

“URUNDAY” AFFORESTATION PROJECT

Document Prepared by Nullaexitus



Name	"URUNDAY", Afforestation Project
Location	-29.434167°, -56.898611°, Paso de los Libres, Corrientes, Argentina.
Start Date	January 01, 2016
End Date	December 31, 2046
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1. PROJECT DETAILS

1.1 Project Summary Description

The project encompasses a total of 3,143 hectares with low vegetation cover or grasslands, where forest plantations will be established to obtain high-value, long-life timber products and to sequester large amounts of carbon dioxide from the atmosphere. The program is based on Eucalyptus plantations with a rotation of 15 to 17 years, managed with pruning and two thinning operations, to obtain large-diameter, knot-free logs suitable for sawmilling. The plantation is complete at the time of submitting this document for VCU analysis, and the forests will be replanted after clearcutting.

The practices operate under the FSC standard. Planted forests will remove carbon dioxide from the atmosphere and store it in different carbon pools (aboveground and belowground living biomass, litter, dead wood). Project monitoring will quantify changes in carbon pools exclusively within the aboveground biomass (AGB) and belowground biomass (BGB) pools of the planted trees (*Eucalyptus Grandis*). Ex-ante estimates are primarily performed by applying biomass expansion factors (BEF) and wood density (D) to projected stem volumes through locally calibrated growth models. These estimates, as well as the basis for ex-post AGB monitoring, are regularly supported and verified through field measurements (DBH, Height) carried out in permanent sampling plots, whose data are also used with specific allometric equations to validate and/or adjust biomass projections. BGB will be estimated using an appropriate root-shoot ratio (R), applied to AGB estimates. Carbon pools corresponding to dead wood, litter, soil organic carbon, and harvested wood products have been conservatively excluded from project accounting.

The non-permanence risk assessment, which considers local factors such as fires, pests, and land-use stability, has resulted in a 10% buffer being allocated to estimated removals. The collection, management, and quality assurance of all monitoring data will follow defined standard operating procedures and protocols established in the UNLP methodology. The baseline study determined that the pre-project condition would be the most common use for the area. Additionality is demonstrated by the fact that the expected internal rate of return of the proposed project activity without considering carbon finance is lower than the benchmark internal rate of return for this type of investment in the Mesopotamian region of Argentina where this project is being implemented. Furthermore, the barrier analysis and common practice analysis showed that afforestation in the proposed project activity area is unlikely to occur without carbon finance. The project will result in a significant contribution to the sustainable development of Argentina and the Mesopotamian region, mainly through i) increased employment and quality of employment; ii) rural development (decentralization); iii) increased gross production value.

1.2 Project proponent

The project proponent is "Nullaexitus," a trade name under a CUIT (IRS ID in Argentina) enabled by the corresponding regulatory body, number 20-31963401-1.
Contact: info@nullaexitus.com.ar

1.3 Relationship between Project Proponent and Landowner

The physical spaces used for afforestation subject to this presentation are leased. The corresponding documentation is attached.

Likewise, documentation is attached linking the lessee and the project proponent, authorizing the latter to carry out the corresponding procedures in all matters related to the technical aspects of the carbon credits arising from the afforestation spaces, such as carbon rights.

1.4 Other Entities Involved in the Project

There are no other entities involved in the project.

1.5 Project Objectives

The objective of the project is the sequestration of large quantities of carbon dioxide from the atmosphere, as well as obtaining high-value, long-life timber products guaranteed by the FSC methodology used. As complementary objectives, the project will result in a significant contribution to the sustainable development of Argentina and the Mesopotamian region, mainly through i) increased employment and quality of employment; ii) rural development (decentralization); iii) increased gross production value.

1.6 Project Location.

The project georeference is established. A ".kml" file is attached.

Polygon 1 77 Ha.	Polygon 2 85 Ha.	Polygon 3 54 Ha.
29°32'50"S 56°57'27"W 29°32'17"S 56°56'47"W 29°31'32"S 56°57'43"W 29°32'40"S 56°58'20"W	29°25'46"S 56°53'58"W 29°25'57"S 56°54'13"W 29°26'25"S 56°53'49"W 29°26'26"S 56°58'20"W 29°26'20"S 56°53'31"W	29°24'49"S 56°53'17"W 29°24'24"S 56°53'40"W 29°24'11"S 56°52'52"W 29°26'20"S 56°53'31"W

Polygon 4 45 Ha.	Polygon 5 51 Ha.	Polygon 6 2.983 Ha.
29°32'15"S 56°58'07"W 29°32'57"S 56°57'20"W 29°32'00"S 56°57'09"W 29°32'17"S 56°56'47"W 29°32'25"S 56°56'54"W 29°32'29"S 56°57'10"W 29°32'16"S 56°57'39"W 29°32'22"S 56°57'50"W	29°31'57"S 56°58'09"W 29°31'33"S 56°57'43"W 29°31'49"S 56°57'44"W 29°31'57"S 56°57'33"W 29°32'03"S 56°57'44"W 29°32'03"S 56°57'58"W	29°11'44"S 57°10'18"W 29°11'07"S 57°05'46"W 29°10'36"S 57°05'25"W 29°09'33"S 57°06'44"W 29°08'31"S 57°07'03"W 29°08'12"S 57°07'55"W 29°07'24"S 57°08'10"W 29°08'13"S 57°09'18"W 29°08'40"S 57°08'42"W

The map in Fig.1 shows the project location

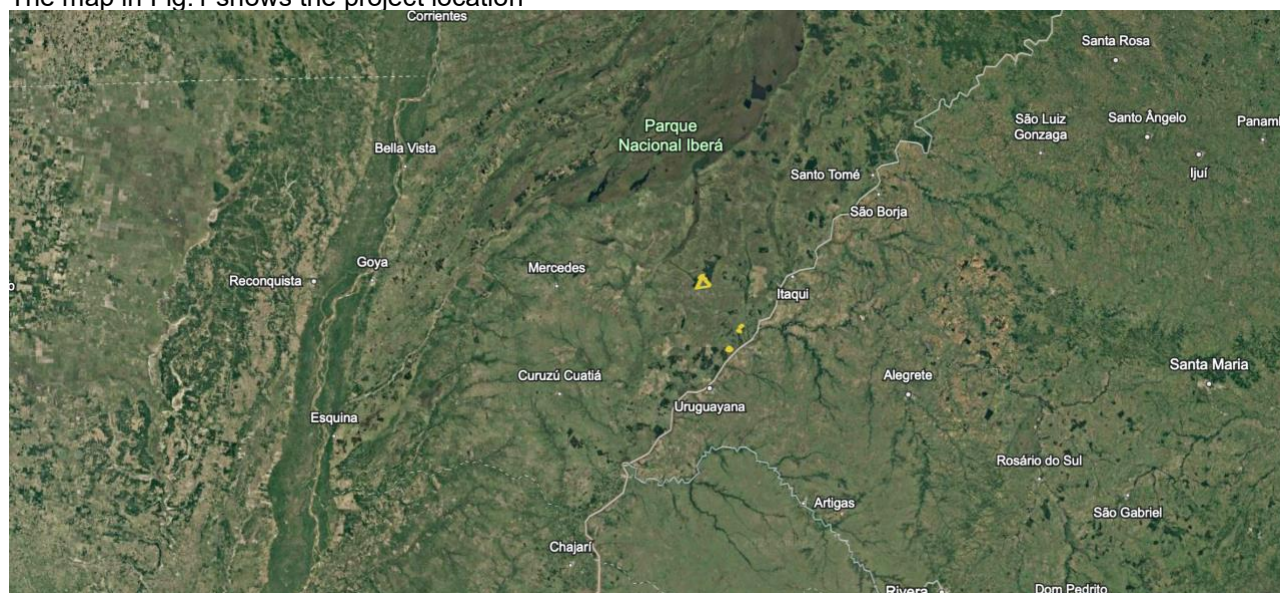


Figure 1. Map of the region, detailing area included in the project.

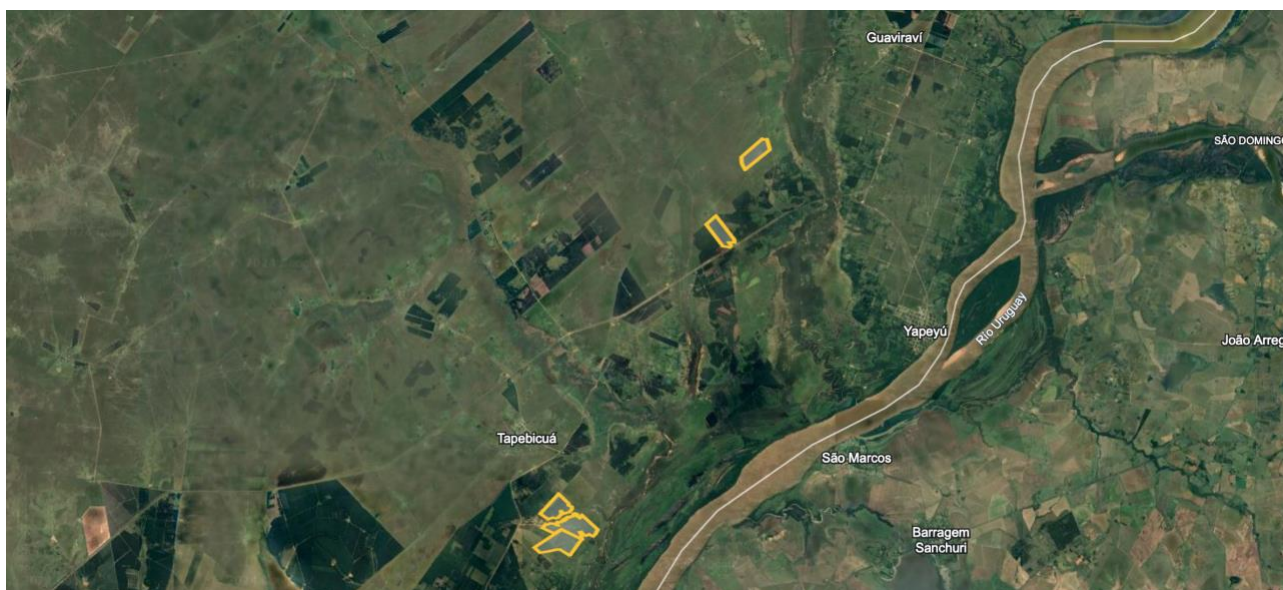


Figure 2. Map of the region, detailing area included in the project.

1.7 Project Type

The project is classified as "Afforestation" as no pre-existing tree plantation was verified at the start date and the land had low vegetation cover or grasslands, as detailed in later sections of the document.

1.8 Project Start and End Date

The Project's crediting period will be 31 years starting from January 01, 2016 (when activities for greenhouse gas removal were first considered), ending on December 31, 2046

1.9 Project Scale and Estimated GHG Emission Reductions or Removals

Urunday Project is classified as "Afforestation" and will remove a total of 1,035,361.6 tCO₂ during its 31-year period. This means an average of 33,398.80 tCO₂ per year.

Table 01 | Estimated GHG Emissions Removed "Urunday"

YEAR	ESTIMATED GHG REMOVED
2016	13.017,1
2017	18.024,7
2018	22.365,1
2019	24.717,3
2020	29.054,1
2021	34.998,0
2022	39.698,6
2023	44.573,7
2024	47.876,1
2025	48.942,5
2026	49.484,2
2027	50.270,5
2028	53.013,5
2029	30.126,0
2030	9.073,4



2031	8.561,0
2032	13.017,1
2033	18.024,7
2034	22.365,1
2035	24.717,3
2036	29.054,1
2037	34.998,0
2038	39.698,6
2039	44.573,7
2040	47.876,1
2041	48.942,5
2042	49.484,2
2043	50.270,5
2044	53.013,5
2045	30.126,0
2046	5.504,4
TOTAL REMOVAL	1.035.361,6
TOTAL ACCREDITED YEARS	31
ANNUAL AVERAGE EMISSIONS REMOVED	33.398,80

1.10 Project Activity Description

The project covers a total area of 3,143 ha, which was previously grassland before forest development.

The forests consist of Eucalyptus (Grandis) plantations managed with a rotation period of 15 to 17 years.

The main objectives of the project activity are timber production and carbon sequestration through afforestation. The forest plantation has been complete since January 01, 2016, with planting activities carried out beforehand, and the forests will be replanted after clearcutting. The project's crediting period is 31 years. All practices are executed under the FSC standard, ensuring sustainable forest management.

The planted forests remove carbon dioxide from the atmosphere and store it in different carbon pools (aboveground and belowground living biomass, soil organic carbon, litter, and dead wood). Aboveground and belowground biomass carbon pools will be accounted for carbon credit (VCU) issuance. For this, aboveground biomass will be monitored, and belowground biomass will be estimated through models and conversion factors.

Corresponding measures for proper fire management have been considered in the project.

Biological Corridors

Forest plantations are designed with the aim of establishing conditions that favor the movement of flora and fauna (avoiding fragmentation). The project is prepared to favor connectivity between lowlands and native forests, although the presence of the latter is not a dominant part of the site's geography.

The delimitation of the stands is carried out before soil preparation. Following the planting design, preparation was done with a plowing machine. The main internal roads are approximately 12 meters wide and follow the watershed line. Secondary internal roads are made following the watershed approach and are approximately 8 meters wide.

The delimitation of stands will be carried out according to the following general criteria, when applicable according to the type of boundary. The criteria used arise from best practices suggested by VCS.



Table 02 | Delimitation Criteria

Minimum distance limits	
Rivers and Stream	5 m
Wetlands	5 m
Lakes	10 m
Cultural Sites	20 m
Native Forests	20 m
Firebreaks	12 m
Adjoining Neighbours	25 m
Power Lines	
High Voltage	80 m
Medium Voltage	30 m
National, Provincial Road, railways, etc.	15 m

Plantations are established following appropriate criteria to stop any existing degradation process.

The delimitation of stands is carried out only within planting strips, which tend to follow a perpendicular pattern across the main slope (with a 2% gradient).

Sample pits are dug before tilling activities to support the decision to subsoil and define the appropriate depth of the operation. Subsoiling is performed when soil bulk density is greater than 1.4 g/cm³. In sandy soils with a bulk density lower than 1 g/cm³, no subsoiling is performed. In all cases, shallow plows are used to loosen the soil and eliminate air pockets.

Weed control in the entire area where the plantation will be established is applied before delimitation activities (glyphosate application). A second application over the entire area is carried out one week before the planting operation. Up to one month after planting, a pre-emergent herbicide could be applied only in one-meter-wide strips after the planting rows. From one to one and a half years after planting, some additional control might be applied depending on weed responses.

Tractors were used for the required soil movements. This would allow plants to have better root-soil contact, favoring soil exploration and greater survival.

Planting and Fertilization

The site was manually planted with 720 seedlings per hectare.

Table 03 | Planting Design

Species	Density (Tress/ha)	Row Spacing (m)	Planting Spacing (m).
Eucalyptus	720	4.0	3.5

Soil analysis was performed before stand delimitation to determine the necessary fertility level and fertilization. Fertilizer is applied only when deficiencies are identified. Application is done by hand, no later than 15 days after planting

Silviculture

Three pruning/thinning operations are projected during the program execution.

Table 04 | Pruning Operations

Pruning	Crown Pruning Percentage	Dominant Height (m)	Pruning Height (m)	Number of Trees
1st	50	7.00	2.3 – 3.3	600
2nd	50	9.50	4.40	350
3rd	45	11.00	5.6	350



A pre-commercial thinning is projected when the plantation reaches 6 meters in dominant height, and a commercial thinning when it reaches 16 meters

Table 05 | Thinning Operations

Thinning	Year	Trees to be treated	Untreated Trees	Total Height (m)
1	5	200	520	6 – 7.6
2	9 – 10	300	220	15
3	15 - 17	220	0	30

Final harvest

Final harvest (FH) is planned to occur 15 to 17 years after planting.

Disease and Pest Control

Manual, mechanical, and biological controls are prioritized when they prove to be more efficient than chemical control.

Ant control is performed before planting. Constant doses of insecticide are applied at regular intervals throughout the area. Control is performed over the entire planted area and in a strip of at least 40 meters outside the perimeter of the affected area. This is done to prevent possible damage caused by ant nests at the boundaries.

Pests in the area tend to attack trees suffering from intense competition, especially in unthinned stands. Prevention is achieved by avoiding overly dense managed stands. Populations are monitored from year 6 after planting.

Previous Activity

Grasslands or low vegetation cover.

Silvopastoral Management

The Project does not contemplate silvopastoral management. After final harvest, reforestation is carried out as soon as possible (projected within the calendar year of harvest)

Monitoring

Forestry operations are supervised, focusing on strict compliance with technical requirements, current regulatory frameworks, environmental and safety standards, review of yields, planned execution times, and social impacts.

Inventory is carried out to evaluate the development of new plantations (measurements include tree height, DBH, number of healthy, missing, dead, and diseased plants, among other parameters). The second inventory also aims to generate information to specifically decide on the pruning and thinning plan. Each pruning operation is followed by checks, where the quality of the operation is evaluated.

The same would be done after commercial thinning (the size, quantity, and quality of the remaining trees will be recorded). In stands between 7 and 10 years old, field data will be collected to project forest growth and estimate future timber flows. Before final felling, a final inventory will be carried out to obtain standing timber stocks.

Plantation Health and Development

Trained personnel regularly patrol the plantations to identify nutritional deficiencies and/or pest problems. At year 2, foliar analyses are performed during autumn. The objective of these analyses is to identify eventual nutritional deficiencies and apply corrective fertilizations if necessary. If a pest is detected, a specialized evaluation is performed.

Pre-Project Conditions

The topography of the area consists of a plain with minor altitude variations of less than 20m. The predominant climate is subtropical without a dry season, with abundant rainfall and high temperatures with few daily and seasonal variations. The average annual temperature is 21.5 °C. Annual rainfall in the area ranges between 1,400 and 1,600 mm, homogeneously distributed throughout the year, although periods of drought and excess



water can occur. Potential evapotranspiration is about 900 mm/year. Runoff and drainage average around 300 mm/year, feeding an extensive river network and the Guaraní Aquifer, one of the largest in the world.

Soils are generally shallow, sandy in texture, with medium natural fertility. The dominant land cover in the area is predominantly herbaceous vegetation with interspersed and sparse shrubs. This could be attributed to the natural occurrence of frequent droughts that prevented slow-growing trees from establishing themselves against aggressive grass competition.

The project will be established with a long-term perspective. Sustainable timber production and climate change mitigation are part of the program's objectives.

1.11 Regulatory Framework

The Project is framed under all current regulatory frameworks in the Argentine Republic in 2013 - when planting began - with continuous review of the state of the art in subsequent years to ensure full compliance with updated regulations.

The main national regulatory framework is Law 25.080 on Investments for Cultivated Forests (Enacted in 1999, extended and modified by Law 27.487 until 2029). Its objective is to promote investments in new forestry ventures and the expansion of existing forests (cultivated, not native). Its National Enforcement Authority is the Ministry of Agriculture, Livestock and Fisheries of the Nation (or the current name), through its forestry area.

The province of Corrientes, through Law 6.532, adhered to Law 27.487 extending and modifying Law 25.080 for Cultivated Forests.

Additionally, there are complementary regulatory frameworks such as Provincial Law 6.058 on the promotion of medium-sized forestations, or specific resolutions from the provincial enforcement authority for the proper application of the national reference framework.

1.12 Other Programs

1.12.1 Emission Trading Schemes and Other Binding Caps

The GHG removals generated by the project will not be used to comply with binding GHG emission limits. The program aims to meet the needs of the voluntary carbon market.

1.12.2 Participation in Other GHG Programs

It is noted that this Project is not presented and/or registered in other GHG validation or verification platforms.

1.12.3 Other Forms of Environmental Credits

This project will only generate credits for carbon sequestration through forest sinks, and these will be under the framework administered by the National University of La Plata.

1.12.4 Projects Rejected by Other GHG Management Programs

"Urunday" afforestation has not been submitted to or rejected by other entities that verify carbon credits.

1.13 Eligibility Assessment

This project complies with the requirements established by the methodological framework developed by the Faculty of Engineering of the National University of La Plata for the verification of carbon credits.

Project activities do not involve mechanical off-site removal or burning of significant pre-existing dead wood reserves (e.g., for site preparation). Project site preparation did not include (nor did it require) chipping, crushing, or mechanical stacking processes.

- Project activity does not occur in tidal wetlands.
- Project activity does not occur in organic soils or wetlands and has not altered the water table.
- The project activity is clearly limited, allowing for its clear spatial delimitation, as verified throughout this document.

Project boundaries are established in this document. Furthermore, the project is not in the vicinity of the items mentioned in Lists 1 and 2 of the "Guidance for afforestation and reforestation projects" developed by the National University of La Plata.



2. APPLICATION OF THE METHODOLOGICAL FRAMEWORK

2.1 Title and Reference of the Methodology Used

The methodology for the verification of carbon credits developed by the Faculty of Engineering of the National University of La Plata (version 1.0) was applied.

In this sense, the determinations and projections used for carbon removal accreditation were carried out under the area-based approach.

The following methodological tools, to which the selected methodology refers, were used:

- Version 01 of "Procedures for demonstrating the eligibility of lands for afforestation and reforestation CDM project activities"
- Version 01 of "Combined tool to identify the baseline scenario and demonstrate additionality in afforestation and reforestation CDM project activities"
- Version 01 of "Tool for the identification of degraded or degrading lands for consideration in the implementation of afforestation and reforestation CDM project activities"
- Version 03.1 of "Estimation of non-CO2 GHG emissions from biomass burning attributable to an afforestation and reforestation CDM project activity"
- Version 01 of "Estimation of increase in GHG emissions attributable to displacement of pre-project agricultural activities in afforestation and reforestation CDM project activity"
- Version 01.1 of "Tool for the estimation of change in soil organic carbon stocks due to the implementation of afforestation and reforestation CDM project activities"
- Version 02.1.0 of "Calculation of the number of sampling plots for measurements within afforestation and reforestation CDM project activities"
- Version 01 of "Guidance on the application of the project boundary definition to afforestation and reforestation CDM project activities"
- Version 01 of "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in afforestation and reforestation CDM project activity"
- Version 01 of "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in afforestation and reforestation CDM project activity"
- Version 02 of "Guidance on conservative choice and application of default data in estimating net anthropogenic GHG removals by sinks".

2.2 Applicability of the Methodological Framework

Applicability Conditions

Soil

The project will be executed on lands with low vegetation cover or grasslands. These are sandy soils with good drainage. Native vegetation in the project region was originally composed mainly by tall grasses. The renewal of plant residues maintained relatively high levels of organic matter in the soil.



Figure 3. Site images (areas that had grasslands) prior to Project initiation.

The change in vegetation reduced the renewal of plant residues and, consequently, the soil organic matter content, what led to a more degraded state of the soils. Some recent studies support this statement, finding that 370 years of grazing have caused, in average for 11 grassland sites in Argentina and Uruguay, decreases in soil organic nitrogen content (-880 kg ha^{-1} or -19%), soil organic carbon content ($-21,200 \text{ kg ha}^{-1}$ or -22%) and net primary productivity ($-2,192 \text{ kg ha}^{-1}$ or -24%). The conditions in which this study was carried out coincide with those of all the sites included in the project activity.

According to the national meteorological service, the annual average rainfall in the region ranges between 1,200 and 1,400 mm, although in years with the occurrence of the El Niño phenomenon, such as the 1982-1983 and 1997-1998 periods, annual values greater than 2,000mm accumulated.

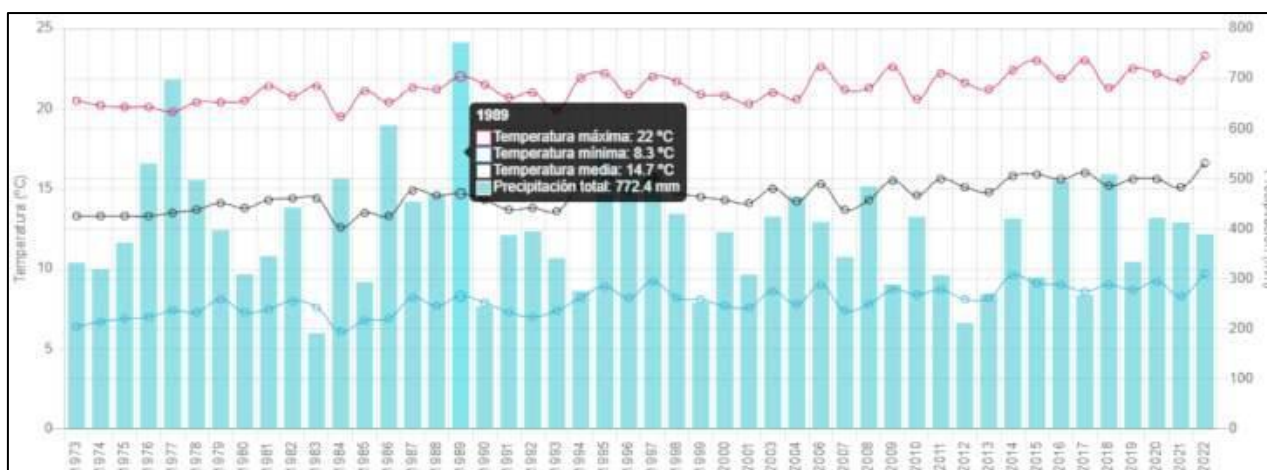


Figure 4. Historical Rainfall. 1973-2022 Record. SMN

A global evaluation¹ has estimated that Argentina will be among the countries with the largest expected increase in runoff during the 2000-2050 period. This shows that soil erosion pressures are expected to increase in the future.

¹ Milly, P.C.D, Betancourt, J., Falkenmark, M., Hirsch, R.M., Kundzewicz, Z.W., Lettenmeier, D.P and Stoufler, R.J. 2008. Stationarity is dead. Whither water management?. Science 319:573-574

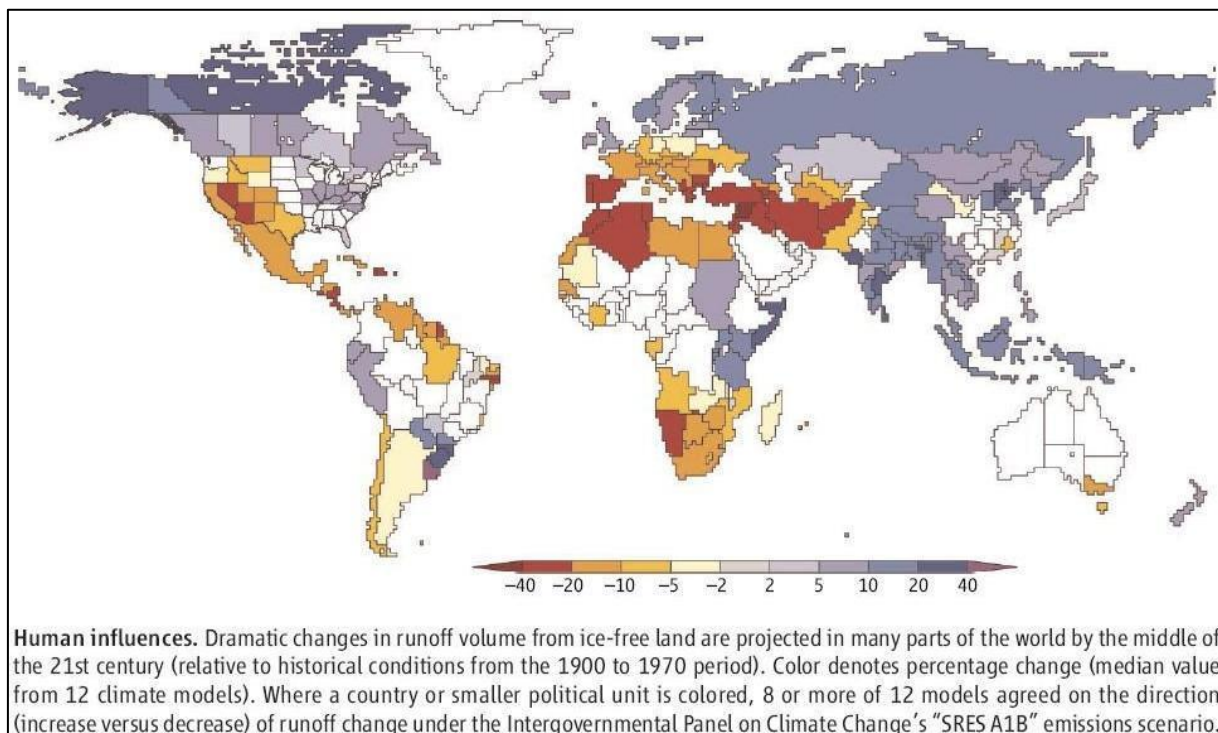


Figure 5. Projected increase in surface runoff in different regions of the world during the 2000-2050 period. Source: Milly et al., 2008 (Science, 329:573-574)

Residue Removal

Forest residues will not be removed during Project execution.

Wetlands

N/A as the present area is not considered under the mentioned category.

Organic Soil Drainage

No organic soils were verified in the Project area.

Conditions for Soil Preparation (especially considering changes in soil carbon

Plowing/ripping/scarification attributable to the project activity, if any, is:

- Carried out in accordance with appropriate soil conservation practices.
- Limited to the first five years from the initial site preparation year.
- Not repeated, if applicable, within 30 years.
- Tillage is performed in accordance with the applicability conditions for soil organic carbon accounting.

Justification for the Methodology Applied to the Project

The project activity complies with all applicability conditions of the selected methodology.

2.3 Project Boundaries

Project boundaries include all areas that will be afforested. These areas have been defined based on the criteria discussed below.

The effectively planted forest area is delimited using GPS technology and aerial photographs. Project boundaries are organized into polygons. The group of all polygons comprising the total land area constitutes the project boundaries.

Only areas that meet the methodology's land eligibility requirement (i.e., land areas within the project boundaries that have not been forested in the last 25 years) and the methodology's applicability conditions (in this project, lands with sparse vegetation cover or grasslands) are included within the project boundaries.

Land eligibility for afforestation under the provisions of the selected methodology

Through the application of step 2a) of the "Procedure for demonstrating the eligibility of lands for afforestation

and reforestation CDM project activities", it is demonstrated that the land vegetation has been below the forest threshold until the project start date. The result of a remote sensing analysis is shown below. Satellite imagery analysis shows that the afforestation process did not begin within the project boundaries until the established date.



Figure 6. Project area for year 2015.

Soil Map and Topographic Position

Areas that imposed restrictions on tree growth or with high vulnerability to water erosion were excluded; for example, soils that were too shallow were discarded because the soil's water storage capacity is very low, or because tree root anchorage may be impaired; areas with very steep slopes were excluded; to avoid severe soil erosion losses.

Site Suitability for Tree Species to be Planted

Areas suitable for eucalyptus were included.

Biological Richness and Diversity Value

Buffer zones and wildlife corridors are excluded from the project area. These buffer zones will basically be 12 m wide strips at the edge of the project's planted areas.

Firebreaks

A network of 12 m wide firebreak strips will separate forest blocks with a maximum size of 50 ha, according to Argentine regulations. These areas are not included in the carbon sequestration project boundaries. They receive permanent preventive maintenance tasks.

Infrastructure needs

Areas necessary for infrastructure were excluded from the project area.

The project boundaries have been identified using a GPS and aerial photographs have been established in a geographic information system. No visible field benchmarks have been established.

Carbon Stock

According to the methodology, the following carbon pools could be eligible for the project: aboveground biomass (including stems, branches, and leaves) and belowground biomass (roots).

Carbon pools in dead wood, litter, and soil organic carbon, which could have been incorporated into the analysis according to the current methodology, were excluded from accounting in view of specific research on the region that suggests minimum carbon absorption levels for these elements in forestations of this type². The

² Pérez, C. A., Frangi, J. L., Goya, J. F., Luy, A. M., & Arturi, M. F. (2013). Contenido de nutrientes en las raíces finas y el mantillo de rodales de *Eucalyptus grandis* de diferente edad en la Mesopotamia Argentina. *Bosque (Valdivia)*, 34(3), 303-310



intention was to avoid overestimating the CO₂ capture that happens within it. Likewise, harvested wood products were excluded as they are not eligible under this methodology.

Aboveground and belowground biomass were quantified using the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activity" through the CO₂Fix simulator, calibrated for local conditions.

Furthermore, specific allometric equations for the species were used, based on measurements of diameter at breast height (DBH) and total height of a representative number of trees. The purpose of these is to provide support for the estimates made by the tools mentioned in the paragraph above.

2.4 Scenario for Baseline Determination.

The scenario for baseline determination was carried out in line with the guidelines described in the methodology developed by the UNLP. Relevant aspects of the determination are detailed below.

In this sense, the determinations and projections used for carbon removal accreditation were carried out under the area-based approach.

Step 1: Identification of alternative land uses to the proposed Project Afforestation.

According to a study conducted by INTA "Since the early 90s, agricultural land expanded in the northeast and northwest (NEA and NOA) of the country..[].As a common denominator, in general, a large preponderance of legumes is observed in these regions, crops that make little contribution of carbon to the soil"³.

The NEA region is characterized by having very varied soils ranging from sandy and loam in the west to clayey and silty in the east.

The northern regions of the country, NEA and NOA, possess 11.5% and 9.6% of the total land area used by agricultural holdings. Their planted area reaches 2.3 and 2.4 million hectares respectively, which means a high percentage of their total area occupied by pastures, natural forests, and woodlands.

Among the main land uses in the NEA Region, human-planted forests and woodlands occupy the largest surface of the total cultivated land. About 660 thousand hectares of forests allow the development of the timber industry, affecting mainly the province of Misiones and Corrientes.

Sub-item 1a. The following realistic and credible alternatives to the proposed project activity are identified:

1.- Livestock farming:

The provinces of northeastern Argentina (NEA) concentrate 16% of the national livestock stock, positioning themselves as the extra-Pampas region with greater production of beef cattle (SENASA, 2022). Beef cattle production is a significant activity for the economic development of this region.

In Corrientes, livestock farming is concentrated in the Departments of Mercedes, Curuzú Cuatiá, Goya, San Martín, Santo Tomé, Paso de los Libres, Esquina, Ituzaingó, Concepción and Monte Caseros, with production being relevant for almost all of the 7 departments. In the north, the herds are mostly crosses, and in the south, they are Hereford and Braford.

Livestock activity is developed on 6,860,000 ha, which represents 75% of the provincial surface. The main activity is breeding, even so, in recent years, steer rearing and fattening activities have been incorporated, especially in the southern fields of the province.

2.- Forestation

Corrientes is the Argentine province with the largest area of planted forests. However, of the 8,000,000 tons of wood it produces annually, only 20% is industrialized in the province, the rest is sold as raw material to neighboring provinces (Misiones-Entre Ríos). The species of greatest interest are *Eucalyptus grandis*, *Eucalyptus saligna*, *Pinus elliotti*, *Pinus taeda* and *Pinus caribea* var. *Hondurensis*

Sub-item 1b. Consistency with applicable mandatory laws and regulatory frameworks.

All identified land use alternatives comply with all mandatory regulations in the country. No alternatives are

³ <https://www.argentina.gob.ar/noticias/elaboran-un-mapa-que-revela-la-salud-del-suelo-del-norte-argentino>



eliminated based on this criterion.

Step 2: Barrier Analysis

Sub-item 2a. List of potential barriers.

A list of potential barriers for land use and project execution is detailed.

Investment / Financing Barriers

- Lack of access to medium/long-term credit.

Barriers related to land management, leasing or ownership.

- Lack of incentives for landowners to lease or invest in their land.
- Distance of land from urban areas or areas with greater public service coverage and which affect the final competitiveness level.

Ecological Barriers

- Degraded soils
- Generalized opportunistic species that prevail in land use
- Unfavourable meteorological conditions
- High erosion risk (e.g., steep slopes)
- Low soil quality

Technological Barriers

- Lack of capacity to predict system productivity (e.g., doubtful growth models)

Sub-item 2b. Elimination of scenarios prevented by barriers.

Alternative 1

It is not prevented by any barrier. It is the current land use in many places in Argentina, and it verifies successes in other places in the region.

Alternative 2

Forest plantation with the characteristics applied by "Urunday" is a practice in the region. However, the specific considerations of the methodology applied for the adequate management of the project as a carbon sink, are not. Compared to cattle grazing it is a new form of production. There is a notable difference between the return periods considered by livestock landowners who are accustomed to expecting an annual income from their production. Furthermore, landowners in the region typically lack the capacity and equipment necessary to carry out forestry activities.

In terms of technology, the adoption of a 15 to 17-year rotation imposes uncertainties regarding productivity and wood quality; wind damage; and the utilization of thick logs, which are added to other uncertainties applicable to shorter rotation plantations (e.g., even longer payback periods for investment and potential outbreaks of pests and diseases, among others).

There are uncertainties related to the productivity that can be achieved, especially considering that the soils in the project area are of lower quality than the soils in the Misiones regions, where many long-rotation plantations have been developed. Adopting a long rotation implies adhering to the same genotypes for long periods, thus losing the opportunity to capitalize on progress through plant breeding, which would be achieved through more frequent replanting. Lastly, the quality of the wood to be obtained (i.e., whether it would be suitable for the target market) is also subject to uncertainty.

Another uncertainty relates to an eventual increase in felling or damage to trees by windstorms. Intensive thinning of eucalyptus plantations is known to increase the risk of wind damage due to the opening of wide spaces within the forest that can channel wind and increase its speed, aggravated by the vulnerability of tall trees. There is no information on an eventual increase of this vulnerability in thinned stands with very tall trees, such as those of 20 years or more, but there have been some cases of plantation losses due to strong windstorms.

The erosion risk within the site area is moderate, which results in a vulnerability of the soils.

Sub-item 2c. List of scenarios that are not prevented by any barrier

The application of the decision tree of sub-item 2c (considering the result of sub-item 2b) leads to the following



conclusions:

- It has been determined that the continuation of the pre-project activity is the most plausible hypothesis in the absence of the proposed project activity.

2.5 Additionality

Additionality has been demonstrated through the application of Steps 0 to 2 above and through the Common Practice Analysis in Step 4 (in this section below).

Even though sub-step 2c resulted in a single land use scenario and that is the baseline scenario, the investment analysis was carried out in the afforestation activity to reinforce the conclusion that the forest activity in the area was not destined to develop without being registered in a carbon scheme and its corresponding generation of carbon credits.

Investment Analysis

Sub-item 3a. Determination of the appropriate analysis method

The investment analysis will not determine which of the remaining land use scenarios is the most attractive economically or financially because only one land use scenario remains. However, it will demonstrate that the IRR of the location does not reach the benchmark cost of capital.

An investment comparison analysis is selected.

Sub-item 3b. Application of the investment comparison analysis.

The benchmark should represent standard returns in the market, considering the specific risk of the project type, but not linked to the subjective expectation of profitability or the risk profile of a particular project developer.

The IRR is selected as the indicator for the benchmark analysis. The Capital Asset Pricing Model (CAPM) is used to estimate the expected internal rate of return of unleveraged project activities that compensates the investor for risk and the time value of money (K_e).

The benchmark analysis is performed considering the base year as 2016, the date established to begin computing the project.

In line with international best practices and considering the capital access barriers identified above, capital costs will be analyzed in US dollars.

For a developing country, K_e is determined by the following equation:

$$K_e = r_f + (\text{MPR} * B) + \text{SRP}$$

Where:

K_e = Project Cost of Capital (projected benchmark for IRR)

r_f = Risk Free Rate (%)

MPR = Market Risk Premium (%)

B = Beta. Non-diversifiable risk of the activity.

SRP = Sovereign Risk Premium (%)

Determination of the risk-free rate.

According to the Project characteristics, the value selected for the risk-free rate is that of the United States Treasury, with a 30-year yield, at values from January 01, 2016.

<https://home.treasury.gov/policy-issues/financing-the-government/interest-rate-statistics?data=yieldYear&year=2006>

Determination of the Market Risk Premium

A scenario on an average annual arithmetic market risk premium with respect to US Treasury bonds was analyzed. This is a conservative value, from a well-documented source (Damodaran⁴) that calculated the market risk premium for the period between 2000 and 2015.

⁴ <https://pages.stern.nyu.edu/~adamodar/>



Likewise, the value of the Market Risk Premium at the time of the initial project investment and the existing one at the time of establishing the project's carbon credit accreditation date (January 01, 2016) was considered.

The PRM used was from 2016 to maintain consistency with the initial investment moment. The value used was 5.0%

Determination of the Project's Non-Diversifiable Risk

According to the general state of the art and identified practices, the project's non-diversifiable risk has been considered in its link with the market in which it operates.

In this sense, the systemic risk analysis is given by the type of economic activity and integrating the type of market in which the forest investment is located to use the appropriate value for the present analysis.

The comparable economic sector for a project of these characteristics is the Paper/Forest Products industry, according to the frameworks presented by the source.

Understanding that Argentina is a country considered emerging in the world economy, the value corresponding to the project's systemic risk integrates this factor together with that of the economic sector, to arrive at the final value to be used as non-diversifiable risk of the analysis we seek to perform.

The value of the Beta (non-diversifiable risk) of the project was determined to be 1.5%.

Determination of the Sovereign Risk Premium

Sovereign risk reflects the amount of additional market risk for a country's public bonds compared to the benchmark case. Understanding that the present analysis is conducted under US legal tender, the yield difference between US Treasury bonds and Argentine bonds constitutes the Sovereign Risk Premium.

For the present analysis, the Country Risk value was considered as data for the determination of the Sovereign Risk Premium.

The Country Risk value at the time of the project investment was 949 basis points.

Other aspects of Analysis

To force the economic analysis so that the economic barriers to be analyzed are as rigorous as possible, variables such as liquidity risk or bankruptcy risk are not added to the capital cost analysis.

Although it is understood that both risks are present in the project, their integration into the capital cost formula would only contribute to raising that value. A higher capital cost demands greater income sources to justify the investment and therefore would give greater ease to the justification of the need to integrate the income of carbon credits as part of the project.

Understanding that the spirit of additionality goes against this idea, it was opted not to integrate these risks into the equation, so that the IRR (excluding carbon credit project revenues) confronts greater analysis stress.

Determination of Capital Cost

$$K_e = r_f + (\text{MPM} * B) + \text{SRP}$$

$$\text{Cost of Capital} = 4,0 + 5,0 * 1,5 + 9,49$$

In conclusion, the capital cost for the afforestation project in question is 18.76%. This value, confronted with the IRR of forest yield, will allow determining, as will be verified below, the need to integrate carbon credits into the project.

Sub-item 3c. Determination and Comparison of IRR

The projected cash flow for an afforestation program without the economic benefits of carbon credits was performed for this analysis.

$$\text{IRR}^5 = 12\%$$

⁵ The IRR excludes the economic benefits perceived by carbon credits.



Ke = 20,99%

Therefore, the estimated IRR for afforestation in the project area without carbon credit benefits are lower than the established benchmark capital cost for the entirety of the project.

It is again concluded that the continuation of the pre-project land use is the baseline scenario. A sensitivity analysis was performed to make the conclusion more robust that the project activity does not meet the benchmark.

Sub-item 3d. Sensitivity Analysis

This sensitivity analysis aims to evaluate how the variability in the main input variables impacts the project results. The analysis will be performed through Monte Carlo simulation. .

Key Variables

The key variables identified for this analysis are:

- Tree Growth Rate (m³/ha/year)
- Tree Mortality Rate (%)
- Carbon Sequestration Rate (tCO₂/ha/year)
- Establishment and Maintenance Costs (USD/ha)
- Carbon Price in the Market (USD/tCO₂)

Assignment of Probability Distributions

For each variable, probability distributions were assigned based on historical data and relevant studies:

- Tree Growth Rate:
 - Distribution: Normal
 - Mean: 30 m³/ha/year
 - Standard deviation: 5 m³/ha/year
- Tree Mortality Rate:
 - Distribution: Triangular
 - Minimum: 2%
 - Maximum: 10%
 - Mode: 5%
- Carbon Sequestration Rate:
 - Distribution: Normal
 - Mean: 14 tnCO₂/ha/year
 - Standard deviation: 2 tCO₂/ha/year
- Establishment and Maintenance Costs:
 - Distribution: Triangular
 - Minimum: 500 USD/ha
 - Maximum: 1,500 USD/ha
 - Mode: 1,000 USD/ha
- Carbon Price in the Market:
 - Distribution: Log-normal
 - Mean: 10 USD/tnCO₂
 - Standard deviation: 2 USD/tnCO₂

Monte Carlo Simulation

A Monte Carlo simulation was performed with 10,000 iterations to evaluate the impact of the variability of the key variables on the final project outcome. In each iteration, random values were generated for each variable according to their probability distributions.

Results of the Analysis

The results of the simulations are summarized below:

1. **Distribution of total carbon sequestration:**
 - Mean: 840 tnCO₂/ha in 30 years

- Range (5th-95th percentile): 700 - 980 tnCO₂/ha
- 2. **Distribution of total costo:**
 - Mean: 70,000 USD
 - Range (5th-95th percentile): 60.000 – 80.000 USD
- 3. **Distribution of Net Present Value (NPV):**
 - Mean: 200.000 USD
 - Range (5th-95th percentile): 150.000 – 250.000 USD

Analysis of Results

The results indicate that the tree growth rate and the carbon price in the market are the variables that have the greatest impact on the final project outcome. The mortality rate and the establishment and maintenance costs have a minor but still significant impact.

Conclusions

The sensitivity analysis performed using Monte Carlo simulation provides a detailed view of how uncertainty in key variables can affect project outcomes. This analysis is fundamental for risk management and informed decision-making in the development and implementation of the afforestation project.

Below is the summary (table and graph that shows the distribution of simulated IRR values for the models) of the results obtained by the Monte Carlo simulation.

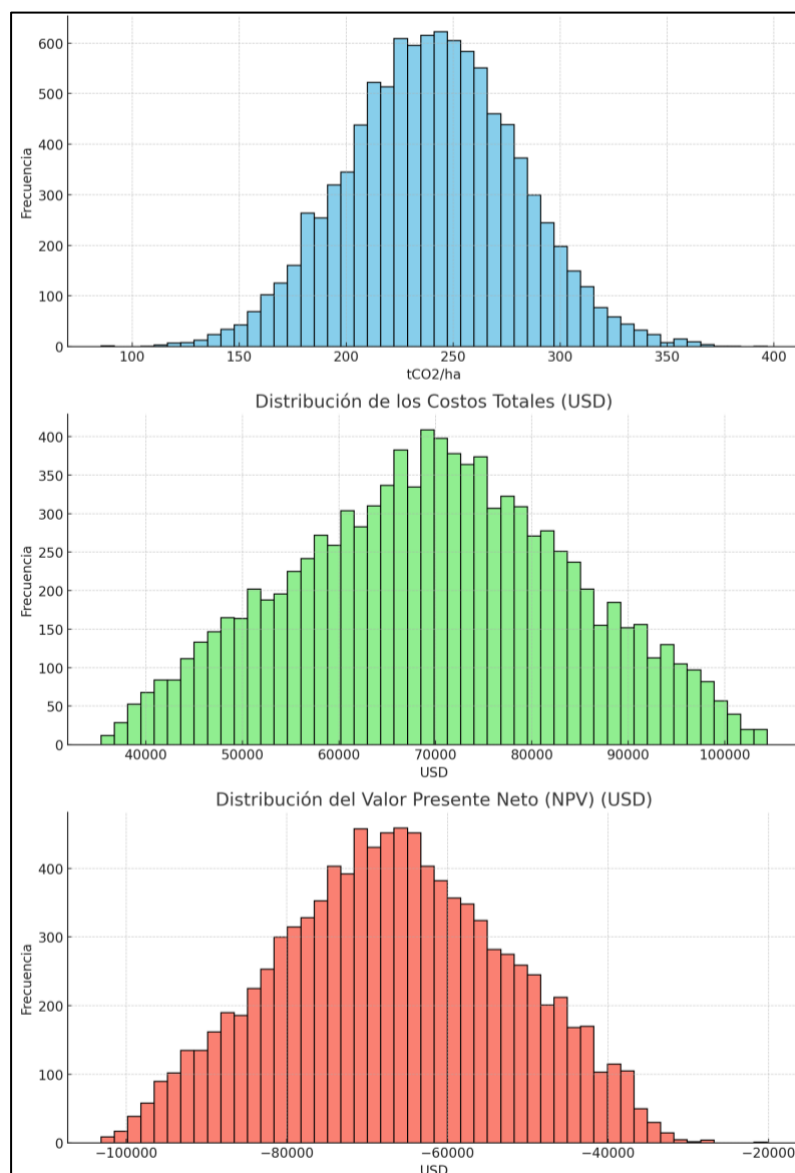


Figure 7. Results of the Sensitivity Analysis



Step 4. Common Practice Analysis

The development of forestry activity is accompanied by constant technological innovation linked to propagation material, cultivation techniques, and the organization of actors that have transformed the sector into one of the most dynamic in recent times. Among the key actors we can cite the presence of INTA Bella Vista and its Extension network, the Forest Consortia (Corrientes Norte, Corrientes Centro and Consorcio Forestal del Río Uruguay), the Provincial Directorate of Forest Resources and the thriving business sector linked to the forest activity.

Law 25.080: Law on investments for cultivated forests - Promotion regime for investments made in new forestry ventures and the expansion of existing forests. The continuity of law 25.080 (Law 27.487) foresees that at least 30,000 ha per year will be planted, with greater participation of small and medium producers in forest activity within the framework of the new Resolution N°810/11 (referring to planting and silvicultural activities of cultivated forests and enrichment of native forests for small producers in a grouped manner).

The forest industry is made up of 232 sawmills (Forest-Industrial Census of Corrientes. Ministry of Production, Labor and Tourism. 2005), 313 carpentry shops and 12 impregnating plants with an apparent annual consumption of 1.6 million tons. Of the sawmills, the largest proportion (57%) processes up to 500 t/month, 25% between 500 and 1,400 and 16% greater than this volume. Most sawmills (68%) have a low technological level and 78% of them do not have their own forest plantations. Only 10% of sawmills market their residues, with which about 480 thousand t/year of edgings, sawdust chips and bark are wasted. Planting season: Traditionally, plantings are carried out during spring and late summer months.

Harvesting is carried out in most cases in a “semi-mechanized” way (felling: chainsaw; extraction: miniskidder, motor-tractor, forwarder, and loading: front loader or forest crane) or in a “manual” way (felling: chainsaw; extraction: manual or with tractor with chains or slings, and loading: manual or loader). In recent years, some companies and medium-sized producers in the region have incorporated machinery and adopted a fully “mechanized” harvesting scheme (felling: harvester; extraction: skidder, and loading: three-tire loader).

Although it is estimated that only 20% of Corrientes’ primary production is processed locally, sending the bulk of the primary production to the province of Misiones, depending on the location of the plantation and the integration of the forest company.

The common practice analysis was carried out following the requirements established in Step 4 of the “Combined tool to determine the baseline scenario and demonstrate additionality in Reforestation project activities”. The extent to which afforestation activities similar to the proposed one have been implemented or are being carried out was analyzed. These activities are defined as those that are of similar scale, are carried out in a comparable environment, among other things, with respect to the regulatory framework and are carried out in the relevant geographic area.

Throughout the analysis, it is concluded that there are similar forest activities (in terms of scale, species, etc.) in the area. However, no carbon sequestration registration projects are verified in the area, which deteriorates a healthy comparability between projects. This further consolidates the notion of additionality given by the present project

2.6 Methodological Deviations

There are no methodological deviations in the presented project.



3. QUANTIFICATION OF GHG REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

Given that the 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 accordance with the IPCC Good Practice Guidance for Land Use, Land-Use Change and Forestry (2003), that the changes in net GHG removals by sinks in the baseline are equal to zero.

3.2 Project Emissions

The net anthropogenic GHG removals by sinks are estimated as the effective 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 from a forest liability 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; t CO ₂ -e
ΔC_{ACTUAL}	Actual effective net GHG removals by sinks by sinks; t CO ₂ -e
ΔC_{BSL}	Baseline net GHG removals by sinks; t CO ₂ -e
LK	Total GHG emissions due to leakage; t CO ₂ -e

The effective net greenhouse gas removals by sinks were estimated using the following equation based on the methodology:

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

Where:

ΔC_{ACTUAL}	Effective net GHG removals by sinks; t CO ₂ -e
ΔC_P	Sum of the changes in aboveground and belowground tree biomass, dead wood, litter, and soil organic carbon stocks in the project scenario; t CO ₂ -e
GHG_E	Increase in GHG emissions as a result of the implementation of the proposed reforestation project activity within the project scope; t CO ₂ -e

CHANGES IN CARBON STOCK

ΔC_P represents the sum of the changes in aboveground and belowground tree biomass, dead wood, litter, and soil organic carbon stocks in the project scenario. For the ex-ante estimation, some of these groups were accounted for. Below is the equation for estimating.

$$\Delta C_P = \Delta C_{TREE} + \Delta C_{DW} + \Delta C_{LI} + \Delta C_{SOC}$$

ΔC_P	Change in carbon stocks in all selected carbon pools in the project scenario, t CO ₂ -e
ΔC_{TREE}	Change in carbon stocks in tree biomass in the project, as estimated in the tool ""Estimation of carbon stocks and change in carbon stocks of trees and shrubs in the A/R CDM project activity""; t CO ₂ -e
ΔC_{DW}	Change in carbon stocks in dead wood biomass in the project, estimated in the tool ""Estimation of carbon stocks and change in carbon stocks in dead wood and litter in the CDM project activity""; t CO ₂ -e; The project did not consider this item in the analysis.



ΔC_{LI} Change in carbon stocks in litter biomass in the project, estimated in the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in the CDM project activity"; t CO₂-e; **The project did not consider this item in the analysis.**

ΔC_{SOC} Change in carbon stock in the project SOC estimated in the tool, "Tool for the estimation of changes in soil organic carbon stocks due to the implementation of afforestation and reforestation CDM project activities"; t CO₂-e; **The project did not consider this item in the analysis.**

Studies conducted on the carbon capture potential of *Eucalyptus Grandis* for the region where the project is executed and surrounding areas, verified minimal CO₂ capture values for the elements excluded from the analysis⁶. To avoid overestimating the carbon capture performed by the project, it was decided to exclude them from this calculation.

BIOMASS CARBON RESERVOIRS

Aboveground and belowground biomass has been estimated in accordance with the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in the A/R CDM project activity". A summary of the main factors used for the ex ante estimations and each of the data sources is presented in the table below. The data used to estimate tree biomass are shown in the table below.

The following equations were used to estimate aboveground and belowground biomass and biomass carbon stocks:

$$B_{TREE} = V_{TREE} * D_j * BEF_{2,j} * (1+R_j)$$

B_{TREE} Biomass of trees within project boundaries at a given time.

V_{TREE} Stem volume of tree species estimated using tree dimension(s) as input data in the project participant's model (based on the CO₂Fix simulator, calibrated for local conditions); m³. Ex post estimates consider the same equations but with monitoring data: DBH and height.

D_j Basic wood density of tree species j; t d.m. /m³.

$BEF_{2,j}$ Biomass expansion factor for converting stem biomass to aboveground tree biomass, for tree species j; dimensionless.

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

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

C_{TREE} Carbon stocks in tree biomass within the project scope at a given time; t CO₂-e.

B_{TREE} Biomass of trees within project boundaries at a given time.

CF_{TREE} Carbon fraction of tree biomass; t C t d.m.⁻¹

⁶ Goya, J. F., Frangi, J. L., & Dalla Tea, F. (1997). Relación entre biomasa aérea, área foliar y tipos de suelos en plantaciones de *Eucalyptus grandis* del NE de Entre Ríos, Argentina. *Revista de la Facultad de Agronomía, La Plata*, 102(1), 11-21

Table 06 | Parameters used for estimating tree biomass carbon stocks

Parameters	Symbol	Eucalyptus	Source
Average Annual Increment (m ³ .ha ⁻¹ .yr ¹)	MAI _j	30	Project design hypothesis. The MAI considers the volume per year that the species can produce at the end of the rotation period, which is 30 m ³ x ha x 15 years. It is based on expert judgment and coincides with the lower end of the IMA values for plantations of these characteristics in table 3A.1.7 of the IPCC Good Practice Guidance for LULUCF (2003).
Basic Wood Density (Mg.m ⁻³)	D _j	0,52	2006 IPCC for National Greenhouse Gas Inventories (Volume 4: AFOLU - Agriculture, Forestry and Other Land Use). Table 4.13. Default values for wood density.
Biomass Expansion Factor (dimensionless)	BEF _{2,j}	1,4	IPCC Guidance on good practice in LULUCF (2003), table 3A.1.10 (BEF ₂ for temperate climate zone, eucalyptus forest type and applicable for commercial volume equations).
Carbon Fraction (dimensionless)	CF _{TREE}	0,47	Tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs"
Root-shoot ratio (dimensionless)	R _j	0,37	Tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs"

Table 07 | Carbon sequestration estimation for one (01) project hectare.

Age	AGB_t _MS_ha	BGB_t _MS_ha	Biomass _Total_t _MS_ha	C_Biomass _Total_t _C_ha	Delta_C_Biomass _Annual_t _C_ha_year	Delta_C_Soil _Annual_t _C_ha_year	Delta_C_Total _Annual_t _C_ha_year	CO2_Removal _Annual_t _CO2_ha_year
1	1,5	0,0	1,5	0,71	0,71	0	0,71	2,6
2	3,4	0,1	3,5	1,65	0,9	0	0,9	3,4
3	6,4	0,1	6,5	3,06	1,4	0	1,4	5,2
4	10,2	0,2	10,4	4,91	1,9	0	1,9	6,8
5	14,7	0,3	15,0	7,05	2,1	0	2,1	7,9
6	19,3	0,4	19,7	9,26	2,2	0	2,2	8,1
7	25,4	0,5	25,9	12,17	2,9	0	2,9	10,7
8	32,3	0,7	33,0	15,51	3,3	0	3,3	12,2
9	40,0	0,8	40,8	19,18	3,7	0	3,7	13,4
10	48,7	1,0	49,7	23,36	4,2	0	4,2	15,3
11	57,5	1,2	58,7	27,59	4,2	0	4,2	15,5
12	66,4	1,4	67,8	31,87	4,3	0	4,3	15,7
13	75,5	1,5	77,0	36,19	4,3	0	4,3	15,9
14	84,7	1,7	86,4	40,61	4,4	0	4,4	16,2
15	94,8	1,9	96,7	45,45	4,8	0	4,8	17,8

As mentioned earlier and in full accordance with the current methodology, the final values - which express the volume of sequestered CO₂ - arise from the carbon changes identified throughout the project (detailed up to year 15, coinciding with the only projected rotation). Carbon volumes (or variations) in soil organic carbon, dead wood, and litter were not considered, as verified in Table 07



AGB_t_MS_ha	Total Aboveground Biomass expressed in tons of Dry Matter per Hectare.
BGB_t_MS_ha	Total Belowground Biomass expressed in tons of Dry Matter per Hectare.
Biomass_Total_t_MS_ha	Total Biomass expressed in tons of Dry Matter per Hectare.
C_Biomass_Total_t_C_ha	Carbon contained in Total Biomass (Aboveground + Belowground), expressed in tons of Carbon per hectare. Obtained by multiplying Total Dry Matter Biomass by the carbon fraction coefficient (0.47).
Delta_C_Biomass_Total_t_C_ha_year	Changes in Carbon contained in Total Biomass per hectare per year.
Delta_C_Soil_Annual_t_C_ha_year	Changes in Soil Carbon per hectare per year (a value of zero was assigned to avoid overestimating project values).
Delta_C_Total_Annual_t_C_ha_year	Sum of total changes in Carbon of total biomass and soil.
CO2_Removal_Annual_t_CO2_ha_year	The amount of Carbon Dioxide (CO ₂), expressed in tons (tCO ₂), estimated to be sequestered annually (year) per hectare (ha) by afforestation. Obtained by multiplying total Carbon changes by (44/12).

The values for Aboveground Biomass (AGB) and Belowground Biomass (BGB) expressed in tons of Dry Matter per Hectare, where the former is of greater relevance than the latter, is consistent with available research for this region⁷, and justifies the project's decision not to quantify litter, dead wood, and soil organic carbon to avoid overestimating total CO₂ sequestration.

Table 09 (below) shows the carbon sequestration curve for each of the polygons that make up the project, according to the accreditation year established within it.

To facilitate its interpretation, Table 08 (below) includes details of the various polygons that comprise the project in concordance with the information set forth in Section 1 of the document and the supporting KML file.

Table 08 | Polygons that make up the project

URUNDAY	Total Ha.	Exclusion Ha.	Net Ha.
SEC. 01	77	1	76
SEC. 02	85	6	79
SEC. 03	54	0	54
SEC. 04	45	1	45
SEC. 05	51	0	51
SEC. 06	2.983	144	2.839
	3.295		3.143

Table 09 | Carbon Sequestration Curve by polygon

# / YEAR	SEC. 01	SEC. 02	SEC. 03	SEC. 04	SEC. 05	SEC. 06 (Sub.01)	SEC. 06 (Sub.02)
1 2016	196,62	203,22	139,58	115,44	132,19	7.338,02	4.892,01
2 2017	262,16	270,96	186,11	153,92	176,25	9.637,26	7.338,02
3 2018	393,24	406,43	279,17	230,88	264,38	11.153,79	9.637,26
4 2019	516,45	533,78	366,64	303,22	347,21	11.496,23	11.153,79
5 2020	597,72	617,78	424,34	350,93	401,85	15.165,24	11.496,23

⁷ Frangi, J. L., Pérez, C., Goya, J., Tesón, N., Barrera, M., & Arturi, M. (2016). Modelo empírico integral de una plantación de *Eucalyptus grandis* en Concordia, Entre Ríos. *Bosque (Valdivia)*, 37(1), 191-204.



6	2021	616,07	636,75	437,37	361,71	414,19	17.366,64	15.165,24
7	2022	812,69	839,96	576,95	477,15	546,38	19.078,85	17.366,64
8	2023	930,66	961,89	660,70	546,41	625,69	21.769,45	19.078,85
9	2024	1.022,41	1.056,73	725,84	600,28	687,38	22.014,05	21.769,45
10	2025	1.166,60	1.205,76	828,20	684,93	784,32	22.258,65	22.014,05
11	2026	1.179,71	1.219,30	837,51	692,63	793,13	22.503,25	22.258,65
12	2027	1.192,81	1.232,85	846,81	700,33	801,94	22.992,46	22.503,25
13	2028	1.205,92	1.246,40	856,12	708,02	810,76	25.193,86	22.992,46
14	2029	1.232,14	1.273,49	874,73	723,41	828,38	0,00	25.193,86
15	2030	1.350,11	1.395,42	958,48	792,68	907,69	3.669,01	0,00
Total 2016-2030		12.675,29	13.100,73	8.998,57	7.441,93	8.521,74	227.967,76	232.859,77

Note: Polygon Nro. 06 (SEC 06) contains two subsections due to internal organization purposes.

Table 10 | Carbon Sequestration in Project

ACCREDITATION YEAR	ANNUAL GHG SEQUESTRATION	ACCUMULATED GHG SEQUESTRATION
2016	13.017,1	13.017,1
2017	18.024,7	31.041,8
2018	22.365,1	53.406,9
2019	24.717,3	78.124,2
2020	29.054,1	107.178,3
2021	34.998,0	142.176,3
2022	39.698,6	181.874,9
2023	44.573,7	226.448,5
2024	47.876,1	274.324,7
2025	48.942,5	323.267,2
2026	49.484,2	372.751,4
2027	50.270,5	423.021,8
2028	53.013,5	476.035,4
2029	30.126,0	506.161,4
2030	9.073,4	515.234,8
2031	8.561,0	523.795,8
2032	13.017,1	536.812,9
2033	18.024,7	554.837,6
2034	22.365,1	577.202,7
2035	24.717,3	601.920,0
2036	29.054,1	630.974,1
2037	34.998,0	665.972,1
2038	39.698,6	705.670,7
2039	44.573,7	750.244,3
2040	47.876,1	798.120,5
2041	48.942,5	847.063,0
2042	49.484,2	896.547,2

2043	50.270,5	946.817,7
2044	53.013,5	999.831,2
2045	30.126,0	1.029.957,2
2046	5.404,4	1.035.361,6
TOTAL	1.035.361,6	N/A

In addition to the equations expressed above, specific allometric equations for the species were also used, in order to contrast the results obtained⁸. These were used to determine the aboveground biomass and were integrated from diameter at breast height (DBH) and total height values of a representative number of project trees. The objective was to provide support for the estimates made by the tool mentioned above.

The equation used to corroborate the values in Table 07 is the following:

$$\text{Total Aboveground Biomass} = 0,0253 \times (\text{DBH}^2 \times \text{Ht})^{0,8175}$$

Breakdown of Elements:

- **Total Aboveground Biomass:**
 - The unit of measurement is mass - kilograms (kg) of Dry Matter (DM) - per tree.
- **DBH (Independent Variable):**
 - Is the Diameter at Breast Height, measured at 1.3 meters above ground level; it is a field measurement. The unit of measure used is centimeters (cm).
- **Ht (Independent Variable):**
 - Is the total tree height; it is a field measurement. The unit of measure used is meters (m).
- **DBH²×Ht (Combined Predictor Variable):**
 - This is the combined variable that best predicts the total aboveground biomass. It is calculated by squaring the DBH and multiplying it by the height. This combination better reflects the volume or overall size of the tree than using only the DBH or the Ht separately.
- **0.0253 (Multiplying Coefficient 'a'):**
 - This is one of the empirical coefficients. It acts as a scaling factor in the power equation. It does not have a direct simple biological interpretation, but it is the numerical value that, together with the exponent, best fits the equation to the observed data in the region.
- **0.8175 (Exponential Coefficient 'b'):**
 - Describes how biomass changes in relation to the change in tree size (represented by DBH²×Ht).

DBH²×Ht).

Data collected from the afforestation in situ over five different years (according to plantation age) were used.

Table 11 | DBH and Total Height of Species.

TREE AGE	DBH (cm)	Ht -Total Height- (m)
4	13	14
7	18,5	21
10	24,1	27,5

The values for Total Aboveground Biomass expressed in these equations are in kilograms of carbon, and correspond to one (01) tree. To project it to the afforestation level subject to this presentation, the values were multiplied by 720 (number of trees in one hectare) and then converted to tons to be compatible with the Biomass values in Table 07.

Table 12 | Allometric Equation Application

TREE AGE	DBH (cm)	Ht -Total Height - (m)	Equation Results (720 Plants / 1 Ha.)	Table 07 Results (720 Plantas / 1 Ha.)
4	13	14	10,44	10,23
7	18,5	21	25,89	25,38

⁸ Winck, R. A., Fassola, H. E., Barth, S. R., Crechi, E. H., Keller, A. E., Videla, D., & Zaderenko, C. (2015). Modelos predictivos de biomasa aérea de Eucalyptus grandis para el Noreste de Argentina. *Ciencia Florestal, Santa Maria*, 25(3), 595-606



10	24,1	27,5	49,73	48,71
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The results in Table 12 are expressed in tons (t) of dry matter (DM) per hectare. The first conclusion is that the values expressed in Table 07 are verified, even showing a slightly higher volume of approximately 2%, similar to the Total Biomass value.

Regardless, the project's decision was to maintain the most conservative values to avoid any overestimation of the final CO₂ capture.

3.3 Leakage

The methodology requires the evaluation of leakage sources due to activity displacement. The application of the guidelines on the conditions under which the increase in GHG emissions related to the displacement of pre-project activities in the reforestation CDM project activity is insignificant; this leads to the conclusion that the project will not cause any displacement of activity before its execution⁹.

Therefore, it is concluded that the leakages of the present project are non-existent, and accounted as zero.

3.4 Summary of GHG Emissions Reduced or Removed

The period over which the benefits of carbon capture are estimated cannot exceed the term determined for the project; in this case it is given by the 31-year limit. Within the determined period and based on all the information developed, the removals of carbon equivalent tCO₂e for each individual year of the project were projected.

Table 12 | Summary of GHG Emissions Reduced or Removed

YEAR	Estimated Baseline Emissions or Removals	Estimated Project Removals	Estimated Leakage	Estimated Net GHG Reduced or Removed
2016	0,0	13.017,1	0,0	13.017,1
2017	0,0	18.024,7	0,0	18.024,7
2018	0,0	22.365,1	0,0	22.365,1
2019	0,0	24.717,3	0,0	24.717,3
2020	0,0	29.054,1	0,0	29.054,1
2021	0,0	34.998,0	0,0	34.998,0
2022	0,0	39.698,6	0,0	39.698,6
2023	0,0	44.573,7	0,0	44.573,7
2024	0,0	47.876,1	0,0	47.876,1
2025	0,0	48.942,5	0,0	48.942,5
2026	0,0	49.484,2	0,0	49.484,2
2027	0,0	50.270,5	0,0	50.270,5
2028	0,0	53.013,5	0,0	53.013,5
2029	0,0	30.126,0	0,0	30.126,0
2030	0,0	9.073,4	0,0	9.073,4
2031	0,0	8.561,0	0,0	8.561,0
2032	0,0	13.017,1	0,0	13.017,1
2033	0,0	18.024,7	0,0	18.024,7

⁹ Secretaría de Agricultura, Ganadería y Pesca (SAGyP) - INTA EEA Concordia (Eds. Carpineti, L., Dalla Tea, F., Glade, J., Marcó, M.). (1995). *Manual para productores de eucaliptos de la Mesopotamia argentina*. Secretaría de Agricultura, Ganadería y Pesca / INTA.



2034	0,0	22.365,1	0,0	22.365,1
2035	0,0	24.717,3	0,0	24.717,3
2036	0,0	29.054,1	0,0	29.054,1
2037	0,0	34.998,0	0,0	34.998,0
2038	0,0	39.698,6	0,0	39.698,6
2039	0,0	44.573,7	0,0	44.573,7
2040	0,0	47.876,1	0,0	47.876,1
2041	0,0	48.942,5	0,0	48.942,5
2042	0,0	49.484,2	0,0	49.484,2
2043	0,0	50.270,5	0,0	50.270,5
2044	0,0	53.013,5	0,0	53.013,5
2045	0,0	30.126,0	0,0	30.126,0
2046	0,0	5.404,4	0,0	5.404,4
		1.035.361,6		1.035.361,6



4. MONITORING

4.1 Data and Parameters Available at Validation

Table 13 | Parameters available at validation

Data Unit / Parameter:	A _i
Data unit:	Ha
Description:	Area of stratum i
Source of data:	Monitoring of the boundaries of the strata and stands is carried out using a Geographic Information System (GIS) that allows integrating data from different sources (including GPS coordinates and remote sensing data)
Value applied:	Variable depending on stratum
Justification for data choice or description of applied measurement methods and procedures:	N/A
Additional comment:	N/A

Data Unit / Parameter:	D _j
Data unit:	t d,m, m ⁻³
Description:	Basic wood density for the species or species group.
Source of data:	2006 IPCC for National Greenhouse Gas Inventories (Volume 4: AFOLU - Agriculture, Forestry and Other Land Use). Table 4.13. Default values for wood density.
Value applied:	0,52
Justification for data choice or description of applied measurement methods and procedures:	N/A
Additional comment:	N/A

Data Unit / Parameter:	R _j
Data unit:	Dimensionless
Description:	Root-shoot ratio for species or species group j
Source of data:	Tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs"
Value applied:	0,37
Justification for data choice or description of applied measurement methods and procedures:	N/A
Additional comment:	N/A

Data Unit / Parameter:	V TREE j p i
Data unit:	m ³
Description:	Stem volume of trees of species or species group j in plot p in stratum i
Source of data:	Local growth models
Value applied:	N/A
Justification for data choice or description of applied measurement methods and procedures:	N/A
Additional comment:	Growth was estimated based on the average growth according to the specific conditions presented at the project site. Local growth models were used for the ex ante estimation to describe the yield curve and determine the long-term average of the available carbon credits. Local growth models will not be used for ex post estimation, which will be based on field measurements: DBH and height.



Data Unit / Parameter:	Bark Volume
Data unit:	m ³ /ha
Description:	Bark Volume of tree species
Source of data:	Methodological tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs"
Value applied:	15% of total stem volume
Justification for data choice or description of applied measurement methods and procedures:	N/A
Additional comment:	Stem volume estimates from local growth models are performed under bark, so this factor is applied.

Data Unit / Parameter:	f _{IN,i}
Data unit:	Dimensionless
Description:	Relative stock change factor for the baseline input regime in stratum i of land areas.
Source of data:	Table 6 of the activities ""Tool for the estimation of change in soil organic carbon stocks due to the implementation of the afforestation and reforestation CDM project.""
Value applied:	0,7
Justification for data choice or description of applied measurement methods and procedures:	N/A
Additional comment:	N/A

4.2 Data and Parameters Monitored

Table 14 | Monitored Parameters

Data Unit / Parameter:	D _n
Data unit:	Cm
Description:	Diameter of piece n of dead wood lying in intersection of a transect line
Source of data:	Field measurements along transect lines in sample plots
Description of methods and measurement procedures to be applied:	Standard operating procedures are applied. In the absence of these, the procedures from published manuals or the IPCC GPG LULUCF 2003 can be applied.
Monitoring/Recording Frequency:	Before each verification event.
Value applied:	N/A
Equipment Used:	N/A
Quality control and quality assurance procedures implemented:	Quality control/assurance procedures described by current regulations are applied. In the absence of these, the QC/QA procedures from published manuals or the IPCC GPG LULUCF 2003.
Calculation method:	N/A
Additional comment:	N/A

Data Unit / Parameter:	DBH
Data unit:	Cm
Description:	Diameter at breast height of the tree
Source of data:	Field measurements in sampling plots



Description of methods and measurement procedures to be applied:	Diameter at breast height (1.3 meters). Standard operating procedures are applied. In the absence of these, the procedures from published manuals or the IPCC GPG LULUCF 2003 can be applied.
Monitoring/Recording Frequency:	Before each verification event.
Value applied:	N/A
Equipment Used:	N/A
Quality control and quality assurance procedures implemented:	Quality control/assurance procedures described by current regulations are applied. In the absence of these, the QC/QA procedures from published manuals or the IPCC GPG LULUCF 2003.
Calculation method:	N/A
Additional comment:	N/A

Data Unit / Parameter:	H
Data unit:	M
Description:	Tree Height
Source of data:	Field measurements in sampling plots
Description of methods and measurement procedures to be applied:	Standard operating procedures are applied. In the absence of these, the procedures from published manuals or the IPCC GPG LULUCF 2003 can be applied.
Monitoring/Recording Frequency:	Before each verification event.
Value applied:	N/A
Equipment Used:	N/A
Quality control and quality assurance procedures implemented:	Quality control/assurance procedures described by current regulations are applied. In the absence of these, the QC/QA procedures from published manuals or the IPCC GPG LULUCF 2003.
Calculation method:	N/A
Additional comment:	N/A

Data Unit / Parameter:	T
Data unit:	Year
Description:	Time period elapsed between two successive estimates of carbon stocks in Trees.
Source of data:	Recorded time
Description of methods and measurement procedures to be applied:	N/A
Monitoring/Recording Frequency:	N/A
Value applied:	N/A
Equipment Used:	N/A
Quality control and quality assurance procedures implemented:	N/A
Calculation method:	N/A
Additional comment:	If the two successive estimates of carbon stocks in trees are carried out at different times of the year t2 and t1 (for example, in February of year t1 and in November of year t2), then a fractional value is assigned to T.

4.3 Description of the Monitoring Plan

Monitoring will be carried out in accordance with the consolidated methodology AR-ACM0001 "Afforestation and reforestation of degraded lands" (version 05,1,1, EB 60). The analysis of its applicability conditions has been developed in section 2,2 of this document.

Monitoring comprises the collection of information, the carrying out of calculations and the estimation of GHG



emissions and removals. It ensures the implementation of commonly established principles of forest inventory and management. All data collected as part of the monitoring plan are electronically archived and retained at least for two years after the end of the last crediting period.

Physical boundaries will be calculated and verified periodically. The project boundary and the predefined stratum boundaries will be adjusted after the plantations are established. This is performed by aerial photography and using GPS technology and the information will be organized in GIS format. The areas of each stratum will be recalculated and adjusted accordingly.

All activities carried out in each stratum will be recorded and relevant parameters will be quantified, among which are the following:

- Site preparation: herbicide and insecticide application, tillage operations (date of operation, tools used, number of passes, width of operation in strip tillage, depth of operation, chemical weed control).
- Planting date, number of trees planted per unit area, tree species.
- Tree survival rate.
- Fertilization date, form of application, type and quantity of fertilizer used.
- Harvest date, volumes of wood extracted by type of product.
- Disturbances: date, location, affected area (using GPS), type of disturbance, biomass lost.

Sample Design and Stratification

The project boundaries will be defined at the beginning of the project activity and will be updated throughout the crediting period. The boundaries may vary or new strata may be created after the effects of disturbances (pests, droughts, fires) and the 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.
- Soil map.
- Projected land use map.
- Roads, fences, firebreaks, etc.
- Permanent sampling plots.

Any type of addition of information or adjustments in the design and stratification of samples will be duly informed.

The IPCC Good Practice Guidance for LULUCF, chapter 4.3, recommends using a single plot that varies between 100 m² and 600 m², increasing the size of densely planted stands of 1000 trees per hectare to sparsely planted stands of multi-purpose trees.

Considering the IPCC guidelines and the specific project conditions, circular plots of 500 m² have been selected for monitoring. Permanent sampling plots were selected, in full accordance with the guidelines of the methodology and understanding that they are more efficient for estimating changes in carbon stocks by filtering out any variation due to the plot effect.

The estimation of the number of sampling plots was carried out in accordance with the methodological tool "Calculation of the number of sampling plots for measurements within the A/R CDM project activities". The distribution of the sampling plots within the project area of 3,143 hectares will be carried out using a simple random sampling method; a total of 30 sampling plots will be established.

The monitoring plan will seek to achieve an estimation of the average carbon stocks with a target accuracy level of 85% (i.e., a maximum relative sampling error of $\pm 15\%$ with a 95% confidence level). This level is considered an adequate and commonly accepted balance between the reliability of the estimation and the resources necessary for sampling, in line with good practices (IPCC GPG 2003, section 4.3.3.4.1) and the requirements of the applicable standard.

The project manages sampling uncertainties by evaluating and trying to reduce the type of errors.

Data Quality Management

Quality assurance measures will be implemented, in order to verify that data quality objectives are met and, in general, to support the effectiveness of the quality assurance system. The quality assurance plan includes a



- series of activities aimed at achieving data accuracy and precision and transparency of procedures, such as:
- Development of Standard Operating Procedures for field measurements, clearly defining all staff responsibilities and creating awareness about the importance of each task to produce reliable results.
 - Adequate training of field measurement teams.
 - Periodic review and maintenance of measurement instruments; all mechanical, optical and electronic instruments will be periodically reviewed by qualified personnel.
 - In addition, the consistency of field data will be permanently monitored, in order to detect any malfunction.
 - Perform area measurements using different methods (e.g., aerial photography, cadastral data, satellite images, terrestrial measurements) to verify accuracy and consistency.
 - Documentation and archiving of field data and processed data, as well as all procedures used; to ensure data preservation, all relevant data, data analyses, static factors, photographs, images, GIS results and other data will be stored in electronic and paper format.
 - Verify project data with benchmarks. This will help detect possible inconsistencies in data collection or processing.

Operational and Management Structure

Monitoring will be coordinated by Nullaexitus teams, in coordination with specialized technical personnel



5. ENVIRONMENTAL IMPACT

This section details the potential environmental impacts of the project and the mitigation measures adopted, following international best practices and the requirements of the applicable standard.

Climate Change Mitigation

The main positive environmental impact of the project is climate change mitigation, achieved through the sequestration of atmospheric carbon dioxide in forest biomass and potentially in the soil, quantified according to the methodology applied in this document.

Biodiversity Preservation

The project design incorporates the identification and preservation of areas of high conservation value (HCVAs) within the project boundaries or in its area of influence, such as remnants of native forests, wetlands and watercourses, avoiding intervention in them. Although the main objective is carbon sequestration, it is expected that afforestation in previously degraded areas or extensive agricultural use can, over time, offer some habitat value or connectivity for some generalist species, compared to the baseline. The project will implement monitoring or follow guidelines to minimize negative impacts on local biodiversity.

Hydrological Cycle

It is recognized that forest plantations can influence the local hydrological cycle, potentially reducing runoff and increasing evapotranspiration compared to the previous vegetation cover. The potential risk of competition for water resources with other downstream users has been evaluated. However, considering the scale of the project, the characteristics of the basin and the average precipitation rates, no significant negative impacts on water availability for other uses or dependent ecosystems are anticipated.

Soils

The project area presented sandy soils, with low vegetation cover or grasslands in some cases. The established forest cover is expected to contribute to soil protection against erosion and favor the accumulation of organic matter, helping to improve its properties in the long term. Management practices are designed to minimize soil disturbance; site preparation was carried out with tractors for the required soil movements. This allowed the plants to have better root-soil contact, favoring soil exploration and greater survival. Following contour curves. During harvesting, residues (bark, leaves, branches) are planned to be left on the ground to maintain coverage, protect the soil from erosion and machinery impact, and contribute to the nutrient cycle.

Use of Herbicides

The project will use a limited amount of certain chemical products during site preparation for planting; that is, only twice throughout the life of the project. These products include:

- Herbicides for site preparation (including glyphosate). Their application is planned selectively (only when and where necessary for the successful establishment of the plantation), using recommended doses and adequate equipment. Safe handling procedures for storage, mixing and application are adopted, [mencionar si aplica: ej: 'respetando zonas de amortiguamiento con cursos de agua'] with the aim of minimizing risks to human health and the environment.
- Insecticides. Their use is restricted to localized applications and in low doses, mainly during the initial establishment phase to control specific pests (e.g. leaf-cutter ants). Safe handling procedures are followed, like those described for herbicides, in order to minimize associated risks.

Fire Management

The project includes a forest fire prevention and management plan, which contemplates the design, construction and maintenance of perimeter and internal firebreaks, in accordance with the good practices of the sector and the current local regulations.

Socio-economic Impacts

Project activities are expected to generate local employment opportunities, both in planting, maintenance, and harvesting tasks, in a region characterized by limited labor alternatives. This generation of employment can contribute to diversifying income sources and offering alternatives to rural-urban migration, thus supporting the permanence of families in the area.



Conclusion

After the evaluation of potential impacts and the implementation of the described mitigation measures, no significant negative environmental impacts derived from the project activities are anticipated. A monitoring plan will be established to verify environmental performance during the life of the project.