“Weyerhaeuser Uruguay” Forest Plantations on Degraded Grasslands under Extensive Grazing

Monitoring Report Version III

Document Prepared by Carbosur

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1 PROJECT DETAILS

1.1 Summary Description of Project

The project comprises a total of 18.191 ha of land previously under extensive grazing by beef cattle, on which forest plantations were established in order to obtain high-value, long-lived timber products and to sequester large amounts of carbon dioxide from the atmosphere.

Forests are based mainly on *Eucalyptus grandis* and, to a lesser extent, on *Eucalyptus dunnii* and *Pinus taeda* plantations in 16 and 21-year rotations, managed with pruning to a height of 9 and 6 meters, respectively; one thinning operation in Eucalyptus at the age of 11 and two thinning operations in Pinus at the age of 12 and 16, to obtain knot-free, high-diameter logs suitable for saw-milling and veneering. Plantation was completed by year 7 of project and forests were replanted after clear-cut harvest. Practices were compatible with PEFC standard for sustainable forest management. Planted forests will remove carbon dioxide from the atmosphere and store it in different carbon pools (living above-ground and below-ground biomass, soil, litter, non-tree vegetation, dead wood and harvested wood products). Monitoring covered carbon stock changes for living above-ground, litter and dead wood pools. Below ground biomass will be estimated indirectly based on above-ground biomass measurements. Non-tree vegetation and harvested wood products were not accounted for as per the methodology applied. The potential non-permanence of stored carbon was considered by the non-permanence risk analysis and buffer determination, and by the fact that a significant fraction of the sequestered carbon will be stored in long-lived products which will not be accounted.

The baseline study determined that continuation of extensive grazing is the most likely use of the land. 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 Uruguay. In addition, barriers analysis and common practice analysis showed that afforestation in the area of the proposed project activity is not likely to occur without carbon financing.

The project will result in a significant contribution to sustainable development of Uruguay, mainly through: i) increasing employment and quality of employment; ii) rural development (decentralization); iii) increasing gross value of production; iv) improving fiscal balance; v) biodiversity preservation and vi) improvement and preservation of soil quality.

The project activity consists on the establishment of forests on land that has been grassland for more than 300 years. It was developed under the VCS scope 14: “Agriculture, Forestry and Other Land Uses” as an “Afforestation, Reforestation and Revegetation” project.

1.2 Sectorial Scope and Project Type

The activity implemented by the project was the establishment of forests on land that had been grassland for more than 50 years, and therefore belongs in the VCS category Afforestation, Reforestation and Revegetation (ARR).

The project is not a grouped project.

1.3 Project Proponent

The project proponent is ´ Weyerhaeuser Uruguay S.A.´. The company is legally constituted to carry out investments in Uruguay. Contacts details are as follows:

Contact person: Juan Martínez Galán

Street: José Iturriaga 3589

City: Montevideo

Zip code: 11.300

Country: Uruguay

Phone number: +598 2623 4470

All property of ´Weyerhaeuser Uruguay S.A.´ is legally owned and covered by deeds duly registered with the National Records, registered with the corresponding number for the Registration of Real Estate. There are no controversies regarding tenure or use rights over the land assigned to the project or its products.

´Weyerhaeuser Uruguay S.A.´ is 100% property of ´Weyerhaeuser Company´. It was established in 2004, and started its operation in 2005, buying land in the eastern part of the country (Cerro Largo and Treinta y Tres). Since 2010, ´Weyerhaeuser Uruguay S.A.´ has been a REIT (Real Estate Investment Trust) subsidiary of ´Weyerhaeuser Company´ (REIT). All sales (related or non-related parties) of Weyerhaeuser Uruguay are conducted on a PAC (Pay As Cut) basis. Currently, the legal entity sales are split between ´Weyerhaeuser Productos S.A.´ (100% property of Weyerhaeuser Company) and third-party customers. From 2005 to 2010 there was no implementing partner. Since ´Weyerhaeuser Uruguay S.A´ became a REIT, the implementing partner has been ´Weyerhaeuser Productos S.A.´ ´Weyerhaeuser Productos S.A.´ (Non REIT) is a subsidiary of Weyerhaeuser Company (Non REIT) that owns timberland and industry located in the northern region of the country (Tacuarembó and Rivera).

1.4 Other Entities Involved in the Project

Carbosur Ltda. is the consultant in charge of developing the carbon component of the project. It has a contractual agreement with ´Weyerhaeuser Uruguay S.A.´ to develop and manage the carbon project.

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In this verification, field measurements were conducted by an outsourced third party: Campara Consultores. The company was hired -after a competitive tender process- to provide this specific service for Weyerhaeuser Uruguay S.A. Technicians of Campara Consultores will be part of the technical team attending the verification site visit.

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1.5 Project Start Date

The project start date is February 22nd, 2006, when the activities leading to the generation of GHG emission removals (preparing land for planting) were first implemented.

1.6 Project Crediting Period

Project crediting period will be of 100 years, from February 2006 to February 2106.

1.7 Project Location

The project is located in the east of Uruguay, in the departments of Cerro Largo and Treinta y Tres. It comprises several sites, which are classified in 4 regions: ´Centurion´, ´Octava CL´, ´Ruta 7´ and ´Ruta 8´; based on their geographic location. The areas are homogeneous in terms of soil type, climate, land use history and socio-economic conditions. The following map (Figure 1) shows the exact location of the project, and the cadastral units owned by ´Weyerhaeuser Uruguay S.A´., where the project is located.

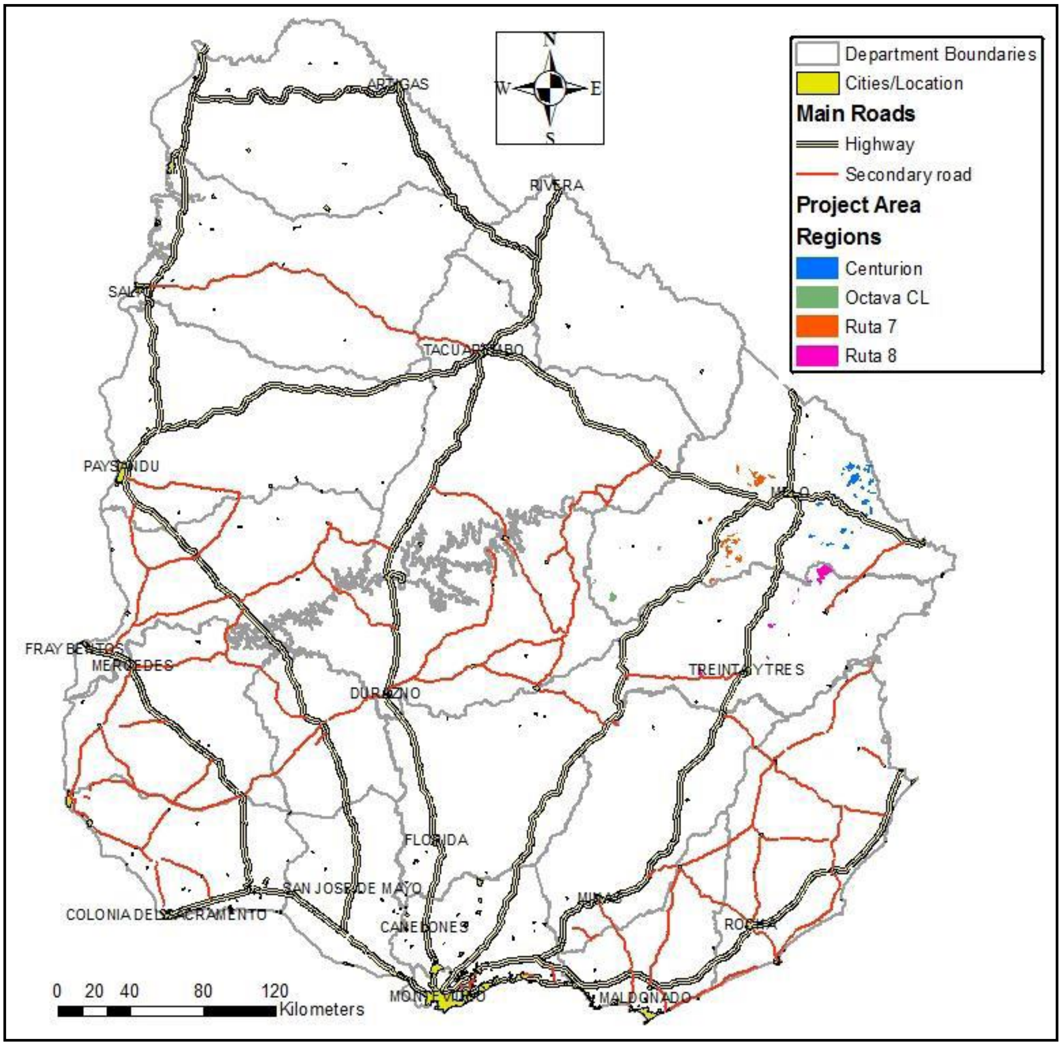

Figure 1. Map of Uruguay showing the location of the areas included in the proposed project activity (black frame).

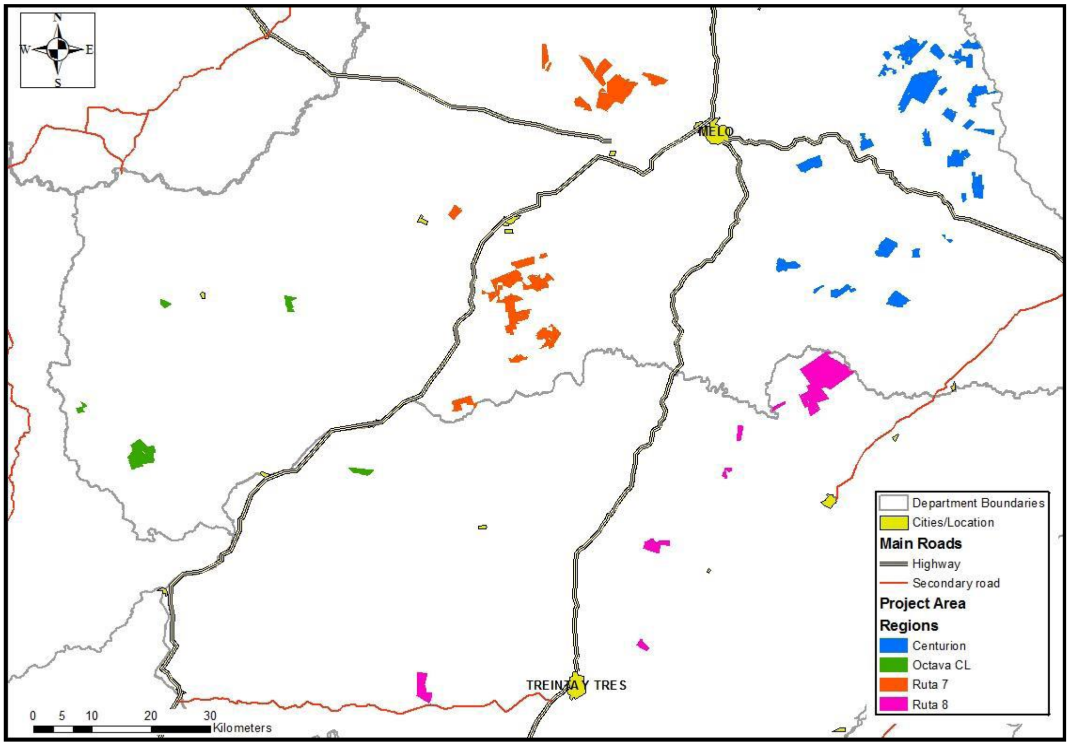

Figure 2. Map indicating the four project regions divided in four different colors.

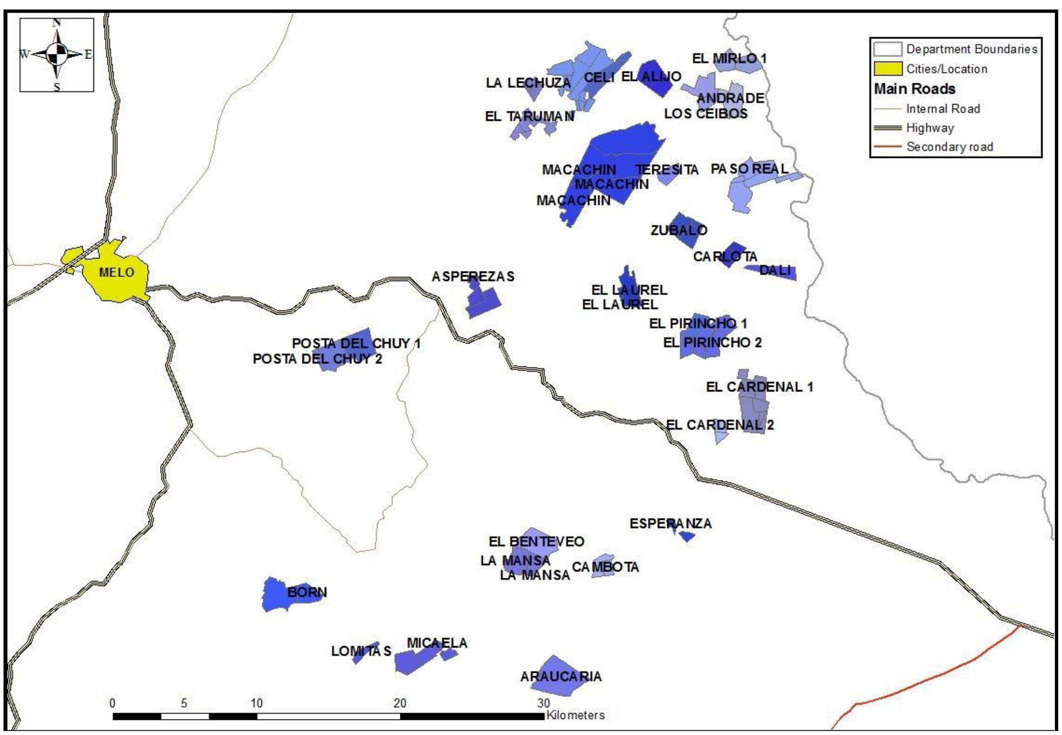

Figure 3. Location of properties which make up the ´Centurión´ region.

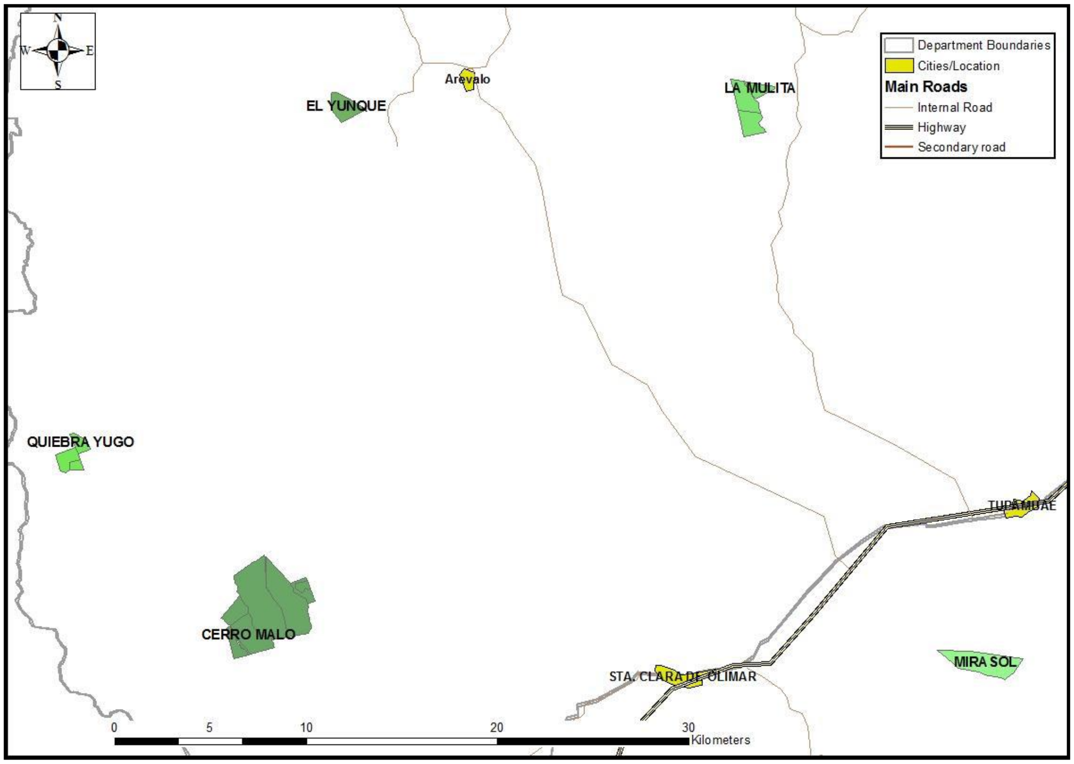

Figure 4. Location of properties which make up the ´Octava CL´ region.

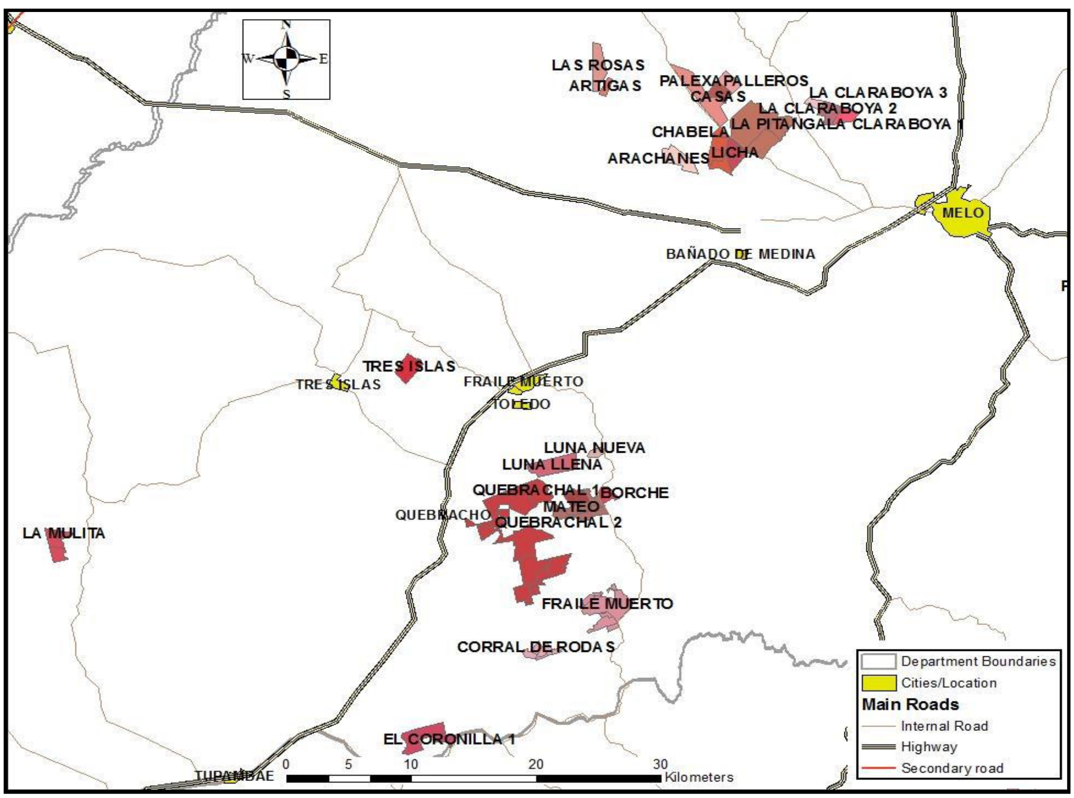

Figure 5. Location of properties which make up the ´Ruta 7´ region.

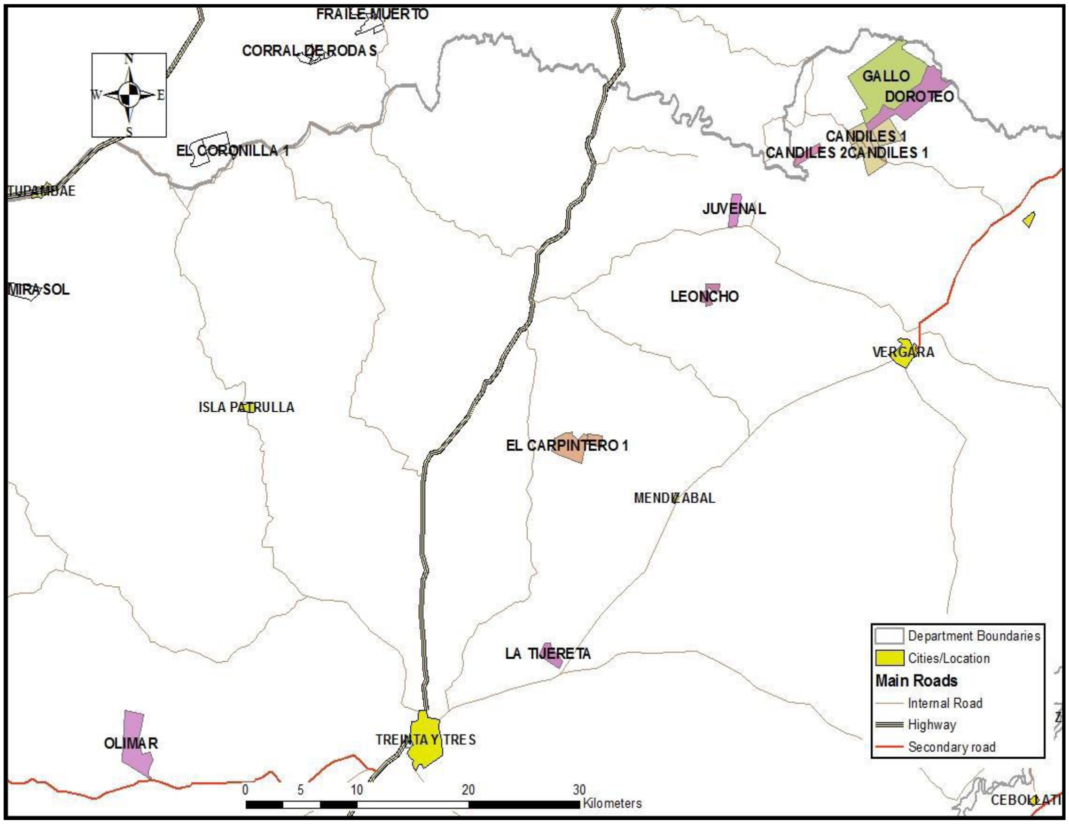

Figure 6. Location of properties which make up the ´Ruta 8´ region.

Following, Table 1 shows details of each species planted area on each project region.

Table 1. Project boundaries by region and species.

Region	*E. grandis (ha)*	*E. dunnii (ha)*	*P. taeda (ha)*	Total area (ha)
Centurión	5.963	673	765	7.400
Octava CL	310	122	376	807
Ruta 7	4.147	716	890	5.753
Ruta 8	3.658	207	366	4.230
Total area (ha)	14.077	1.717	2.397	18.191

Project boundaries were identified using a GPS and aerial photography, and have been laid on a geographic information system. The information provided during verification is the same information showed in the validation, there were no boundaries modifications in these 5 months after project registration. No visible landmarks are established on the field, the limits are on plantations edges defined by tillage during land preparation and plantation.

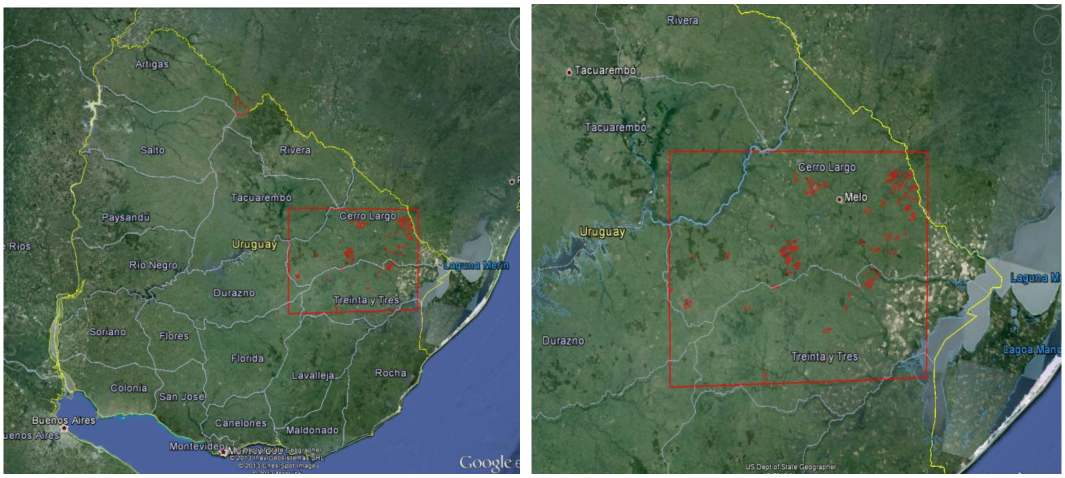

Figure 7. ´Weyerhaeuser Uruguay S.A.´ project boundaries.

1.8 Title and Reference of Methodology

The consolidated CDM methodology AR-ACM0001 “Afforestation and reforestation of degraded land”[1] (version 05.2.0, EB 65) was applied.

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

- Version 01 of “Combined tool to identify the baseline scenario and demonstrate the additionality in A/R CDM project activities”.
- Version 01 of “Tool for testing significance of GHG emissions in A/R CDM project activities”.
- Version 04.0.0 of “Estimation of non-CO2 GHG emissions from burning of biomass attributable to a A/R CDM project activity” (*) (Validated and registered as Version 03.1).
- Version 01 of “Tool for the identification of degraded or degrading lands for consideration in implementing CDM A/R project activities”.
- Version 02.0.0 of “Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activity”. (*) (Validated and registered as Version 01).
- Version 03.0.0 of “Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/RCDM project activity”. (*) (Validated and registered as Version 01).
- Version 01 of “Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity”.
- Version 01.1 of “Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities”.

[1] The methodology expired on the 18th January 2013 and was substituted by the methodology AR-ACM0003 “Afforestation and reforestation of lands except wetlands (version 1.0.0)

2 IMPLEMENTATION STATUS

2.1 Implementation Status of the Project Activity

The ´Weyerhaeuser Uruguay S.A.´ project has recently completed its seventh year. The first areas were planted in 2006, and the last ones in 2012. Under this section, the VCS Monitoring Report Template suggests to describe how leakage and non-permanence risk factors are being monitored and managed.

As was stated in PD document, this project activity does not result in leakage emissions. During validation an exhaustive analysis was carried out that determined this conclusion and therefore leakage is nor monitored or managed. The methodology required 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 may be neglected. 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 is one of the applicability conditions of the tool, resulted in the conclusion that the project will not cause any displacement of the activity occurring before project implementation. Therefore, leakage is assumed to be zero.

With regards to the non-permanence risk factors, it is important to inform that the Non-permanence Risk Report was redacted and approved during validation and is recent. Therefore risk factors stated and described on it were valid at the time of monitoring events and at the instance of writing the present document. A new Non-permanence Risk Report is prepared for this verification and the risks factors and scores are reported in that document.

2.2 Project Description Deviations

´Weyerhaeuser Uruguay S.A.´ Project Design was validated and ultimately registered under the VCS on the 18th January 2013. At that moment the methodology “AR-ACM0001 Afforestation and Reforestation on degraded land” (V 5.2.0, EB 65) was still valid to be used in Afforestation and Reforestation CDM (or VCS) projects. According to the CDM, the request for registration of any project using the mentioned methodology could be submitted until the day in which the project was registered. After that date the methodology was substituted with the Combined Methodology: “AR-ACM0003: Afforestation and reforestation of lands except wetlands”. However, for the purpose of this project Monitoring Reports and subsequent monitoring reports, the methodology to be applied correspond to AR-ACM0001.

With regards to litter and dead wood pools, it was decided to follow the tool “Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities” and not to measure the respective variables. For the estimation of carbon stock in litter and dead wood a conservative default-factor based model was applied, and two factors were used: conservative default factor expressing carbon stock in dead wood as a percentage of carbon stock in tree biomass (8%) and default factor for the relationship between carbon stock in litter and carbon stock in living trees.

2.3 Grouped Project

´Weyerhaeuser Uruguay S.A.´ forest plantations on degraded grasslands under extensive grazing is a single GHG Project.

3 DATA AND PARAMETERS

3.1 Data and Parameters Available at Validation

Table 2. Parameters available at Validation.

Data Unit / Parameter:	A_i
Data unit:	ha
Description:	Area of stratum i
Source of data:	Monitoring of strata and stand boundaries is done using a Geographical Information System (GIS) which allows for integrating data from different sources (including GPS coordinates and Remote Sensing data)
Value applied:	Variable according to stratum
Purpose of the data:	N/A
Any comment:	GPS is the most important tool used for measuring geographical variables or parameters: project boundaries and predefined stratum boundaries, forest area, area of disturbances (fires, droughts, harvesting, etc.). All information collected will be immediately integrated to the GIS.

Data Unit / Parameter:	$BEF_{2,j}$
Data unit:	Dimensionless
Description:	Biomass expansion factor for conversion of stem biomass to above-ground biomass for tree species or group of species j
Source of data:	IPCC default values (e.g. Table 3A.1.10 of IPCC GPG-LULUCF 2003)
Value applied:	From 1.15 to 3.4, depending on the tree age
Purpose of the data:	N/A
Any comment:	BEFs in IPCC reports and national forest inventories are usually applicable to closed canopy forests. If applied to individual trees growing in open field.

Data Unit / Parameter:	CF_j
Data unit:	$t\ C\ t^{-1}$ d.m.
Description:	Carbon fraction of tree biomass for species or group of species j

Source of data:	The IPCC default value of 0.5 t C t^{-1} d.m.
Value applied:	0.5
Purpose of the data:	N/A
Any comment:	N/A

Data Unit / Parameter:	D_j
Data unit:	t d.m. m^{-3}
Description:	Basic wood density for species or group of species j
Source of data:	IPCC 2003. Table 3A.1.9-1 Basic wood densities of stem wood
Value applied:	0.44; 0.46 and 0.482 for *P. taeda*, *E. grandis* and *E. dunnii*, respectively.
Purpose of the data:	N/A
Any comment:	N/A

Data Unit / Parameter:	R_j
Data unit:	Dimensionless
Description:	Root-shoot ratio for species or group of species j
Source of data:	Tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs"
Value applied:	0.2 to 0.4 depending on the tree age: equation from the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs" $R = \frac{exp[-1.085 + 0.9256 \times ln(A)]}{A}$
Purpose of the data:	N/A
Any comment:	N/A

Data Unit / Parameter:	$f_{IN,i}$
Data unit:	Dimensionless
Description:	Relative stock change factor for baseline input regime (e.g. crop residue returns, manure) in stratum i of the areas of land
Source of data:	Tables 6 of "Tool for estimation of change in soil organic carbon stocks due to the implementation

	of A/R CDM Project" activities.
Value applied:	0.7
Purpose of the data:	N/A
Any comment:	N/A

Data Unit / Parameter:	SOC_{REF}
Data unit:	t C ha^{-1}
Description:	Reference SOC stock corresponding to the reference condition in native lands (i.e. non-degraded, unimproved lands under native vegetation . normally forest) by climate region and soil type applicable to stratum i of the areas of land
Source of data:	Table 3 of "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM Project" activities.
Value applied:	88
Purpose of the data:	N/A
Any comment:	NA

Data Unit / Parameter:	$f_{MG,i}$
Data unit:	Dimensionless
Description:	Relative stock change factor for baseline management regime in stratum i of the areas of land.
Source of data:	Table 6 of "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM Project" activities.
Value applied:	0.95
Purpose of the data:	N/A
Any comment:	N/A

Data Unit / Parameter:	$f_{LU,i}$
Data unit:	Dimensionless
Description:	Relative stock change factor for baseline land-use in stratum i of the areas of land; dimensionless
Source of data:	Tables 6 of "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM Project" activities.
Value applied:	1
Purpose of the data:	N/A
Any comment:	N/A

Data Unit / Parameter:	Dead Wood
Data unit:	t C ha^{-1}
Description:	Conservative default factor expressing carbon stock in dead wood as a percentage of carbon stock in tree biomass
Source of data:	Tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"
Value applied:	8% of carbon stock in trees biomass
Purpose of the data:	N/A
Any comment:	N/A

Data Unit / Parameter:	Litter
Data unit:	t C ha^{-1}
Description:	Conservative default factor expressing carbon stock in litter as a percentage of carbon stock in tree biomass
Source of data:	Tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"
Value applied:	4% of carbon stock in trees biomass
Purpose of the data:	N/A
Any comment:	N/A

3.2 Data and Parameters Monitored

Monitoring tasks were performed during the period of time comprised between February, 24th and April, 7th, 2013. The third party involved in this stage was ´Campara Consultores´ which is a Uruguayan consultancy services company, specialized in forest inventories.

´Campara Consultores´ staff working during the monitoring events was compound by 3 permanent persons, occasionally 4 for those strata with a higher number of sample plots. In those exceptional cases, they worked divided in two groups of 2 persons.

During this stage staff´s locomotion consisted of a truck and motorbikes.

´Campara Consultores´ had to randomly re-measure 10% of total number of plots, which resulted in 18 "control plots". The staff in charge of this stage had to be different from the one who firstly made the measurements. If in any plot there was a difference higher than 5% in carbon stock, the company in charge of measurements should measure for a third and definitive time that specific plot. If the difference between both sample plots is higher than 10%, this sample plot should be eliminated from the total estimation of carbon stock.

Although in the PD it was stated that the number of necessary sample plots to measure during the monitoring events was 174. Carbosur Ltda. proceeded to hire statistics expert services, resulting in the need to add sample plots on some stratum in order to achieve higher statistical confidence.

Monitored parameters are listed below.

Table 3. Parameters monitored.

Data Unit / 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	If disturbances events that may affect project boundaries take place, project participants should re-built the stratum and add the area of the project under disturbance in the GIS.
Value monitored:	18.191 ha
Monitoring equipment:	Garmin GPS
QA/QC procedures to be applied:	N/A
Calculation method:	N/A
Any comment:	As stated in the PD, ´Weyerhaeuser Uruguay S.A.´ continuously monitors the area of the forest plantations. 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 03.0.0), equations N° 7 and 13 of the Methodological tool "Estimation of carbon stocks

	and change in carbon stocks in dead wood and litter in A/R CDM project activities" (Version 02.0.0).The field worksheet used was: "Biomasa Aérea.xls".

Data Unit / Parameter:	DBH
Data unit:	cm
Description:	Diameter at Breast Height of tree
Source of data:	
Description of measurement methods and procedures to be applied:	DBH is measured at 1,30 m above ground, over the bark. In case of stem deformation at this level, measurement must be done over the deformation once the stem took its normal shape.
Frequency of monitoring/recording:	Every tree within sample plots and 5 trees outside the plot of one plot per stratum
Value monitored:	5,989 values in 45 strata in 209 plots
Monitoring equipment:	Lufkin diametric tape, model "Executive". 
QA/QC procedures to be applied:	A quality control procedure consists in staff member periodical training. A common practice is to train staff members to make DBH measurements without errors: using firstly a measuring tape (to determine exactly where 1,3 meters height is located in their own bodies) Afterwards, they measure DBH in front of experts and member´s staff to achieve procedures consistency. Quality assurance of DBH measurement is done through measurement of 5 trees surrounding one sample plot per strata. A "t" pair test is conducted to obtain values with a 95% confidence level. This is also useful to demonstrate that sample plots, on which carbon stock is measured, were not treated differently from the rest of the forests (for instance treated with irrigation or fertilizers). Bark that is not stick to the stem shall be removed before measuring. Regarding the use of diameter tapes, expert must consider cleaning (from death bark and branches) the tree stem.
Calculation method:	
Any comment:	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. This parameter was used indirectly in equation N° 1 of the Methodological tool “Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities“ (Version 03.0.0); for calculation of basal area and then volume. The field worksheet used was: “Biomasa Aérea.xls”.

Data Unit / Parameter:	H
Data unit:	m
Description:	Height of trees within sample plot
Source of data:	Field measurement
Description of measurement methods and procedures to be applied:	According to the most common practices applied in biometrics, the diameters of existing trees within a sampling plot are grouped in different classes. The different classes are formed by expert judge based on results obtained from DBH measurement. Following, one tree from the largest diameter class and one tree from the lowest diameter class will be measured in height and finally 5 additional trees are also measured trying to cover uniformly all the diameter variation range between both mark tree classes. The measurement was done according to the following procedure: • Identification of the individual tree to measure. • at the same level (independently that the measuring equipment corrects the value according to the slope). The expert always tried to be situated at a certain distance to the tree equivalent to the height of the tree
Frequency of monitoring/recording:	7 trees per sampling plot and 5 trees outside the plot of one plot per stratum
Value monitored:	
Monitoring equipment:	Clinometer. See the following figure of the type of clinometer used during the monitoring events to measure tree heights. This image represents an electronic clinometer of Haglof, Sweden.  It was also used a telescopic pole to a lesser

	extent of trees.
QA/QC procedures to be applied:	Quality assurance of height measurement was done through the measurement of 5 trees surrounding one sample plot per strata. A "t" pair test was conducted to determine the correctness of the obtained values inside the plot with a 95% confidence level. This will also be useful to demonstrate that sample plots measured for carbon stocks calculations were not treated differently (for example with irrigation or fertilizers) from the rest of the forests. When referring to this electronic device, it is recommended to check the correct visualization of the display. The clinometer was always kept in safe places in order to avoid display rupture. The equipment was always full charge of batteries and back up batteries were always available in case of emergency. Make control measurements using all involved equipment (human error should be minimized at minimum with well training and cross-checked control measurement activities).
Calculation method:	The height of the non-measured trees was estimated with a specific model. This model was developled by Pike Consultora Forestal and has been used successfully for the past five years in various commercial forest inventories that the company makes in various regions of Uruguay. It is based on software that operates as a macro to tun in Excel. This macro performs the following function:1) identifies a plot, 2) assigns the height of the measured trees within the plot and 3) a tre that was not measured in height, the macro identifies the dbh class to which it belong and assigns the average height of the trees in the same dbh class within the same plot. The reliability of height values obtained by the Pike & Co. height model vs a regression function per species. Based on height values measured in the field and their respective DBH values, it was obtained a linear function of height (DBH) for each project region (Ruta 7, Ruta 8, Octava CL and Centurión). Functions were differentiated by region based on the fact that height is considered a site index. By using these functions, those height values not measured in field, were calculated for each individual tree in each plot for each stratum. It was demonstrated by comparing both estimation methods with a t pair test. This test considered a simple of n size of pairs of observations (for *Eucalyptus grandis* n = 4.130,

	for *E. dunnii* n = 1.068 and for *Pinus taeda* n = 791). In this test the hypothesis was that there was no difference between regression functions and Pike&Co. model height values, with a significance of α = 0,05. As a result of this study, the hypothesis is accepted, concluding that there are no siginificative differences between both models height values.
Any comment:	Parameter used indirectly in Equation N° 1 of the Methodological tool “Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities“ (Version 03.0.0); for volume calculation. The field worksheet used was: “Biomasa Aérea.xls”.

Data Unit / Parameter:	$A_{p,i}$
Data unit:	ha
Description:	Area of sample plot
Source of data:	Field measurement
Description of measurement methods and procedures to be applied:	The center of the plot was marked with the assistance of a GPS. One staff member stayed at the center of the plot taking notes of the diameters and heights measured while the other expert of the team walked inside the plot measuring them. Both experts were always connected with a measuring tape, and every tree measured was previously checked in order to determine if the distance to the center was minor to 12.62 m (radius of a circular plot of 500m^2).
Frequency of monitoring/recording:	Every plot measured in Weyerhaeuser Uruguay, 209 in total.
Value monitored:	N/A
Monitoring equipment:	N/A
QA/QC procedures to be applied:	In order to avoid over and under-estimations, every tree was considered inside the plot when the mark of 12.62 m over-passed the 50% of the diameter of every tree.
Calculation method:	$500m^2 = r^2(12.62).\pi$
Any comment:	Sample plots are permanent and circular. The plots were laid down in a shapefile, positioned systematically with a random start. The location of the plots within the forest plantation was done with a GPS. The area of each plot is not a variable but a fixed value, but must be measured by its radius in order

	to determine the variable "number of trees within the plot".

3.3. Description of the Monitoring Plan

The aim of the Monitoring Plan is to record and monitor a number of different parameters in order to ensure that the project followed the corresponding methodology in the validated and registered PD and that the inputs to the carbon calculations are both accurate and up-to-date.

Monitoring was done according to the consolidated methodology AR-ACM 0001 “Afforestation and reforestation of degraded lands” (version 05.2.0, EB 65). The PD was registered mentioning the version 5.1.1 of the referred methodology but the applicable version is the one stated above. Analysis of its applicability conditions have been developed in section 2.2 of the PD.

Monitoring stage comprises gathering information, performing calculations and making estimations of GHG emissions and removals. It ensures that commonly established principles of forest inventory and management are put into practice. All data gathered as part of the monitoring plan was archived electronically and will be kept at least for two years after the end of the crediting period.

Sampling design and stratification

Project boundaries were defined at the beginning of project activity and will be updated along the crediting period, since boundaries may vary or new strata may be created after disturbances effects (pests, droughts, fire). Geographic coordinates are established, recorded and archived. A Geographic Information System was implemented for the validation and is updated for verification. All the geographical information will be available for the verification team.

Other layers will be added in the future, which will be linked to several databases.

With the purpose of developing the monitoring plan, ´Weyerhaeuser Uruguay S.A.´ plantations were stratified into 45 strata. Stratification was done considering region (as described in section 2.3); age class (plantation date); and species planted (*E. grandis, E. dunnii* and *P. taed*a). Current stratification could experiment 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 management activities like thinning or harvesting). The size of the sample plot was decided taking into account accuracy, precision, and time (cost) of measurement. The size of the plot 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 the necessary 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 $600m^2$, increasing the size from densely planted stands of 1000 trees per hectare to sparsely planted stands of multi-purpose trees. Because of application of thinning, forest stands in this project, have a low number of trees per hectare, tending to have a few large trees per hectare as the stands get older, and uniformly distributed. Taking into consideration the guidance by IPCC and the project-specific conditions, circular plots of 500 m^2 have been selected for monitoring. Permanent sampling plots are selected, since these are considered to be more efficient for estimating changes in carbon stocks by filtering out any variance due to plot effect.

Estimation of the number of sample plots was done in accordance with the methodological tool “Calculation of the number of sample plots for measurements within A/R CDM project activities”. Calculations are archived as part of project documentation. The monitoring plan will aim at an estimation of the mean carbon stocks with a precision level of 10% with 90% confidence. These are the values suggested by the selected methodology, and have also been chosen because they reach a compromise between precision in estimation of the population parameters and costs of the measurement and processing (section 4.3.3.4.1 IPCC GPG). The outcome of the estimation from the tool was a total of 209 plots for the whole project area. The distribution of permanent sampling plots per stratum is presented in Table 4.

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

According to the A/R Methodological Tool "Calculation of the number of sample plots for measurements within A/R CDM project activities" (Version 02.1.0) the allocation of sample plots per strata is based on the following formula:

$$n_i = \mathrm{n} * \frac{\mathrm{w_i} * \mathrm{s_i}}{\sum_i \mathrm{w_i} * \mathrm{s_i}}$$

Where:

n_i: Number of sample plots allocated to stratum i; dimensionless

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

w_i: Relative weight of the area of stratum i (i.e. the area of the stratum i divided by the project area); dimensionless

s_i: Estimated standard deviation of biomass stock in stratum i; t d.m. (or t d.m. ha-1)

i: 1, 2, 3, … biomass stock estimation strata within the project boundary.

An Arc-Map software (NAPA) was used to randomly locate the permanent sampling plots (location is systematic, with random start). This software has a feature to enable the location of all plots on forest areas (i.e., it avoids plots from being located in firebreaks and other non-planted areas). The map with the location of the sampling plots is loaded on the GPS receptors used by forest inventory crews, so that they can reach the plots accurately. An example of the software output for two contiguous strata is shown in Figure .

Data collection

Although in the PD it was stated that the necessary number of sample plots was 158; in order to reduce potential sources of error, after validation this number was modified, turning into 209 sample plots. The following table shows the number of strata and number of plots per stratum.

Table 4. Number of plots per stratum.

Region	Stratum N°	Specie	Year plant.	Ex-post	
				Area (hectares)	Plot/Stratum
Centurión	1	*E. dunnii*	2008	320	6
	2		2009	284	3
	3		2010	69	2
	4	*E. grandis*	2007	951	14
	5		2008	2.166	24
	6		2009	910	9
	7		2010	1.532	15
	8		2011	248	2
	9		2012	157	2
	10	*P. taeda*	2007	219	2
	11		2008	388	2
	12		2009	112	2
	13		2010	45	2
Octava CL	14	*E. dunnii*	2008	122	2
	15	*E. grandis*	2010	51	2
	16		2011	259	2
	17	*P. taeda*	2009	118	2
	18		2010	258	2

Ruta 7	19	*E. dunnii*	2007	146	3
	20	*E. dunnii*	2008	134	2
	21		2009	307	3
	22		2010	129	2
	23	*E. grandis*	2006	685	3
	24		2007	1.237	18
	25		2008	614	8
	26		2009	543	5
	27		2010	802	8
	28		2011	267	2
	29	*P. taeda*	2006	388	2
	30		2007	209	2
	31		2008	161	2
	32		2010	133	2
Ruta 8	33	*E. dunnii*	2007	5	2
	34		2008	30	2
	35		2009	90	2
	36		2010	37	2
	37		2012	45	2
	38	*E. grandis*	2007	792	12
	39		2008	517	7
	40		2009	773	7
	41		2010	997	10
	42		2011	430	2
	43		2012	149	2
	44	*P. taeda*	2007	245	2
	45		2008	121	2
Total					**209**

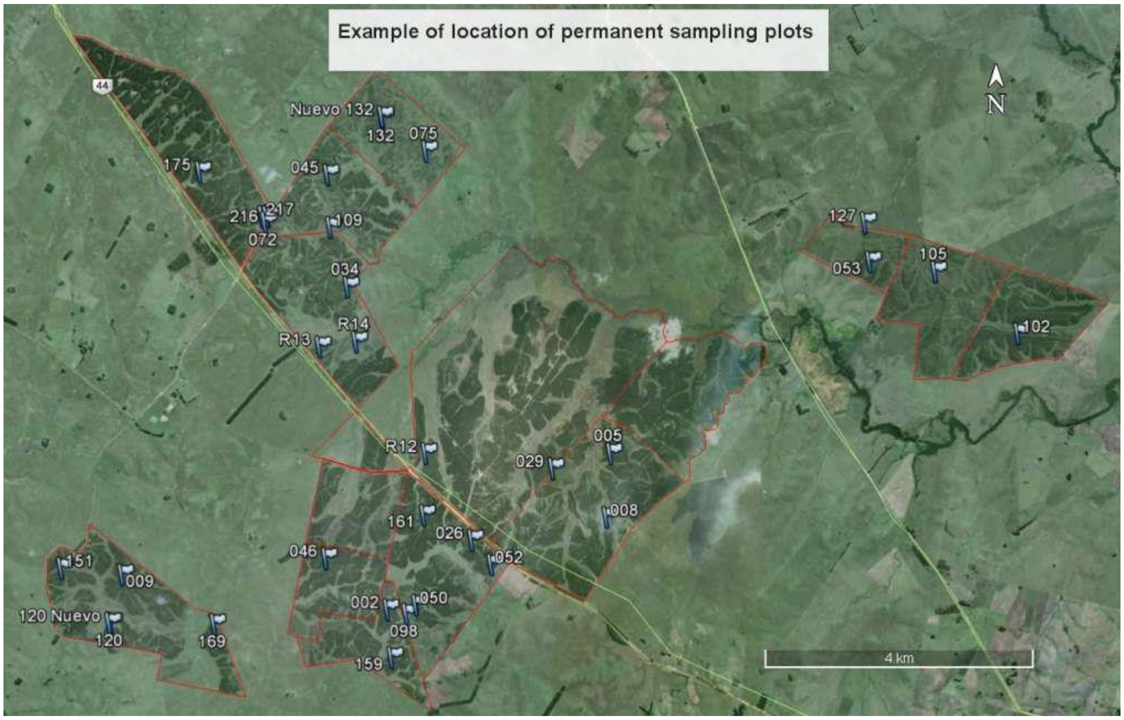

Figure 8. Example of location of permanent sampling plots.

Table 5. Weyerhaeuser Uruguay S.A.´ sample plots coordinates, classified by project region.

Region	Plot N°	Site Name	Latitude	Longitude
Centurion	3	MICAELA	32° 36' 42,718" S	53° 55' 15,128" W
Centurion	4	EL BENTEVEO	32° 32' 7,912" S	53° 50' 10,097" W
Centurion	6	POSTA DEL CHUY 1	32° 24' 47,394" S	53° 58' 19,632" W
Centurion	10	EL PIRINCHO 2	32° 23' 27,989" S	53° 42' 11,844" W
Centurion	12	EL PIRINCHO 2	32° 24' 30,766" S	53° 43' 0,988" W
Centurion	14	ANDRADE	32° 14' 59,215" S	53° 41' 55,637" W
Centurion	17	ARAUCARIA	32° 37' 47,705" S	53° 48' 58,586" W
Centurion	18	EL ALIJO	32° 14' 16,591" S	53° 45' 46,123" W
Centurion	22	BORN	32° 34' 24,935" S	54° 2' 15,594" W
Centurion	24	POSTA DEL CHUY 2	32° 25' 12,475" S	53° 59' 11,317" W
Centurion	25	CAMBOTA	32° 32' 40,315" S	53° 47' 30,095" W
Centurion	27	ZUBALO	32° 19' 38,309" S	53° 44' 28,828" W
Centurion	31	EL BENTEVEO	32° 32' 9,269" S	53° 50' 44,221" W
Centurion	35	ZUBALO	32° 20' 21,016" S	53° 43' 52,338" W
Centurion	37	MACACHIN	32° 17' 37,097" S	53° 48' 21,611" W
Centurion	39	EL MISTO	32° 13' 36,948" S	53° 48' 47,711" W
Centurion	42	LOS CEIBOS	32° 14' 42,371" S	53° 43' 8,018" W
Centurion	48	MICAELA	32° 36' 42,142" S	53° 56' 23,183" W
Centurion	49	DALI	32° 21' 10,199" S	53° 39' 18,850" W

Centurion	54	DALI	32° 21' 13,226" S	53° 41' 13,434" W
Centurion	55	EL PIRINCHO 2	32° 24' 31,003" S	53° 43' 37,762" W
Centurion	56	MICAELA	32° 36' 40,644" S	53° 54' 14,814" W
Centurion	59	ASPEREZAS	32° 23' 17,534" S	53° 53' 30,145" W
Centurion	61	EL CARDENAL 1	32° 25' 41,009" S	53° 41' 4,459" W
Centurion	66	EL CARDENAL 1	32° 26' 25,879" S	53° 41' 29,206" W
Centurion	67	LA MANSA	32° 32' 51,634" S	53° 51' 39,535" W
Centurion	68	EL PIRINCHO 2	32° 24' 1,332" S	53° 44' 6,245" W
Centurion	69	TERESITA	32° 17' 32,222" S	53° 45' 10,735" W
Centurion	70	MACACHIN	32° 17' 0,780" S	53° 45' 50,062" W
Centurion	78	MICAELA	32° 37' 9,548" S	53° 55' 48,158" W
Centurion	80	TERESITA	32° 17' 21,271" S	53° 44' 41,874" W
Centurion	82	MACACHIN	32° 17' 38,062" S	53° 48' 59,785" W
Centurion	83	DALI	32° 21' 16,078" S	53° 39' 59,990" W
Centurion	86	ARAUCARIA	32° 37' 32,426" S	53° 48' 13,288" W
Centurion	87	EL CARDENAL 1	32° 26' 28,633" S	53° 40' 20,212" W
Centurion	88	ASPEREZAS	32° 22' 43,198" S	53° 52' 55,218" W
Centurion	89	EL MIRLO 1	32° 13' 1,736" S	53° 42' 13,640" W
Centurion	90	LOS CEIBOS	32° 14' 12,721" S	53° 43' 25,896" W
Centurion	92	POSTA DEL CHUY 2	32° 25' 27,156" S	53° 59' 33,778" W
Centurion	95	CARLOTA	32° 20' 39,818" S	53° 41' 52,771" W
Centurion	96	ARAUCARIA	32° 36' 58,028" S	53° 49' 31,256" W
Centurion	101	POSTA DEL CHUY 2	32° 24' 58,223" S	54° 0' 15,617" W
Centurion	103	EL PIRINCHO 2	32° 23' 58,340" S	53° 43' 2,161" W
Centurion	106	LA MANSA	32° 32' 47,796" S	53° 50' 22,074" W
Centurion	107	MACACHIN	32° 17' 2,627" S	53° 47' 44,707" W
Centurion	108	ANDRADE	32° 14' 19,104" S	53° 41' 59,003" W
Centurion	113	LOS CEIBOS	32° 14' 45,665" S	53° 43' 27,372" W
Centurion	114	PASO REAL	32° 17' 57,098" S	53° 42' 6,775" W
Centurion	116	EL MISTO	32° 15' 2,387" S	53° 48' 50,591" W
Centurion	117	MACACHIN	32° 18' 40,010" S	53° 47' 2,965" W
Centurion	118	EL CARDENAL 1	32° 27' 32,796" S	53° 40' 53,371" W
Centurion	122	LA MANSA	32° 32' 50,068" S	53° 51' 2,228" W
Centurion	124	MACACHIN	32° 18' 10,490" S	53° 48' 58,651" W
Centurion	130	ANDRADE	32° 14' 54,067" S	53° 42' 38,912" W
Centurion	129	ZUBALO	32° 19' 39,947" S	53° 43' 49,728" W
Centurion	131	ARAUCARIA	32° 37' 23,812" S	53° 49' 37,312" W
Centurion	134	EL CARDENAL 2	32° 27' 43,373" S	53° 42' 26,982" W
Centurion	135	PASO REAL	32° 18' 29,642" S	53° 42' 13,050" W
Centurion	136	PASO REAL	32° 17' 24,490" S	53° 40' 45,106" W
Centurion	137	PASO REAL	32° 17' 22,463" S	53° 40' 16,316" W

Centurion	140	MACACHIN	32° 16' 2,291" S	53° 46' 33,694" W
Centurion	141	MACACHIN	32° 16' 30,724" S	53° 45' 51,224" W
Centurion	144	ARAUCARIA	32° 37' 25,162" S	53° 48' 27,356" W
Centurion	148	MACACHIN	32° 16' 29,453" S	53° 46' 28,402" W
Centurion	150	MACACHIN	32° 17' 34,184" S	53° 46' 27,084" W
Centurion	154	EL MIRLO 1	32° 13' 34,075" S	53° 41' 35,491" W
Centurion	155	EL LAUREL	32° 22' 33,769" S	53° 46' 20,863" W
Centurion	158	EL CARDENAL 1	32° 25' 47,226" S	53° 40' 52,478" W
Centurion	162	MACACHIN	32° 18' 9,504" S	53° 47' 42,227" W
Centurion	163	POSTA DEL CHUY 1	32° 24' 48,762" S	53° 58' 50,218" W
Centurion	166	CAMBOTA	32° 32' 56,875" S	53° 47' 2,609" W
Centurion	167	ARAUCARIA	32° 36' 59,371" S	53° 48' 59,717" W
Centurion	171	EL CARDENAL 1	32° 27' 1,642" S	53° 40' 47,554" W
Centurion	172	MICAELA	32° 36' 16,063" S	53° 54' 44,737" W
Centurion	180	EL TARUMAN	32° 15' 34,160" S	53° 51' 19,591" W
Centurion	177	ASPEREZAS	32° 22' 43,424" S	53° 53' 37,010" W
Centurion	184	LOMITAS	32° 36' 27,090" S	53° 57' 50,425" W
Centurion	185	MACACHIN	32° 16' 51,982" S	53° 48' 36,806" W
Centurion	106-2	LA MANSA	32° 32' 47,796" S	53° 50' 22,074" W
Centurion	135-2	PASO REAL	32° 18' 29,642" S	53° 42' 13,050" W
Centurion	140-2	MACACHIN	32° 16' 2,291" S	53° 46' 33,694" W
Centurion	167-2	ARAUCARIA	32° 36' 59,371" S	53° 48' 59,717" W
Centurion	171-2	EL CARDENAL 1	32° 27' 1,642" S	53° 40' 47,554" W
Centurion	69-2	TERESITA	32° 17' 32,222" S	53° 45' 10,735" W
Centurion	95-2	CARLOTA	32° 20' 39,818" S	53° 41' 52,771" W
Centurion	R1	PASO REAL	32° 17' 44,246" S	53° 40' 36,962" W
Centurion	R2	EL PIRINCHO 1	32° 23' 12,160" S	53° 43' 21,097" W
Centurion	R3	ESPERANZA	32° 31' 38,557" S	53° 43' 28,384" W
Centurion	R4	MICAELA	32° 36' 33,332" S	53° 56' 5,132" W
Centurion	R5	CELI	32° 13' 2,532" S	53° 47' 8,484" W
Centurion	R6	EL MISTO	32° 14' 40,096" S	53° 48' 52,603" W
Region	**Plot N°**	**Site Name**	**Latitude**	**Longitude**
Octava CL	21	EL YUNQUE	32° 39' 8,716" S	55° 8' 51,072" W
Octava CL	44	MIRASOL	32° 54' 46,562" S	54° 46' 14,923" W
Octava CL	76	LA MULITA	32° 38' 26,869" S	54° 55' 29,219" W
Octava CL	100	LA MULITA	32° 38' 52,217" S	54° 55' 28,632" W
Octava CL	104	CERRO MALO	32° 54' 22,446" S	55° 11' 52,195" W
Octava CL	176	CERRO MALO	32° 53' 17,239" S	55° 10' 41,408" W
Octava CL	104-2	CERRO MALO	32° 54' 22,446" S	55° 11' 52,195" W
Octava CL	R10	CERRO MALO	32° 54' 16,499" S	55° 12' 12,683" W
Octava CL	R7	EL YUNQUE	32° 39' 16,661" S	55° 8' 12,970" W

Octava CL	R8	QUIEBRA YUGO	32° 49' 11,863" S	55° 17' 55,964" W
Octava CL	R9	CERRO MALO	32° 53' 59,932" S	55° 12' 14,580" W
Region	**Plot N°**	**Site Name**	**Latitude**	**Longitude**
Ruta 7	2	CHABELA	32° 19' 48,580" S	54° 21' 33,448" W
Ruta 7	5	LA PITANGA	32° 18' 34,538" S	54° 19' 26,087" W
Ruta 7	7	QUEBRACHAL 1	32° 36' 30,636" S	54° 31' 18,984" W
Ruta 7	8	LA PITANGA	32° 19' 5,178" S	54° 19' 28,600" W
Ruta 7	9	ARACHANES	32° 19' 31,148" S	54° 24' 4,187" W
Ruta 7	13	LAS ROSAS	32° 15' 29,830" S	54° 28' 6,697" W
Ruta 7	19	FRAILE MUERTO	32° 41' 25,688" S	54° 25' 59,477" W
Ruta 7	20	EL CORONILLA 1	32° 48' 6,206" S	54° 34' 41,228" W
Ruta 7	26	LICHA	32° 19' 15,643" S	54° 20' 45,208" W
Ruta 7	29	LA PITANGA	32° 18' 41,612" S	54° 19' 59,128" W
Ruta 7	32	LAS ROSAS	32° 14' 30,444" S	54° 28' 8,101" W
Ruta 7	34	PALEXA	32° 17' 14,233" S	54° 21' 54,954" W
Ruta 7	36	LAS ROSAS	32° 15' 54,619" S	54° 28' 12,482" W
Ruta 7	38	QUEBRACHAL 1	32° 37' 0,268" S	54° 31' 22,087" W
Ruta 7	40	QUEBRACHAL 1	32° 35' 51,148" S	54° 31' 49,213" W
Ruta 7	43	FRAILE MUERTO	32° 41' 30,361" S	54° 27' 44,514" W
Ruta 7	45	CASAS	32° 16' 20,402" S	54° 22' 5,948" W
Ruta 7	46	CHABELA	32° 19' 23,862" S	54° 22' 8,249" W
Ruta 7	50	LICHA	32° 19' 46,510" S	54° 21' 17,197" W
Ruta 7	52	LICHA	32° 19' 27,322" S	54° 20' 34,282" W
Ruta 7	53	LA CLARABOYA 3	32° 17' 3,534" S	54° 16' 58,235" W
Ruta 7	60	EL CORONILLA 1	32° 48' 12,467" S	54° 36' 33,930" W
Ruta 7	64	LUNA NUEVA	32° 34' 18,250" S	54° 27' 54,256" W
Ruta 7	71	QUEBRACHAL 1	32° 39' 21,661" S	54° 30' 7,200" W
Ruta 7	72	CASAS	32° 16' 40,087" S	54° 22' 39,932" W
Ruta 7	75	PALLEROS	32° 16' 9,494" S	54° 21' 9,911" W
Ruta 7	77	TRES ISLAS	32° 30' 26,885" S	54° 37' 32,135" W
Ruta 7	79	LUNA LLENA	32° 34' 44,756" S	54° 29' 3,030" W
Ruta 7	98	LICHA	32° 19' 50,725" S	54° 21' 22,709" W
Ruta 7	102	LA CLARABOYA 1	32° 17' 38,220" S	54° 15' 33,887" W
Ruta 7	105	LA CLARABOYA 2	32° 17' 8,448" S	54° 16' 21,029" W
Ruta 7	109	PALEXA	32° 16' 45,498" S	54° 22' 4,692" W
Ruta 7	110	FRAILE MUERTO	32° 41' 33,108" S	54° 26' 31,942" W
Ruta 7	112	EL CORONILLA 1	32° 47' 32,762" S	54° 35' 16,310" W
Ruta 7	119	BORCHE	32° 36' 10,426" S	54° 26' 56,101" W
Ruta 7	120	ARACHANES	32° 19' 54,250" S	54° 24' 11,635" W
Ruta 7	127	LA CLARABOYA 3	32° 16' 44,904" S	54° 17' 1,086" W
Ruta 7	132	PALLEROS	32° 15' 52,787" S	54° 21' 34,812" W

Ruta 7	138	QUEBRACHAL 1	32° 39' 50,026" S	54° 31' 12,058" W
Ruta 7	139	FRAILE MUERTO	32° 41' 59,680" S	54° 27' 8,917" W
Ruta 7	142	QUEBRACHAL 1	32° 39' 19,591" S	54° 29' 21,372" W
Ruta 7	145	LUNA LLENA	32° 34' 50,052" S	54° 30' 2,167" W
Ruta 7	149	LAS ROSAS	32° 14' 59,942" S	54° 28' 4,750" W
Ruta 7	151	ARACHANES	32° 19' 27,743" S	54° 24' 38,502" W
Ruta 7	153	QUEBRACHAL 1	32° 36' 29,066" S	54° 31' 48,288" W
Ruta 7	159	CHABELA	32° 20' 11,623" S	54° 21' 31,270" W
Ruta 7	160	LUNA LLENA	32° 34' 54,073" S	54° 29' 54,488" W
Ruta 7	161	LICHA	32° 19' 3,515" S	54° 21' 12,409" W
Ruta 7	168	ARTIGAS	32° 16' 27,502" S	54° 27' 58,752" W
Ruta 7	169	ARACHANES	32° 19' 55,168" S	54° 23' 12,041" W
Ruta 7	173	QUEBRACHAL 1	32° 35' 49,589" S	54° 30' 31,853" W
Ruta 7	174	QUEBRACHAL 2	32° 36' 54,252" S	54° 29' 20,742" W
Ruta 7	175	PALEXA	32° 16' 18,671" S	54° 23' 18,514" W
Ruta 7	178	EL CORONILLA 1	32° 48' 34,495" S	54° 36' 38,218" W
Ruta 7	179	FRAILE MUERTO	32° 41' 26,419" S	54° 26' 30,235" W
Ruta 7	181	FRAILE MUERTO	32° 41' 9,287" S	54° 27' 49,630" W
Ruta 7	186	QUEBRACHAL 1	32° 38' 18,744" S	54° 30' 19,591" W
Ruta 7	149-2	LAS ROSAS	32° 14' 59,942" S	54° 28' 4,750" W
Ruta 7	174-2	QUEBRACHAL 2	32° 36' 54,252" S	54° 29' 20,742" W
Ruta 7	178-2	EL CORONILLA 1	32° 48' 34,495" S	54° 36' 38,218" W
Ruta 7	60-2	EL CORONILLA 1	32° 48' 12,467" S	54° 36' 33,930" W
Ruta 7	R11	CORRAL DE RODAS	32° 43' 29,899" S	54° 30' 9,439" W
Ruta 7	R12	LA PITANGA	32° 18' 34,049" S	54° 21' 11,304" W
Ruta 7	R13	PALEXA	32° 17' 42,648" S	54° 22' 11,150" W
Ruta 7	R14	PALEXA	32° 17' 40,409" S	54° 21' 50,418" W
Ruta 7	R15	FRAILE MUERTO	32° 42' 26,759" S	54° 26' 24,932" W
Region	**Plot N°**	**Site Name**	**Latitude**	**Longitude**
Ruta 8	1	CANDILES 2	32° 47' 19,918" S	54° 1' 14,466" W
Ruta 8	11	CANDILES 1	32° 47' 6,544" S	53° 58' 18,653" W
Ruta 8	15	CANDILES 1	32° 47' 50,107" S	53° 57' 22,432" W
Ruta 8	16	GALLO	32° 44' 39,865" S	53° 59' 2,202" W
Ruta 8	23	OLIMAR	33° 14' 21,862" S	54° 39' 53,950" W
Ruta 8	28	CANDILES 1	32° 46' 54,084" S	53° 57' 30,604" W
Ruta 8	30	CANDILES 1	32° 46' 48,767" S	53° 56' 30,275" W
Ruta 8	33	GALLO	32° 43' 58,962" S	53° 56' 27,416" W
Ruta 8	41	EL CARPINTERO 1	33° 1' 11,849" S	54° 15' 27,850" W
Ruta 8	47	GALLO	32° 45' 19,170" S	53° 57' 52,448" W
Ruta 8	51	GALLO	32° 44' 56,699" S	53° 57' 19,778" W
Ruta 8	57	DOROTEO	32° 46' 6,406" S	53° 58' 1,621" W

Ruta 8	58	GALLO	32° 44' 48,541" S	53° 56' 17,462" W
Ruta 8	62	LEONCHO	32° 54' 2,473" S	54° 7' 35,108" W
Ruta 8	63	JUVENAL	32° 50' 37,860" S	54° 5' 59,143" W
Ruta 8	65	GALLO	32° 43' 4,951" S	53° 56' 20,386" W
Ruta 8	73	GALLO	32° 45' 45,335" S	53° 58' 24,834" W
Ruta 8	74	GALLO	32° 43' 9,440" S	53° 56' 49,780" W
Ruta 8	81	GALLO	32° 43' 42,316" S	53° 58' 35,555" W
Ruta 8	84	CANDILES 1	32° 46' 15,560" S	53° 58' 32,005" W
Ruta 8	85	CANDILES 1	32° 46' 41,732" S	53° 59' 29,699" W
Ruta 8	91	CANDILES 2	32° 47' 24,227" S	54° 1' 44,080" W
Ruta 8	93	GALLO	32° 45' 22,720" S	53° 58' 26,256" W
Ruta 8	94	GALLO	32° 44' 40,614" S	53° 57' 58,446" W
Ruta 8	97	DOROTEO	32° 45' 55,364" S	53° 57' 17,752" W
Ruta 8	99	GALLO	32° 44' 26,372" S	53° 58' 32,232" W
Ruta 8	111	EL CARPINTERO 1	33° 0' 35,737" S	54° 14' 54,323" W
Ruta 8	115	LA TIJERETA	33° 10' 20,636" S	54° 16' 26,090" W
Ruta 8	121	GALLO	32° 44' 52,940" S	53° 56' 47,818" W
Ruta 8	123	DOROTEO	32° 45' 18,727" S	53° 55' 18,797" W
Ruta 8	125	GALLO	32° 44' 3,091" S	53° 57' 29,822" W
Ruta 8	126	CANDILES 1	32° 47' 34,616" S	53° 58' 58,195" W
Ruta 8	128	CANDILES 1	32° 47' 52,256" S	53° 57' 52,718" W
Ruta 8	133	GALLO	32° 43' 52,280" S	53° 58' 46,092" W
Ruta 8	143	DOROTEO	32° 45' 12,823" S	53° 55' 13,350" W
Ruta 8	146	DOROTEO	32° 44' 37,835" S	53° 55' 36,606" W
Ruta 8	147	GALLO	32° 44' 58,888" S	53° 58' 6,539" W
Ruta 8	152	CANDILES 1	32° 46' 35,501" S	53° 58' 55,654" W
Ruta 8	156	LEONCHO	32° 54' 5,288" S	54° 7' 17,890" W
Ruta 8	157	JUVENAL	32° 49' 53,202" S	54° 5' 54,017" W
Ruta 8	164	DOROTEO	32° 44' 54,769" S	53° 55' 52,370" W
Ruta 8	165	GALLO	32° 44' 17,822" S	53° 56' 3,520" W
Ruta 8	170	CANDILES 1	32° 47' 30,026" S	53° 58' 19,315" W
Ruta 8	182	OLIMAR	33° 15' 23,594" S	54° 40' 26,771" W
Ruta 8	183	OLIMAR	33° 15' 44,863" S	54° 39' 12,236" W
Ruta 8	111-2	EL CARPINTERO 1	33° 0' 35,737" S	54° 14' 54,323" W
Ruta 8	125-2	GALLO	32° 44' 3,091" S	53° 57' 29,822" W
Ruta 8	62-2	LEONCHO	32° 54' 2,473" S	54° 7' 35,108" W
Ruta 8	85-2	CANDILES 1	32° 46' 41,732" S	53° 59' 29,699" W
Ruta 8	97-2	DOROTEO	32° 45' 55,364" S	53° 57' 17,752" W
Ruta 8	R16	CANDILES 1	32° 46' 50,650" S	53° 56' 33,598" W
Ruta 8	R17	GALLO	32° 43' 22,238" S	53° 56' 47,623" W
Ruta 8	R18	GALLO	32° 43' 34,061" S	53° 58' 27,163" W

Ruta 8	R19	JUVENAL	32° 49' 41,023" S	54° 5' 41,399" W
Ruta 8	R20	OLIMAR	33° 15' 58,716" S	54° 39' 36,958" W
Ruta 8	R21	OLIMAR	33° 15' 29,988" S	54° 39' 40,180" W
Ruta 8	R22	OLIMAR	33° 16' 15,535" S	54° 39' 3,971" W
Ruta 8	R23	CANDILES 1	32° 47' 41,777" S	53° 57' 49,151" W

Each carbon pool was measured following the methodology procedures and IPCC Good Practice Guidance for LULUCF (2003). Carbon stocks in above and below ground biomass of trees are estimated by applying the BEF method, which calculates the biomass of trees of each species per unit area in each stratum at a given point of time, based on the following tree dimensions: diameter, basal area and height, obtained from field measurements. By applying BEF method, volume equations are used to convert tree dimensions to stem volume of trees based on DBH and height measurement in each plot. Stem volume of trees is then converted to above-ground and below-ground tree biomass using basic wood density (D), biomass expansion factor (BEF) and root-to-shoot ratio (R). Default carbon fraction (CF) value was used in order to estimate the carbon stock.

Deadwood and litter was calculated according to the tool “Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities”. The conservative default approach was selected.

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

Managing data quality

1) A Quality Control System will be implemented for routinely checking for data consistency, correctness and completeness; for identifying and correcting errors and omissions; and for properly documenting and archiving data and documentation related with the monitoring activities. 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 QC system.

2) QA/QC plan includes a number of activities aiming at achieving accuracy and precision of data, and transparency of procedures, such as:

-development of Standard Operating Procedures for field measurements, clearly defining all staff responsibilities and raising awareness about the importance of each tasks for producing reliable results;

-proper training of field measuring teams;

-periodical check and maintenance of measuring instruments; all mechanical, optical and electronic instruments will be periodically checked by qualified personnel. In addition, consistency on field data will be permanently monitored, in order to detect any malfunctioning.

-perform area measurements using different methods (e.g., aerial photograph, cadastral data, satellite images, ground measurements), and check for accuracy and consistency.

-development of electronic worksheets for data processing; special software may be designed for the monitoring process, with graphical capabilities and data consistency checking functions.

-fully document and archive field and processed data, as well as all procedures used; to ensure data preservation, all relevant data, data analyses, static factors, photos, images, GIS output and other data shall be stored in electronic and paper format.

-establish procedures for eliminating inconsistent or erroneous field data; perform random checks of field measurements in order to detect measurement errors or systematic biases; some of such measures are:

- use field computers and automatic data loggers (e.g., electronic recording caliper), and hire independent workers for transferring field data to digital media. (IPCC GPG 5.3.6.1); 2) during field work, double check 10% of sampling measurements with an independent party team or with a team different from the one that performed the measurement or sampling; if the difference between measurements is higher than 5%, a third definitive measurement will be run. If the difference is higher than 10%, the data or the plot will be eliminated.

- establish procedures to ensure representativeness of PSPs (i.e., to avoid biased estimates due to differential management of PSPs); The allocation of samples in the field will be systematic with random start, so, the differences between population and sample mean and variance will tend to neutralized, as the sample fraction is wide enough; identification of plots in the field should be coded and apparent only to the monitoring team; periodical checks will be performed on simple measurements (e.g., DBH) outside PSPs, in order to correlate these values with plot measurements.

- development of algometric equations and emission/C-stock-change factors; project-specific equations and stock change factors would minimize errors, as compared to the use of default factors.

- check project data with benchmarks; this will help detecting possible inconsistencies in data collection or processing.

Operational and management structure

The monitoring was coordinated by the property manager and implemented by a qualified contractor. One staff member of Weyerhaeuser Uruguay S.A.´ was identified as the focal point.

Entity applying monitoring plan:

Company: ´Weyerhaeuser Uruguay S.A.´

Street: José Iturriaga 3589

City: Montevideo / Zip code: 11.300

Country: Uruguay

Phone: +598 2623 4470

Monitoring measuring events and initial data processing were developed by the consultant ´Campara Consultores.´

Entity applying measuring events in 2013:

Company: ´Campara Consultores´ --- Address: Achiras 1384 Apt. 702

City: Montevideo /Zip code: 11.300

Country: Uruguay

Phone: +598 2 709 9037—Website www.campara.com.uy

Figure 9. Measuring events on field.

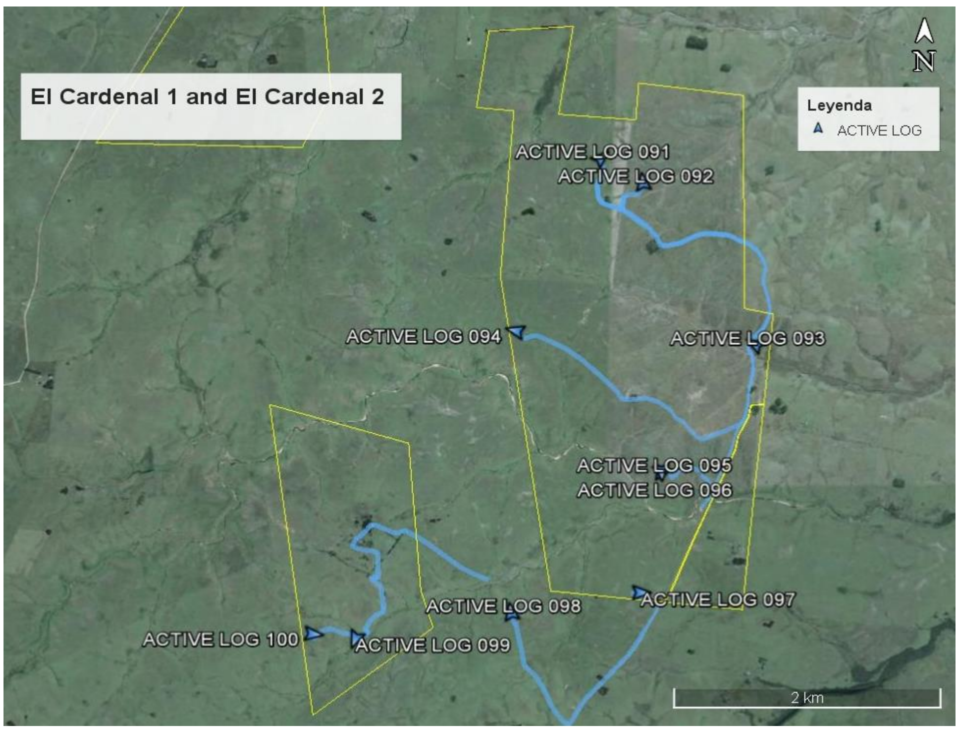

Figure 10. Example of tracks followed in order to reach the sampling plots during the monitoring events.

4. QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 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 accordance 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.

4.2 Project Emissions

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; t CO_2-e.
ΔC_{ACTUAL}	Actual net GHG removals 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 actual net greenhouse gas removals by sinks were estimated using the following equation described in the methodology:

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

Where:

C_{ACTUAL}	Actual net greenhouse gas removals by sinks; t CO_2-e.
ΔC_P	Sum of the changes in above-ground and below-ground tree biomass, 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 A/R CDM project activity within the project boundary; t CO_2-e.

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

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

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; t CO_2-e.
$GHG_{E,t}$	Increase in non-CO_2 emissions due to biomass burning of existing vegetation as part of site preparation in year t; t CO2-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

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. For ex-ante estimation, all pools were accounted. Following is presented the equation for the estimation of ΔC_P. 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, t $CO_{2\text{-e.}}$
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”; t $CO_{2\text{-e.}}$
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”; t $CO_{2\text{-e.}}$
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”; t $CO_{2\text{-e.}}$
ΔC_{SOC}	Change in carbon stock in SOC in project, in areas of land meeting the applicability conditions of the tool “Tool 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; t $CO_{2\text{-e.}}$

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”. Carbon estimations in trees are based on field measurements of monitored parameters, chapter 3.2 of the Monitoring Report. Estimations are archived as part of the project verfication 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:

$$B_{TREE,j,p,i,t} = V_{TREEj,p,i,t} \times D_j \times BEF_{2,j} \times (1 + R_j)$$

Where:

$B_{TREE,j,p,i,t}$ Biomass of trees of species j in sample plot p of stratum i at early 2013

$V_{TREEj,p,i,t}$ Stem volume of tree species using field measurements of tree parameters (DBH and height), default values (tree shape factor) and complemented with worksheets data processing (interpolation of not-measured heights); m^3

The applied equation for volume estimation is no other formula than the cylinder volume equation corrected by a taper value:

$$V_{TREE} = Basal\ area \times height$$

Where:

$$Basal\ area = \frac{\pi \times DBH^2}{4}$$

Being DBH Diameter at Breast Height.

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:

a) The equation is used both in the national forestry inventory and the national GHG inventory of Uruguay, and

b) The equation has been used in commercial forestry sector in Uruguay for 10 years or more.

The taper corrective value or tree shape factor used is 0.5 and the appropriateness of it was demonstrated during validation, it is a parameter available at validation and is not monitored. It is neither mentioned in the methodology as a monitored parameter.

However, it is preferred to demonstrate the appropriateness of this value with some other documents that support it[2].

D_j Basic wood density of tree species j. The species j corresponds to the three species planted in the project: *Eucalyptus grandis*, *Eucalyptus dunnii* and *Pinus taeda*, with a basic density of 46, 48 and 44 t.d.m./m^3, respectively. This parameter was established as “available at validation” in the Project Design, thus it was not measured or monitored. The value was

[2] "Proyecto Regional de alternativas para la inversión forestal", Cap VI, cuadro 6.7 (http://www.oas.org/dsd/publications/Unit/oea20s/ch08.htm)

obtained and corresponds to default value for *Pinus pinaster* in IPCC LULUCF Good Practice Guidance (2003), Table 3A.1.9-1

(http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf_files/Chp3/Anx_3A_1_Data_Tables.pdf).

As also established in the validation report, the applied value is also mid-range in values for loblolly pine wood density published by Oregon State.

$BEF_{2,j}$ Biomass expansion factor for conversion of stem biomass to above-ground tree biomass, for tree species j (*E. grandis*, *E. dunnii* and *P. taeda*.); dimensionless. The BEF_2 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)). These values were also available at validation and not monitored, it ranged from 3.4 and 2.80 for young forest to 1.68 and 1.55 for mature forests, of *Eucalyptus sp*. and *P.taeda* respectively. Exact values applied for different plantation dates are reported in the final worksheet for carbon stock calculation.

R_j Root-shoot ratio for tree species j; dimensionless. The values applied were taken from the suggested equation from the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs":

$$R = \frac{exp[-1.085 + 0.9256 \times ln(A)]}{A}$$

Where A is aboveground biomass content (t.d.m./ha). The aboveground biomass was calculated per year of plantation and different values were obtained.

The following table illustrates the values of measured on field aboveground biomass (t.d.m./ha) and the corresponding value for R (dimensionless).

Table 6. Field aboveground biomass and their correspondent root-shoot values for each project species.

Year of plantation	Aboveground biomass (t.dm/ha)		R estimated based on the aboveground biomass measurement (dimensionless)		R Used for ex-ante estimations in and approved in validation	
	P. taeda	*Eucalyptus*	*P. taeda*	*Eucalyptus*	*P. taeda*	*Eucalyptus*
2006	71,22	169,19	0,25	0,23	0,30	0,20
2007	46,38	136,70	0,25	0,23	0,30	0,20
2008	25,39	82,59	0,27	0,24	0,30	0,20
2009	4,73	38,73	0,30	0,26	0,30	0,30
2010	0,56	18,01	0,35	0,27	0,30	0,30
2011	0,00	4,85	0	0,30	0,30	0,30
2012	0,00	0,53	0	0,35	0,30	0,30

For *Pinus taeda* plantations, the calculation of R for years 2011 and 2012 does not have any result due to the inexistence of aboveground biomass in the mentioned plantation years.

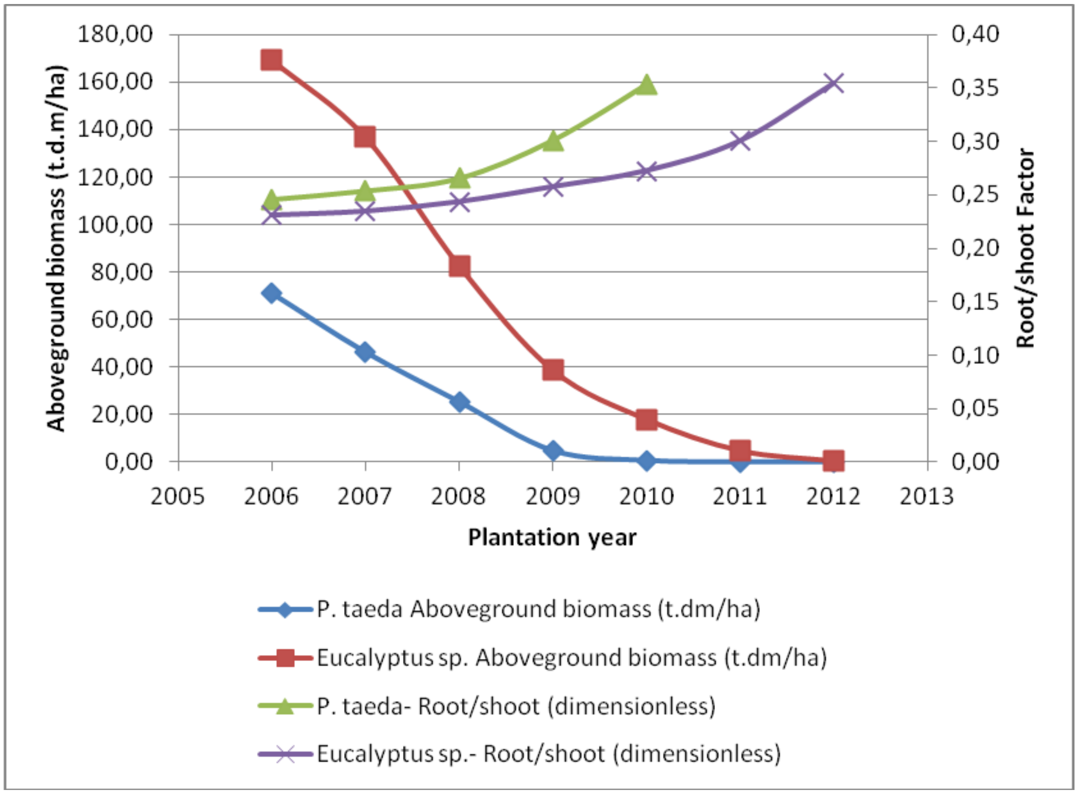

Figure 7. Relationship between aboveground biomass and root-shoot factor for *P. taeda* and *Eucalyptus sp*.

Finally, the carbon stock in tree biomass within the project boundary is estimated as follows:

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

Where:

C_{TREE} Carbon stock in tree biomass within the project boundary; t CO2-e.

B_{TREE} Biomass of trees within the project boundaries.

CF_{TREE} Carbon fraction of tree biomass; 0.5 t C td.m^{-3}

Soil organic carbon

Estimations of soil organic carbon (SOC) stocks were done in accordance to the "Tool for the estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activity". As suggested by the tool, it is assumed that the implementation of the project activity increases the SOC content of the lands from the pre-project level to the level that is equal to the steady-state SOC content under native vegetation. The increase in SOC content in the project scenario takes place at a constant rate over a period of 20 years from the year of planting. The project meets the applicability conditions of this tool –as demonstrated in validation- since the areas of land to which the tool is applied do not fall into wetland category, do not contain organic soils and are not subject to any of the land management practices and application of inputs listed in the tool.

It is important to emphasize that, according to the applicability conditions stated in the methodological "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities", only areas planted with *Pinus taeda were* considered for this estimation. This is explained by the fact that the calculation of this parameter is limited to those areas where soil disturbance is not repeated in less than twenty years after site preparation. In case of *Eucalyptus sp.* areas, due to its rotation period of 16 years, soil disturbance after site preparation is repeated in less than twenty years, though only *P. taeda* areas (rotation period of 24- 25 years) were considered for estimating SOC stocks.

Litter remains on site and is not removed and soil disturbance is in accordance with appropriate conservation practices, limited to site preparation and not repeated within 20 years.

Table 7. Parameters used for estimation of Soil Organic Carbon (SOC).

Parameter	Symbol	Value	Source (SOC estimation tool, V01.1.0)
Reference SOC (Tc/ha)	$SOC_{REF,i}$	88	Table 3 HAC soils, warm temperate
Land use factor	$f_{LU,i}$	1	Table 6 All permanent grassland
Management factor	$f_{MG,i}$	0.95	Table 6 Moderately degraded grassland Overgrazed or moderately degraded grassland, with somewhat reduced productivity (relative to the native or nominally managed grassland) and receiving no management inputs
Input factor	$f_{IN,i}$	1	Table 6 Grassland without input of fertilizer

SOC at the beginning of the project ($SOC_{INICIAL,i}$) is estimated by multiplying the factors in Table 8 by the reference SOC . As per the tool, a loss in SOC ($SOC_{LOSS,i}$) is applied in the case that soil disturbance occurs on more than 10 per cent of the land area, which is the case of ´Weyerhaeuser Uruguay S.A.´ project. The following methodological formula is used for calculating the annual change in SOC stock:

$$dSOC_{t,i} = \frac{SOC_{REF,i} - [(SOC_{INICIAL,i} - SOC_{LOSS,i})]}{20}$$

Where:

$dSOC_{t,i}$ The rate of change in SOC stock in stratum I of the area of land, in year t; t C/ha/yr.

$SOC_{REF,i}$ Reference SOC stock corresponding to the reference condition in native lands by climate region and soil types applicable to stratum I of the area of land; Tc/ha.

$SOC_{INICIAL,i}$ SOC stock at the beginning of the A/R CDM project activity in stratum I of the areas of land.

$SOC_{LOSS,i}$ Loss of SOC caused by soil disturbance attributable to the A/R CDM project activity, in stratum I of the areas of land; tC/ha.

Application of the equation results in an estimated increase of 0.64 t C/ha/year in soil organic carbon. From the project start day there has passed 2.555 days and the correspondent carbon sequestration is presented to the verification team in the calculation worksheet.

Litter and Dead Wood

Estimations were done in accordance with the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities" using a default and conservative value of 8% and 4% of carbon stock in tree biomass for dead wood and litter respectively.

4.3 Leakage

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. 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 is one of the applicability conditions of the tool, resulted in the conclusion that the project will not cause any displacement of the activity occurring before project implementation.

Beef cattle breeding (cow-calf) was the dominant activity in the pre-project land (Eastern hilly areas of Uruguay). Cattle were based on a breeding herd where heifers are mostly placed with bulls at the age of 3 years. Sales include culling cows to be fattened, surplus heifers, and calves (at weaning). Average production is 33 kg per ha per year[3]. Existing cattle in the pre-project situation it is commonly sold to the market. (calves and surplus heifers are normally sold in the market for fattening on other grazing areas, while cows, heifers and a reduced number of bulls are sold to slaughterhouses).

Furthermore, according to data gathered from governmental Livestock Controller Division (DICOSE)[4] there has been a smooth increase in the beef cattle and sheep stock in the departments of Cerro Largo and Treinta y Tres (where the project activity occurs) in the last decade (from 1.75 million livestock units, LSU, in 2003 to 1.92 million LSU in 2009). On the other hand, according to data taken from National Forest Directorate (DGF)[5] forest plantations have also been increasing for the same period of time (from 37 thousand hectares in 2003 to 72 thousand hectares in 2009) in the same departments. In addition, native forest has been also increasing in terms of area in the last 43 years at the National level. According to National Forest Inventory (2010)[6] and to the forest maps based on aerial photographs of 1967[7] native forests have increased 21% in terms of area. The fact that total forest area and amount of livestock have been increasing, analyzing Cerro Largo and Treinta y Tres official data, is evidence that project activity does not result in displacement of the previous productive system. Therefore, leakage is assumed to be zero.

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. The application of the "Guidelines on conditions under which increase in GHG emissions related to displacement of pre-project grazing

[3] INIA., 2001. Tecnologías forrajeras para sistemas ganaderos de Uruguay. Boletín de Divulgación 76.

[4] http://www.mgap.gub.uy/DGSG/DICOSE/dicose.htm

[5] http://www.mgap.gub.uy/portal/hgxpp001.aspx?7,20,442,O,S,0,,

[6] http://www.mgap.gub.uy/portal/hgxpp001.aspx?7,20,440,O,S,0,,

[7] URUGUAY MAP. Forest Directorate.- First Forest Chart. Montevideo: MAP, 1979 (http://www.mgap.gub.uy/portal/hgxpp001.aspx?7,20,410,O,S,0,MNU;E;2;15;125;1;MNU;,)

activities in A/R CDM project activity is insignificant", which is one of the applicability conditions of the tool, resulted in the conclusion that the project will not cause any displacement of the activity occurring before project implementation.

4.4 Summary of GHG Emission Reductions and Removals

The final results for aboveground and below ground are presented below, distinguished by plantation year.

Baseline net GHG removals and total GHG emissions due to leakage are zero, thus ex-post measurement of C_{AR-CDM} equals ΔC_{ACTUAL}:

Table 8. Summary of GHG Emission Reductions and Removals.

	GHG Emission Reductions and Removals (tCO_2)				
Planted year	Above and belowground biomass	Dead wood	Litter	SOC	Total (tCO_2)
2006	324.449	25.956	12.978	3.570	366.953
2007	1.047.281	83.782	41.891	6.198	1.179.152
2008	776.943	62.155	31.078	6.174	876.350
2009	263.242	21.059	10.530	2.123	296.953
2010	157.577	12.606	6.303	4.007	180.494
2011	13.845	1.108	554	0	15.507
2012	387	31	15	0	434
Total (t CO_2)	2.583.724	206.698	103.349	22.072	**2.915.843**

According to VCS version 3, AFOLU requirements, the amount of carbon credits must not exceed the long term GHG benefit of the project, which is 5.601.938 tCO_2.

Uncertainty of tree biomass per hectare

According to the instructions given in Version 03.0.0 of "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/RCDM project activity" tool, uncertainty of tree biomass per hectare within the project boundary was calculated, using the following formula:

$$u_{bTREE,t} = \frac{\mathrm{t_{VAL}} x\, S_{bTREE,t}}{\mathrm{b_{TREE,t}}}$$

Where:

$u_{bTREE,t}$ Uncertainty of tree biomass per hectare within the project boundary at a given point of time in year *t*, %.

t_{VAL} Two – sided Student´s *t*-value for: (i) Degrees of freedom equal to *n-M*, where *n* is total number of sample plots within the project boundary, and *M* is the total number of tree biomass estimation strata; and (ii) a confidence level of 90%.

$S_{bTREE,t}$ Square root of the variance of mean tree biomass per hectare within project boundary at a given point of time in year *t* (i.e. the standard error of the mean); t d.m.ha^{-1}.

$b_{TREE,t}$ Mean tree biomass per hectare within the project boundary at a given point of time in year t; t d.m.ha^{-1}.

In order to assure the reliability of the obtained results, a statistical analysis was done, including three items:

- Calculate the uncertainty of the mean tree biomass per hectare within the project boundary, by applying the formula stated above.
- Random re-measure of 10% of the measured number of plots, resulting in 18 "control plots". The staff in charge of this stage had to be different from the one who firstly made the measurements. If in any plot there was a difference higher than 5% in carbon stock, the company in charge of measurements should measure for a third and definitive time that specific plot. If the difference between both sample plots is higher than 10%, this sample plot should be eliminated from the total estimation of carbon stock.
- In order to follow the QA/QC standards it was necessary to ensure that there was no significant difference between obtained volume values of inside-plot measured trees and the 5 trees measured outside the plots. For this stage there were randomly selected 50 sample plots.

Regarding the uncertainty of the mean tree biomass per hectare within the project boundary, the obtained value resulted in 3,64%, which means that the value of GHG Emission Reductions and Removals (tCO_2) calculated is totally reliable. Calculations were based on α value of 0.05.

About the second point, the result was that with a 95% of confidence it is possible to state that there is not significant difference between both measurement groups average. Although the number of plots to be re- measured was 18, there were considered in this analysis 17 plots, due to the lack of data in one of the 18 plots.

Finally, regarding the QA/QC analysis, the result was that 7 of the 50 sample plots showed significant differences between results inside and outside the plots. Only in 2 of those 7 sample plots, there was found a higher average on the original plot over the outside-plot measured trees average. This two special cases are plots N° 150 and 104, being plot N° 150 the most relevant due to the higher difference between average values. In case of plot N° 104, the original average is 0,001 and average of the 5 outside-plot measured trees is 0.

<u>Emission Reduction by Year (vintage)</u>

A carbon credit's "vintage" refers to the year that the emissions reduction took place. In Weyerhaeuser's project, due to the biomass volume increments registered in its forests, a high percentage of GHG Emission Reductions and Removals occurred during 2011 and 2012. Figure 8 shows the growth curve measured for the *Eucalyptus grandis*, *Eucalyptus dunnii* and *Pinus taeda* during the field works performed on April 2013.

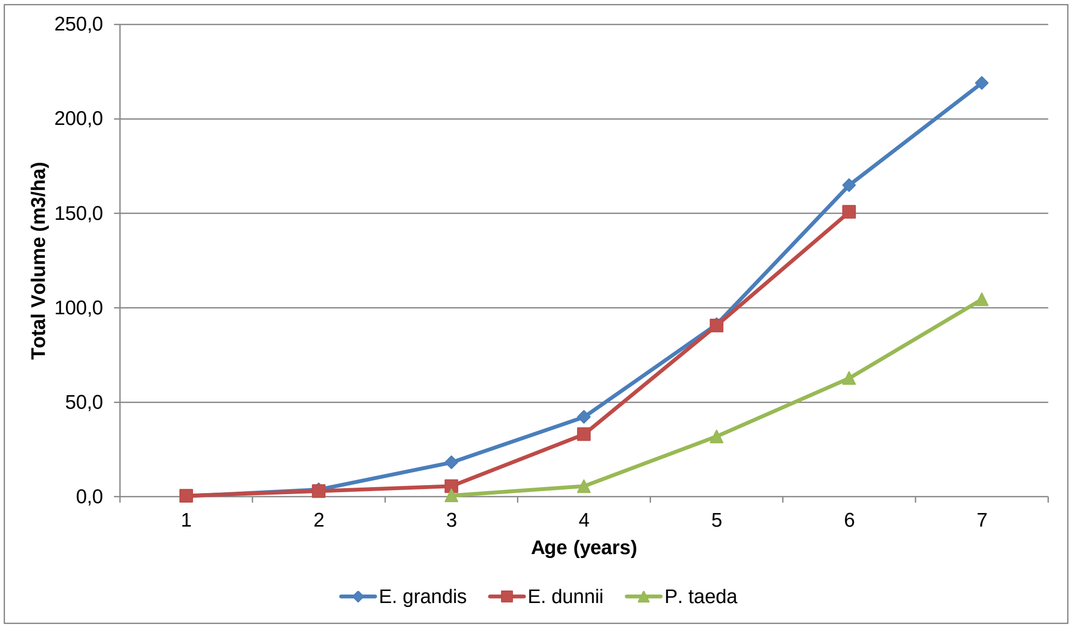

Figure 8. Growth curve measured for the *Eucalyptus grandis*, *Eucalyptus dunnii* and *Pinus taeda*.

With the growth increments presented in figure above, we calculated the Current Annual Increment (CAI- It is the increment, which a tree puts on in a single year) for each specie/genus. The CAI for each specie is presented in Table 9.

Table 9. Current Annual Increment (CAI) (m3/ha/year).

	Current Annual Increment (CAI) (m3/ha/year)						
Specie	2012	2011	2010	2009	2008	2007	2006
E. grandis	0,27	3,49	14,36	24,05	49,03	73,69	54,03
E. dunnii	0,44	2,54	2,54	27,54	57,53	60,13	--
P. taeda	0,05	0,20	0,35	4,91	26,36	30,86	41,68

After obtaining the CAI for each species, we calculated the annual growth by year (m3/year) and the percentage of GHG Emission Reductions and Removals by year on the different forests owned by Weyerhaeuser.

Table 10. Year that the emissions reduction took place (Vintage) (tCO2).

	Total GHG Emission Reductions and Removals by year and by forest age (t CO2)							
Planted Year	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	
Age	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**TOTAL**
Planted 2006	398	4.753	19.217	35.415	84.402	120.313	102.454	**366.953**
Planted 2007	0	1.940	23.131	92.010	167.738	365.660	528.674	**1.179.152**
Planted 2008	0	0	2.795	30.627	114.192	230.821	497.915	**876.350**
Planted 2009	0	0	0	2.323	24.077	85.244	185.309	**296.953**
Planted 2010	0	0	0	0	3.017	35.843	141.634	**180.494**
Planted 2011	0	0	0	0	0	1.128	14.379	**15.507**
Planted 2012	0	0	0	0	0	0	434	**434**
TOTAL (t CO2)	**398**	**6.694**	**45.143**	**160.376**	**393.425**	**839.009**	**1.470.797**	**2.915.843**
	0,0%	**0,2%**	**1,5%**	**5,5%**	**13,5%**	**28,8%**	**50,5%**	**100,0%**

The following tables present the calculation of total VCUs of Weyerhaeuser Uruguay S.A. project. The minimum risk rating is selected (10 percent, according to the Non-Permanence Risk Tool), given the fact that the overall risk rating does not overpass the minimum applicable holding percentage. The amount of VCUs retained in the buffer account can be modified according to subsequent risk assessments at the verification stage.

The estimated amount of GHG credits for the 100-year crediting period is presented in the following table.

GHG Credit Calculation	tCO_2
Change in carbon stocks	5,601,938
Leakage	0
Net GHG Benefits (change in carbon stocks minus leakage)	5,601,938
Buffer credits (10% of Net GHG benefits)	560,194
GHG credits issued (VCUs)	5,041,744

Finally, the estimated amount of GHG credits for the first verification event of the monitoring period is presented in the following table:

GHG Credit Calculation	tCO_2
Change in carbon stocks	2,915,843
Leakage	0
Net GHG Benefits (change in carbon stocks minus leakage)	2,915,843
Buffer credits (10% of Net GHG benefits)	291,584
GHG credits issued (VCUs)	2,624,259

5. ADDITIONAL INFORMATION

Table 11. Indicators for unique identification of project properties in each project region.

Region	Property name	LAT	LONG	Cadastral Unit	Area (ha)
Centurión	Andrade	-32° 14' 43"	-53° 42' 20"	12764	232
	Araucaria	-32° 37' 20"	-53° 49' 13"	15600	3
				15601	430
	Asperezas	-32° 22' 41"	-53° 53' 11"	1884	157
				4309	14
				4310	4
				4311	17
				6532	56
	Born	-32° 34' 24"	-54° 1' 24"	6238	118
	Cambota	-32° 32' 56"	-53° 47' 22"	14543	62
				14544	58
	Carlota	-32° 20' 53"	-53° 42' 6"	12111	65
				12112	57
	Celi	-32° 13' 53"	-53° 47' 58"	6577	100
				15864	29
	Dali	-32° 21' 17"	-53° 40' 10"	10940	156
	El Alijo	-32° 13' 56"	-53° 45' 47"	12739	142
	El Benteveo	-32° 32' 8"	-53° 50' 20"	7908	263
	El Cardenal 1	-32° 26' 25"	-53° 40' 56"	5111	28
				7897	108
				9263	203
				9902	32
				11245	96
				14056	59
	El Cardenal 2	-32° 27' 31"	-53° 42' 23"	11826	31
				15325	53
	El Laurel	-32° 22' 10"	-53° 46' 36"	1818	185
	El Mirlo 1	-32° 13' 15"	-53° 42' 7"	7492	107
				11077	87
	El Misto	-32° 13' 54"	-53° 49' 2"	1836	0
				1910	1
				4074	47
				4686	12
				4943	14
				4987	98
				6567	16
				9271	48

				15352	5
				15353	3
				15354	8
	El Pirincho 1	-32° 23' 27''	-53° 43' 32''	1897	135
	El Pirincho 2	-32° 23' 60''	-53° 43' 6''	1908	107
				6552	88
				12385	125
				12386	90
				12387	51
	El Taruman	-32° 15' 54''	-53° 51' 10''	1935	40
				1984	31
				4281	29
				5661	12
	Esperanza	-32° 23' 27''	-53° 43' 32''	11546	31
				11547	21
	La Lechuza	-32° 14' 26''	-53° 51' 9''	6534	14
				6538	33
	La Mansa	-32° 32' 53''	-53°50' 56''	2098	228
	Lomitas	-32° 36' 33''	-53°50' 56''	15642	59
	Los Ceibos	-32° 14' 23''	-53°43' 34''	15869	38
				15870	107
	Macachin	-32° 17' 27''	-53°47' 34''	1793	425
				1811	529
				9243	476
	Micaela	-32° 36' 40''	-53°55' 21''	3755	98
				5597	154
				7287	3
				12032	40
				15178	29
	Paso real	-32° 17' 50''	-53°41' 14''	5107	100
				6576	39
				6580	172
				12108	10
				12445	65
				12446	100
	Posta del Chuy 1	-32° 24' 37''	-53°58' 31''	10285	183
	Posta del Chuy 2	-32° 25' 5''	-53°59' 43''	2276	177
				13392	23
	Teresita	-32° 17' 39''	-53°45' 1''	15799	102

	Zubalo	-32° 19' 47"	-53°44' 11"	1791	23
				12117	21
				12118	93
				12119	95

Region	Property name	LAT	LONG	Cadastral Unit	Area (ha)
Octava CL	Cerro Malo	- 32° 53' 30"	- 55° 11' 6"	652	236
				14719	26
				14720	113
	El Yunque	- 32° 39' 16"	- 55° 8' 48"	10992	51
	La Mulita	- 32° 39' 1"	- 54° 55' 15"	15120	42
				15127	80
	Mirasol	- 32° 54' 38"	- 54° 47' 3"	8058	178
	Quiebrayugo	- 32° 49' 14"	- 55° 17' 40"	13164	57
				13165	2
				13166	22

Region	Property name	LAT	LONG	Cadastral Unit	Area (ha)
Ruta 7	Arachanes	-32° 19' 45"	-54° 23' 58"	14986	196
	Artigas	-32° 16' 19"	-54° 27' 45"	11921	56
	Borche	-32° 36' 6"	-54° 27' 8"	1049	84
	Casas	-32° 16' 27"	-54° 22' 0"	4473	145
	Chabela	-32° 19' 20"	-54° 21' 54"	4934	101
				4935	103
				8976	105
				10932	21
	Corral de Rodas	-32° 43' 48"	-54° 30' 19"	221	12
				3572	18
				5228	14
				12867	37
				12869	43
				12870	34
	El Coronilla 1	-32° 48' 5"	-54° 27' 9"	482	34
				12247	151
				12397	169
				15826	61
	Fraile Muerto	-32° 41' 39"	-54° 27' 0"	46	40
				107	351
				4717	2
				5751	20

				6050	9
				6052	9
				6098	22
				11946	14
				15781	2
				15782	0
				15783	4
	La Claraboya 1	-32° 17' 28''	-54° 15' 31''	15504	141
	La Claraboya 2	-32° 17' 7''	-54° 16' 20''	15545	177
	La Claraboya 3	-32° 16' 53''	-54° 17' 6''	15856	47
	La Pitanga	-32° 18' 11''	-54° 19' 55''	1169	532
				9078	262
				15853	203
	Las Rosas	-32° 15' 19''	-54° 28' 11''	15806	267
	Licha	-32° 19' 25''	-54° 21' 7''	10442	204
	Luna Llena	-32° 34' 45''	-54° 29' 53''	6056	211
	Luna Nueva	-32° 34' 5''	-54° 27' 47''	12916	55
	Mateo	-32° 36' 16''	-54° 28' 45''	71	31
				6028	41
	Palexa	-32° 16' 37''	-54° 22' 50''	7586	121
				7587	197
	Palleros	-32° 15' 57''	-54° 21' 29''	14195	139
	Quebrachal 1	-32° 38' 13''	-54° 31' 22''	269	0
				290	15
				4091	8
				7416	70
				11381	4
				11382	7
				13962	90
				13963	20
				13964	132
				15859	227
				15890	221
				15893	53
	Quebrachal 2	-32° 36' 51''	-54° 28' 25''	73	66
				11249	69
				15251	116
				15745	50
	Tres Islas	-32° 30' 9''	-54° 37' 29''	15208	116

Region	Property name	LAT	LONG	Cadastral Unit	Area (ha)

Ruta 8	Candiles 1	- 32° 47' 1"	- 53° 58' 6"	1811	112
				3953	225
				4715	171
				5397	59
				5398	54
				7721	258
	Candiles 2	- 32° 47' 36"	- 54° 1' 49"	7079	74
	Doroteo	- 32° 44' 58"	- 53° 55' 49"	7735	560
	El Carpintero 1	- 33° 0' 57"	- 54° 14' 49"	9352	77
				9357	299
	Gallo	- 32° 44' 9"	- 53° 57' 21"	1805	1310
	Juvenal	- 32° 50' 13"	- 54° 5' 57"	2432	159
	La Tijereta	- 33° 10' 23"	- 54° 15' 53"	7241	163
	Leoncho	- 32° 53' 57"	- 54° 7' 16"	2314	41
				2640	45
	Olimar	- 33° 14' 51"	- 54° 39' 49"	8855	623