UNITÁN AFFORESTATION AND REFORESTATION OF GRAZING LANDS PROJECT

Document Prepared by ProSustentia

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1 PROJECT DETAILS

1.1 Summary Description of the Project

The project activity "Unitán Afforestation and reforestation of grazing land project" (hereafter, "Unitán project") is an afforestation project on extensive cattle grazing pastures area and abandoned agricultural lands, using native (*Schinopsis balansae*) and exotic species (various varieties of *Eucalyptus* including *Eucalyptus gxc*) aiming to produce, as a priority product, logs for tannin industry and secondarily, fuelwood. The project is located in a region where commercial forestry plantations are not common, or even non-existent. The afforestation with this species will prevent the use of timber from native forests in the future

Unitán comprises 5 properties located in Chaco and Formosa province, in the NorthEast region of Argentina (the host country), with a total area of 3331.6ha of which 304.7ha were effectively planted before project start date (September 2016) on an experimental phase, hence not included within VCS project boundary. This experimental area, planted since 1990 were small research scale areas where *Schinopsis balansae*, *Eucalyptus* and *Pinus* species were being tested for two decades, experimenting different combinations and densities due to the lack of detailed information on *Schinopsis balansae* response under commercial scale plantation. This allowed the project to be designed accordingly.

The Unitán project is carried out in 5 properties, on lightly degraded grassland as a consequence of many decades of extensive cattle grazing and set aside agriculture land by previous owners. This degradation is expected to continue in the absence of the project. From September 2016 until the time of PDD elaboration, a total area of 884.9 ha of the project was effectively planted. In addition, there is an area of 1,463.8 ha of planned plantation for the period 2021 to 2025 (mainly in owned and a minor part in leased lands). The area of grasslands to be effectively planted and to be included within the Unitán project boundary is then 2,348.7ha (70.5% of Unitán total area).

The project utilizes two main species: *Schinopsis balansae*, a native species, and *Eucalyptus* (different varieties: mainly *gxc* and *cloeziana*), occupying 37%, 63% of the total planted area, and with rotation periods of 40 years, 6 and 20, respectively. Biomass was estimated based on the forest inventory conducted between June 10th and August 15th of year 2021, meaning this first monitoring period is from September 16th, 2016 to August 15th, 2021.

The project sequesters CO_2 through forest plantation in grassland areas, generating net anthropogenic removals by sinks that can be measured, monitored and verified. The long-term average GHG benefit (LTA) is determined by averaging the expected total GHG benefit for the length of the project where a whole rotation and harvest takes place (50 years: from 16/09/2016 – until 15/09/2065). The total GHG benefit expected at the end of crediting period is 449.643 tCO_2e. The sum of the expected GHG benefit annually when divided by 50 years (period for estimating LTA) results in 298,727 tCO_2e. Reaching average annual VERs of 7.468 tCO_2e.

The project contributes to the sustainable development of Argentina, specifically by:

- Increasing labour demand from the local population: switching to forestry plantation activities will generate a much larger demand of labour when compared to current activities being developed separately, including new labour qualifications.
- Promoting an integrated management scheme with the ecosystem in privately owned land, avoiding natural forest extractions, specifically those dominated by *Schinopsis balansae*, which are harvested for the tanning industry.
- Installing an innovative native species plantation will bring along environmental benefits such as soil protection, water runoff regulation and biodiversity benefits; at the same time, generating new information on native species forest management
- Developing and improving a new mechanism to finance projects in the forestry sector.

1.2 Sectoral Scope and Project Type

- Sectoral scope: 14 (Agriculture, Forestry, Land Use)
- Category: Afforestation, Reforestation and Revegetation (ARR)
- Activity type: establishment of forests on land that had previously been under grassland and set aside agriculture
- Unitán Project is not a grouped project.

1.3 Project Eligibility

1.4 The project is eligible under the scope of the VCS Program as the project includes AFOLU activities (project category ARR) which are supported by a methodology approved under the VCS Program as described in section 3.2. Project Design

Unitán Project is a single project and a single activity (ARR).

Eligibility Criteria

Unitán project is not a grouped project

1.5 Project Proponent

Organization name	Unitán S.A.I.C.A
Contact person	Ariel Lopez Mato
Title	Vicepresidente

Address	Paseo Colón 221 P. 10; CABA - Argentina
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1.6 Other Entities Involved in the Project

Organization name	ProSustentia
Role in the project	VCS certification consultant
Contact person	Federico Moyano
Title	Director
Address	San Martín 543, 3rd i, Buenos Aires, Argentina
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1.7 Ownership

Unitán S.A.I.C.A has 3331.6ha of managed land properties (not including tanning industry area and other related activities) among which 12.6% are leased properties (although within project boundaries, 10% is leased land). Unitán Project is operated and administered by Unitán S.A.I.C.A on private property of its own, except for one of the properties which is leased to: Sociedad Rural (Margarita Belén plots) for a period of 10, and with a certified signed commitment (signed in August 2nd, 2021) to extend contract for 10 more years after the end of current leasing contract[1], with no legal impediment to further extend it. The area planted in these leased property represents 3.7% of the total planted projected area for VCS project.

The project is led by the Forestry Area of the company, supervised by Ariel López Mato, an area which fulfills all the tasks of managing the area and carrying on the implementation of the project´s business plan. The area responds to the company's Directory and acts as its representative to carry on all

[1] Documentation available to VVB during validation in shared Google Drive folder as 1. Contract extension Soc. Rural_signed commitment

operational and commercial activities related to the project. Among these activities are the necessary tasks to certify the carbon credits that could be generated with the Unitán project.

1.8 Project Start Date

16/09/2016

Is the date when the activities that lead to the generation of GHG emission removals (soil preparation in Margarita Belén plots) were first implemented[2].

1.9 Project Crediting Period

Project crediting period: 40 years (*although the project lifetime will be of 100 years and the period for LTA calculation is 50 years*)

Start date: 16/09/2016

End date: 15/09/2055

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	X
Large project	

Year	Estimated GHG emission reductions or removals (tCO_2e)	Year	Estimated GHG emission reductions or removals (tCO_2e)

[2] Bill from Martina, Osvaldo Rubén to Unitán that evidence the works at Margarita Belén. Available to the VVB at validation at drive folder reference n°2

2016 (from 16/09/2016)	468	2042	-32.973
2017	2.321	2043	-22.518
2018	6.214	2044	26.381
2019	15.671	2045	29.704
2020	27.985	2046	32.113
2021	42.726	2047	29.564
2022	39.546	2048	-28.776
2023	49.288	2049	-17.799
2024	-2.801	2050	29.529
2025	19.631	2051	32.183
2026	21.930	2052	34.288
2027	24.618	2053	31.558
2028	26.664	2054	-43.530
2029	23.929	2055	-16.295
2030	-34.556	2056	-13.774
2031	-24.271	2057	13.091
2032	22.887	2058	-9.287
2033	25.508	2059	-14.212
2034	27.467	2060	-16.423
2035	8.208	2061	-26.871
2036	-33.618	2062	-16.745
2037	-24.979	2063	-13.738
2038	23.850	2064	-77.908
2039	25.415	2065	-70.780
2040	27.333		
2041	24.781		
Total estimated ERs (LTA)		**298.727**	
Total number of crediting years		**40**	

Average annual ERs	**7.468**

1.11 Description of the Project Activity

As mentioned above, the area to be effectively planted, forming part of the VCS project boundary, are 2,348.7ha, currently distributed in 5 properties (Don Antonio, Ex-Glombosvky, Sociedad Rural, Irineo and Doña Virginia) from which 90% is owned and 10% leased (calculated based on land planted to 2020); with the possibility of adding new properties if needed to complete project plan out of a total Unitán´s area of 3331.6 hectares distributed in 5 properties between privately owned properties and leased properties. The project is located in a region where commercial forestry plantations are not common, or even non-existent. This area is not found in a jurisdiction covered by a jurisdictional REDD+ program.

Unitán SAICA had effectively planted an area of 304.7ha in Puerto Tirol plots for the period 1990 to 2015 (10ha per year on average), prior to the Project but it was merely for research, studying *Schinopsis balansae* response alone and within a mixt plantation (*Pinus* and *Eucalyptus*) as there are few experiences with commercial plantations with the species in the country. All other plantations (*Pinus* and *Eucalyptus*) had been going on and off sporadically, with no management plan, and were not used commercially. It is not till the project´s start date, as from September 2016, that the company begins with the commercial scale plantations on the project area, after Unitán SAICA proposes a reforestation plan with *Schinopsis*, for tanning supply in the long term, as well as *Eucalyptus* (various species) for fuelwood for the planned biomass energy plant.

Regarding those areas with effectively planted trees before the starting date of the project (304.7ha), they will not be included within the VCS project boundary. At the same line, within the 5 properties that are being considered as part of the VCS project, plots with presence of forest either by the time the VCS project started or 10 years prior, were excluded of the project area or considered partially. This can be seen on the maps and tables in section 3.2.

The project activity is carried out on lightly degraded land as a consequence of many decades of cattle grazing and set aside agriculture lands. This degradation is expected to continue in the absence of the project according to the additionality analysis.
The project utilizes two main species, one is native: *Schinopsis*, and the other exotic: *Eucalyptus* with different varieties such as *gxc, cloeziana, grandis, variegate*; occupying 37% and 63% of the projected planted area, respectively. By planting these species the project seeks:

a) Long and short term results given that the growing period of *Schinopsis* is expected to be of 40 years whilst *Eucalyptus* has a growing period of 6-20 years according to management plan and species.

b) Biological diversity: species with different growth curves and hence different susceptibility to disease, pests, frost risk, etc. At the same time, prior tests have shown competition helps *Schinopsis* to lose its shrub shape faster and grow into a tree with a main trunk.

c) Productive diversification: some species grow better than others in certain areas of the project lands. The project will consider the site-specific advantages so carbon can be taken up more efficiently by the plantations.

The planting activities will be completed through years: 2016 to 2025. By 2020 884.9 ha will have been effectively planted, while 2021 to 2025 will follow the plan stated below:

Table 1: Area effectively planted (2016-2020) and plantation plan for 2021-2025

Plantation year	Properties	Species	Area [ha]
2016	Don Antonio	*Schinopsis balansae*	81.2
	Soc. Rural & Don Antonio	*Eucalyptus gxc*	35.8
	Soc. Rural	*Eucalyptus various*	25,0
2017	Don Antonio & Irineo	*Schinopsis balansae*	20.1
	Ex-Glombosvky	*Eucalyptus gxc*	44.7
2018	Irineo	*Schinopsis balansae*	16,0
	Ex-Glombosvky & Soc. Rural	*Eucalyptus gxc*	212.6
	Soc. Rural	*Eucalyptus various*	3.2
2019	Doña Virginia	*Schinopsis balansae*	65.0
	Ex-Glombosvky	*Eucalyptus gxc*	166.5
2020	Doña Virginia & Irineo	*Schinopsis balansae*	20.8
	Ex-Glombosvky	*Eucalyptus gxc*	194.0
2021	Doña Virginia & Irineo	*Schinopsis*	60
	Ex-Glombosvky & Soc. Rural	*Eucalyptus*	203.8
2022	Doña Virginia	*Schinopsis*	150
	Ex-Glombosvki	*Eucalyptus*	150
2023	Doña Virginia	*Schinopsis*	150
	Ex-Glombosvky	*Eucalyptus*	150
2024	To be defined	*Schinopsis*	150
	To be defined	*Eucalyptus*	150

2025	To be defined	*Schinopsis*	150
	To be defined	*Eucalyptus*	150
	Total		2348.7

After harvest of *Eucalyptus* plantations, with their respective rotation (6 and 20 years) a coppicing and replanting management will be practiced to obtain a following rotations repeating this process until the project duration is completed. For *Schinopsis* only one rotation (40 years) will be carried out during the project duration.

Planted trees will uptake carbon dioxide from the atmosphere and store it in different carbon pools (living above-ground and below-ground biomass, soil organic carbon, litter and dead wood). Only living above and below ground carbon pools will be accounted towards issuance of VCUs. Above ground biomass will be measured according to the monitoring methodology and below-ground carbon pools will be estimated based on use of conservative default factors suggested in the methodological tool.

Besides capturing and storing carbon, other purposes of the project are:

i. To produce timber for the tannin industry as a priority product (*Schinopsis)* and secondarily, biomass for wood fuel (*Eucalyptus*).

ii. To promote a one of its kind management scheme integrated with the local ecosystem and environment with a commercial scale plantation of a native species.

iii. To conduct operations in a social and economically responsible fashion, strictly following labour and business local regulations.

The table below summarizes the main technical characteristics of the project:

Table 2: Main technical characteristics of the VCS project

Parameter		Value
Unitán total area		3,331.6ha
VCS planted project area		884.9ha
VCS projected planted project area		2348.7 ha
% of VCS planted area within Unitán total area		70.7%
% of project area planted with *Schinopsis balansae*		37%
% of project area planted with *Eucalyptus*		63%
Rotation period	*Eucalyptus gxc*	6 years
	Eucalyptus various	20 years
	Schinopsis	40 years

Project land area is rather flat or with low slope, and the land was used mostly for raising cattle, or set aside agricultural activities of cotton and vegetable patches in some of the cases. The surroundings of the project area include, alternately, both lowlands and forests of native forest conserved within Unitán´s

properties. Site preparation and plantation take this mosaic structure into account, limiting land management impacts.

a. Site preparation and plantation

Plantation site for the first rotation period is prepared by forming the planting line made of ridges of 60 cm wide and 45 cm. It includes ploughing the soil on strips where the trees will be planted, while subsoiling in the same line, unifying two tasks in one. Depending on soil humidity conditions and weed presence, it may be necessary to break the ground, in which case a first harrow pass followed by another, in the opposite direction, 7 days later is conducted.

This will be done in a certain manner that reduces the risk of erosion and degradation, achieved by working the soil at field capacity, avoiding soil compression and soil lumps affecting the correct formation of the striped ridges. The objective of ploughing is to favour the establishment and initial development of plants by increasing the aeration, infiltration and nutrient availability of the soil, and controlling weeds. Soil disturbance is limited to the plantation area and is carried out only once throughout the rotation cycle.

Figure 1. Site preparation Don Antonio property

Pest control is performed by applying herbicide, both mechanically and manually over the ridge line, mainly for cutting ants control during pre and post emergence. The control is carried out, first, days before tillage and/or plantation and during the first four years, unless ant or other insect attack is observed during inspection. In the case of *Schinopsis*, inspections include the presence of powdery mildew, which is controlled using phytosanitary products applied manually.

Weed control is performed using Atrazina[3] and Glyphosate[4]. Application is carried out some days before tillage and/or plantation. Post planting control is done to avoid competition with the younger individuals. Herbicide use is decided upon the frequency and types of weed sprouts. In the case of *Eucalyptus* it takes place till the second year, as the rapid growth covers the lines and between lines, controlling weeds. It is generally done by applying herbicide manually over the plantation line three times in the year. In the case of *Schinopsis*, weed control is continued till the fifth year due to the slower growth rate. Between plantation lines the work is done mechanically, with a lightweight breaker. Over the plantation line, every six months, a manual ploughing with a hoe is followed by herbicide manual application. Burning is not practiced as a weed control technique.

The agrochemicals used are all allowed by national legislation. They are applied by trained operators, and follow strict controls on purchase, storage, dispatch and application management standards, as well as final waste disposition.

Seedlings are brought from the nursery owned by Unitán in the case of *Schinopsis*, and bought from certified nurseries in the case of clonal *Eucalyptus*. In the case of its own nursery, it is located in Puerto Tirol, where more than 200,000 seedlings are grown per year, from selected seeds. Seed sources for the production of these seedlings are selected based on phenotypic assessments made by the professionals in charge, where the evaluation criteria to select the genetic origin takes into account desirable features for tannin extraction.

[3] The application is described in the Forest Management Plan (Reference n° 3 in shared Google Drive form) as follows:
Atrazina - Gesaprim 90 WDG/trac 90.- Dosis: 2,2 kg/ha – total aplication

[4] This herbicide is classified under the FSC standard as of "restricted use" but not "prohibited use" nor "very restricted use" since it does not present environmental toxicity, heavy metals nor acute toxicity (https://fsc.org/en/document-centre/documents/retrieve/f1427c5d-a0d8-490e-8857-fd390613c139).
The application is described in the Forest Management Plan as follows:
Glifosato - Panzer Gold.- Dosis: 4 l/ha - Action: traslocable total

Figure 2. Owned nursery for 200,000 seedlings a year

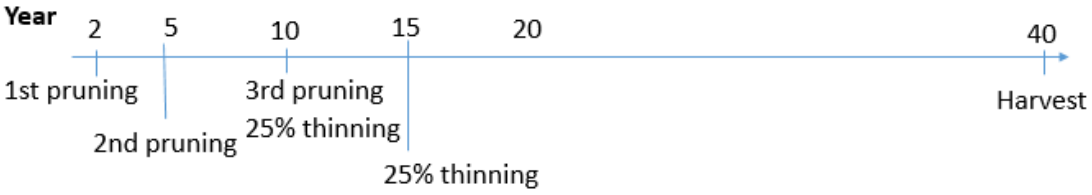
Seedling plantation is done manually both for *Schinopsis* and *Eucalyptus*, with manual tools such as shovels, planting guns, and picks, except in Puerto Tirol plots, where *Eucalyptus* seedlings are planted mechanically. Start-up gel is applied in the planting pit, together with NPK fertilizer[5]. Plants establishment, survival control, reposition and quality is monitored within the first few weeks after planting, checks are performed to identify and replace lost plants.

[5] NPK Basacote 6m 16-8-12, at a concentration of 12 gr/plant. More information available in Forest Management Plan (Reference n° 5 in shared Google Drive form)

Figure 3. Manual plantation at Sociedad Rural property

b. Pruning and Thinning

Forest maintenance operations include pruning and thinning, according to the forest management plan. These treatments along the rotation allow logs to reach greater diameter and quality increasing their market value. As for *Schinopsis balansae*, a formation pruning takes place with the elimination of lateral branches during year 1 or 2, helping the growth in height while eradicating the tendency of shrub formation. Second and third pruning takes place at the age of 5 and 10 years respectively. In the case of thinning, 25% takes place during year 10, and another 25% during year 15 leaving a density of around 468 trees/ha for final harvest at year 40th. The timeline below shows the different interventions for *Schinopsis balansae* rotation period.



Pruning intervention is not carried out for *Eucalyptus gxc*. Only in the case of an event affecting the plantation -as fire, hail and/or frost, pruning and thinning takes place in order to select the dominant rods of the new outbreaks. But in the case of thinning two interventions are performed, during year three and four, before harvest takes place in year six. The first thinning removes 25% of the stocked volume. Its goal is to eliminate the competence and remove the bad shaped and weak individuals. In the second thinning, at year 4, another 25% before final harvest at 6th year (in the case of *Eucalyptus cloeziana*, this period extends till year 20th).

Plantation densities vary according to species and variety, but values are around 833 for *Schinopsis*, 2500plants per hectare for *Eucalyptus* hybrid and 1205 for other varieties of *Eucalyptus*.

In those properties where cattle grazing is being carried out before plantation takes place, cattle will be temporarily moved within the property and, after plantations have reached 3 years of age (in the case of *Eucalyptus* plantations), reintroduced in the plantation so the individuals are not damaged.

c. Final Harvest

Final felling is at year 6 in the case of *Eucalyptus gxc*, year 20 for the *Eucalyptus cloeziana* (and various) and year 40 for *Schinopsis balansae*. In all cases, pre-harvest inventories are conducted. In *Eucalyptus gxc* sprouts are managed after harvest for the second rotation cycle. At this stage sprouts from previous thinning are controlled in *Eucalyptus gxc.*

d. Production Standards

Given the wide use of tannin for different industries (cosmetics, food, textile, pharmaceuticals, among others), Unitán SAICA (industrial area) counts with many different certifications according to the final use of the product (Kosher, Halal, GMP+ B2 and GMP+ B3, Organic Bio for EOS products and IRAM NM323, NM324, BPM and HACCP certifications, among others), ISO 9001/2001 following its work procedures and manuals. Unitán SAICA has also obtained the PEFC for the chain of custody of its wood products supply. For the moment, none of the standards apply to the forestry project evaluated.

The management objective is to carry out an efficient organization with trained and stimulated staff, in compliance with legal requirements, controlling the impacts of undesirable situations, and good relationships with customers and the community. The following documents will complement the process standards: Forest Management Plan (operational and environmental), forest inventory field reports, and annual operating budget and workplace safety standards[6].

1.12 Project Location

Unitán´s area covers a total of 3,331.6ha located in the North of Argentina distributed in four departments of Chaco and Formosa provinces (Figure 4, Table 3). As mentioned above, the Unitán Project is a fraction of Unitán´s total area, planning to reach a specific effective planted area of 2,348.7ha comprising 5 properties, between owned and leased areas: Doña Virginia, Irineo, Sociedad Rural, Don Antonio, Ex-Glombosvky. This is clearly seen in the table below wherein the names, areas and unique geographical locations of the already planted plots are detailed (figures of property´s plots Figures 9 to 13 in section 3.2).

The planting activities will be completed through years: 2016 to 2025, both in owned and leased properties. From September 2016 until December 2020, a total area of 884.9ha (37.9%) of the project was effectively planted.

[6] Mentioned documents, all available for the VVB at validation if requested. Forest management Plan available as reference 3 in shared Google Drive folder, while forest inventory field reports available under reference “6. Inventory reports”

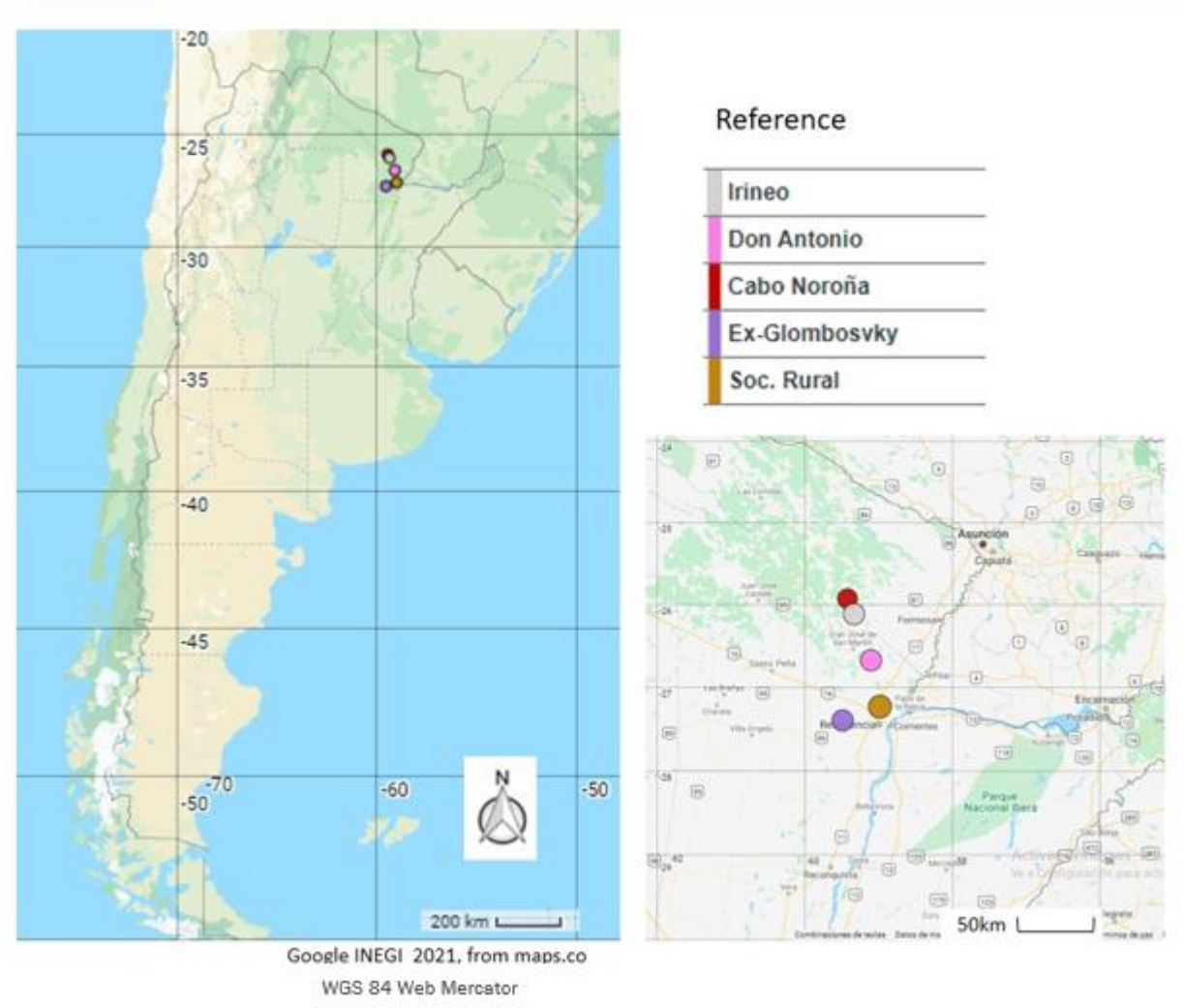


Figure 4. Properties location in host country.**Table 3:** Detailed information on properties and current plantations within project boundary

Province and Department	Property name	Plot name	Geographic location		Plantation year	Total area (ha)	Project Area (ha)
			Latitude	Longitude			
Chaco 1° de Mayo	Margarita Belén "Sociedad Rural"		27°15'24.95"	58°59'7.82"		225.6	70.5
		Section I 1 Plots 1, 3 & 5			2016		22.6
		Section I 2 Plot 1			2016		25
		Section II 1 Plot 2			2018		15.7
		Section II 5 Plots 1, 2 & 3			2018		3.2
		Section III 1			2018		4
Chaco San Martin	Pampa Almiron "Don Antonio"		26°41'22.61"	59°6'21.37"		195	104.6
		Section I 1,3,4 & 5			2016		81.2
		Section I 2			2016		13.2
		Section I 6 & 7			2017		10.2
Chaco Libertad	Puerto Tirol "ex Golombovski"		27°23'35.43"	59°6'34.11"		2347	598.1
		Section I 2 Plots 3, 7, 8, 10 & 11			2017		44.7
		Section I 2 Plots 4 to 6			2018		24.8
		Section I 3 Plot 3			2018		16.1
		Section IV 1 to 4			2018		152.0
		Section I 1 Plot 3, 5 & 6			2019		91.1
		Section II Plot 2 & 4			2019		38.8
		Section V Plot 1			2019		36.6
		Section IV 5 & 6			2020		194
Formosa Pirane	Cabo Noroña "Doña Virginia"		25°55'59.49"	59°23'47.41",		205	65
		Section D1 V1, & D3 V3			2019		43.7
		Section D4 V4			2020		21.3
Formosa Pirane	Villa 213 "Irineo"		26°7'20.05"	59°18'46.37",		359	46.7
		Section II 1			2017		9.9
		Section I 3, 4			2018		8.5
		Section II 2			2018		7.4
		Section I 1			2020		20.8

1.13 Conditions Prior to Project Initiation

The Unitán Project takes place in an alluvial area east of Chaco and Formosa provinces. The climate is subtropical-humid with average annual temperature of 23ºC (figure 5)and rainfall over 1,100 mm per year (increasing from west to east) (figure 6).

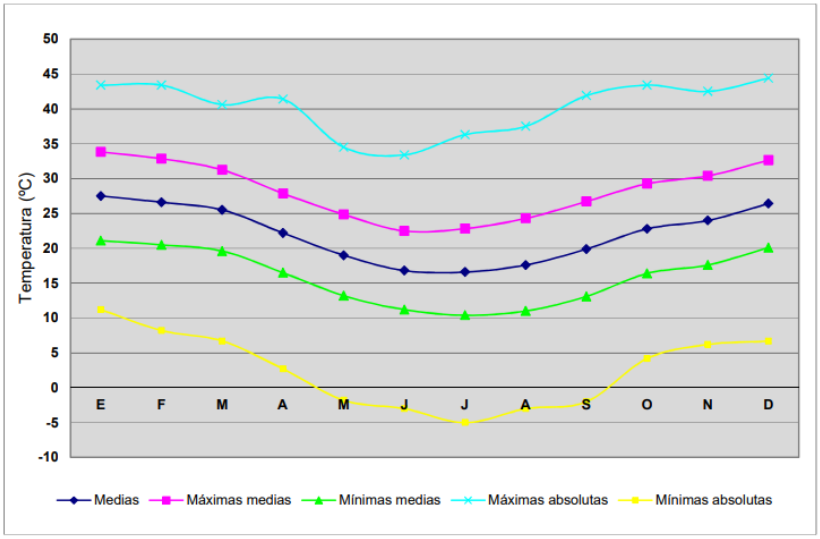


Figure 5: Mean, maximum and minimum monthly and absolute temperatures. Period 1960-2014. El Colorado Agricultural Experiment Station - INTA[7].

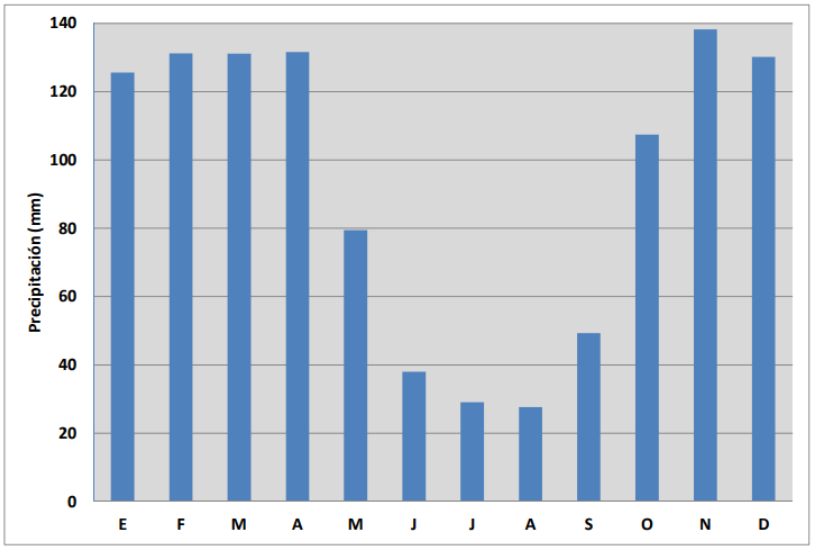


Figure 6: Average monthly precipitation (mm). Period 1960-2014. El Colorado Agricultural Experiment Station – INTA.

[7] INTA – Carta de suelos de la República Argentina, departamento Pirané-sector Sur, provincia de Formosa

In Chaco, the area constitutes a depression with multiple rivers and temporary streams. The floodplain area has poorly differentiated terraces furrowed by streams that over time have moderated a complex of meandering forms and lagoons alternating with remnants of the terraces and the flood plain. In the higher altitudes forests dominate the landscape while at the lowlands the landscape is dominated by grasslands[8]. The soils are of medium to heavy textures with limitations due to waterlogging, erosion and salinity. Water erosion affects most of the province, with natural and/or anthropogenic causes. Livestock use of the land resulted in a degraded pastoral landscape that favored the appearance of erosion furrows and the loss of the superficial horizon where native grasses used to take root.

In Formosa, both fields are at the department of Pirané where the soils are more fertile. It is a plain of alluvial origin that is characterized by an alternation of ridges, flooded interfluves, and plains dissected by streams and wandering channels. Gallery jungles and tall forests have developed. In the slopes of the streams grow jungles and tall forests while in the depressed interfluves there are grasslands and savannahs. The soils of positive relief are generally suitable for agriculture and depressed areas, for livestock. These are soils of low stability, very susceptible to water erosion. The areas of subnormal or concave relief have clay, sodic saline and waterlogged soils with palm groves and low forest on pasture.

The most important economic activities associated with land use in the region are soybeans, cotton, sunflower, rice and corn crops, as well as livestock breeding. However, in the departments involved in the project the agricultural activity is perfectly defined by the land relief, for the sector of the province of Chaco, in the hills agriculture is carried out (clearing riverside forests) and in the low areas the activity is cattle raising, , and in Formosa, activities are restricted to livestock production and native forest extraction.

The land within the project boundary is defined as grassland as a result of the multi-temporal land use change analysis developed using satellite images. The land proposed for the forestry activity (eligible area) was found under the category of natural grass, managed grass, crops, low stubbles and eroded soil. Moreover, it was classified as graminoid crops and closed grasses in flooded areas in 2006[9] and categorized as sites of low and medium conservation value by the law 26.331[10] (Law 26,331 of Minimum Budgets of Environmental Protection of Native Forests). All the plantations will be planted on grasslands, set aside agriculture lands or past grazing areas. Native flora has been transformed many years ago due to grazing leading to the appearance of some exotic species such as *Cynodon dactylon*. Dominant plants include graminoids, and Cyperaceous in temporary flooded areas. In some fields, some old Quebracho trees suggest the area had native forest at some point in time.

Regarding native fauna, the cattle stocking rate present prior to project activity, drove away part of the native fauna, in addition to the relative proximity to population centres. Nevertheless, rheas, hares and

[8] INTA Zonifacación Chaco, available at: https://inta.gob.ar/sites/default/files/script-tmp-zonificacin_rian_chaco_y_formosa_2010.pdf
[9] https://inta.gob.ar/documentos/cobertura-del-suelo-de-la-republica-argentina.-ano-2006-2007-lccs-fao
[10] https://argentinambiental.com/legislacion/chaco/ley-6409-ordenamiento-territorial-los-bosques-nativos/

partridges can be seen periodically, as well as birds such as woodpeckers, teros (Vanellus chilensis), caracara (Caracara plancus).

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

The activities proposed by the Project comply with national law and regulations, since the management plan has been approved by the Ministry of Agriculture, Livestock and Fisheries under the Law 25.080 on the Promotion of Cultivated Forest, which goes in line with the Law 26.331 on Minimum Budgets for Environmental Protection of Native Forests. The first law promotes the development of planted forests while regulating that it is carried out respecting good sustainability practices towards renewable resources, together with fire mitigation. The second law limits the type of activities that can be carried out on native forest lands depending on their conservation category. Current and future plantations developed within this project are planned in sites categorized as of low and medium conservation value as it can be seen from the maps below, showing land use characterisation according to the Native Forest Conservation National Law (Law 26,331)[11].

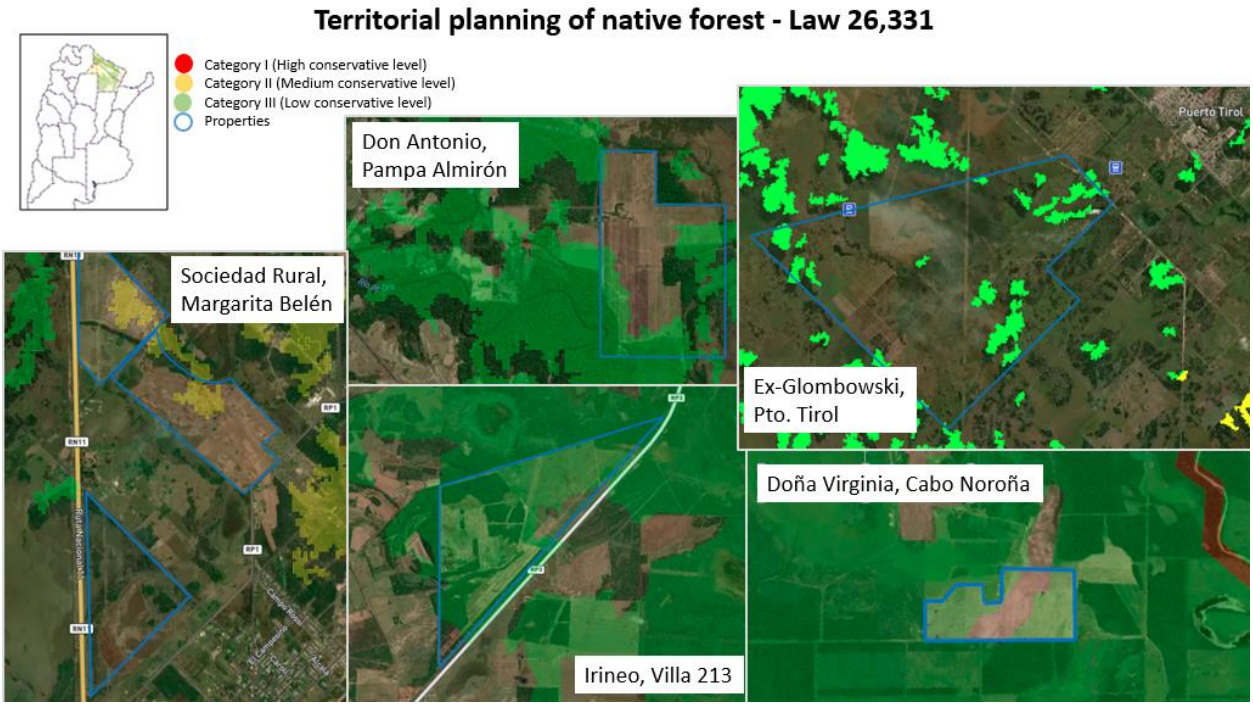


Figure 5. Territorial planning of native forest according to Law 26331 within the total area of the properties. Extracted from CREA (regional consortia for agricultural experimentation)

[11] Maps available for Formosa at: https://www.crea.org.ar/mapalegal/otbn/formosa ; for Chaco at: https://www.crea.org.ar/mapalegal/otbn/chaco

The project has conducted the requested Environmental Impact assessment according to Law 25080[12], in line with Law 25.675 —the National General Environmental Law—, and provincial versions. It consists of a preventive technical-administrative procedure, which allows an informed decision-making by the environmental authority regarding the environmental viability of a project and its environmental management. The authority is then issued through a "work certificate", a license for the project´s plantation. Further information on section 2.3

In the table below are listed relevant local, regional and national laws, statutes and regulatory frameworks.

Table 4: Local, regional and national laws, statutes and regulatory frameworks complied with

Act / Regulation	Relevance to Project
Law 25080/99 (and its actualisation Law 27487/18), Forestry Law to promote plantation of new forests in areas classified as of low or medium conservation value within the country.	The project is located in an area categorized as of low or medium conservation value and has been granted the "work certificate".
Decree 133/99 - Regulation of Law 25080 for cultivated forests promotion	The project has been registered under the cultivated forest promotion program complying with the commitments stated in the regulatory decree
Law 25675– Environmental Protection General Act.	The project plantations complies with the Environmental Impact assessment requested by the Ministry of Environment and Sustainable Development (MAyDS).
Law 26.331 - Minimum Budgets for Environmental Protection of Native Forests	The project is located in an area categorized as of low or medium conservation value and has been granted authorisation.
Law 6409 - Native forest land use classification Chaco Province	The project plantations are located within suitable planting and forest management lands defined by the Provincial Secretariat for Territorial Development and Environment
Decree 349/005 – Environmental impact assessment, Law 25675	The project plantations complies with the Environmental Impact assessment requested by the Ministry of Environment and Sustainable Development (MAyDS).
Law 3230 – Water code for Chaco Province	The project plantations complies with conditions stated in Law defined by the Secretariat for Territorial Development and Environment in Chaco

[12] Decree 133/99 de la Law N° 25.080 available at http://servicios.infoleg.gob.ar/infolegInternet/anexos/55000-59999/56255/norma.htm

Law 1060 - Ecology and environment policy - Formosa Province	The project meets the guidelines including Art. 78
Law 1552 - Land Use planning program- Formosa Province	The project plantations are located within suitable planting and forest management lands defined by the Provincial Ministry of production and environment

1.15 Participation under Other GHG Programs

1.15.1 Projects Registered (or seeking registration) under Other GHG Program(s)

Unitán project has not been registered, or is seeking registration under any other GHG programs.

1.15.2 Projects Rejected by Other GHG Programs

Unitán project has not been rejected by any other GHG programs.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

GHG removals generated by the project will not be used for compliance with binding limits to GHG emissions since Argentina does not have GHG emission compliance nor trading programs in place.

1.16.2 Other Forms of Environmental Credit

Unitán Project is a new afforestation project and is not registered in any other GHG program. The project will only generate credits from the storage of carbon in forest pools, and these are claimed only under the VCS program.

1.17 Additional Information Relevant to the Project

Leakage Management

According to the applicable methodology only leakage due to the displacement of agricultural activities shall be considered. As explained in section 3.2 below, the project does not displace pre-project agricultural activities. Thus, neither a leakage management plan nor leakage mitigation measures are required.

Commercially Sensitive Information

No commercially sensitive information has been excluded from the public version of the project description.

Sustainable Development

Argentina is among the 150 countries that adopted the 2030 Agenda for Sustainable Development, including the Sustainable Development Goals (SDGs) at the United Nations Sustainable Development Summit on 25 September 2015.

The National Council for the Coordination of Social Policies, the National Statistics and Census Institute (INDEC) and the International Relations and Institutional Communication Direction are coordinating efforts at government level to establish and implement monitoring systems for SDG indicators integrated with the national planning and identifying the advances and challenges in relation to them.[13. 14, 15]

The 17 SDGs aim to end poverty, hunger and inequality, take action on climate change and the environment, improve access to health and education, and build strong institutions and partnerships, and more.

In this regard, Unitán´s project contributes to the achievement of the country's goals defined to reach the SDGs by:

- Increasing labour demand from the local population: the common activity developed in the project region is cattle breeding and native forest exploitation. Besides the forestry plantation activities, the project will maintain the cattle rising -in those properties with existing animals- both on the unplanted area and under its plantations from year 3 to the end (many local researchers support cattle breeding inside forests as animals suffer less temperature stress and for storm protection). This will generate a much larger demand of labour when compared to these activities being developed separately.

- Diversifying the regional production will lead to higher economic revenues for the region. This includes generating supplies for the biomass thermal plants in the area.

- Promoting an integrated management scheme with the ecosystem by avoiding native forest exploitation. In this sense, it already obtained the necessary approval from the MAyDS (Environment and Sustainable Development Ministry) as well as provincial authorities (Production and Environment for Formosa properties, and Secretariat for Territorial Development and Environment in Chaco).

- Creating and developing a new mechanism to finance projects in the forestry sector by becoming the first forest plantation to validate under VCS standards.

- Generating net anthropogenic CO_2 removals by sinks.

The Unitán project has a Forest Management Plan in place, where social, economic and environmental impacts are identified and action to mitigate as well as commitments to public are stated. Please, refer to section 2 below for further information.

[13] https://www.argentina.gob.ar/politicassociales/ods
[14] https://www.indec.gob.ar/indec/web/Institucional-GacetillaCompleta-177
[15] https://www.argentina.gob.ar/politicassociales/ods/subnacional/provincias/informes/2019

The generation of net anthropogenic CO_2 removals by sinks will be monitored as part of the present VCS project and methodology is described in section 5.3 as well as the Monitor Plan in place[16].

Further Information

Native forest conservation

Unitán project seeks to become the first forest plantation project verified under VCS in Argentina, leading an example for other producers in the region since the national forestry promotion act hasn´t been able to comply with the expected economic assistance and producers expectations. At the same time, by planting *Schinopsis balansae*, it seeks to reduce pressure on native forest demand for the tannin industry supplies. Although native forest exploitation is done under legal authorisation, demonstrated by Unitán´s PEFC Chain of Custody Certification[17], the company is thinking forward in terms of industry supplies and forest restoration. This goes in line with its climate policy, where the whole Unitán industry is turning towards becoming climate positive[18].

At the same time, the uniqueness of the project has attracted research groups into working together to respond to unanswered questions on *Schinopsis balansae* characteristics, together with Unitán´s technical teams. The objective is to test the response to different doses of nutrients and greater water supply, as well as the reaction to variable silvicultural management, such as planting density, thinning, pruning, etc. Obtaining these answers and having genetically superior propagation material allows to continue implementing efficient afforestation plans in the region and protect native forest. Also, Unitán social responsibility policy, fundamentally helps health and educational institutions, as well as community engagement in different projects.

In addition, field personnel have been trained to record the sighting of endangered species and implementation of necessary measures of preservation. The permanent surveillance includes strictly monitoring the prohibition of hunting within the field.

Following the companies sustainable policy Unitán, together with other tannin, coal and forest industry businessmen are leading the creation of a Sustainable Forest Management Pact, which aims at self-regulating the sector to promote sustainable forest management and focus on the care of the Chaco biodiversity, restoration of degraded areas and increase of biomass. The process seeks to achieve international quality and traceability certifications -such as PEFC, Fair Trade of Organic- at the same time while seeking carbon credit and green financing boosts for unproductive areas. It is expected to improve agroforestry productivity and modernize livestock production, leading to social benefits such as new quality jobs[19]. The process has had highly positive results in other countries like Canada and Australia.

[16] Monitor Plan available for VVB at validation reference 15. Monitor Plan_Unitán in shared Google Drive folder
[17] Certification demonstrated in: https://www.pefc.org.ar/index.php/emprecertificad/menuemprecdc
[18] Sustainable policy available at: http://www.Unitán.net/

[19] https://www.tresmandamientos.com.ar/2021/07/14/empresarios-forestales-proponen-un-pacto-de-gestion-forestal-sostenible-en-chaco/

Socio-economic aspects

The project generates direct and indirect employment, and both company operators and third parties are formally hired, respecting benefits and rights, within a legal framework that includes national and provincial legislation. The number of hiring is around 250 people, with the intervention of some 20 forestry or related service companies throughout the rotation period. In addition, these activities generate the payment of fees and taxes, the benefit of which indirectly impacts society[20].

At the same time, the project has opened up to the community in order to generate synergies with different economic enterprises compatible with forestry, by allowing the installation of such enterprises in the project area. This may include apiculture, silvopastoral practices, etc. As well as the already mentioned, research synergies and educational visits.

2 SAFEGUARDS

2.1 No Net Harm

Socioeconomic impacts

The Unitán project is developed, until the moment of this presentation, in five Forest Management Units (FMU) –or properties- as can be seen in the Forest Management Plan that is publicly available (summary)[21]. Although it is planned within the project to increase the hectares forested in the coming years -by approximately 2400 hectares by 2025-, the analysis has taken place on the area for the effectively planted area until 2020, organized in the 5 FMU previously mentioned. These units are made up of small plots mostly of less than 100 hectares located in 4 departments of Chaco and Formosa provinces. Future plots and sites are planned on lands within the area with similar characteristics. Up to 2020 there are 884.9 hectares that will be impacted by the afforestation project.

The project proponent or any other entity involved in project design or implementation is not involved in any form of discrimination or sexual harassment. Unitán is a registered company, compliant with local and national regulations regarding discrimination (National Law 23,592), with the regarding registration certifications as evidence. Moreover, non-discrimination is part of the company´s policy, providing same working opportunities without gender, color or religion considerations[22].

All the FMUs are placed in rural areas and these soils and landscapes have been highly anthropized. Both provinces presents a low demography (Chaco: 1.97 hab/km^2, Formosa: 8.03 hab/km^2), and the

[20] All information and certifications available to VVC at validation under request.

[21] UNITÁN Forest Plan available at http://www.Unitán.net/Plan-Forestal-Y-De-Manejo-2021.pdf

22 Evidence for VVB during verification and information on company´s policy in the general Forestry Managemet Plan, see previous reference, section 5.4

rural population in this region of argentina double the national average (20% of population is rural, compared to 5% in the average of the country) so the negative socio economical impact of the Forest Management Units located in this rural areas, where the are very little surrounding population and the nearby villages are also very few, is minimal. But nevertheless the positive impact by new jobs generated would be very important and positive for these areas.

On the other hand, altough there are confirmed existence of indigenous communities surveyed by the Institute of Indigenous Affairs (INAI)[23] in both provinces, it can be confirmed that these communities have no productive or sacred link with the properties that have been included in the project. All the plots are owned by Unitán except for one rented, and there is no legal conflicts in these areas. There is no indigenous community directly impacted by this project in any FMU so it can be said that no negative impacts have been found on any indigenous community by the project.

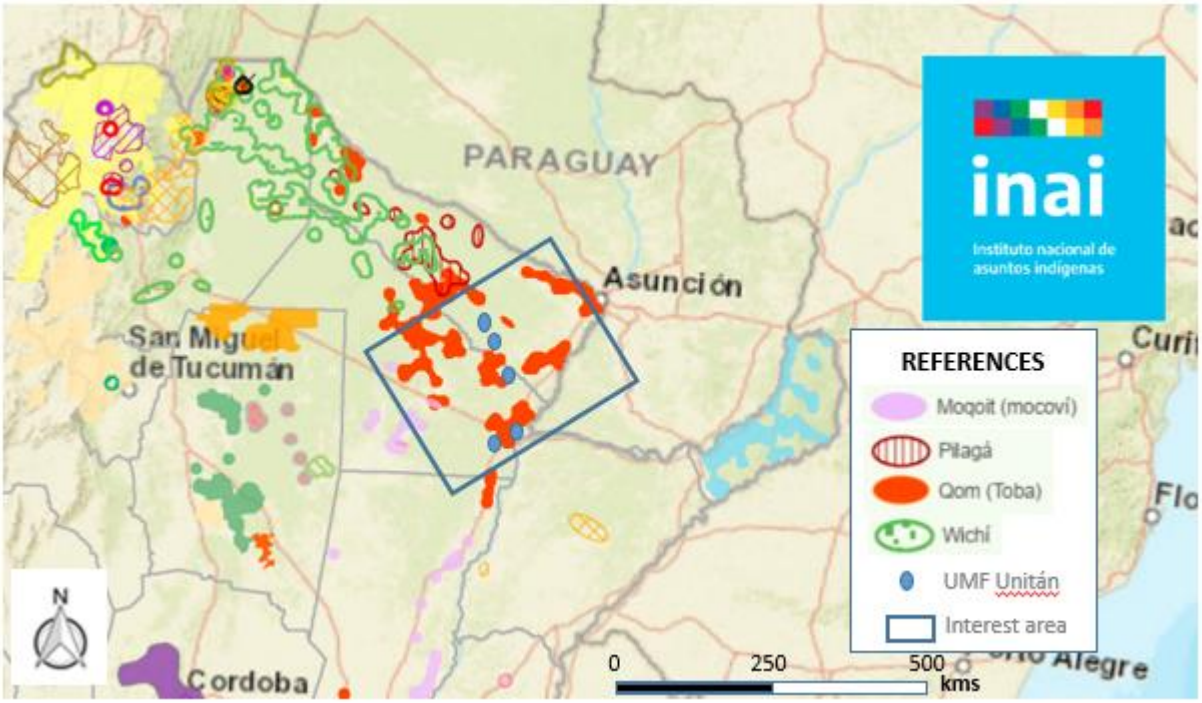


Figure 6. Comparative FMU maps of UNITÁN and indigenous communities surveyed by INAI.

Environmental Impacts

Complying with national and provincial regulations, an Environmental Impact Assessment was carried out by Agronomist Engineer Daniel MARADEI of MARADEI-PIKE consulters[24], during September 2019 for the land owned by UNITAN (Ex-Glombosvky) near the town of Puerto Tirol, department of Libertad in Chaco, being this land the only one with plots greater than 100 hectares. This EIA that was carried out on the acquired property in Puerto Tirol, defined the bases for environmental monitoring, the

[23] https://www.argentina.gob.ar/derechoshumanos/inai/mapa

[24] EIA available for VVB during validation.

management in forest operations and the conservatory plan of biological diversity in the native forest areas of every plot in each of the 5 FMU.

The analysis carried out by the consultancy shows that there are no significant negative environmental impacts due to the afforestation activity as proposed for this area.

"In the specific case of the project you can say that the impacts are minimal. This statement can be corroborated in each of the members of the ecosystem.

a) **Impact on vegetation**: the project is planned to be carried out on areas without native forests at present nor 10 years prior to plantation.
b) **Impact on the soil**: the ploughing will be the minimum essential to be able to form with the camels that will ensure a greater thickness of soil of the surface layer and the greater aeration of the root system and therefore better defense against water accumulations. In order to reduce emissions and all the impacts of mechanical tasks, a "taipero" equipment has been acquired that in the same operation performs vertical tillage.
c) **Impact on water:** there are no lagoons or watercourses in the area of the plantation where entrainment of chemicals could take place, as well as of eroded soil particles.
d) **Impact on air:** the air in the project area may be impacted by burning of fossil fuels, ground blasting and emissions from agricultural equipment engines only."

Environmental Management Plan, mitigation of global impacts.

Based on the EIA, a "Forest Environmental and Social Management Plan"[25] was carried out for all project's plots altogether, whether or not they have more than 100ha. In this way, Unitan seeks to ensure the correct management of resources and mitigations of the potential impacts identified:

- **Use of agrochemicals:** Weeds will be controlled with total translocable herbicides using doses recommended by the manufacturers. All the herbicides used are permitted by the legislation of the Argentina. All products are used under the control of purchase and storage, dispatch and application, and the final disposal of packaging. In addition, all agrochemical operators are trained and use PPE.

Pest control is performed by applying herbicide (fipronil and sulfluramida), both mechanically and manually over the ridge line, mainly for cutting ants control during pre and post emergence. The control is carried out, first, days before tillage and/or plantation and during the first four years, unless ant or other insect attack is observed during inspection. In the case of *Schinopsis*, inspections include the presence of powdery mildew, which is controlled using phytosanitary products applied manually.

Weed control is performed using Atrazina[26] and Glyphosate[27]. Application is carried out some days before tillage and/or plantation. Post planting control is done to avoid competition with the younger individuals.

[25] Available at http://www.unitan.net/Plan-Forestal-Y-De-Manejo-2021.pdf

[26] The application is described in the Forest Management Plan (Reference n° 3 in shared Google Drive form) as follows:
Atrazina - Gesaprim 90 WDG/trac 90.- Dosis: 2,2 kg/ha – total aplication

[27] This herbicide is classified under the FSC standard as of "restricted use" but not "prohibited use" nor "very restricted use" since it does not present environmental toxicity, heavy metals nor acute toxicity (https://fsc.org/en/document-centre/documents/retrieve/f1427c5d-a0d8-490e-8857-fd390613c139).
The application is described in the Forest Management Plan as follows:

Herbicide use is decided upon the frequency and types of weed sprouts. In the case of *Eucalyptus* it takes place till the second year, as the rapid growth covers the lines and between lines, controlling weeds. It is generally done by applying herbicide manually over the plantation line three times in the year. In the case of *Schinopsis*, weed control is continued till the fifth year due to the slower growth rate. Between plantation lines the work is done mechanically, with a lightweight breaker. Over the plantation line, every six months, a manual ploughing with a hoe is followed by herbicide manual application. Burning is not practiced as a weed control technique.

The agrochemicals used are all allowed by national legislation. They are applied by trained operators, using the corresponding PPE, and follow strict controls on purchase, storage, dispatch and application management standards, as well as final waste disposition. Moreover, it should be noted that the doses are those recommended by the manufacturers, but because only the planting rows are treated, 50% or less per actual hectare is applied.

All the above lead to the mitigation of possible adverse impacts of agrochemicals use. These adverse impacts include:

- Low to moderately toxicity for human is exposed directly without protection (case of accident),
- Low to medium possibility of bioaccumulation,
- Agrochemicals runoffs on ground and water if applied in excess and not considering optimal climate conditions,

- **Fire prevention:** Fire emergency equipment can be found in all fields and a methodology for cleaning flammable plant material, maintenance of suitable roads, water tanks of 5000 and 10000 liters and training for all personnel affected by the project is ensured (see table bellow for equipment detail on every property[28]). In the same way, the residues of pruning and thinning will not be burned, thus avoiding the emission of greenhouse gases, and potential fire risks. These trainings, along with those on safety at work, protection of biodiversity, water resources, among others, are part of the commitments to the UNITAN community and therefore mandatory for all personel employed or contracted for the project.

Glifosato - Panzer Gold.- Dosis: 4 l/ha - Action: traslocable total

[28] More information available for VVB during validation

Fire equipment/mechanism	Ex - Glombosvky	Sociedad Rural	Don Antonio	Irineo/Doña Virgina
Vehicles owned in the property have fire extinguishers in proper conditions	Si			Si
Vehicles and personnel in the property have radio or other mean of communication	Si			Si
Presence of permanent water sources within the property limits or less than 1km that can be used in case of emergency	Pond, water tank, factory water reserve	Water tank	2 perforations with australian tanks	Perforation with diaphragm pump
Tools and machinery to fight against fire, within premises	Material deposit + 10000 lts motopump tank	Fire extingisher backpack, bombonas & 1000 lts water tanks	Water tanks, fire extingisher backpack, shovel & pulaski ax; fire flapper; rakes and harrow	Fire chief; material deposit. Shovel & pulaski ax. Fire extingisher backpack & fire flapper; 5000lts tank
Emergency organization in case of fires	Firefighters Puerto Tirol	Firefighters Margaria Belen	Firefighters Gral san Martin	Police firefighters El Colorado

- **Biodiversity conservation:** The whole area has an important anthropic process (anthropized lands), the native flora has been modified for approximately 40 years, and the sites were transformed to spaces with pasture which served as a basis for the breeding of cattle in some cases; in others the appearance of introduced species such as grasses could be seen. Despite these modifications,native fauna can still be seen in the project area and native areas surrounding it. For this reason UNITAN has committed to comply with the following conservation measures:

  - Any defined native ecosystem shall be preserved as such.
  - Biological corridors will be maintained between areas of native forest, or different environments, such as palm groves or estuaries
  - The functionality of the corridors will be determined with periodic monitoring.
  - Emphasis will be placed on monitoring bird species and movement of other animals as well as endemic plant species identification
  - If an endangered species is identified, the means for its conservation shall be articulated.
  - Company staff and third parties shall be trained for the detection, identification and care of the different species of flora and fauna
  - Entry of strangers to the premises is prohibited
  - Entry of people with dogs is prohibited
  - Entry of people with weapons is prohibited
  - With regard to invasive species, their possible invasion will be controlled
  - Controlled and uncontrolled burning is prohibited

Taking into account the studies carried out on the basis of the legislation in force for the rest of the plots and given that they are less than 100 hectares, UNITAN has managed the approbation of *"construction certificates"* in each province for all the plots in the project. They are listed in *Section 3*.

In conclusion, there is no potential negative environmental or socio-economic impact due to the project. On the contrary, starting from degraded, anthropized or over exploited land, project activities can only issue environmental and socio-economic benefits as described further in this section and in 2.3.

2.2 Local Stakeholder Consultation

The Argentine Constitution guarantees the right of access to public information through article 1 of articles 33, 41 and 42. Taking these constitutional guarantees in 2003, Decree 1172/2003 was promulgated, which recognizes that the Public Hearing enables citizen participation in the decision-making process through an institutional space in which all those who may feel affected, express their knowledge or experience and present their individual, group or collective perspective regarding the decision to be taken. Beyond this regulation, which is not mandatory for this specific situation, the regulatory framework around Unitán's afforestation project does not oblige the company to hold a Public Hearing or a Stakeholders Consultation Process.

However, in order to deepen the company's commitments to the community and the associated impacts (positive and negative) the company UNITÁN carried out an analysis of the communities around the different plots of each Forest Management Unit (FMU), including an impact analysis on indigenous communities in the area.

To carry out the survey of Interested Parties by UNITÁN, they toured the surrounding areas to the 5 Forest Management Units of the project, summoning the neighbors of the plots and the neighbors of the surrounding towns and villages. Given that the sites are in rural areas with low population density, in two different provinces and faced with the impossibility of meetings in closed spaces due to health issues, it was decided to convene a virtual meeting where the Stakeholders identified around the FMU in both provinces will know the details of the project and have time an opportunity to express their opinions.

Given the quarantine situation in Argentina and the complicated epidemiological situation at the time of the stakeholder meeting, it was decided to hold it virtually on Wednesday, July 14, 2021 (National Decree 455/21[29]). Images of the online meeting in which the 40 attendees from the different communities surrounding the Forest Management Units participated are shown. Among the attendees were local authorities, the representatives of diferent educational communities (teachers and directors), neighbours of the plots and producers from the different surrounding villages; forestry technicians and engineers from both provinces, representatives of forestry chambers and provincial agencies, as well as neighbors who participate in environmental NGOs.

[29] Decree available at: https://www.boletinoficial.gob.ar/detalleAviso/primera/246737/20210709 and drive folder for VVB during validation

Figure 7. Participants in the meeting of stakeholders in Meet platform.

The call and invitations were made on July 6 and 7, they were made via email, google calendar and personally in fewer cases. In Annex 1 are some of the invitations by email, google calendar and letters that have been sent[30]. Thus, on July 14th at 10.30 a.m., the stakeholder consultation meeting took place. It was held over a Meet platform, and recorded to keep record of the presentation and participation of the different participants. A transcript of the relevant participations to the afforestation project can be found in Annex 2. The list of guests and attendees by site are listed in Table 5 below. This same mechanism will be implemented to communicate and invite stakeholders to validation/verification body´s audit.

Javier Vazquez from ProSustentia moderated the meeting. Jose Otarán a Forestry Engineer and technical leader of the project presented the project design and implementation details of the project, which included the environmental impacts identified and their mitigations, the benefits and negative impacts around the communities. The Mechanism of Claims, Complaints and Concerns (CC&C) was also presented. The project management report and CC&C mechanism presented during the stakeholder´s meeting is available to public at Unitán´s webpage, as will monitoring results be, once available.

The negative impacts on the community presented by the company UNITÁN are transcribed:

● Modification of the landscape: During the first year, the population can find a visual that is not familiar to them, regarding their accustomed nature of natural landscapes and their heterogeneity.

● Risk of the population: They can be given by proximity to transit routes, by circulation of vehicles or machines.

● Increased circulation of vehicles (vans and trucks) in times of thinning and wood harvesting: The circulation can increase slightly in areas near the fields and in transit routes, since the entry to the fields can be continuous in short periods of time.

[30] All invitation and communication material available to VVB in drive folder under reference “26. Public consultation invitations”.

● Generation of emissions, particulate matter (dust), noise and vibrations: In a moderate way, an increase can be generated at times of greater activity, in proximity to the Forest Management Units (FMU).

Mitigation strategies for these negative impacts of the Forest Management Plan were also presented:

● Training, awareness-raising to stakeholders and employees, suppliers and anyone related to the afforestation project.

● Control of operational risks and equipment, with training and monitoring plan.

● Measures to ensure the well-being and support of the population, through a complaints mechanism.

● Control of vehicles and heavy machinery to reduce emissions, dust, noise and vibrations.

Table 5: Stakeholders identified and invited the local stakeholders consultation

Name	Stakeholder type	Intitution/ profession	Department	Present
Emanuel Carrocino	Regional Government	CPN-Forest director	Pto. Tirol	Yes
Mark Giordano	Government	Forest management	Pto. Tirol	Yes
Luciano Olivares	Regional Government	Undersecretary of Forestry Development	Pto. Tirol	Yes
Sergio Soto	Private sector	Corfor -President	Pto. Tirol	Yes
Hector Ferrario	Research instituion	IIFA - President	Pto. Tirol	Yes
M. Elina Serrano	Regional Government	Ministry of Environment	Pto. Tirol	No
Luis Holbash	Neighbor		Pto. Tirol	No
Claudia Gronda	Neighbor		Pto. Tirol	No
Ariel Caro	Neighbor		Pto. Tirol	Yes
Lucas Vera	National Government	DNDFI technician	Pto. Tirol	Yes
Marta Soneira	Regional Government	Secretary of territorial planning and environment	Pto. Tirol	No
Edmundo Ybarra	Neighbor		Pto. Tirol	Yes
Paula Staszewski	Neighbor		Pto. Tirol	Yes
Humberto Pompert Bangher	Local Government	Mayor	Pto. Tirol	Yes
Maria Natalia Canal	Neighbor		Pto. Tirol	Yes
Joseph Derewicki	Neighbor		Pto. Tirol	Yes
Maria Rosa Bandeo	Education institution	Teacher	Pto. Tirol	Yes
Liliana Zacharias	Education institution	Teacher	Pto. Tirol	Yes
María Sanchez	Neighbor		Pto. Tirol	Yes
Nuria Martinez	Neighbor		Pto. Tirol	Yes
Walter Acosta	Research institution	IIFA Technician assistant	Pto. Tirol	Yes
Marcelo Repetto	Private sector	Rural Society president	Margarita Belén	Yes
Raul Vera	Neighbor		Margarita Belén	Yes
Braian Foschiatti	Neighbor		Margarita Belén	Yes
Horace Frey	Private sector	Producer and neighbor	Margarita Belén	No
Ivan Vera	Private sector	Contractor and neighbor	Margarita Belén	No
Gladys Piccilli	Local Government	Mayor	Pampa Almirón	No
Ramón Roso	Private sector	Producer and neighbor	Pampa Almirón	Yes
Julio Antonio Tito Martinez	Private sector	Producer and neighbor	Pampa Almirón	Yes
Javier Candela	Neighbor		Pampa Almirón	Yes
Robert Nardelli	Neighbor		Pampa Almirón	No
Victor Franco	Regional Government	Forestry program	Villa 213	Yes
Raul Ritter	Regional Government	Forestry program	Villa 214	Yes
Patricia Britos	Private sector	President of the Forestry Council	Villa 215	Yes
Gustavo Díaz	Regional Government	Technical assistance M° of Production and Environment	Villa 216	Yes
Marcos Atanasio	Research instituion	Inta technician	Villa 217	Yes
Lawrence Schmidt	Local Government	Mayor	Cabo Noroña	No
Dante Boldorini	Private sector	Contractor and neighbor	Cabo Noroña	Yes
Hugo Demchuk	Private sector	Producer and neighbor	Cabo Noroña	Yes
Andrés Armando Peyro	Private sector	Producer and neighbor	Cabo Noroña	No
Antonio Sbardella	Private sector	Producer and neighbor	Cabo Noroña	No
Rolando Recaldo	Neighbor		Cabo Noroña	Yes
Carlos Scheffer	Private sector	Producer and neighbor	Cabo Noroña	No
Edgardo Pagani	Project developer	Unitán personel	Pto. Tirol	Yes
Cristian Aquino	Neighbor	Unitán personel	Pto. Tirol	No
Ricardo Winkler Fields	Neighbor	Unitán personel	Pto. Tirol	Yes
Ariel Lopez Mato	Project developer	Unitán personel	Pto. Tirol	yes
Paola Bellucci	Project developer	Unitán personel	Pto. Tirol	yes
Silvio Battaglia	Neighbor	Unitán personel	Pto. Tirol	yes
Martin Orcellet	Neighbor	Unitán personel	Pto. Tirol	Yes
Antonio Gil	Project developer	Unitán personel	Pto. Tirol	Yes
Guillermo Bernal	Neighbor	Unitán personel	Pto. Tirol	No
Daniel Eichenberger	Neighbor	Unitán personel	Pto. Tirol	yes
Ricardo Cristanchi	Neighbor	Unitán personel	Pto. Tirol	No
Sergio Budiño	Neighbor	Unitán personel	Pto. Tirol	No
Gustavo Ferrer	Neighbor	Unitán personel	Pto. Tirol	yes
José Otarán	Project developer	Unitán personel	Pto. Tirol	yes

Complaints, Concerns and Claims Mechanism (CCCM)

During the stakeholders consultation, special emphasis was placed on the importance of using the Claims, Complaints and Concerns Mechanism that was presented (see Figure 8). This mechanism was

generated by the company UNITÁN within a broader system of communications and reception of claims in place to receive concerns for the whole company´s logistic , a system that has ISO 9001 certification of quality management. This specific channel that was presented for the Afforestation Project has phone numbers, emails, digital mailboxes and physical mailboxes. In addition, those responsible for receiving the claims are part of the project team and only deal with the complaints or claims around the afforestation project.

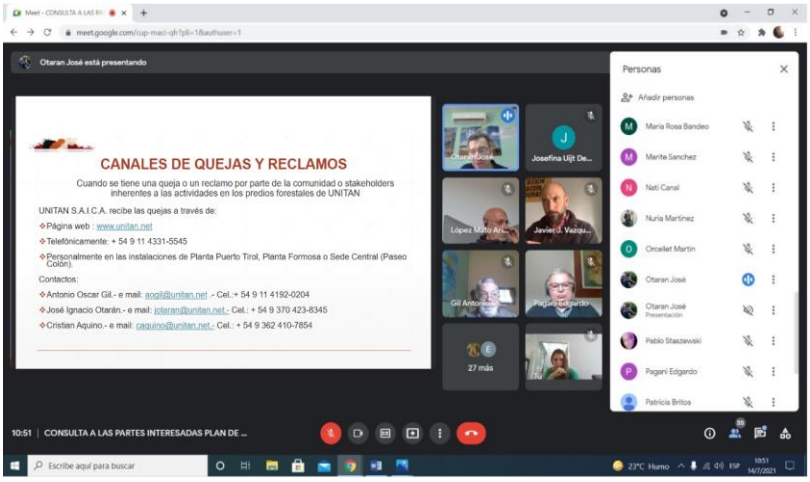


Figure 8. Local stakeholder's consultation presentation: the communication channels of the Claims Mechanism.

The recording of the meeting, the non-technical document (NTS) prepared by the company prior to the meeting that was distributed to attendees, and the presentation that was displayed during the meeting can be found on the UNITÁN website (http://www.Unitán.net/).

The NTS declares the Environmental and Social commitments that the company has assumed with the community:

- Constant and updated monitoring plan
- Annual stakeholder update
- Updating online documents if necessary
- Constant training to all those involved in the afforestation project under UNITÁN or suppliers as the mitigation measures of impacts and associated risks.
- The local employment commitments that UNITÁN has assumed with the communities as well as the national and international legal labor commitments that the company assumes.
- Company staff and contractors will be trained and sensitized for the detection, identification and care of the different species of flora and fauna
- Any defined natural environment shall be preserved as such.
- Biological corridors will be maintained between areas of native forest, or different environments, such as palm groves, estuaries and grasslands in the surrounding areas of the project
- The functionality of the same will be determined with periodic monitoring.

- Emphasis will be placed on monitoring bird species and movement of other animals
- If an endangered species is identified, the means for its conservation will be articulated.
- The communication channels will always be open to be in contact with the needs and doubts of the communities.

2.3 Environmental Impact

As mentioned in section 1.14, Law 25,675 is a fundamental law that determines the conditions and requirements to carry out interventions that may affect natural resources or the environment, this means that an enviromental impact assessement is require to carry out a forestation project under specific conditions. Also Law 26,331 of Minimum Budgets of sustainable management of native forests has a tipification code for the different tipe of native forests that determine its risk and threats. It's codify by colors, red for untouchable, yellow medium conservation level and green as a zone that's viable for intervention with no further analysis.

Based on the prior legislation, national Law 25,080/98 on Promotion of Commercial Forest Plantations -and its updated version Law 27,487 of 2019- were sanctioned. Its regulatory Decree 133/99 details, in *ARTICLE 5, the eligibility conditions for forestation proyects seeking funding:*

- Projects must conserve (neutral impact) or improve (positive impact) the biophysical environment and the natural resources involved.

- Any enterprise that exceeds one hundred hectares (100 ha) of annual planting must carry out an Environmental Impact Assessment, with the aim of predicting the risks and impacts, both positive and negative, the project´s implementation will cause to the environment .

- The EIA will determine and statethe necessary mitigation measures for the harmful impacts, and establish a system of environmental monitoring. In this framework, *"The Enforcement Authority and the provinces that adhere to this Law shall agree on appropriate measures, for the purposes of the Environmental Impact Assessment , in the case of small investments or small-scale forest areas (less than 100 ha).*

In this sense, the regulatory decree of Law 25,080 determines that for projects that will be carried out on land of less than 100 ha, environmental impact assessments are not compulsory. Complying with national and provincial regulations, an Environmental Impact Assessment was carried out by Agronomist Engineer Daniel MARADEI of MARADEI-PIKE consulters – authorized consultancy in the province- during September 2019 for the land owned by UNITÁN, Ex-Glombosvky, near the town of Puerto Tirol, in Chaco[31]. This property is the only one with plots greater than 100 hectares. At the same time, this property is expected to represent 65% of the total are planted whithin project boundary.

It's important to note that although no Environment Impact Assessment has been carried out for those plots of less of 100 hectares, all of these have been classified as viable planting areas by Law 27,487 with the corresponding authorization considering they are within the low or medium conservation tipification by Law 26,331 of Minimum Budgets of sustainable management of native forests. No further

[31] EIA documents available to VVB during validation. Reference "24. EIA_Pto. Tirol" in shared Google Drive folder

analysis was requested and only the "*construction certificates" granted by the authority for the Promotion of cultivated forest* was required by the corresponding provincial agencies.

Table 6: List of plantations to date with corresponding habilitations file n°[32]

PROVINCE	DEPARTAMENT	PROPERTY	PLOT NRO.	PLANTATION YEAR	GENRE	AREA [ha]	LAW 25080 HABILITATION FILE N°
Chaco	Libertad	Puerto Tirol	Ensayo primavera	2017	Eucalyptus Híbrido	0,3	05-012-034/17
Chaco	Libertad	Puerto Tirol	Sección I cuadro 1 Lotes 2 y 3	2017	Eucalyptus Híbrido	86,5	05-012-034/17
Chaco	Libertad	Puerto Tirol	Sección I cuadro 2 Lotes 7 a 11	2017	Eucalyptus Híbrido	10,2	05-012-034/17
Chaco	Libertad	Puerto Tirol	Sección I cuadro 2 Lotes 4 a 6 Sección I cuadro 3 Lotes 3 al 7 Sección IV cuadro 1 a 4	2018	Eucalyptus Híbrido	151,2	05-012-086/18
Chaco	Libertad	Puerto Tirol	Sección I cuadro 1 Lotes 1 a 6	2019	Eucalyptus Híbrido	177,0	Faltan cargar ant. en el Mº
Chaco	Libertad	Puerto Tirol	Sección IV cuadro 5 y 6	2020	Eucalyptus Híbrido	195,0	Faltan cargar ant. en el Mº
Chaco	1° de Mayo	Margarita Belén	Sección I cuadro 1 Lotes 1 al 5	2016	Eucalyptus Híbrido	43,8	05-018-025/16_05-018-035/16
Chaco	1° de Mayo	Margarita Belén	Sección I cuadro 2 Lotes 1 y 10	2018	Eucalyptus Varios	27,35	05-018-088/18
Chaco	1° de Mayo	Margarita Belén	Sección I cuadro 2 Lotes 2 al 7	2018	Eucalyptus Varios	1,9	05-018-088/18
Chaco	1° de Mayo	Margarita Belén	Sección II cuadro 1 Lotes 1, 2 y 5	2018	Eucalyptus Híbrido	12,5	05-018-088/18
Chaco	1° de Mayo	Margarita Belén	Sección II cuadro 1 Lotes 4	2018	Eucalyptus Varios	1,2	05-018-088/18
Chaco	1° de Mayo	Margarita Belén	Sección II cuadro 1 lote 3	2018	Eucalyptus Híbrido	0,7	05-018-088/18
Chaco	1° de Mayo	Margarita Belén	Sección III cuadro1	2018	Eucalyptus Híbrido	3,0	05-018-088/18
Chaco	1° de Mayo	Margarita Belén	Sección II cuadro 5	2018	Eucalyptus Varios	4,5	05-018-088/18
Chaco	San Martín	Pampa Almirón	Sección I cuadro 1,3,4 y 5	2016	Schinopsis	80,0	05-013-036/16
Chaco	San Martín	Pampa Almirón	Sección I cuadro 2	2016	Eucalyptus Híbrido	13,0	05-013-036/16
Chaco	San Martín	Pampa Almirón	Sección I cuadro 6 y 7	2017	Schinopsis	13,0	05-013-036/17
Formosa	Pirane	Villa 213	Sección II cuadro 1	2017	Schinopsis	10,0	08-003-001/17
Formosa	Pirane	Villa 213	Sección I cuadro 3, 4 - Sección II cuadro 2	2018	Schinopsis	23	08-003-002/19
Formosa	Pirane	Villa 213	Sección I cuadro 1	2020	Schinopsis	25	08-003-003-19
Formosa	Pirane	Cabo Noroña	Sección D1 V1, D2 V2 y D3 V3	2019	Schinopsis	54,0	08-003-004/19
Formosa	Pirane	Cabo Noroña	Sección D2 V2	2019	Eucalyptus Varios	2,1	08-003-004/19
Formosa	Pirane	Cabo Noroña	Sección D2 V2	2019	Eucalyptus Híbrido	2,4	08-003-004/19
Formosa	Pirane	Cabo Noroña	Sección D2 V2	2019	Eucalyptus Varios	1,7	08-003-004/19
			TOTAL			**939,4**	

The Environmental and Social Management Plan of the entire project presents the identified environmental impacts and associated mitigation strategies. This information can also be found online.

The identified environmental impacts were characterized as minimal. This statement can be corroborated according to the analysis of the different elements of the ecosystem.

a) **Impact on vegetation:** the project is planned to be carried out on areas without native forests at present.
b) **Impact on the soil:** the ploughing will be the minimum essential to be able to form with the camels that will ensure a greater thickness of soil of the surface layer and the greater aeration of the root system and therefore better defense against water accumulations. In order to reduce emissions and all the impacts of mechanical tasks, a taipero equipment has been acquired that in the same operation performs vertical tillage.
c) **Impact on water:** there are no lagoons or watercourses in the area of the plantation where there could be the possibility of entrainment of chemicals, as well as of eroded soil particles

[32] State habilitations available at https://inforestal.agroindustria.gob.ar/

d) **Impact on the air:** the air in the project area can be impacted by burning, blasting of soil and emissions from the engines of agricultural equipment.

2.4 Public Comments

Since the project start date in 2016 Unitán has not received complaints or claims of any kind through the communication channels that the company had at the moment (see 2.1 Complaints and Concerns Mechanism).

Due to the sanitary recommendations in the context of the COVID-19 pandemic (stated under National Decree 455/21[33]), the local stakeholders consultation was held on 14th July 2021 on a virtual meeting modality (see section 2.2). The meeting, as well as all the comments made, were recorded and are available at Unitán´s website. Annex II contains the transcript of the comments at the end of the meeting by the participants from the diferentes towns and villages from Chaco and Formosa.

Within the comments that were made, there have been no complaints or negative views about the project. On the other hand have been received comments on the importance of generating this type of projects that generate local employment, regenerate the native forest and allow to boost the forest industry in the provinces in a sustainable way.

From November 2nd to December 2nd, 2021, the project was available for public comment at VCS webpage. No comments were received during that period of time.

2.5 AFOLU-Specific Safeguards

As explained in section 2, the company UNITÁN identifyed the neighbors around the plots and in the communities near the FMU (Puerto Tirol, Margarita Belén, Pampa Almiron, Villa 231, and Cabo Noroña). Residents and communities in the surrounding villages were invited to connect to the Stakeholder Consultation Meeting on July 14th 2021. It had 40 attendees, these being from all the invited communities of the two provinces. As explained in section 2, when the stakeholder survey was carried out, the survey map of the National Institute of Indigenous Affairs was incorporated into the analysis to confirm that there is no impact on areas of indigenous lands surveyed in the INAI Census.

Risks and mitigation action taken or planned to take place, were detailed in section 2.2 (over community) and section 2.3 (environment impacts), based on the Environmental Impact Assesment conducted at Pto. Tirol property.

Some of the requests that arised from the public comments have been assumed as commitments by UNITÁN were: thinking of afforestation from a basin scale vision; invite schools to visit the afforested plots; willingness to carry out new forests in third-party fields. Faced with these comments and the willingness of the company to include them in the project, communication channels (phone numbers, emails, digital mailboxes and physical mailboxes within the project´s Claims, Complaints and Concerns

[33] Decree available at: https://www.boletinoficial.gob.ar/detalleAviso/primera/246737/20210709 and drive folder under reference “25. National Decree 455_21_COVID” for VVB during validation

Mechanism) presented will be always open to more ideas or comments for the project, and the importance that the community use them so the company is able to respond to doubts or claims that arise from the project was mentioned.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

The following methodology and tools referenced in it are applicable to the present project activity:

- "AR-ACM 0003: Afforestation and reforestation of lands except wetlands", Version 02.0
- "Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities" V.1
- "Tool for the demonstration and assessment of additionality", Version 07.0.0
- "Tool for the demonstration and assessment of additionality in VCS agriculture, forestry and other land use (AFOLU) project activities" version 3.0
- "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities", Version 04.2
- "Estimation of carbon stock and change in carbon stocks in dead wood and litter in A/R CDM project activities", Version 03.1
- "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities", Version 01.1.0
- "Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity", Version 2.0
- "Calculation of the number of sample plots for measurements within A/R CDM project activities"; Version 2.1.0

Note: the tool "Estimation of non-CO2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity" wasn´t considered since biomass burning practices will not be part of the project activity.

The tools "Estimation of carbon stock and change in carbon stocks in dead wood and litter in A/R CDM project activities", Version 03.1 and "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities" Version 01.1 were not considered as only above and belowground biomass carbon stocks will be accounted for. In the case of soil carbon stocks, the exclusion follows the conditions on the "Procedure to determine when accounting of the soil organic carbon pool may be conservatively neglected in CDM A/R project activities" Version 1.0

3.2 Applicability of Methodology

As established in the methodology, it is applicable under the following conditions:

(a) The land subject to the project activity does not fall in wetland category;

(b) Soil disturbance attributable to the project activity does not cover more than 10 per cent of area in each of the following types of land, when these lands are included within the project boundary:

1. Land containing organic soils;
2. Land which, in the baseline, is subjected to land-use and management practices and receives inputs listed in appendices 1 (Cropland in which soil disturbance is restricted) and 2 (Grassland in which soil disturbance is restricted) to this methodology.

Wetland

Plantation only takes place in high non flooded areas and has no fragile lands such as riparian forests or flood plains within the project area. When present in the surrounding areas within the properties, these are protected by the project owner and only grasslands are subject to AR project activities.

Margarita Belén property is found on the west limit of Chaco wetlands, but defined as agricultural land, use and degraded by years of cattle breeding and approved by the National Commercial Forestry Promotion Law for commercial plantation purposes.

Soil Disturbance

The soil types of the project cannot be categorized as (i) organic or (ii) cropland/grassland in which soil disturbance is restricted. According to 2006 IPCC Guidelines (Annex 3A.5, Chapter 3, Volume 4), organic soils must have at least 12 percent organic carbon by weight (i.e., about 20.7% organic matter). Sample analysis for all properties has shown the highest value for organic matter in soil reaching 3.19% at Sociedad Rural plots. Soil classification has also been analysed at department level from INTA reports[34]. Project area soil organic matter content is below the IPCC guidelines for organic soil threshold, hence it is concluded that the soil types of the project are not organic.

Table 7: Soil results for Unitán project properties.

Properties	Soil type	Organic matter %
Ex-Glombosvky	Alfisol	1%
Sociedad Rural	Clay loam	3.19%
Don Antonio	Silt loam	2.43
Irineo	Clay loam	1.13%
Doña Virginia	Silt loam	3.1%

Unitán lands are characterized by grazing lands and set aside agricultural lands (cotton crops). In the case of grasslands, these area had regular usage capacity, without technological improvements or implanted pastures. In the case of the crops prior to the project, the management included full tillage

[34] Department analysis for Pirané and Bermejo by INTA, soil analysis for properties by Unitán and national soil classification map available for VVB at validation/verification.

and low inputs. These lands have not received intensive management with added agricultural inputs such as fertilization, reseeding, etc. The soils are of reduced natural fertility and current erosion is moderate, caused by hydric erosion during wet season. Hence, the Project is applicable to this methodology.

A project activity applying this methodology shall also comply with the applicability conditions of the tools contained within the methodology and applied by the project activity.

VCS project standard

This standard establishes a set of specific requirements for project eligibility, among which stands out the AFOLU project categories eligibility (VCS-Methodology requirements V4.1).

In order to demonstrate the project as Afforestation, reforestation and revegetation (ARR) category, the project participants shall provide evidence that the land within the planned project boundary has not been cleared of native ecosystems within the 10-year period prior to the project start date.

First, it must be stated that grassland vegetation dominating before project start is not the native ecosystem of the land within project boundaries. The native condition was modified due to native forest exploitation and the introduction of beef cattle due to a relocation of livestock production out of the Pampean areas of Argentina and into the north of the country. Both Formosa and Chaco, located in the northwest, have undergone structural and geographical changes as a result of the transformation of the agricultural sector of Argentina due to agricultural displacement[35] [36].

Both forest and grassland in the region have been historically impacted by agriculture activities. Cattle breeding in the region dates from 1552 with livestock entry from Brazil which quickly adapted to the subtropic conditions by changing to a smaller size (due to more fibrous grass)[37]. In more recent history, the NEA (Northeast region of Argentina), and particularly Chaco and Formosa, increased its cattle stock as a result of the shift of the agricultural frontier in the first decade of the 21st century, reaching 25% of the livestock national stock[38] (Rearte 2002/05), being the NEA the second region in importance regarding livestock breeding[39]. "*From the 1990s until 2007, all the productive regions of Chaco recorded*

35 Di Paola, M. M (2005) Expansión de la frontera agropecuaria. Apuntes Agroeconómicos. ISSN 1667-3212 Año 3 - N°4. Available at: https://www.agro.uba.ar/apuntes/wp-content/uploads/2020/03/expansion-de-la-frontera-agropecuaria.pdf

36 Gomez Lende, S. (2018) Destrucción de bosques nativos y deforestación ilegal: el caso Argentino (1998-2016) Papeles de Geografía, 64 (2018), 154-180.

37 Chiossone G.O. (2018). Reconocimiento y manejo de ambientes naturales del Chaco Húmedo Formoseño. Buenas prácticas para una ganadería sustentable de pastizal. Kit de extensión para las Pampas y Campos. Fundación Vida Silvestre Argentina. Buenos Aires. Available at: https://www.avesargentinas.org.ar/sites/default/files/kit_pampas__cartilla_reconocimiento_y_manejo_de_ambientes_naturales_del_chaco_humedo_formoseno.pdf

38 Rearte, D. (2002/05) La integración de la ganadería Argentina. ed. PAN Producción Animal I. INTA, Balcarce quoted in reference n° 37.

39 Chiossone, G. (2006) Sistemas de producción ganaderos del noreste argentino: Situación actual y propuestas tecnológicas para mejorar su productividad. Available at: https://www.produccion-animal.com.ar/informacion_tecnica/origenes_evolucion_y_estadisticas_de_la_ganaderia/65-Guillermo_Chiossone.pdf

increases in their livestock stocks, although this trend was higher in the Central-Eastern part of the province, which reached 1.8 million heads in 2007 and 2008[40]*"*. This cattle breeding area in Chaco is located the region known as Centro-oriental.

For the departments where the project takes place, the agriculture exploitations´ land use in 2002[41] was reported occupied in a 93% by natural grassland and native forest, while only 3% is implanted ecosystem, this is explained by the fact that the economic activities have been mainly characterized by the exploitation of natural ecosystems like wood harvest[42] and cattle breeding on native grassland and native forest both in Chaco and Formosa with low technology and inputs[43] [44]. This exploitations are widely described for the region in different publications, stating the level of degradation of forest and grasslands throughout 100 years of agriculture activities[45] [46]. Degradation has led to an imbalance of such magnitude that it has favoured the proliferation of economically undesirable species[47] together with soil erosion by exposing the soil to extreme precipitations and temperatures, with the loss of native species habitat[48].

In 1974, Morello[49] described the area as stratified vegetation with a tall canopy of trees dominated by quebracho colorado (*Schinopsis lorentzii, S. balansae*), quebracho blanco (*Aspidosperma q.blanco*),

40 Cuadra, D.E. (2016) Regiones productivas de la Provincia de Chaco. 1816-2016 Bicentenario de la Declaración de la Independencia Argentina actas del XIV encuentro de profesionales y licenciados en geografía de Formosa. Volumen 1. 14 Y 15 de octubre de 2016. Formosa Capital. ISBN 978-987-1604-49-4 EDITORIAL EDUNAF.

41 National agriculture census 2002

42 See reference 40

43 In the report Formosa 2015. El plan de inversiones que conduce a la visión de provincia de largo plazo it is stated: "Formosa's cattle farming is concentrated in the eastern region, which is home to almost 75% of the province's cattle stock. More than 90% of the cattle farms are oriented towards breeding, with rudimentary approaches, little incorporation of technology, based on herding on natural pastures and woodland, without rational grazing and lacking in the planning of fodder reserves to ensure an adequate nutritional level throughout the year"

44 D´Agostini, A. 1997. Los pastizales del parque Chaqueño; manejo y productividad. Conferencia. 3ª Jornada Regional de Manejo de Pastizales Naturales. AER INTA San Cristóbal, Sta. Fe.

45 Chiossone G.O. (2018). Reconocimiento y manejo de ambientes naturales del Chaco Húmedo Formoseño. Buenas prácticas para una ganadería sustentable de pastizal. Kit de extensión para las Pampas y Campos. Fundación Vida Silvestre Argentina. Buenos Aires. Available at: https://www.avesargentinas.org.ar/sites/default/files/kit_pampas__cartilla_reconocimiento_y_manejo_de_ambientes_naturales_del_chaco_humedo_formoseno.pdf

46 Plan de Gestión Integrada de Riesgos Agropecuarios de la Provincia del Chaco. Ministerio de Hacienda y Finanzas Pública, Chaco - p. 12

47 OAS (2004): "Características de la explotación rural chaqueña" www.oas.org/usde/publications/unit/oea22s/ch14.htm

48 See reference 46

49 Morello, J. y Adamoli, J. (1974) Las grandes unidades de vegetación y ambiente del Chaco Argentina quoted in Morello et al (2005) Un siglo de cambios de diseño del paisaje: el chaco argentino. I Jornadas Argentinas de Ecología de paisajes

timbó (*Entorolobium contortisiliquum*), urunday (*Astronium balansae*); quayacán (*Casalpinia paraguariensis*); lapacho (*Tabebuia ipe*); and a middle canopy with algarrobos (*Prosopis alba, P. nigra*), vinal (*Prosopis ruscifolia*) and chañar (*Geoffroea decorticans*). All species exploited for its wood quality for years, and affected during fire practices in areas of cattle breeding[50]. Hence, the non-forest areas present in the project´s properties are not natural ecosystems but a transition from already impacted lands.

Secondly, in terms of forest lands, the land eligibility is demonstrated through the use of satellite imagery showing that vegetation on the project land has been below the forest threshold, according to the definition of native forest adopted by Argentina[51], up to 10 years prior to project start date. In this regard, the table below provides the details of the adopted definition:

A single minimum tree crown cover value between 10 and 30 per cent	A single minimum land area value between 0,05 and 1 hectare	A single minimum tree height value between 2 and 5 metres
20%	0,5 ha	3 mts

In order to confirm the absence of forest and define project boundary, a chronosequence of Landsat surface reflectance images was used. Despite these images having a low resolution (30 m), they are available for a wide range of dates. Thus, analysing images of different dates between the plantation date and 10 years before the absence of forest during that 10-year period for the proposed plots was assessed.

In order to illustrate the land use of the properties and selection of plots according the absence of forest 10 years prior to the project start date, different kinds of images for every field in the properties are shown. Google Earth images downloaded from Google Earth Pro for the nearest available dates between the 10 year period, and Landsat images built from the median value per pixel across a stack of valid pixels during January and June. Those plots where neither the Google Earth images nor the Landsat images displayed below contain forest, were selected for the project area, and where the plantations take place (see section 3.3 for project boundary maps according to suitable plantation fields). Regarding the few scattered trees on the project area, the tree crown cover of the land is still far below 20% of the threshold value of forests in Argentina, and would remain so under continuation of current management.

The images presented on the next pages (figure 9 to 13) represent the land cover for the whole properties between the plantation date and 10 years before in order to select the proposed boundary where plots

50 Oliva, Gabriel (2019) Manejo de pastizales naturales en Argentina. Presentación en XXV Reunión del Grupo Técnico Regional del Cono Sur en mejoramiento y utilización de los recursos forrajeros del área Tropical y Subtropical

51 Classification proposed by FAO through the FRA 2000 (Evaluation of Forest Resources as to year 2000) adapted to the characteristics and particularities of Argentina, specified in Law No. 26,331 of Minimum Budgets for Environmental Protection of Native Forests, its Regulatory Decree No. 91 / 2009 and COFEMA Resolution No. 230/2012

were not cleared of native ecosystems at the time the project started, nor 10 years prior (see figure 14 in section 3.3 for project boundary selection).

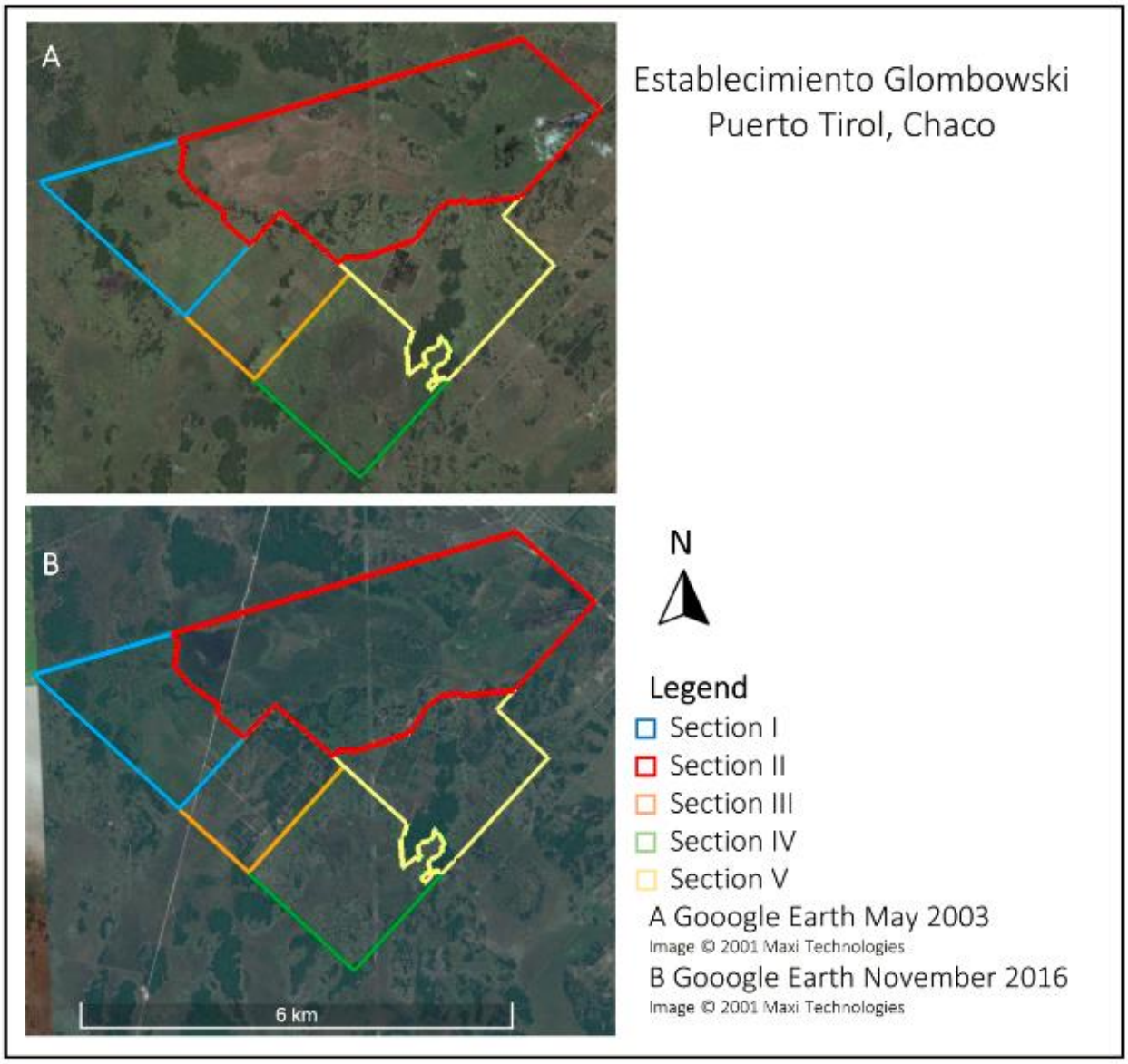


Figure 9. Satellite images for Ex-Glombosvky property sections for year 2003 and 2016

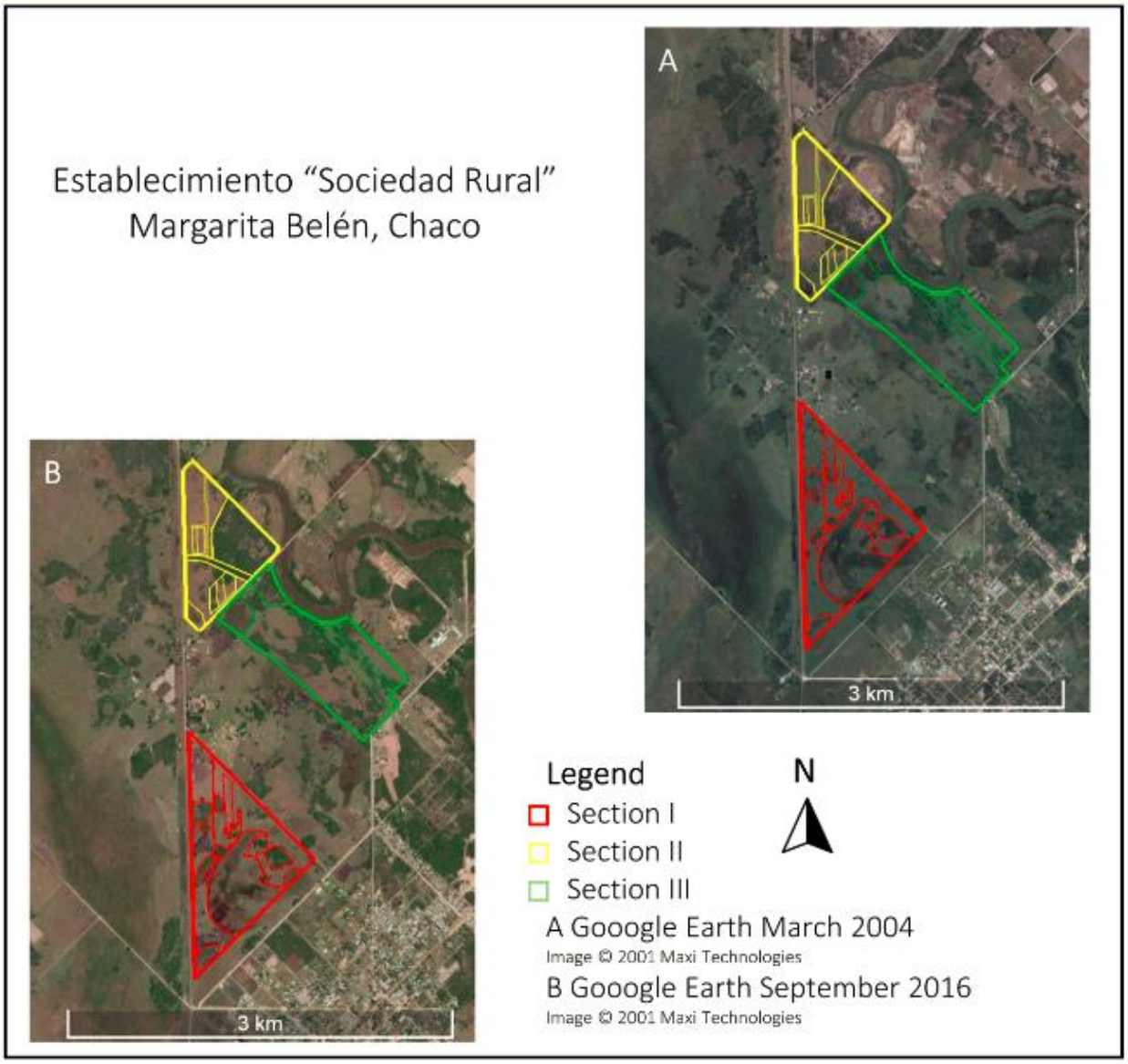


Figure 10. Satellite images for Sociedad Rural property sections for year 2004 and 2016

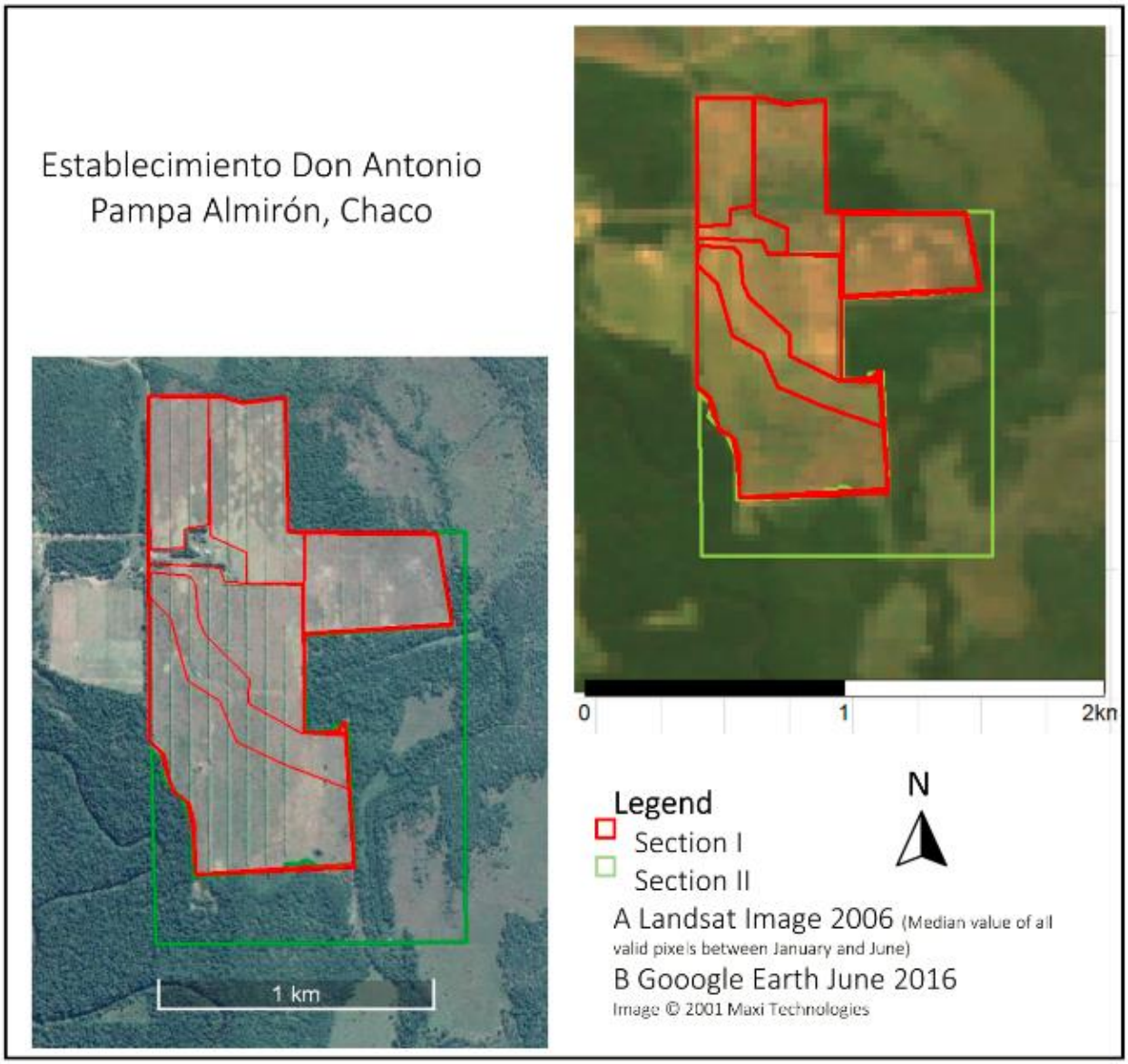


Figure 11. Satellite images for Don Antonio property sections for year 2006 and 2016

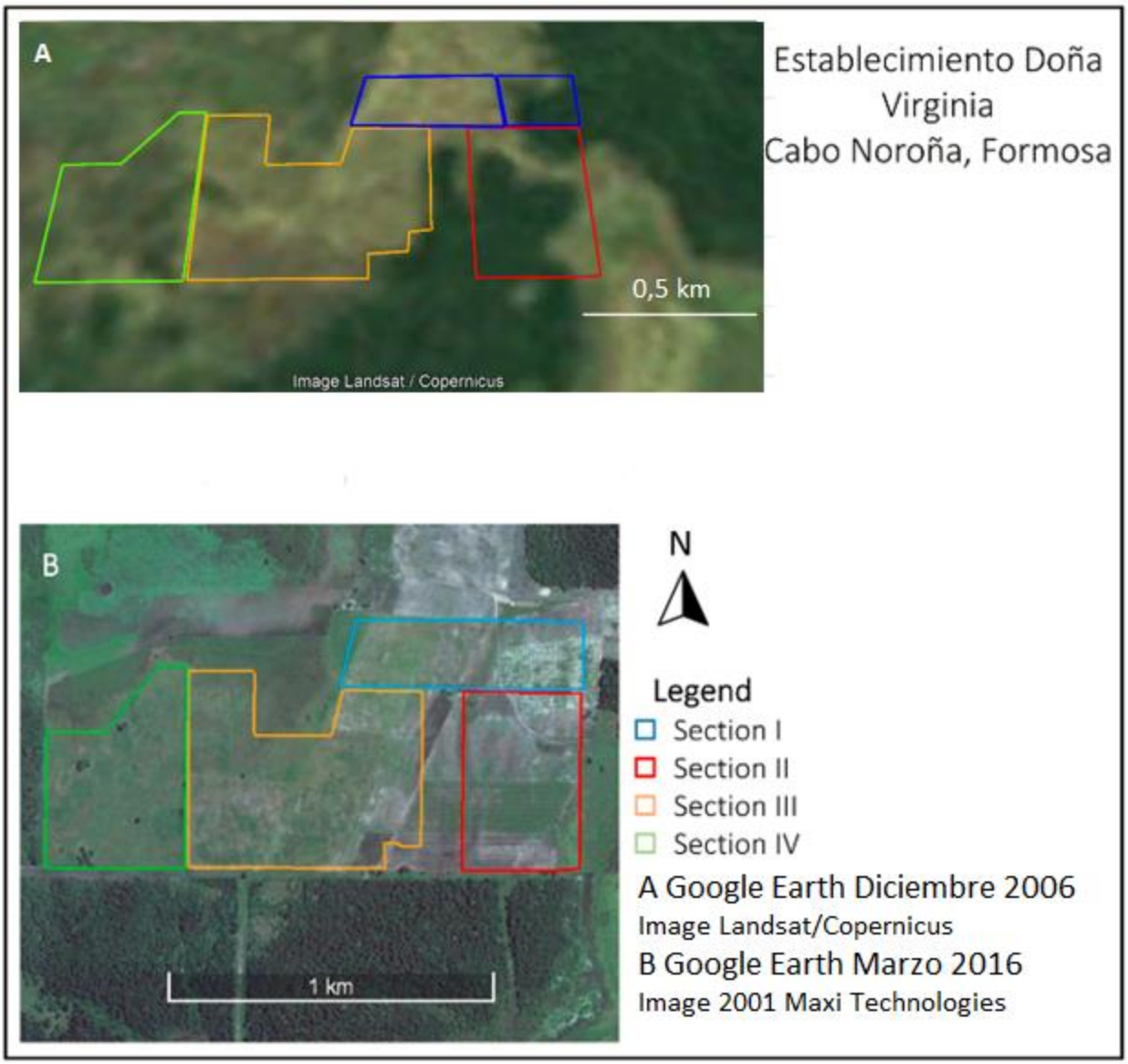


Figure 12. Satellite images for Doña Virginia property sections for year 2006 and 2016-.

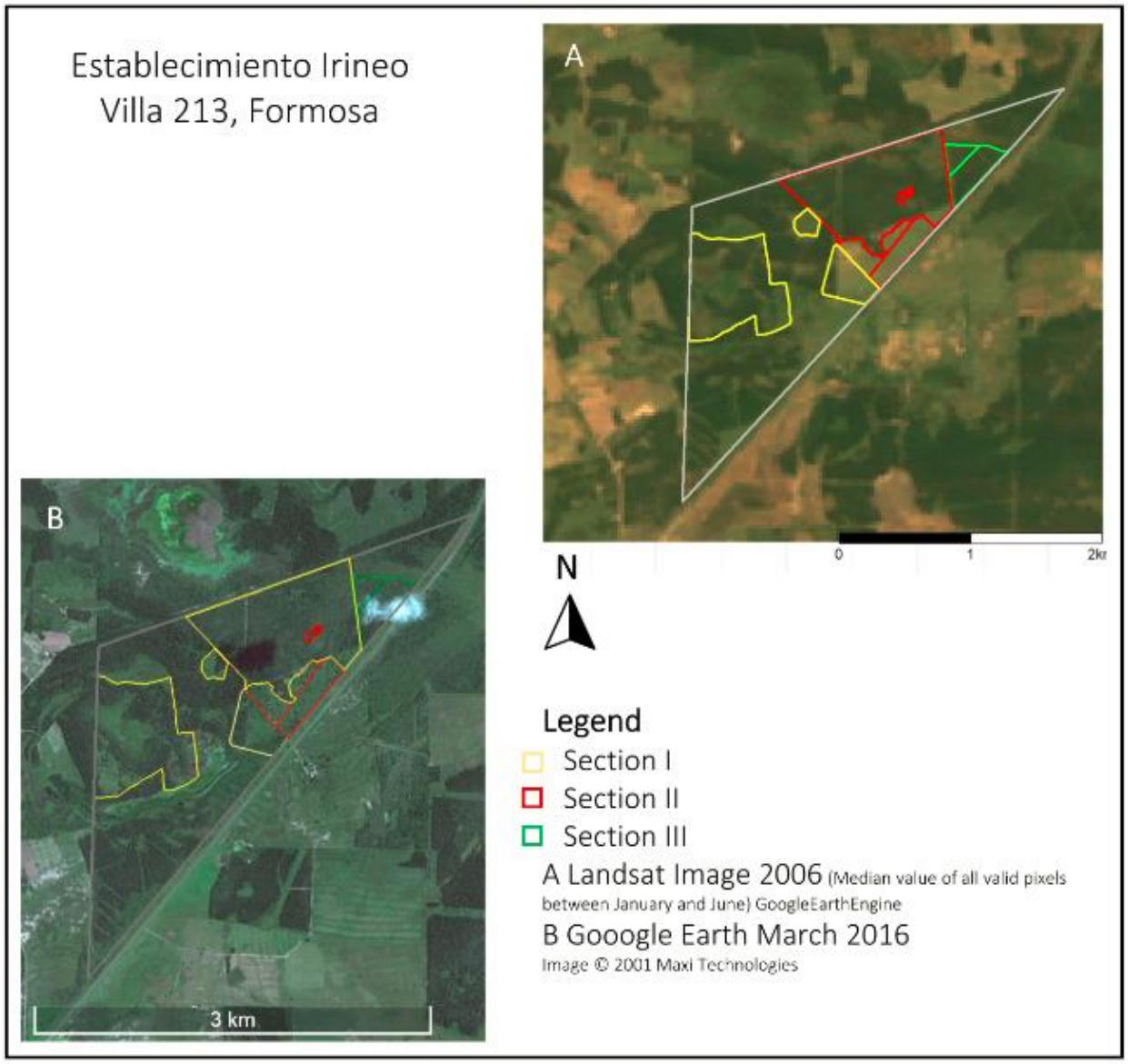


Figure 13. Satellite images for Irineo property sections for year 2006 and 2016

Additionality Tool

The "Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities" is applicable under the following conditions:

- Forestation of the land within the proposed project boundary performed with or without being registered as the A/R CDM project activity shall not lead to violation of any applicable law even if the law is not enforced.
- This tool is not applicable to small - scale afforestation and reforestation project activities.

These conditions are met by the proposed project activity. The project has received all required approvals from the necessary local authorities to start the implementation and the project is considered a large-scale afforestation.

Carbon stock of trees, shrubs, dead wood and litter

Tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities" does not establish applicability conditions. In the case of dead wood and litter carbon stocks, given its optional condition, it has been decided not to be considered as carbon stocks for these pools are considered to increase due to the project, compared to degraded grassland baseline condition.

Soil Organic Carbon Stock

The "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities" is applicable when the baseline scenario and the project activity areas of land do not fall into wetland category; contain organic soils or are not cropland/grassland in which soil disturbance is restricted. Also, when the proposed project activity meets the following conditions: Litter remains on site and is not removed and soil disturbance, if any, is in accordance with appropriate soil conservation practices required and/or allowed.

Although, both the land features and the conservation practices applicability requirements are met by the project making this tool applicable to it, it has been decided not to consider soil carbon stocks for the project, in line with the "Procedure to determine when accounting of the soil organic carbon pool may be conservatively neglected in CDM A/R project activities"; Version 1.0. The tool is applicable while:

1) The areas shall not include organic soils (e.g., peat-lands), or wetlands
2) The rate of loss of carbon stocks in mineral soils due to erosion within the project boundary shall not be permanently increased above baseline rates by the CDM A/R project activity.
3) Fine litter (woody twigs less than 2mm diameter, bark and leaves) shall remain on site.

It has already been stated in this same section that the area does not include organic soils or wetlands. In terms of rate of carbon stock loss, the grazing grassland area of the project is considered to be degraded[52] due to many years of cattle grazing and long term cropland so carbon sequestration is expected to increase with the project after the first years of carbon loss due to land preparation.

The Province of Chaco has a total area of 99.633 km2, and 24% of this surface have some degree of water and/or wind erosion[53]. The available evidence suggests that the changes in land use to pastures led to a significant degradation in the physical and chemical quality of soils compared to pristine situation in a relatively short time. The results reveal losses of total organic carbon, particulate organic carbon and

[52] Casas R. R. 2017. La degradación del suelo en la Argentina. Chapter Región NEA At: Manejo y conservación de suelos. Con especial énfasis en situaciones Argentinas. Ed. Mabel E. Vazquez. Asociación Argentina de la Ciencia del Suelo. ISBN 978-987-24771-8-9. Pp.386. Buenos Aires.

[53] https://fecic.org.ar/wp-content/uploads/2020/03/EROSI%C3%93N-ACTUAL-DEL-SUELO.pdf

total nitrogen implying loss of fertility in the surface horizon, as well as values of apparent density and erodible fraction that warn about possible compaction processes[54].

In the last 30 years [1991-2021], the pasture area in the Chaco region increased by 137% (from 4.3 to 10.2 million hectares. A decrease in productivity has been observed over the years in these grasslands, linked to processes of physical and chemical degradation of soils (Roncedo et al., 2003; Padilla et al., 2009; Muñoz Iniestra et al., 2013). Grassland degradation is manifested in the loss of coverage, vigor and productivity of desirable forage species, the invasion of weeds or undesirable herbaceous species, the invasion of woody or shrubs (especially in recent rolling or clearings), the increase of bare soil spaces and evidence of erosive processes and soil compaction (Fumagalli y Kunst, 2002; Betancourt, 2006; Escalante Torres, 2015)[55].

In relation to the conservation practices (litter removal and soil disturbance) it is important to mention that rotation periods for *Schinopsis balansae* are of 40 years, and in the case of *Eucalyptus* 6 to 20, according to species, using regrowth techniques when possible, so the land is expected low frequency disturbance in the project lifetime in all cases and litter from thinning remain on site as no burning of biomass practices will take place.

Emissions from Biomass Burning

In terms of biomass burning practices, as above mentioned, it is not applicable to the present project activity as no burning practices are authorized for the project areas.

Displacement of Agricultural Activities

The tool "Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity" is applicable to the present project activity since the displacement of agricultural activities is not expected to cause, directly or indirectly, any drainage of wetlands or peat lands, as requested in the applicability condition of the tool.

At the only two properties with cattle at the time of plantation (Margarita Belén and Irineo) cattle was relocated within Unitán´s property. In the case of Irineo, plots were sectioned and cattle relocated during plantation in order to be reintroduced in the third year. For the two properties with agricultural activities in Formosa (Villa 213 and Cabo Noroña) it included abandoned agricultural lands used for cotton, grassland and other vegetable patches unused for years before Unitán become owner of the property.

In conclusion, the project activity complies with all applicability conditions of the selected methodology.

[54] https://inta.gob.ar/sites/default/files/manual_ics_final.pdf

[55] Gaitan et al (2021) Cartografía del estado de degradación de las pasturas del Gran Chaco Americano Technical Report Available at: https://www.researchgate.net/publication/354604170

3.3 Project Boundary

Carbon Pools		Gas	Included?	Justification/Explanation
Baseline	Above-ground biomass	CO_2	No	As described above the project area is composed mainly of degraded pastures and set aside cropland with no tree or shrub biomass on it. In plots with scattered trees present, trees won´t be neither harvested, nor suffer mortality due to competition nor be inventoried along with the project trees in monitoring of carbon stocks in accordance with AR TOOL 14 (V4.2). In conclusion, the project area excludes existing tree biomass from the project whilst from baseline. Thus, above-ground biomass is negligible as per the CDM tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities".
	Below-ground biomass	CO_2	No	Same rationale as with above-ground biomass
	Dead-wood	CO_2	No	Assumed to be nil for the life of the project.
	Litter	CO_2	No	Assumed to be nil for the life of the project.
	Soil organic carbon	CO_2	No	Soil organic carbon stocks are expected to remain at a steady state or decrease in the baseline scenario.
Project	Above-ground biomass	CO_2	Yes	Required. Largest pool affected by project activity.
	Below-ground biomass	CO_2	Yes	Shall be included. Expected to increase due to project activity.

	Dead-wood	CO_2	No	Optional. Although expected to increase due to project activity, since it does not virtually exist in the pre-project situation, will not be accounted for.
	Litter	CO_2	No	Optional. Although expected to increase due to project activity, since it does not virtually exist in the pre-project situation, will not be accounted for.
	Soil organic carbon	*CO_2*	*No*	Optional. Although it is expected to increase due to project activity it will be conservatively neglected. Even though there may be a transient reduction in soil organic carbon due to site preparation (e.g., tillage), the establishment of forest is expected to cause an increase in net primary productivity and, therefore, in the turnover of plant residues into the soil. This would lead to a long-term increase in the soil organic carbon pool.

The table below shows the emission sources and associated GHGs selected for accounting:

Source		Gas	Included?	Justification/Explanation
Baseline	Burning of woody biomass	CO_2	No	GHG emissions in the baseline can be conservatively ignored.
		CH_4	No	
		N_2O	No	
Project	Burning of woody biomass	CO_2	No	Burning will not be part of project implementation. Hence, in conformance with
		CH_4	No	

		N_2O	No	the methodology, no emission sources are included in the project boundary.

Based on VCS Methodology requirements, version 4.1, section 3.3.6, the following GHG sources may be deemed insignificant and need not to be accounted for in the case of ARR projects:

- N_2O emissions from project activities that apply nitrogen containing soil amendments and N_2O emissions caused by microbial decomposition of plant materials that fixes nitrogen.
- GHG emissions from the removal or burning of herbaceous vegetation and collection of non-renewable wood sources for fencing of the project area.
- Fossil fuel combustion from transport and machinery use in project activities.

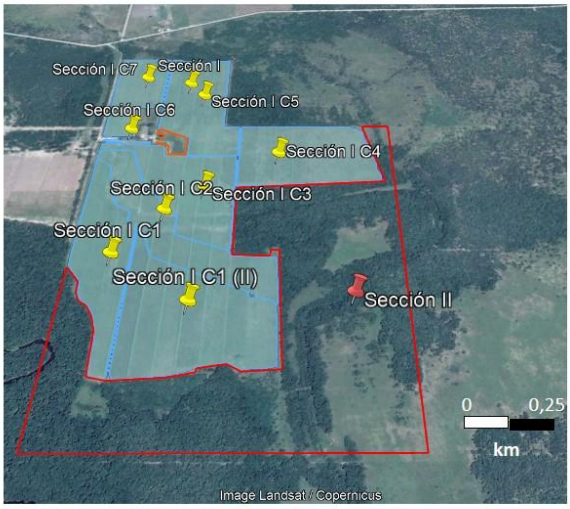
On the other hand, methodology AR-ACM 0003 states "GHG emissions resulting from removal of herbaceous vegetation, combustion of fossil fuel, fertilizer application, use of wood, decomposition of litter and fine roots of N-fixing trees, construction of access roads within the project boundary, and transportation attributable to the project activity shall be considered insignificant and therefore accounted as zero."

The only emission source that must be included in the project boundary is methane and nitrous oxide emissions resulting from burning of woody biomass (excluding herbaceous biomass). No burning will be involved as part of project implementation. Hence, in conformance with the methodology, no emission sources are included in the project boundary.

The VCS Project boundary takes into account all the land suitable for planting with *Schinopsis balansae* Engl. and *Eucalyptus* species. These areas have been defined based on the following criteria:

1. **Planted areas complying with land eligibility requirements:** procedures to demonstrate the Eligibility of Lands for Afforestation and Reforestation VCS Project Activities are included within project boundary.
2. **Suitable areas:** those areas suitable for planting *Eucalyptus* and *Schinopsis* trees were included. Areas not suitable (shallow soils, frost and waterlogging damage risk, etc) were excluded
3. **Flora and Fauna diversity:** native forest will be excluded from VCS project area and endangered species, if any protected.
4. **Infrastructure areas and Firebreaks:** areas needed for infrastructure (e.g. areas needed for roads, cattle fences, buildings, stocking of harvested wood, and other) and firebreaks (twenty meter wide strips separating forest blocks) were excluded from the VCS project area.

Satellite photographs and GPS equipment were used to delineate the forest areas effectively planted from the project start date to the date of issuance of these documents. These areas constitute the project boundaries and have been laid on a geographic information system. No visible landmarks have been set on the field to delimit the project area. Polygons of planted areas are grouped by property and all properties comprising the total land area constitutes the project boundaries. Maps with project boundaries for each of the project properties are shown below. The following plantation maps show the areas included within the project boundary for the already established plantation. Future plantations (from 2021 to 2025) will be planted in areas with the same eligibility features:



Establecimiento Don Antonio
Pampa Almirón

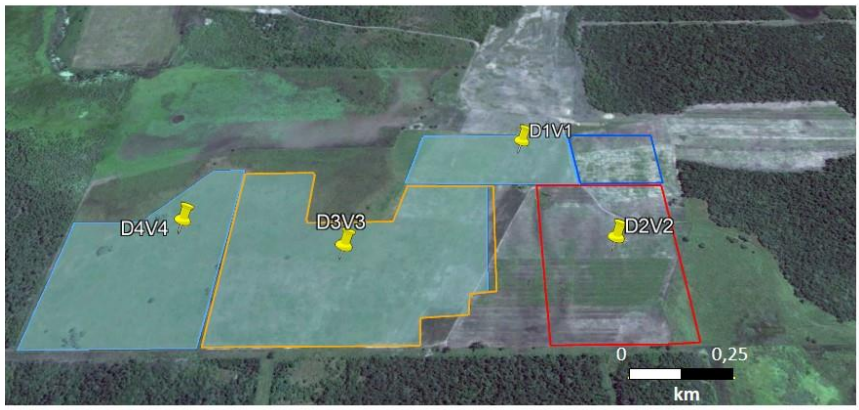
N

Legend

- Section I
- Section II
- Property infraestructura
- Planted area within project boundary 2020

Google Earth March 2016
Landsat/Copernicus

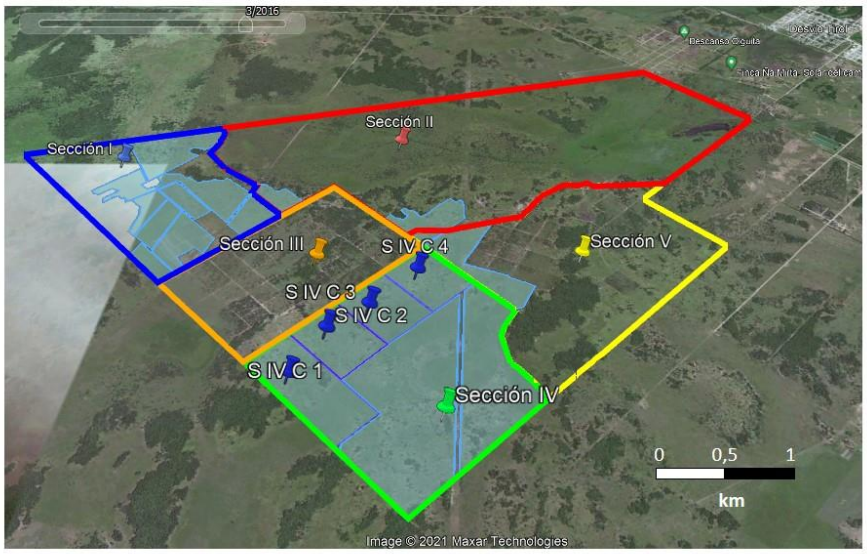
Establecimiento Doña Virginia
Cabo Noroña



N

Legend
- Section I
- Section II
- Section III
- Section IV
- Planted area within project boundary 2020

Google Earth March 2016
Maxar Technologies

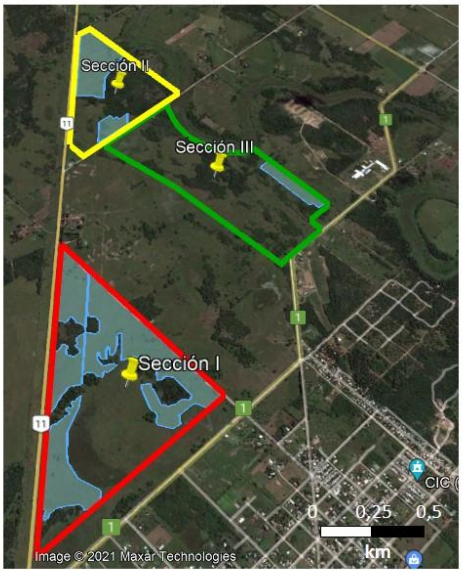


Establecimiento Ex-Glombovski
Pto. Tirol

N

Legend
- Section I
- Section II
- Section III
- Section IV
- Section V
- Planted area within project boundary 2020

Google Earth March 2016
Maxar technologies

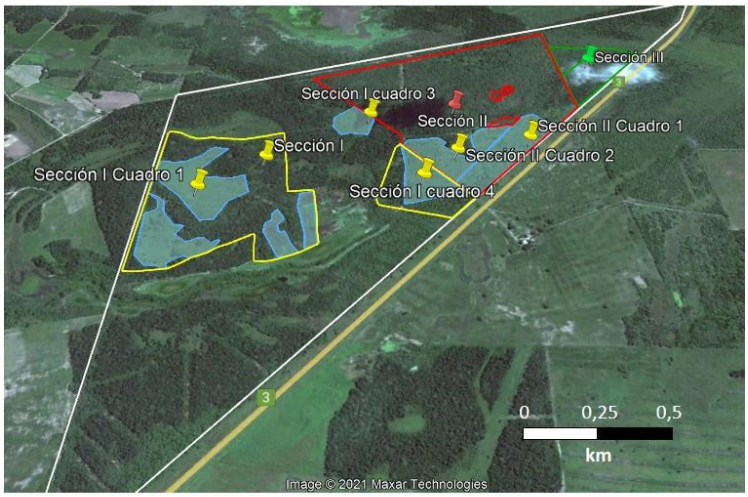


Establecimiento Sociedad Rural Margarita Belén

N

Legend
- Section I
- Section II
- Section III
- Planted area within project boundary 2020

Google Earth March 2016
Maxar technologies



Establecimiento Irineo Villa 213

N

Legend
- Section I
- Section II
- Section III
- Planted area within project boundary 2020

Google Earth March 2016
Maxar technologies

Figure 14:.Google Images for year 2016 for the project boundary defined till year 2020, as effectively planted areas within period 2016 to 2020. 1. Establecimiento Don Antonio; 2. Establecimiento Doña Virginia; 3. Establecimiento Ex. Glombovski; 4. Establecimiento Sociedad Rural; 5. Establecimiento Irineo

3.4 Baseline Scenario

AR-ACM 0003 Version 02.0 paragraph 11 establishes: "Project participants (PPs) shall identify the baseline demonstrate that the project activity is additional by selecting one of the following options:

(a) Applying the "Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities";

(b) Applying an approved standardized baseline appropriate to their project.

Option (a) has been selected. In this regard, the proposed "Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities" Version 1 is used. Therefore, the baseline scenario will be justified in the next Section (3.5 Additionality) applying the mentioned tool.

Selected baseline scenario: historic use of the land

The land within the project boundary is defined as grassland as a result of the multi-temporal land use change analysis; developed using satellite images. The land proposed for the forestry activity (eligible area) was found under the category of natural grass, managed grass, crops, low stubbles and eroded soil.

3.5 Additionality

The assessment and demonstration of additionality and the identification and justification of the baseline scenario are described using the document "Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities" Version 1 version 1.0, issued by CDM, which shall be hereinafter referred to as the "CDM AFOLU additionality tool".

Applicability conditions of the tool

The tool is applicable under the following conditions:

a) AFOLU of the land within the proposed project boundary performed with or without being registered as the A/R CDM project activity shall not lead to violation of any applicable law even if the law is not enforced;

b) This tool is not applicable to small - scale afforestation and reforestation project activities

Project proponent(s) shall apply the following steps:

a) STEP 0. Preliminary screening based on the starting date of the A/R CDM project activity

b) STEP 1. Identification of alternative scenarios to the A/R CDM project activity.

c) STEP 2. Barriers analysis;

d) STEP 3. Investment analysis to determine that the proposed project activity is not the most economically or financially attractive of the identified land use scenarios; or; and

e) STEP 4. Common practice analysis.

Step 0. Preliminary screening based on the starting date of the A/R project activity

According to section 3.2.4 of VCS Validation and Verification Manual Version 3.2, it clearly states that the CDM´s requirement for prior consideration of carbon finance can be disregarded, replaced by VCS retroactive condition for project presentations.

Step 1. Identification of alternative scenarios to the A/R CDM project activity

Sub-step 1a: Identify credible alternative land use scenarios to the proposed CDM project activity.

According to the A/R CDM additionality tool, realistic and credible land-use scenarios - that would have occurred on the land within the proposed project boundary in the absence of the afforestation or reforestation project activity- should be feasible for the project participants or similar project developers considering relevant national and/or sectoral policies and circumstances, such as historical land uses, practices and economic trends. The identified land use scenarios shall at least include:

- Continuation of the pre-project land use;

- Forestation of the land within the project boundary performed without being registered as the AR/CDM (VCS) project activity;

- If applicable, forestation of at least a part of the land within the project boundary of the proposed AFOLU project at a rate resulting from:

  - o Legal requirements; or

  - o Extrapolation of observed similar activities in the geographical area with similar socio-economic and ecological conditions to the proposed AFOLU project activity occurring in the period –according to CDM- “since 31 December 1989 as selected by the PPs” but considered based on VCS retroactive condition for project presentations: “beginning ten years prior to the project start date.”

Land use change in the north of the country into agricultural land began at the beginning of 2010, mainly due to a higher profitability of soybean and corn prices compared to meat. This led to a relocation of livestock production out of the Pampean areas, mainly towards the northeast and northwest regions of

Argentina. Both Formosa and Chaco, located in the northwest have undergone structural and geographical changes as a result of the transformation of the agricultural sector of Argentina[56] [57].

The agro-ecological conditions of the region lead to the development of livestock breeding in extensive production schemes. Most of the calves produced in this region are sent to other provinces for fattening and finishing, where they have a better supply of fodder. While technological advancement and activity growth allowed to overcome some natural obstacles, the activity is still carried out with a low adoption of technology and low efficiency use of pastures [7]

The land use type pattern was further confirmed with the national agricultural census carried out in 2018. As it can be seen in the table below, most of the land is used for agricultural and livestock production. Meanwhile, implanted forest only represents 0.02% of the total area of those provinces.

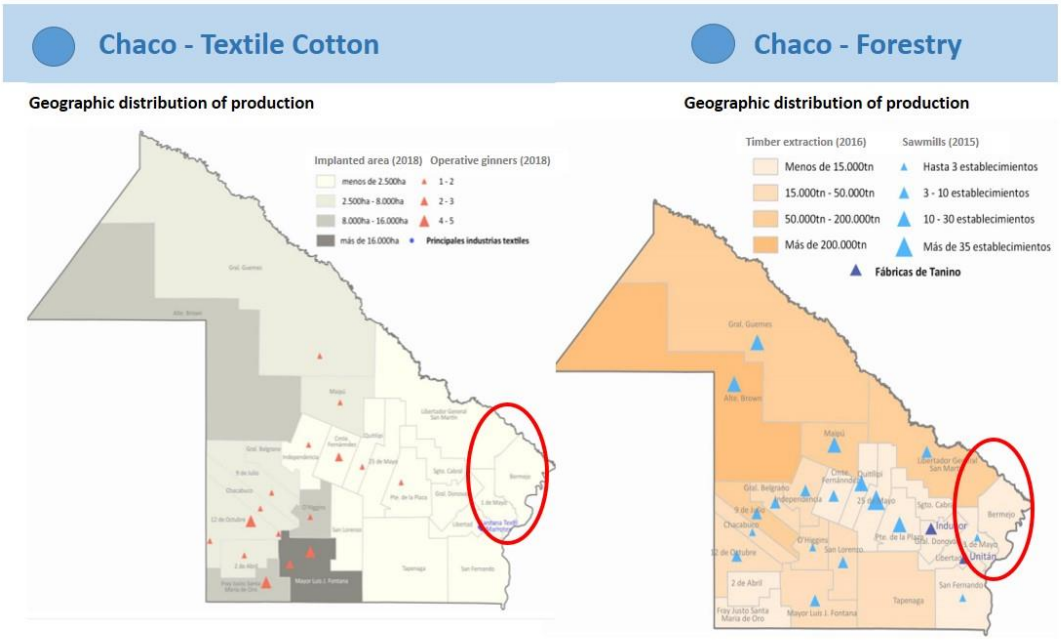
Table 8: Land Use by type of production. Data in hectares from 1st of July 2017 until 30th of June 2018[58]

Province	Total	Land Use						
		Implanted Surface						
		Total	Annual crops	Perennial crops	Annual foragers	Perennial foragers	Implanted forest	Other
		Hectares						
Argentina	**154,811,827**	**31,899,871**	**22,230,131**	**1,064,023**	**3,260,617**	**3,521,230**	**804,097**	**1,019,773**
Chaco	5,780,264	1,024,873	843,478	102	42,797	83,451	1,425	53,620
Formosa	4,434,917	267,781	24,833	2,261	5,182	211,623	314	23,567

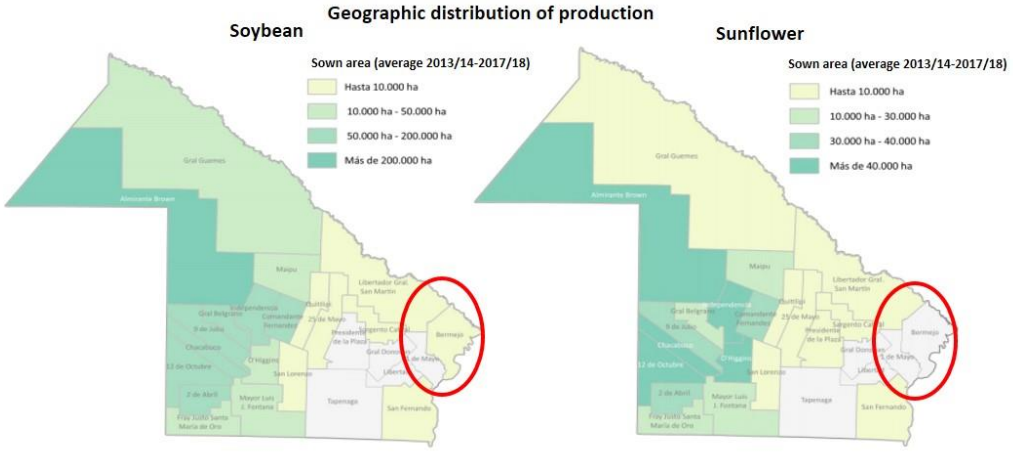
		Other land use					
		Total	Grasslands	Native Forest	Suitable area not cultivated	Not suitable area	Roads, parks, and housing
		Hectares					
Argentina	**157,423,932**	**115,109,310**	**71,476,513**	**30,161,884**	**2,264,760**	**9,727,132**	**1,479,022**
Chaco	5,769,139	4,441,439	1,529,053	2,213,595	133,934	499,003	65,854
Formosa	4,513,082	3,973,522	1,394,542	2,045,995	35,404	453,969	43,612

[56] Chaco informe productivo provincial 2019, Subsecretaría de Programación Regional y Sectorial. Ministerio de economía de la nación Argentina. https://www.argentina.gob.ar/sites/default/files/sspmicro_informes_productivos_provinciales_chaco_0.pdf
[57] Formosa informe productivo provincial 2019, Subsecretaría de Programación Regional y Sectorial. Ministerio de economía de la nación Argentina. https://www.argentina.gob.ar/sites/default/files/sspmicro_informes_productivos_provinciales_formosa_1.pdf
[58] Censo Nacional Agropecuario 2018. Resultados Definitivos. Instituto Nacional de Estadística y Censos (INDEC)https://www.indec.gob.ar/ftp/cuadros/economia/cna2018_resultados_definitivos.pdf

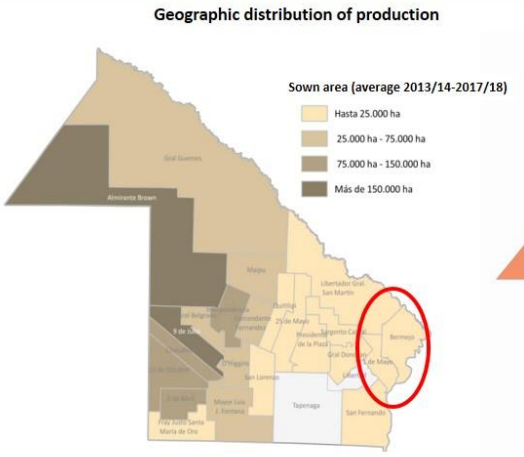
The province of Chaco presents a diversity of economic primary productive activities, such as cotton, oil and grain productions, native forest management and livestock production. However, when the focus is set in the specific departments where Unitán Project is being developed it can be seen from the following maps, that the productive activities of the area are mainly restricted to livestock production.



Chaco - Oilseeds



Chaco - Grains (Corn)



Chaco – Bovine livestock

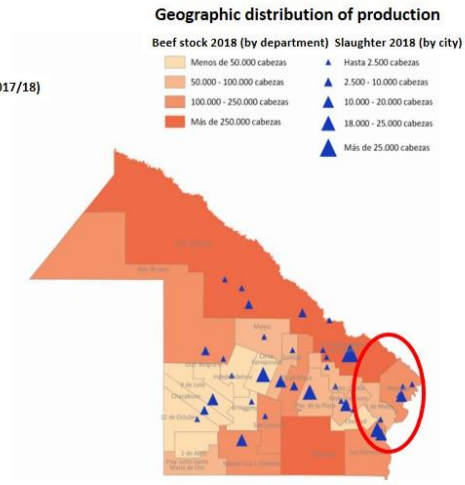
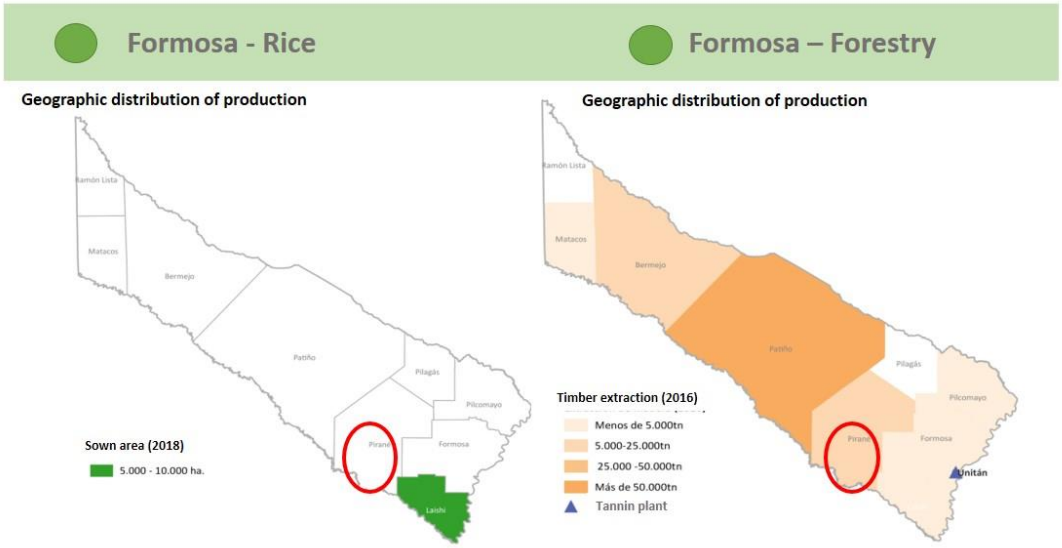
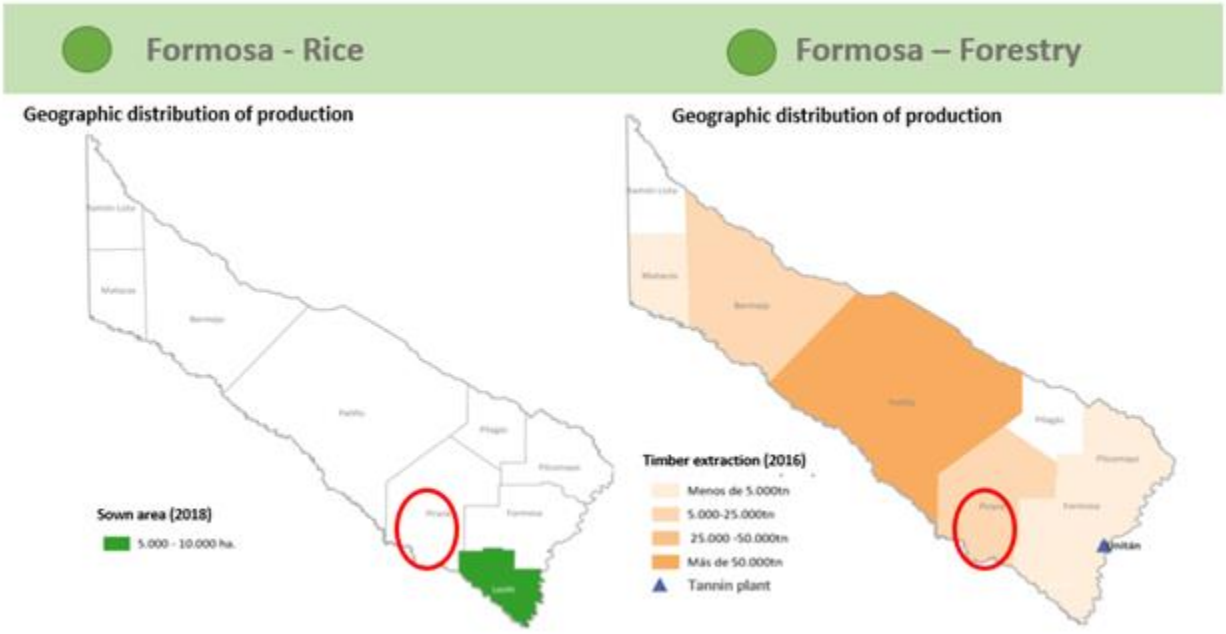


Figure 15. Chaco´s main production areas and activity

In the case of Formosa, the economic production is not as diversified as it is in Chaco. There are two main primary production activities, cattle grazing and native forest extraction, followed by rice production but at a much lower level. However, only the first two productions take place in the department where Unitán Project is located, i.e. Pirané. This can be seen in the following maps:





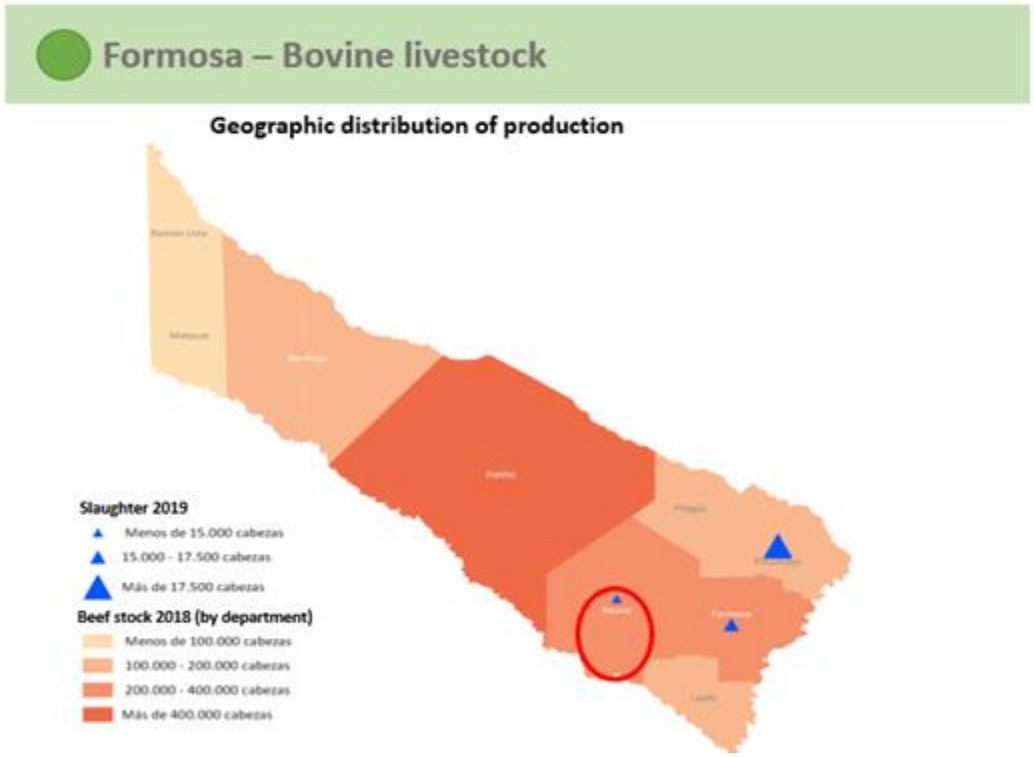


Figure 16. Formosa´s main production areas and activity

Outcome of Sub-step 1a: List of credible alternative land use scenarios that would have occurred on the land within the project boundary of the A/R CDM (VCS) project activity.

Based on the information described above the only realistic and credible alternative scenarios of land use for these fields are basically extensive livestock breeding production and the forestry activities without the VCS component.

- **Scenario 1**. Continuation of the current situation: extensive livestock breeding production and abandoned agricultural land converted to livestock breeding production.

As seen above this is the most traditional activity in the departments where the project is located. There are no restrictions to raise cattle in these two provinces as long as the producers respect the current regulation regarding soil and water conservation. This is described in the Rural Code for the province of Chaco[59] and in the Provincial Livestock Promotion Program of Formosa[60].

- **Scenario 2**. The proposed project activity without considering CDM/VCS: afforestation with exotic and native species.

Both the province of Formosa and Chaco have adhered the National Act 25.080[61] that promotes the plantation of forests. This law establishes that the national and provincial enforcement authorities must

[59] http://www.saij.gob.ar/legislacion/ley-chaco-3727-codigo_rural_provincia_chaco.htm
[60] https://www.formosa.gob.ar/programa/ganadero
[61] http://servicios.infoleg.gob.ar/infolegInternet/anexos/55000-59999/55596/texact.htm

establish a zoning for the location of the plantations, based on environmental, economic and social sustainable criterion. The zoning will respect the territorial ordering of native forests adopted by provincial law as established in Law 26,331. Plantation projects must obtain the corresponding provincial environmental approvals, and be developed through the use of practices framed in environmental, economic and social sustainable criterion. Therefore, this scenario complies with applicable laws and regulations.

Even though the provinces adhered to the Forestry Plantation Law, the extension of forest plantations in the region of the project without considering CDM/VCS is practically inexistent.

- Scenario 3. Afforestation of at least a part of the land within the project boundary of the proposed A/R VCS project is not applicable since:

  i) there are no legal requirements that could limit the area of land within the project boundary that is afforested and

  ii) as it is explained in step 4 below, the rate of forestation activities in the geographical area with similar socio-economic and ecological conditions to the proposed project activity is very low, almost nil (figure 8).

The above mentioned Forestry Law and the provincial forestry programs do not require or enforce private producers to plant new forest. Therefore, this scenario is not considered.

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

The two land use scenarios identified in the sub-step 1a are in compliance with all mandatory applicable legal and regulatory requirements.

Outcome of Sub-step 1b: Based on the information described above the only realistic and credible alternative scenarios of land use for these fields are:

- Scenario 1. Continuation of the current situation: extensive livestock breeding production in grasslands and abandoned agricultural land converted to livestock breeding production. As seen above this is the most traditional activity in the region.
- Scenario 2. The proposed project activity without considering VCS: afforestation with exotic and native species. The extension of forest plantations in the region of the project without considering VCS is limited.

Step 2. Barrier analysis

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

Sub-step 2a Identification of barrier that would prevent the implementation of at least one alternative land use scenarios

This analysis was carried out in order to understand the barriers for the land use scenarios identified in the Sub-step 1b. To this end, matrixes were constructed for each project in which the optional barriers potentially existing in each of the projects are determined and discussed.

Based on the examples provided by the tool, the following list describes the barriers that were identified and described in the following analysis:

§ **Investment barriers:**

Argentina has a long history of political and economic instability - with significant GDP growth fluctuations every year. The country risk of Argentina makes any long-term investment a risky decision.

Figure 17. Argentina country risk 2008-2017 period - JP Morgan EMBI+

Figure 18: GDP growth (annual %) 1961-2017 period- Argentina[62]

In the country there are many agricultural financial instruments, with a vision of productive chain and policies that give more and better stimulus for farming and livestock activities[63]. These activities have lower perceived risks, proven experience, and a steady cash flow. Minimal investment is required, and the region's ecological conditions permit the supply of grass required for production.

In comparison, no local sources of finance are found specifically for forestry. It is necessary to consider the forest sector as atypical compared to the agricultural sector, due to the high initial investment funds it demands, maturity deadlines, biological cycles, maintenance demands, etc.

Commercial reforestations in Argentina are supported by incentives and tax benefits given by the government under the Act. 25,080 (1999/2019). The regulation indicates that subsidies must be paid within two years of the plantation certification. However, due to the lack of adequate budgeting[64], average payment times exceed by far the 2-year period established by the law, with delays of 3 or 4 years. On the other hand, these subsidies are not updated according to inflation rates (2021 values exceeded 40% for the region[65]) causing a heavy discount on the amounts received by the forestry producers. These previous conditions discourage farmers from getting into the forestry business[66].

[62] *World Bank national accounts data, and OECD National Accounts data files.*
[63] *Banco Nación Argentina. Available at: : https://www.bna.com.ar/Empresas/*
[64] *AFoA – Asociación Forestal Argentina (2015) Difícil situación del sector forestal argentina. La falta de presupuesto en la ley promoción provoca la pérdida de miles de hectáreas de bosques plantados y puestos de trabajo rurales. Available at: https://www.afoa.org.ar/bosques_en_argentina_detalle.php?p=140*

[65] *INDEC (2022) Índices y variaciones porcentuales mensuales e interanuales según principales aperturas de la canasta. Diciembre de 2016-mayo de 2022; available at: https://www.indec.gob.ar/indec/web/Nivel4-Tema-3-5-31*

[66] *AFoA - Asociación Forestal Argentina. Available at: https://www.afoa.org.ar/novedades_detalle.php?p=222*

Another issue that impacts greatly on the accessibility to financing sources to produce native species such as quebracho (*Schinopsis* spp) is the investment period (slow growing native species represent 36% of project area). The project investment horizon for this species is 20 to 40 years[67] longer than the average length of wood pulp projects (10-12 years). Political and economic instability may affect the investment project in many ways until the proceeds from the sales of wood are collected. Moreover, the historic limitation of the lack of long-term financial options for the productive sector persists. This situation is a consequence of a low development of the banking system and the capital market, which in turn is explained by the persistent instability of economic activity and the price system, which have promoted short-termism in the demand and supply of financing[68].

The production of *Eucalyptus,* on the other side, is aimed for biomass production for future energy generation projects. Even though the growing cycle here is shorter (from 6 to 12 years) it faces the same financial constraints as any other forestry project. Financial risks in this case could be mitigated through long-term supply contracts with biomass power plants. Similar projects are generally financed by large international forestry companies or investment funds with fluent access to capital markets, venture capital and stock actions. For the case of Unitán VCS Project, as it is developed as an independent initiative from the company´s industry, it would only have access to financial resources in case the Group presents some type of properties as collaterals.

A cash flow analysis for the project results in negative NPV for the project: considering the three different species plantation the NVP value equals -791 USD/ha (with values of -1835USD/ha for Quebracho plantation, which represents 36% of planted area)[69]. These means the project represents an economic loss for the company and without the corresponding investment it is not economically viable.

In short, the information mentioned above provides a strong argument to justify that forestry investment, for this scale and type, faces a concrete barrier related to financial restrictions.

- ***Barriers related to local tradition:***

Contrary to cattle breeding production, which has been carried out in the region for centuries, forestry activities started its commercial development in the 1990's, being a relatively new type of production. Forest plantations with the characteristics of the proposed VCS AFOLU project, high density and short rotation *Eucalyptus* and long rotations *Schinopsis*, are not a common practice in the region. Therefore,

[67] Gimenez, A.M. & Ríos, N. (1999) Crecimiento de *Schinopsis* quebracho-colorado (Schlecht.) Barkl. et Meyer, Anacardiaceae *Available at:* https://www.researchgate.net/publication/237221439_Crecimiento_de_Schinopsis_quebracho-colorado_Schlecht_Barkl_et_Meyer_Anacardiaceae (from previous reference)

68 Clarín (2017) Editorial. La falta de crédito de largo plazo. Febrero 2017, available at https://www.clarin.com/opinion/falta-credito-largo-plazo_0_r1EzC9RpKe.html

69 Cashflow analysis for the forestry project available to VVB during validation and verification

local knowledge and technology for its implementation is giving its first steps in the area generating significant uncertainties.

The forestry sector in the province of Chaco and Formosa relies mainly on the use of native forest. The activity began in the late nineteenth century to supply the factories of the tannin industry and railway sleepers[70] [71]. Exploitation without natural replenishment led to the current degradation state of the native forests in the region.

Forestry activity is characterized by a large number of small-scale companies. Producers are generally not integrated into the industrial stages, and they sell their products to tannin manufacturers, sawmills and furniture manufacturers. Furthermore, its relevance in the local economy is difficult to measure because of the high informality of the sector in which some companies operate[72] [73].

There are not large-scale commercial *Schinopsis* afforestation projects in the province of Chaco and Formosa, among other reasons such as financial and technical restrictions, because they face unfair competition from logs that come from the exploitation of native forests. Forest areas are under constant pressure from legal and illegal logging. Land use and native forest areas are regulated by the Native Forest Act (Act. 26,331), but so far, since the implementation of the act, the stipulated budget has never matched the actual financial needs to implement forest conservation initiatives. Many relevant native forest initiatives, including the National Native Forest Protection Program, rely heavily on international funding. When international cooperation programs finish, it is difficult to continue with the activities and often to sustain the operation of the products and tools generated[74]. As a result, there are no incentives to landowners to maintain native forest areas or to manage the forests in a sustainable way. Afforestation programs lose competitiveness against forest extraction practices that do not comply with the Native Forest Act.

The national agriculture Census (2018) shows that the forestry sector and afforestation is not highly developed in Chaco and Formosa. In 2018 the total surface of *Eucalyptus* and Quebracho was 375 and 178 hectares respectively[75].

[70] Formosa informe productivo provincial (2019) - Ministerio de Hacienda de la Nación Argentina. https://www.argentina.gob.ar/economia/politicaeconomica/regionalysectorial/informesproductivos
[71] Chaco informe productivo provincial (2019) - Ministerio de Hacienda de la Nación Argentina.https://www.argentina.gob.ar/sites/default/files/sspmicro_informes_productivos_provinciales_chaco_0.pdf
[72] Chaco informe productivo provincial (2019) - Ministerio de Hacienda de la Nación Argentina.https://www.argentina.gob.ar/sites/default/files/sspmicro_informes_productivos_provinciales_chaco_0.pdf
[73] Diagnóstico actualizado del estado de implementación Ley n° 26331 – FARN 2020. https://farn.org.ar/wp-content/uploads/2020/07/FVSA-FARN_Diagnostico-estado-de-implementacion_compressed.pdf
[74] Diagnóstico actualizado del estado de implementación Ley n° 26331 – FARN 2020. https://farn.org.ar/wp-content/uploads/2020/07/FVSA-FARN_Diagnostico-estado-de-implementacion_compressed.pdf
[75] Censo Nacional Agropecuario 2018. Resultados Definitivos. Instituto Nacional de Estadística y Censos (INDEC). https://www.indec.gob.ar/ftp/cuadros/economia/cna2018_resultados_definitivos.pdf

Local farmers lack access to quality seedlings as well as the necessary tending and forest management techniques. They also lack the skills needed to prevent planted trees from being subject to fire, pest and disease attack. There is a lack of forestry related services and products suppliers in the region.

The adoption of longer rotation in Quebracho plantations generates uncertainties concerning technical and commercial issues such as wood productivity and quality, wind damages, potential pest and disease outbreaks, and longer periods for investment returns among others.

For the case of *Eucalyptus*, all current plantations in these provinces present a traditional design, different to the one proposed by Unitán Project, i.e high density and short rotation cycles. This situation translates in the lack of suppliers, trained labor force and knowledge to achieve a successful plantation. Even though the company has being testing these species for various years, the established trials never reached the commercial scale and maturity needed to provide the required technical certainty.

In conclusion, the lack of experience, technological knowledge and service & products providers for the development of these types of afforestation projects in these two provinces, prevents its development at large commercial scales, as is the case of Unitán Project.

Outcome of Step 2a: List of barriers that may prevent one or more land use scenarios identified in the Step 1b.

As analysed above, the proposed AFOLU VCS project without being registered as a VCS project activity faces several barriers preventing its development. Meanwhile, the continuation of the current land-use - extensive livestock breeding production – does not face any barrier.

The table below summarizes the identified barriers:

Barriers	**Scenario 1**: Continuation of the current land-use: extensive livestock breeding production	**Scenario 2**: The proposed project activity without being registered as a VCS project activity
Investment barriers	No	Yes
Barriers related to local tradition	No	Yes

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

The proposed project activity without being registered as an A/R VCS project activity faces barriers of different kinds that prevents its development as described above. Therefore, it is eliminated from the alternative scenarios list.

Outcome of Sub-step 2b: List of land use scenarios that are not prevented by any barrier.

Therefore, the land use scenario that is not prevented by any barrier is:

Scenario 1. Continuation of the current land-use: extensive livestock breeding production.

Sub-step 2c. Determination of baseline scenario (if allowed by the barrier analysis)

This sub-step consists of applying the decision tree from the tool. As demonstrated above, forestation without being registered as an A/R VCS project activity is not included in the list of land use scenarios that are not prevented by any barrier and the list contains only one land use scenario.

Therefore, according to the decision tree of sub-step 2c of the combined tool, it is concluded that Scenario 1: Continuation of the current situation: extensive livestock breeding production, is the baseline scenario and Step 4: "Common practice test" is the next step in the analysis.

Step 4. Common practice analysis

According to the "Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities", the previous steps shall be complemented with an analysis of the extent to which forestation activity has already diffused in the geographical area of the proposed AFOLU VCS project activity. This test is a credibility check to demonstrate additionality which complements the barrier analysis (Step 2) above conducted.

The analysis consists in examining to which extent similar activities to the one proposed as the VCS AFOLU project activity have been implemented previously or are currently underway. Furthermore, the tool defines similar forestation activities as those which are of similar scale, take place in a comparable environment, *inter alia*, with respect to the regulatory framework and are undertaken in the relevant geographical area, subject to further guidance by the underlying methodology.

Neither the combined tool nor AR-ACM 0003 Version 02.0 provides a definition of the "relevant geographical area". Therefore, the definition contained in the "Tool for the demonstration and assessment of additionality", Version 07.0.0 has been taken as reference: "Applicable geographical area should be the entire host country. If the project participants opt to limit the applicable geographical area to a specific geographical area (such as province, region, etc.) within the host country, then they shall provide justification on the essential distinction between the identified specific geographical area and the rest of the host country."

Regarding Argentina's forestry regions, four regional clusters can be identified: Mesopotamia, North, Center and Patagonia[76].

- The Mesopotamia forestry cluster covers the provinces of Misiones, Corrientes and Entre Ríos. It is the region with the highest concentration of activity in the country, with a relative share of 70.6% of the wood production. It is the region with the greatest comparative advantage given the ecoregion characteristics both in climate and soil. With the highest proportion of hectares of afforestation and reforestation projects, wood extractions amount to 10.4 million tons mainly of pine and *Eucalyptus*. The region has sawmills, board production and cellulose paste industries that absorb most of the wood offered in the region.

- The North forestry cluster activities mainly contemplates the use of native forest timber, and therefore presents the environmental restrictions imposed by the Native Forest Act. Implanted

[76] Análisis del complejo foresto industrial maderero en Argentina. Eduardo Misirlian – 2019. http://www.unsam.edu.ar/escuelas/economia/economia_regional/Industria%20foresto%20industrial%20maderera%20N%C2%BA66.pdf

forest initiatives are difficult to develop when the ecoregion is contemplated for the development of other activities. Most of the industry is based on the extraction of firewood, with the total extractions accounting for 1.97 million tons.

· The Patagonia forestry cluster is concentrated in the South Andes region with a total production that reaches 272.1 thousand tons per year.

· The Center forestry Cluster has a low proportion of implanted and native forests. The total extractions account for 188.7 thousand tons per year, with industries located mainly in Córdoba and Buenos Aires.

The proposed VCS AFOLU project activity is distributed in the provinces of Chaco and Formosa, being located in the North Cluster of the country. As mentioned before, this cluster is basically focused on the use of native forest timber. And while there is extensive experience in native forest management in the area, there are no records of large-scale *Eucalyptus* and *Schinopsis* afforestation projects. The total surface for each specie was registered by National Agriculture Census (2018) and is presented in the following table:

Table 9: Afforestation / Reforestation Project. Area by species, by province, in hectares. As of June 30, 2018[77]

Province	Total	Implanted Forest	
		Eucalypt	Quebracho
	Hectares		
Argentina	**929,106**	**245,845**	**178**
Chaco	1,425	373	96
Formosa	358	2	82

Even though government plans and programs have promoted reforestation across the country, forest plantations are usually located in the areas where the industrial activities of pulp, particleboard and sawmill occur. That is the reason why the Mesopotamia region concentrates most of the activity with the 84.5% of the total implanted surface. Chaco and Formosa on the other hand have 0.2% of the total implanted forest surface. This is shown in the table below.

[77] Censo Nacional Agropecuario 2018. Resultados Definitivos. Instituto Nacional de Estadística y Censos (INDEC)
https://www.indec.gob.ar/ftp/cuadros/economia/cna2018_resultados_definitivos.pdf

Table 10: Total surface of implanted forest (*Eucalyptus* & Pine), in Hectares. As of June 30, 2018[78]

Province	Total		Implanted Forest	
			Eucalyptus	Pine
Argentina	**929,106**	**100%**	**245,845**	**596,025**
Chaco	1,425	0.2%	373	-
Corrientes	322,802	34.7%	97,223	223,831
Entre Ríos	107,206	11.5%	88,696	9,933
Formosa	358	0.0%	2	1
Misiones	355,086	38.2%	46,728	286,181

The *Eucalyptus* wood from the proposed VCS AFOLU project is expected to be used as biomass in renewable energy plants. The first biomass plants were planned under the RENOVAR 1 Program in 2017 where two plants of 13MW and 2MW were built in the provinces of Corrientes and Misiones respectively[79]. In 2017, most of *Eucalyptus* production was used in pulp, particleboard, and sawmill industries.

The following map shows the reduced presence of forestry activity in the project area:

[78] Censo Nacional Agropecuario 2018. Resultados Definitivos. Instituto Nacional de Estadística y Censos (INDEC)
https://www.indec.gob.ar/ftp/cuadros/economia/cna2018_resultados_definitivos.pdf

[79] CAMMESA - www.portalweb.cammesa.com

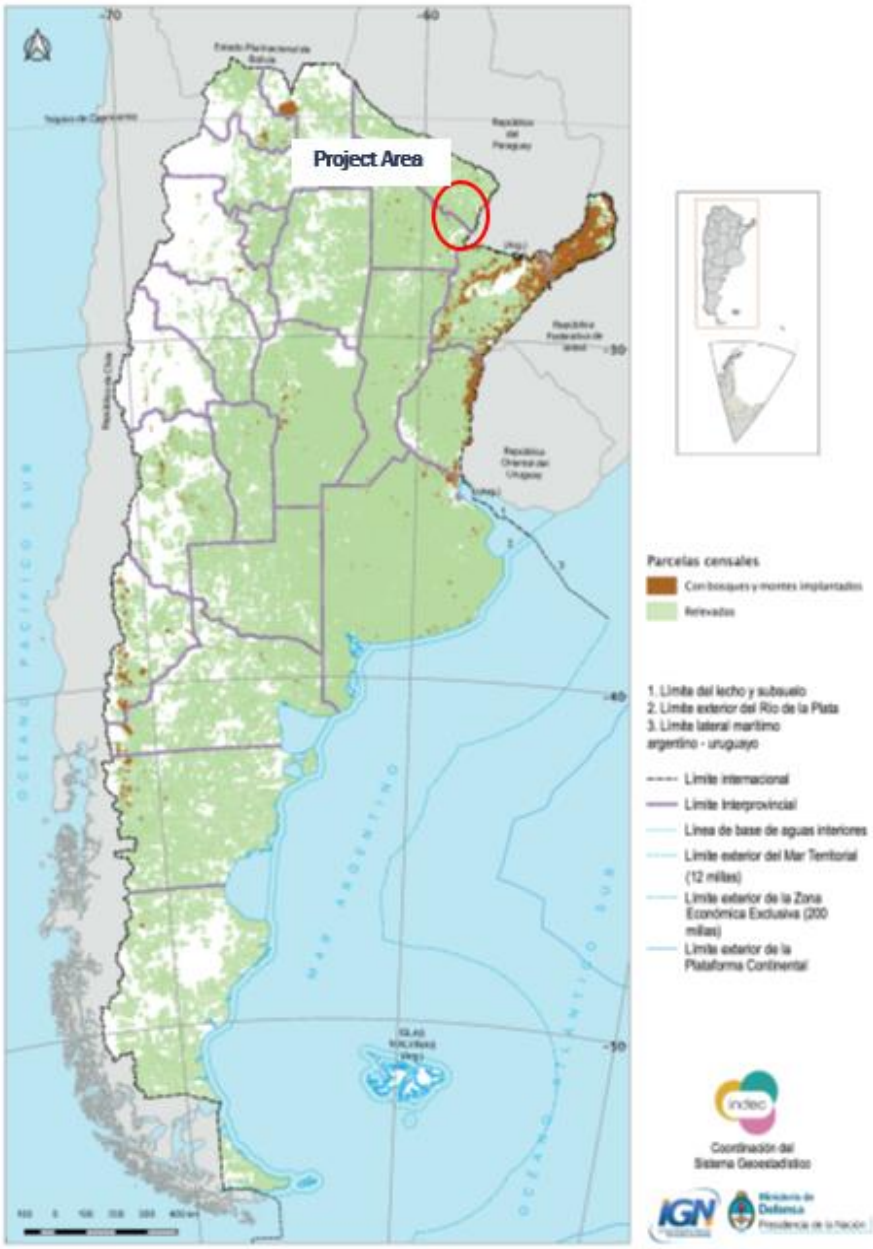


Figure 17. Forest Lots with implanted forest[80].

Due to the above reasons, it can be concluded that there are essential distinctions between the identified specific geographical area (Provinces of Chaco and Formosa) where the proposed AFOLU VCS project is located and the Mesopotamia region where forestry plantations are concentrated.

[80] Censo Nacional Agropecuario 2018. Resultados Preliminares. Instituto Nacional de Estadística y Censos (INDEC)
https://www.indec.gob.ar/ftp/cuadros/economia/cna2018_resultados_preliminares_agricultura.pdf

The traditional production in proposed AFOLU VCS project´s region is extensive livestock production based on natural pastures. Afforestation and reforestation initiatives in the area are limited, representing less than 0.02% of the total surface of the provinces of Chaco and Formosa.

In conclusion, similar activities cannot be observed in the project region, then the project activity is not the baseline scenario, and hence it is additional.

3.6 Methodology Deviations

There are no methodology deviations.

4 ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

According to methodology AR-ACM 0003 v.2.0, section 5.4, baseline net GHG removals by sinks are calculated as follows:

$$\Delta C_{BSL,t} = \Delta C_{TREE\_BSL,t} + \Delta C_{SHRUB\_BSL,t} + \Delta C_{DW\_BSL,t} + \Delta C_{LI\_BSL,t}$$

Where,

$\Delta C_{BSL,t}$	=	Baseline net GHG removals by sinks in year *t*; tCO_2-e
$\Delta C_{TREE\_BSL,t}$	=	Change in carbon stock in baseline tree biomass within the project boundary, in year *t*, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; tCO_2-e
$\Delta C_{SHRUB\_BSL,t}$	=	Change in carbon stock in baseline shrub biomass within the project boundary, in year *t*, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; tCO_2-e
$\Delta C_{DW\_BSL,t}$	=	Change in carbon stock in baseline dead wood biomass within the project boundary, in year *t*, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"; tCO_2-e

$\Delta C_{LI\_BSL,t}$ = Change in carbon stock in baseline litter biomass within the project boundary, in year *t*, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"; tCO_2-e

As it was demonstrated above, the baseline scenario is the continuation of historic use of land, which consists of extensive cattle grazing and set aside cropland. This means that the project area without the project activity would have remained as pasture land. The only existing trees within the Unitán project area are scattered individuals. Those scattered trees present in the project area will be neither harvested, nor cleared, nor removed; will not suffer mortality because of competition from trees planted in the project, or damage because of implementation of the project activity, and will not be inventoried along with the project trees in monitoring of carbon stocks but their continued existence, consistent with the baseline scenario, is monitored, all of the above throughout the crediting period of the project activity. It is clear that carbon stock and change in carbon stock may be estimated as zero

Therefore, changes in carbon stock of above-ground and below-ground biomass of non-tree vegetation is assumed to be nil in the baseline scenario.

Likewise, it is expected that the dead wood and litter carbon pools will not increase in the baseline. Finally, the change in carbon stock in SOC may be conservatively assumed to be nil since it is unlikely to increase in the baseline extensive.

In summary, and based on IPCC Good Practice Guidance for Land Use, Land Use Change and Forestry (2003), given that the activity of the identified baseline scenario has been the same for the last decades, it is assumed that the net GHG removals by sinks in the baseline are nil.

$$DC_{BSL,t} = 0$$

4.2 Project Emissions

Actual net GHG removals by sinks

According to methodology AR-ACM 0003 v.2.0, section 5.5. GHG emissions resulting from removal of herbaceous vegetation, combustion of fossil fuel, fertilizer application, use of wood, decomposition of litter and fine roots of N-fixing trees, construction of access roads within the project boundary, and transportation attributable to the project activity shall be considered insignificant and therefore accounted as zero.

The actual net GHG removals by sinks shall be calculated as follows:

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

Where:

$\Delta C_{ACTUAL,t}$ = Actual net GHG removals by sinks, in year *t*; tCO_2-e

$\Delta C_{P,t}$ = Change in the carbon stocks in project, occurring in the selected carbon pools, in year *t*; tCO_2-e

$GHG_{E,t}$ = Increase in non-CO_2 GHG emissions within the project boundary as a result of the implementation of the A/R CDM project activity, in year *t*, as estimated in the tool "Estimation of non-CO_2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity"; tCO_2-e

The use of fire for site preparation and/or to clear the land of harvest residue prior to replanting is specifically excluded from the project management. Hence, as explained in section 3.2 project emissions are estimated as zero.

$GHG_{E,t} = 0$

Change in the carbon stocks in project, occurring in the selected carbon pools in year t shall be calculated as follows:

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

Where:

$\Delta C_{P,t}$ = Change in the carbon stocks in project, occurring in the selected carbon pools, in year *t*; tCO_2-e

$\Delta C_{TREE\_PROJ,t}$ = Change in carbon stock in tree biomass in project in year *t*, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; tCO_2-e

$\Delta C_{SHRUB\_PROJ,t}$ = Change in carbon stock in shrub biomass in project in year *t*, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; tCO_2-e

$\Delta C_{DW\_PROJ,t}$ = Change in carbon stock in dead wood biomass in project in year *t*, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"; tCO_2-e

$\Delta C_{LI\_PROJ,t}$ = Change in carbon stock in litter biomass in project in year *t*, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"; tCO_2-e

$\Delta SOC_{AL,t}$ = Change in carbon stock in SOC in project, in year *t*, in areas of land meeting the applicability conditions of the tool "Tools for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities", as estimated in the same tool; tCO_2-e

In this case, as mentioned, dead wood, litter and SOC won´t be measured as carbon stock.

Above and below ground biomass carbon pools

- **Change in carbon stock in trees in a year**

According to the "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activity" tool, v. 4.2, section 7, change in carbon stock in trees in a year (annual change) between two successive verifications is estimated on the assumption of linear change. Change in carbon stock in trees in a year is estimated as follows:

$$\Delta C_{TREE,t} = \frac{C_{TREE,t_2} - C_{TREE,t_1}}{T} \times 1\ year$$

Where:

$\Delta C_{TREE,t}$	=	Change in carbon stock in trees within the project boundary in year *t;* tCO_2-e
$C_{TREE,t2}$	=	Carbon stock in trees within the project boundary at time t2; tCO_2-e
$C_{TREE,t1}$	=	Carbon stock in trees within the project boundary at time t1; tCO_2-e
T	=	Time elapsed between two successive estimations (T=t2 – t1); yr

According to the tool, carbon stock in trees at a point of time can be estimated by using one or a combination of four methods.

- *Ex-ante estimation (projection) of carbon stock in trees*

Method (b) "Estimation by modelling of tree growth and stand development" has been applied as follows:

$C_{TREE} = 44/12 * B_{TREE} * CF_{TREE}$

Where:

CTREE	=	Carbon stock in tree biomass within the project boundary at a given point of time; t CO2-e
BTREE	=	Biomass of trees within the project boundaries at a given point in time; t d.m
CFTREE	=	Carbon fraction of tree biomass; t C (t d.m) $^{-1}$

With:

B_{TREE} = $VTREE * DJ * BEF J,2 * (1+ RJ)$

VTREE = Stem volume of tree species; m^3

Vtree is obtained from growth projections: for the case of *Eucalyptus* using the recognized tool SIS Eucalipto based on the parameters for each specie (density, site index, etc) including tillage and pruning practices [81].

For Schinopsis, the growth projection is based on the study from Barkl. et Meyer, 1993 and the biomass corrected based on better breeding, wetter region, and considering it is a managed plantation and not native forest with the competition this implies.

DJ = Basic wood density of tree species j; t d.m. /m^3

BEF J ,2 = Biomass expansion factor for conversion of stem biomass to above-ground tree biomass, for tree species j; dimensionless

RJ = Root-shoot ratio for tree species j; dimensionless

- *Ex-post estimation of carbon stock in trees*

Ex-post estimations will be based on method (a) of the applicable tool ("Estimation by measurement of sample plots") and more specifically in option (a) of this method: "Stratified random sampling".

According to this method, mean carbon stock in trees within the tree biomass estimation strata and the associated uncertainty will be estimated as follows:

[81] SIS EUCALIPTO, EMBRAPA. Available at: https://www.embrapa.br/florestas/transferencia-de-tecnologia/softwares-florestais

Gimenez, A.M. & Ríos, N . (1999) Crecimiento de *Schinopsis* quebracho-colorado (Schlecht.) Barkl. et Meyer, Anacardiaceae (Ref. 45 in Google Drive folder)

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

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

$$b_{TREE} = \sum_{i=1}^{M} w_i \times b_{TREE,i}$$

$$u_C = \frac{t_{VAL} \times \sqrt{\sum_{i=1}^{M} w_i^2 \times \frac{s_i^2}{n_i}}}{b_{TREE}}$$

Where:

C_{TREE}	=	Carbon stock in trees in the tree biomass estimation strata; tCO_2-e
CF_{TREE}	=	Carbon fraction of tree biomass; t C $(t.d.m)^{-1}$ A default value of 0.47 is used unless transparent and verifiable information can be provided to justify a different value.
B_{TREE}	=	Tree biomass in the tree biomass estimation strata; t.d.m
A	=	Sum of areas of the tree biomass estimation strata; ha
b_{TREE}	=	Mean tree biomass per hectare in the tree biomass estimation strata; t.d.m ha^{-1}
w_i	=	Ration of the area of stratum *i* to the sum of areas of tree biomass estimation strata (i.e. $w_i=A_i/A$); dimensionless
b_{TREEi}	=	Mean tree biomass per hectare in stratum *i*; t.d.m. ha^{-1}
Uc	=	Uncertainty in C_{TREE}
T_{val}	=	Two-sided Student´s t-value for a confidence level of 90 per cent and degrees of freedom equal to n-M, where n is total number of sample plots within the tree biomass estimation strata and M is the total number of tree biomass estimation strata
s_i^2	=	Variance of tree biomass per hectare across all sample plots in stratum *i*; $(t.d.m.\ ha^{-1})^2$
n_i	=	Number of sample plots in stratum *i*

Mean tree biomass per hectare in a stratum (b_{TREE}) and the associated variance (si^2) will be estimated as follows:

$$b_{TREE,i} = \frac{\sum_{p=1}^{n_i} b_{TREE,p,i}}{n_i}$$

$$s_i^2 = \frac{n_i \times \sum_{p=1}^{n_i} b_{TREE,p,i}^2 - \left(\sum_{p=1}^{n_i} b_{TREE,p,i}\right)^2}{n_i \times (n_i - 1)}$$

Where:

$b_{TREE\ p,I}$	=	Tree biomass per hectare in plot *p* of stratum *i*; t.d.m. ha^{-1}
n_i	=	Number of sample plots in stratum *i*

Finally, according to Appendix 1 (Methods of plot biomass measurement) of the tool, the plot biomass value will be determined as follows:

$$b_{TREE,p,i} = \frac{B_{TREE,p,i}}{A_{PLOT,i}}$$

$$B_{TREE,p,i} = \sum_j B_{TREE,j,p,i}$$

$$B_{TREE,j,p,i} = \sum_l B_{TREE,l,j,p,i}$$

Where:

$b_{TREE\ p,i}$	=	Tree biomass per hectare in sample plot *p* of stratum *i*; t.d.m. ha^{-1}
$B_{TREE\ p,I}$	=	Tree biomass in sample plot *p* of stratum *i*; t.d.m.
$A_{PLOT\ I}$	=	Size of sample plot in stratum *i;* ha
$B_{TREE\ j,p,I}$	=	Biomass of trees of species *j* in sample plot *p* of stratum *i*; t.d.m.
$B_{TREE\ I,j,p,I}$	=	Biomass of tree *I* of species *j* in sample plot *p* of stratum *i*; t.d.m.

With,

$$B_{TREE,l,j,p,i} = f_j(x_{1,l}, x_{2,l}, x_{3,l}, \dots) \times (1 + R_j)$$

$$B_{TREE,l,j,p,i} = V_{TREE,j}(x_{1,l}, x_{2,l}, x_{3,l}, \dots) \times D_j \times BEF_{2,j} \times (1 + R_j)$$

Where:

$f_j(x_{1,l}, x_{2,l}, x_{3,l}, \dots)$ = Above-ground biomass of the tree returned by the allometric equation for species j relating to measurements of three l to the above-ground biomass of the tree; t.d.m.

R_j = Root-shoot ratio for tree species j; dimensionless

The value of Ri is estimated as:

$$R_j = \frac{e^{(-1.085+0.9256 \times \ln b)}}{b}$$

Where b is the above-ground tree biomass per hectare (in t.d.m. ha^{-1}), unless transparent and verifiable information can be provided to justify a different value.

Note. If trees have grown as coppice regeneration after a harvest, then the value of R_j should be multiplied by a factor equal to $V_{harvest}/V_{TREE}$ or 1, whichever is greater, where $V_{harvest}$ is the volume per hectare of trees harvested and V_{TREE} is the volume per hectare of trees standing in the plot at the time of measurement.

$V_{TREE,j}(x_{1,l}, x_{2,l}, x_{3,l}, \dots)$ = Stem volume of tree l of species j in sample plot p of stratum i estimated from the tree dimension(s) as entry data into a volume table or volume equation; m3

Note. Where the volume table or volume equation predicts under-bark volume (i.e. wood volume, rather than gross stem volume), suitable correction will be applied to estimate the over-bark volume.

D_j = Density (over-bark) of tree species j; t.d.m m^{-3}

Values are taken from Table 3.A.1.9 of IPCC GPC-LULUCF 2003 unless transparent and verifiable information can be provided to justify different values.

Note. Where density (specific gravity) of the bark of a tree species is different from the density of the wood, suitable correction should be applied to estimate a conservative value of the overall (over-bark) density of tree stem.

$BEF_{2,j}$ = Biomass expansion factor for conversion of tree stem biomass to above-ground tree biomass, for tree species j; dimensionless

For ex-post estimation the conservative default value of 1.15 is used, unless transparent and verifiable information can be provided to justify a different value.

In line with AR-TOOL14 Appendix 1 "Demonstrating appropriateness of volume equations for estimation of aboveground tree biomass in A/R CDM project activities", only recognised by public entities or peer reviewed VTREE and Fi equations will be used, meaning national or regional forest inventories or research institutions recommendations.

For *Eucalyptus*, the equation used is the one recommended for Northeast region by the National Institution of Agricultural Technology (INTA) from Glade J (1984)[82]:

V_{TREE} (m3) = exp(-3.11072 + 1.83316. LN(DBH)+ 1.07762 LN(H))

As demonstrated in reference 57, the equation used for *Eucalyptus* is the one promoted by the national agroindustry Ministry and INTA for, at least, the last 15 years for commercial plantation inventories.

For the case of *Schinopsis balansae*, given there is no data available, and in line with the Second National Native Forest Inventory (INBN2)[83], a general equation will be used:

V_{TREE}= -0.09996+0.00057954*DBH^2 (V being *stem volume over bark)*[84]

While the *Schinopsis* plantations are young and small, and individuals do not reach the minimum BDH values (1,3mt), a modified version of the allometric equation by Atanasio et al. 2013[85] will be used ,

[82] Reference from "Normas de inventario forestal para los planes de manejo predial. Proyecto de implantación de un modelo de desarrollo forestal sustentable en Argentina y Uruguay". INTA 2006 and "Curso: Principios técnicos para el cultivo de especies Forestales de Entre Ríos Planificación, Inventario y cubicación"(p.5) INTA and Ministerio de Agroindustria, 2017

[83] Volume for *Schinopsis balasae*: Segundo Inventario Nacional de Bosques Nativos (INBN2). Informe Región Forestal Parque Chaqueño. Primera revision. 2020. Section with equation at: Annex 4. Table 34. Available at: https://www.argentina.gob.ar/ambiente/bosques/segundo-inventario-nacional-bosques-nativos

[84] Source for the equation: PINBN analysis

[85] Atanasio, et al. (2013) Determinación de biomasa aérea en Quebracho Colorado Santiagueño (*Schinopsis* quebracho colorado Schlencht), en el Chaco Semiárido. ISSN 1669-6786 4to Congreso Forestal Argentino y Latinoamericano Iguazú 2013. PONENCIAS. Trabajo Nº 24. INTA

based on Iglesias & Barchuk, 2010 findings[86], where neck diameter or diameter at base height is considered more appropriate for young and/or small individuals:

Above-ground biomass (t.d.m)= 0.05619*ND^2.7152.

Where ND is neck diameter.

Refer to sections 5.2 and 5.3 for further information regarding monitored parameters and method of plot biomass measurement.

- *Change in carbon stock in shrub biomass in the project*

Regarding change in carbon stock in shrub biomass in the project, since the baseline scenario is the continuation of extensive cattle breeding in pasture land, this landscape does not present shrubs on it[87].

Therefore it is not a source of GHG emissions.

$$AC_{SHRUB\_PROJ,t} = 0$$

Litter and Dead Wood Carbon Pools

Not estimated

Soil organic carbon Pool

Not estimated

4.3 Leakage

The Project activity does not expect any displacement of agricultural activities present in the Project´s boundary before the beginning of it, thus leakage emissions are considered insignificant and hence accounted as zero.

According to the methodology AR-ACM 0003 v.2.0, section 5.6, leakage emissions shall be estimated as follows:

[86] Iglesias, M.R & Barchuk, H. (2010) Estimación de la biomasa aérea de seis leguminosas leñosas del Chaco Árido (Argentina) Ecología Austral 20:71-79. Abril de 2010. Asociación Argentina de Ecología

[87] Only at Irineo´s property (which represent 4% of project area), one plot presented shrubs among the grassland, accompanying the *Schinopsis* plantation

$$LK_t = LK_{AGRIC,t}$$

Where:

LKt = GHG emissions due to leakage, in year *t*; tCO_2-e

$LK_{AGRIC,\ t}$ = Leakage due to the displacement of agricultural activities in year t, as estimated in the toll "Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity"; tCO_2-e

According to the "Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity" tool v.2, leakage emission attributable to the displacement of agricultural activities due to implementation of an A/R CDM project activity is estimated as the decrease in carbon stocks in the affected carbon pools of the land receiving the displaced activity.

Leakage emission attributable to the displacement of grazing activities under the following conditions is considered insignificant and hence accounted as zero:

a. Animals are displaced to existing grazing land and the total number of animals in the receiving grazing land (displaced and existing) does not exceed the carrying capacity of the grazing land;
b. Animals are displaced to existing non-grazing grassland and the total number of animals displaced does not exceed the carrying capacity of the receiving grassland;
c. Animals are displaced to cropland that has been abandoned within the last five years;
d. Animals are displaced to forested lands, and no clearance of trees, or decrease in crown cover of trees and shrubs, occurs due to the displaced animals;
e. Animals are displaced to zero-grazing system.

For the case of Unitán Project, condition "a" applies. For the only property with remaining animals present at time of plantation, cattle can keep grazing the land until the moment of plantation. Then, the cattle will be transferred to grazing lands within the same property or others owned by Unitán, but not within the project´s boundary. This scheme is possible given the effective area to be covered with new forests and the rate of plantation. Regarding plantation rate, activities will be carried out in 9 years meaning that by the third year of plantations, the cattle could go back to the areas planted in the first year. If this area is not enough to hold 100% of the cattle then part of it could stay in other grazing lands within the property. Since the type of production carried out in this region is extensive, the carrying capacity of the grazing land was not reached before the project start date. Therefore, the cattle could be moved to the unplanted areas or to neighbour farms without exceeding the carrying capacity.

In the case of the two properties with set aside croplands, these took place prior to Unitán buying the properties. Given the baseline analysis, where cattle breeding is the most preferable activity in the region, together with the fact that the cotton plantation activities had already been abandoned prior to Unitán acquiring the land it is concluded that the displacement of agricultural activities are considered insignificant and hence accounted as zero.

$LK_t = 0$

4.4 Estimated Net GHG Emission Reductions and Removals

According to the methodology AR-ACM 0003 v.2.0, section 5.7, net anthropogenic GHG removals by sinks shall be calculated as follows:

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

Where:

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

1) Based on the parameters detailed in section 5.1 and 5.2 and equation in section 4.4, the following table summarizes the GHG removals estimated for the project crediting period:

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
2016	0	468	0	468
2017	0	2.321	0	2.321
2018	0	6.214	0	6.214
2019	0	15.671	0	15.671
2020	0	27.985	0	27.985
2021	0	42.726	0	42.726

2022	0	39.546	0	39.546
2023	0	49.288	0	49.288
2024	0	-2.801	0	-2.801
2025	0	19.631	0	19.631
2026	0	21.930	0	21.930
2027	0	24.618	0	24.618
2028	0	26.664	0	26.664
2029	0	23.929	0	23.929
2030	0	-34.556	0	-34.556
2031	0	-24.271	0	-24.271
2032	0	22.887	0	22.887
2033	0	25.508	0	25.508
2034	0	27.467	0	27.467
2035	0	8.208	0	8.208
2036	0	-33.618	0	-33.618
2037	0	-24.979	0	-24.979
2038	0	23.850	0	23.850
2039	0	25.415	0	25.415
2040	0	27.333	0	27.333
2041	0	24.781	0	24.781
2042	0	-32.973	0	-32.973

2043	0	-22.518	0	-22.518
2044	0	26.381	0	26.381
2045	0	29.704	0	29.704
2046	0	32.113	0	32.113
2047	0	29.564	0	29.564
2048	0	-28.776	0	-28.776
2049	0	-17.799	0	-17.799
2050	0	29.529	0	29.529
2051	0	32.183	0	32.183
2052	0	34.288	0	34.288
2053	0	31.558	0	31.558
2054	0	-43.530	0	-43.530
2055	0	-16.295	0	-16.295
Total	0	449.643	0	449.643

2) The long-term average GHG benefit (LTA) is determined by averaging the expected total GHG benefit for the length of the project. As explained in Section 3.2.21 VCS Standard V4.2, the Long Term Average GHG benefit shall be calculated by establishing the period over which the long-term average GHG benefit shall be calculated, including at minimum one full harvest/cutting cycle. Then, the project has to:

- Determine the expected total GHG benefit of the project for each year of the established time period. For each year, the total GHG benefit is the to-date GHG emission reductions or removals from the project scenario minus baseline scenario.

- Sum the total GHG benefit of each year over the established time period.

- Calculate the average GHG benefit of the project over the established time period.

- Use the following equation:

$$LA = \frac{\sum_{t=0}^{n} PE_t - BE_t}{n}$$

Where:

LA = the long-term average GHG benefit

PE_t = the total to-date GHG emission reductions and removals generated in the project scenario (tCO_2e). Project scenario emission reductions and removals shall also consider project emissions of CO_2, N_2O, CH_4 and leakage.

BE_t = the total to-date GHG emission reductions and removals projected for the baseline scenario (tCO_2e)

t = Year

n = Total number of years in the established time period

In this sense, taking into consideration that plantations will take place till year 2025 and Schinopsis harvest year is 40 years, then the period over which the long-term average GHG benefit shall be calculated (n) is 50 years.

For this project the total GHG benefit expected at the end of crediting period is 449,643 tCO_2e. The sum of the expected GHG benefit annually when divided by 50 years (period for estimating LTA) results in 298,727 tCO_2e as seen in the following table. This amount is subject to buffer withholding.

Year	Baseline scenario: to date GHG emission reductions and removals at year t	Project scenario: to date GHG emission reductions and removals at year t	Annual change in GHG benefit	Expected total GHG benefit to date	Total credits available each year
t	BE	PE	PEt - PEt-1	PEt - BEt	
2016	0	468	468	468	468
2017	0	2.789	2.321	2.789	2.321
2018	0	9.003	6.214	9.003	6.214
2019	0	24.674	15.671	24.674	15.671
2020	0	52.659	27.985	52.659	27.985
2021	0	95.385	42.726	95.385	42.726
2022	0	134.931	39.546	134.931	39.546
2023	0	184.219	49.288	184.219	49.288
2024	0	181.418	-2.801	181.418	0
2025	0	201.049	19.631	201.049	19.631
2026	0	222.979	21.930	222.979	21.930

2027	0	247.597	24.618	247.597	24.618
2028	0	274.261	26.664	274.261	26.664
2029	0	298.190	23.929	298.190	21.665
2030	0	263.633	-34.556	263.633	0
2031	0	239.362	-24.271	239.362	0
2032	0	262.249	22.887	262.249	0
2033	0	287.757	25.508	287.757	0
2034	0	315.225	27.467	315.225	0
2035	0	323.433	8.208	323.433	0
2036	0	289.815	-33.618	289.815	0
2037	0	264.836	-24.979	264.836	0
2038	0	288.686	23.850	288.686	0
2039	0	314.100	25.415	314.100	0
2040	0	341.433	27.333	341.433	0
2041	0	366.215	24.781	366.215	0
2042	0	333.242	-32.973	333.242	0
2043	0	310.724	-22.518	310.724	0
2044	0	337.105	26.381	337.105	0
2045	0	366.809	29.704	366.809	0
2046	0	398.921	32.113	398.921	0
2047	0	428.486	29.564	428.486	0
2048	0	399.710	-28.776	399.710	0
2049	0	381.910	-17.799	381.910	0
2050	0	411.440	29.529	411.440	0
2051	0	443.622	32.183	443.622	0
2052	0	477.910	34.288	477.910	0
2053	0	509.468	31.558	509.468	0
2054	0	465.938	-43.530	465.938	0
2055	0	449.643	-16.295	449.643	0
2056	0	435.869	-13.774	435.869	0
2057	0	448.961	13.091	448.961	0
2058	0	439.673	-9.287	439.673	0
2059	0	425.461	-14.212	425.461	0
2060	0	409.038	-16.423	409.038	0
2061	0	382.168	-26.871	382.168	0
2062	0	365.423	-16.745	365.423	0
2063	0	351.685	-13.738	351.685	0
2064	0	273.777	-77.908	273.777	0
2065	0	202.997	-70.780	202.997	0
		TOTAL		**14,936.346**	**298,727**
		LTA		**298,727**	

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	D_j
Data unit	t d.m. m^{-3}
Description	Density (over-bark) of tree species j
Source of data	INTA Winck, R. et al, 2020; INTI-CITEMA wood density report for *Schinopsis balansae*[88]
Value applied	0.396 – 0.566 (varies with age) for Eucaliptus; 1.2 for Schinopsis
Justification of choice of data or description of measurement methods and procedures applied	Eucaliptus: 1) basic density values are taken from results of an investigation work (regional data) 2) values are plotted and tendency line is added, the tendency line with the highest r^2 3) power function is used to estimate the density values for the whole period
Purpose of Data	Calculation of project emissions
Comments	---

Data / Parameter	$BEF_{2,j}$
Data unit	Dimensionless
Description	Biomass expansion factor for conversion of stem biomass to above-ground biomass for tree species j

[88] Winck, R. et al. (2020) Variación de la densidad básica de *Eucalyptus grandis* para diferentes edades y zonas agroecológicas de la Mesopotamia.

INTI-CITEMA. Atencia, M.E (2003) Densidad de maderas (Kg/m3) ordenadas por nombre científico. Available at: https://www.inti.gob.ar/publicaciones/descargac/365

Source of data	Conservative value of 1.15 from AR-tool 14 for *Eucalyptus* and default values from Table 3A.1.10 of IPCC GPG-LULUCF 2003 for *Schinopsis*
Value applied	1,5for *Eucalyptus*; 2 for *Schinopsis*
Justification of choice of data or description of measurement methods and procedures applied	BEF varies with age, being the highest values for young plantations and the lowest for mature plantations. A conservative approach was taken for *Schinopsis*, using temperate broadleaf values instead of tropical, taking into consideration the project is subtropical climate and that *Schinopsis* diameter is less than 10cm during the first 20 years. So, we are reducing and maintaining BEF to 2 (temperate broadleaf average and minimum range for tropical broadleaf) throughout the rotation.
Purpose of Data	Calculation of project emissions
Comments	According to the A/R methodological tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities", for ex post estimation the conservative default value of 1.15 will be used unless transparent and verifiable information can be provided to justify a different value. This applies for Eucalyptus where no allometric equation is used.

Data / Parameter	R_j
Data unit	dimensionless
Description	Root-shoot ratio for tree species j
Source of data	Table 3A.1.8 of IPCC GPG-LULUCF 2003.
Value applied	0.20 to 0.45 for *Eucalyptus*; 0.25 for *Schinopsis*
Justification of choice of data or description of measurement methods and procedures applied	According to IPCC 2003, the value of R depends on aerial biomass (t / ha). For ex-ante values less than 50 tonnes/ha 0.45 was used, for values between 50 and 150t/ha 0.35 was used and for over 150 0.2 was used. In the same line, to be conservative due to lack of data, R_j value for *Schinopsis* is considered 0.25 for all ages, which is both, the conservative recommended value for baselines and nearest value to mean subtropical primary forest R_j.
Purpose of Data	Calculation of project emissions
Comments	For ex-post estimations, R_j will be estimated using the recommended equation taken from the suggested equation from the tool "Estimation of carbon stocks and change in carbon

	stocks of trees and shrubs" and calculated based on estimated aboveground biomass for each verification period.

Data / Parameter	CF
Data unit	dimensionless
Description	Carbon fraction
Source of data	GPG IPCC
Value applied	0.47
Justification of choice of data or description of measurement methods and procedures applied	Default value recommended by IPCC
Purpose of Data	Calculation of project emissions
Comments	N/A

Data / Parameter	$V_{TREE,j,p,i}$
Data unit	m^3
Description	Stem volume of trees of species or group of species j in plot p in stratum I
Source of data	Regional growth model (SIS eucalipto, EMBRAPA); local growth model for *Schinopsis balansae* (Gimenez, A.M. & Ríos, N., 1999)[89]
Value applied	Varies with species and date of plantation. See project calculator
Justification of choice of data or description of measurement methods and procedures applied	SIS eucalipto is developed by a recognized organization in Brazil which projects *Eucalyptus* growth, allowing to include detail on densities, thinning years, forestry index, among other parameters. In the case of *Schinopsis*, a regression was calculated based on regional information on *Schinopsis* growth. In this last case, 1.3

[89] For Schinopsis Gimenez, A.M. & Ríos, N . (1999) Crecimiento de Schinopsis quebracho-colorado Barkl. et Meyer, Anacardiaceae (Ref. 81 in shared Google Drive folder)

EMBRAPA. SIS EUCALIPTO. Available at: https://www.embrapa.br/florestas/transferencia-de-tecnologia/softwares-florestais

	correction factor was used given wetter region, better breeds and managed plantation instead of native forest
Purpose of Data	The stem volume values (or growth simulators) are used to predict the plantation growth both for *Eucalyptus* and *Schinopsis balansae*
Comments	For ex-post calculations, allometric equations will be used based on DBH and H values measured and estimated

5.2 Data and Parameters Monitored

Data / Parameter	A_i
Data unit	ha
Description	Area of stratum I
Source of data	Monitoring of strata and stand boundaries was done using a Geographical Information System (GIS)
Description of measurement methods and procedures to be applied	Strata area were measured based on cartography documents, related with GIS.
Frequency of monitoring/recording	Every time the project boundaries are modified. when disturbances events take place, the project participants shall re-built the stratum and add the area of the project under disturbance in the GIS
Value applied	

Species	Year of plantation	Stratum	Area (ha)
Eucalyptus hybrid	2016	1	35.84
Eucalyptus hybrid	2017	2	44.74
Eucalyptus hybrid	2018	3	212.62
Eucalyptus hybrid	2019	4	166.50

	Eucalyptus hybrid	2020	5	194.00
	Eucalyptus various	2016	11	24.95
	Eucalyptus various	2018	12	3.20
	Schinopsis	2016	13	81.20
	Schinopsis	2017	14	20.09
	Schinopsis	2018	15	15.97
	Schinopsis	2019	16	64.96
	Schinopsis	2020	17	20.79
Monitoring equipment	Garmin GPS, model eTrex Legend HCx, Serie 16C353228; Google Earth, QGis			
QA/QC procedures to be applied	Quality control/quality assurance (QA/QC) procedures prescribed under national forest inventory are applied. In the absence of these, QA/QC procedures from published handbooks, or from the IPCC GPG LULUCF 2003, are applied.			
Purpose of data	Calculation of project emissions			
Calculation method	The value was used in equations N° 3, 12 y 24 of the Methodological tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities" (Version 4.1)			
Comments	-			

Data / Parameter	$A_{PLOT,i}$,
Data unit	ha
Description	Total area of sample plots in stratum i
Source of data	Field measurement
Description of measurement methods and procedures to be applied	Standard operating procedures (SOPs) prescribed under national forest inventory are applied. In the absence of these, SOPs from published handbooks, or from the IPCC GPG LULUCF 2003, are applied.
Frequency of monitoring/recording	Before every verification event.

Value applied	For *Schinopsis* sample plots are squares of 400m^2 For *Eucalyptus* sample plots are squares of 300m^2
Monitoring equipment	30 and 20mts measuring tapes with no series number 
QA/QC procedures to be applied	Quality control/quality assurance (QA/QC) procedures prescribed under national forest inventory are applied. In the absence of these, QA/QC procedures from published handbooks, or from the IPCC GPG LULUCF 2003, are applied.
Purpose of data	Calculation of project emissions
Calculation method	The plots are located using GPS Garmin Etrex Legend and Avenza maps App used in a cell phone, with previously loaded maps of plots. Each having its own coordinates. In the case of Eucalyptus plots are marked based on the first tree in the row and then its vertices. In the case of Schinopsis a spray painted rod is located.
Comments	-

Data / Parameter	DBH
Data unit	cm
Description	Diameter at breast height of tree
Source of data	Field measurements in sample plots
Description of measurement methods	DBH is measured at 1.3 m above ground, over the bark. In case of stem deformation at this level, measurement was done over the deformation once the stem took its normal shape, with the

and procedures to be applied	purpose of being conservative. DBH was measured in all trees within the plots.
Frequency of monitoring/recording	Every tree within sample plots
Value applied	Varies with plot, see file "Forest inventory - Verification I"
Monitoring equipment	 The instrument used for measuring DBH was a Haglof caliper of 460 mm with no series number; with diameter accuracy, aluminum scales with clear digits anti-wear off, printed on both sides, light and robust. In some cases a diametric tape is used.
QA/QC procedures to be applied	Quality control/quality assurance (QA/QC) procedures prescribed under national forest inventory are applied. In the absence of these, QA/QC procedures from published handbooks, or from the IPCC GPG LULUCF 2003, are applied. A quality control procedure consisted in qualified personnel conducting the measurements in the first place, and the first control is conducted by contractor. Secondly, instruments are checked and tested before starting the verification process. Items checked: -Correct visualization if numbers in the calliper. -The straightness of the calliper and the lack of mechanical problems. The calliper length is not a problem since it is impossible the equipment stretches. Bark that is not stick to the stem is removed before measuring.

Purpose of data	Calculation of project emissions
Calculation method	The trees are considered to be inside the plot if more than 50% of DBH is inside the plot. Diameters were measured by taking one measure, always pointing the instrument´s shaft in direction to the middle of the plot.
Comments	

Data / Parameter	ND
Data unit	cm
Description	Diameter at neck height of tree (10cm from ground land)
Source of data	Field measurements in sample plots
Description of measurement methods and procedures to be applied	This variable will be monitored for those *Schinopsis* plots with the presence of young individuals with heights less than 1.3mt.
Frequency of monitoring/recording	Every tree within sample plots
Value applied	Varies with plot, see file “Forest inventory - Verification I”
Monitoring equipment	 The instrument used for measuring DBH was a Haglof caliper of 460 mm with no series number; with diameter accuracy, aluminum scales with clear digits anti-wear off, printed on both sides, light and robust. In some cases a diametric tape is used.

QA/QC procedures to be applied	Quality control/quality assurance (QA/QC) procedures prescribed under national forest inventory are applied. In the absence of these, QA/QC procedures from published handbooks, or from the IPCC GPG LULUCF 2003, are applied.
Purpose of data	Calculation of project emissions
Calculation method	In the case of young plantations of Schinopsis, a genus with slow growth periods, neck diameter was measured instead of DBH as the maximum height in some individuals within the plot was less than 1.3mts., based on Iglesias & Barchuk, 2010; Loguercio & Defossé 2001; Pérez-Cordero & Kanninen 2002 findings, where neck diameter or diameter at base height is considered more appropriate for young and/or small individuals90.
Comments	

Data / Parameter	R_j
Data unit	dimensionless
Description	Root-shoot ratio for tree species j
Source of data	Estimation of carbon stocks and change in carbon stocks of trees and shrubs AR Tool 14.
Description of measurement methods and procedures to be applied	For ex-post estimations, R_j will be estimated using the recommended equation taken from the suggested equation from the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs" and calculated based on estimated aboveground biomass for each verification period and not a default value for ranges of biomass: $R_j = \frac{e^{(-1.085+0.9256\times\ln b)}}{b}$ Where B is aboveground biomass content (t.d.m./ha). The aboveground biomass will be calculated per verification period.
Frequency of monitoring/recording	For every plot measured
Value applied	Ex ante: Default values from IPCC guidelines for *Eucalyptus* in temperate forest according to above-biomass (t/ha): <50= 0.45

[90] Iglesias, M.R & Barchuk, H. (2010) Estimación de la biomasa aérea de seis leguminosas leñosas del Chaco Árido (Argentina) Ecología Austral 20:71-79. Abril de 2010. Asociación Argentina de Ecología. Reference n° 86 in shared Google Drive folder

	51-150= 0.35 >150 = 0.2 In the case of Schinopsis, the value 0.25 is used, based on average value for subtropical forest and conservative value from the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs" Ex post: varies with measuring plot. See “Forest inventory_verification I”
Monitoring equipment	Excel spreadsheet
QA/QC procedures to be applied	Calculations revised by third party within consultancy firm
Purpose of Data	Calculation of project emissions
Comments	

Data / Parameter	H
Data unit	m
Description	Height of tree
Source of data	Field measurements in sample plots
Description of measurement methods and procedures to be applied	Standard operating procedures (SOPs) prescribed under national forest inventory are applied. In the absence of these, SOPs from published handbooks, or from the IPCC GPG LULUCF 2003, are applied. In relation to the height measurement, the following considerations according to each situation take place: 1. Trees with zero slope: To achieve a correct measurement, the operator must be located at a distance equivalent to the tree height. It is important to keep in mind that the distance taken with the tape measure is the one entered in the inclinometer. 2. Measurements with slope (positive or negative): In those cases where the tree base is located over the contractor's visual sight, the measurement and total height will be a result of the subtraction of the measurements. If the operator is over a hill, the height will be the sum of the measurements. 3. Trees that are dead, burned, or broken will be excluded from the measurement.

Frequency of monitoring/recording	In general, total height of 6-10 trees per plot area measured and the rest calculated based on a regression equation; in other cases (p.e. in the case of *Schinopsis* in Formosa plots (15,16,17, 18) all heights are measured.
Value applied	See file "Forest inventory - Verification I"
Monitoring equipment	 The equipment used includes a Sunnto Helsinki Patent Serie 801862 and a telescopic rod.
QA/QC procedures to be applied	Quality control/quality assurance (QA/QC) procedures prescribed under national forest inventory are applied. In the absence of these, QA/QC procedures from published handbooks, or from the IPCC GPG LULUCF 2003, are applied.
Purpose of data	Calculation of project emissions
Calculation method	Formosa plots, all individuals are measured with a telescopic rod, while in Chaco the trees are measured with Suunto inclinometer
Comments	N/A

Data / Parameter	Wi
Data unit	dimensionless
Description	Relative weight of stratum
Source of data	Area field measurements
Description of measurement methods and procedures to be applied	Standard operating procedures (SOPs) prescribed under national forest inventory are applied. In the absence of these, SOPs from

	published handbooks, or from the IPCC GPG LULUCF 2003, are applied.
Frequency of monitoring/recording	During every verification event.
Value applied	

		Stratum	Area (ha)	Wi
Eucalyptus híbrido	2016	1	35,84	0,04
	2017	2	44,74	0,05
	2018	3	212,62	0,24
	2019	4	166,50	0,19
	2020	5	194,00	0,22
Eucalyptus varios	2016	11	24,95	0,03
	2018	12	3,20	0,00
Schinopsis	2016	13	81,2	0,09
	2017	14	20,09	0,02
	2018	15	15,97	0,02
	2019	16	64,96	0,07
	2020	17	20,79	0,02

Monitoring equipment	Excel - Microsoft Office based on data
QA/QC procedures to be applied	Quality control/quality assurance (QA/QC) procedures prescribed under national forest inventory are applied. In the absence of these, QA/QC procedures from published handbooks, or from the IPCC GPG LULUCF 2003, are applied.
Purpose of data	Calculation of project emissions
Calculation method	Ratio of the area of stratum i to the sum of areas of biomass estimation strata (i.e.Ai /A)
Comments	N/A

Data / Parameter	Si^2
Data unit	(t d.m. ha-1) ^2
Description	Variance of tree biomass per hectare across all sample plots in each stratum
Source of data	Tree biomass from field measurements
Description of measurement methods	Standard operating procedures (SOPs) prescribed under national forest inventory are applied. In the absence of these, SOPs from

and procedures to be applied	published handbooks, or from the IPCC GPG LULUCF 2003, are applied.
Frequency of monitoring/recording	During every verification event.
Value applied	See file "Forest inventory - Verification I"
Monitoring equipment	Excel - Microsoft Office based on measured data
QA/QC procedures to be applied	Quality control/quality assurance (QA/QC) procedures prescribed under national forest inventory are applied. In the absence of these, QA/QC procedures from published handbooks, or from the IPCC GPG LULUCF 2003, are applied.
Purpose of data	Calculation of project emissions
Calculation method	Equation 17 from AR-Tool 14 $s_i^2 = \frac{n_i \times \sum_{p=1}^{n_i} b_{TREE,p,i}^2 - \left(\sum_{p=1}^{n_i} b_{TREE,p,i}\right)^2}{n_i \times (n_i - 1)}$
Comments	N/A

Data / Parameter	T
Data unit	Year
Description	Time period elapsed between two successive estimations of carbon stock
Source of data	Recorded time
Description of measurement methods and procedures to be applied	N/A
Frequency of monitoring/recording	N/A
Value applied	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of project emissions

Calculation method	N/A
Comments	If the two successive estimations of carbon stock are carried out at different points of time in year t2 and t1, (e.g. in the month of April in year t1 and in the month of September in year t2), then a fractional value is assigned to T.

5.3 Monitoring Plan

Monitoring will be organized according to the AR-ACM 0003 tool. All the data that are mentioned in this section will be collected and archived electronically and kept for 3 years after the end of last crediting period.

In this section, the actions that as a monitoring strategy will be a tool for improvement during the development of the project are objectified. Mainly to direct the management in the implementation of the corporate forestry policy by increasing the analysis and management capacity of the services and direct responsibilities over the forestation areas directly involved.

Unitán has set a forest management system for the Unitán project. The system includes a Monitoring Plan - which specifies (among other relevant information) the forestry inventory -, procedures and monitoring reports[91]. Procedures will be handed to third parties in charge of forest inventory. Therefore, both Unitán staff and third parties are aware of the importance that monitoring has and are committed to monitor the data correctly and consistently for the entire crediting period.

Unitán monitoring plan has been designed in line with the methodology AR-ACM 0003 and its applicable tools referenced in sections 2.1 and 2.2 above in order to provide all relevant data necessary to verify: i) the applicability conditions listed under section 2.2 are met; ii) changes in carbon stocks in the pools selected; and iii) project emissions and leakage emissions.

When available, commonly accepted principles and practices of forest inventory and forest management in the host country are applied. Otherwise, as above mentioned, standard operating procedures (SOPs) and quality control/quality assurance (QA/QC) procedures for inventory operations, including field data collection and data management are identified, recorded and applied (i.e.: SOPs from the "IPCC Good Practice Guidance for Land Use, Land-Use Change and Forestry 2003")[92].

The necessity to carry out a forest inventory arises from the impossibility of measuring the stocks of the total area of the project, so that it is necessary to take representative samples of the population. These samples, named sample units or sampling plots, are a relatively small proportion of the project area, established over the entire area in order to obtain estimations of the variables of interest.

[91] Available to VVB during verification referenced as "15. Monitor Plan Unitan" in shared Google Drive folder

[92] Monitoring Plan available to VVB during validation same reference as previous footnote: "15. Monitor Plan_Unitan"

The monitoring plan is designed to produce biomass stock estimates with a 90% confidence level in line with the precision requirements established in the "Estimation of carbon stocks of trees and shrubs in A/R CDM Project activities" version 04.2 tool.

Data collected will be archived for a period of at least two years after the end of the last crediting period of the project activity.

Sampling Plan

The forest inventory is carried out taking into account statistical predefined parameters, aiming at establishing the precision and the probability level of the results. The selection of the work methodology for developing forest inventory involves the determination of the following variables, in line with the Monitoring Plan:

- Sample size
- Sampling error
- Sampling process
- Sampling method.
- Mapping of the sampling,
- Capture of field data (indicating variables to be measured and instruments to be used).
- Calculation processes
- Statistical analysis, indicating precision and probability level used.

Project boundaries are defined at the beginning of project activity and updated along the crediting period,

Boundaries may vary or new strata may be created after disturbances effects (pests, droughts, fire) and boundaries will be redefined.

Geographic coordinates are established, recorded and archived. A Geographic Information System will be implemented with the following basic layers:

- Project boundaries
- Aerial photographs
- Infrastructure (nursery, roads, etc.)
- Permanent sampling plots

Other layers could be added in the future. The layers will be linked to several databases.

- Stratification

The stratification eliminates sources of variation that can mask the results of the inventory, once the variability inside the strata shall be lower than that of the whole population. Hence, it will be possible to obtain more precise statistics due to the population stratification. The stratification also facilitates the data collection and the processing of it per stratum, being also suitable for the planning and execution of the work on the field.

Stratification was done considering age class (plantation date 2016, 2017, 2018, ..., 2025); and species planted (*Schinopsis balansae*, *Eucalyptus gxc* & *Eucalyptus* various). Total project area will be divided into 22 stratums as *Eucalyptus* various plantations are only projected for 2016 and 2018.

Current stratification could suffer subdivisions or merges in the case unexpected disturbances occur or insignificant intra-stratum variability is detected in the annual variation in carbon pools (e.g: forest fires).

- Sampling

Design

The design includes the setting of the different variables to be used in the sampling, that is, the distribution of plots, setting their quantities and sizes, as well as the information analysis techniques. In this case, the design used was "Systematic Random", through the implementation of a rectangular grid and location of the plots in each stratum. The plots have been distributed over the area of interest to be inventoried in homogeneous units (lots), determining the dasometric parameters corresponding to the lots they represent.

The stratum are characterized by homogeneity in species, age, density, in order that the variability is absorbed within the batch and thus improve inventory precision.

Sample size

The sample size involves the number of plots to be distributed with a certain statistical criterion in every stratum. The representative number of plots of the total project area and of every stratum shall be previously decided in order to accomplish the predefined level of accuracy and precision.

The size of the sample plot is a trade-off between accuracy, precision, and time (cost) of measurement. The size is also related to the number of trees, their diameter and the carbon stock variance among plots. The plot should be large enough to contain an adequate number of trees per plot to be measured. IPCC Good Practice Guidance for LULUCF, Chapter 4.3 recommends using a single plot varying between 100 m^2 to 600 m^2, increasing the size from densely planted stands of 1000 trees per hectare to sparsely planted stands of multi-purpose trees.

Thus, taking into consideration the project-specific conditions and the IPCC guidance, square plots of 300 m^2 have been selected for monitoring of stratums with *Eucalyptus* (densities between 1205 and 2500 plants/ha) and a size of 400 m^2 for stratums with *Schinopsis* due to lower densities (833 plants/ha) according to plant densities.

Plots number

Permanent sampling plots are used to measure and monitor changes in carbon stocks from the most relevant carbon pools over the time. These are considered to be more efficient for estimating changes in carbon stocks by filtering out any variance due to plot effect. The plots will be located with GPS and although physically marked, they will be as invisible as possible to avoid any possible special treatments (e.g. during site and soil preparation, weeding, fertilization, harvesting, etc.) that could affect growth. They will also be prevented from being deforested over the crediting period.

The number of sample plots was first estimated according to the "Calculation of the number of sample plots for measurements within A/R CDM project activities" tool. The outcome for the estimation of number of sample plots with the tool was 43 for the whole project area, with value cero for some of the stratums. This number was increased in order to achieve a 10% significance. Calculations are archived as part of project documentation. The new number estimated for the whole project area is of a total of 149 sample plots described in the table below, for each stratum:

Table 11: Plots detail per stratum

Species	Year of plantation	Stratum	Area (ha)	Plots
Eucalyptus hybrid	2016	1	35.84	4
Eucalyptus hybrid	2017	2	44.74	3
Eucalyptus hybrid	2018	3	212.62	11
Eucalyptus hybrid	2019	4	166.50	9
Eucalyptus hybrid	2020	5	194.00	10
Eucalyptus hybrid	2021	6	203.80	12
Eucalyptus hybrid	2022	7	150	10
Eucalyptus hybrid	2023	8	150	10
Eucalyptus hybrid	2024	9	150	10
Eucalyptus hybrid	2025	10	150	10
Eucalyptus various	2016	11	24.95	2
Eucalyptus various	2018	12	3.20	1
Schinopsis	2016	13	81.20	5
Schinopsis	2017	14	20.09	2
Schinopsis	2018	15	15.97	1
Schinopsis	2019	16	64.96	4
Schinopsis	2020	17	20.79	1
Schinopsis	2021	18	60	4
Schinopsis	2022	19	150	10
Schinopsis	2023	20	150	10
Schinopsis	2024	21	150	10
Schinopsis	2025	22	150	10
		Total	2.349	149

- Mapping

The location of the plots will follow the guidance given by the corresponding methodological tool, as well as IPCC Good Practice Guidance for LULUCF (2002), Chapter 4.3.

For the location of the sampling units, the assistance of the ArcGIS 10.4 Software will be used. Therefore, the digital format is compatible for uploading to GPS navigating equipment. For field measurements, instruments which guarantee precision are used. The DBH will be measured with a haglof calliper and the heights with the sunnto clinometer. For the location of the plots, a Garmin Etrex Legend GPS navigator and Avenza Maps verification application will be used, with the cartographies and plots to be measured previously loaded, so the forest inventory crews can reach the plots accurately.

- Measurements

Each pool will be measured following the methodology procedures and IPCC Good Practice Guidance for LULUCF (2003).

Each source of GHG emissions/removals will be estimated ex post according to the equations described in section 3 and based on the following methods and monitored parameters:

- C_{TREE} (carbon stocks in above and below ground biomass of trees)

It will be estimated based on stratified random sampling method as described in section 3. For this purpose, V_{TREE} (stem volume of tree) will be calculated applying a manual of procedures developed for local conditions, based on diameter at breast height (DBH) and height (H) measurement in each plot.

- DBH measuring

By convention, the diameter is measured at 1.30 m from the ground level, so this measure remains standardized independently of the operator and its height. At this height the instrument is also easily to manage. The DBH is a direct measure from which it is possible to calculate the transverse area, the basal area, the individual and total volume, the growth and the form quotient of the tree, and other variables of interest. In the estimating processes that involve the use of regression functions, the DBH is always the first independent variable because of its easy assessment and for presenting normally a high correlation with the volume, weight and other dependent variables.

ND measuringIn the case of young plantations of Schinopsis, a genus with slow growth periods, neck diameter was measured instead of DBH if the maximum height of some individuals within the plot were less than 1.3mts. Based on Iglesias & Barchuk, 2010; Loguercio & Defossé 2001; Pérez-Cordero & Kanninen 2002 findings, neck diameter or diameter at base height (DBH) is considered more appropriate for young and/or small individuals. All heights values are measured. ND corresponds to the diameter at 10cm from ground level. For those with bifurcations in the base, the quadratic diameter is calculated.

- H measuring

The height of a tree or portion of it is the linear distance along its principal axis, departing from the ground up to the top or up to another referential point, always in conformity with the type of height that is needed

to measure. The height serves essentially for the calculation of volume and for the calculation of increases in height and in volume. Total Height refers to the distance between the ground and the apex along the principal axis.

- C_{DW} *(carbon stocks in deadwood):* this stock will not be calculated.

- C_{LI} (cabon stock in litter): is stock will not be calculated

Prior to the start of the inventory, all equipment used during the field work shall be checked and calibrated.

All plots are geo-referenced, using first tree in row 1 in direction to row 2. This first tree is marked with a small metallic sign in order to facilitate future monitoring, in the case Formosa plots, and with red aerosol, in the case of Chaco. All other three trees in plot corners are marked, visible only for monitoring purposes.

The plot is delimited using a 30 and 20mts measuring tapes. All trees with more than 50% within plot limit are considered, and at least 10 trees must be included within a plot, if not, third parties should communicate with the employee in charge of monitoring in order to define new plot size.The project will manage the sampling uncertainties evaluating and trying to reduce the type of errors.

Quality assurance and Quality control

The implementation of the monitoring plan includes a QA/QC system to minimize errors in measurement and data analysis, and to provide documentation and consistency in data archiving.

Quality Assurance measures are implemented, in order to verify that data quality objectives are met, and in general, to support the effectiveness of the QC system.

QA/QC plan includes procedures such as (1) hiring experienced third party contractors (2) assuring reliable field measurements, (2) documenting data entry and analysis techniques and (3) data maintenance and archiving.

Unitán will hire third party contractors for the forest inventories, with renowned experiences but its own personnel will be in charge of monitoring their work. Some of activities aiming at achieving accuracy and precision of data, and transparency of procedures are:

- Development of a Monitoring plan, stating objectives and methodology for contractors to follow
- Clear staff responsibilities and raising awareness about the importance of producing reliable results;
- General training on field measuring for staff in charge of analysing inventories reports;
- Request fully document and archive field and processed data: to ensure data preservation, all relevant monitoring documents (data, data analyses, static factors, photos, images, GIS

output and other data) will be stored in electronic and/or paper format and back-ups will be done periodically.

In addition, other measures include the following tasks:

- Measuring the geographical coordinates of the plot centre by GPS.
- Complete the plot data in the observation sheet.
- Carry out the measurements of DBH and height as described in this document and record the data in the measurement sheet.

The figure bellow shows an observation sheet used for monitoring during forest inventories in Formosa plots.

INVENTARIO EN PLANTACIONES DE UNITAN. Formosa 2021

PLANILLA 1: Datos Dasométricos De Schinopis.

Fecha: Planillero:

ID Parcela: **Coordenadas:**.....

.....

DATOS DE SITIO (seleccionar la opción correcta):

- Altitud (m.s.n.m):
- Formas de vida: epifitas gramíneas orquídeas otras:.....

➢ **ACTIVIDADES HUMANAS** (seleccionar la opción correcta)

- Incendios: presencia ausencia
- Pastoreo: presencia ausencia
- Erosión: presencia ausencia eólica hídrico

Nº IND	Dcue(cm)	HT(m)	Observaciones
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			

To control whether the measured data (DBH and height) of all plots have been correctly transferred to the Excel table and to minimise possible data transfer errors, the hired team of independent experts check whether the data (DBH and height) in the Excel table are realistic and consistent with the documentation sheet.

Plot quality control

To control whether the plots have been established correctly, two systems are used for plot identification: GPS and Cellular with the Avenza Maps application, for the location of the preliminary sampling points and the geo-referencing of the final points.

During the execution of the monitoring activities, one or more quality control checks may be carried out by Unitán on the service company on site, unannounced and as an audit. In this regard, the quality of the measurements made in the field shall be checked randomly on measurements of 5% of the plots carried out, using the same data collection form and cross-checking with the attached form:

Fecha								
Establecimiento								
Auditor								
Parcela								
Especie								
Año								
Variables:	Aceptable (si/no)	Comentarios						
Ubicación								
Identificación								
Error DAP								
Error H								
	Individuo (n°)	**Medido**		**Control**		**Error**		
		DAP	**H**	**DAP**	**H**	**DAP**	**H**	

The following aspects will be assessed:

- Location: the plot must be identifiable in the field and in accordance with the defined geographical location.
- Identification: the plot must be correctly identified and the area must correspond to the prescribed size.

- Measurement: the measurement sequence must be followed (first inventory data must match tree 1).
- Total height: differences of more than 5% in height measured with clinometer are not acceptable.
- DBH: differences of more than 3% in DBH measured with diameter tape are not acceptable.
- Based on the results obtained, a comparison will be made with the information sent by the inventory contractor, establishing an admissible criterion for variations in results as detailed in the table below.

Table- Maximum deviations admitted in plot controls

Criteria	Max deviation admited
DBH	3%
Total H	5%

Considerations

- The contractor will be responsible for the training of the personnel related to the calibration of the instruments, measurement technique and classification of the inventory data, based on the previously established criteria.

- In case of detection of errors greater than the admissible ones, the service company will have to carry out again 100% of the plot.

- The following points are considered to be serious problems:

  - Plots registered in the spreadsheet, but not located in the field.

  - Plots with incorrectly reported area.

  - Errors in the density of trees on the plot.

In addition, Unitán will carry out forest inventory surveys in some of the plots in order to keep track of species growth and general conditions which will be used to cross-check with the values surveyed during the full-scope inventories of the sample. During 2019 and 2020 Unitán conducted inventories in Chaco farms (Soc. Rural, Don Antonio and Ex- Glombosvky) used in this first verification period as cross-check with full scale forest inventories (documents available for VVB during verification upon request).

Data Storing

Unitán will control the information reported by the contractor by checking the field sheets against the information reported in the calculation files. If differences are found, they will be corrected and the final values will be those considered for the calculation of captured carbon.

All monitoring data are stored electronically and on paper (if available), including the monitoring spreadsheets, the Excel table with the monitoring data, GPS data, data and maps stored and generated in the GIS, spreadsheets, etc.

Forest inventory values, estimations and calculations are stored in company´s cloud system, in special folder, as well as all other company´s information used in other certifications. This will be recorded for at least 5 years, or needed for verification uses.

Organizational structure, responsibilities and competencies.

The organizational structure and responsibilities of Unitán forestry team with regards to the monitoring system are as follow:

- **General Area Director:** has the overall responsibility of the forest management area and thus, the monitoring plan;

- Administrative Coordinator: general supervision of personnel and approval of system documentation.

- **Property forest manager:** responsible for the operational management; resources monitoring; contractors and forestry inventories monitor; coordination and control of activities; supervision of technical operators; among other activities.

- Technical operator: provide access to contractors; supervising activities of contractor's staff inside the property; reporting finding to forests managers.

Project continuation and carbon conservation

As stated in the Non-Permanence Risk Report for the project, the PP´s objective is to continue the project for as many years as possible in order to provide supplies to its industry (both tannin and fuelwood) ensuring sustainable management in line with international demands, meaning the project will not finish once the crediting period is over. Schinopsis balansae Engl. has a long rotation period of 40 years or more, and there are very few commercial scale experiences due to this long term factor, and the historic general lack of knowledge on the species characteristics[93]. For this reason, previous to the project implementation, and since 1990, Unitán has been working in a research project planting small areas (average 10ha annually, with a maximum of 46ha in 1997), dedicated to study Schinopsis response and design the project accordingly, and with the intention to extend the project beyond the crediting period.

Moreover, there are many reasons to ensure that once a pasture land is converted into forestry it will remain that way in the long term:

[93] https://nordeste.conicet.gov.ar/quebracho-colorado-el-arbol-forestal-argentino-que-era-desconocido-para-la-ciencia/

- Due to an increase in the demand for timber and the lack of sustainable management of native forests, these areas are showing difficulty to recover; together with a potential customer´s demand, in the near future, on more sustainable management of resources the company is prone to find supply from plantations avoiding relying on native forest in the future.

- The main source of biomass for the energy plant is tannin industry wood waste but it is not enough, therefore, the company needs Eucalyptus plants to complete the biomass supply. Given the low area with forest plantations in the region, the project will become the main source of biomass for its plant.

- Unitán, together with the provincial government and the other main tannin company in the region (Indosur), are working in a large scale project promoting sustainable forest management through promotion plans, examples and small scale experiences[94].

- This goes in line with the provincial promotion of biomass plants, which will lead to an increase in industries and services related to forestry, further consolidating the activity and in the long term. If Unitán´s project was to be finished, land would continue under forestry activity by a third party.

The previous description shows that the demand for forestry products at a local level will continue in the long term. This, together with the government policies, will promote forestry production in the region, as the Unitán´s project. In summary, all the factors mentioned above represent arguments to ensure that the planted forest will continue after crediting period.

Nevertheless, if the cessation of plantation is the case after the final harvest, measures will be taken in order to manage the land accordingly to avoid carbon

[94] https://chaco.gov.ar/noticia/64046/el-gobierno-trabaja-en-el-abastecimiento-de-materia-prima-sostenible-y-de-calidad-para-las-tanineras

https://www.argentinaforestal.com/2010/09/13/formosa-establecimiento-santa-rosa-obtuvo-la-certificaci-sc-por-manejo-sustentable-de-bosques-nativos/

https://www.tresmandamientos.com.ar/2021/07/14/empresarios-forestales-proponen-un-pacto-de-gestion-forestal-sostenible-en-chaco/

http://www.unitan.net/Pacto-Gestion-Forestal-Sostenible.pdf

6 ACHIEVED GHG EMISSION REDUCTIONS AND REMOVALS

6.1 Data and Parameters Monitored

Data / Parameter	A_i
Data unit	ha
Description	Area of stratum i
Value applied	

Species	Year of plantation	Stratum	Area (ha)
Eucalyptus hybrid	2016	1	35.84
Eucalyptus hybrid	2017	2	44.74
Eucalyptus hybrid	2018	3	212.62
Eucalyptus hybrid	2019	4	166.50
Eucalyptus hybrid	2020	5	194.00
Eucalyptus various	2016	11	24.95
Eucalyptus various	2018	12	3.20
Schinopsis	2016	13	81.20
Schinopsis	2017	14	20.09
Schinopsis	2018	15	15.97
Schinopsis	2019	16	64.96
Schinopsis	2020	17	20.79

Comments	Stratum numbers were assigned considering projected stratums as well– *Eucalyptus gxc* 2021, *Eucalyptus gxc* 2022, etc – for these reason the ones shown in the table above do not follow a linear numbering. The total number is expected in 23 stratums

Data / Parameter	$A_{PLOT,i}$,
Data unit	ha
Description	Total area of sample plots in stratum i
Value applied	For *Schinopsis* sample plots are squares of 400m^2 For *Eucalyptus* sample plots are squares of 300m^2
Comments	-

Data / Parameter	DBH
Data unit	cm
Description	Diameter at breast height of tree
Value applied	See file "Forest inventory - Verification I"
Comments	In the case of young plantations of Schinopsis, with slow growth periods, neck diameter was measured instead.

Data / Parameter	Neck diameter (ND)
Data unit	cm
Description	Diameter 10 cm from land
Value applied	See file "Forest inventory - Verification I"
Comments	In the case of young plantations of Schinopsis, a genus with slow growth periods, neck diameter was measured instead of DBH as the maximum height in individuals within the plot was less than 1.3mts. based on Iglesias & Barchuk, 2010 findings, where neck diameter or diameter at base height is considered more appropriate for young and/or small individuals[95].

Data / Parameter	H

[95] Iglesias, M.R & Barchuk, H. (2010) Estimación de la biomasa aérea de seis leguminosas leñosas del Chaco Árido (Argentina) Ecología Austral 20:71-79. Abril de 2010. Asociación Argentina de Ecología in reference n° 86 in shared Google Drive folder

Data unit	m
Description	Height of tree
Value applied	See file “Forest inventory - Verification I” In general, total height of 6-10 trees per plot area measured and the rest calculated based on a regression equation; in other cases (p.e. in the case of *Schinopsis* in Formosa plots (15,16,17, 18) all heights are measured.
Comments	A sample of trees is measured in the plot and the rest estimated based on DBH, introduced in a double entrance equation.

Data / Parameter	Wi
Data unit	dimensionless
Description	Relative weight of stratum
Value applied	

		Stratum	Area (ha)	Wi
Eucalyptus híbrido	2016	1	35,84	0,04
	2017	2	44,74	0,05
	2018	3	212,62	0,24
	2019	4	166,50	0,19
	2020	5	194,00	0,22
Eucalyptus varios	2016	11	24,95	0,03
	2018	12	3,20	0,00
Schinopsis	2016	13	81,2	0,09
	2017	14	20,09	0,02
	2018	15	15,97	0,02
	2019	16	64,96	0,07
	2020	17	20,79	0,02

Comments	

Data / Parameter	Si^2
Data unit	(t d.m. ha-1) ^2
Description	Variance of tree biomass per hectare across all sample plots in each stratum
Value applied	See file “Forest inventory - Verification I”

Comments	

Data / Parameter	R_j
Data unit	dimensionless
Description	Root-shoot ratio for tree species j
Value applied	See file "Forest inventory - Verification I"
Comments	Values result from applying total estimated above-ground biomass to the recommended equation: $R_j = \frac{e^{(-1.085+0.9256\times\ln b)}}{b}$ where b is the total biomass in t.d.m

Data / Parameter	T
Data unit	Year
Description	Time period elapsed between two successive estimations of carbon stock
Value applied	In this first verification the calculation corresponds to carbon stock for the whole period
Comments	If the two successive estimations of carbon stock are carried out at different points of time in year t2 and t1, (e.g. in the month of April in year t1 and in the month of September in year t2), then a fractional value is assigned to T.

6.2 Baseline Emissions

Since continuation of an activity that has been applied without changes for more than 20 years has been selected as the baseline scenario, it is assumed, in agreement with IPCC Good Practice Guidance for Land Use, Land Use Change and Forestry (2003) that the net GHG removals by sinks in the baseline equals zero.

6.3 Project Emissions

Unitán project activity does not have GHG emissions. However, this chapter refers to the removals of GHG performed by this project activity.

Net anthropogenic GHG removals by sinks is estimated as the actual net GHG removals by sinks minus the baseline net GHG removals, minus leakage. The following general formula described in the methodology is used to calculate the net anthropogenic GHG removals by sinks of an A/R project activity, in t CO2-e:

$$C_{AR-CDM} = \Delta C_{ACTUAL} - \Delta C_{BSL} - LK$$

Where:

C_{AR-CDM}	=	Net anthropogenic GHG removals by sinks; tCO_2-e
ΔC_{ACTUAL}	=	Actual net GHG removals by sinks; tCO_2-e
ΔC_{BSL}	=	Baseline net GHG removals by sinks; tCO_2-e
LK	=	Total GHG emissions due to leakage; tCO_2-e

The actual net greenhouse gas removals by sinks were estimated using the following equation described in the methodology:

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

Where:

ΔC_{ACTUAL}	=	Actual net greenhouse gas removals by sinks; tCO_2-e
ΔC_p	=	Sum of the changes in above-ground and below-ground tree biomass, dead wood, litter and soil organic carbon stocks in the project scenario; tCO_2-e
GHG_E	=	Increase in GHG emissions as a result of the implementation of the proposed A/R CDM project activity within the project boundary; tCO_2-e

In this case, dead wood, litter and SOC stocks are not considered.

The following formula described in the methodology is used in order to estimate GHG emissions:

$$GHG_E = \sum_{t=1}^{t*} GHG_{E,t}$$

Where:

GHG_E = Increase in GHG emissions as a result of the implementation of the proposed A/R CDM project activity within the project boundary; tCO_2-e

$GHG_{E,t}$ = Increase in non-CO2 emissions fue to biomass burning of existing vegetation as part of site preparation in year t; tCO_2-e

t = 1,2,3,……. t* years elapsed since the start of the A/R CDM project activity

The tool for "Estimation of non-CO_2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity" has been considered. The use of fire for site preparation and/or to clear the land of harvest residue prior to replanting is specifically excluded from the project management and therefore project emissions are estimated as zero.

Carbon stock changes:

ΔCP is the sum of the changes in above-ground and below-ground tree biomass, dead wood, litter and soil organic carbon stocks in the project scenario. Calculations are described below.

$$\Delta c_P = \Delta c_{TREE} + \Delta c_{DW} + \Delta c_{LI} + \Delta c_{SOC}$$

Where:

ΔC_p = Change in carbon stock in all selected carbon pools in the project scenario, tCO_2-e

ΔC_{TREE} = Change in carbon stock in tree biomass in project, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; tCO_2-e

ΔC_{DW} = Change in carbon stock in dead wood biomass in project, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"; tCO_2-e

ΔC_{LI} = Change in carbon stock in litter biomass in project, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"; tCO_2-e

ΔC_{SOC} = Change in carbon stock in SOC in project, in areas of land meeting the applicability conditions of the tool "Estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities", as estimated in the same tool; tCO_2-e

Neither ex-ante estimations, nor this monitoring period estimations accounted for dead wood, litter and soil organic carbon pools in the project. Following is presented the equation used for the estimation of ΔCP:

$$\Delta C_P = \Delta C_{TREE}$$

Where:

ΔC_p = Change in carbon stock in all selected carbon pools in the project scenario; tCO_2-e

ΔC_{TREE} = Change in carbon stock in tree biomass in project, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"; tCO_2-e

Biomass carbon pools

Above and below ground biomass have been estimated according to the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activity Version 4.2". Carbon estimations in trees are based on field measurements of monitored parameters, described in section 5.3.

Calculations are archived as part of the project verification and will be available for the verification team.

The aboveground biomass corresponds to tree biomass, no shrubs are considered for estimation. The method used for estimating change in carbon stock in trees is the "stock change method". Change in carbon stock in trees in two successive points in time is calculated as the difference between the two estimated stocks. As this is the first monitoring report the carbon values in every pool is the final result, the starting point of the crediting period is zero carbon.

As in ex-ante estimations, the following equations were used in order to estimate above and below ground biomass ex-post measurements:

According to this method, mean carbon stock in trees within the tree biomass estimation strata and the associated uncertainty will be estimated as follows:

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

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

$$b_{TREE} = \sum_{i=1}^{M} w_i \times b_{TREE,i}$$

$$u_C = \frac{t_{VAL} \times \sqrt{\sum_{i=1}^{M} w_i^2 \times \frac{s_i^2}{n_i}}}{b_{TREE}}$$

Where:

C_{TREE} = Carbon stock in trees in the tree biomass estimation strata; tCO_2-e

CF_{TREE} = Carbon fraction of tree biomass; t C $(t.d.m)^{-1}$

A default value of 0.47 is used unless transparent and verifiable information can be provided to justify a different value.

B_{TREE} = Tree biomass in the tree biomass estimation strata; t.d.m

A = Sum of areas of the tree biomass estimation strata; ha

b_{TREE} = Mean tree biomass per hectare in the tree biomass estimation strata; t.d.m ha^{-1}

w_i = Ration of the area of stratum *i* to the sum of areas of tree biomass estimation strata (i.e. $w_i=A_i/A$); dimensionless

b_{TREEi} = Mean tree biomass per hectare in stratum *i*; t.d.m. ha^{-1}

Uc = Uncertainty in C_{TREE}

T_{val} = Two-sided Student´s t-value for a confidence level of 90 per cent and degrees of freedom equal to n-M, where n is total number of sample plots within the tree biomass estimation strata and M is the total number of tree biomass estimation strata

s_i^2 = Variance of tree biomass per hectare across all sample plots in stratum *i*; (t.d.m. ha^{-1})^2

n_i = Number of sample plots in stratum *i*

Tree biomass (BTREE) is estimated using:

$$B_{TREE,l,j,p,i} = f_j(x_{1,l}, x_{2,l}, x_{3,l}, \ldots) \times (1 + R_j)$$

$$B_{TREEj,p,i,t} = V_{TREEj,p,i,t} * D_J * BEF_{2,J} * (1 + R_J)$$

Where:

$B_{TREE,j,p,i,t}$ = Biomass of tree of species j in sample plot p of stratum i, at mid-2021

f_j = Above-ground biomass of the tree returned by the allometric equation for species j relating the measurements of tree l to the above-ground biomass of the tree; t d.m.

Rj = Root shoot ratio for tree species j;dimensionless

The value of R_j is estimated as:

$$R_j = \frac{e^{(-1.085+0.9256\times \ln b)}}{b}$$

where b is the above-ground tree biomass per hectare (in t.d.m.ha^{-1}), unless transparent and verifiable information can be provided to justify a different value.

Note, if trees have grown as coppice regeneration after a harvest, then the value of R_j should be multiplied by a factor equal to $V_{harvest}/V_{tree}$ or 1, whichever is greater, where $V_{harvest}$ is the volume per hectare of trees harvested and V_{tree} is the volume per hectare of trees standing in the plot at the time of measurement

$V_{TREE,j,p,i,t}$ = Stem volume of tree species using field measurements of tree parameters (DBH, neck diameter, height), default values (tree shape factor) and complemented with worksheets data processing (interpolation of non-measured heights); m3.

In this case, the applied equation for stem volume estimation (V_{tree}) is an equation which considers DBH and H of the inventoried plantation.

For *Eucalyptus*, the equation used is the one recommended for Northeast region by the National Institution of Agricultural Technology (INTA) from Glade J (1984)[96]:

[96] Reference from "Normas de inventario forestal para los planes de manejo predial. Proyecto de implantación de un modelo de desarrollo forestal sustentable en Argentina y Uruguay". INTA 2006 and "Curso: Principios técnicos para el cultivo de especies Forestales de Entre Ríos Planificación, Inventario y cubicación" INTA and Ministerio de Agroindustria, 2017. In reference N° 82 of shared Google Drive folder

V_{TREE} (m3) = exp(-3.11072 + 1.83316. LN(DBH)+ 1.07762 LN(H))

For the case of *Schinopsis balansae*, given there is no data available, and in line with the Second National Native Forest Inventory (INBN2)[97], when the minimum height of the plantation allows it, a general equation is used:

V_{TREE}= -0.09996+0.00057954*DBH^2 (V being stem volume over bark)[98]

Given for these verification period the plantations are young and some individuals less than 1.3mt tall, the biomass was estimated based on neck diameter, 10 cm above ground, replacing DBH values in equation.

While the *Schinopsis* plantations are young and do not reach the minimum BDH values, a modified version of the allometric equation by Atanasio et al. 2013[99] will be used:

Above-ground biomass (t.d.m)= 0.05619*ND^2.7152.

Where ND is neck diameter

According to the methodology, for ex-post estimation, the volume equation used must be demonstrated to be appropriate for the purpose of estimation of tree biomass by applying the tool "Demonstrating appropriateness of volume equations for estimation of aboveground tree biomass in A/R CDM project activities". The appropriateness of the equations is demonstrated through the satisfaction of the following conditions, in the sense that the formula is very generic and applicable in any case:

- The equation has been used for volume estimation for the same specie for more than 10 year is commercial forestry industry, demonstrated by the fact that the equation for used for Eucalyptus is the one promoted by the national agroindustry Ministry and INTA for, at least, the last 15 years for commercial plantation inventories (as stated in reference 63).
- The equation has been used in National Forest Inventories, demonstrated in the references, where the *Schinopsis* volumetric equation is used in the Second Native National Forest Inventory

In the case of young *Schinopsis* plantations, the equation used is provided by the National Institution for Agricultural Technology (INTA), based on a sample of 15 trees at Almirante Brown

[97] Volume for *Schinopsis balasae:* Segundo Inventario Nacional de Bosques Nativos (INBN2). Informe Región Forestal Parque Chaqueño. Primera revision. 2020. Section with equation at: Annex 4. Table 34. Available at: https://www.argentina.gob.ar/ambiente/bosques/segundo-inventario-nacional-bosques-nativos.

[98] Source for the equation: PINBN analysis

[99] Atanasio, et al. (2013) Determinación de biomasa aérea en Quebracho Colorado Santiagueño (*Schinopsis* quebracho colorado Schlencht), en el Chaco Semiárido. ISSN 1669-6786 4to Congreso Forestal Argentino y Latinoamericano Iguazú 2013. PONENCIAS. Trabajo N° 24. INTA. In reference N° 85 in shared Google Drive folder

Department, Chaco for *Schinopsis* quebracho colorado Schlencht given the lack of data for *Schinopsis balansae*, but can be considered extrapolated to young *Schinopsis.*

D_j = Basic wood density of tree species j. This parameter was established as "available at validation", thus it was not measured or monitored. The value was obtained and corresponds to Winck et al 2020 estimated value for *Eucalyptus* and a default value from INTI for *Schinopsis*[100]

$BEF_{2,j}$ = Biomass expansion factor for conversion of stem biomass to above-ground tree biomass, for tree species j (Pinus sp.); dimensionless. The BEF2 is to be used in connection to growing stock biomass data and not with increment data, as described in chapter 3.2 of the GPG for LULUCF (2003)). The value was also available at validation and not monitored, it ranged from 3.4 (for young forest) to 1.15 (mature forests) and the exact values applied for different plantation dates are reported in the final worksheet for carbon stock calculation.

6.4 Leakage

As it has been stated in previous sections of this document, the methodology requires the assessment of sources of leakage due to activity displacement (conversion from grazing land to forestry). Application of the tool "Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity" led to the conclusion that this source can be neglected. This is so as the total area under project activity is not afforested in the same year, first areas were planted in 2016, and the last ones in 2025. The impact of this staggered plantation plan substantially reduces the eventual grazing displacement, cattle that has to be moved to other areas can be put in farms that were not afforested or in areas that have more than two/three years with plantation owned by Unitán.
It was already demonstrated that the project areas are degraded or degrading, and because the grazing animals are moved to neighbour zones (to control during on-site validation visit), the same conditions apply to this specific area.

Beyond all, we believe the application of the tool "Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity" is not necessary. The application of the "Guidelines on conditions under which increase in GHG emissions related to displacement of pre-project grazing activities in A/R CDM project activity is insignificant", which was superseded by the previously mentioned tool, resulted in the conclusion

[100] INTI report Available at:
https://www.inti.gob.ar/publicaciones/descargac/365+&cd=1&hl=es&ct=clnk&gl=ar

that the project will not cause any displacement of the activity occurring before project implementation.

6.5 Net GHG Emission Reductions and Removals

Biomass was estimated based on the forest inventory conducted between June 10th and August 15th of year 2021, meaning this first monitoring period is from September 16th, 2016 to August 15th, 2021. The total emission removals for the period equals 11,335.38 tnCO2e, subjected to buffer withdrawal (-10%), as detailed in table below.

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)	Buffer pool allocation	VCUs eligible for Issuance
2016	0	755.692	0	755.692	75.569	680.123
2017	0	2,267.076	0	2,267.076	226.708	2,040.368
2018	0	2,267.076	0	2,267.076	226.708	2,040.368
2019	0	2,267.076	0	2,267.076	226.708	2,040.368
2020	0	2,267.076	0	2,267.076	226.708	2,040.368
2021	0	1,511.384	0	1,511.384	151.138	1,360.246
Total	0	11,335.38	0	11,335.38	1,133.538	10,201.84

The uncertainty for carbon stock in trees level calculated for this verification period according to the AR tool 14 Version 4.2 in equation 15 equals 0,135 (1,85%), so no discount is necessary according to appendix 2.

LTA value ex-post updated, based on calculated biomass values for the first 5 years of the project lifetime, equals **123.325tCO_2e**, meaning all net GHG emission removals (minus buffer pool allocation) are eligible for VCUs issuance. Calculations are as follows:

The long-term average GHG benefit (LTA) is determined by averaging the expected total GHG benefit for the length of the project. As explained in Section 3.2.21 VCS Standard V4.2, the Long Term Average GHG benefit shall be calculated by establishing the period over which the long-term

average GHG benefit shall be calculated, including at minimum one full harvest/cutting cycle. Then, the project has to:

- Determine the expected total GHG benefit of the project for each year of the established time period. For each year, the total GHG benefit is the to-date GHG emission reductions or removals from the project scenario minus baseline scenario.
- Sum the total GHG benefit of each year over the established time period.
- Calculate the average GHG benefit of the project over the established time period.
- Use the following equation:

$$LA = \frac{\sum_{t=0}^{n} PE_t - BE_t}{n}$$

Where:

LA = the long-term average GHG benefit

PE_t = the total to-date GHG emission reductions and removals generated in the project scenario (tCO_2e). Project scenario emission reductions and removals shall also consider project emissions of CO_2, N_2O, CH_4 and leakage.

BE_t = the total to-date GHG emission reductions and removals projected for the baseline scenario (tCO_2e)

t = Year

n = Total number of years in the established time period

In this sense, taking into consideration that plantations will take place till year 2025 and Schinopsis harvest year is 40 years, then the period over which the long-term average GHG benefit shall be calculated (n) is 50 years.

For this project the total GHG benefit expected at the end of crediting period, corrected to the biomass values measured during the first five years (2016-2021), is 175.699 tCO_2e. The sum of the expected GHG benefit annually when divided by 50 years (period for estimating LTA) results in 123,325tCO_2e as seen in the following table. This amount is subject to buffer withholding.

	Baseline scenario: to-date GHG emission reductions and removals at year t	**Project scenario: to-date GHG emission reductions and removals at year t**	**Annual change in GHG benefit**	**Expected total GHG benefit to-date**	**Total credits available each year**

Year	BE	PE	PEt - PEt-1	PEt - BEt	
2016	0	85	85	85	85
2017	0	1.158	1.072	1.158	1.072
2018	0	3.451	2.293	3.451	2.293
2019	0	10.025	6.574	10.025	6.574
2020	0	23.336	13.311	23.336	13.311
2021	0	42.353	19.017	42.353	19.017
2022	0	60.592	18.239	60.592	18.239
2023	0	82.560	21.968	82.560	21.968
2024	0	81.052	-1.508	81.052	0
2025	0	89.462	8.410	89.462	8.410
2026	0	98.859	9.398	98.859	9.398
2027	0	109.285	10.425	109.285	10.425
2028	0	120.990	11.705	120.990	12.531
2029	0	131.228	10.239	131.228	0
2030	0	114.286	-16.942	114.286	0
2031	0	102.546	-11.740	102.546	0
2032	0	112.284	9.738	112.284	0
2033	0	123.189	10.905	123.189	0
2034	0	134.974	11.785	134.974	0
2035	0	139.210	4.235	139.210	0
2036	0	123.028	-16.182	123.028	0
2037	0	110.712	-12.316	110.712	0
2038	0	120.502	9.790	120.502	0
2039	0	132.228	11.726	132.228	0
2040	0	143.711	11.483	143.711	0
2041	0	154.378	10.667	154.378	0
2042	0	138.467	-15.911	138.467	0
2043	0	127.327	-11.140	127.327	0
2044	0	138.300	10.973	138.300	0
2045	0	150.681	12.381	150.681	0
2046	0	164.102	13.421	164.102	0
2047	0	176.315	12.213	176.315	0
2048	0	161.888	-14.427	161.888	0
2049	0	152.415	-9.473	152.415	0
2050	0	164.479	12.064	164.479	0
2051	0	177.721	13.242	177.721	0
2052	0	191.894	14.173	191.894	0
2053	0	204.797	12.903	204.797	0
2054	0	184.704	-20.093	184.704	0

2055	0	175.699	-9.005	175.699	0	Crediting Period (40 years)
2056	0	171.324	-4.375	171.324	0	
2057	0	176.548	5.224	176.548	0	
2058	0	172.304	-4.244	172.304	0	
2059	0	165.968	-6.336	165.968	0	
2060	0	158.955	-7.012	158.955	0	
2061	0	148.071	-10.885	148.071	0	
2062	0	146.429	-1.641	146.429	0	
2063	0	145.801	-628	145.801	0	
2064	0	116.364	-29.438	116.364	-29.438	
2065	0	90.202	-26.162	90.202	-26.162	6.166.238
						123.325

APPENDIX 1: Invitations to the Stakeholders Consultation Meeting.

Unitán

Formosa, 13 de julio de 2021

Sra.
María Rosa Bandeo
Presente

De mi consideración:

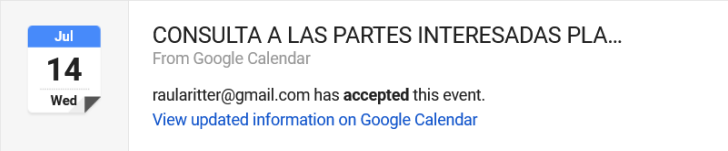
Me dirijo a Ud. a fin de invitarlo a participar de la Reunión de Consulta a las Partes Interesadas / Stakeholders, la que se hará por la plataforma meet, cuyos datos enviaremos en breve.

En la misma se dará a conocer el ***Plan de Manejo Forestal, Ambiental y Social*** de UNITAN, y la relación de nuestras Forestaciones con la captura de Carbono y su Certificación.

Mucho nos gustaría contar con su participación, el próximo día 14 de julio de 2021 a las 10.30 hs.

Agradeciéndole desde ya su presencia, saludamos a Ud. muy atentamente.

Written letter invitation to Local Stakeholders Consultation



Jul
14
Wed

CONSULTA A LAS PARTES INTERESADAS PLA...
From Google Calendar

raularitter@gmail.com has **accepted** this event.
View updated information on Google Calendar

Google Calendar format to Local Stakeholders Consultation

Date: mar, 13 jul 2021 a las 9:09
Subject: INVITACION CONSULTA A LAS PARTES_PROYECTO FORESTACIÓN_CAPTURA DE CARBONO UNITAN
To: <liliana-beatriz09@hotmail.com>
Cc: Gil Antonio Oscar <aogil@unitan.net>

Estimada Liliana:

Unitán tiene el objetivo de certificar sus forestaciones de Chaco y Formosa..

Para ello la norma exige, invitar a una audiencia pública a las partes que pueden estar interesadas en el proyecto o les sea de utilidad su conocimiento atento las ventajas de dicha certificación.

Es por ello que lo invitamos a participar de dicha audiencia mediante la invitación adjunta.

Mucho nos agradaría que nos acompañe
Reciba un cordial saludo.

PD: apreciaremos, por requisitos de la norma de certificación, nos confirme la recepción de la presente.
Gracias!!

MEET-CONSULTA A LAS PARTES INTERESADAS PLAN DE MANEJO FORESTAL, AMBIENTAL Y SOCIAL DE UNITAN SAICA
Miércoles, 14 de julio · 10:30am – 12:00pm
Información para unirse a Google Meet
Enlace a la videollamada: https://meet.google.com/cup-maci-qfr
O marca el: (AR) +54 11 3986-3700 PIN: 139 373 261 4974#
Más números de teléfono: https://tel.meet/cup-maci-qfr?pin=1393732614974

Email invitation format to Local Stakeholders Consultation

APPENDIX 2: Transcripts of Public Comments during Local Stakeholders Consultation

Stakeholder	*Comment/Claim*	*Answer*
Patricia (vecina Formosa Capital)	Sobre la s*elección de especies exóticas. ¿Por qué se seleccionaron? Y hacer forestación desde una visión de cuenca.*	*José Otaran (UNITÁN): Buscaremos replicarlo, e incorporar vecinos desde la visión de Cuenca*
Sergio Soto (presidente Corfor)	*lo importante de estos proyectos para poder cuidar el capital natural. Producir dentro de los límites de la naturaleza.*	*Ariel (Tec..Forestal de Pto. Tirol) rescató la importancia del proyecto de forestación en Chaco, ya que es un proyecto que genera dinamismo económico en la provincia.*
María Rosa (docente Vecina Formosa Capital)	*se refiere a los impactos ambientales que han producido la empresa en los últimos 100 años.*	*Javier Vazquez (ProSustentia) hace hincapié que esta reunión de consulta es para debatir sobre el proyecto de forestación, que los impactos que otras actividades productivas de la empresa hayan producido tiempo atrás es debate para otro espacio.*
Natalia (directora de escuela primaria y jardín en Puerto Tirol)	*la importancia de esta reunión para poder entender y poder comunicar el proyecto. Entenderlo y poder participar.*	*Antonio Gil (UNITÁN): los invitamos a conocer las plantaciones en cuanto la cuarentena y la pandemia, y el crecimiento de las especies lo permitan.*
Liliana (docente directora Pto. Tirol)	*¿hay un plan de actividades para acompañar el proyecto?*	
Patricia (docente de consejo de Ing forestales de Chaco)	*esperamos los resultados de este proyecto, que es experimental, para poder analizarlos. Es muy importante poder pensar acciones conjuntas para poder llevarles a los alumnos los resultados de este proyecto privado experimental*	
Dante (Formosa)	*en la zona no creían en la reforestación. Hasta el intendente lo pensaba como una pantalla. Muchas veces se tomaban los créditos para reforestar, se plantaban 5 plantas y nada más. Nunca se sostuvo en el tiempo. Unitán es la primera que está tomando en serio este tema*	

Lucas Vera (técnico forestal, Chaco)	*este proyecto plantea un cambio sociocultural, ya que históricamente se trabajó en la extracción de bosque nativo. Es importante este cambio. ¿Este proyecto sólo se puede llevar adelante en terrenos de la empresa o está abierto a hacerlo en tierras de terceros?*	*Ariel López Matos: estamos abiertos a llevar adelante modelos de implantación o regeneración en terrenos terceros o arrendados.*