conservation of Nature (IUCN). Most of the recorded species have a conservation status of 'least concern' – ICMBio: 480 species; IUCN: 477 species; highlighted in the categories; 'near threatened' are the species Syndactyla ucayalae and Sarcoramphus papa; in the 'vulnerable category', the species Pionites leucogaster and Primolius couloni.

Table 66 - Avifauna species included in endangered categories recorded in the avifauna survey in the area of Santa Rosa Farm, Santa Rosa do Purus, Acre, 2023.

Subtitles: ICMBio = Chico Mendes Institute for Biodiversity Conservation; IUCN = International Union for Conservation of Nature; VU – vulnerable; NT – almost threatened.

Species	Popular name	ICMBio	IUCN

Tinamus so	azulona	VU	VU
Tinamus guttatus	inhambu-galinha	-	NT
Crypturellus strigulosus	inhambu-relógio	NT	-
Psophia leucoptera	jacamim-de-costas-brancas	-	NT
Pygochelidon melanoleuca	andorinha-de-coleira	NT	-
Sarcoramphus papa	urubu-rei	NT	-
Harpyja Harpy	gavião-real	VU	VU
Spizaetus ornatus	gavião-de-penacho	NT	NT
Ibycter americanus	cancão	NT	-
Celeus torquatus	pica-pau-de-coleira	-	NT
Ara chloropterus	arara-vermelha	NT	-
Pionites leucogaster	marianinha-de-cabeça-amarela	-	VU
Primolius couloni	maracanã-de-cabeça-azul	-	VU
Syndactyla ucayalae	limpa-folha-de-bico-virado	-	NT

Source: Self Elaboration

The results showed that, approximately, 67% of the species recorded in this survey of avifauna are not categorized as threatened, however, there are species that inhabit the region that is in a worrying category of 'almost threatened', such as the limpa-folha-de-bico-virado (*Syndactyla ucayalae*). In Acre, the species is associated with the habitats with a predominance of bamboo of the genus *Guadua*, and due to the peculiarity of its inconspicuity, although the vocalization is easily identified, it is considered rare and/or uncommon. According to information extracted from citizen science platforms, the number of visual/photographic records is limited: 12 records for the state of Acre. The size of the global population is certainly small because of the irregular distribution of its habitat. Information on the abundance of the species' population is unknown (Remsen, 2020). In the Manu National Park in Peru, there are indications that the population of the species is limited to 2000 couples. The construction of roads and opening of open areas for settlements and pastures is one of the threats to conservation of the species (Remsen, 2020).

The Amazon is one of the biomes that houses one of the highest levels of endemism, and consequently, one of the largest in relation to the number of bird species in the country (Sick, 1997; Marini & Garcia, 2005) and the geographical distribution of birds recorded in Brazil is irregular, with some species classified as rare, unusual or punctually distributed. Regarding the rare species, during the survey of secondary information and field data, the gavião-real (*Harpia harpyja*), the gavião-vaqueiro (*Leucopternis kuhli*) and the tovacuçu-xodó (*Grallaria eludens*) were recorded.

Of the bird species, 23 are restricted to the Inambari endemism center, in particular: the formigueiro-de-goeldi (*Akletos goeldii*), the cantado-galego (*Hypocnemis subflava*), the xodó tovacuçu (*Grallaria eludens*), the barranqueiro-ferrugem-do-acre (*Clibanornis watkinsorum*) and the ferreirinho-de-cara-branca (*Poecilotriccus albifacies*). This number of endemic species from the region of the project area covers the total value of endemisms of the southwest of the Amazon (Guilherme, 2016), showing, the high value of positive impact that the region has in relation to the diversity of birds and the conservation of fauna in general.

Regarding the birds associated and/or specialists to the habitats dominated by bamboo of the genus *Guadua* in the southwest of the Amazon, 21 species were recorded, with emphasis on the maria-topetuda (*Lophotriccus eulophotes*), the barranqueiro-de-topete (*Anabazenops dorsalis*), the pica-pau-lindo (*Celeus spectabilis*) and the choquinha-ornada (*Epinecrophylla ornata*). These species are associated with bamboo-dominated habitats of the genus *Guadua* (Guilherme, 2016), regionally known as the 'tabocais'.

Twenty-five migratory species were recorded, of these, nine are nearctic migrants (MN), moving from the Northern Hemisphere to the Neotropical region, such as the suiriri-valente (Tyrannus tyrannus) and the maçarico-de-perna-amarela (*Tringa flavipes*); 11 species are southern migrants (MA), originating in the south of the South American continent: the tesourinha (*Tyrannus savannah*) and the príncipe (*Pyrocephalus rubinus*); and five species are intratropical migrants (IM) that perform regional migration, that is, in the interior of the American continent, especially the gavião-tesoura (*Elanoides forficatus*) and the estrela-do-norte (*Sporophila bouvronides*). These species migrate from the region of origin to the Amazon due to changes in the climatic season, and the territory of Acre is an important route for their wintering season, as these birds use forest areas as a place of refuge, search for food resources, rest, nesting and, consequently, permanence of small populations in the region.

During field sampling of the avifauna at Fazenda Santa Rosa, the cabeça-branca species (*Pseudopipra pipra*/; In the state of Acre, this species is restricted to the center and extreme west of the state, that is, a large area of the left bank of the Purus River (Guilherme, 2016). Some large rivers, in a certain way, act in the delimitation of the distribution of some species in the southwest of the Amazon. The extent of floodplain forests is a limiting factor in the distribution of some species of terra firme birds. Therefore, some species have a distribution limited to some localities of the state and are present on one of the banks of the Purus or Juruá. The cabeça-branca (*P. pipra*) inhabit campinaranas (Guilherme, 2016), forests in high relief (Sick, 1997) and open forests with palm trees (Guilherme, 2016) and these characteristics of the last types of vegetation cited corroborates with what observed in the Santa Rosa property. The species is not included in categories of threats to extinction and despite the wide range of the estimated population of 4,950,000 km², the predicted levels on climate change can have a catastrophic effect on the habitat and range of this species and may cause great impact on the conservation of this species (Kirwan et al., 2021). It is worth mentioning that the region of the property is of high priority for conservation projects because it is inserted in an area of 'knowledge gap' of science and biodiversity of the state, because the information of the surroundings and radius of action are, exclusively, of fauna surveys in UCs that are relatively distant from the property.

Figure 127 - Species of bird of new record for the region recorded in the survey of avifauna, Santa Rosa Farm, Santa Rosa do Purus, Acre, 2023. In the photo, a cabeça branca specimen (Pseudopipra pipra).

Source: Field Team

Hunting animals are those species that are usually hunted by riverine and/or isolated communities in the Amazon for the consumption of animal protein. We recorded 40 species considered hunting (Appendix 6), with emphasis on the taxonomic families with the highest number of records: Tinamidae (n = 12 species), with emphasis on the inhambu-relógio species (*Crypturellus strigulosus*); Cracidae (n = 3 species) represented by the jacu-de-spix (*Penelope jacquacu*;) Psittacity (n = 7 species), for example, the maracanã-guaçu (*Ara severus*) and Ramphastidae (n = 2 species) as the tucano-de-papo-branco (*Ramphastos tucanus*).

Figure 128 - Species of game birds recorded in the avifauna survey, Santa Rosa Farm, Santa Rosa do Purus, Acre, 2023. A – Jacu-de-Spix (Penelope jacquacu); B - tucano-de-papo-branco (Ramphastos tucanus).

Source: Field team

In this survey, species of economic and hunting interest were recorded, such as the species of the families Cracidade and Tinamidae. It is worth mentioning that the representatives of parrots (macaws and the like), ramphastidae (toucans and the like) and among others have hunting value and the meat of these birds causes an intense pressure resulting from predatory hunting or subsistence. All game bird species sensitive to environmental changes and hunting, therefore, are groups of wild animals important bioindicators of environmental quality and consequently, and the most threatened with extinction in South America.

Wild birds have rapid responses to habitat changes at various scales (Sick, 1997). Some bird species are considered more sensitive than other species (Stotz et al., 1996), and those with high sensitivity are considered and recommended as good indicators of environmental quality (Gardner et al., 2008). The area has several species of birds that are considered as bioindicators of environmental quality, highlighted: the inhambu-anhangaí (*Crypturellus bartletti*), the capitão-de-colar-amarelo (*Eubucco tucinkae*), periquito-da-amazônia (*Nannopsittaca dachilleae*), the choca-do-bambu (*Cymbilaimus* *sanctaemariae*) and the caneleiro-de-cara-amarela (*Pachyramphus xanthogenys*) and among other species that need preserved habitats and are sensitive to intense environmental changes.

During the collection of secondary data, there are some invasive species recorded in the range of action in the project, such as the quero-quero (*Vanellus chilensis*), the burrowing owl (*Athene cunicularia*) and the gavião-de-rabo-branco (*Geranoaetus albicaudatus*). However, it is worth mentioning that none of these invasive species were recorded inside the Santa Rosa property and within a radius of 10 km², proving that the area of the property is highly conserved, protecting the local fauna and flora.

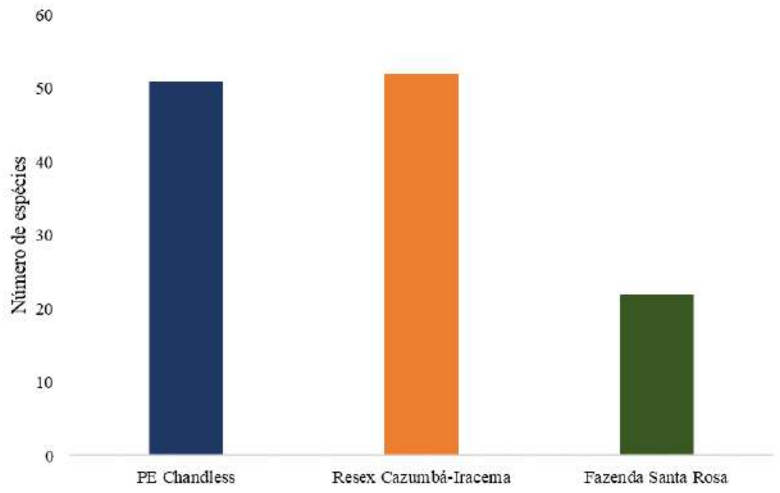
These species arrived in the region of the project's radius of action due to the deforestation of the native vegetation cover for the formation of open environments (for example, pastures), because these birds are adapted to these habitats. Although these species do not compete and interfere in the permanence of native birds, invasive species are indications of environmental imbalance due to intense anthropic actions in the environment. To contain the arrival of new invasive species, the suggestion is to carry out environmental education in the region, guiding to reduce deforestation and other anthropic actions, such as illegal opening of roads and forest fires.

5.1.1.5.5 Mastofauna

Based on the survey of secondary data, in bibliographic databases and databases on online biodiversity, 36 species of mammals were recorded, taxonomically divided between six orders and 19 families. The most representative orders in relation to richness (S) considering secondary records were Primates (S=15) and Rodentia (S=13). The broad representativeness of the primate group is a pattern already documented for the southwestern Amazon region (Borges et al., 2015; Oliveira & Calouro, 2020).

Despite the absence of a single list that portrays the mammal fauna of Acre, we consider as a comparative basis the list of mammal species of the Chandless State Park, a conservation unit of integral protection, located in the municipality of Manoel Urbano, Acre. The UC is the only reference closest to Fazenda Santa Rosa with robust and published data. In PE Chandless, 51 species of medium and large mammals are recorded (Borges et al., 2015), recorded through a strong sampling effort with the most diverse methods. The area of Faz. Stª Rosa, considering only the secondary data, presents 70% of the mammal species recorded in PE Chandless. These estimates can be exceeded by compiling field data and increasing field sampling. The RESEX of Cazumbá Iracema presents the same estimates as PE Chandless, with 52 mammal species recorded. The data indicate that the area of Faz. Stª Rosa has a high richness of mammal species in its territory.

Figure 129 - Species richness of mammals for the Santa Rosa farm from secondary data. Comparative evaluation with the nearest Conservation Units and with lists of published species.



Source: Self Elaboration

The source of the secondary records was in its part originated from records of biodiversity platforms such as *inaturalist*, and data from the Economic-Ecological Zoning of the state of Acre, which estimates the richness of 203 species of mammals. The fauna of Fazenda Santa Rosa represents 17% of this estimate, however, the EEZ data (Acre, 2010), refer to the entire state of Acre, including species from distinct watersheds.

The surroundings of the property are composed of native Amazon forest, preserved by Conservation Units (CUs) of Federal management, such as, to the southwest the National Forest (FLONA) Santa Rosa do Purus and to the east the Extractive Reserve (RESEX) Cazumbá-Iracema; and State management, to the southeast, the State Chandless State Park, and near the Indigenous Lands (TIs). Forming a large block of conservation units in southern Acre, and protected areas in Peru, protecting an extremely diverse region in terms of biological diversity (Borges et al., 2015). What makes the region where Faz is located. St. Rosa an Important Area for the Preservation of Fauna in which it covers several municipalities of the Tarauacá/Envira - Purus interfluvium, in the state of Acre.

In all, 10 field days were spent, considering the displacement of the technical team from Rio Branco-Acre, to the municipality of Feijó-Acre, in which the team made a displacement by river, towards the upstream of the Envira River. Seven days of in situ field sampling were performed to record mammals in the area. A total of 22 mammal species were recorded. The most representative orders in relation to richness (S) considering secondary records were Primates (S=9) and Rodentia (S=6). In the study area it was common to find numerous traces of mammals, such as: tracks, burrows, feces, markings among others (A) and presence of primates (B).

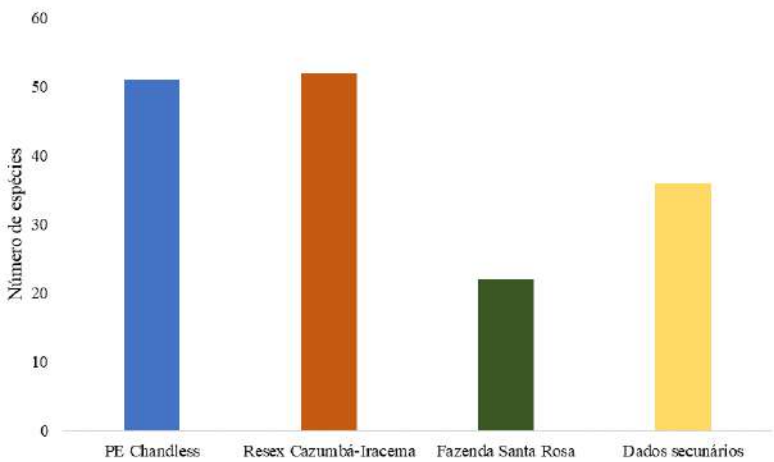
Figure 130 - Traces and presence of mammals in the area of Santa Rosa Farm, Santa Rosa do Purus, 2023. A – Paca-de-rabo burrow (Dinomys branickii); B – Macaco preto (Ateles chamek). Photos: A – Tallyson Cavalcante; B – Luana Alencar.

Source: Self Elaboration

The most abundant species were Macaco Preto (*Ateles chamek*, n=12), Guariba monkey (*Alouatta puruensis*, n=10) and the deer (*Mazama americana*, n=8). The three most abundant species are species considered hunting of high economic value. In addition to being important dispersers and predators of seeds, contributing to the reproductive success of flora species and consequently to the local carbon stock (Bello et al., 2015; Culot et al., 2017).

In just seven days, 61% of all species predicted to occur in the area were recorded considering the secondary data (36 species), 43% of the species recorded in the Chandless State Park (Borges et al., 2015). The species richness recorded only in this campaign is quite representative for the region in which the enterprise is inserted.

Figure 131 - Comparative graph of the lists of mammal species in different localities in the Upper Purus River region.



Source: Self Elaboration

During the sampling of the field data survey, 22 species of small, medium and large mammals were recorded, belonging to 16 Families and 6 Orders. This number is significant if only the seven days of sampling are considered. The species most sighted in abundance (N) during the sense were Macaco Preto (*Ateles chamek*, n=12), Monkey Guariba (*Alouatta puruensis*, n=10), the presence of these two large species, *Ateles chamek* and *Alouatta puruensis*, reflects the degree of conservation of this unit, since both have a low reproductive rate and are quite targeted by hunters in the Amazon, being susceptible to local extinction in areas under heavy hunting pressure (Peres, 2000).

Table 67 - Diversity indices in the survey of avifauna, Fazenda Santa Rosa, Santa Rosa do Purus, Acre, 2023.

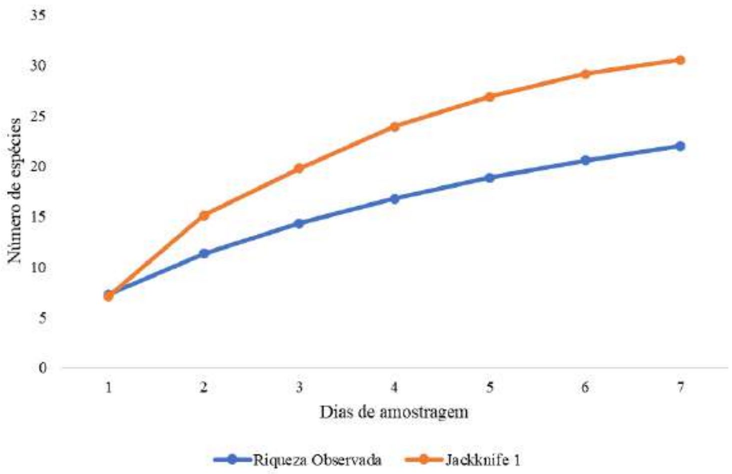
	Primary	**Secondary**
Richness (S)	22	36
Abundance (N)	74	61
Dominance (K)	0,1622	0,0330
Shannon-Wiener diversity (H')	2,694	3,463
Equitable Pielou (J)	0,8714	0,982

Source: Self Elaboration

According to the hypothesis proposed by MacArthur & MacArthur in 1961, habitat complexity can have a significant influence on the diversity of animal species. This hypothesis suggests that the presence and abundance of species are strongly affected by the structural components of vegetation present in the habitat. In other words, habitat heterogeneity, in relation to niche distribution, can increase the availability of resources for different species, which in turn can result in greater diversity of species at the site. This implies that the conservation of biological diversity must consider the importance of habitat complexity for wildlife maintenance.

When we used the Jackknife 1 richness estimator, we noticed that, by increasing the effort in the field, the estimate of the richness of mammalian species in the Santa Rosa Property reaches 31. The species record curve does not show any sign of reaching an asymptote, that is, it has not yet achieved stability. This indicates that by increasing sampling, more species are expected to be recorded.

Figure 132 - Sample sufficiency observed in the mastofauna survey, Santa Rosa Farm, Santa Rosa do Purus, Acre, 2023.



Source: Self Elaboration

We highlight here the relevance of the record of species that have high habitat requirements for their survival, as well as species threatened with extinction, rare or restricted distribution. During the research, it was possible to register the presence of eight species that are classified as threatened with extinction, according to the criteria established by the Red List of the International Union for Conservation of Nature (IUCN). Listed as Almost Threatened (NT) and Vulnerable (VU) are the jaguar (*Panthera onca*), the Peccary (*Tayassu pecari*), Armadillo Canastra (*Priodontes maximus*), the Anta (*Tapirus terrestris*) o and the tail-tailed paca (*Dinomys branickii*), both are species sensitive to anthropic changes, and hunting pressure, in addition to Tatu Canastra and Anta occur naturally at low densities (Aya-Cuero et al., 2017; Mayor et al., 2017; Desbiez et al., 2019; Oliveira & Calouro, 2019), which includes them in the list as vulnerable to extinction in the wild.

Table 68 - Species included in endangered categories recorded in the survey of the mammal fauna in the area of Fazenda Santa Rosa, Santa Rosa do Purus, Acre, 2023.

Legend: VU – vulnerable; NT – almost threatened.

Order	Family	Species	Status
Carnivorous	Felidae	*Panthera onca*	NT
Artiodactyla	Tayassuidae	*Tayassu pecari*	VU
Cingulata	Dasypodidae	*Priodontes maximus*	VU

Perissodactyla	Tapiridae	*Tapirus terrestris*	VU
Rodentia	Dinomydae	*Dinomys branickii*	VU

Source: Self Elaboration

The tail-tailed paca (*Dinomys branickii*) is a species with little scientific information available about it. There are few records of it in the wild, and according to the IUCN list, it is classified as "vulnerable." It is currently the only living representative of the rodent family known as Dinomyidae. The fact that this species is naturally rare is one of the main factors that, associated with the hunting pressure exerted in various regions within its fragmented distribution area, make them more susceptible to disappearance, emphasizing the importance of protected areas located in the area of occurrence of these species (Gottdenker et al., 2001).

Peccaries (*Tayassu pecari*) are animals that require large areas of territory to roam and forage, play a key role in seed dispersal and maintenance of plant diversity. They eat fruits and seeds, including some that are too large for other animals to eat, and then spread them through feces. This helps ensure the regeneration and survival of many plant species. In addition, their presence in the forest can affect the composition and density of other animal species, including their predators, as they are an important food source for various carnivores, such as jaguars and ocelots (Beck et al., 2010). However, habitat loss and hunting can threaten their survival and the ecological balance of the forests they inhabit. They are considered "vulnerable" to extinction by the IUCN.

Despite being considered, according to Desbiez and Kluyber (2013), an important "engineer" of the ecosystem, little is known about the ecology and behavior of the giant armadillo (*Priodontes maximus*) in the Amazon, it is currently classified as "vulnerable" on the IUCN (International Union for Conservation of Nature) Red List of Threatened Species, which means that the species faces a high risk of extinction in its natural habitat.

The jaguar (*Panthera onca*) is a top-of-the-chain predator, meaning it is at the top of the food chain and plays a key role in regulating the populations of its prey. As a predator, the jaguar contributes to the balance of ecosystems, maintaining control over the herbivore population and preventing overpopulation of these species. In addition, the jaguar has an important role in maintaining biodiversity, as its presence is a sign that the ecosystem is healthy and in balance (Sollmann et al. , 2008; Tobler et al. , 2013). It is currently in the "Near Threatened" category (IUCN, 2020).

Among the neotropical primates, the black monkey (*Ateles chamek*), is the one that feeds the most on fruits. The predominantly frugivorous diet also includes, less frequently, leaves, flowers, shoots, seeds, tree bark, aerial roots, decaying wood, fungi, and invertebrates. As they consume a large amount of fruits and have the habit of swallowing the seeds intact, they play an important ecological role in seed dispersal and ecosystem restoration (Peres, 1997). The main threats to the species are: rural settlements, agriculture, deforestation, increased energy matrix, expansion of the road network, habitat loss and hunting (Peres, 2000). It is categorized as "vulnerable" by the International Union for Conservation of Nature (IUCN).

Habitat change and hunting pressure are increasingly relevant factors that affect the presence of several mammals in forest environments, and the Amazon Biome is one of the most impacted regions. In addition to ethnic-cultural and economic issues, other factors such as deforestation, agricultural expansion and extractivism can contribute to habitat degradation and the reduction of the mammal population in the region (Endo et al., n.d.; Peres, 2010; Harrison et al., 2016; Ripple et al., 2016; Rebêlo et al., 2019; Silva et al., 2022). The preservation of forest areas and the adoption of effective measures to protect fauna are fundamental to prevent the decline of mammal populations and ensure the sustainability of the Amazon ecosystem.

The tapir (*Tapirus terrestris*) is a species of neotropical ointment that plays an important ecological role as a seed disperser. However, despite this important function, the tapir is also the most sensitive species to hunting pressure among the ungulates of the region (Bodmer et al., 1988). Subsistence, commercial and sport hunting are anthropogenic factors that have significantly reduced the biomass of these animals, threatening the survival of their populations and causing changes in the patterns of regeneration and diversity of some plant species (Tobler et al., 2014). The tapir is currently classified as "Vulnerable" by the International Union for Conservation of Nature (IUCN) due to declining populations and persistent threats. It is important to emphasize the need for conservation measures and adequate management to ensure the survival of the species and the maintenance of its important ecological function in seed dispersal.

The *American Mazama*, also known as the deer, is an important species for the ecosystem. Its diet consists mainly of leaves, shoots and fruits of plants, which makes it an important seed disperser. In addition, the species is prey to predators such as the jaguar and the suçuarana, helping to regulate the populations of these animals. (Duarte et al., 2012), the species is considered "vulnerable" by the IUCN.

In their wide distribution, peccaries (*Tayassu pecari*) have already lost much of their habitat and now exist only about 21% of the species' historical distribution, according to the IUCN Red List (Beck et al., 2010). Thornton et al. (2020) estimated that the range of the species in Mesoamerica has been reduced by up to 87%. Amazon populations, however, are more stable, but still face risks due to continued loss of their habitat and indiscriminate hunting.

Poaching of these species has a significant impact on local biodiversity, affecting the dynamics and ecology of the region's ecosystems. In addition, hunting can also negatively affect the local economy and the livelihoods of traditional communities that depend on these natural resources for food and income (Peres, 2000).

The unparalleled biodiversity and productivity of Amazonian forests are maintained in part by key ecosystem services provided by seed dispersers such as frugivorous primates. The higher density of trees characterizes more structured habitats and mature forests with greater richness of plant species, representing an important source of resources for mammals that inhabit it, especially frugivores (Link & Fiore 2006; Arévalo-Sandi et al., 2018).

Isothrix is a genus of tree rodents of the family Echimyidae, popularly known as bush agoutis, are solitary and nocturnal animals, feeding mainly on fruits, seeds and insects. They are important seed dispersers, helping to maintain forest biodiversity, habitat loss and hunting for human food pose threats to the survival of these animals.

The presence of the giant armadillo (*Priodontes maximus*) is considered an important environmental indicator, since they help to aerate the soil while digging their burrows and feeding on insects and other organisms present in the soil. In addition, your diet composed mainly of fruits and seeds may indicate the presence of fruit trees in a certain area, which can be a sign that the area is healthy and has a good diversity of plant species.

The tapir (*Tapirus terrestris*), is also an important environmental indicator in forest ecosystems. This is because its presence is strongly associated with the existence of healthy and diverse natural environments. Tapirs need large continuous forest areas to survive, feeding on a wide variety of plants and fruits that are only found in conserved habitats.

The presence of jaguar (*Panthera onca*) reflects on the integrity of the local habitat, the species is considered essential for the maintenance of ecosystem services, mainly by controlling the populations of its prey, acting with key species for the functioning of the ecosystem. However, they are among the animals that are often slaughtered due to the conflict generated with humans, a result of the predation they exert on human domestic creations (Michalski et al., 2006).

5.1.1.5.5.1 Vegetation

Data processing indicated the existence of 172 tree species distributed in 43 botanical families, with 1,290 individuals. The Fabaceae family is the most abundant, with 15.12% of the identified species (n=26) representing 12.64% of the surveyed individuals (n=163), followed by Malvaceae (6.40% of the species and 11.71% of individuals), Meliaceae (8.14% of species and 10.85% of individuals), Moraceae (7.56% of species and 9.53% of individuals), Sapotaceae (4.65% of species and 4.96 % of individuals), Olacaceae (2.91% of species and 4.57% of individuals) and Annonaceae (4.07% of species and 4.42% of individuals). These 7 most abundant families concentrate around 48.84% of all species and 58.68% of inventoried individuals.

Table 69 - Composition of the forest considering the inventoried botanical families and the participation in the inventoried population.

N.	Family	Nº Ind.	Nº Ind.%	Nº Specie	Nº Specie %
1	Fabaceae	163	12,64%	26	15,12%
2	Malvaceae	151	11,71%	11	6,40%
3	Meliaceae	140	10,85%	14	8,14%
4	Moraceae	123	9,53%	13	7,56%
5	Sapotaceae	64	4,96%	8	4,65%
6	Olacaceae	59	4,57%	5	2,91%
7	Annonaceae	57	4,42%	7	4,07%
8	Nyctaginaceae	51	3,95%	3	1,74%
9	Lauraceae	46	3,57%	7	4,07%
10	Sapindaceae	33	2,56%	4	2,33%
11	Anonaceae	30	2,33%	5	2,91%
12	Apocynaceae	30	2,33%	4	2,33%
13	Bignoniaceae	29	2,25%	3	1,74%
14	Violaceae	26	2,02%	2	1,16%
15	Chrysobalanaceae	25	1,94%	3	1,74%
16	Salicaceae	24	1,86%	4	2,33%
17	Lecythidaceae	21	1,63%	5	2,91%
18	Euphorbiaceae	20	1,55%	4	2,33%
19	Polygonaceae	20	1,55%	3	1,74%

N.	Family	Nº Ind.	Nº Ind.%	Nº Specie	Nº Specie %
20	Cannabaceae	18	1,40%	1	0,58%
21	Urticaceae	18	1,40%	3	1,74%
22	Rubiaceae	14	1,09%	6	3,49%
23	Burseraceae	13	1,01%	1	0,58%
24	Elaeocarpaceae	13	1,01%	1	0,58%
25	Myristicaceae	13	1,01%	4	2,33%
26	Não Identificado	11	0,85%	1	0,58%
27	Anacardiaceae	10	0,78%	5	2,91%
28	Celastraceae	7	0,54%	1	0,58%
29	Combretaceae	7	0,54%	1	0,58%
30	Ulmaceae	7	0,54%	1	0,58%
31	Putranjivaceae	6	0,47%	1	0,58%
32	Siparunaceae	6	0,47%	2	1,16%
33	Phyllanthaceae	5	0,39%	1	0,58%
34	Ochnaceae	5	0,39%	1	0,58%
35	Clusiaceae	4	0,31%	1	0,58%
36	Rutaceae	4	0,31%	1	0,58%
37	Arecaceae	3	0,23%	1	0,58%
38	Caricaceae	3	0,23%	1	0,58%
39	Myrtaceae	3	0,23%	2	1,16%
40	Simaroubaceae	3	0,23%	1	0,58%

N.	Family	Nº Ind.	Nº Ind.%	Nº Specie	Nº Specie %
41	Boraginaceae	2	0,16%	2	1,16%
42	Lythraceae	2	0,16%	1	0,58%
43	Coulaceae	1	0,08%	1	0,58%
Total	43	1290	100,00%	172	100,00%

Source: Self Elaboration

The composition of the forest is completed with the identification of 8 species of liana and 7 species of palm tree. No bamboo species was sampled, probably due to the inclusion diameter (DBH > 10 cm). However, reports from the inventory team indicate the presence of the species Guadua sp. The most abundant family is Arecaceae (palm tree) with 189 individuals sampled for 7 species, while for lianas (vines) the families with the highest occurrence were Bignoniaceae and Fabaceae with 2 species each, totaling 12 individuals for Bignociaceae and 4 for Fabaceae. In all, 28 individuals considered lianas were inventoried.

The phytosociological parameters of a forest population can support several actions in different fields of knowledge, such as recovery of degraded areas, production of seeds and seedlings, identification of endangered, rare, and endemic species, decision on management actions for conservation purposes, among others (BRITO et al., 2007).

The results of the phytosociological parameters are shown, where the estimated total density was 410.62 individuals per hectare, equivalent to a total basal area of 2,062.917 m²/km². These values are close to those found in the Antimary State Forest, Santa Rosa do Purus, Acre, whose total estimated density was 404 ind/ha and total basal area 1,983.82 m²/km² (TECMAN, 2012), while for Seringal Itatinga and Porto Central, in Manoel Urbano, Acre, the estimated total density was 311 ind/ha, making 1,487.22 m²/km² of total basal area (TECMAN, 2020) and for the area of Jaraguá Farm, Bujari, Acre, the density The estimated total was 363.19 individuals per hectare, equivalent to a total basal area of 1,623.898 m²/km² (TECMAN, 2023).

Among the 172 tree species identified, about 89 species (51.74%) had an absolute density (AD) equal to or greater than 1.00 ind/ha. The most abundant species, whose AD is greater than 10 ind/ha, were Envira-sapotinha (19,417 ind/ha), Pama-ferro (18,144 ind/ha) and NI 46 (16,552 ind/ha). These species represented approximately 13.18% of the absolute density of the inventoried population.

The species with the highest dominance (DOr ≥ 2.0%) represent approximately 33.13% of the total, where the species NI 46 was the most dominant with 3.65%, followed by the Sapota-macho species

(3.63%), Pama-ferro (3.23%), Garapeira (3.10%), Coassú (2.79%), Paineira (2.63%), Copaiba (2.60%), Cumaru-ferro (2.44%), Envira-sapotinha (2.40%), Pau-sangue (2.37%), Matamata (2.28%) and Ipê-amarelo (2.02%). Species with large diameter (DBH > 100 cm) are among the most dominant in the forest, Coassú (Coccoloba mollis), Copaiba (Copaifera multijuga), Garapeira (Apuleia leiocarpa) and Paineira (Ceiba speciosa).

Regarding the absolute frequency, the species that presented values greater than 75% were Ingá (80%), João-mole (80%), NI 46 (76%), Envira-sapotinha (76%) and Pau-sangue (76 %), representing about 11% of the total frequency.

In the first positions of the Importance Value Index (IVI%), which characterizes the importance of each species in the studied forest (under the horizontal perspective), the species stand out (IVI > 5%): NI 46 (9.81%), Pama-ferro (9.45%), Envira-sapotinha (9.26%), Sapota-macho (7.48%), Pau-blood (6.52%), Ingá (5.99%), Ipê-amarelo (5.49%), João-mole (5.30%), Envira-fofa (5.15%) and Coassú (5.03%).

These species had an absolute density of approximately 107 individuals per hectare and an absolute dominance of 492,531 m²/km², representing about 26.28% of the total number of individuals and 23.88% of the basal area per km² sampled. The relative frequency (FRr) calculated for these species was 19.33% of representativeness in the sampled plots. Species with higher IVI, at least theoretically, are better able to use the resources in their habitat.

Table 70 - Table with phytosociological parameters for species occurring in the study area, where: Nº=number of individuals; AB=basal area; D=density; DO=dominance; FR=frequency; CVI=coverage value index; IVI=Importance value index; a=absolute values; r=relative

Nº	Popular Name	Nº	BA (m²)	D a (Ind/ha)	D r (%)	DO a (m²/km²)	DO r (%)	FR a (%)	FR r (%)	IVC (%)	IVI (%)
1	NI 46	52	2,365 m²	16,552	4,03%	75,275	3,65%	76,00%	2,13%	7,68%	9,81%
2	Pama-ferro	57	2,095 m²	18,144	4,42%	66,678	3,23%	64,00%	1,80%	7,65%	9,45%
3	Envira-sapotinha	61	1,554 m²	19,417	4,73%	49,460	2,40%	76,00%	2,13%	7,13%	9,26%
4	Sapota-macho	25	2,351 m²	7,958	1,94%	74,844	3,63%	68,00%	1,91%	5,57%	7,48%
5	Pau-sangue	26	1,534 m²	8,276	2,02%	48,821	2,37%	76,00%	2,13%	4,38%	6,52%

Nº	Popular Name	Nº	BA (m²)	D a (Ind/ha)	D r (%)	DO a (m²/km²)	DO r (%)	FR a (%)	FR r (%)	IVC (%)	IVI (%)
6	Ingá	30	0,920 m²	9,549	2,33%	29,269	1,42%	80,00%	2,25%	3,74%	5,99%
7	Ipê-amarelo	23	1,309 m²	7,321	1,78%	41,662	2,02%	60,00%	1,69%	3,80%	5,49%
8	João-mole	29	0,521 m²	9,231	2,25%	16,588	0,80%	80,00%	2,25%	3,05%	5,30%
9	Envira-fofa	23	1,019 m²	7,321	1,78%	32,432	1,57%	64,00%	1,80%	3,36%	5,15%
10	Coassú	13	1,807 m²	4,138	1,01%	57,503	2,79%	44,00%	1,24%	3,80%	5,03%
11	NI 66	27	0,766 m²	8,594	2,09%	24,383	1,18%	56,00%	1,57%	3,28%	4,85%
12	Jitó	26	0,636 m²	8,276	2,02%	20,242	0,98%	64,00%	1,80%	3,00%	4,79%
13	Chichá-amarelo	21	1,152 m²	6,685	1,63%	36,662	1,78%	48,00%	1,35%	3,41%	4,75%
14	Matamata	14	1,481 m²	4,456	1,09%	47,128	2,28%	48,00%	1,35%	3,37%	4,72%
15	NI 54	21	0,777 m²	6,685	1,63%	24,732	1,20%	60,00%	1,69%	2,83%	4,51%
16	Carapanaúba	19	1,132 m²	6,048	1,47%	36,040	1,75%	44,00%	1,24%	3,22%	4,46%
17	Matuti	22	0,699 m²	7,003	1,71%	22,264	1,08%	52,00%	1,46%	2,78%	4,25%
18	NI 02	25	0,464 m²	7,958	1,94%	14,779	0,72%	52,00%	1,46%	2,65%	4,12%
19	NI 24	14	0,992 m²	4,456	1,09%	31,590	1,53%	52,00%	1,46%	2,62%	4,08%
20	Jaca-brava	20	0,732 m²	6,366	1,55%	23,293	1,13%	44,00%	1,24%	2,68%	3,92%
21	Itaubarana-mirim	20	0,551 m²	6,366	1,55%	17,535	0,85%	52,00%	1,46%	2,40%	3,86%
22	Farinha-seca	18	0,534 m²	5,730	1,40%	17,011	0,82%	52,00%	1,46%	2,22%	3,68%
23	Espinheiro-preto	13	1,073 m²	4,138	1,01%	34,151	1,66%	36,00%	1,01%	2,66%	3,67%
24	Garapeira	3	2,010 m²	0,955	0,23%	63,976	3,10%	12,00%	0,34%	3,33%	3,67%
25	Munguba	10	1,224 m²	3,183	0,78%	38,965	1,89%	32,00%	0,90%	2,66%	3,56%
26	Maparajuba	15	0,659 m²	4,775	1,16%	20,990	1,02%	48,00%	1,35%	2,18%	3,53%

Nº	Popular Name	Nº	BA (m²)	D a (Ind/ha)	D r (%)	DO a (m²/km²)	DO r (%)	FR a (%)	FR r (%)	IVC (%)	IVI (%)
27	Louro	15	0,675 m²	4,775	1,16%	21,475	1,04%	44,00%	1,24%	2,20%	3,44%
28	Pau-estalador	23	0,244 m²	7,321	1,78%	7,759	0,38%	44,00%	1,24%	2,16%	3,40%
29	Cumaru-ferro	5	1,581 m²	1,592	0,39%	50,331	2,44%	20,00%	0,56%	2,83%	3,39%
30	NI 01	16	0,435 m²	5,093	1,24%	13,858	0,67%	48,00%	1,35%	1,91%	3,26%
31	Paineira	3	1,701 m²	0,955	0,23%	54,155	2,63%	12,00%	0,34%	2,86%	3,19%
32	Copaiba	3	1,682 m²	0,955	0,23%	53,547	2,60%	12,00%	0,34%	2,83%	3,17%
33	Vassorinha-branca	16	0,513 m²	5,093	1,24%	16,331	0,79%	36,00%	1,01%	2,03%	3,04%
34	NI 65	14	0,513 m²	4,456	1,09%	16,338	0,79%	40,00%	1,12%	1,88%	3,00%
35	NI 37	13	0,463 m²	4,138	1,01%	14,743	0,71%	44,00%	1,24%	1,72%	2,96%
36	Curticeiro	12	0,613 m²	3,820	0,93%	19,528	0,95%	36,00%	1,01%	1,88%	2,89%
37	NI 16	11	0,682 m²	3,501	0,85%	21,725	1,05%	32,00%	0,90%	1,91%	2,80%
38	Cacau	18	0,254 m²	5,730	1,40%	8,072	0,39%	36,00%	1,01%	1,79%	2,80%
39	Caucho	10	0,728 m²	3,183	0,78%	23,164	1,12%	32,00%	0,90%	1,90%	2,80%
40	NI 40	17	0,287 m²	5,411	1,32%	9,134	0,44%	32,00%	0,90%	1,76%	2,66%
41	Bacubichá	12	0,438 m²	3,820	0,93%	13,944	0,68%	36,00%	1,01%	1,61%	2,62%
42	NI 60	14	0,381 m²	4,456	1,09%	12,113	0,59%	32,00%	0,90%	1,67%	2,57%
43	Guariúba	5	0,957 m²	1,592	0,39%	30,475	1,48%	20,00%	0,56%	1,86%	2,43%
44	Urucurana	13	0,269 m²	4,138	1,01%	8,576	0,42%	32,00%	0,90%	1,42%	2,32%
45	Abiorana-vermelha	12	0,199 m²	3,820	0,93%	6,329	0,31%	36,00%	1,01%	1,24%	2,25%
46	NI 43	8	0,643 m²	2,546	0,62%	20,465	0,99%	20,00%	0,56%	1,61%	2,17%
47	NI 06	9	0,368 m²	2,865	0,70%	11,706	0,57%	32,00%	0,90%	1,27%	2,16%

Nº	Popular Name	Nº	BA (m²)	D a (Ind/ha)	D r (%)	DO a (m²/km²)	DO r (%)	FR a (%)	FR r (%)	IVC (%)	IVI (%)
48	Tanimbuca	7	0,483 m²	2,228	0,54%	15,384	0,75%	28,00%	0,79%	1,29%	2,07%
49	NI 30	9	0,300 m²	2,865	0,70%	9,550	0,46%	32,00%	0,90%	1,16%	2,06%
50	NI 44	10	0,144 m²	3,183	0,78%	4,576	0,22%	36,00%	1,01%	1,00%	2,01%
51	Quebra-faca	10	0,271 m²	3,183	0,78%	8,632	0,42%	28,00%	0,79%	1,19%	1,98%
52	NI 19	9	0,316 m²	2,865	0,70%	10,054	0,49%	28,00%	0,79%	1,19%	1,97%
53	Samaúma-branca	2	1,021 m²	0,637	0,16%	32,512	1,58%	8,00%	0,22%	1,73%	1,96%
54	Falça-sorva	8	0,354 m²	2,546	0,62%	11,259	0,55%	28,00%	0,79%	1,17%	1,95%
55	NI 32	5	0,641 m²	1,592	0,39%	20,414	0,99%	20,00%	0,56%	1,38%	1,94%
56	Urtiga	9	0,289 m²	2,865	0,70%	9,214	0,45%	28,00%	0,79%	1,14%	1,93%
57	NI 51	10	0,158 m²	3,183	0,78%	5,031	0,24%	32,00%	0,90%	1,02%	1,92%
58	Burra-leiteira	5	0,610 m²	1,592	0,39%	19,423	0,94%	20,00%	0,56%	1,33%	1,89%
59	NI 63	9	0,153 m²	2,865	0,70%	4,885	0,24%	32,00%	0,90%	0,93%	1,83%
60	NI 18	7	0,519 m²	2,228	0,54%	16,516	0,80%	16,00%	0,45%	1,34%	1,79%
61	NI 47	8	0,368 m²	2,546	0,62%	11,710	0,57%	20,00%	0,56%	1,19%	1,75%
62	Condurú	9	0,329 m²	2,865	0,70%	10,472	0,51%	16,00%	0,45%	1,21%	1,65%
63	Marfim-vermelho	7	0,191 m²	2,228	0,54%	6,087	0,30%	28,00%	0,79%	0,84%	1,62%
64	Envira-iodo	7	0,230 m²	2,228	0,54%	7,314	0,35%	24,00%	0,67%	0,90%	1,57%
65	Pau-brasil-do-Acre	7	0,223 m²	2,228	0,54%	7,102	0,34%	24,00%	0,67%	0,89%	1,56%
66	Cabelo-de-cutia	5	0,389 m²	1,592	0,39%	12,376	0,60%	20,00%	0,56%	0,99%	1,55%
67	Mamuí	3	0,618 m²	0,955	0,23%	19,679	0,95%	12,00%	0,34%	1,19%	1,52%
68	Abiu-fofo	3	0,653 m²	0,955	0,23%	20,776	1,01%	8,00%	0,22%	1,24%	1,46%

Nº	Popular Name	Nº	BA (m^2)	D a (Ind/ha)	D r (%)	DO a (m^2/km^2)	DO r (%)	FR a (%)	FR r (%)	IVC (%)	IVI (%)
69	Bálsamo	5	0,313 m^2	1,592	0,39%	9,957	0,48%	20,00%	0,56%	0,87%	1,43%
70	Botijão	6	0,252 m^2	1,910	0,47%	8,027	0,39%	20,00%	0,56%	0,85%	1,42%
71	Guaribeiro	3	0,532 m^2	0,955	0,23%	16,923	0,82%	12,00%	0,34%	1,05%	1,39%
72	Pama-branca	6	0,159 m^2	1,910	0,47%	5,052	0,24%	24,00%	0,67%	0,71%	1,38%
73	Assacu	4	0,471 m^2	1,273	0,31%	14,990	0,73%	12,00%	0,34%	1,04%	1,37%
74	Castanhola	7	0,171 m^2	2,228	0,54%	5,435	0,26%	20,00%	0,56%	0,81%	1,37%
75	Macacaúba	5	0,239 m^2	1,592	0,39%	7,618	0,37%	20,00%	0,56%	0,76%	1,32%
76	NI 31	6	0,162 m^2	1,910	0,47%	5,166	0,25%	20,00%	0,56%	0,72%	1,28%
77	NI 27	6	0,077 m^2	1,910	0,47%	2,445	0,12%	24,00%	0,67%	0,58%	1,26%
78	Cheiloclinium	7	0,091 m^2	2,228	0,54%	2,883	0,14%	20,00%	0,56%	0,68%	1,24%
79	Embaúba-vermelha	5	0,259 m^2	1,592	0,39%	8,250	0,40%	16,00%	0,45%	0,79%	1,24%
80	Alecrim	3	0,431 m^2	0,955	0,23%	13,721	0,67%	12,00%	0,34%	0,90%	1,23%
81	Limãozinho	4	0,378 m^2	1,273	0,31%	12,021	0,58%	12,00%	0,34%	0,89%	1,23%
82	NI 59	6	0,127 m^2	1,910	0,47%	4,040	0,20%	20,00%	0,56%	0,66%	1,22%
83	NI 25	6	0,115 m^2	1,910	0,47%	3,649	0,18%	20,00%	0,56%	0,64%	1,20%
84	Cernambi-de-índio	6	0,114 m^2	1,910	0,47%	3,634	0,18%	20,00%	0,56%	0,64%	1,20%
85	Muiracatiara	4	0,274 m^2	1,273	0,31%	8,708	0,42%	16,00%	0,45%	0,73%	1,18%
86	Manitê	5	0,181 m^2	1,592	0,39%	5,775	0,28%	16,00%	0,45%	0,67%	1,12%
87	Botãozinho	5	0,095 m^2	1,592	0,39%	3,025	0,15%	20,00%	0,56%	0,53%	1,10%
88	Corrimboque	1	0,567 m^2	0,318	0,08%	18,058	0,88%	4,00%	0,11%	0,95%	1,07%
89	Tamboril	2	0,432 m^2	0,637	0,16%	13,755	0,67%	8,00%	0,22%	0,82%	1,05%

Nº	Popular Name	Nº	BA (m²)	D a (Ind/ha)	D r (%)	DO a (m²/km²)	DO r (%)	FR a (%)	FR r (%)	IVC (%)	IVI (%)
90	Sangue-de-boi	4	0,176 m²	1,273	0,31%	5,597	0,27%	16,00%	0,45%	0,58%	1,03%
91	Cerejeira	2	0,421 m²	0,637	0,16%	13,405	0,65%	8,00%	0,22%	0,80%	1,03%
92	NI 57	5	0,124 m²	1,592	0,39%	3,951	0,19%	16,00%	0,45%	0,58%	1,03%
93	Ipê	3	0,355 m²	0,955	0,23%	11,298	0,55%	8,00%	0,22%	0,78%	1,00%
94	NI 04	4	0,128 m²	1,273	0,31%	4,069	0,20%	16,00%	0,45%	0,51%	0,96%
95	NI 39	4	0,177 m²	1,273	0,31%	5,628	0,27%	12,00%	0,34%	0,58%	0,92%
96	Capitiú	5	0,051 m²	1,592	0,39%	1,627	0,08%	16,00%	0,45%	0,47%	0,92%
97	Maruparana	3	0,262 m²	0,955	0,23%	8,348	0,40%	8,00%	0,22%	0,64%	0,86%
98	Embaúba-branca	4	0,137 m²	1,273	0,31%	4,347	0,21%	12,00%	0,34%	0,52%	0,86%
99	Ucuúba-preta	4	0,060 m²	1,273	0,31%	1,917	0,09%	16,00%	0,45%	0,40%	0,85%
100	Tachi-de-igapó	4	0,132 m²	1,273	0,31%	4,203	0,20%	12,00%	0,34%	0,51%	0,85%
101	Bacuri	4	0,050 m²	1,273	0,31%	1,577	0,08%	16,00%	0,45%	0,39%	0,84%
102	Sucuuba	3	0,167 m²	0,955	0,23%	5,319	0,26%	12,00%	0,34%	0,49%	0,83%
103	Cajuí	2	0,269 m²	0,637	0,16%	8,566	0,42%	8,00%	0,22%	0,57%	0,79%
104	Caroba-branca	3	0,126 m²	0,955	0,23%	4,021	0,19%	12,00%	0,34%	0,43%	0,76%
105	Sapota	2	0,226 m²	0,637	0,16%	7,191	0,35%	8,00%	0,22%	0,50%	0,73%
106	Canela-de-velho	3	0,174 m²	0,955	0,23%	5,537	0,27%	8,00%	0,22%	0,50%	0,73%
107	NI 35	4	0,050 m²	1,273	0,31%	1,592	0,08%	12,00%	0,34%	0,39%	0,72%

Nº	Popular Name	Nº	BA (m²)	D a (Ind/ha)	D r (%)	DO a (m²/km²)	DO r (%)	FR a (%)	FR r (%)	IVC (%)	IVI (%)
108	Mororó-branco	3	0,100 m²	0,955	0,23%	3,186	0,15%	12,00%	0,34%	0,39%	0,72%
109	NI 53	2	0,205 m²	0,637	0,16%	6,513	0,32%	8,00%	0,22%	0,47%	0,70%
110	Lacre	2	0,192 m²	0,637	0,16%	6,103	0,30%	8,00%	0,22%	0,45%	0,68%
111	NI 50	3	0,063 m²	0,955	0,23%	2,010	0,10%	12,00%	0,34%	0,33%	0,67%
112	Inharé-mole	3	0,063 m²	0,955	0,23%	1,994	0,10%	12,00%	0,34%	0,33%	0,67%
113	Jitó-da-várzera	3	0,061 m²	0,955	0,23%	1,940	0,09%	12,00%	0,34%	0,33%	0,66%
114	Cedro-rosa	1	0,303 m²	0,318	0,08%	9,632	0,47%	4,00%	0,11%	0,54%	0,66%
115	NI 67	3	0,051 m²	0,955	0,23%	1,634	0,08%	12,00%	0,34%	0,31%	0,65%
116	Pama	3	0,050 m²	0,955	0,23%	1,576	0,08%	12,00%	0,34%	0,31%	0,65%
117	Matamatá-branco	1	0,281 m²	0,318	0,08%	8,953	0,43%	4,00%	0,11%	0,51%	0,62%
118	Matamatá	3	0,032 m²	0,955	0,23%	1,022	0,05%	12,00%	0,34%	0,28%	0,62%
119	NI 28	3	0,026 m²	0,955	0,23%	0,813	0,04%	12,00%	0,34%	0,27%	0,61%
120	Jatobá	1	0,269 m²	0,318	0,08%	8,576	0,42%	4,00%	0,11%	0,49%	0,61%
121	Copinho	2	0,122 m²	0,637	0,16%	3,878	0,19%	8,00%	0,22%	0,34%	0,57%
122	Pau-pombo	2	0,102 m²	0,637	0,16%	3,231	0,16%	8,00%	0,22%	0,31%	0,54%

Nº	Popular Name	Nº	BA (m²)	D a (Ind/ha)	D r (%)	DO a (m²/km²)	DO r (%)	FR a (%)	FR r (%)	IVC (%)	IVI (%)
123	Açaí	3	0,047 m²	0,955	0,23%	1,496	0,07%	8,00%	0,22%	0,31%	0,53%
124	Cacauí	3	0,043 m²	0,955	0,23%	1,371	0,07%	8,00%	0,22%	0,30%	0,52%
125	Jutaí	2	0,091 m²	0,637	0,16%	2,884	0,14%	8,00%	0,22%	0,29%	0,52%
126	NI 55	2	0,077 m²	0,637	0,16%	2,455	0,12%	8,00%	0,22%	0,27%	0,50%
127	NI 62	2	0,075 m²	0,637	0,16%	2,379	0,12%	8,00%	0,22%	0,27%	0,50%
128	NI 45	2	0,074 m²	0,637	0,16%	2,365	0,11%	8,00%	0,22%	0,27%	0,49%
129	NI 61	2	0,072 m²	0,637	0,16%	2,303	0,11%	8,00%	0,22%	0,27%	0,49%
130	NI 34	2	0,046 m²	0,637	0,16%	1,468	0,07%	8,00%	0,22%	0,23%	0,45%
131	Ingá-fava	1	0,150 m²	0,318	0,08%	4,789	0,23%	4,00%	0,11%	0,31%	0,42%
132	Tachi-vermelho	1	0,146 m²	0,318	0,08%	4,658	0,23%	4,00%	0,11%	0,30%	0,42%
133	Figo-de-macaco-preto	2	0,023 m²	0,637	0,16%	0,731	0,04%	8,00%	0,22%	0,19%	0,42%
134	NI 38	2	0,022 m²	0,637	0,16%	0,701	0,03%	8,00%	0,22%	0,19%	0,41%
135	Araçá	2	0,016 m²	0,637	0,16%	0,522	0,03%	8,00%	0,22%	0,18%	0,41%
136	Malva-peluda	1	0,133 m²	0,318	0,08%	4,228	0,20%	4,00%	0,11%	0,28%	0,39%
137	NI 58	2	0,082 m²	0,637	0,16%	2,603	0,13%	4,00%	0,11%	0,28%	0,39%

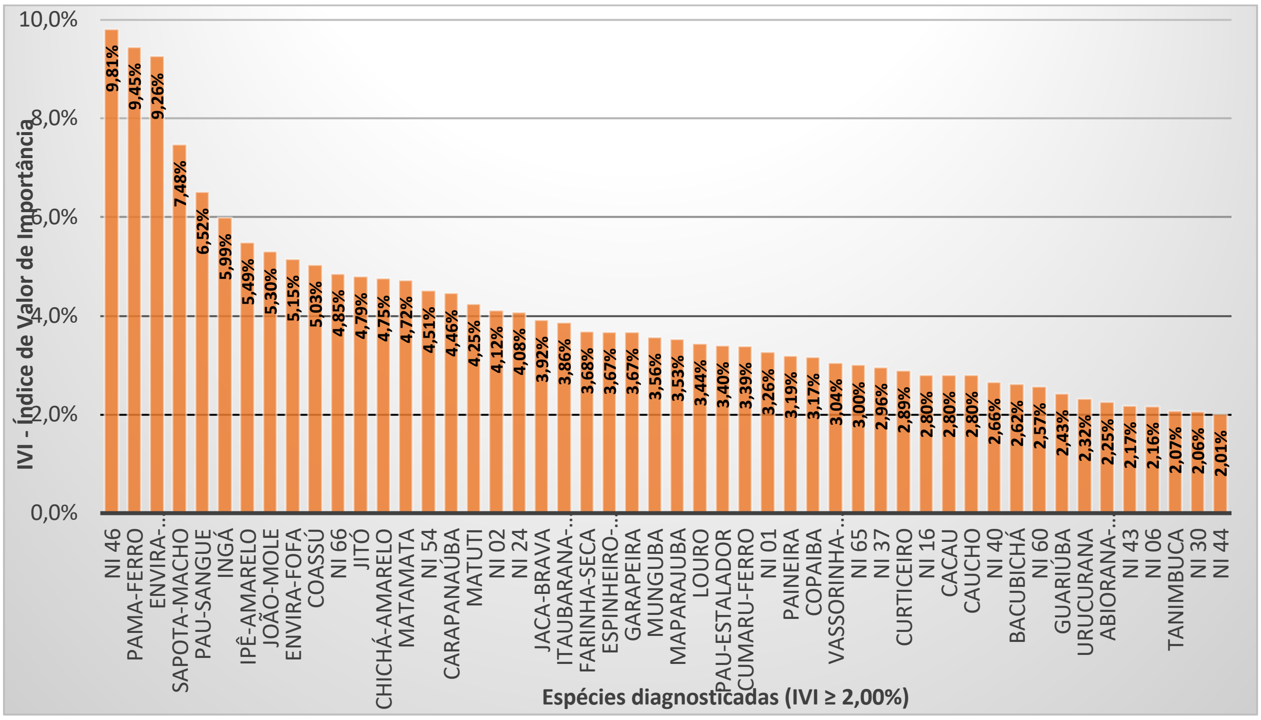
Nº	Popular Name	Nº	BA (m²)	D a (Ind/ha)	D r (%)	DO a (m²/km²)	DO r (%)	FR a (%)	FR r (%)	IVC (%)	IVI (%)
138	Jitó-branco	2	0,045 m²	0,637	0,16%	1,421	0,07%	4,00%	0,11%	0,22%	0,34%
139	NI 64	1	0,076 m²	0,318	0,08%	2,408	0,12%	4,00%	0,11%	0,19%	0,31%
140	Cedro-branco	1	0,059 m²	0,318	0,08%	1,873	0,09%	4,00%	0,11%	0,17%	0,28%
141	NI 52	1	0,052 m²	0,318	0,08%	1,666	0,08%	4,00%	0,11%	0,16%	0,27%
142	NI 05	1	0,052 m²	0,318	0,08%	1,641	0,08%	4,00%	0,11%	0,16%	0,27%
143	NI 22	1	0,051 m²	0,318	0,08%	1,621	0,08%	4,00%	0,11%	0,16%	0,27%
144	Taperibá	1	0,048 m²	0,318	0,08%	1,541	0,07%	4,00%	0,11%	0,15%	0,26%
145	Feijó	1	0,044 m²	0,318	0,08%	1,413	0,07%	4,00%	0,11%	0,15%	0,26%
146	Fava-preta	1	0,044 m²	0,318	0,08%	1,410	0,07%	4,00%	0,11%	0,15%	0,26%
147	Apui	1	0,041 m²	0,318	0,08%	1,313	0,06%	4,00%	0,11%	0,14%	0,25%
148	Cajá	1	0,040 m²	0,318	0,08%	1,277	0,06%	4,00%	0,11%	0,14%	0,25%
149	Apui-vermelho	1	0,039 m²	0,318	0,08%	1,241	0,06%	4,00%	0,11%	0,14%	0,25%
150	Pente-de-macaco	1	0,038 m²	0,318	0,08%	1,213	0,06%	4,00%	0,11%	0,14%	0,25%
151	NI 08	1	0,036 m²	0,318	0,08%	1,151	0,06%	4,00%	0,11%	0,13%	0,25%
152	Envira-cajú	1	0,031 m²	0,318	0,08%	0,977	0,05%	4,00%	0,11%	0,12%	0,24%

Nº	Popular Name	Nº	BA (m²)	D a (Ind/ha)	D r (%)	DO a (m²/km²)	DO r (%)	FR a (%)	FR r (%)	IVC (%)	IVI (%)
153	NI 36	1	0,030 m²	0,318	0,08%	0,955	0,05%	4,00%	0,11%	0,12%	0,24%
154	Pau-de-formiga	1	0,028 m²	0,318	0,08%	0,906	0,04%	4,00%	0,11%	0,12%	0,23%
155	NI 07	1	0,025 m²	0,318	0,08%	0,806	0,04%	4,00%	0,11%	0,12%	0,23%
156	NI 42	1	0,025 m²	0,318	0,08%	0,794	0,04%	4,00%	0,11%	0,12%	0,23%
157	Mogno	1	0,022 m²	0,318	0,08%	0,685	0,03%	4,00%	0,11%	0,11%	0,22%
158	Envira-vassourinha	1	0,019 m²	0,318	0,08%	0,618	0,03%	4,00%	0,11%	0,11%	0,22%
159	NI 49	1	0,018 m²	0,318	0,08%	0,560	0,03%	4,00%	0,11%	0,10%	0,22%
160	NI 56	1	0,018 m²	0,318	0,08%	0,560	0,03%	4,00%	0,11%	0,10%	0,22%
161	Aquariquara	1	0,017 m²	0,318	0,08%	0,543	0,03%	4,00%	0,11%	0,10%	0,22%
162	Angelim-amargoso	1	0,014 m²	0,318	0,08%	0,458	0,02%	4,00%	0,11%	0,10%	0,21%
163	NI 41	1	0,014 m²	0,318	0,08%	0,430	0,02%	4,00%	0,11%	0,10%	0,21%
164	NI 13	1	0,013 m²	0,318	0,08%	0,409	0,02%	4,00%	0,11%	0,10%	0,21%
165	Goiabinha	1	0,012 m²	0,318	0,08%	0,395	0,02%	4,00%	0,11%	0,10%	0,21%
166	Grão-de-galo	1	0,012 m²	0,318	0,08%	0,391	0,02%	4,00%	0,11%	0,10%	0,21%
167	Caripé	1	0,011 m²	0,318	0,08%	0,360	0,02%	4,00%	0,11%	0,09%	0,21%

Nº	Popular Name	Nº	BA (m²)	D a (Ind/ha)	D r (%)	DO a (m²/km²)	DO r (%)	FR a (%)	FR r (%)	IVC (%)	IVI (%)
168	NI 20	1	0,010 m²	0,318	0,08%	0,332	0,02%	4,00%	0,11%	0,09%	0,21%
169	Envira-preta-de-igapó	1	0,010 m²	0,318	0,08%	0,328	0,02%	4,00%	0,11%	0,09%	0,21%
170	Espinho-de-judeu	1	0,010 m²	0,318	0,08%	0,316	0,02%	4,00%	0,11%	0,09%	0,21%
171	NI 12	1	0,009 m²	0,318	0,08%	0,283	0,01%	4,00%	0,11%	0,09%	0,20%
172	NI 48	1	0,009 m²	0,318	0,08%	0,276	0,01%	4,00%	0,11%	0,09%	0,20%
	Total	**1290**	**64,808 m²**	**410,62**	**100,00%**	**2062,917**	**100,00%**	**3560,00%**	**100,00%**	**200,00%**	**300,00%**

Source: Self Elaboration

Table 71 - Distribution of inventoried species according to Importance Value Index (IVI).

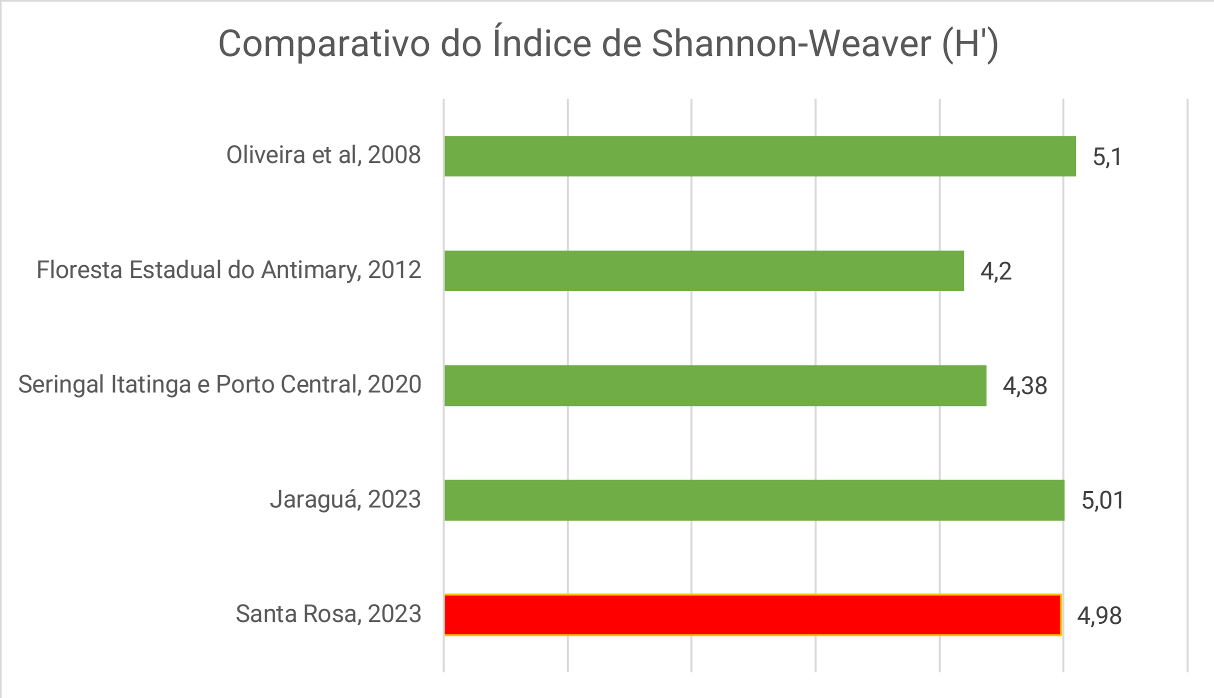


Diversity is composed of the variety of species and the number of individuals within each species and most of the time diversity studies are related to patterns of spatial and environmental variation. It is not correlated with the number of individuals per hectare of the population, but with a set of species and their number of representatives (CARVALHO, 2019).

The Shannon-Weaver Index (H') was used, which considers equal weight between rare and abundant species, providing an idea of the degree of uncertainty in predicting which species an individual drawn randomly from the population would belong to. The higher the value of H', the greater the floristic diversity of the population under study.

The Shannon-Weaver Index (H') for the inventory was 4.58, thus indicating that the forest is well diversified. Oliveira et al (2008) indicated the same situation being evaluated in the Manaus region, whose index obtained was H'=5.10 (Figure 166). Comparatively, the calculated index was higher in relation to the Antimary State Forest, where the index was 4.2 (TECMAN, 2012), as well as, for an area located in Manoel Urbano, Seringal Itatinga and Porto Central, the index was 4 ,38 (TECMAN, 2020).

Figure 133 - Comparison of Shannon-Weaver indices in different forest areas.



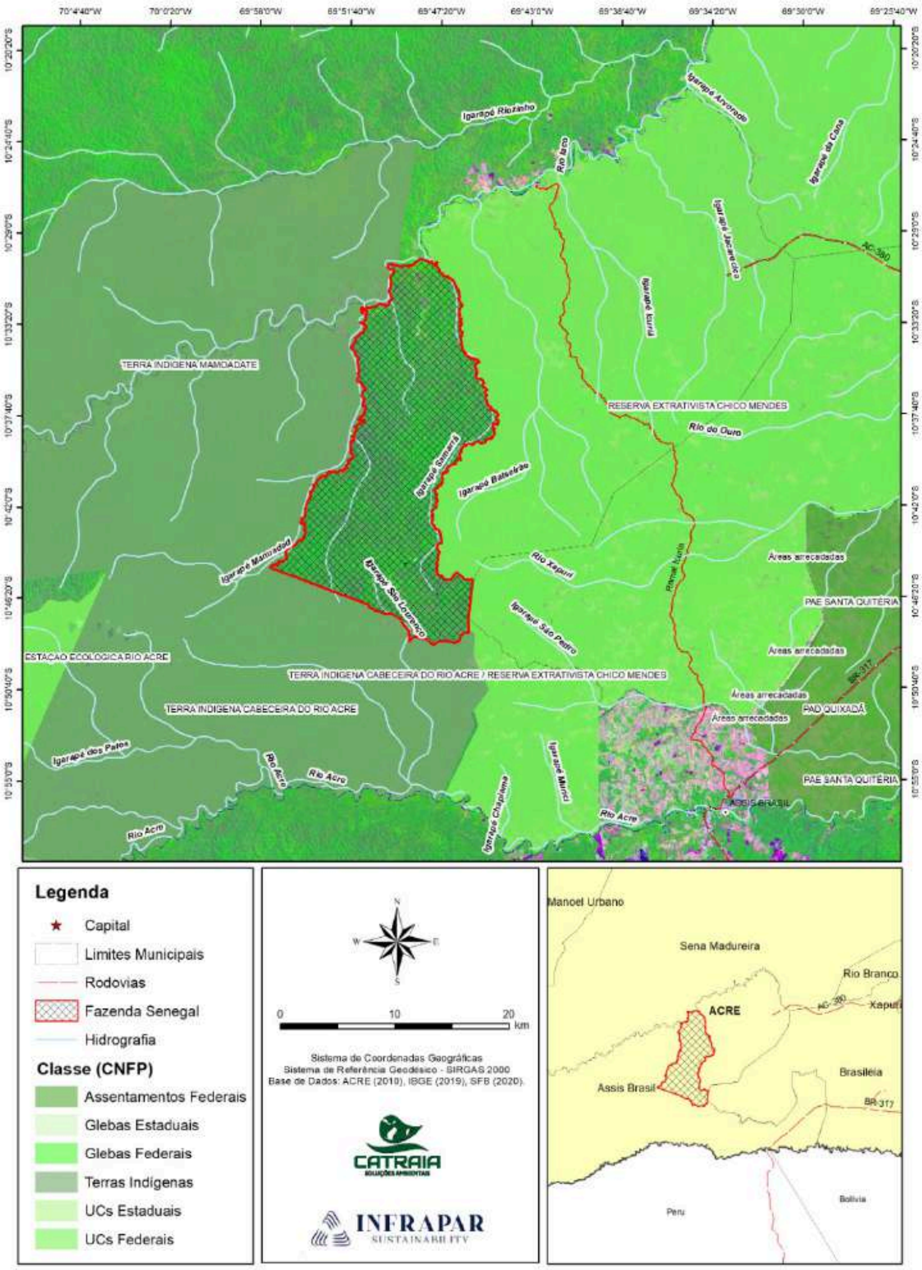
Source: Self Elaboration

5.1.1.6 Fazenda Senegal, Assis Brasil, Acre

The biodiversity surveys were conducted at the Senegal Farm (10°30′39.85″ S 69°48′10.00″ W; Figure 167), which is located in the easternmost portion of the state of Acre, in the municipality of Assis Brasil, located on the right bank of the Iaco River, with an approximate distance of 20 km from the urban perimeter of Assis Brasil, and with an approximate distance of 220 km from the capital Rio Branco. The climate of the region is characterized as Am, according to the Köeppen classification. It is a humid tropical climate, with an average annual temperature between 26 and 27° C, with a short-term dry season. The Senegal Farm is located near four protected areas: the Chico Mendes Extractive Reserve and Rio Acre Ecological Station, and the Mamoadate and Cabeceiras do Rio Acre Indigenous Lands.

Table 72 - General area of Fazenda Senegal, Assis Brasil Acre, Brazil. Property with incentive to the Carbon Credit Project. Map: Catraia Soluções Ambientais, 2023

Legend – red line: territorial boundaries of the property area.



Source: Self Elaboration

5.1.1.6.1 Entomofauna

The studies that take place in view of the understanding of the Entomofauna are still seen with little attention within the lay community, and the reasons that contribute to this area of knowledge being poorly understood is because more work involving insects is undeserved or seen as low attractive (Arias & Penny, 1979; Siva & Carneiro, 1986). However, field sample studies and even analyses that focus on the literature review on these organisms are essential for data to be systematically reviewed and interpreted, seeking to understand the relevance of this area in our days and a greater understanding of decision-making. about which tools should be used to manage and prospect this group (Silva, 2019).

The Entomofauna has several areas that contribute to a broad view of the importance of how insects are essential in our days. Understanding more about insects allows a dynamic analysis of the existing relationship between organisms and the environment in which they are inserted, thus associating these communities with humans (Marques et al., 2017). Studies involving entomology associated with diseases caused by insects within the Amazon, and the increasing number of studies carried out by specialists who work with insects, confirm how necessary it is to carry out new studies in isolated regions of the Amazon. In the Amazon region, studies that emphasize the need to understand more about the Entomofauna grow more and more and are carried out by different researchers from the country and the world (Menezes, 2006).

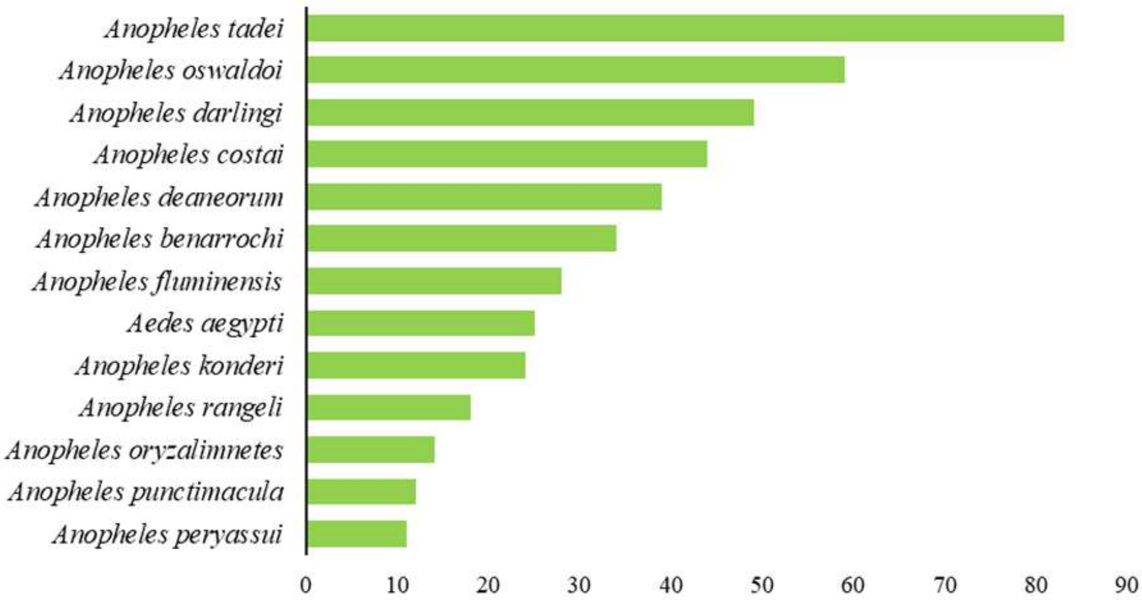
However, in Acre, where this technical study took place, it can be seen in the scientific literature that the record of investigative studies on medical and general Entomofauna is still below what could exist, since scientific studies could present more relevant indices that corresponded to the existing demand in the region, aiming at an in-depth view of these groups (Ribeiro et al., 2019; Madeira et al., 2020).

Secondary data collection was standardized for all fauna groups (see topic 4.1.1 – Secondary data). In addition to the GBIF database, it was performed in the form of an association using the Boolean operator and the Health Sciences Descriptors (DECS) and their counterparts in the Medical Subject Headings (MeSH): "Medical Entomofauna in Acre" and "Use of Insects in Zoonotic Studies". The search included literature in English, Spanish and Portuguese where the target group and environment (i.e., culicidae, dipterans, medical importance, entomofana, Amazon rainforest) was applied as a search parameter, and some characteristics associated with the group and different keywords (for example: zoonoses; public health; vectors).

The online databases consulted, in the period of March 2023, were: Latin American and Caribbean Health Sciences Information (LILACS), Scientific Electronic Library Online (SciELO), Database in Medical Biology and Medical Entomology and Medical Literature Analysis and Retrieval System Online (MEDLINE), considering that studies focusing on Medical Entomology are published in a journal with a scope focused on medicine.

During the survey in the databases on Diptera in the state of Acre (Figure 150), a total of 36 species were found, within 8 genera, of these records the species that presented the highest number of occurrences were Anopheles tadei, Anopheles oswaldoi and Anopheles darlingi. Insects belonging to the subfamily Anophelinae are more important in the transmission of parasites of the genus Plasmodium, which cause the malaria disease that is endemic in the Amazon region (Cdc, 2022).

Figure 134 - Occurrence of Culicidae species in the state of Acre.

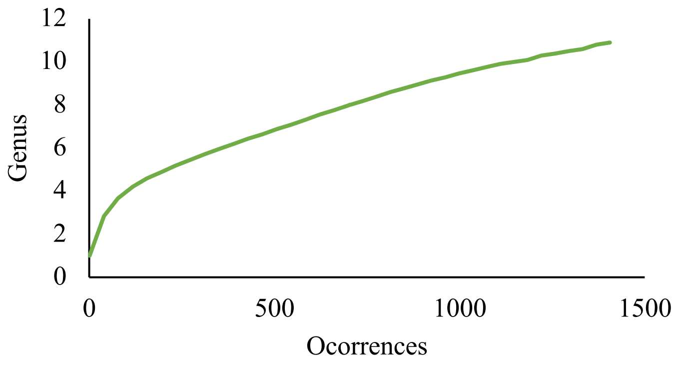


Source: Self Elaboration

For the Senegal farm there was only a single record of *Aedes aegypti*. This species is widely distributed in urban areas, being the vector responsible for the transmission of the dengue virus throughout Acre, as well as other diseases transmitted by these insects, such as Zika and Chikungunya (Brasil, 2020).

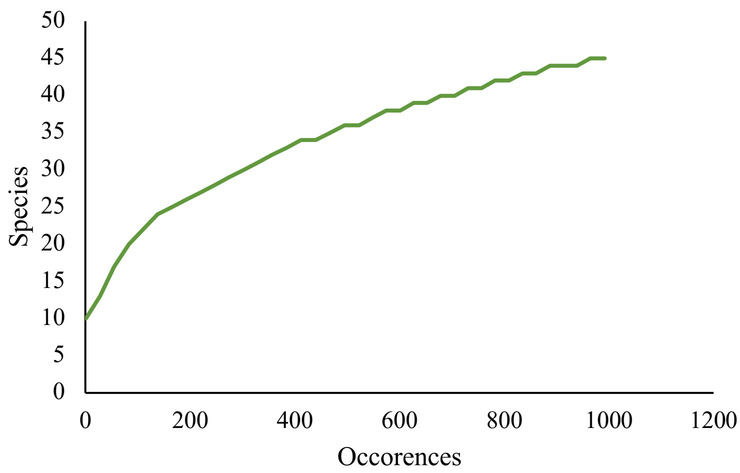
The richness of the medical entomofauna in Acre showed that the number of occurrences was insufficient to represent the community of Diptera species in Fazenda Senegal. Both the rarefied curve of genus and species did not stabilize. Therefore, the lack of data shows how relevant it is to carry out new studies in these areas. In addition, the observed richness for Acre was 36 species and the estimated 59 species, while observed Shannon diversity was 16.50 and 17.52 estimated and Simpson diversity 12.07 and 12.34 estimated.

Table 73 - Sampling Sufficiency of Genera registered in the Entomofauna Survey, Senegal Farm, Assis Brasil, Acre, 2023.



Source: Self Elaboration

Figure 135 - Sampling Sufficiency of Genera registered in the Entomofauna Survey, Senegal Farm, Assis Brasil, Acre, 2023.



Source: Self Elaboration

Table 74 - Diversity indices in the entomofauna survey, Senegal Farm, Assis Brasil, Acre, 2023.

Indexes	Observed	Estimated
Richness (S)	36,00	59,95
Diversity of Shannon-Wiener (H')	16,50	17,52

Diversity of Simpson	12,07	12,34

Source: Self Elaboration

Studies conducted with dipterans throughout the state of Acre are scarce, therefore, both the number of species and the occurrences of this region are insufficient for the knowledge of the regional pool of these species. In addition, the secondary data were not sufficient, since there was only one record for the area, which reinforces the need for sampling on the farm using alternative methods, to meet the lack of data from the unsampled areas.

The survey involving the study area showed that it is necessary to carry out in-depth studies in these areas, because, in order to know the endangered species of these areas, a technical study such as this one is important. Teles (2015) in his study conducted in the Upper Purus River, region of the state of Acre, noted that the prevalence of Leishmaniasis cases in some municipalities characterized a great concern for the health authorities of the state.

Another important factor is that most of the studies conducted in Acre have identified the correlation of the increase in the fauna of sandfly mosquitoes and the considerable cases of Leishmania in isolated regions of urban areas. Therefore, by relating the occurrence of these organisms with the records of diseases that are caused by insects, it becomes clear the understanding that technical studies compromised in scientific research are determinant for further investigation of these organisms.

Every year, several entomology studies in Acre are conducted and published, however, most of them strive to propose new approaches with a focus on agriculture, since the state of Acre has grown considerably in the agricultural sector forgetting the environmental aspect and zoonoses (Mendonça et al., 2003). In this survey of secondary data some of the records that were found in the entomological surveys, have an evident medical importance according to the records of the Surveillance and Entomology Service of the State of Acre, however, especially within the rubber plantations the absence of these studies reveals the need to go to the field so that new species of insects that cause diseases and other arboviruses are known.

In Acre, species of the culicidae family have important epidemiological prominence since they can transmit pathogens to humans and the literature describes these organisms as potential causes of diseases such as arboviruses and other human health problems in the state.

Collecting information about insects in Acre is characterized as an important tool in areas far from large urban centers in Acre, because knowing more about these organisms is the first step to propose decision-making in the face of public health problems.

In addition, it is noted that there are other genera such as *Coquillettidia, Haemagogus, Mansonia, Psorophora and Sabethes* and that are also related to the transmission of etiological agents of various diseases such as encephalitis, wild yellow fever, among other arboviruses, however, for these genera to be better understood, studies in the field and especially in these areas are essential.

5.1.1.6.2 Ichthyofauna

With an area of about 7 million km², with more than 5 million in Brazilian territory, the Amazon Basin is the largest watershed in the world (Val, 2019). It is home to tropical forest ecosystems that account for 40% of the global tropical area and is responsible for draining all water resources that converge on the Amazon River (Aragon et al., 2014; Weng et al., 2018). This basin is composed of a great diversity of water bodies, including rivers, lakes and small streams called igarapés (Brito Júnior & Estácio, 2013; Beltrão et al., 2019).

The igarapés are a fundamental part of Amazonian aquatic ecosystems, harboring a great diversity of fish (Beighley & Gummadi, 2011; Beltrão et al. , 2019). Most of these species are small and belong to several orders, such as Characiformes, Siluriformes, Ciclhiformes, Gymnotiformes and Cyprinodontiformes, the first two being the most predominant (Sabino & Zuanon, 1998; Lowe-McConnell, 1999; Dutra et al. , 2020). It is estimated that about half of the fish species found in the Amazon inhabit bedside igarapés, which have high levels of endemism (Junk & Piedade, 2004;d).

It is essential to emphasize that the fish that inhabit the igarapés depend heavily on the presence of riparian vegetation that surrounds these bodies of water. And this vegetation provides allochthonous material, such as flowers, fruits, leaves and insects, which are fundamental to the survival and diversity of these fish (Goulding, 1980; Lowe-McConnell, 1999; Roa-Fuentes & Casatti, 2017). In addition, the presence of riparian forest acts directly in maintaining the diversity of stream fish, as it modifies the physical and chemical structure of the environment (Roa-Fuentes & Casatti, 2017).

According to Goulding (1997), the roots of riparian forest trees make the soil firmer and prevent slippage within the stream, which results in clearer and more transparent waters. Another important factor generated by riparian vegetation is the presence of wood from the branches that fall from the trees, which is used by fish as a food resource and refuge (Brejão et al., 2013; Montag et al., 2019; Benone et al., 2020), which is directly related to the physical structural complexity of the habitat.

The diversity of species found in Amazonian igarapés drives all regional diversity, making the Amazon watershed the most biodiverse on the planet, with about 4,000 species identified (Jezequel et al., 2021). However, it is estimated that this diversity can reach more than 10,000 species (Reis et al., 2016). Unfortunately, much of this diversity has not yet been exploited in many areas, and these species are at risk of extinction due to anthropogenic actions, such as pasture, agriculture, urban sprawl, and illegal mining (Leitão et al., 2013), leading to the extinction of many fish communities, even before they are discovered. Therefore, it is important to adopt effective measures for the preservation of the Amazonian streams and their biodiversity, thus ensuring the survival of these communities and the maintenance of the ecological wealth of the region.

In this context, it is of paramount importance to understand and know how the structures of aquatic community's work in the Amazon region, especially the western region where information and fauna are still totally undersampled, resulting in large gaps, both for the knowledge of new species and for the distribution pattern.

Secondary data collection was standardized for all fauna groups in this project. In addition to the GBIF database, the survey was directed to the most diverse aquatic ecosystems located in the region of the state of Acre, such as: lakes, streams, and rivers. The search included literature in English, Spanish and Portuguese applying as a search criterion the target group and the environment (i.e., fish from streams, fish from lakes, fish from rivers, ichthyofauna, streams, river, lake), and some characteristics referring to the group "fish" and different keywords (for example, analysis of intestinal content; community diet; trophic structure of the community; food ecology; trophic interactions. In addition, we use our own stored or published databases.

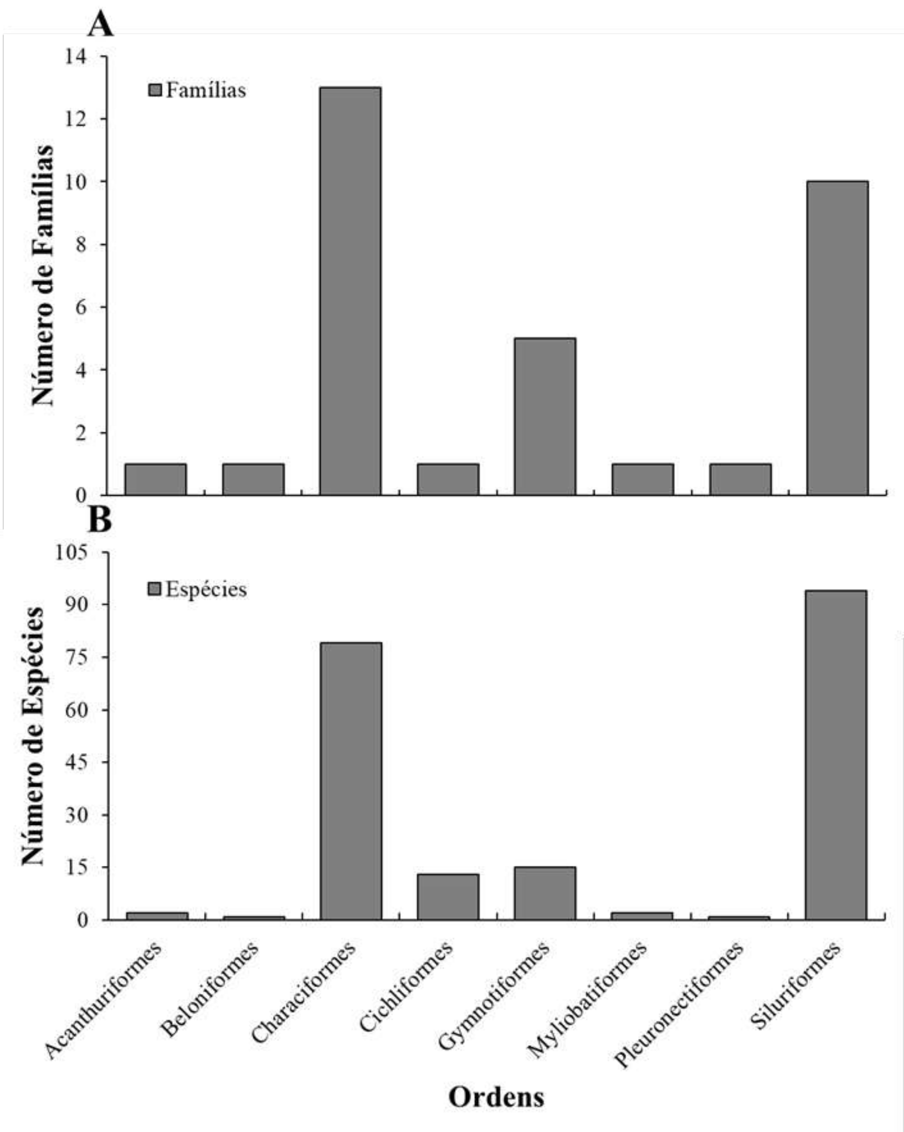
In addition, an extensive search was carried out in the online data repositories on the occurrence record of fish species in Brazil, such as SpeciesLink (2023) stands out for aggregating information on records of occurrences of species while Fishbase (Froese & Pauly, 2023) and Catalog of Fishes (Fricke et al., 2023) for providing information on taxonomy, distribution and life history of species in Brazil and the world. Other important databases have been published (Jézéquel et al., 2020; Dagosta & De Pinna, 2021; Tonella et al., 2022) or made available by Brazilian portals (https:// portaldabiodiversidade.icmbio.gov.br/portal/). Data that presented the information of location (latitude and longitude), date, location, team of collectors and deposited collection were prioritized.

The spreadsheet data underwent an extensive filtering and exclusion of some occurrences following some criteria, such as: occurrences without geographic coordinates, species that do not present proven geographic distribution for the region, as well as species that present endemic occurrence for other spatially distant basins. In addition, all species were evaluated for taxonomic status to verify whether the species are still valid.

From the quantification of the use of land cover within the buffer of 120km we found that the area surrounding the Senegal farm presents a high percentage of forest cover (92.25%), and a low percentage of pasture (7.29%) and very low percentage of urbanized area, with only 0.005%.

The initial survey in the available databases resulted in a total of 638 records, belonging to 207 species, 144 genera, 33 families and 8 orders. Among the orders, Characiformes was the one that presented the highest number of occurrences with 296, families (13) and species (79), however, for species the order Siluriformes was the most representative with 94 species. The other orders presented low values of richness, number of families and species. We highlight that for fish the popular names vary by regions, and commonly we can find the same popular name for several different species, we can highlight the Characiformes: piabas, traíra, tambaqui, matrinchã, dourado, curimatá, piranha, peixe-borboleta, piau, peixe-cachorro. Siluriformes: bagres, mandi, cascudos, candiru. Gymnotiformes: sarapó, poraquê. Acanthuriformes: Pescada. Belonidae: peixe-agulha. Cichliformes: acará, tucunaré, joaninhas. Myliobatiformes: raias. Pleuronectiformes: linguado. We emphasize that popular names of fish vary from locality to locality, in addition a popular name, in its great majority, is used for different species of fish.

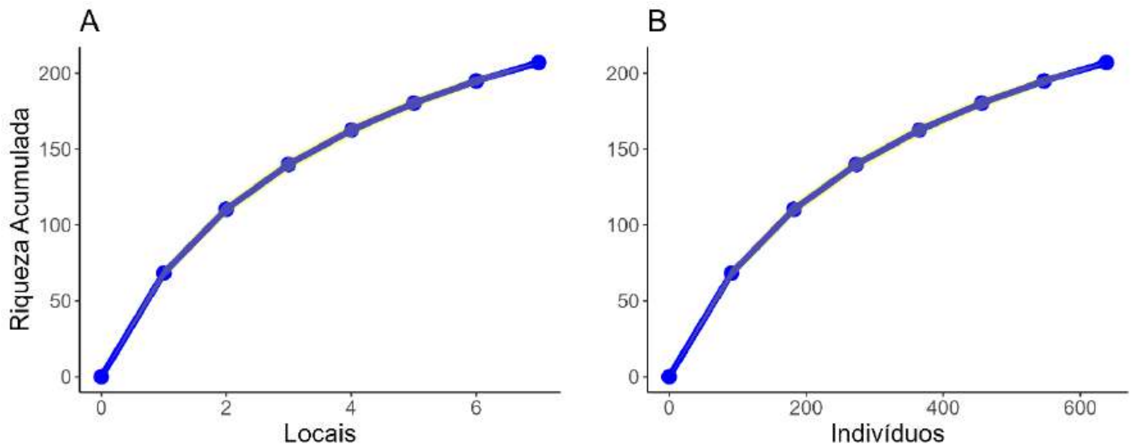
Figure 136 - Richness of Ichthyofauna recorded in the survey of the Senegal Farm, Assis Brasil, Acre, 2023. A - Orders, families, and occurrences of fish; B - Orders, number of species and occurrences of fish.



Source: Self Elaboration

The species accumulation curve showed that the number of occurrences is not enough to represent the fish community in the Senegal area, either evaluated by locations or based on the number of individuals, in this case the number of occurrences. The non-stabilization of the curve reflects which subsampled the region is, requiring extensive studies in a short period of time to remove the temporal bias that the data may indicate.

Figure 137 - Sample sufficiency observed during the Herpetofauna survey in Fazenda Senegal, Assis Brasil, Acre, 2023. A – secondary sampling sites; B – registered wealth.



Source: Self Elaboration

The diversity analysis indicated that the area of the Senegal Farm has a high value of total Shannon Diversity (H' = 4.99), ranging from 0.69 (Grid4) to 4.19 (Grid3). The Pielou Equitable Value ranged from 0.953 (Grid3) to 0.987 (Grid6; Table 2). We also observed that the place with the highest richness (Grid3) presented the highest value of Shannon Diversity (H' = 4.28) and Dominance (D = 0.983).

Table 75 - Diversity indices obtained in the survey of the Ichthyofauna at Fazenda Senegal, Assis Brasil, Acre, 2023.

	Richness	Shannon	Simpson	Pielou
Grid1	65	4.002	0.979	0.959
Grid2	18	2.846	0.939	0.985

Grid3	89	4.280	0.983	0.954
Grid4	1	0.000	0.000	-
Grid5	31	3.362	0.963	0.979
Grid6	47	3.803	0.976	0.988
Grid7	81	4.198	0.982	0.955

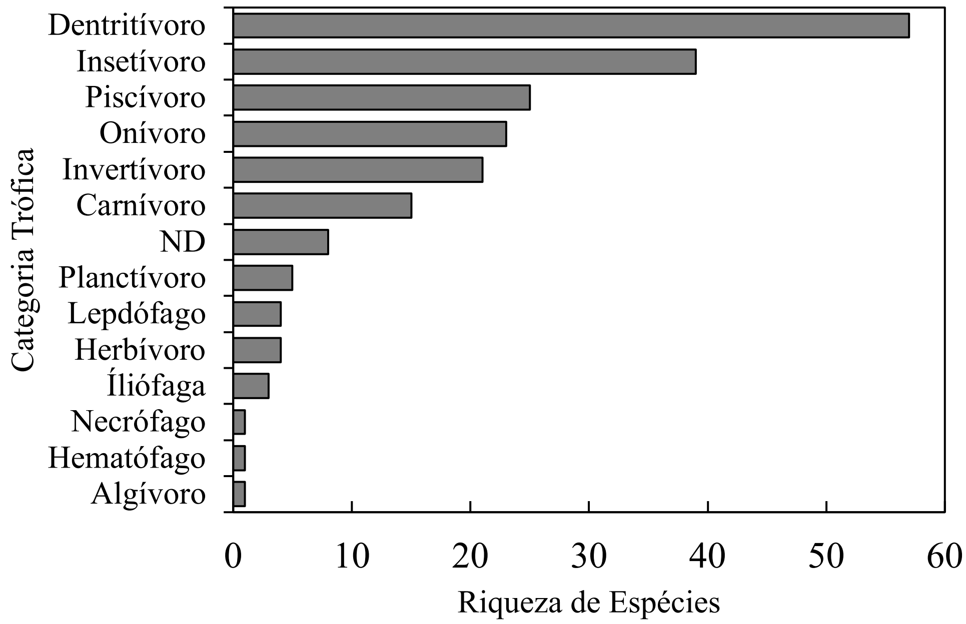
Source: Self Elaboration

The Western Amazon presents a huge diversity of fish, distributed in the most diverse environments, being concentrated mainly in rivers, lakes, and streams. This pattern found in the region follows that described for the fish fauna of the Neotropical region (LoweMcConnell, 1999; Duarte et al., 2010; Reis et al., 2016). This great diversity found is mainly driven by the terra firme streams, which usually has a forest cover that provides allochthonous resources for the maintenance of the ecosystem (Montag et., 2019). In fact, the presence of riparian vegetation is fundamental for the maintenance of aquatic communities (Arantes et al., 2018), making available food resources, such as insects, which will feed the species dependent on this resource and that will indirectly feed the piscivorous and carnivorous species, maintaining the flow of energy within the chain (Ferreira et al., 2018). In this sense, the high diversity, equitableness, richness, and dominance recorded in our results is related to these factors.

Despite this, the non-stabilization of rarefied richness demonstrates that the regional *pool* of species is not yet fully known, and new fish can still be found with other studies. This information is paramount to understanding how the Amazonian ichthyofauna is still underestimated, as new species are described every year (Drawert, 2022; Guimarães et al., 2022). We also emphasize that aquatic biota is at risk due to the conversion of forested areas to pasture, opening of roads and expansion of cities (Lujan et al., 2013; Arantes et al. 2018). These activities can lead to increases in similarity and decrease in spatial rotation of species, caused by a reduction in structural complexity and habitat diversity, resulting in biotic homogenization (Hewitt et al., 2005; Petsch, 2016).

The species were classified into 15 trophic categories, and the most representative category was detritivorous with 57 species, followed by insectivorous (39 species) and piscivorous with 25 species. Eight species were not possible to classify because they are data not available in the literature, so we classified them as ND – Not Defined.

Figure 138 - Trophic structure of the fish that occur in the surrounding area of the Senegal Farm.



Source: Self Elaboration

The trophic categories of specialized species, such as detritivores (the cascudos *Ancistrus* sp. and *Rhadinoloricaria bahuaja* and the piaba *Knodus smithi*), the insectivores (piabas *Astyanax bimaculatus*, *Creagrutus barrigai* e *Engraulisoma taeniatum*), the piscivores (traíra *Hoplias malabaricus*, cachara *Pseudoplatystoma fasciatum* and piranha *Serrasalmus rhombeus*) presented higher species richness than generalists such as omnivores (acará *Cichlasoma amazonarum*, the piabas *Gymnocorymbus thayeri*, *Serrapinnus microdon*).

This finding is a good indication of the environmental balance maintained in the locality investigated in the present study, as specialist fish species tend to be favoured in preserved localities (Ferreira et al., 2018). In addition, degraded sites decrease species with specific sets of functional characteristics associated with allochthonous and litter structures, negatively affecting them and in some cases extinguishing them (Brejão et al., 2018). In addition, Santos et al. (2020) recorded how highly fragmented sites decrease water quality and, consequently, the abundance of specialist fish, such as detritivores.

Riverine communities make heavy use of fish protein for food and supply of local and regional markets (Passos et al., 2008; Sarti et al., 2015), therefore, in certain cases, these populations are dependent on these organisms. In this sense, among the registered fish, we highlight below some with economic importance that are probably consumed or traded by the surrounding community, as well as can be exported.

Pimelodids can reach high sizes, with species widely used throughout South America for commercial and subsistence fishing, such as piracatinga *Calophysus macropterus*, the mandim *Pimelodus blochii*, pintado

Pseudoplatystoma fasciatum (Queiroz et al., 2013), and one of the most consumed fish in the state of Acre, the bico-de-pato *Sorubim lima* (Cavalcante et al., 2016). In addition, other species, such as the piau *Leporinus friderici*, matrinxã *Brycon* sp., curimatã *Prochilodus nigricans*, tucunaré *Cichlasoma amazonarum*, the branquinha *Potamorhina* sp., among others they are also important for Acre riverine communities (Jacó et al., 2020; Ferreira et al., 2022).

Another market that can be taken advantage of by local communities is the export of ornamental fish from the Amazon. Tribuzy-Neto et al. (2020) reported that between 2006 and 2015, only for the state of Amazonas, 142,552,253 units of live fish specimens, referring to 375 species, were exported to countries such as Germany, Taiwan, the United States, etc. Among the exported species, there are several species reported in our studies, such as: the glass wiper bagre *Otocinclus vittatus*, the calictiídeo *Corydoras rabauti*, the piaba *Hyphessobrycon*, the traíra *Hoplias malabaricus*, the loricarídeo *Peckoltia brevis*, among others. In this way, these species can be used, sustainably, to move the local economy. Evers et al. (2019) point out that fisheries and aquaculture aimed at supplying the freshwater ornamental fish trade can be sustainable if managed and regulated properly.

5.1.1.6.3 Herpetofauna

Considering the threats caused by environmental impacts in the Amazon, the importance of amphibians and reptiles for the maintenance and balance of the environment, and as bioindicators of environmental quality, this partial report provides relevant information on the survey of herpetofauna at Fazenda Senegal, in the municipality of Assis Brasil, Acre, Brazil, where REDD+ actions will be implemented.

Secondary data collection was standardized for all fauna groups. In addition to the GBIF database, the survey and systematization of secondary data on the biodiversity of the Herpetofauna in the study area and surroundings was carried out through information in a database of academic-scientific production: scientific articles and reports, dissertations and theses, technical reports, and environmental impact studies.

In addition, surveys were carried out in the field, through time-limited search - day and night (PLTD AND PLTN). It consisted of moving on foot, slowly in a transect, looking for visually exposed amphibians and reptiles. The search effort covered all visually accessible micro-habitats. In this method it is possible to obtain more accurate information about the activity of the animal and its location in the habitat. This method differs from the active search because the researcher goes through transects and does not turn the environment, looking only for visually exposed animals (Bernarde et al., 2017). The activities were initiated in the morning (05:30h to 10:30h) and in the night period (18:00h to 21:00h), totaling eight hours daily of search.

During the PLTD (Figure 174 A) and PLTN (Figure 174 B) all the observed species were recorded in a field booklet. When possible, amphibian and reptile species were photographed with a digital camera to aid in identification. Some specimens were captured manually (amphibians and lizards, and non-venomous snakes) for identification at the lowest possible taxonomic level and then released. The species were identified in the field using the photographic guides, keys and descriptions present in literature (e.g., Avila-Pires, 1995; Souza, 2009; Bernarde et al., 2011; 2013; 2017; Fonseca et al., 2019; Freitas et al., 2020). The nomenclature used for the species follows that proposed by Segalla et al. (2021) for amphibians and Costa et al. (2021) for reptiles.

Figure 139 - Trophic structure of the fish that occur in the surrounding area of the Senegal Farm.

Source: Field Team

During the PLT, anuran amphibian species in vocalization activity were recorded, estimating the number of vocalizing specimens (Heyer et al., 1994).

Specimens of amphibians and reptiles observed after or before PLTD and PLTN were recorded in the study area. The species recorded during occasional encounters were not used in the data analysis of this report, however, they were used to complement the list of species of the herpetofauna of the property (Martins & Oliveira, 1998).

A total of 159 amphibian and reptile species were recorded using primary and secondary data. See some photos taken. A total of 155 species were recorded through secondary data for the surroundings of the farm, being 72 species of amphibians (two orders and nine families) and 83 of reptiles (three orders, three suborders and 20 families Among the amphibians, the most representative families in relation to species were Hylidae (28 species), followed by Leptodactylidae (13) and Craugastoridae (8). Regarding reptiles, the most representative families were Dipsadidae (23 species; Snakes), followed by Colubridae (14; Snakes), Teiidae (6; Sauria), Boidae (4; Snakes), Gymnophthalmidae (4; Sauria), Viperidae (4; Snakes).

Figure 140 - Some species of amphibians and reptiles recorded in the survey of herpetofauna, Fazenda Senegal, Assis Brasil, Acre, 2023. A- Rhinella margaritifera; B- Ameerega trivittata; C- Gonatodes humeralis; D- Copeoglossum nigropunctatum; E- Epicrates cenchri

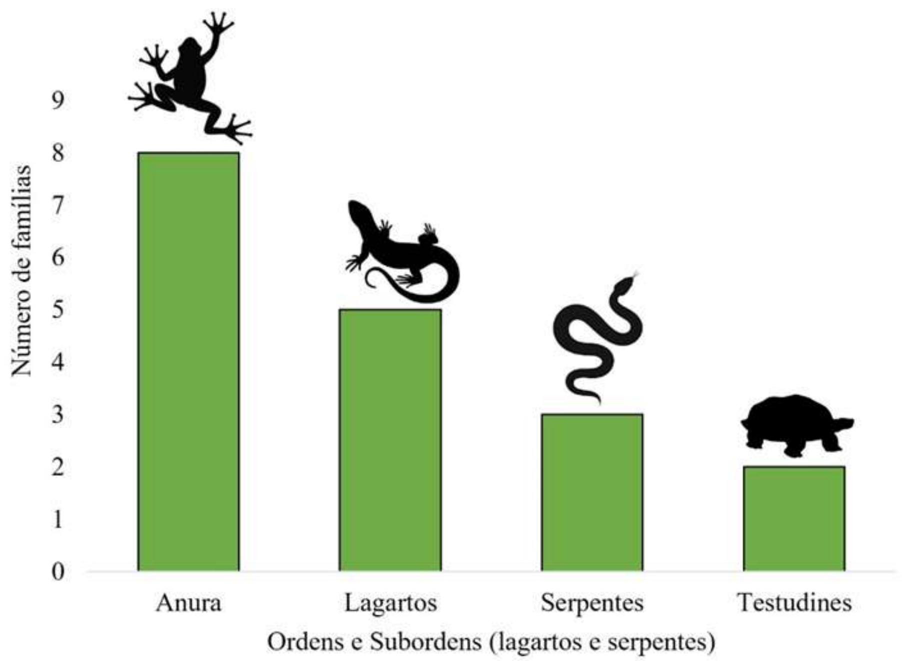
Source: Field Teams

The richness recorded through secondary data during the survey of herpetofauna in the surroundings of the Senegal farm represents 46.1% of the amphibian species and 53.5% of reptiles that occur in the state of Acre (Fonseca et al., 2022). In the case of the Amazon, the number of species is equivalent to 17.6%

of amphibians and 21.5% of reptiles recorded in this biome (Prudente, 2017; Avila-Pires, 2022; Hoogmoed, 2023).

During the survey of the Herpetofauna in the area of the Senegal farm, 33 species of amphibians (20 species) and reptiles (13 species) were recorded, represented by three orders (Anura, Squamata and Testudines) and two suborders (Lizards and Snakes). The family with the highest number of amphibian species was Hylidae (8), while for reptiles, the families with the highest number of species were Colubridae (snakes), Sphaerodactylidae (lizards) and Podocnemididae (turtles), all with two species. The richness recorded during the herpetofauna survey in the Senegal farm area represents 12.5% of amphibian species and 8.3% of reptiles that occur in the state of Acre (Fonseca et al., 2022).

Figure 141 - Richness of families of the orders Anura, Squamata (suborders Lizards and Snakes) and Testudines, recorded in the survey of the herpetofauna at Fazenda Senegal, Assis Brasil, Acre, 2023.

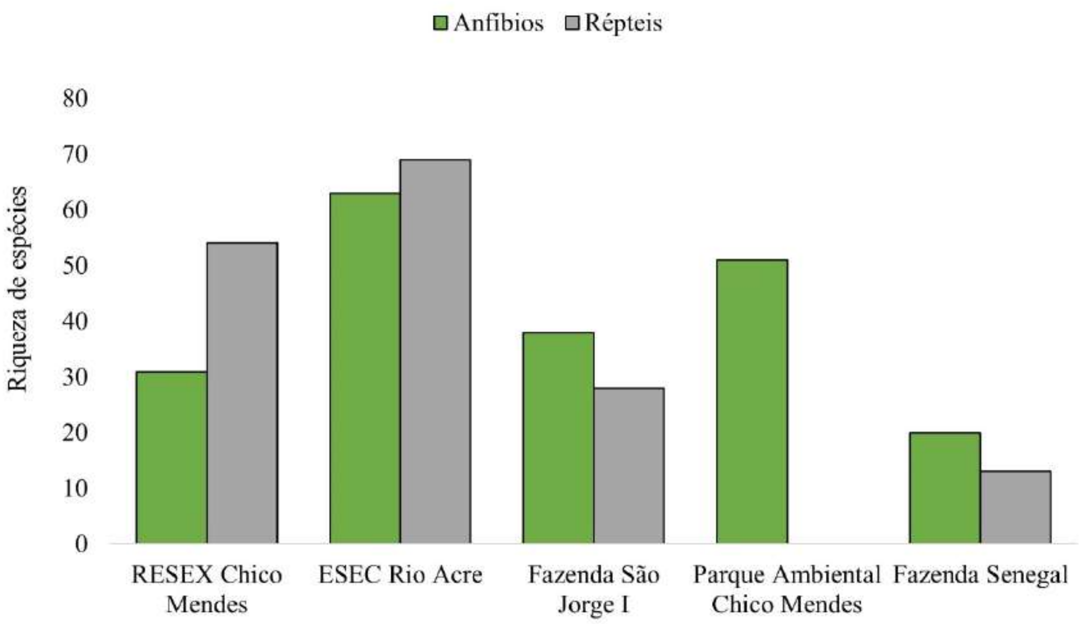


Source: Self Elaboration

Compared to studies conducted near the farm property, the richness of amphibians recorded in the project area is quite representative considering the short sampling period. In the area of the farm, the richness found is equivalent to 64.5% of the species recorded in the Chico Mendes RESEX (França et al., 2017), 31.7% of those registered for the ESEC Rio Acre (Freitas et al., 2020), 52.6% of those registered for the São Jorge I Farm (Miranda et al., 2014) and 39.2% of the species registered for the Chico Mendes

Environmental Park (Venâncio & Souza, 2016). In relation to reptiles, the richness of the area is 24.7% of the species found in the Chico Mendes RESEX (França et al., 2017) and 18.8% of the species recorded for the ESEC Rio Acre (Freitas et al., 2020).

Figure 142 - Comparative graph of the lists of species of Amphibians and Reptiles recorded in studies around the Senegal Farm, Assis Brasil, Acre.

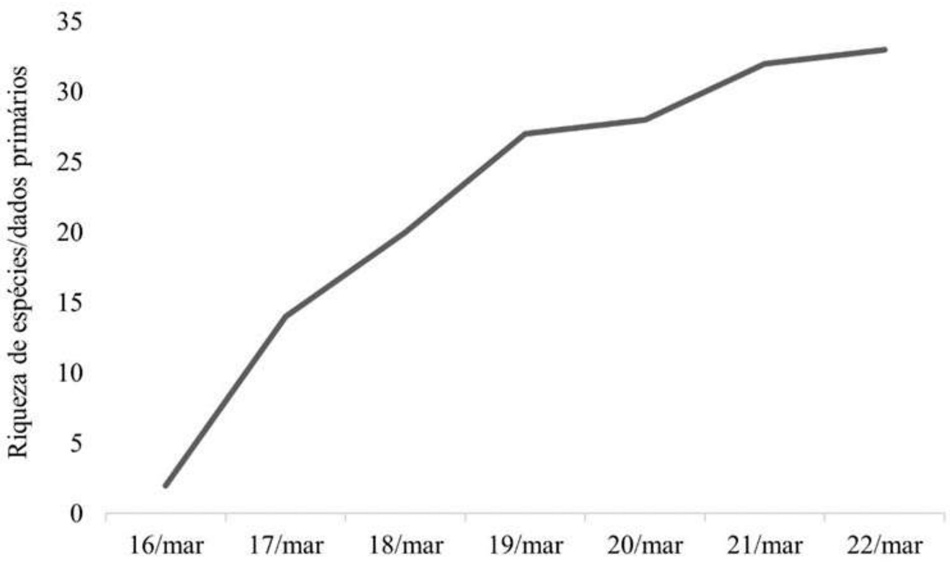


Source: Self Elaboration

The low species richness recorded during primary data collection may be associated with the vegetation of the area where the collections were performed. In the area there is a large presence of bamboo (*Guadua* sp.), which may be directly affecting the abundance and richness of species, since most species are also recorded in anthropogenic environments and are not very dependent on primary and secondary forests for their survival.

Thirty-three species of amphibians and reptiles were found in the Senegal farm area using the Time Limited Search method. To confirm whether the effort employed during the monitoring of the herpetofauna was sufficient to record the species in the study area, species accumulation curves were performed as a function of the sampling days. The species accumulation curve did not estimate a stabilization trend in an asymntote and, based on the number of species recorded, the Jackknife 1 estimator estimated the possibility of 15 more species being recorded, indicating the need for a greater sampling effort in the area.

Figure 143 -Sample sufficiency observed during the Herpetofauna survey in Fazenda Senegal, Assis Brasil, Acre, 2023.



Source: Self Elaboration

Table 76 - Diversity indices obtained in the Herpetofauna survey at Fazenda Senegal, Assis Brasil, Acre, 2023.

Abundance (N)	Richness (S)	Shannon-Wiener (H')	Equitable of Pielou (E)	Dominance (K)
33	107	2.72	0.77	0.04

Source: Self Elaboration

According to the Red Book of Endangered Fauna (ICMBio, 2018) no species recorded through the collection of secondary data falls under any degree of threat of extinction. The lizard *Pseudogonatodes gasconi* is a relatively small (45 mm) and rare species, known only to the left bank of the Juruá River in the municipality of Porto Walter, Acre, and was recently registered for the ESEC Rio Acre, in Assis Brasil (Freitas et al., 2020). The amphibians *Boana cinerascens* and *Pristimantis diadematus*, the snake *Thamnodynastes pallidus* and the chelonium *Podocnemis sextuberculata* represent the first records of the species for the Upper Acre region (Ferrara et al., 2017; Fonseca et al., 2022). No invasive species were recorded for the region of the project zone.

Two species of turtles (*Chelonoidis denticulatus* and *Podocnemis unifilis*) are hunted for subsistence by traditional populations. In addition to their hunting importance, these animals have great ecological importance in the environment, since they are seed dispersers and consumers of organic matter, directly assisting in the decomposition and cycling of nutrients in the ecosystem (Cajaiba et al., 2015).

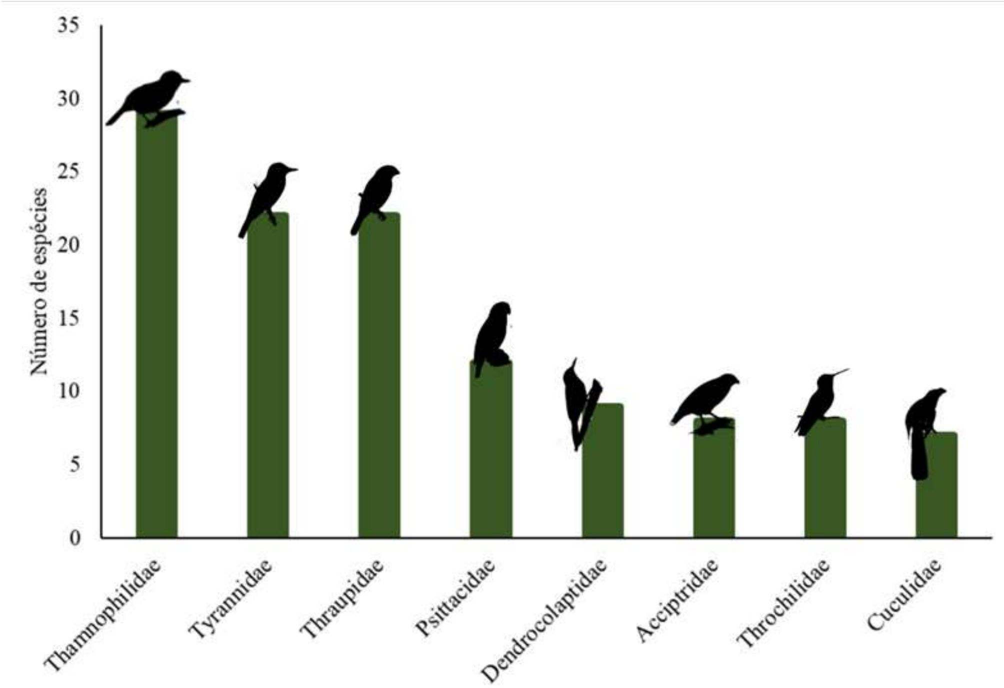
Some recorded amphibian species, for example, *Trachycephalus cunauaru* and *Ctenophryne geayi*, as well as some lizard species (*Alopoglossus brevifrontalis*, *Cercosaura eigenmanni* and *Copeoglossum nigropunctatum*), are considered bioindicators of environmental quality because they are sensitive to environmental changes and are dependent on primary forest or with little environmental disturbance for their survival (Lima et al., 2006; Vitt et al., 2008; Ribeiro-Júnior & Amaral, 2017). These records demonstrate that the forest area of the farm is important for the conservation of the species.

The snakes of the family Elapidae (True Corals) and Viperidae (Jararaca, Papagaia, Surucucu-pico-de-jaca, Surucucu) recorded by primary and secondary data present medical importance for presenting the ability to inoculate venom in humans (Bernarde, 2014). These animals are bioindicators of environmental quality, since some species are recorded only in well-preserved terra firme forest environments and some have arboreal habits, for example, the species *Bothrops bilineatus smaragdinus*) (Bernarde, 2012).

5.1.1.6.4 Avifauna

A total of 281 bird species belonging to 61 families and 25 taxonomic orders were recorded, totalling 661 specimens. A total of 186 species were recorded in the secondary data collection methodology and 204 species during the active field search. Of the total number of species recorded, 139 species belong to the non-passerine taxa and 142 species belong to the order Passeriformes. Among the non-passerines, the families with the highest number of species were Psittacidae (12 species), Acciptridae (8 species), Trochilidade (8 species) and Cuculidae (7 species); for Passeriformes, the most representative families were Thamnophilidae (29 species), Tyrannidae (22 species), Thraupidae (22 species) and Dendrocolaptidae (9 species).

Figure 144 - Representativeness of the species richness of the Family taxon recorded in the survey of avifauna, Fazenda Senegal, Assis Brasil, Acre, 2023.



Source: Self Elaboration

In this survey, the List Frequency Index (LFI) was calculated, which discloses the relative abundance of each species as a function of the conspicuity coefficient, through the number of eye and/or auditory contact and the total number of samples (Blondel et al., 1970). In this study, the number of contacts was obtained for each species registered on the Senegal property and divided by the total number of lists (33) in the period of the survey of the avifauna in the field. The values of List Frequency Index there are variations from 0.03 (1 contact) to 0.69 (23 contacts), with an average of 0.30, that is, approximately 8 contacts/species. What was observed is that 15% of the species are abundant in the area, that is, more generalists and a greater number of registered individuals, and the species with the lowest number of contacts (65%) are inserted in categories of discrete and/or inconspicuous ones, of difficult audiovisual contact.

Frequency of contacts with bird species through the List Frequency Index using the Mackinnon list methodology in the survey of avifauna, Fazenda Senegal, Assis Brasil, Acre, 2023

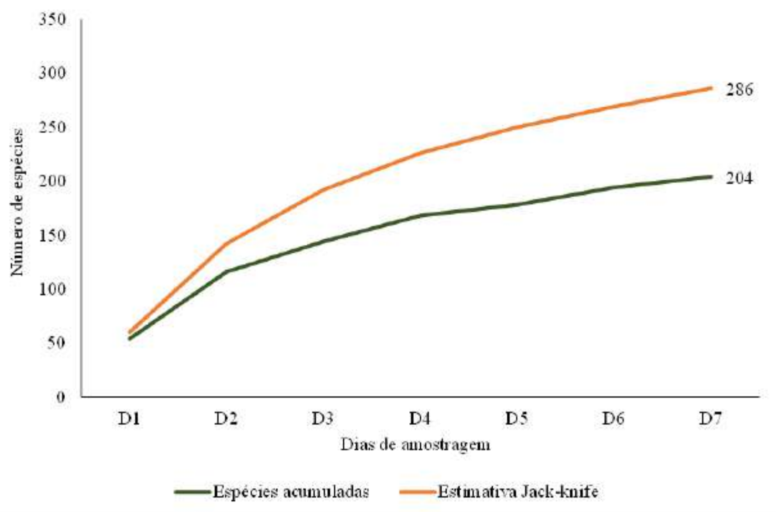
Table 77 - Frequency of contacts with bird species through the List Frequency Index using the Mackinnon list methodology in the survey of avifauna, Fazenda Senegal, Assis Brasil, Acre, 2023

Contacts	Average	Number of species per contact
1 a 4	0,03-0,12	123
5 a 8	0,15-0,24	26
9 a 12	0,27-0,36	9
13 a 17	0,39-0,51	3
23	0,69	1

Source: Self Elaboration

The sample sufficiency in the species accumulation curve at the Senegal Farm presented the following information: the actual number observed was 204 species and the non-parametric richness estimator presented a higher value than that observed in the field (Jackknife 1 = 286 species; The actual richness observed did not reach levels of stability, but a high number of species and even a value similar to that defined by the non-parametric estimator (82 species of difference) is considered, due to the size of the property, access to sampling sites and, mainly, the number of days of sampling in the field. It is worth mentioning that in tropical regions it is not common to achieve stability in the cumulative curve of species (Santos, 2006), because it depends on the sampling effort employed and easy access to sampling points.

Figure 145 - Sample sufficiency observed in the survey of avifauna, Fazenda Senegal, Assis Brasil, Acre, 2023.



Source: Self Elaboration

In the Shannon-Wiener diversity analysis (H'), the results showed that the area has a high richness of bird species. Diversity indices may be high due to more sampling days on the field bird community, in addition, and other characteristics influence the values of the indices, such as regional climate instability, limiting the time of daily sampling. These values of richness and abundance of birds in the area can be answered by the conservation of fauna, which is directly linked to flora, since the surroundings of the property are limited by protected areas, and this is an important factor for the conservation of bird species.

Table 78 - Frequency of contacts with bird species through the List Frequency Index using the Mackinnon list methodology in the survey of avifauna, Fazenda Senegal, Assis Brasil, Acre, 2023

DIVERSITY INDICES				
Abundance (N)	**Richness (S)**	**Shannon-Wiener (H')**	**Equitable of Pielou (E)**	**Dominance (K)**
569	204	4,75	0,93	0,01

Source: Self Elaboration

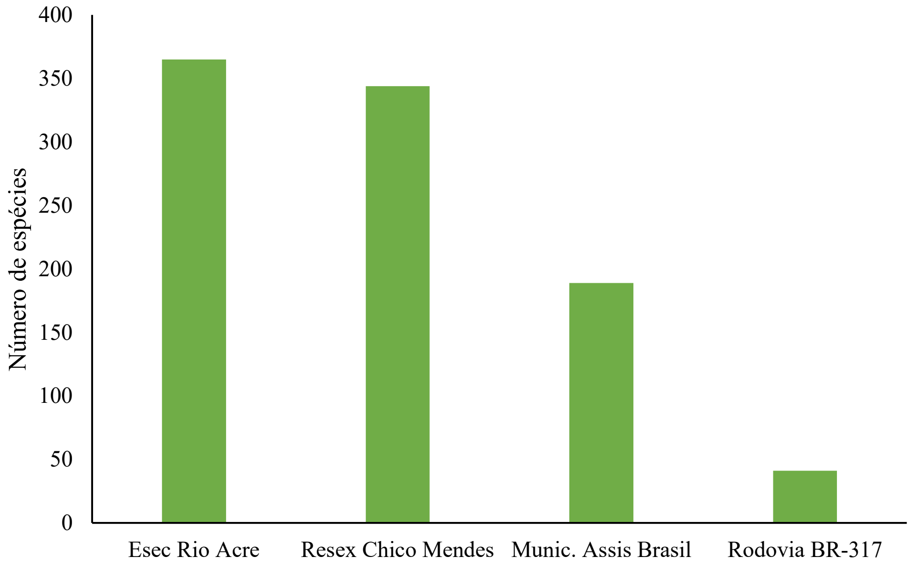
The survey of available scientific information about the avifauna in the surroundings of the Senegal Farm represents 39.6% of the species recorded for the state of Acre. This richness of the avifauna can reach higher levels when observed the heterogeneity of the vegetation and the high elevations of the terrain inside the property and the longer sampling time in the area. Richness estimators (e.g., the jack-knife) are related to the presence of a high number of rare and/or less frequent species in the area (Ribon et al., 2006), in addition to the experience of the specialist.

The surroundings of the property are composed of native Amazon rainforest and areas opened by anthropic actions. To reduce the negative impact in relation to deforestation in the southwest region of the state, there are protected areas or Conservation Units (UCs) of Federal management in the area surrounding the property, such as the Chico Mendes Extractive Reserve (RESEX), the Ecological Station (ESEC) Rio Acre and the Indigenous Lands (TIs) Mamoadate and Cabeceiras do Rio Acre.

The richness of bird species recorded in the survey of secondary data for the region is similar to that found in samples of scientific survey of avifauna in Conservation Units, such as the RESEX Chico Mendes (344 species; Mestre et al., 2010) and ESEC Rio Acre (365 species; Alexios & William, 2010).

The secondary data information acquired in the GBIF platform presented the following information: 189 species of birds for the municipality of Assis Brasil and 41 species recorded on the federal highway BR-317, access to the municipalities of Assis Brasil and Brasileia. These results originate from people who practice *birdwatchig*, that is, a person or group of people who observe wild birds in the region and provide the data of the records in national and/or international citizen science platforms, such as the wild bird information application, eBird. From the provision of this data, scientists use these platforms to explore the pattern of distribution and abundance of avifauna species, assisting in the conservation of birds and, directly, in the conservation of general biodiversity.

Figure 146 - Representativeness of bird species richness among areas that were carried out secondary data collection in the southwest region of the state of Acre.



Source: Self Elaboration

The bird species recorded in this field survey and secondary data were classified into the following food guilds insectivores (n= 145 species), omnivores (n = 60 species), frugivores (n= 21 species), carnivores (n= 16 species), nectarivores (n= 8 species), granivores (n= 7 species) and dentritivores (n= 4 species).

The food guilds recorded in the surroundings and in the field are typical species of open environments, primary forest, and forest edges. The vegetation of the study area is composed of primary forest and areas in advanced stage of regeneration, both with characteristics of ombrophilous forest open with bamboo, and a characteristic of this habitat is the presence of birds specialized to this vegetation, usually the taminophilids that, in large majority are inserted in the insectivore food guilds. The habitats dominated by bamboo of the genus *Guadua* have biotic and abiotic conditions favourable for the arrival and permanence of several species of insects that use the micro-habitat as the stems and internodes for reproduction, therefore, creating conditions with greater availability of food resources, benefiting the species of birds that have intimate association with these habitats. Insectivorous species are experts and abundant in forests and more open areas by having an improved field of view, allowing efficiency to forage by insects and other invertebrates (Terraube et al., 2016). The species included in the frugivorous and omnivorous food guilds are more resilient to generalist habitats (Guilherme & Cintra, 2001; Henriques et al., 2008), and adapted to look for food available for a limited time, such as trees with fruits and seeds (Alencar & Guilherme, 2020).

Food guilds of the species recorded in the survey of avifauna, Fazenda Senegal, Assis Brasil, Acre, 2023.

In this survey, two databases were used to classify the conservation status of bird species: the Chico Mendes Institute for Biodiversity Conservation (ICMBio) and the International Union for Conservation of Nature (IUCN). Most of the species recorded have a conservation status 'least concern' - ICMBio: 275 species and IUCN: 267 species; highlighted in the categories: 'almost threatened' are the species *Spizaetus ornatus* and *Ara chloropterus*; in the 'vulnerable category', the species *Agamia agami* and *Cnipodectes superrufus*.

Table 79 - Avifauna species included in endangered categories recorded in the survey of avifauna in the area of Fazenda Senegal, Assis Brasil, Acre, 2023.

Legend: ICMBio = Chico Mendes Institute for Biodiversity Conservation; IUCN = International Union for Conservation of Nature; VU – vulnerable; NT – almost threatened.

Species	Popular name	ICMBio	IUCN
Sarcoramphus papa	urubu-rei	NT	-
Spizaetus ornatus	gavião-de-penacho	NT	NT
Ibycter americanus	cancão	NT	-
Ara chloropterus	arara-vermelha	NT	-
Chaetura pelagica	andorinhão-peregrino	-	VU
Agamia agami	garça-da-mata	-	VU
Cnipodectes superrufus	flautim-rufo	-	VU

Source: Self Elaboration

The results showed that, approximately, 97% of the species recorded in this survey of avifauna are not categorized as threatened, however, there are species that inhabit the area that are in categories of concern, such as vulnerable to extinction, such as flautim-rufo (*Cnipodectes superrufus*), a species recently described for science (Lane et al., 2007), restricted to the southwest of the Amazon and specialist in habitats dominated by native bamboo of the genus *Guadua* (Tobias et al., 2008). Because it is a kind of difficult visualization, there are no descriptive works of reproductive biology and behavior. According to Wilman et al. (2014), its diet is composed of insects and small invertebrates, a characteristic that is shared with the other species of the family Rhynchocyclidae. Therefore, encouraging the conservation of the area of the property is of interest to the conservation of bird species, such as the flautim-rufo (*C. superrufus*), with the potential to be a refuge area for this species and others that are inserted in categories of conservation concern.

The Amazon is one of the biomes that houses one of the highest levels of endemism, and consequently, one of the largest in relation to the number of bird species in the country (Sick, 1997; Marini & Garcia, 2005) and the geographical distribution of birds recorded in Brazil is irregular, with some species classified as rare, unusual or punctually distributed. Regarding the rare species, during the survey of secondary information and field data, the pinto-do-mato-de-fronte-ruiva (*Formicarius rufifrons*) and the pica-pau-de-coleira (*Celeus torquatus*) were recorded.

Research over the past five decades in the forests of the southwestern Amazon shows that the region is home to incredible wealth (Kratter, 2020). The pinto-do-mato-de-fronte-ruiva (*F. rufifrons*) is a rare and little-known species, recorded only in the southeastern region of Peru (Schulenberg et al., 2010) and in Brazil, it was recorded in the upper Juruá region (Whittaker & Oren, 1999) and in the extreme east of the state, in the region of the headwaters of the Acre River, in the UC ESEC Rio Acre (Aleixo & Guilherme, 2010), a region located around the Senegal estate, coexisting with the information in the literature on its natural distribution and abundance of the species.

Of the bird species, 13 are restricted to the Inambari endemism center, highlighted: uirapuru-azul (Thamnomanes schistogynus); maria-topetuda (Lophotriccus eulophotes); maria-sebinha-do-acre (Hemitriccus cohnhafti); anambé-da-cara-preta (Conioptilon mcilhennyi) e mãe-de-taoca-de-cauda-barrada (Oneillornis salvini).

Figure 147 - Bird species restricted to the Inambari endemism center recorded in the survey of avifauna, Fazenda Senegal, Assis Brasil, Acre, 2023. A – uirapuru-azul (Thamnomanes schistogynus); B – anambé-da-cara-preta (Conioptilon mcilhennyi). Photos: Ueslei Ma

Source: Field Team

Regarding the birds associated and/or specialists with the habitats dominated by bamboo of the genus Guadua in the southwest of the Amazon, 17 species were recorded, especially the banded antbird (Microrhopias quixensis;), o pica-pau-lindo (Celeus spectabilis) and maria-cabeçuda (Ramphotrigon megacephalum). These species are associated with bamboo-dominated habitats of the genus *Guadua* (Melo & Guilherme, 2016; Guilherme, 2016), regionally known as the 'tabocais'.

Source: Field Team

Figure 148 - Bird species associated with and/or restricted to habitats dominated by bamboo of the genus Guadua recorded in the survey of avifauna, Fazenda Senegal, Assis Brasil, Acre, 2023. A – papa-formiga-de-bando (Microrhopias quixensis); B – pica-pau-lindo

Source: Field Team

It were recorded 13 migratory species. These, five are nearctic migrants (MN), moving from the Northern Hemisphere to the Neotropical region, such as the maçarico-solitário (*Tringa solitaria*) and águia-pescadora (*Pandion haliaetus*); four species are southern migrants (MA), originating in the south of the South American continent: the príncipe (*Pyrocephalus rubinus*) and filipe (*Myiophobus fasciatus*); and four species are intratropical migrants (IM) that perform regional migration, that is, in the interior of the American continent, especially the bem-te-vi-de-barriga-sulfúrea (*Myiodynastes luteiventris*) and the papa-capim-preto-e-branco (*Sporophila luctuosa*). These species migrate from the region of origin to the Amazon due to changes in the climatic season, and the territory of Acre is an important route for their wintering season, as these birds use forest areas as a place of refuge, search for food resources, rest, nesting and, consequently, permanence of small populations in the region.

During the field sampling of the avifauna at the Senegal Farm, two new species were recorded for the region, with the expansion of distribution in the state of Acre and the first audiovisual records for the Brazilian territory: the bem-te-vi-de-barriga-sulfúrea (*Myiodynastes luteiventris*) and the papa-capim-preto-e-branco (*Sporophila luctuosa*). Both are intratropical migrants, that is, they make regional displacements within the Neotropical region. These records are important because they highlight the importance of preserving the native vegetation of the property and surroundings, in which these habitats are used by rare migratory species, such as refuge and rest, for food, nesting, and even being able to fix small populations in the area.

Hunting animals are those species that are usually hunted by riverine and/or isolated communities in the Amazon for the consumption of animal protein. We recorded 30 species considered hunting, with emphasis on the taxonomic families with the highest number of records: Tinamidae (n = 7 species), with emphasis on the species inhambu-anhangá (*Crypturellus variegatus*); Cracidae (n = 2 espécies) represented by jacutinga-de-garganta-azul (*Aburria cumanensis*) Psittacidade (n = 7 espécies), for instance, araracanga (*Ara macao*); Columbidae (n = 3 espécies), as the juriti-pupu (*Leptotila verreauxi*), Ramphastidae (n = 2 espécie) as the tucano-de-papo-branco (*Ramphastos tucanus*), and Psophiidae (1 espécie) with the species jacamim-de-costas-brancas (*Psophia leucoptera*), the latter, endemic to the southwest of the Amazon.

Figure 149 - - Species of hunting birds recorded in the survey of avifauna, Fazenda Senegal, Assis Brasil, Acre, 2023. A – jacutinga-de-garganta-azul (Aburria cumanensis); B – araracanga (Ara macao).

Source: Field Team

Birds with chicken size and robust species have important components in the avian biomass of the Amazon region, providing amounts of animal protein for riparians and indigenous people. During this survey of the avifauna, rare and inconspicuous birds were recorded, such as the inhambu-de-coroa-preta (*Crypturellus atrocapillus*), endemic species and restricted to the Amazonian southwest, with little ecological information, and its first record in Brazilian territory happened in 1994 (Sick, 1997). According to platforms of ornithological records and Brazilian citizen science, there are only nine photographic records for the state of Acre and two auditory records for the territory of Assis Brasil, Acre (Wiki Aves, 2023).

The birds of the Order Tinamiformes are endemic to the Neotropical region and gathers species of galinaceous aspect that have size that has variation of small and medium size and have terrestrial habits due to their adaptation to the environment with mimetic colors (Sigrist, 2014). Although wild birds are not the main source of animal protein in the area, they are fundamental for the subsistence of humans in different areas of the tropical region, especially those who live in places of difficult access (Figueira et al., 2003). In this survey, species of economic and hunting interest were recorded, such as the species of the families Cracidade and Tinamidae. It is worth mentioning that the representatives of parrots (macaws and the like), ramphastids (toucans and the like) and among others have hunting value and the meat of these birds causes an intense pressure resulting from predatory hunting or subsistence. All game bird species sensitive to environmental changes and hunting, therefore, are groups of wild animals important bioindicators of environmental quality and consequently, and the most threatened with extinction in South America.

The area has several species of birds that are considered as bioindicators of environmental quality, highlighted: uru-de-topete (*Odontophorus stellatus*), rabo-branco-amarelo (*Phaethornis philippii*), anambé-una (*Querula purpurata*), formigueiro-chumbo (*Myrmelastes hyperythrus*), chupa-dente-de-cinta (*Conopophaga aurita*), vite-vite-de-barriga-amarela (*Pachysylvia hypoxantha*), saíra-mascarada (*Stilpnia nigrocincta*) and among other species that need preserved habitats and are sensitive to intense environmental changes.

Wild birds have rapid responses to habitat changes at various scales (Sick, 1997). Some bird species are considered more sensitive than other species (Stotz et al., 1996), and those with high sensitivity are considered and recommended as good indicators that environmental quality (Gardner et al., 2008), therefore, what observed in this survey shows that there are several species of birds specialized and/or restricted with high sensitivity to environmental changes, and this is an important sign that the area of the Senegal property has good conditions of ecological balance for the maintenance of the local avifauna, without great pressure and threat to the continuous conservation of these species.

Approximately 90% of bird species in the state are native and resident (Guilherme, 2016). However, during the collection of secondary data and in the field in this study there are records of some invasive species, such as the quero-quero (*Vanellus chilensis*), a coruja-buraqueira (*Athene cunicularia*) e a garça-vaqueira (*Bubulcus ibis*). These species arrived in the region due to the deforestation of native vegetation cover to form open environments (for example, pastures), as these birds are adapted to these habitats. Although these species do not compete and interfere in the permanence of native birds, invasive species are indications of environmental imbalance due to intense anthropic actions in the environment.

To contain the arrival of new invasive species is environmental education in the region, guiding to reduce deforestation and other anthropogenic actions, such as illegal opening of roads and forest fires.

Figure 150 - Invasive bird species recorded in the avifauna survey, Fazenda Senegal, Assis Brasil, Acre, 2023. A – quero-quero (Vanellus chilensis); B – coruja-buraqueira (Athene cunicularia).

Source: Field Team

5.1.1.6.5 Mastofauna

Mammals exhibit wide morphological and physiological diversity (Jones & Safi, 2011), and as a result play several key roles in the regulation and structuring of forest ecosystems (Wright, 2003). The different species can act in different ecological services, acting in the dispersal and predation of seeds (Stoner & Henry, 2005), with a direct impact on the carbon stock (Bello et al., 2015; Sobral et al., 2017) or as predators playing an important role in controlling herbivore populations (Terborgh, 2015).

Despite the important role played, especially in tropical forests (Jorge et al., 2013), mammal species are under constant threats, such as commercial and predatory hunting, habitat loss and degradation through deforestation and forest fires, as well as global climate change through the repetitive extreme events of drought and rainfall in recent years (Bogoni et al., 2020). Thus, the continuous reduction of the population of mammalian species over recent decades has a direct impact on ecosystem dynamics (IUCN, 2020).

Studies that evaluate parameters of terrestrial fauna communities are considered essential for assessing ecosystem health, especially in regions inserted in the context of high biological diversity such as Acre. Based on previous monitoring studies in areas of REDD+ (Reduction of Emissions from Deforestation and Forest Degradation and conservation, sustainable management and increase of carbon stocks), Botelho et al., (2018) cite that the state of Acre is considered of extreme importance for the conservation of mammals, since it has 86% of its area is occupied by forests (INPE, 2020), counting mainly that 46% of the state's territory is protected by Natural Protected Areas - ANP. This reinforces the need for survey and monitoring studies of mammals in private areas.

Secondary data collection was standardized for all fauna groups for this project. In addition to the GBIF database, the survey and systematization of secondary data on the biodiversity of the Mastofauna in the study area and surroundings was carried out through information in a database of academic-scientific production: articles and scientific reports, dissertations and theses, technical reports, and environmental impact studies.

For sampling of diurnal and arboreal mammals, an active search census was performed at the sampling sites by an observer. The active search was carried out by going through the pre-existing trails, for the installation of camera traps. During this activity, active searches for direct and indirect records (traces such as fecal material, tracks, burrows, scratches and among others) were recorded for the listing of mammal species. The trails were covered at an average speed of 1.25 km / h, in the day (on average 5:30 hours to 10:30 hours) and night (18:00 hours to 21:00 hours), totaling eight hours/day. From this method, a total sampling effort of seven days was employed.

All records of mammalian species performed outside the standard hours of the active search methodology and outside the points defined as standard for sampling are considered here to be occasional records. These records were used to assist in the composition of the species list, not being considered in the analysis of standardized data, since they were recorded were of the standard methodology. During this activity (active searches) were recorded both directly (visualization of the animal itself) and indirectly, trace materials such as: fecal material, tracks, burrows, scratches and among others, were noted for the listing of mammal species.

Based on the evaluation of local vegetation and logistical feasibility, to sample an area that allows obtaining data regarding the community of medium and large mammals, two traps were installed, sampling stations composed of a BUSHNELL TROPHY CAM HD trap, often used for mammal sampling (Tobler et al., 2008), tied to a tree approximately 40 cm from the ground. The traps were configured to operate 24 hours a day, with an interval of 30 seconds between photos/videos. Baits were not used in the sampling stations to avoid possible biases for some species.

The species were identified following the taxonomic nomenclature proposed by (Abreu et al., 2022). To obtain a measure of species abundance, the Relative Abundance Index (IAR) will be used as a measure of species abundance in each area, since the IAR has a strong relationship with the actual abundance of the species.

Figure 151 - Biologist specialized in mammal fauna during the installation of camera traps during the survey of avifauna, Fazenda Senegal, Assis Brasil, Acre, 2023.

Source: Field Team

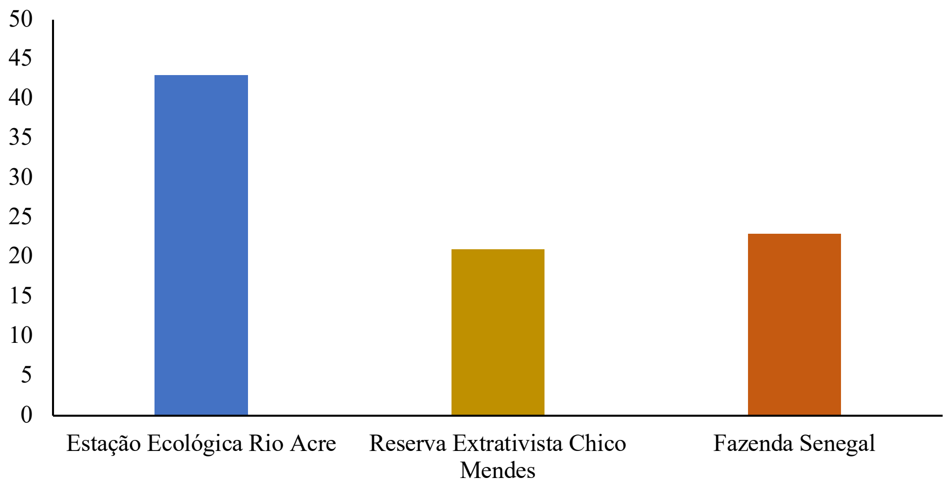
The species were identified based on Emmons and Feer (1996), Eisenberg & Redford (1999); and Reis et al. (2006), the traces of the species were identified through field guides (Becker & Dalponte, 1991; Prist, 2020), the taxonomy of species follows that proposed by Abreu et al. (2022) and Quintela et al. (2020), the conservation status of the species was classified according to the categories used by the International Union for Conservation of Nature (IUCN) and the Red Book of Brazilian Fauna Threatened with Extinction (ICMBio, 2018).

In all, considering the sampling effort employed in the field (primary data) and the information obtained in all online search databases, collections of zoological collections and biodiversity recording platforms (Secondary data) a total of 46 species were recorded, 22 through primary data and 29 through secondary data. Of the total records, 15 species were recorded only using standardized field methodology for wildlife survey.

Based on the survey of secondary data, in bibliographic databases and databases on online biodiversity, 29 species of mammals were recorded, taxonomically divided between 6 orders and 18 families. The most representative orders in relation to richness (S) considering secondary records were Primates (S=16) and Rodentia (S=5). The broad representativeness of the primate group is a pattern already documented for the southwestern Amazon region (Borges et. al., 2015, Oliveira & Calouro, 2020).

When compared with conservation units that are in the surroundings of the landscape where the Senegal property is inserted, it is observed that the richness of species recorded in only seven days of field is relevant. The Acre River Ecological Station, for example, presents in its list of 43 species of mammals after intense field and sampling effort, the Senegal Property represents 48% of this species list. If compared with the study of small mammals of Resex Chico Mendes the species richness of the Senegal Property exceeds these numbers, however this comparison does not consider the difference in methods, or the groups sampled. In just seven days, using different methodologies, 10% of the Acre mammal fauna was recorded (Reference Value ZEE, ACRE, 2010). It is worth mentioning that ESEC Rio Acre and Chico Mendes Extractive Reserve are consolidated conservation units, under the management of the Chico Mendes Institute for the Protection of Biodiversity, with the main objective of protecting and safeguarding the diversity of local species.

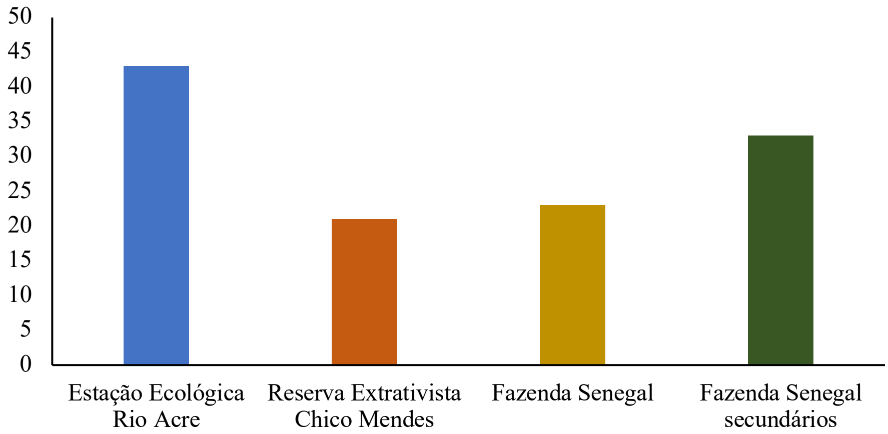
Figure 152 - Comparative graph of the species richness recorded in the Senegal Property through standard methodology, with the mammal richness of two Conservation Units located in the same landscape



Source: Self Elaboration

Also based on the secondary data obtained from platforms on global biodiversity (GBIF and Specieslink), it can be observed that the Senegal Property presents a relevant species richness of mammals, if compared to the estimated, and when compared with bibliography data from two Conservation Units, the Chico Mendes Extractive Reserve and the Rio Acre Ecological Station.

Figure 153 - Comparative graph of mammal species richness with potential to occur for the Senegal Estate, considering the landscape of UCs, in the state of Acre



Source: Self Elaboration

In relation to the primary data, in the field, 10 field days were spent, considering the displacement of the technical team from Rio Branco, Acre, to the municipality of Assis Brasil, in which the team made a displacement by land and river, towards the upstream of the Iaco River. Seven days of field sampling were performed to record mammals in the area. In the study area it was common to find traces of mammals, such as: tracks, burrows, feces and even a skull of a tapir was found.

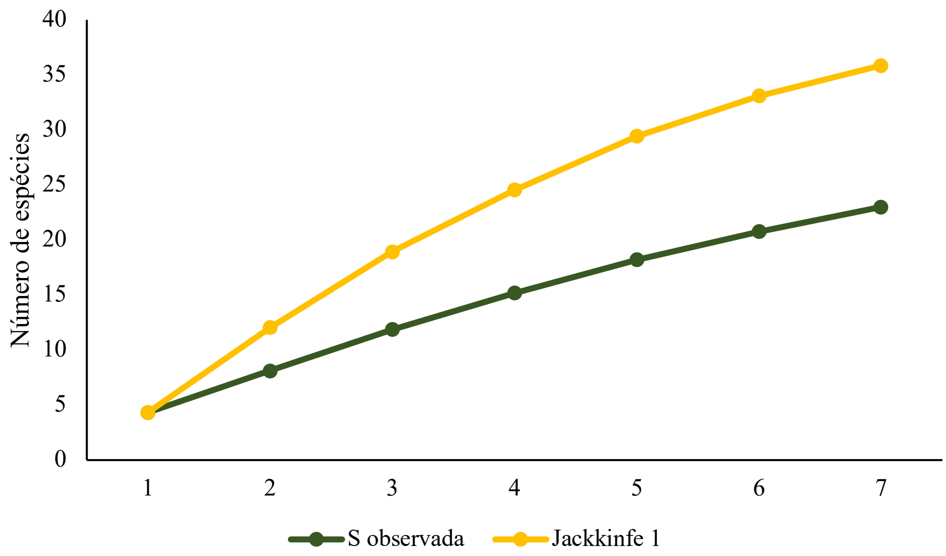
Figure 154 - Comparative graph of mammal species richness with potential to occur for the Senegal Estate, considering the landscape of UCs, in the state of Acre

Source: Field Team

When using the Jackknife 1 richness estimator, we observed that with a greater use of effort in the field, the estimated richness is 36 species of mammals in the Senegal Property. The curve of species records did not show a tendency to reach asymptote, that is, it did not reach stability, which means that with greater sampling effort more species will be recorded.

During the sampling of the field data survey, 23 species of small, medium and large mammals belonging to 17 Families and 7 Orders were recorded. This number is significant if we consider the days of sampling and limited by inclement weather and logistics of access to property. The most representative orders in relation to wealth (S) considering records were Primates (S=7) and Rodentia (S=7). The species most sighted in abundance (N) during sensing were *Saguinus weddelli* (N=4) in the diurnal period and bush rat (*Rattus sp*) at night. They are species with great distribution, *the S. weddelli* is a small primate that lives in an area of forest edge and is associated with other primates forming mixed flock, that is, it is not so judicious in terms of habitat. (IUCN). They have been spotted several times throughout the active search, the environment is surrounded by palm trees where they manage to make nests and hide from predators.

Figure 155 - Jackknife 1 richness estimator graph of the species richness of the Senegal Property



Source: Self Elaboration

To assess the structure of the mammalian community on a property, we used indices related to species richness and dominance, based on data collected during field sampling. The results showed a high richness and abundance of species recorded in the study area, considering the sampling effort, indicating a diverse and balanced community. In addition, the lack of a dominant species was reflected by the evenness index, which was also high. Therefore, it can be concluded that the mammal community of Senegal property is structured and complete, with high diversity and balance between species.

Table 80 - Diversity indices in the survey of avifauna, Fazenda Senegal, Assis Brasil, Acre, 2023.

Diversity index	Primary	Secondary
Richness (S)	22	28
Abundance (N)	61	84
Dominance(K)	0.09057	0.05017
Diversity of Shannon-Wiener (H')	2.757	3.137
Equitable of Pielou (J)	0.8918	0.9413

Source: Self Elaboration

According to MacArthur and MacArthur (1961) the hypothesis around the influence of habitat complexity on diversity, considers that the composition of animal species and their abundances depend on components of the vegetation structure, because heterogeneity increases the availability of niches and species diversity.

Table 81 - Diurnal and nocturnal mammal species recorded during the avifauna survey, Fazenda Senegal, Assis Brasil, Acre, 2023. A – soim (Saguinus weddelli); B - bush rat (Rattus sp).

Source: Field Team

Here we reinforce the importance for the registration of species that present high habitat requirements for their survival in relation to habitat, endangered species, rare or restricted distribution. Eight species were recorded that are listed as threatened with extinction according to the criteria of the Red List of threatened species of the International Union for Conservation of Nature (IUCN). They are listed as Endangered and Vulnerable (VU). The Peccary (*Tayassu pecari*), the Canastra Armadillo (*Priodontes maximus*), the Anta (*Tapirus terrestris*) and the Black Soin (*Callimico goeldi*), both are species sensitive to anthropogenic changes, and hunting pressure, in addition to the Canastra Armadillo and the Anta occur naturally at low densities (Aya-Cuero et al., 2017; Mayor et al., 2017; Rio, 2017; Desbiez et al., 2019; Oliveira & Calouro, 2019), which includes them in the list as vulnerable to extinction in the wild.

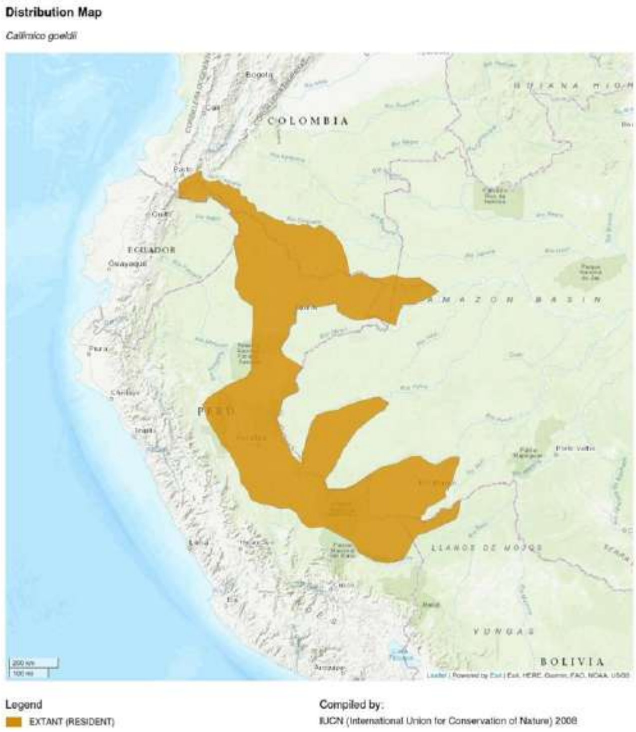
Table 82 - Mastofauna species included in endangered categories recorded in the survey of the mammal fauna in the area of Fazenda Senegal, Assis Brasil, Acre, 2023. Subtitles: VU – vulnerable; NT – almost threatened; EN – in danger.

Order	Family	Species	Status
Primates	Atelidae	*Ateles chamek*	EN
Primates	Cebidae	*Ateles chamek*	EN
Primates	Cebidae	*Lagothrix cana*	EN
Artiodactyla	Tayassuidae	*Tayassu pecari*	VU
Cingulata	Dasypodidae	*Priodontes maximus*	VU
Perissodactyla	Tapiridae	*Tapirus terrestris*	VU
Primates	Callitrichidae	*Callimico goeldii*	VU

Source: Self Elaboration

One of the preponderant factors for the inclusion of Soim-preto in the list of threatened species is endemism (restricted distribution of the species to a certain biogeographic region). Naturally rare and with restricted distribution to the southwest of the Amazon, occurring at naturally low densities and sensitive to anthropogenic changes, the Callimico goeldii (Watsa et al., 2012), commonly known as Soim-preto is a species with a very strong requirement of habitat: it prefers forest typologies with dense understory and with occurrence of bamboo (Regh, 2006). The black Soim occurs in flocks of up to 6 individuals and can form mixed flocks with other small primates such as red Soim, squirrel monkey and capuchin monkey (Rehg, 2006; Watsa et al., 2012).

Figure 156 - Distribution map of the black soin (Callimico goeldii).



Source: IUCN, 2023.

Ateles chamek is a species found mainly in the emerging trees and in the upper part of the forest canopy, population decline and local extinction of *Ateles* (Iwanaga & Ferrari 2002; Levi et al. 2009; Reis et al., 2011) in most areas with human activity are the result of hunting pressure often associated with habitat destruction and degradation (Peres, 1997). Their diet is frugivorous, feeding on the ripe and soft parts of a wide variety of fruits, which comprise about 80-90% of their diet (Reis et al., 2011).

The giant armadillo – tatu canastra (*Priodontes maximus*) is currently classified as "vulnerable" on the IUCN (International Union for Conservation of Nature) Red List of Threatened Species, meaning the species faces a high risk of extinction in its natural habitat. The main threats to the survival of the giant armadillo are indiscriminate hunting, habitat loss due to agricultural expansion and road construction, as well as roadkill.

The macaco-barrigudo (*Lagothrix cana)* has several characteristics in common with species of the genus *Ateles*: it has a basically frugivorous diet, being an important disperser of large seeds; it has a low reproductive rate; it prefers high and dense primary forests and is very sensitive to hunting pressure (Peres, 1994; Reis et al., 2011; Nunes & Orsini, 2016). Because it is an important species for seed dispersal and predation, the barrigudo monkey plays a fundamental role in the maintenance of forests.

Habitat alteration and hunting pressure are the main factors that can affect the occurrence of various mammals in forest environments, with the Amazon Biome being the most affected, due to ethnic-cultural and economic issues (Endo et al. 2010; Peres 2010; Harrison et al. 2016; Ripple et al. 2016; Rebêlo et al. 2019; Silva et al. 2022).

According to the IUCN (2019) the species *Ateles chamek* is classified as "Endangered", these primates are the very sensitive to hunting pressure, as they have long gestation periods and slow development. A greater hunting pressure produces a rapid decline of their populations, so it is necessary to conserve the species (Peres 2000; Iwanaga & Ferrari 2002; Levi et al. 2009; Evi et al. 2011).

The tapir (*Tapirus terrestres*) is considered the most sensitive species to hunting pressure among the neotropical ungulates (Bodmer et al., 1988), despite being an efficient seed disperser, it is among the most hunted species. Anthropogenic factors such as subsistence, commercial and sport hunting have been reducing the biomass of these animals, which in addition to changes in the regeneration patterns and diversity of some plant species, puts their populations at risk of extinction (Tobler et al., 2014).

Peccaries (*Tayassu pecari*) are animals that need large tracts of land to roam and forage, roam in herds of up to 100 or more individuals, are listed as vulnerable to extinction by the IUCN, deforestation and hunting can leave populations more vulnerable (Beck et al., 2010). They are an important source of protein for indigenous populations.

Another species that is present in the Senegal Property and that deserves attention, because it is widely targeted by hunters is the purple deer (*Mazama nemorivaga*), little is known about the biology, ecology and behaviour of the species. They occur in sympathy with the catingueiro deer (*M. americana).* In addition to habitat loss and fragmentation, domestic animals can negatively affect purple deer populations through contamination by parasitic, viral, or bacterial diseases (Hurtado-Gonzales 2004).

Tropical forests are particularly sensitive to the processes resulting from habitat destruction and degradation because they have a high richness and number of endemic and rare species and species with great ecological demand and/or with interdependence of others with which they have co-evolved (Laurance et al., 1997; (Carignano Torres et al. 2017; Schleicher et al., 2017). More specifically the ecoregion of the Humid Forests of the Southwest Amazon has a vast extension with regional and local variations in flora and habitat. Endemism and overall richness are high in vascular plants and invertebrates and vertebrate animals. There are 257 mammal species recorded with 11 endemic. This includes *anta, onça, capivara, Gogó-de-sola, queixada, soins, mico, macaco-prego, macaco-de-cheiro, preguiças de dois dedos e de três dedos, tamanduá-bandeira e jaguatirica* (WWF, 2023).

Most medium and large mammals play a fundamental role in the maintenance and reproductive success of more than 200 plant species. They are plants with more varied interests, including economic. In a study evaluating how the process of local mammal extinction can affect the structure of forests (Bello et al.

2015; Culot et al., 2017) found that a consequence of the loss of large mammals is a negative impact on the carbon stock of forests in the medium and long term. Thus, species of great apes and ungulates are extremely important for the maintenance of the forest and carbon stock.

Spider monkeys (*Ateles chamek*) are one of the largest forest primates in South America and play a very important ecological role as dispersers of some of the largest tree seeds and vines that smaller species cannot open. As they are in constant motion, they help to carry the seeds away from the mother trees while consuming the fruits (Peres, 1997).

Tapirus terrestris are solitary and territorial animals, which feed mainly on leaves, fruits and shoots of trees and shrubs. As large herbivores, they play an important role in regulating vegetation as they can help control the overgrowth of certain plant species, allowing for the regeneration of others. In addition, tapirs also play an important role in seed dispersal, because when feeding, they ingest seeds that are later eliminated with feces, contributing to the regeneration of the forest (Tobler et al., 2014). In addition, tapirs are preyed upon by big cats like the jaguar, and their presence is a sign that the ecosystem is healthy and balanced.

The giant armadillo (*Priodontes maximus*) provides valuable "ecosystem services" to the rest of the ecological community: provide shelter from predators and extreme temperatures, as well as new food sources (Desbiez & Kluiber, 2013). The species is currently classified as "vulnerable", one of the threats to the survival of the giant armadillo are indiscriminate hunting, habitat loss due to agricultural expansion and road construction, as well as roadkill.

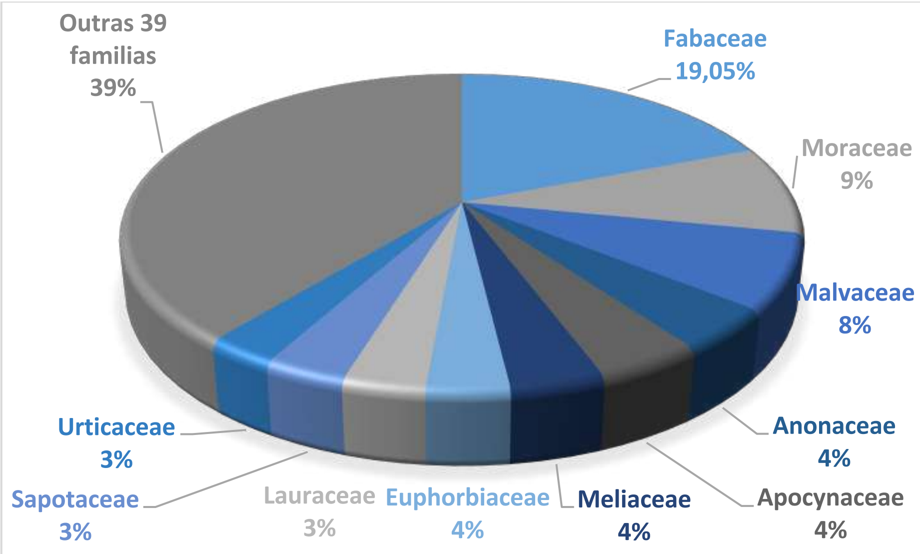
The jaguar (*Panthera onca*) is a top-of-the-chain predator, meaning it is at the top of the food chain and plays a key role in regulating the populations of its prey. As a predator, the jaguar contributes to the balance of ecosystems, maintaining control over the herbivore population and preventing overpopulation of these species. In addition, the jaguar has an important role in maintaining biodiversity, as its presence is a sign that the ecosystem is healthy and in balance (Tobler et al., 2013). It is currently in the "Near Threatened" category (IUCN, 2020).

5.1.1.6.6 Vegetation

Data processing indicated the existence of 210 tree species distributed in 49 botanical families, with 1,533 individuals surveyed. The Fabaceae family is the most abundant, with 19.05% of the identified species (n=40) representing 15.26% of the individuals surveyed (n=234), followed by Moraceae (9.05% of the species and 9.13% of the individuals), Malvaceae (7.62% of the species and 14.42% of the individuals), Annonaceae (4.29% of the species and 1.57% of the individuals), Apocynaceae (4.29% of the species and 2.87% of the individuals) and Meliaceae (3.81% of the species and 7.37% of the individuals). It is noteworthy the family Putranjivaceae that presented only one species, however it represents 7.57% of the individuals surveyed.

The 10 most abundant families concentrate about 61% of all species in the survey.

Figure 157 - Distribution of botanical families and their representativeness in the sampled population.



Source: Self Elaboration

The composition of the forest is completed with the identification of 10 species of liana and 4 species of palm trees. The most abundant Family is Arecaceae (palm tree) with 88 individuals sampled for 4 species.

Table 83 - Distribution of botanical families and their representativeness in the sampled population.

Ord.	**Popular name**	***Scientific name***	***Family***	***Total Frequency***
1	Abiorana-preta	*Chrysophyllum amazonicum*	Sapotaceae	1
2	Abiurana-de-quina	*Pouteria caimito*	Sapotaceae	7
3	Algodoeiro	*Ochroma pyramidale*	Malvaceae	4
4	Amarelão	*Aspidosperma vargasii*	Apocynaceae	10

Ord.	**Popular name**	***Scientific name***	***Family***	***Total Frequency***
5	Ameixa	*Antrocaryon amazonicum*	Anacardiaceae	4
6	Angelca-amarela	*Drypetes variabilis*	Putranjivaceae	116
7	Angelim-amargoso	*Vatairea sericea*	Fabaceae	1
8	Apuí-preto	*Ficus gomelleira*	Moraceae	5
9	Apui-vermelho	*Ficus sp. 1*	Moraceae	7
10	Assacu	*Hura creptans*	Euphorbiaceae	11
11	Bacubichá	*Micropholis sp.*	Sapotaceae	8
12	Bacuri	*Garcinia sp.*	Clusiaceae	1
13	Bacuri-de-espinho	*Garcinia madruno*	Clusiaceae	3
14	Baginha	*Stryphnodendron sp.*	Fabaceae	1
15	Bálsamo	*Myroxylon balsamum*	Fabaceae	5
16	Bauhinia-falsa	*Não identificado*	Fabaceae	12
17	Botijão	*Cavanillesia hylogeiton*	Malvaceae	15
18	Breu	*Protium sp.*	Burseraceae	11
19	Breu-de-leite	*Protium gallosum*	Burseraceae	33
20	Burdão	*Samanea tubulosa*	Fabaceae	2
21	Burra-leiteira	*Sapium marmieri*	Euphorbiaceae	9
22	Cabelo-de-cutia	*Banara nitida*	Salicaceae	5
23	Cacau	*Theobroma cacao*	Malvaceae	7
24	Cacauí	*Theobroma speciosum*	Malvaceae	13
25	Caferana	*Casearia sp.*	Salicaceae	10
26	Cajá	*Spondias mombin*	Anacardiaceae	28

Ord.	**Popular name**	***Scientific name***	***Family***	***Total Frequency***
27	Cajarana-do-mato	*Spondias testudinis*	Anacardiaceae	5
28	Cajuzinho	*Cathedra acuminata*	Aptandraceae	3
29	Camelo-de-guariba	*Ampelocera sp.*	Ulmaceae	2
30	Canela-de-velho	*Rinorea sp.*	Violaceae	1
31	Capança	*Ryania sp.*	Salicaceae	3
32	Carapanaúba	*Aspidosperma carapanauba*	Apocynaceae	22
33	Caripé	*Couepia sp.*	Chrysobalanaceae	2
34	Caripé-vermelho	*Hirtella rodriguesii*	Chrysobalanaceae	1
35	Caripezinho	*Couepia elata*	Chrysobalanaceae	1
36	Casca-amarela	*Aspidosperma sp.*	Apocynaceae	1
37	Catauba-amarela	*Qualea tessmannii*	Vochysiaceae	1
38	Caucho	*Castilla ulei*	Moraceae	6
39	Cedro-branco	*Cedrela fissilis*	Meliaceae	3
40	Cedro-rosa	*Cedrela odorata*	Meliaceae	8
41	Cerejeira	*Amburana acreana*	Fabaceae	3
42	Chachoeira-preta	*Senefeldera sp.*	Euphorbiaceae	2
43	Chichá-miúdo	*Sterculia frondosa*	Malvaceae	3
44	Chichuá	*Maytenus sp.*	Celastraceae	2
45	Coassú	*Coccoloba mollis*	Polygonaceae	33
46	Coité-de-macaco	*Couroupita guianensis*	Lecythidaceae	3
47	Condurú	*Duguetia sp.*	Annonaceae	1
48	Copaiba	*Copaifera sp.*	Fabaceae	2

Ord.	**Popular name**	***Scientific name***	***Family***	***Total Frequency***
49	Copeiro	*Colubrina glandulosa*	Rhamnaceae	3
50	Corrimboque	*Cariniana sp.*	Lecythidaceae	1
51	Cumarú	*Dipteryx polyphylla*	Fabaceae	1
52	Cumarurana	*Dipteryx micrantha*	Fabaceae	1
53	Embaúba-branca	*Cecropia distachya*	Urticaceae	3
54	Embaubão	*Cecropia sciadophylla*	Urticaceae	2
55	Embaúba-vermelha	*Cecropia sp.*	Urticaceae	1
56	Embira	*Diclinanona sp.*	Annonaceae	2
57	Embirema	*Couratari macrosperma*	Lecythidaceae	1
58	Envira-cajú	*Onychopetalum periquino*	Anonaceae	2
59	Envira-cascuda	*Unonopsis duckei*	Anonaceae	3
60	Envira-iodo	*Ampelocera edentula*	Ulmaceae	1
61	Envira-piaca	*Lonchocarpus sp.*	Fabaceae	5
62	Envira-preta	*Ephedranthus amazonicus*	Anonaceae	2
63	Envira-preta-de-igapó	*Unonopsis sp.*	Anonaceae	1
64	Envira-sapotinha	*Quararibea guianensis*	Malvaceae	25
65	Envira-vassourinha	*Oxandra sp.*	Anonaceae	9
66	Envireira	*Maquira guianense*	Moraceae	5
67	Envireira-preta	*Oxandra xylopioides*	Annonaceae	1
68	Escama-de-peixe	*Capparis sp.*	Capparaceae	4
69	Espinheiro-preto	*Senegalia polyphylla*	Fabaceae	28
70	Falça-sorva	*Batocarpus amazonicus*	Moraceae	7

Ord.	**Popular name**	***Scientific name***	***Family***	***Total Frequency***
71	Farinha-seca	*Celtis schippii*	Cannabaceae	11
72	Fava-seca	*Albizia sp.*	Fabaceae	21
73	Figo-de-macaco-preto	*Guatteria sp. 1*	Anonaceae	4
74	Freijó	*Cordia goeldiana*	Boraginaceae	19
75	Fruto-de-jacamin	*Margaritaria nobilis*	Euphorbiaceae	4
76	Garapeira	*Apuleia leiocarpa*	Fabaceae	12
77	Genipapo	*Genipa americana*	Rubiaceae	1
78	Grão-de-galo	*Tabernaemontana sp.*	Apocynaceae	3
79	Guaribeiro	*Barnebydendron riedelii*	Fabaceae	9
80	Guariúba	*Clarisia racemosa*	Moraceae	5
81	Guatambu	*Aspidosperma spruceanum*	Apocynaceae	1
82	Ingá	*Inga sp. 1*	Fabaceae	3
83	Ingá-branco	*Inga sp. 3*	Fabaceae	8
84	Ingá-chata	*Inga macrophylla*	Fabaceae	3
85	Ingá-grande	*Inga grandiflora*	Fabaceae	1
86	Ingá-preto	*Inga sp. 2*	Fabaceae	6
87	Ingarana	*Zygia juruana*	Fabaceae	1
88	Ingá-seco	*Zygia sp.*	Fabaceae	3
89	Inharé	*Brosimum lactescens*	Moraceae	4
90	Inharé-mole	*Brosimum guianense*	Moraceae	1
91	Ipê	*Handroanthus sp.*	Bignoniaceae	1
92	Itanibuca	*Buchenavia guianensis*	Combretaceae	1

Ord.	Popular name	Scientific name	Family	Total Frequency
93	Itaubarana	*Heisteria ovata*	Olacaceae	5
94	Jaca-brava	*Sorocea briquetii*	Moraceae	31
95	Jacarandá-branco	*Dalbergia sp. 1*	Fabaceae	8
96	Jatobá	*Hymenaea courbaril*	Fabaceae	1
97	Jitó	*Guarea sp.*	Meliaceae	10
98	Jitózinho	*Allophylus sp.*	Sapindaceae	11
99	João-mole	*Neea floribunda*	Nyctaginaceae	18
100	João-mole-vermelho	*Neea madeirana*	Nyctaginaceae	8
101	Lacre	*Vismia guianensis*	Myristicaceae	2
102	Laranja-fedorenta	*Leonia glycycarpa*	Violaceae	6
103	Laranjinha	*Casearia ulmifolia*	Salicaceae	1
104	Limãozinho	*Zanthoxylum rhoifolium*	Rutaceae	8
105	Louro-abacate	*Ocotea sp.*	Lauraceae	1
106	Louro-chumbo	*Licaria sp.*	Lauraceae	2
107	Louro-preto	*Ocotea longifolia*	Lauraceae	2
108	Maçaranduba	*Manilkara bidentata*	Sapotaceae	6
109	Malva-peluda	*Apeiba tibourbou*	Malvaceae	5
110	Mamuí	*Jaracatia spinosa*	Caricaceae	15
111	Manga-de-anta	*Diclinanona calycina*	Annonaceae	7
112	Manitê	*Brosimum alicastrum*	Moraceae	4
113	Maparajuba	*Pouteria sp. 2*	Sapotaceae	17
114	Mapatí	*Pourouma cecropiifolia*	Urticaceae	5

Ord.	Popular name	Scientific name	Family	Total Frequency
115	Maraximbé	*Trichilia pleeana*	Meliaceae	33
116	Maruparana	*Simarouba amara*	Simaroubaceae	2
117	Mataiba	*Matayba sp.*	Sapindaceae	4
118	Matamatá	*Eschweilera pedicellata*	Lecythidaceae	3
119	Matamatá-branco	*Eschweilera coriacea*	Lecythidaceae	3
120	Matuti	*Pterocarpus sp.*	Fabaceae	5
121	Mirindiba-amarela	*Buchenavia sp.*	Combretaceae	1
122	Mogno	*Swietenia macrophylla*	Meliaceae	1
123	Moirajiboia	*Swartzia arborescens*	Fabaceae	3
124	Moiratinga-preta	*Maquira sp.*	Moraceae	2
125	Mororó-branco	*Bauhinia acreana*	Fabaceae	2
126	Morototó	*Schefflera morototoni*	Araliaceae	11
127	Muiracatiara	*Astronium lecointei*	Anacardiaceae	15
128	Muirapiranga	*Ormosia sp. 1*	Fabaceae	1
129	Muiratinga	*Naucleopsis caloneura*	Moraceae	4
130	Mulateiro	*Calycophyllum spruceanum*	Rubiaceae	7
131	Mulungu	*Erythrina falcata*	Fabaceae	26
132	Munguba	*Pachira sp.*	Malvaceae	41
133	Murici-branco	*Byrsonima crispa*	Malpighiaceae	1
134	Mutamba	*Guazuma ulmifolia*	Malvaceae	6
135	NI 01	*Ficus sp. 2*	Moraceae	1
136	NI 02	*Ficus sp. 3*	Moraceae	1

Ord.	**Popular name**	***Scientific name***	***Family***	***Total Frequency***
137	NI 03	*Centrolobium sp.*	Fabaceae	1
138	NI 04	*Eriotheca globosa*	Malvaceae	3
139	NI 05	*Ormosia sp. 2*	Fabaceae	1
140	NI 06	*Rauvolfia sp.*	Apocynaceae	1
141	NI 07	*Terminalia sp.*	Combretaceae	13
142	NI 10	*Annona sp.*	Anonaceae	1
143	NI 11	*Bauhinia sp.*	Fabaceae	8
144	NI 13	*Aniba sp.*	Lauraceae	1
145	NI 14	*Duroia sp.*	Rubiaceae	1
146	NI 26	*Pouteria sp.*	Sapotaceae	2
147	NI 27	*Pouteria sp. 1*	Sapotaceae	6
148	NI 37	*Swartzia sp.*	Fabaceae	9
149	NI 38	*Talisia sp.*	Sapindaceae	1
150	NI 40	*Trichilia sp.*	Meliaceae	50
151	NI 52	*Ocotea sp. 1*	Lauraceae	1
152	NI 53	*Ocotea sp. 2*	Lauraceae	1
153	NI 54	*Guarea trunciflora*	Meliaceae	2
154	NI 56	*Guatteria sp. 2*	Anonaceae	1
155	NI 58	*Guatteria sp. 3*	Anonaceae	1
156	NI 66	*Ocotea minor*	Lauraceae	2
157	NI 68	*Ormosia sp. 3*	Fabaceae	1
158	NI 69	*Pterocarpus officinalis*	Fabaceae	8

Ord.	Popular name	Scientific name	Family	Total Frequency
159	NI 70	*Ptrocarpus amazonum*	Fabaceae	1
160	NI 71	*Rhamnaceae*	Rhamnaceae	3
161	NI 72	*Rauwolfia sp.*	Apocynaceae	1
162	NI 73	*Rutaceae*	Rutaceae	1
163	NI 74	*Rudgea sp.*	Rutaceae	1
164	NI 75	*Ulmaceae*	Ulmaceae	12
165	Paineira	*Chorisia speciosa*	Malvaceae	22
166	Pama	*Naucleopsis sp.*	Moraceae	1
167	Pama-branca	*Helicostylis tomentosa*	Moraceae	5
168	Pama-mão-de-onça	*Perebea mollis*	Moraceae	8
169	Pama-preta	*Pseudolmedia laevis*	Moraceae	42
170	Paricá	*Schizolobium parahyba var. amazonicum*	Fabaceae	5
171	Pau-alho	*Gallesia integrifolia*	Phytolaccaceae	13
172	Pau-brasil-roxo	*Simira sp.*	Rubiaceae	2
173	Pau-catinga	*Capparidastrum sp.*	Capparaceae	2
174	Pau-de-formiga	*Cordia nodosa*	Boraginaceae	8
175	Pau-ferrugem	*Tapura guianensis*	Dichapetalaceae	4
176	Pau-rosa	*Rosaceae*	Rosaceae	2
177	Pau-sangue-casca-grossa	*Platymiscium sp.*	Fabaceae	3
178	Pente-de-macaco	*Apeiba echinata*	Malvaceae	6
179	Pereiro	*Aspidosperma macrocarpon*	Apocynaceae	1
180	Piaca	*Diplotropis martiusii*	Fabaceae	20

Ord.	**Popular name**	***Scientific name***	***Family***	***Total Frequency***
181	Piquiteira	*Trema micrantha*	Ulmaceae	1
182	Pirarara	*Metrodorea flavida*	Rutaceae	1
183	Pitomba	*Toulicia guianensis*	Sapindaceae	9
184	Quebra-pedra	*Phyllanthus sp.*	Phyllanthaceae	8
185	Sabonetinho	*Sapindus saponaria*	Sapindaceae	1
186	Sabugueiro	*Sambucus mexicana*	Adoxaceae	3
187	Samaúma-branca	*Ceiba pentandra*	Malvaceae	8
188	Sapota-do-solimões	*Matisia cordata*	Malvaceae	58
189	Seringaí	*Mabea nitida*	Euphorbiaceae	7
190	Seringarana	*Sapium glandulosum*	Euphorbiaceae	3
191	Seringueira	*Hevea brasiliensis*	Euphorbiaceae	21
192	Sino	*Lafoensia pacari*	Lythraceae	1
193	Sucuuba	*Himatanthus sucuuba*	Apocynaceae	4
194	Tacacazeiro	*Sterculia excelsa*	Malvaceae	1
195	Tachi-da-folha-larga	*Triplaris sp.*	Polygonaceae	2
196	Tachi-de-igapó	*Triplaris americana*	Polygonaceae	1
197	Tamanqueiro	*Alseis sp.*	Rubiaceae	74
198	Tamboril	*Enterolobium maximum*	Fabaceae	2
199	Taperibá	*spondias globosa*	Anacardiaceae	4
200	Tarumã	*Vitex triflora*	Lamiaceae	1
201	Tatajuba	*Maclura tinctoria*	Moraceae	1
202	Tento	*Ormosia paraense*	Fabaceae	1

Ord.	**Popular name**	***Scientific name***	***Family***	***Total Frequency***
203	Tomate-bravo	*Diospyros sp.*	Ebenaceae	3
204	Torém-de-lixa	*Pourouma guianensis*	Urticaceae	1
205	Trichilia-miúda	*Trichilia micrantha*	Meliaceae	6
206	Ucuúba-mole	*Virola mollissima*	Myristicaceae	8
207	Urtiga	*Urera caracasana*	Urticaceae	6
208	Urucurana	*Sloanea sp.*	Elaeocarpaceae	1
209	Vela-branca	*Casearia pitumba*	Salicaceae	1
210	Xixá-da-casca-dura	*Sterculia apelata*	Malvaceae	4
	General Total			**1.533**

Source: Seelf Elaboration

The phytosociologic parameters of a forest population can provide support for various actions in different fields of knowledge, such as recovery of degraded areas, production of seeds and seedlings, identification of threatened, rare and endemic species, decision on management actions for conservation purposes, among others (BRITO et al., 2007).

The results of the phytosociological parameters, where the total density estimated at 243.98 individuals per hectare is equivalent to the total basal area of 1,556.66 m²/km². These values are lower than those found in the State Forest of Antimary, Bujari, Acre, whose total estimated density was 404 ind/ha and total basal area 1,983.82 m²/km² (TECMAN, 2012), in Seringal Itatinga and Porto Central, in Manoel Urbano, Acre, the total estimated density was 311 ind/ha, making up 1,487.22 m²/km² of total basal area (TECMAN, 2020). It was also higher than the values for the areas of Jaraguá and Santa Rosa. For the Santa Rosa area, located in Santa Rosa do Purus, Acre, the density was 342.18 ind/ha and total basal area of 1,719.097 m²/km² (TECMAN, 2023a) and for the area of Jaraguá, Bujari, Acre, the density was 363.19 ind/ha equivalent to the total basal area of 1,623.898 m²/km² (TECMAN, 2023b).

Among the 210 species identified, about 64 species (30.47%) presented absolute density (AD) equal to or greater than 1.00 ind/ha. The 9 most abundant species (AD ≥ 5.00 ind/ha) were: Angelca-amarela (18,462 ind/ha); Tamanqueiro (11,777 ind/ha); Sapota-do-solimões (9,231 ind/ha); NI 40 (7,958 ind/ha);

Pama-preta (6,685 ind/ha); Munguba (6,525 ind/ha); Breu-de-leite (5,252 ind/ha); Coassú (5,252 ind/ha) and Maraximbé (5,252 ind/ha). These species represented approximately 31.31% of the absolute density of the inventoried population.

The species with the highest dominance (DO r ≥ 2.0%) represent approximately 42.60% of the total, where the species Paineira is the most dominant with 6.08%, followed by Cajá (4,27%), Pau-alho (3,68%), Mulungu (3,20%), Botijão (2,86%), Angelca-amarela (2,64%), Tamanqueiro (2,57%), Espinheiro-preto (2,54%), Munguba (2,36%), Apui-vermelho (2,13%), NI 40 (2,09%), Maraximbé (2,08%), Apuí-preto (2,06%), Mulateiro (2,04%) e Sapota-do-solimões (2,00%). The Species Paineira stands out in the 1st position due to the diameters presented by its individuals (DAP = 140 cm), since the density was high with 3,501 ind/ha. Other species of the most dominant indicate to be of large size as pau-alho, apuí-preto, mogno, assacú, among others.

Regarding the absolute frequency, the study revealed that the species that presented values greater than 50% were Sapota-do-Solimões (68%), Angelica-amarela (56%) and Munguba (50%), representing about 8.69 % of the total frequency.

In the first positions of the Importance Value Index (IVI%), which characterizes the importance of each species in the studied forest (under the horizontal perspective), the species Angelica-amarela (13.00%), Tamanqueiro (9. 49%), Paineira (9.21%), Sapota-do-Solimões (9.18%), Cajá (7.90%), Munguba (7.53%), NI 40 (7.25%), Mulungu (6.69%), Maraximbé (6.03%), Espinheiro-preto (5.97%), Pama-preta (5.76%), Pau-alho (5.43%), Coassú (5.16%) and Jaca-brava (5.00%). These species had an absolute density of approximately 95 individuals per hectare and an absolute dominance of 587.156 m²/km², representing for both parameters about 38.81% of the total number of individuals and 37.72% of the basal area per km² sampled. The relative frequency (RF) calculated for these species was 27.07% representativeness in the sampled plots. Species with higher IVI, at least theoretically, are better able to use the resources in their habitat.

The distribution of species according to the Importance Value Index (IVI) can be seen.

Table 84 - phytosociological parameters for species occurring in the study area, where: Nº=number of individuals; AB=basal area; D=density; DO=dominance; FR=frequency; CVI=coverage value index; IVI=Importance value index; a=absolute values; r=relative values (%)

Ord	Popular Name	N°	AB (m^2)	D a (Ind/ha)	D r (%)	DO a (m^2/km^2)	DO r (%)	FR a (%)	FR r (%)	IVC (%)	IVI (%)
1	Angelca-amarela	116	2,583 m²	18,462	7,57%	41,109	2,64%	56,00%	2,80%	10,21%	13,00%
2	Tamanqueiro	74	2,511 m²	11,777	4,83%	39,967	2,57%	42,00%	2,10%	7,39%	9,49%
3	Paineira	22	5,944 m²	3,501	1,44%	94,605	6,08%	34,00%	1,70%	7,51%	9,21%
4	Sapota-do-solimões	58	1,952 m²	9,231	3,78%	31,071	2,00%	68,00%	3,40%	5,78%	9,18%
5	Cajá	28	4,177 m²	4,456	1,83%	66,477	4,27%	36,00%	1,80%	6,10%	7,90%
6	Munguba	41	2,307 m²	6,525	2,67%	36,719	2,36%	50,00%	2,50%	5,03%	7,53%
7	NI 40	50	2,048 m²	7,958	3,26%	32,602	2,09%	38,00%	1,90%	5,36%	7,25%
8	Mulungu	26	3,129 m²	4,138	1,70%	49,805	3,20%	36,00%	1,80%	4,90%	6,69%
9	Maraximbé	33	2,037 m²	5,252	2,15%	32,421	2,08%	36,00%	1,80%	4,24%	6,03%
10	Espinheiro-preto	28	2,487 m²	4,456	1,83%	39,575	2,54%	32,00%	1,60%	4,37%	5,97%
11	Pama-preta	42	1,778 m²	6,685	2,74%	28,301	1,82%	24,00%	1,20%	4,56%	5,76%
12	Pau-alho	13	3,603 m²	2,069	0,85%	57,344	3,68%	18,00%	0,90%	4,53%	5,43%
13	Coassú	33	1,283 m²	5,252	2,15%	20,425	1,31%	34,00%	1,70%	3,46%	5,16%
14	Jaca-brava	31	1,052 m²	4,934	2,02%	16,735	1,08%	38,00%	1,90%	3,10%	5,00%
15	Botijão	15	2,793 m²	2,387	0,98%	44,449	2,86%	20,00%	1,00%	3,83%	4,83%
16	Breu-de-leite	33	1,016 m²	5,252	2,15%	16,170	1,04%	30,00%	1,50%	3,19%	4,69%
17	Fava-seca	21	1,694 m²	3,342	1,37%	26,960	1,73%	26,00%	1,30%	3,10%	4,40%
18	Piaca	20	0,994 m²	3,183	1,30%	15,819	1,02%	36,00%	1,80%	2,32%	4,12%
19	Carapanaúba	22	0,974 m²	3,501	1,44%	15,504	1,00%	30,00%	1,50%	2,43%	3,93%
20	Mamuí	15	1,626 m²	2,387	0,98%	25,874	1,66%	24,00%	1,20%	2,64%	3,84%

Ord	Popular Name	N°	AB (m^2)	D a (Ind/ha)	D r (%)	DO a (m^2/km^2)	DO r (%)	FR a (%)	FR r (%)	IVC (%)	IVI (%)
21	Freijó	19	0,992 m^2	3,024	1,24%	15,786	1,01%	26,00%	1,30%	2,25%	3,55%
22	NI 07	13	1,446 m^2	2,069	0,85%	23,020	1,48%	20,00%	1,00%	2,33%	3,33%
23	Envira-sapotinha	25	0,394 m^2	3,979	1,63%	6,275	0,40%	24,00%	1,20%	2,03%	3,23%
24	Muiracatiara	15	1,027 m^2	2,387	0,98%	16,352	1,05%	24,00%	1,20%	2,03%	3,23%
25	João-mole	18	0,442 m^2	2,865	1,17%	7,040	0,45%	32,00%	1,60%	1,63%	3,22%
26	Mulateiro	7	1,997 m^2	1,114	0,46%	31,775	2,04%	14,00%	0,70%	2,50%	3,20%
27	Maparajuba	17	0,863 m^2	2,706	1,11%	13,740	0,88%	24,00%	1,20%	1,99%	3,19%
28	Apui-vermelho	7	2,086 m^2	1,114	0,46%	33,207	2,13%	12,00%	0,60%	2,59%	3,19%
29	Assacu	11	1,811 m^2	1,751	0,72%	28,830	1,85%	12,00%	0,60%	2,57%	3,17%
30	NI 37	9	1,839 m^2	1,432	0,59%	29,269	1,88%	14,00%	0,70%	2,47%	3,17%
31	Samaúma-branca	8	1,564 m^2	1,273	0,52%	24,888	1,60%	14,00%	0,70%	2,12%	2,82%
32	Apuí-preto	5	2,012 m^2	0,796	0,33%	32,027	2,06%	8,00%	0,40%	2,38%	2,78%
33	Bauhinia-falsa	12	0,719 m^2	1,910	0,78%	11,438	0,73%	18,00%	0,90%	1,52%	2,42%
34	Seringueira	21	0,510 m^2	3,342	1,37%	8,110	0,52%	10,00%	0,50%	1,89%	2,39%
35	Burra-leiteira	9	1,080 m^2	1,432	0,59%	17,184	1,10%	14,00%	0,70%	1,69%	2,39%
36	Limãozinho	8	1,299 m^2	1,273	0,52%	20,680	1,33%	8,00%	0,40%	1,85%	2,25%
37	Cedro-rosa	8	0,993 m^2	1,273	0,52%	15,805	1,02%	14,00%	0,70%	1,54%	2,24%
38	NI 75	12	0,500 m^2	1,910	0,78%	7,959	0,51%	18,00%	0,90%	1,29%	2,19%
39	Paricá	5	1,272 m^2	0,796	0,33%	20,252	1,30%	10,00%	0,50%	1,63%	2,13%
40	Morototó	11	0,590 m^2	1,751	0,72%	9,385	0,60%	16,00%	0,80%	1,32%	2,12%
41	Jitózinho	11	0,380 m^2	1,751	0,72%	6,054	0,39%	20,00%	1,00%	1,11%	2,11%
42	Farinha-seca	11	0,288 m^2	1,751	0,72%	4,585	0,29%	20,00%	1,00%	1,01%	2,01%
43	Guaribeiro	9	0,505 m^2	1,432	0,59%	8,030	0,52%	18,00%	0,90%	1,10%	2,00%

Ord	Popular Name	N°	AB (m²)	D a (Ind/ha)	D r (%)	DO a (m²/km²)	DO r (%)	FR a (%)	FR r (%)	IVC (%)	IVI (%)
44	Falça-sorva	7	0,647 m²	1,114	0,46%	10,293	0,66%	14,00%	0,70%	1,12%	1,82%
45	Jitó	10	0,228 m²	1,592	0,65%	3,633	0,23%	18,00%	0,90%	0,89%	1,78%
46	Amarelão	10	0,505 m²	1,592	0,65%	8,041	0,52%	12,00%	0,60%	1,17%	1,77%
47	Breu	11	0,319 m²	1,751	0,72%	5,075	0,33%	14,00%	0,70%	1,04%	1,74%
48	Ingá-branco	8	0,492 m²	1,273	0,52%	7,838	0,50%	14,00%	0,70%	1,03%	1,72%
49	Ingá-preto	6	0,689 m²	0,955	0,39%	10,958	0,70%	12,00%	0,60%	1,10%	1,69%
50	NI 27	6	0,648 m²	0,955	0,39%	10,321	0,66%	12,00%	0,60%	1,05%	1,65%
51	Pama-mão-de-onça	8	0,307 m²	1,273	0,52%	4,889	0,31%	16,00%	0,80%	0,84%	1,64%
52	Caferana	10	0,173 m²	1,592	0,65%	2,759	0,18%	16,00%	0,80%	0,83%	1,63%
53	Pitomba	9	0,137 m²	1,432	0,59%	2,182	0,14%	18,00%	0,90%	0,73%	1,63%
54	NI 69	8	0,208 m²	1,273	0,52%	3,304	0,21%	16,00%	0,80%	0,73%	1,53%
55	Pau-de-formiga	8	0,145 m²	1,273	0,52%	2,311	0,15%	16,00%	0,80%	0,67%	1,47%
56	Garapeira	12	0,275 m²	1,910	0,78%	4,376	0,28%	8,00%	0,40%	1,06%	1,46%
57	Jacarandá-branco	8	0,328 m²	1,273	0,52%	5,218	0,34%	12,00%	0,60%	0,86%	1,46%
58	Manga-de-anta	7	0,390 m²	1,114	0,46%	6,205	0,40%	12,00%	0,60%	0,86%	1,45%
59	Cacauí	13	0,178 m²	2,069	0,85%	2,832	0,18%	8,00%	0,40%	1,03%	1,43%
60	Quebra-pedra	8	0,197 m²	1,273	0,52%	3,137	0,20%	14,00%	0,70%	0,72%	1,42%
61	João-mole-vermelho	8	0,282 m²	1,273	0,52%	4,484	0,29%	12,00%	0,60%	0,81%	1,41%
62	Mutamba	6	0,407 m²	0,955	0,39%	6,477	0,42%	12,00%	0,60%	0,81%	1,41%
63	Ucuúba-mole	8	0,358 m²	1,273	0,52%	5,693	0,37%	10,00%	0,50%	0,89%	1,39%
64	NI 04	3	0,863 m²	0,477	0,20%	13,733	0,88%	6,00%	0,30%	1,08%	1,38%
65	NI 11	8	0,315 m²	1,273	0,52%	5,021	0,32%	10,00%	0,50%	0,84%	1,34%
66	Pente-de-macaco	6	0,580 m²	0,955	0,39%	9,224	0,59%	6,00%	0,30%	0,98%	1,28%

Ord	Popular Name	N°	AB (m²)	Da (Ind/ha)	Dr (%)	DOa (m²/km²)	DOr (%)	FRa (%)	FRr (%)	IVC (%)	IVI (%)
67	Bálsamo	5	0,528 m²	0,796	0,33%	8,401	0,54%	8,00%	0,40%	0,87%	1,27%
68	Cacau	7	0,096 m²	1,114	0,46%	1,527	0,10%	14,00%	0,70%	0,55%	1,25%
69	Maçaranduba	6	0,252 m²	0,955	0,39%	4,006	0,26%	12,00%	0,60%	0,65%	1,25%
70	Bacubichá	8	0,220 m²	1,273	0,52%	3,505	0,23%	10,00%	0,50%	0,75%	1,25%
71	Seringaí	7	0,350 m²	1,114	0,46%	5,569	0,36%	8,00%	0,40%	0,81%	1,21%
72	Envira-piaca	5	0,462 m²	0,796	0,33%	7,349	0,47%	8,00%	0,40%	0,80%	1,20%
73	Caucho	6	0,181 m²	0,955	0,39%	2,875	0,18%	12,00%	0,60%	0,58%	1,18%
74	Malva-peluda	5	0,536 m²	0,796	0,33%	8,535	0,55%	6,00%	0,30%	0,87%	1,17%
75	Mogno	1	0,975 m²	0,159	0,07%	15,515	1,00%	2,00%	0,10%	1,06%	1,16%
76	Xixá-da-casca-dura	4	0,432 m²	0,637	0,26%	6,872	0,44%	8,00%	0,40%	0,70%	1,10%
77	Cabelo-de-cutia	5	0,261 m²	0,796	0,33%	4,156	0,27%	10,00%	0,50%	0,59%	1,09%
78	Trichilia-miúda	6	0,097 m²	0,955	0,39%	1,540	0,10%	12,00%	0,60%	0,49%	1,09%
79	Urtiga	6	0,181 m²	0,955	0,39%	2,882	0,19%	10,00%	0,50%	0,58%	1,08%
80	Guariúba	5	0,329 m²	0,796	0,33%	5,243	0,34%	8,00%	0,40%	0,66%	1,06%
81	Abiurana-de-quina	7	0,198 m²	1,114	0,46%	3,156	0,20%	8,00%	0,40%	0,66%	1,06%
82	Cumarú	1	0,867 m²	0,159	0,07%	13,792	0,89%	2,00%	0,10%	0,95%	1,05%
83	Envireira	5	0,205 m²	0,796	0,33%	3,265	0,21%	10,00%	0,50%	0,54%	1,04%
84	Itaubarana	5	0,199 m²	0,796	0,33%	3,162	0,20%	10,00%	0,50%	0,53%	1,03%
85	Envira-vassourinha	9	0,137 m²	1,432	0,59%	2,182	0,14%	6,00%	0,30%	0,73%	1,03%
86	Cajarana-do-mato	5	0,194 m²	0,796	0,33%	3,094	0,20%	10,00%	0,50%	0,52%	1,02%
87	Pau-ferrugem	4	0,326 m²	0,637	0,26%	5,189	0,33%	8,00%	0,40%	0,59%	0,99%
88	Matuti	5	0,261 m²	0,796	0,33%	4,162	0,27%	8,00%	0,40%	0,59%	0,99%
89	Cerejeira	3	0,481 m²	0,477	0,20%	7,656	0,49%	6,00%	0,30%	0,69%	0,99%

Ord	Popular Name	N°	AB (m²)	D a (Ind/ha)	D r (%)	DO a (m²/km²)	DO r (%)	FR a (%)	FR r (%)	IVC (%)	IVI (%)
90	Mapatí	5	0,247 m²	0,796	0,33%	3,928	0,25%	8,00%	0,40%	0,58%	0,98%
91	Manitê	4	0,355 m²	0,637	0,26%	5,644	0,36%	6,00%	0,30%	0,62%	0,92%
92	Ameixa	4	0,249 m²	0,637	0,26%	3,966	0,25%	8,00%	0,40%	0,52%	0,92%
93	Pama-branca	5	0,083 m²	0,796	0,33%	1,318	0,08%	10,00%	0,50%	0,41%	0,91%
94	Laranja-fedorenta	6	0,100 m²	0,955	0,39%	1,586	0,10%	8,00%	0,40%	0,49%	0,89%
95	Cedro-branco	3	0,377 m²	0,477	0,20%	5,995	0,39%	6,00%	0,30%	0,58%	0,88%
96	Fruto-de-jacamin	4	0,198 m²	0,637	0,26%	3,152	0,20%	8,00%	0,40%	0,46%	0,86%
97	Figo-de-macaco-preto	4	0,142 m²	0,637	0,26%	2,253	0,14%	8,00%	0,40%	0,41%	0,81%
98	Inharé	4	0,105 m²	0,637	0,26%	1,677	0,11%	8,00%	0,40%	0,37%	0,77%
99	Escama-de-peixe	4	0,300 m²	0,637	0,26%	4,774	0,31%	4,00%	0,20%	0,57%	0,77%
100	Muiratinga	4	0,047 m²	0,637	0,26%	0,752	0,05%	8,00%	0,40%	0,31%	0,71%
101	Seringarana	3	0,272 m²	0,477	0,20%	4,326	0,28%	4,00%	0,20%	0,47%	0,67%
102	Copaiba	2	0,321 m²	0,318	0,13%	5,105	0,33%	4,00%	0,20%	0,46%	0,66%
103	Copeiro	3	0,156 m²	0,477	0,20%	2,475	0,16%	6,00%	0,30%	0,35%	0,65%
104	Chichá-miúdo	3	0,147 m²	0,477	0,20%	2,336	0,15%	6,00%	0,30%	0,35%	0,65%
105	Ingá	3	0,144 m²	0,477	0,20%	2,299	0,15%	6,00%	0,30%	0,34%	0,64%
106	Capança	3	0,142 m²	0,477	0,20%	2,262	0,15%	6,00%	0,30%	0,34%	0,64%
107	Taperibá	4	0,170 m²	0,637	0,26%	2,699	0,17%	4,00%	0,20%	0,43%	0,63%
108	NI 26	2	0,290 m²	0,318	0,13%	4,613	0,30%	4,00%	0,20%	0,43%	0,63%
109	Cajuzinho	3	0,114 m²	0,477	0,20%	1,812	0,12%	6,00%	0,30%	0,31%	0,61%
110	Camelo-de-guariba	2	0,266 m²	0,318	0,13%	4,236	0,27%	4,00%	0,20%	0,40%	0,60%
111	Mataiba	4	0,039 m²	0,637	0,26%	0,614	0,04%	6,00%	0,30%	0,30%	0,60%
112	Jatobá	1	0,421 m²	0,159	0,07%	6,700	0,43%	2,00%	0,10%	0,50%	0,60%

Ord	Popular Name	N°	AB (m^2)	D a (Ind/ha)	D r (%)	DO a (m^2/km^2)	DO r (%)	FR a (%)	FR r (%)	IVC (%)	IVI (%)
113	Grão-de-galo	3	0,096 m^2	0,477	0,20%	1,531	0,10%	6,00%	0,30%	0,29%	0,59%
114	Ingá-chata	3	0,083 m^2	0,477	0,20%	1,319	0,08%	6,00%	0,30%	0,28%	0,58%
115	Sabugueiro	3	0,065 m^2	0,477	0,20%	1,032	0,07%	6,00%	0,30%	0,26%	0,56%
116	Sucuuba	4	0,094 m^2	0,637	0,26%	1,498	0,10%	4,00%	0,20%	0,36%	0,56%
117	Moirajiboia	3	0,053 m^2	0,477	0,20%	0,851	0,05%	6,00%	0,30%	0,25%	0,55%
118	Burdão	2	0,215 m^2	0,318	0,13%	3,419	0,22%	4,00%	0,20%	0,35%	0,55%
119	Bacuri-de-espinho	3	0,040 m^2	0,477	0,20%	0,638	0,04%	6,00%	0,30%	0,24%	0,54%
120	Coité-de-macaco	3	0,040 m^2	0,477	0,20%	0,635	0,04%	6,00%	0,30%	0,24%	0,54%
121	Tomate-bravo	3	0,034 m^2	0,477	0,20%	0,543	0,03%	6,00%	0,30%	0,23%	0,53%
122	NI 71	3	0,032 m^2	0,477	0,20%	0,515	0,03%	6,00%	0,30%	0,23%	0,53%
123	Matamatá	3	0,030 m^2	0,477	0,20%	0,476	0,03%	6,00%	0,30%	0,23%	0,53%
124	Tarumã	1	0,331 m^2	0,159	0,07%	5,271	0,34%	2,00%	0,10%	0,40%	0,50%
125	Envira-cascuda	3	0,095 m^2	0,477	0,20%	1,519	0,10%	4,00%	0,20%	0,29%	0,49%
126	Embaúba-branca	3	0,070 m^2	0,477	0,20%	1,119	0,07%	4,00%	0,20%	0,27%	0,47%
127	Algodoeiro	4	0,100 m^2	0,637	0,26%	1,586	0,10%	2,00%	0,10%	0,36%	0,46%
128	Pereiro	1	0,278 m^2	0,159	0,07%	4,429	0,28%	2,00%	0,10%	0,35%	0,45%
129	NI 72	1	0,273 m^2	0,159	0,07%	4,347	0,28%	2,00%	0,10%	0,34%	0,44%
130	Pau-sangue-casca-grossa	3	0,045 m^2	0,477	0,20%	0,710	0,05%	4,00%	0,20%	0,24%	0,44%
131	Embira	2	0,102 m^2	0,318	0,13%	1,618	0,10%	4,00%	0,20%	0,23%	0,43%
132	Matamatá-branco	3	0,025 m^2	0,477	0,20%	0,402	0,03%	4,00%	0,20%	0,22%	0,42%
133	Moiratinga-preta	2	0,077 m^2	0,318	0,13%	1,229	0,08%	4,00%	0,20%	0,21%	0,41%
134	Tachi-da-folha-larga	2	0,064 m^2	0,318	0,13%	1,011	0,06%	4,00%	0,20%	0,20%	0,40%
135	Caripé	2	0,060 m^2	0,318	0,13%	0,951	0,06%	4,00%	0,20%	0,19%	0,39%

Ord	Popular Name	N°	AB (m²)	D a (Ind/ha)	D r (%)	DO a (m²/km²)	DO r (%)	FR a (%)	FR r (%)	IVC (%)	IVI (%)
136	NI 58	1	0,217 m²	0,159	0,07%	3,448	0,22%	2,00%	0,10%	0,29%	0,39%
137	Embaubão	2	0,053 m²	0,318	0,13%	0,841	0,05%	4,00%	0,20%	0,18%	0,38%
138	Angelim-amargoso	1	0,211 m²	0,159	0,07%	3,365	0,22%	2,00%	0,10%	0,28%	0,38%
139	Chachoeira-preta	2	0,046 m²	0,318	0,13%	0,729	0,05%	4,00%	0,20%	0,18%	0,38%
140	Envira-cajú	2	0,041 m²	0,318	0,13%	0,657	0,04%	4,00%	0,20%	0,17%	0,37%
141	NI 54	2	0,040 m²	0,318	0,13%	0,642	0,04%	4,00%	0,20%	0,17%	0,37%
142	Pau-catinga	2	0,040 m²	0,318	0,13%	0,636	0,04%	4,00%	0,20%	0,17%	0,37%
143	Envira-preta	2	0,039 m²	0,318	0,13%	0,621	0,04%	4,00%	0,20%	0,17%	0,37%
144	Mororó-branco	2	0,033 m²	0,318	0,13%	0,529	0,03%	4,00%	0,20%	0,16%	0,36%
145	Pau-brasil-roxo	2	0,030 m²	0,318	0,13%	0,471	0,03%	4,00%	0,20%	0,16%	0,36%
146	Chichuá	2	0,029 m²	0,318	0,13%	0,469	0,03%	4,00%	0,20%	0,16%	0,36%
147	Pau-rosa	2	0,028 m²	0,318	0,13%	0,444	0,03%	4,00%	0,20%	0,16%	0,36%
148	Baginha	1	0,189 m²	0,159	0,07%	3,004	0,19%	2,00%	0,10%	0,26%	0,36%
149	Louro-preto	2	0,025 m²	0,318	0,13%	0,395	0,03%	4,00%	0,20%	0,16%	0,36%
150	Maruparana	2	0,025 m²	0,318	0,13%	0,395	0,03%	4,00%	0,20%	0,16%	0,36%
151	Louro-chumbo	2	0,021 m²	0,318	0,13%	0,332	0,02%	4,00%	0,20%	0,15%	0,35%
152	NI 66	2	0,019 m²	0,318	0,13%	0,303	0,02%	4,00%	0,20%	0,15%	0,35%
153	NI 10	1	0,179 m²	0,159	0,07%	2,850	0,18%	2,00%	0,10%	0,25%	0,35%
154	Itanibuca	1	0,174 m²	0,159	0,07%	2,774	0,18%	2,00%	0,10%	0,24%	0,34%
155	Ingá-seco	3	0,042 m²	0,477	0,20%	0,670	0,04%	2,00%	0,10%	0,24%	0,34%
156	Catauba-amarela	1	0,168 m²	0,159	0,07%	2,670	0,17%	2,00%	0,10%	0,24%	0,34%
157	Mirindiba-amarela	1	0,167 m²	0,159	0,07%	2,663	0,17%	2,00%	0,10%	0,24%	0,34%
158	Sino	1	0,145 m²	0,159	0,07%	2,315	0,15%	2,00%	0,10%	0,21%	0,31%

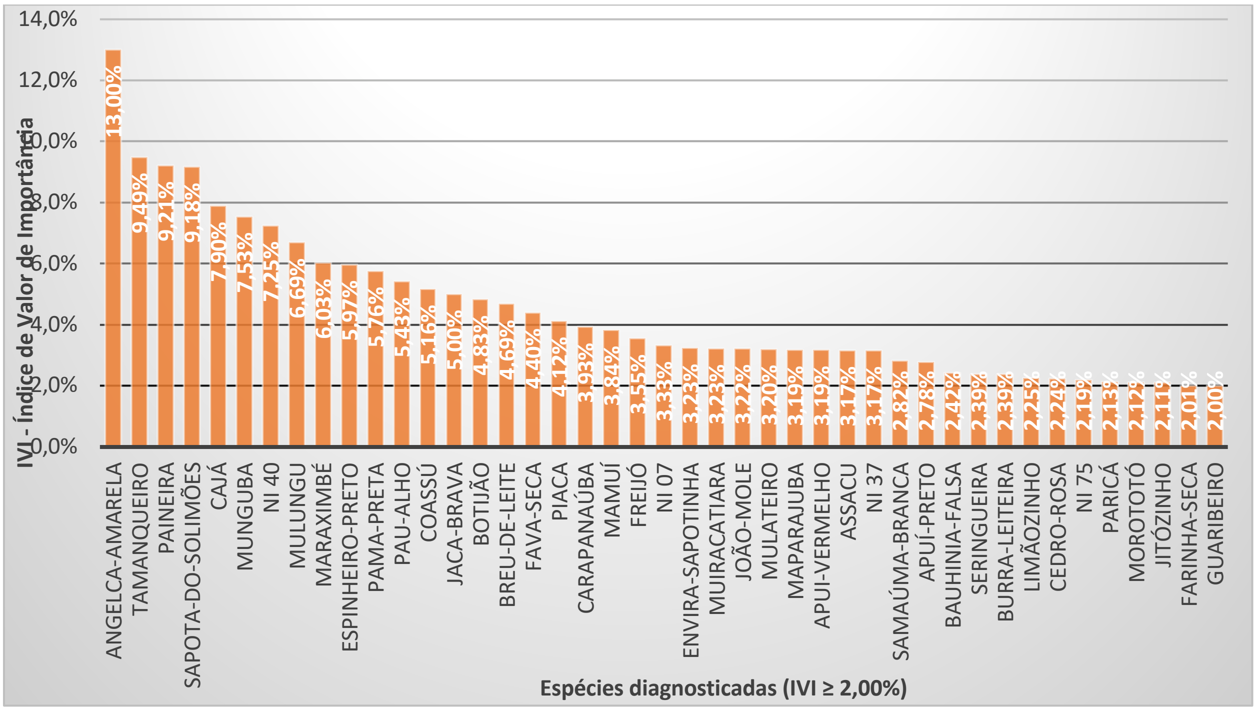
Ord	Popular Name	N°	AB (m²)	D a (Ind/ha)	D r (%)	DO a (m²/km²)	DO r (%)	FR a (%)	FR r (%)	IVC (%)	IVI (%)
159	Tamboril	2	0,079 m²	0,318	0,13%	1,264	0,08%	2,00%	0,10%	0,21%	0,31%
160	Inharé-mole	1	0,117 m²	0,159	0,07%	1,854	0,12%	2,00%	0,10%	0,18%	0,28%
161	Lacre	2	0,052 m²	0,318	0,13%	0,823	0,05%	2,00%	0,10%	0,18%	0,28%
162	Corrimboque	1	0,109 m²	0,159	0,07%	1,734	0,11%	2,00%	0,10%	0,18%	0,28%
163	Envira-preta-de-igapó	1	0,103 m²	0,159	0,07%	1,646	0,11%	2,00%	0,10%	0,17%	0,27%
164	Abiorana-preta	1	0,101 m²	0,159	0,07%	1,603	0,10%	2,00%	0,10%	0,17%	0,27%
165	NI 13	1	0,076 m²	0,159	0,07%	1,204	0,08%	2,00%	0,10%	0,14%	0,24%
166	Laranjinha	1	0,071 m²	0,159	0,07%	1,131	0,07%	2,00%	0,10%	0,14%	0,24%
167	NI 02	1	0,063 m²	0,159	0,07%	1,003	0,06%	2,00%	0,10%	0,13%	0,23%
168	Murici-branco	1	0,062 m²	0,159	0,07%	0,985	0,06%	2,00%	0,10%	0,13%	0,23%
169	Guatambu	1	0,061 m²	0,159	0,07%	0,963	0,06%	2,00%	0,10%	0,13%	0,23%
170	NI 53	1	0,059 m²	0,159	0,07%	0,943	0,06%	2,00%	0,10%	0,13%	0,23%
171	Muirapiranga	1	0,054 m²	0,159	0,07%	0,852	0,05%	2,00%	0,10%	0,12%	0,22%
172	Urucurana	1	0,053 m²	0,159	0,07%	0,841	0,05%	2,00%	0,10%	0,12%	0,22%
173	NI 06	1	0,048 m²	0,159	0,07%	0,771	0,05%	2,00%	0,10%	0,11%	0,21%
174	Pama	1	0,045 m²	0,159	0,07%	0,712	0,05%	2,00%	0,10%	0,11%	0,21%
175	Torém-de-lixa	1	0,041 m²	0,159	0,07%	0,653	0,04%	2,00%	0,10%	0,11%	0,21%
176	Casca-amarela	1	0,037 m²	0,159	0,07%	0,594	0,04%	2,00%	0,10%	0,10%	0,20%
177	Tacacazeiro	1	0,037 m²	0,159	0,07%	0,586	0,04%	2,00%	0,10%	0,10%	0,20%
178	Ipê	1	0,035 m²	0,159	0,07%	0,550	0,04%	2,00%	0,10%	0,10%	0,20%
179	NI 56	1	0,034 m²	0,159	0,07%	0,543	0,03%	2,00%	0,10%	0,10%	0,20%
180	NI 70	1	0,028 m²	0,159	0,07%	0,444	0,03%	2,00%	0,10%	0,09%	0,19%
181	Envira-iodo	1	0,026 m²	0,159	0,07%	0,419	0,03%	2,00%	0,10%	0,09%	0,19%

Ord	Popular Name	N°	AB (m²)	D a (Ind/ha)	D r (%)	DO a (m²/km²)	DO r (%)	FR a (%)	FR r (%)	IVC (%)	IVI (%)
182	NI 03	1	0,025 m²	0,159	0,07%	0,390	0,03%	2,00%	0,10%	0,09%	0,19%
183	Condurú	1	0,023 m²	0,159	0,07%	0,372	0,02%	2,00%	0,10%	0,09%	0,19%
184	NI 05	1	0,022 m²	0,159	0,07%	0,356	0,02%	2,00%	0,10%	0,09%	0,19%
185	Caripezinho	1	0,022 m²	0,159	0,07%	0,346	0,02%	2,00%	0,10%	0,09%	0,19%
186	Embaúba-vermelha	1	0,020 m²	0,159	0,07%	0,313	0,02%	2,00%	0,10%	0,09%	0,19%
187	Caripé-vermelho	1	0,019 m²	0,159	0,07%	0,307	0,02%	2,00%	0,10%	0,08%	0,18%
188	Tento	1	0,019 m²	0,159	0,07%	0,307	0,02%	2,00%	0,10%	0,08%	0,18%
189	Sabonetinho	1	0,018 m²	0,159	0,07%	0,294	0,02%	2,00%	0,10%	0,08%	0,18%
190	Cumarurana	1	0,018 m²	0,159	0,07%	0,292	0,02%	2,00%	0,10%	0,08%	0,18%
191	NI 38	1	0,018 m²	0,159	0,07%	0,287	0,02%	2,00%	0,10%	0,08%	0,18%
192	Tachi-de-igapó	1	0,018 m²	0,159	0,07%	0,279	0,02%	2,00%	0,10%	0,08%	0,18%
193	Piquiteira	1	0,016 m²	0,159	0,07%	0,251	0,02%	2,00%	0,10%	0,08%	0,18%
194	NI 14	1	0,016 m²	0,159	0,07%	0,249	0,02%	2,00%	0,10%	0,08%	0,18%
195	NI 68	1	0,015 m²	0,159	0,07%	0,245	0,02%	2,00%	0,10%	0,08%	0,18%
196	Ingá-grande	1	0,014 m²	0,159	0,07%	0,229	0,01%	2,00%	0,10%	0,08%	0,18%
197	Ingarana	1	0,014 m²	0,159	0,07%	0,227	0,01%	2,00%	0,10%	0,08%	0,18%
198	Tatajuba	1	0,014 m²	0,159	0,07%	0,223	0,01%	2,00%	0,10%	0,08%	0,18%
199	NI 52	1	0,014 m²	0,159	0,07%	0,218	0,01%	2,00%	0,10%	0,08%	0,18%
200	Genipapo	1	0,013 m²	0,159	0,07%	0,213	0,01%	2,00%	0,10%	0,08%	0,18%
201	NI 01	1	0,012 m²	0,159	0,07%	0,195	0,01%	2,00%	0,10%	0,08%	0,18%
202	Embirema	1	0,011 m²	0,159	0,07%	0,169	0,01%	2,00%	0,10%	0,08%	0,18%
203	Canela-de-velho	1	0,010 m²	0,159	0,07%	0,161	0,01%	2,00%	0,10%	0,08%	0,18%
204	Bacuri	1	0,009 m²	0,159	0,07%	0,151	0,01%	2,00%	0,10%	0,07%	0,17%

Ord	Popular Name	N°	AB (m²)	D a (Ind/ha)	D r (%)	DO a (m²/km²)	DO r (%)	FR a (%)	FR r (%)	IVC (%)	IVI (%)
205	Vela-branca	1	0,009 m²	0,159	0,07%	0,146	0,01%	2,00%	0,10%	0,07%	0,17%
206	Pirarara	1	0,009 m²	0,159	0,07%	0,143	0,01%	2,00%	0,10%	0,07%	0,17%
207	Envireira-preta	1	0,009 m²	0,159	0,07%	0,140	0,01%	2,00%	0,10%	0,07%	0,17%
208	Louro-abacate	1	0,008 m²	0,159	0,07%	0,132	0,01%	2,00%	0,10%	0,07%	0,17%
209	NI 74	1	0,008 m²	0,159	0,07%	0,130	0,01%	2,00%	0,10%	0,07%	0,17%
210	NI 73	1	0,008 m²	0,159	0,07%	0,126	0,01%	2,00%	0,10%	0,07%	0,17%
	Total	**1533**	**97,808 m²**	**243,985**	**100,00%**	**1556,660**	**100,00%**	**2002,00%**	**100,00%**	**200,00%**	**300,00%**

Source: Self Elaboration

Figure 132 - Distribution of inventoried species according to Importance Value Index (IVI).



According to Ordinance of the Ministry of the Environment, nº 148, of June 7, 2022 (BRASIL, 2022), regarding the update of the National List of Endangered Species, in the project area there are 6 species categorized as Vulnerable (VU), as shown in the table below. Only one species is Protected by Law, *Hevea brasiliensis* (Rubber Tree/Seringueira), according to Decree 5.975/2006 .

Table 85 - List of species in Annex I of the National List of Endangered Species, Ordinance No. 148/2022 and Protected by law.

Scientific Name	Family	Popular name	Category
Amburana acreana	Fabaceae	Cerejeira	VU
Apuleia leiocarpa	Fabaceae	Garapeira	VU
Cedrela fissilis	Meliaceae	Cedro-branco	VU
Cedrela odorata	Meliaceae	Cedro-rosa	VU
Hevea brasiliensis	Euphorbiaceae	Seringueira	Protected
Swietenia macrophylla	Meliaceae	Mogno	VU
Amburana acreana	Fabaceae	Cerejeira	VU
Apuleia leiocarpa	Fabaceae	Garapeira	VU

Source: Seelf Elaboration

According to data contained in REFLORA (Plants of Brazil: Historical Rescue and Virtual Herbarium for the Knowledge and Conservation of Brazilian Flora) none of the species inventoried in the Senegal area are endemic to Acre.

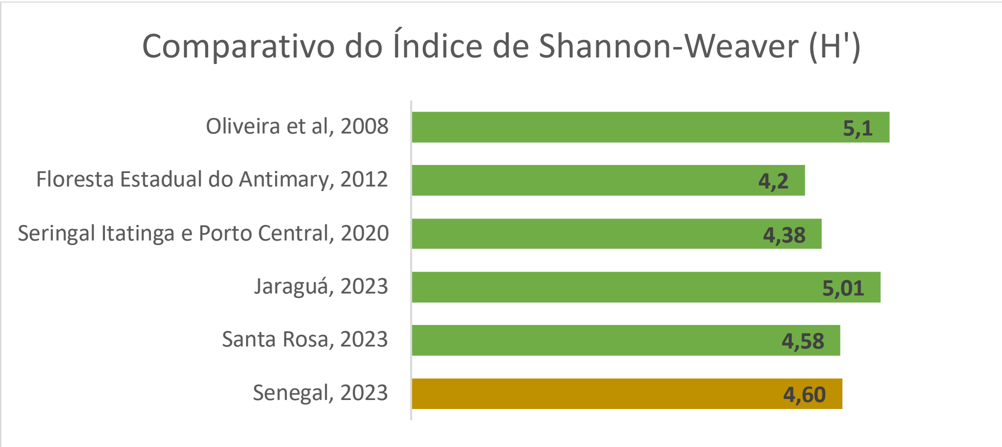
The species identified in the table above participate in the structure of the forest in different ways. Using the data from the phytosociological parameters presented above, it can be inferred that the species *Hevea brasiliensis* (rubber tree) and Cedrela odorata (pink cedar/cedro rosa) participate more in the structure of the forest, are more important when compared to the other species since their respective IVI% were 2.39% and 2.24%, ranking 34th and 37th in terms of importance value. The other species presented IVI below 1.5%, indicating, at least for the studied population, low participation in the structure of the forest.

Diversity is composed of the variety of species and the number of individuals within each species and most often diversity studies are related to patterns of spatial and environmental variation. Itis not correlated with the number of individuals per hectare of the population, but rather with a set of species and with their number of representatives (CARVALHO, 2019).

The Shannon-Weaver Index (H') was used, which considers equal weight between rare and abundant species, providing an idea of the degree of uncertainty in predicting which species would belong to an individual randomly removed from the population. The higher the H' value, the greater the floristic diversity of the population under study, corroborating Saporetti Jr. et al. (2003), who states that values above 3.11 indicate well-preserved plant formations.

The Shannon-Weaver Index (H') for the inventory was 4.60, thus indicating that the forest is well diversified. Oliveira et al (2008) indicated the same situation under evaluation in the region of Manaus whose index obtained was H'=5.10. Comparatively, the calculated index was higher in relation to the Antimary State Forest and Jaraguá Farm, where the indices were respectively 4.2 (TECMAN, 2012) and 5.01 (TECMAN, 2023a), as well as, for an area located in Manoel Urbano, Seringal Itatinga and Porto Central, the index was 4.38 (TECMAN, 2020). For the Santa Rosa area of Purus, the Shannon-Weaver Index was 4.58 (TECMAN, 2023b), similar to that found for Senegal. In the figure below, a comparison is presented between the indexes of the referential studies.

Figure 158 - Comparison of Shannon-Weaver Indexes in the Senegal area with different forest areas.



Source: Self Elaboration

5.1.2 High Conservation Values (B1.2)

Although the projects areas are surrounded by protected areas, most of them suffer from insufficient administration and patrolling, a common portrait of Amazonian protected areas (Marques & Peres, 2015).

At the below there is descriptive evaluation of the High Conservation Values found ate the Project Areas (HCVs). The region of the Projects has three of the six HCVs required by (Nigel Pitman, 2011; Panfil & Harvey, 2016).

Table 86 - Evaluation of the High Conservation Values recorded in the region of Project, Acre, Brazil

High Conservation Value	Area description
HCV 1 – Area Contains globally, regionally, or nationally concentrations of biodiversity values (Endemism, Endangered Species and refuge)	The three areas contain regionally and globally the presence and abundant records of endemic and endangered species of fauna and flora (see description at 5.1.1, above).
HCV 2. Large areas at the globally, regionally, or nationally significant landscape level where viable populations of most, if not all, naturally occurring species exist in natural patterns of distribution and abundance.	The properties are surrounded by protected areas or non-designated primary forests, forming mosaics of protected areas or designated areas with regulation (settlements).
HCV 3. Areas that are within or contain rare, threatened, or endangered ecosystems	The properties and its landscape are immersed in an area of occurrence of the largest natural bamboo forests in the world, with species of the genus *Guadua* sp. Species of fauna have a strong association with these environments in the region, being specialists in this type of vegetation.

Source: Seelf Elaboration

5.1.3 Without – Project Scenario: Biodiversity (B1.3)

The project areas have attributes of high biological and ecological value that allow the maintenance of biodiversity species, a great diversity of natural landscapes, and the unique beauty of tropical forests. The richness and diversity of species is linked to the diversity of habitats and the abundance of resources, a fundamental element to ensure the stability of the biodiversity populations that reside there (Sampaio et al., 2010).

In the absence of the Carbon Credit Project in the areas of the Jaraguá, Santa Rosa and Senegal Projects in Acre, Brazil, the biodiversity will be negatively and directly impacted, mainly by anthropogenic deforestation actions, with an impact on the decline of populations. Among the main threats in a scenario without the project we can mention:

- Advance of the loss of vegetation cover due to deforestation from the banks of roads, which is an existing reality in this region, with expansion of the implementation of pastures and open areas for planting soybeans and corn in the region. This risk is strongly applied to the areas of Jaraguá and Santa Rosa, due to the proximity of highways (implemented and projected).
- Potential risk of the presence of insecticides and fertilizers aimed at controlling insects and increasing production. The use of toxic products in pastures causes irreversible damage to soil, water and air, and the quality of life can be altered through excessive contact with these highly toxic products.
- Susceptibility of forests to the risk of fire, arising from arson used for deforestation and establishment of open areas for cultivation or cattle breeding. This risk is strongly applied to the areas of Jaraguá and Senegal, due to the proximity of settlements.
- Impact on water quality, mainly by the degradation of the tributaries of important rivers for nearby communities and cities, through deforestation in springs and loss of vegetation cover on the banks of rivers and streams.
- Loss of unique and single-occurrence habitats, represented in this southwestern region of the Amazon, which can affect the occurrence and destruction of endemic, rare and threatened species. Loss of species diversity that is associated with specific resources for their survival and maintenance.
- Population declination of species of fauna and flora.
- The increase in hunting pressure on medium and large fauna will lead to empty forests with a simplified structure, with a predominance of common species and few ecological roles to be played, resulting in a reduction in the richness of plant species and consequently in the carbon stock.
- Propensity and permeability of the area for the occurrence of exotic and invasive species, which tend to accompany the advance of deforestation and roads. Because they are non-native species, some species are opportunistic and generalist in habitats, occupying an ecological function of unnatural predator, causing a disturbance in local biodiversity and habitat imbalance.
- The three areas are in regions with great pressure for deforestation. The loss of forested areas will cause the breakdown of large forest massifs that allow the maintenance of viable populations of biodiversity. This risk is potentially important for the Santa Rosa area.
- The potential future deforestation of the areas, without the carbon project, will allow new neighbouring public areas, not destined, to be invaded and deforested. This risk is potential for the Senegal and Santa Rosa areas.
- The non-implementation of the projects will mean the loss of sustainable demonstrative units for the region. On how to keep the forest without deforestation and, at the same time, develop sustainable activities. This risk has a potential impact on the areas of Jaraguá and Senegal that have Extractive Reserves and neighbouring settlements.

5.2 Net Positive Biodiversity Impacts

5.2.1 Expected Biodiversity Changes (B2.1)

Specifically, it is indicated that sets of biodiversity elements will be positively impacted by the project, described in the tables below.

Biodiversity Element	Species associated with bamboo forests.
Estimated Change	At least 5 years
Justification of Change	Important information will be known about the biology of key species associated with this natural environment, found in large areas in Acre that will allow the conservation of this unique natural environment. The data listed in this report serve as a basis for this assumption.

Biodiversity Element	Wildlife species hunted
Estimated Change	At least 5 years
Justification of Change	Important information will be known on the maintenance capacity of species commonly hunted and fished in the region, especially large mammals. The information will generate enough data for the realization of management and conservation plans for these species.

Source: Self Elaboration

5.2.2 Mitigation Measures (B2.3)

To maximize positive impacts and minimize negative impacts, it is important that the implementation of the projects is done in a transparent and participatory way, involving all stakeholders.

It is also important that monitoring and verification mechanisms are put in place to ensure that forest conservation measures are being effective and that greenhouse gas emissions are being significantly reduced.

The Project governance to be established is a fundamental part of the process. A participative, inclusive and transparent management process should be established. In addition, project management should indicate best practices and technologies for the management of social and environmental indicators related to the protection of areas and the social and economic development of territories.

The creation of a Territorial Management Group - TMG is recommended. The Territorial Management Group will be empowered by the project to function as a representation entity for the municipalities and communities involved.

The TMG will be organized and implemented at the beginning of the project, as the proposal is that the activities be carried out in a collaborative, interactive and participatory way. An internal regulation will be developed on the scope and form of participation of the TMG within the scope of the project. The TMG will have a deliberative role in monitoring and supervising all the actions developed within the scope of this Project.

One of the first actions that the Project will carry out is the mapping of all communities and organizations, however small, that are related to the promotion of sustainable development in the territory.

Knowing the scenarios and their actors well is a structuring component of a project like this. This knowledge includes mapping each key actor directly or indirectly involved in socio-environmentally structuring activities, that is, in addition to carrying out a survey related to this, also carrying out geospatialization, to understand where they are, how they act and what interfaces are present. In this sense, it is also necessary to characterize each public policy, project, program and business developed by local actors, whether private or public.

From the installation of participatory governance in the Project it is expected that:

- The establishment of Territorial Hubs or Territorial Digital Empowerment Centers – CEDTs in the municipalities covered by the project.
- That people be trained by the Project's management to develop actions in the municipalities covered by the Project, mainly in communities surrounding the areas.
- Training of members of local organizations in organizational strengthening, technological innovation, etc.
- In-depth knowledge of the social actors in the areas surrounding the Project.
- Activities, results and impacts achieved by the Project communicated in the partners' social media and also in communication vehicles.
- System for monitoring multidimensional aspects of the territory implemented to identify territorial strengths and vulnerabilities and indicate ways to mitigate impacts. The project will

serve as a catalyst that will allow advances in quality of life to be achieved by the communities themselves.

- Digital transformation implemented and welcomed by communities in their various interfaces: personal and professional lives.

Finally, a system for Structured Knowledge of the Territory - SKT will also be set up. The SKT is a stage of field actions integrated with the remote management of data collection and content classification, which will later be used in subsequent stages of the work. The SKT will be essential for documenting expectations, mapping demands and other information that will be essential for the implementation of the Project activities described below:

“Florestas do Acre “System for Monitoring Territorial Development. The “Forests of Acre System”, will be an instrument to be developed by the Project in a collaborative process with the Territorial Management Group, with the aim of visualizing, in an integrated way, the entire territory worked and evaluating its conditions based on the dimensions of human security. There are six dimensions defined by the UN: economic security, health security, environmental security, personal security, community security and political security. However, for the creation of “Forests of Acre System “, and due to the obvious importance related to the climate crisis, the Project opted to add two more dimensions as a way of emphasizing critical and current issues: the climate dimension and the dimension inclusion and digital empowerment, both fundamental elements and pillars of Revolution 4.0.

The combination of these layers will allow to portray the territory, in a systemic and contextualized way, and to use the territorial approach for the chain of actions. The data will be monitored by the TMG, but the idea is that communities and all interested parties have access to information so that they can, in an interactive and concrete way, participate in the territorial transformation.

Territorial Information Platform - TIP “Florestas do Acre“. All information collected and processed according to the methods, metrics and tools developed and applied will be systematically organized on a Platform with storage systems, for remote access by different stakeholders in the territory. A "blend" of low-cost technology solutions will be proposed and used for the production of such deliverables. The Project will use the social technologies developed for this Project, to expand and make territorial monitoring conditions cheaper, with lower costs and always using the technology elements already present in the territories in monitored enterprises, treating the key actors of the anchor areas - Jaraguá, Santa Rosa and Senegal, as members of the same team. The territorial diagnosis will use its own methodology already tested and validated in other territories, with the aim of obtaining and systematizing data in order to portray the geographic space, that is, to gather a set of information that adds a geo-systematized database with several layers , such as: production chains, social organizations, types of companies and enterprises, local public policies for territorial development, engagement of actors -

especially rural producers, logistics, health, local social and environmental committees and councils, local infrastructure, among others.

The objective of the Florestas do Acre Project is to take a step forward in recognizing the territory as sustainable and biosafe for residents and visitors, making digital technologies already incorporated into the daily lives and in the culture of the communities in the territory, instruments for the expansion the use of methodologies and for the expansion and maintenance of a sustainable territory - allowing for even greater precision and diversification of metrics for measuring sustainable development in the coming years and consequent protection of forests.

The low-cost "smartphones" already present in the lives of community members will be able to act as mobile data collection and delivery terminals that already have a known and assimilated interface - especially the instant messaging application provided by Facebook, Inc. called WhatsApp, but also some others that the Project will point out. These Mobile devices will not leave the territory at the end of the Project, on the contrary, they are instruments of the community culture that has already formed a perennial link between the territorial space and the interactions that it may have with the outside world, such as product sales markets sustainability, instruments of regional, national and international public policies, etc.

The Project's proposal for monitoring the territory, added to the information obtained by the municipalities involved and the Territorial Management Group, over the years, aims to build a legacy of capturing data and sending information with multiple purposes, using digital tools already incorporated into the daily lives of communities, and which will thus facilitate the continuity and improvement of practices worked on in local productions and which contribute to the sustainable development of the territory.

The results of the analysis of the data will be consolidated in a Digital Report that will summarize the information to be made available in a "Dashboard" on the Territorial Information Platform (TIP) and made available to the actors and interested parties. In addition, it will serve as a source of information for municipalities to develop plans, resource applications and public policies.

5.2.3 Net Positive Biodiversity Impacts (B2.2, GL1.4)

The projects will contribute positively to the conservation and preservation of species on and around the areas part of this Project. Among the positive impacts we can highlight:

Conservation of biodiversity since the fauna and flora have indispensable ecological functions for self-sufficiency and sufficiency and quality of the environment.

High Conservation Value Areas (HCV) will be maintained and protected by the activities to be carried out with the management of the projects, with the development of research, and with the engagement of local and regional stakeholders.

Conservation of biodiversity since the fauna and flora have indispensable ecological functions for self-sufficiency and sufficiency and quality of the environment. High Conservation Value Areas (HCV) will be maintained and protected by the activities to be carried out with the management of the projects, with the development of research, and with the engagement of local and regional stakeholders.Benefits beyond the project zone, such as the quality of habitat and refuge for the species that occur in its surroundings.

Conservation of biodiversity since the fauna and flora have indispensable ecological functions for self-sufficiency and sufficiency and quality of the environment. High Conservation Value Areas (HCV) will be maintained and protected by the activities to be carried out with the management of the projects, with the development of research, and with the engagement of local and regional stakeholders. Benefits beyond the project zone, such as the quality of habitat and refuge for the species that occur in its surroundings.Environmental education with community/traditional peoples to engage on the importance of biodiversity preservation and forest maintenance.

Forest barrier against the advance of deforestation and to contain the implementation of pastures and areas for monoculture production, which will directly contribute to the reduction of deforestation in the Acre region.

Protection of permanent protection areas (Riparian Zones) assisting in the maintenance and quality of water bodies.

Barrier against the advance of anthropic fire.

Reducing the impact of hunting on some groups of fauna, Mastofauna and Avifauna, through awareness-raising.

Maintenance of primary forest structure not affected or impacted by anthropogenic activities.

Habitat conservation of rare and endemic species, threatened with extinction, helping to maintain minimum viable populations.

Existence and permanence of a source area for fauna, being the properties becoming a favorable environment for reproduction of the species and emigration of the same to other areas, including properties and neighboring protected areas.

The projects areas can be used as scientific research on natural history and ecology of species, contributing to a greater knowledge about the ecology and natural history of fauna species.

The project areas, together, can serve as catalysts for the sustainable development of the territory where they are located, serving as demonstrative anchor areas on how to promote sustainable development.

5.2.4 High Conservation Values Protected (B2.4)

Jaraguá Farm is in an eastern region of the State of Acre, which has high deforestation rates and is home to large livestock projects. Despite this scenario of anthropic pressure, the presence of forests in this region can create favorable conditions for the occurrence of several species of flora, mammals, birds, reptiles and other taxa. With this, the forest area of the property can be considered as a refuge area for the surrounding birds, for instance, such as large raptors such as the monkey hawk (*Spizaetus tyrannus*), recorded during field sampling.

The state of Acre is inserted in the Inambari Endemism Center and the region of the Jaraguá Farm area stands out for the high density of environments dominated with bamboo of the genus *Guadua*, known regionally as 'the tabocais'. Therefore, there are several records of endemic species and habitat specialists. This region is considered as an Important *Bird Area* (IBA) for having species such as the machetado maria (*Hemitriccus flammulatus*), the white-faced ferreirinho (*Poecilotriccus albifaceis*), the Goeldi's Antbird (*Akletos goeldii*) and the Barred-tailed Taoca Mother (*Oneillornis salvini*), which are specialists in the habitats with a predominance of bamboo of the genus *Guadua*.

Several species of vertebrates and invertebrates have specialization or association in habitats, especially those dominated by bamboo, and birds are known for these habitat preferences. One response to this association is the great availability of food and the distinct structure of the vegetation – decrease in tree richness and the invasion pressure of this botanical taxon (Silveira, 2005), which favors specialization in these environments. Therefore, carrying out the conservation of these priority areas is important to understand the dynamics of the conservation of these habitats that house a diversity of vertebrates, invertebrates, and peculiar characteristics of the flora, in which these habitats dominated by *Guadua* is endemic to the southwest of the Amazon.

All information compiled reinforce the effectiveness of the work plan developed to access information related to the local biodiversity as an argument about the importance of preserving this area.

The forest not only provides adequate resources and conditions for local species, but also serves as a corridor for other species, such as mammals and birds, evidencing the interconnectedness of communities. Thus, areas of high ecosystem importance (like the HCV natural bamboo forests, with species of the genus *Guadua* sp.), are highly recommended for the implementation of conservation areas, especially because they are close to other protected areas. This means that there will be larger areas of high biodiversity value, which is extremely beneficial.

The species richness recorded for the region, through primary and secondary data is relatively high. Some species are considered rare and endemic, some have game value and others are considered bioindicators of environmental quality.

However, surely, the conservation of the ecological attributes present in the Jaraguá Farm must be analysed in an integrated way. The Jaraguá Project proposes, in its programs, actions that promote social engagement to create a support base for the area to ensure the preservation of the forest. including the HCVs. Social engagement must take place through processes that allow surrounding communities and other stakeholders in the project to actively participate, closely monitoring and ensuring that the project generates legacies with positive social and environmental impacts. The Jaraguá Project will be a territorial anchor to promote the sustainable transformation of the territory from the conservation and sustainable management of the region's natural resources. Social engagement will allow the sharing of actions, learning and good practices that are developed in the area. It is worth indicating that actions for social inclusion must necessarily involve engagement with the settlements and protected areas of the region.

Santa Rosa Farm is in an area with large portions of forests preserved in protected areas. Because of this scenario of preservation, the presence of forests in this region can create favorable conditions for the occurrence of several species of mammals, birds, reptiles, and other taxa. With this, the forest area of the property can be considered as an aggregated refuge area.

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The species richness recorded for the region, through primary and secondary data is relatively high. Some species are considered rare and endemic, some have game value and others are considered bioindicators of environmental quality.

Like Santa Rosa Farm, Senegal Farm is in an area with large portions of forests preserved in protected areas. Because of this scenario of preservation, the presence of forests in this region can create favorable conditions for the occurrence of several species of mammals, birds, reptiles, and other taxa. With this, the forest area of the property can be considered as an aggregated refuge area.

All information compiled reinforce the effectiveness of the work plan developed to access information related to the local biodiversity as an argument about the importance of preserving this area.

The forest not only provides adequate resources and conditions for local species, but also serves as a corridor for other species, such as mammals and birds, evidencing the interconnectedness of communities. Thus, areas of high ecosystem importance (like the HCV natural bamboo forests, with species of the genus *Guadua* sp.), are highly recommended for the implementation of conservation areas, especially because they are close to other protected areas. This means that there will be larger areas of high biodiversity value, which is extremely beneficial.

The species richness recorded for the region, through primary and secondary data is relatively high. Some species are considered rare and endemic, some have game value and others are considered bioindicators of environmental quality.

However, it will be necessary to engage with the surrounding protected areas, with the Chico Mendes Reserve, due to the anthropic pressure it exerts on the project area.

5.2.5 Species Used (B2.5)

All species compiled and observed throughout the preparatory studies for this project are listed in the Annexes of this PDD: 1 - entomofauna, 2 - ichthyofauna, 3 - herpetofauna, 4 - avifauna, 5 - mammalian fauna and vegetation (item 8.1.3 of this PDD).

5.2.6 Invasive Species (B2.5)

No non-native species will be introduced by the project. However, During the surveys of secondary data, there are some invasive species recorded in the range of action in projects (see item 5.1.1. for detailed lists). However, it is worth mentioning that none of these invasive species were recorded inside the project's areas and within a radius of 10 km², proving that the area of the properties is highly conserved, protecting the local fauna and flora.

Allegedly these species arrived in the region of the project's due to the deforestation of the native vegetation cover for the formation of open environments (for example, pastures). For example, some bird's species are adapted to these habitats. Invasive species are indications of environmental imbalance due to intense anthropic actions in the environment. To contain the arrival of new invasive species, the suggestion is to carry out environmental education in the region, guiding to reduce deforestation and other anthropic actions, such as illegal opening of roads and forest fires.

5.2.7 Impacts of Non-native Species (B2.6)

There is no use of non-native species by the project.

5.2.8 GMO Exclusion (B2.7)

There is no use of genetically modified species on the project's areas and by the Project.

5.2.9 Inputs Justification (B2.8)

None of these products or inputs have been or will be used by the project.

5.2.10 Waste Products (B2.9)

All waste and other products used and resulting from the project must be disposed of and stored according to the safety standards of each. Due to their nature and origin (ABNT NBR 10.004/2004), once disposed of incorrectly, these products can generate great environmental and social impacts and damages for the affected areas.

For this, each product must be classified according to:

- Role of potential risks to the environment (biodiversity, soil, water).
- The role of risks to human health.

5.3 Offsite Biodiversity Impacts

5.3.1 Negative Offsite Biodiversity Impacts (B3.1) and Mitigation Measures (B3.2)

Negative Offsite Impact *Identify potential negative impact on biodiversity.*	Mitigation Measure(s) *Describe the measures needed and designed to mitigate negative impact*
Hunting pressure on species	Environmental education program; oversight; program for monitoring the species most sought after by hunters; promote the development of programs for raising animals for food in settlements, nearby communities, etc.
Deforestation of forest fragments or other areas close to the project's areas	Promotion of enforcement actions; promotion of research, together with research centers and universities, on the economic potential of native species.
Little or insufficient information on the biology of key species, rare, endemic, or threatened species that can support specific management plans.	Partnership with research centers and universities to carry out research.

Source: Self Elaboration

5.3.2 Net Offsite Biodiversity Benefits (B3.3)

The main threats to the areas were identified as:

- Hunting

- Burning

- Logging

- Extraction of economically precious trees

- Crash on highways

- Illegal fishing

- Illegal trade and smuggling of species

- Opening of roads and access roads.

The Project will make it possible to carry out actions for the protection of forests by developing advanced research activities on local biodiversity, proposed by the monitoring programs. Besides, already identified threatened species will be monitored to understand which strategic actions for the preservation of populations in the project area should be made.

The Project's areas will become an Advanced Center for the Protection of Unique Amazonian Forest types, such as bamboo forests, attracting the attention of universities, research centers - national and international.

To do so, it will be necessary to implement an inclusive and transparent management and governance process, including the participating in the process management councils of the protected areas that surrounded the project area.

5.4 Biodiversity Impact Monitoring

5.4.1 Biodiversity Monitoring Plan (B4.1, B4.2, GL 1.4, GL3.4)

CAUSE	FACTOR	What	Why	Where	When		Who	How
		what will be done?	why will it be done?	where will it be done?	when will it be done?		by whom will it be made?	how will it be done?
		ACTION PLAN	EXPECTED RESULT	PLACE OF REALIZATION	Start (dd/mm/yyyy) or seasonal season	Duration (days)	ACCOUNTABLE	HOW WILL IT BE DONE?
Fauna	1.1 Monitoring of Ichthyofauna	Monitoring fish community	Deepen the survey of species in the areas and surroundings. Population estimates of fish species, to monitor population fluctuations of migratory species of economic interest and bioindicators, in addition to evaluating the year-on-year impact of the project implementation process	Project's Areas	Year-round seasonal transition period	10	Consultants	Hiring of new service; training of local and surrounding communities to use a participatory monitoring tool for social inclusion (Application for fishing registration) and monitoring of responsible biologist
Fauna	1.2 Herpetofauna Monitoring	Monitoring amphibians and reptiles' community	Deepen the survey of species in the areas and surroundings. Population estimates of amphibian and reptile species, to monitor population fluctuations of bioindicator species, in addition to evaluating the year-on-year impact of the project implementation process	Project's Areas	Year-round seasonal transition period	10	Consultants	Hiring of company, Implementation of monitoring trails following PEL standard, annual sampling conducted by biologist specialist in the group
Fauna	1.3 Avifauna Monitoring	Monitoring bird community	Deepen the survey of species in the area and surroundings. Population estimates of bird species, to monitor population fluctuations of migratory species of economic interest and bioindicators, in addition to evaluating the year-on-year impact of the project implementation process	Project's Areas	Year-round seasonal transition period	10	Consultants	Hiring of company, Implementation of monitoring trails following PEL standard, annual sampling conducted by biologist specialist in the group with sampling through capture and recapture with ringing for population monitoring
Fauna	1.4 Mastofauna Monitoring	Monitoring mammal community	Deepen the survey of species in the areas and surroundings. Population estimates of mammalian species, to monitor population fluctuations of species of economic interest and bioindicators, in addition to evaluating the year-on-year impact of the project implementation process	Project's Areas	Year-round seasonal transition period	10	Consultants	Hiring of company, Implementation of monitoring tracks following PEL standard, annual sampling conducted by a biologist specialized in the group with sampling, through standardized methodology for estimation of abundance and population density

Flora	**1.5. Vegetation Monitoring**	**Monitoring vegetation natural restoration**	**Monitoring of degraded areas at Fazenda Jaraguá**	**Jaraguá Farm**	**Survey to be carried out once a year**	**10**	**Consultants**	**Hiring of company, Implementation of monitoring tracks, annual sampling conducted by a expert, through standardized methodology for estimation of abundance and population density and level of forest restoration**
Bamboo forests: Fauna and Flora	1.6. Bamboo forests Monitoring	Monitoring de diversity of faunal species and its specific relationships with the bamboo Guandua sp.	Deepen the survey of species in the areas. Population estimates of faunal species, to monitor population fluctuations of species related to the bamboos forests, in addition to evaluating the year-on-year impact of the project implementation process	Project's Areas	Year-round seasonal transition period	10	Consultants	Hiring of company, Implementation of monitoring tracks following PEL standard, annual sampling conducted by a biologist specialized in the group with sampling, through standardized methodology for estimation of abundance and population density

Source: Self Elaboration

5.4.2 Biodiversity Monitoring Plan Dissemination (B4.3)

To expand the list of species and monitor the possible population fluctuations linked to the implementation or not of the project and to understand how in fact the project will benefit local biodiversity is suggested the implementation of a local fauna monitoring program, considering mainly the participation, including the local community in the process of collecting information from the biodiversity through standardized methodologies. In a survey on participatory and community monitoring actions (Constantino et al., 2008; Danielsen et al., 2011; Campos-Silva et al., 2021; Franco et al., 2021) found that surveillance, monitoring, and management actions focused on biodiversity were more successful when the local community was included in the process.

To monitor the local biodiversity, an annual plan to monitor biodiversity, including fish, amphibians, reptiles, birds, and mammals and vegetation, including bamboos forests is suggested. The sampling protocols will follow the standard for each group of fauna e vegetation, considering about 10 days of sampling per year, and linking the use of technology tools aimed at citizen science for inclusion of the local community. The monitoring actions will generate information not only designed and focused on biodiversity, but also for the local community, since riverine communities depend on the protein of wild animals for their subsistence. Listing and monitoring the abundance and/or density of species of fauna is imperative to assist local populations in defining the best use of biodiversity, contributing to the protection and conservation of endangered species.

The monitoring plan should include community training methodology on sampling of the groups of biodiversity to be monitored, training for the use of monitoring technologies, planning and design of annual monitoring actions including joint decision-making of the targets to be monitored, curation and analysis of field data and analytical reporting of information. It will be necessary to obtain specific environmental licenses from the responsible environmental agencies and partnerships with universities and/or research centers.

It will be necessary to prepare a Dissemination and Communication

5.5 Optional Criterion: Expectational Biodiversity Benefits

5.5.1 High Biodiversity Conservation Priority Status (GL3.1)

Below are summarized the data obtained on the conservation status of the fauna and flora species inventoried in the three areas of the Project.

5.5.1.1 Jaraguá Farm

5.5.1.1.1 Ichthyofauna

Although there were no field collections with the faunal group of fish, it was possible to collect important information in the scientific literature. From the verification of the species in the International Union for the Conservation of Nature and Natural Resources - IUCN program, it was found that some species were listed in three categories: LC - Least Concern/Safe or Little Concern with 82 species, NT - Near Threatened/Near Threatened, for the species Panaque cochliodon and DD - Data Deficient/Insufficient Data for 16 species (Appendix 6). In addition, only the stingray species Paratrygon aiereba was classified as CR - Critically Endangered in the Red Book of Brazilian Fauna Threatened with Extinction of the ICMBio.

The destruction of the natural habitat of the species implies population reduction and in case more severe in the local and regional extinction, making more worrisome species that are endemic, as is the case of the species cará Apistograma acrensis and the glass cleaner Corydoras acrensis that are endemic to the Acre River basin. In addition, in the current senary we already come across species that are threatened, such as the stingray Paratrygon aiereba that is listed as Critically Endangered in the Book of Endangered Species of ICMBio. One of the main threats to P. aiereba is ornamental fishing, although its capture is illegal in Brazil, countries such as Colombia and Peru are known to export this species to the ornamental fish trade (Araújo et al., 2018). Demographic studies of P. aiereba have shown that its population is in rapid decline and may decrease by more than 80% soon (Araújo et al., 2018). Given this, more research and local conservation initiatives are urgently needed not only for this species, but for many that today are considered almost threatened as the cascudo Panaque cochliodon or little concern.

The western region of the Amazon, which is located at Fazenda Jaraguá, is home to a great diversity of fish, and much of this diversity is considered important for commercialization and subsistence. Species such as the mapará (Hypophthalmus edentatus, Hypophthalmus marginatus), the Curimatã (Prochilodus nigricans), the calf (Brachyplatystoma filamentosum), the Surubim (Pseudoplatystoma punctifer) and the Pacu (Mylossoma duriventre), which are highly valued economically and generate financial movement in the region.

The region that is around the Jaraguá Farm is widely explored because it is an area close to urban centers and the BR – 364, resulting in a greater loss of forest cover, which directly affects the fish community. For aquatic biota, the forest is very important, as they play a key role in maintaining aquatic biodiversity and the survival of fish. This is because forests regulate the microclimate, maintain water quality, and provide shelter and food for fish (Roa-Fuentes & Casatti, 2017). In addition, fishing is an important activity for many riverine communities, which depend on natural resources for their livelihoods.

5.5.1.1.2 Avifauna

In this survey, two databases were used to classify the conservation status of bird species: the Chico Mendes Institute for Biodiversity Conservation (ICMBio) and the International Union for Conservation of Nature (IUCN). Most of the species recorded have a conservation status of 'least concern' – ICMBio and IUCN, both with 534 species (Appendix 6); 'almost threatened' are the species Tinamus guttatus and Spizaetus ornatus; in the 'vulnerable category', the species Tinamus tao and Harpia harpyja.

The results showed that, approximately, 97% of the species recorded in this survey of avifauna are not categorized as threatened, however, there are species that inhabit the region that is in a worrying category of 'almost threatened', such as the maria-sebinha-do-acre (Hemitriccus cohnhafti), a species recently described for science (Zimmer et al., 2013). Its first record was in the state of Acre, in 2009, until then unknown by researchers. The bird is one of the least known species of the Neotropical region, restricted to the southwest of the Amazon and to the habitats with a predominance of bamboo of the genus Guadua. The population size of the species is unknown, and its current records are limited in point localities. It is believed that the population is decreasing, since its entire territorial extension is estimated at 15,200 km² and is within the so-called 'Arc of Deforestation'. Consequently, the distribution of the species is being impacted because of habitat loss for livestock and forest fragmentation. With these potential risks and threats, in the future the species may be inserted in the 'vulnerable' category. Therefore, it is valid to implement and encourage conservation projects, so that forest areas are places of survival of inconspicuous species, rare and with little information about their natural history.

Table 87 - Avifauna species included in endangered categories recorded in the avifauna survey around Fazenda Jaraguá, Bujari, Acre, 2023. Subtitles: ICMBio = Chico Mendes Institute for Biodiversity Conservation; IUCN = International Union for Conservation.

Species	Popular name	ICMBio	IUCN
Tinamus so	azulona	VU	VU
Tinamus guttatus	inhambu-chicken	-	NT
Crypturellus strigulosus	inhambu-clock	NT	-
Psophia leucoptera	white-backed jacamim	-	NT
Agamia agami	heron	-	VU
Sarcoramphus papa	king vulture	NT	-
Morphnus guianensis	uiraçu	VU	NT
Spizaetus ornatus	feathered hawk	NT	NT
Harpyja Harpy	hawk	VU	VU
Ibycter americanus	Song	NT	-
Ara chloropterus	red macaw	NT	-
Conothraupis speculigera	tiê-black-and-white	NT	-
Celeus torquatus	collared woodpecker	-	NT
Pionites leucogaster	yellow-headed Marianine	-	VU
Primolius couloni	blue-headed maracana	-	VU
Formicarius rufifrons	red-fronted bush chick	-	NT
Syndactyla ucayalae	leaf-leaf-turned-cleaner	-	NT
Cnipodectes superrufus	rufous piccole	-	VU
Hemitriccus cohnhafti	maria-sebinha-do-acre	-	NT

Source: Self Elaboration

5.5.1.1.3 Mastofauna

During the research, it was possible to record the presence of eight species that are classified as threatened with extinction, according to the criteria established by the Red List of the International Union for Conservation of Nature (IUCN). They are listed as Near Threatened (NT) and Vulnerable (VU). The jaguar (Panthera onca), the peccary (Tayassu pecari), Armadillo Canastra (Priodontes maximus), the tapir (Tapirus terrestris) and the primates Soim-preto (Callimico Goeldi) capuchin monkey (Cebus unicolor) and the guariba (Alouatta puruensis), both are species sensitive to anthropogenic changes, and hunting pressure, in addition to Tatu Canastra and Anta occur naturally at low densities (Aya-Cuero et al., 2017; Mayor et al., 2017; Desbiez et al., 2019; Oliveira & Calouro, 2019), which includes them in the list as vulnerable to extinction in the wild.

Order	Family	Species	Status
Carnivorous	Felidae	*Panthera onca*	NT
Artiodactyla	Tayassuidae	*Tayassu pecari*	VU
Cingulata	Dasypodidae	*Priodontes maximus*	VU
Perissodactyla	Tapiridae	*Tapirus terrestris*	VU
Primates	Callitrichidae	*Callimico goeldii*	VU
Primates	Cebidae	*Cebus unicolor*	VU

5.5.1.1.3.1 Vegetation

According to the Ordinance of the Ministry of the Environment, nº 148, of June 7, 2022 (BRASIL, 2022), regarding the update of the National List of Endangered Species, in the project area there are 7 species categorized as Vulnerable (VU), as shown in the table below. Two species are Protected by Law, Bertholletia excelsa (Chestnut Tree/Castanheira), according to Decree 5.975/2006 and Hevea brasiliensis (Rubber Tree/Seringueira), according to Decree 5.975/2006.

Table 88 - List of species in Annex I of the National List of Endangered Species, Ordinance No. 148/2022 and Protected by law.

Scientific Name	Family	Popular Name Portuguese	Category
Amburana acreana	Fabaceae	Cerejeira	VU
Apuleia leiocarpa	Fabaceae	Garapeira	VU
Bertholletia excelsa	Lecythidaceae	Castanheira	VU/Protected
Cedrela fissilis	Meliaceae	Cedro-branco	VU
Cedrela odorata	Meliaceae	Cedro-rosa	VU
Hymenaea parvifolia	Fabaceae	Jutaí	VU
Mezilaurus itauba	Lauraceae	Itaúba	VU
Hevea brasiliensis	Euphorbiaceae	Seringueira	Protected

5.5.1.2 Santa Rosa Farm

5.5.1.2.1.1 Ichthyofauna

From the verification of the species in the International Union for the Conservation of Nature and Natural Resources - IUCN program, it was found that some species were listed in three categories: LC - Least Concern/Safe or Little Concern with 55 species, NT - Near Threatened/Near Threatened, for the species Panaque cochliodon and DD - Data Deficient/Insufficient Data with four species (Appendix 6). In addition, only the stingray/arraia species Paratrygon aiereba was classified as CR - Critically Endangered in the Red Book of Brazilian Fauna Threatened with Extinction of the ICMBio.

The destruction of the natural habitat of the species implies population reduction and in more severe cases in the local and regional extinction, making more worrying species that are endemic. In addition, in the current scenario we already come across species that are threatened, such as the stingray Paratrygon aiereba that is listed as Critically Endangered in the Book of Endangered Species of ICMBio. One of the main threats to P. aiereba is ornamental fishing, although its capture is illegal in Brazil, countries such as Colombia and Peru are known to export this species to the ornamental fish trade (Araújo et al., 2018). Demographic studies of P. aiereba have shown that its population is in rapid decline and may decrease by more than 80% soon (Araújo et al., 2018). Given this, more research and local conservation initiatives are urgently needed not only for this species, but for many that today are considered almost threatened (for example, the cascudo Panaque cochliodon) or species considered of little concern.

In addition, many of the species found in the Santa Rosa Farm area are used for marketing and subsistence. Species such as mapará (Hypophthalmus edentatus, Hypophthalmus marginatus), Cutimatã (Prochilodus nigricans), filhote (Brachyplatystoma filamentosum), Surubim (Pseudoplatystoma punctifer) and Pacu (Mylossoma duriventre) are species of great economic interest, generating great movement in the local economy. Another interesting factor is that in breeding periods many species such as the mandi (Pimelodus blochii) migrate to the headwaters of rivers to reproduce, in a phenomenon called piracema. This period is considered essential for the maintenance of fish stocks, and fishing is prohibited in this period, except for subsistence and with specific fishing gear, such as fishing rod, ensuring one of the main sources of animal protein (Silva & Prazeres, 2019). Despite being prohibited fishing in this period, many people take advantage of the lack of supervision and carry out fishing in a predatory way, without caring about the future consequences, because the trend is the decrease of fish stocks and even the local extinction of species (Silva & Prazeres, 2019).

5.5.1.2.1.2 Herpetofauna

According to the Red Book of Endangered Fauna (ICMBio, 2018) no species recorded through the collection of primary and secondary data fall under any degree of threat of extinction. Many species of amphibians and reptiles can be considered rare, for example, the snake Trilepida macrolepis (Nogueira et al., 2019) and the lizards, Exila nigropalmata and Stenocercus roseiventris (Ribeiro Jr & Amaral, 2016). In addition to these, the true coral Leptomicrurus narduccii is relatively rare in Brazil, with only a single record for the country, in Santa Rosa do Purus (Hoge & Romano, 1965; Nogueira et al., 2019).

Of the 210 species recorded only one species is known only for the state of Acre, the amphibian Allobates subfolionidificans. The amphibians Teratohyla midas and Allobates velocicantus were known only for the Alto Juruá region, in the state of Acre (Melo-Sampaio & Souza, 2015; Souza et al., 2020) and the species Adenomera simonstuarti known only for the municipality of Tarauacá (Carvalho et al., 2020). The records of these species for the farm area are the first for the Alto Purus region. No invasive species were recorded for the region of the project zone.

In addition, some species of amphibians and reptiles recorded are used as food items by some indigenous peoples in the Amazon, for example, the amphibians Boana boans and Leptodactylus pentadactylus (Souza, 2009). Regarding reptiles, two species of alligators, Caiman crocodilus and Paleosuchus trigonatus, are hunted for subsistence in many areas along their geographic distribution, (Campos et al., 2013; Farias et al., 2013). Two species of turtles (Chelonoidis denticulatus and Podocnemis unifilis) are also hunted for subsistence by traditional populations. The snakes of the family Elapidae (True Corals) and Viperidae (Jararaca, Papagaia, Surucucu-pico-de-jaca, Surucucu) recorded by primary and secondary data present medical importance for presenting the ability to inoculate venom in humans (Bernarde, 2014). These animals are bioindicators of environmental quality, since some species are recorded only in well-preserved terra firme forest environments and some have arboreal habits, for example, the species Bothrops bilineatus smaragdinus) (Bernarde, 2012).

5.5.1.2.2 Avifauna

In this survey, two databases were used to classify the conservation status of bird species: the Chico Mendes Institute for Biodiversity Conservation (ICMBio) and the International Union for Conservation of Nature (IUCN). Most of the recorded species have a conservation status of 'least concern' – ICMBio: 480 species; IUCN: 477 species (Appendix 4); highlighted in the categories : 'near threatened' are the species Syndactyla ucayalae and Sarcoramphus papa; in the 'vulnerable category', the species Pionites leucogaster and Primolius couloni.

Table 89 - Avifauna species included in endangered categories recorded in the avifauna survey in the area of Santa Rosa Farm, Santa Rosa do Purus, Acre, 2023. Subtitles: ICMBio = Chico Mendes Institute for Biodiversity Conservation; IUCN = International Union for Conservation

Species	Popular name	ICMBio	IUCN
Tinamus so	azulona	VU	VU
Tinamus guttatus	inhambu-chicken	-	NT
Crypturellus strigulosus	inhambu-clock	NT	-
Psophia leucoptera	white-backed jacamim	-	NT
Pygochelidon melanoleuca	collared swallow	NT	-
Sarcoramphus papa	king vulture	NT	-
Harpyja Harpy	hawk	VU	VU
Spizaetus ornatus	feathered hawk	NT	NT
Ibycter americanus	Song	NT	-
Celeus torquatus	collared woodpecker	-	NT

Ara chloropterus	red macaw	NT	-
Pionites leucogaster	yellow-headed Marianine	-	VU
Primolius couloni	blue-headed maracana	-	VU
Syndactyla ucayalae	leaf-leaf-turned-cleaner	-	NT

The results showed that, approximately, 67% of the species recorded in this survey of avifauna are not categorized as threatened. However, there are species that inhabit the region that is in a worrying category of 'almost threatened', such as the leaf-billed cleaner (Syndactyla ucayalae). In Acre, the species is associated with the habitats with a predominance of bamboo of the genus Guadua, and due to the peculiarity of its inconspicuity, although the vocalization is easily identified, it is considered rare and/or uncommon. According to information extracted from citizen science platforms, the number of visual/photographic records is limited: 12 records for the state of Acre. The size of the global population is certainly small because of the irregular distribution of its habitat. Information on the abundance of the species' population is unknown (Remsen, 2020). In the Manu National Park in Peru, there are indications that the population of the species is limited to 2000 couples. The construction of roads and opening of open areas for settlements and pastures is one of the threats to conservation of the species (Remsen, 2020).

5.5.1.2.3 Mastofauna

During the research, it was possible to register the presence of eight species that are classified as threatened with extinction, according to the criteria established by the Red List of the International Union for Conservation of Nature (IUCN). Listed as Almost Threatened (NT) and Vulnerable (VU) are the jaguar (Panthera onca), the Peccary (Tayassu pecari), Armadillo Canastra (Priodontes maximus), the Anta (Tapirus terrestris) o and the tail-tailed paca (Dinomys branickii), both are species sensitive to anthropic changes, and hunting pressure.

Table 90 - Species included in endangered categories recorded in the survey of the mammal fauna in the area of Fazenda Santa Rosa, Santa Rosa do Purus, Acre, 2023.

Order	Family	Species	Status
Carnivorous	Felidae	*Panthera onca*	NT
Artiodactyla	Tayassuidae	*Tayassu pecari*	VU
Cingulata	Dasypodidae	*Priodontes maximus*	VU

Perissodactyla	Tapiridae	*Tapirus terrestris*	VU
Rodentia	Dinomydae	*Dinomys branickii*	VU

Subtitles: VU – vulnerable; NT – almost threatened.

5.5.1.2.4 Vegetation

According to Ordinance of the Ministry of the Environment, nº 148, of June 7, 2022 (BRASIL, 2022), regarding the update of the National List of Endangered Species, in the project area there are 6 species categorized as Vulnerable (VU). Species Protected by Law, such as Bertholletia excelsa (Castanheira), according to Decree 5.975/2006 and Hevea brasiliensis (Rubber Tree/Seringueira), according to Decree 5.975/2006, were not identified in the study area.

Table 91 - List of species in Annex I of the National List of Endangered Species, Ordinance No. 148/2022.

Scientific Name	Family	Popular Name	Category	IVI%	Position IVI
Apuleia leiocarpa	Fabaceae	Garapeira	VU	3,67%	24ª
Amburana acreana	Fabaceae	Cerejeira	VU	1,03%	91ª
Cedrela odorata	Meliaceae	Cedro-rosa	VU	0,66%	114ª
Hymenaea parvifolia	Meliaceae	Jutaí	VU	0,52%	125ª
Cedrela fissilis	Fabaceae	Cedro-branco	VU	0,28%	140ª
Swietenia macrophylla	Meliaceae	Mogno	VU	0,22%	157ª

According to data contained in REFLORA (Plants of Brazil: Historical Rescue and Virtual Herbarium for the Knowledge and Conservation of Brazilian Flora) none of the species inventoried in the Santa Rosa area are endemic to Acre.

The species identified in the table above participate in the structure of the forest in different ways. Using data from the phytosociological parameters, previously presented, it can be inferred that the species Apuleia leiocarpa (garapeira) participates more in the structure of the forest, it is more important when compared to the other species listed in Annex 6 (Table 1), since its IVI % was equal to 3.67%, occupying 24th position in terms of importance. The other species in Table 1 presented IVI below or close to 1%, indicating, at least for the studied population, low participation in the structure of the forest.

5.5.1.3 Senegal Farm

For avifauna in this survey, two databases were used to classify the conservation status of bird species: the Chico Mendes Institute for Biodiversity Conservation (ICMBio) and the International Union for Conservation of Nature (IUCN). Most of the species recorded have a conservation status 'least concern' - ICMBio: 275 species and IUCN: 267 species); highlighted in the categories: 'almost threatened' are the species Spizaetus ornatus and Ara chloropterus; in the 'vulnerable category', the species Agamia agami and Cnipodectes superrufus.

Table 92 – Avifauna species included in endangered categories recorded in the survey of avifauna in Fazenda Senegal, Assis Brasil, Acre, 2023.

Species	Popular name	ICMBio	IUCN
Sarcoramphus papa	urubu-rei	NT	-
Spizaetus ornatus	gavião-de-penacho	NT	NT
Ibycter americanus	cancão	NT	-
Ara chloropterus	arara-vermelha	NT	-
Chaetura pelagica	andorinhão-peregrino	-	VU
Agamia agami	garça-da-mata	-	VU
Cnipodectes superrufus	flautim-rufo	-	VU

Subtitles: ICMBio = Chico Mendes Institute for Biodiversity Conservation; IUCN = International Union for Conservation of Nature; VU – vulnerable; NT – almost threatened.

Regarding mammals, eight species were recorded that are listed as threatened with extinction according to the criteria of the Red List of threatened species of the International Union for Conservation of Nature (IUCN). They are listed as Endangered and Vulnerable (VU). The Peccary (Tayassu pecari), the

Armadillo Canastra (Priodontes maximus), the Anta (Tapirus terrestris) and the Black Soim (Callimico goeldi), both are species sensitive to anthropogenic changes, and hunting pressure, in addition to which the Tanning and the Anta occur naturally at low densities (Aya-Cuero et al., 2017; Mayor et al., 2017; Rio, 2017; Desbiez et al., 2019; Oliveira & Calouro, 2019), which includes them in the list as vulnerable to extinction in the wild.

Table 93- Mastofauna species included in endangered categories recorded in the survey of the mammal fauna in the area of Fazenda Senegal, Assis Brasil, Acre, 2023. Subtitles: VU – vulnerable; NT – almost threatened; EN – in danger.

Order	Family	Species	Status
Primates	Atelidae	*Ateles chamek*	EN
Primates	Cebidae	*Ateles chamek*	EN
Primates	Cebidae	*Lagothrix cana*	EN
Artiodactyla	Tayassuidae	*Tayassu pecari*	VU
Cingulata	Dasypodidae	*Priodontes maximus*	VU
Perissodactyla	Tapiridae	*Tapirus terrestris*	VU
Primates	Callitrichidae	*Callimico goeldii*	VU

5.5.1.3.1 Vegetation

According to Ordinance of the Ministry of the Environment, nº 148, of June 7, 2022 (BRASIL, 2022), regarding the update of the National List of Endangered Species, in the project area there are 6 species categorized as Vulnerable (VU), as shown in the table below. Only one species is Protected by Law, *Hevea brasiliensis* (Rubber Tree/Seringueira), according to Decree 5.975/2006.

Table 94 – List of species in Annex I of the National List of Endangered Species, Ordinance No. 148/2022 and Protected by law.

Scientific Name	Family	Popular name	Category
Amburana acreana	Fabaceae	Cerejeira	VU
Apuleia leiocarpa	Fabaceae	Garapeira	VU
Cedrela fissilis	Meliaceae	Cedro-branco	VU
Cedrela odorata	Meliaceae	Cedro-rosa	VU
Hevea brasiliensis	Euphorbiaceae	Seringueira	Protected
Swietenia macrophylla	Meliaceae	Mogno	VU
Amburana acreana	Fabaceae	Cerejeira	VU
Apuleia leiocarpa	Fabaceae	Garapeira	VU

According to data contained in REFLORA (Plants of Brazil: Historical Rescue and Virtual Herbarium for the Knowledge and Conservation of Brazilian Flora) none of the species inventoried in the Senegal area are endemic to Acre.

The species identified in the table above participate in the structure of the forest in different ways. Using the data from the phytosociological parameters presented above, it can be inferred that the species *Hevea brasiliensis* (rubber tree) and Cedrela odorata (pink cedar/cedro rosa) participate more in the structure of the forest, are more important when compared to the other species , since their respective IVI% were 2.39% and 2.24%, ranking 34th and 37th in terms of importance value. The other species in Table 1 presented IVI below 1.5%, indicating, at least for the studied population, low participation in the structure of the forest.

5.5.2 Trigger Species Population Trends (GL3.2, GL3.3)

5.5.2.1.1 Jaraguá Farm

Trigger Species	Hemitriccus cohnhafti - Avifauna

Population Trend at Start of Project	The bird is one of the least known species of the Neotropical region, restricted to the southwest of the Amazon and to the habitats with a predominance of bamboo of the genus Guadua. The population size of the species is unknown, and its current records are limited in point localities. It is believed that the population is decreasing, since its entire territorial extension is estimated at 15,200 km² and is within the so-called 'Arc of Deforestation'.
Without-project Scenario	The distribution of the species is being impacted because of habitat loss for livestock and forest fragmentation. With these potential risks and threats, in the future the species may be inserted in the 'vulnerable' category.
With-project Scenario	It will be necessary to develop research in the area to obtain more information about the species, generating data that will allow a specific management plan for the species. It is valid to implement and encourage conservation projects, so that forest areas are places of survival of inconspicuous species, rare and with little information about their natural history.
Trigger Species	Callimico goeldii
Population Trend at Start of Project	One of the preponderant factors for the inclusion of Soim-preto in the list of threatened species is endemism (restricted distribution of the species to a certain biogeographic region). Naturally rare and with restricted distribution to the southwest of the Amazon, occurring at naturally low densities and sensitive to anthropogenic changes, Soim-preto is a species with a very strong habitat requirement: it prefers forest typologies with dense understory and with the occurrence of bamboo. The Black Soim occurs in flocks of up to 6 individuals and can form mixed flocks with other small primates such as Red Soim, Squirrel Monkey and Capuchin Monkey
Without-project Scenario	Habitat loss and consequent local population decrease.

With-project Scenario	Development of a monitoring program for better knowledge about the species and elaboration of a specific management plan.

5.5.2.1.2 Santa Rosa Farm

Trigger Species	Syndactyla ucayalae - Avifauna
Population Trend at Start of Project	In Acre, the species is associated with the habitats with a predominance of bamboo of the genus Guadua, and due to the peculiarity of its inconspicuity, although the vocalization is easily identified, it is considered rare and/or uncommon. According to information extracted from citizen science platforms, the number of visual/photographic records is limited: 12 records for the state of Acre. The size of the global population is certainly small because of the irregular distribution of its habitat. Information on the abundance of the species' population is unknown (Remsen, 2020). In the Manu National Park in Peru, there are indications that the population of the species is limited to 2000 couples. The construction of roads and opening of open areas for settlements and pastures is one of the threats to conservation of the species (Remsen, 2020).
Without-project Scenario	The distribution of the species is being impacted because of habitat loss for livestock and forest fragmentation. With these potential risks and threats, in the future the species may be inserted in the 'vulnerable' category.
With-project Scenario	It will be necessary to develop research in the area to obtain more information about the species, generating data that will allow a specific management plan for the species. It is valid to implement and encourage conservation projects, so that forest

	areas are places of survival of inconspicuous species, rare and with little information about their natural history.
Trigger Species	Tapirus terrestris - tapir
Population Trend at Start of Project	Tapir is a species of neotropical ointment that plays an important ecological role as a seed disperser. However, despite this important function, the tapir is also the most sensitive species to hunting pressure among the ungulates of the region. Subsistence, commercial and sport hunting are anthropogenic factors that have significantly reduced the biomass of these animals, threatening the survival of their populations and causing changes in the patterns of regeneration and diversity of some plant species.
Without-project Scenario	The tapir is currently classified as "Vulnerable" by the International Union for Conservation of Nature (IUCN) due to declining populations and persistent threats. It is also an important environmental indicator in forest ecosystems. This is because its presence is strongly associated with the existence of healthy and diverse natural environments. Tapirs need large continuous forest areas to survive, feeding on a wide variety of plants and fruits that are only found in conserved habitats.
With-project Scenario	Development of a monitoring program for better knowledge about the species and elaboration of a specific management plan and conservation measures and adequate management to ensure the survival of the species and the maintenance of its important ecological function in seed dispersal.

5.5.2.1.3 Senegal Farm

Trigger Species	Cnipodectes superrufus – flautim-rufo

Population Trend at Start of Project	Species recently described for science (Lane et al., 2007), restricted to the southwest of the Amazon and specialist in habitats dominated by bamboo native to the genus Guadua (Tobias et al., 2008). Because it is a kind of difficult visualization, there are no descriptive works of reproductive biology and behavior. According to Wilman et al. (2014), its diet is composed of insects and small invertebrates, a characteristic that is shared with the other species of the family Rhynchocyclidae.
Without-project Scenario	Very likely there will be important information gaps that justify the conservation of this and other species associated with the bamboo forests of Acre.
With-project Scenario	Encouraging the conservation of the area of the property is of interest to the conservation of bird species, such as the flute rufo (C. superrufus), with the potential to be a refuge area for this species and others that are inserted in categories of conservation concern.
Trigger Species	Callimico goeldii – primate - Soim-preto
Population Trend at Start of Project	One of the preponderant factors for the inclusion of Soim-preto in the list of threatened species is endemism (restricted distribution of the species to a certain biogeographic region). Naturally rare and with restricted distribution to the southwest of the Amazon, occurring at naturally low densities and sensitive to anthropogenic changes, is a species with a very strong requirement of habitat: it prefers forest typologies with dense understory and with occurrence of bamboo. The black Soim occurs in flocks of up to 6 individuals, and can form mixed flocks with other small primates such as red Soim, squirrel monkey and capuchin monkey
Without-project Scenario	Very likely there will be important information gaps that justify the conservation of this, and other species associated with the bamboo forests of Acre.

With-project Scenario	Encouraging the conservation of the area of the property is of interest to the conservation of funa species, with the potential to be a refuge area for this species and others that are inserted in categories of conservation concern.

6 Appendices

6.1 Appendix 1: Stakeholder Identification Tables and Interviews

6.2 Appendix 2: Forest Inventory

6.3 Appendix 3: Project Risks Table

6.4 Appendix 4: Estimation of the average carbon stocks

6.5 Appendix 5: Maps and Shapes (3 farm`s)

6.6 Appendix 6: Lists of Species (3 farm`s)

6.7 Appendix 7: Social

6.8 Appendix 8: Legal

6.9 Appendix 9: Climate

6.10 Appendix 10: Code of Ethics

6.11 Appendix 11: Project Portuguese Summary

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