# Monitoring report form (Version 03.1)

## Monitoring report

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|---|---|
| **Title of the project activity** | Carbon Sequestration in Small and Medium Farms in the Brunca Region, Costa Rica (COOPEAGRI Project) |
| **Reference number of the project activity** | 7572 |
| **Version number of the monitoring report** | Version 01 |
| **Completion date of the monitoring report** | 11/03/2013 |
| **Registration date of the project activity** | 03/10/2012 |
| **Monitoring period number and duration of this monitoring period** | 1<br>01/08/2006 – 31/12/2012 |
| **Project participant(s)** | National Forestry Financing Fund (FONAFIFO)<br><br>International Bank for Reconstruction and Development as Trustee for the BioCarbon Fund |
| **Host Party(ies)** | Costa Rica |
| **Sectoral scope(s) and applied methodology(ies)** | 14 : Afforestation and reforestation<br>AR-AM0004 ver. 4 - Reforestation or afforestation of land currently under agricultural use. |
| **Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD** | 60,224 t $CO_2e$ |
| **Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period** | 34,896 t $CO_2e$ |

## SECTION A. Description of project activity

### A.1. Purpose and general description of project activity

The A/R CDM project activity introduces forestry activities in privately owned farms located in 10 districts of the Perez Zeledon Canton, in the San José Province of Costa Rica,.

The project activity is implemented by farmers associated with COOPEAGRI, a cooperative comprised of 10,162 farmers dedicated to agriculture activities such as coffee, sugarcane, and cattle raising. As part of the proposed A/R CDM project activity, farmers associated with COOPEAGRI have introduced forestry activities in their farms.

The A/R CDM project has a total area of **892.42 ha** distributed over three activities - agroforestry systems, assisted natural regeneration and forest plantations (see table 1)

**Table 1. Total project area distributed by A/R activity and Baseline stratum**

| | | A/R activity (ha) | | | |
|---|---|---|---|---|---|
| | | Agroforestry | Assisted Nat. Regene | Forest Plantation | Total |
| Baseline stratum | North Hillsides | 80.49 | 322.19 | 18.32 | **421,00** |
| | Valley Lands and South Hillsides | 306.83 | 74.71 | 89.89 | **471.42** |
| | Total general | **387.32** | **396.90** | **108.20** | **892.42** |

The species planted are Cedro amargo (*Cedrela odorata*), Melina (*Gmelina arborea*) and Teak (*Tectona grandis*). All reforestation activities took place between 2006 and 2009. The total list of reforested species in forest plantations and agroforestry systems is included in the Excel file “Project boundary”.

Two baseline strata were identified in the PDD: North Hillsides; and Valley Lands and South Hillsides. The three forestry activities have been implemented in both strata. In the case of North Hillsides the main activity implemented was Assisted natural regeneration representing a 76% of its area. In Valley Lands and South Hillsides agroforestry was the principal activity with a 65% of the reforested area.

The project is expected to generate a total net anthropogenic GHG removal of approximately 176,050 t $CO_2$-e in a period of 20 years, or 8,803 t $CO_2$-e/yr. In this first monitoring period total net anthropogenic GHG removals by sinks are 34,896.00 t of $CO_2$-e (5,538.31 t $CO_2$-e/yr). per year

The promotion of diverse land uses in the project area implies that farmers will maintain good levels of incomes and food security, but also that it will favor the production of environmental services. In this monitoring period the benefits of the proposed A/R project activity have been: Biodiversity conservation, Local employment, Prevention of land degradation and Improved GHG removals through the increase of biomass carbon pools.

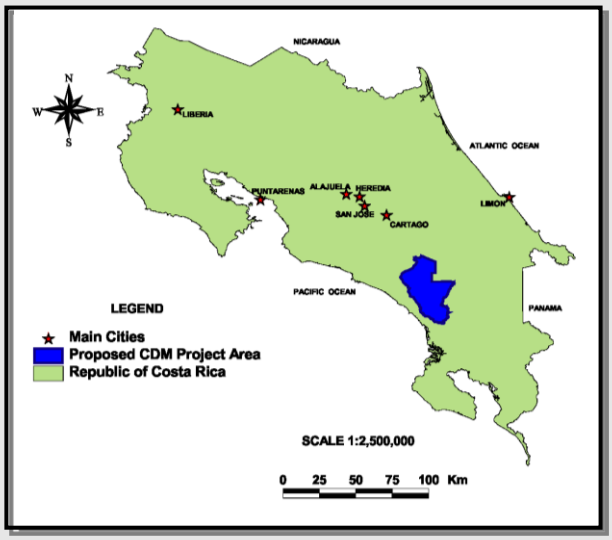
### A.2. Location of project activity

**Host Party:** Costa Rica

**Province/Canton:** San José/Pérez Zeledón

The proposed CDM Project activity is within the administrative limits of the Perez Zeledon Canton (number 119 in the map), which belongs to the San Jose Province (Provincia de San José in the map, dark pink color), Costa Rica (see Maps 1 and 2).


**Map 1**. Costa Rica, provinces and cantons (http://www.mapasdecostarica.info)

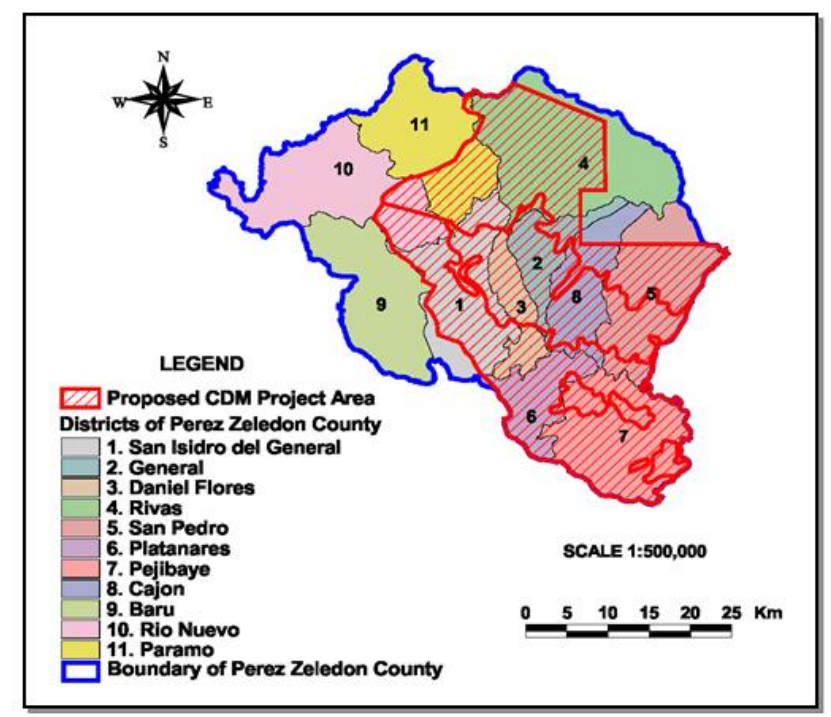



**Map 2**. Location of the CDM project area in Costa Rica

**Districts**

The districts of Perez Zeledon Country within which the project activity will take place are the following ones (see Map 3)*:*

1. *San Isidro del General*
2. *General*
3. *Daniel Flores*
4. *Rivas*
5. *San Pedro*
6. *Platanares*
7. *Pejivaye*
8. *Cajón*
10. *Río Nuevo*
11. *Páramo*




**Map 3.** Districts of Perez Zeledon's County and proposed CDM project area.

**Geographical location**

Table 2 list the individual planting sites, identified via the contract number. Specific information of each parcel location is available in GIS files (geodatabase)

**Table 2. List of discrete parcels of land under the control of the project participants at the start date of the proposed A/R CDM project activities (consolidated table 5.1 of the registered PDD)**

| Contract ID | Owner | Project activity | Stand model ID | Year | Baseline stratum ID | Expost stratum | Area (ha) |
|---|---|---|---|---|---|---|---|
| SJ-02-20-0003-2007 | ESTRADA CAMPOS ALBERTO | Forest Plantation | SM1 | 2007 | BLS2 | SM1_2 | 1.75 |
| SJ-02-20-0007-2007 | ESTRADA CAMPOS ALBERTO | Forest Plantation | SM1 | 2007 | BLS2 | SM1_2 | 2.21 |
| SJ-02-20-0046-2006 | VARGAS Y GARCIA S.A. | Forest Plantation | SM1 | 2006 | BLS2 | SM1_2 | 1.07 |
| SJ-02-20-0048-2006 | QUIROS GARBANZO OVIDIO | Forest Plantation | SM1 | 2006 | BLS2 | SM1_2 | 1.49 |
| SJ-02-20-0049-2006 | ARIAS GAMBOA EDITH DEYANIRA | Forest Plantation | SM2 | 2006 | BLS1 | SM1_2 | 2.05 |
| SJ-02-20-0050-2006 | PADILLA GAMBOA RODRIGO | Forest Plantation | SM1 | 2006 | BLS2 | SM1_2 | 1.41 |
| SJ-02-20-0059-2008 | DIAZ DE AURA S.A. | Forest Plantation | SM2 | 2008 | BLS2 | SM1_2 | 8.00 |
| SJ-02-20-0064-2007 | CORDERO SALAZAR GIOVANNY | Forest Plantation | SM1 | 2007 | BLS2 | SM1_2 | 1.66 |
| SJ-02-20-0065-2007 | CORDERO SALAZAR GIOVANNY | Forest Plantation | SM2 | 2007 | BLS1 | SM1_2 | 2.52 |
| SJ-02-20-0066-2007 | CORDERO SALAZAR GIOVANNY | Forest Plantation | SM1 | 2007 | BLS2 | SM1_2 | 1.64 |
| SJ-02-20-0067-2007 | AMADOR HIDALGO ISIDRO | Forest Plantation | SM1 | 2007 | BLS2 | SM1_2 | 5.85 |
| SJ-02-20-0069-2007 | CERVANTES VARGAS MARITZA | Forest Plantation | SM1 | 2007 | BLS2 | SM1_2 | 1.01 |
| SJ-02-20-0072-2007 | CORDERO SALAZAR ISLAND | Forest Plantation | SM2 | 2007 | BLS1 | SM1_2 | 3.23 |
| SJ-02-20-0082-2006 | ESTRADA CAMPOS ALBERTO | Forest Plantation | SM2 | 2006 | BLS2 | SM1_2 | 4.06 |
| SJ-02-20-0085-2006 | ESTRADA CAMPOS ALBERTO | Forest Plantation | SM1 | 2006 | BLS2 | SM1_2 | 4.26 |
| SJ-02-20-0086-2006 | ESTRADA CAMPOS ALBERTO | Forest Plantation | SM1 | 2006 | BLS2 | SM1_2 | 5.14 |
| SJ-02-20-0148-2009 | AGROINVERSIONES MONTE VERDE DEL SUR S.A. | Forest Plantation | SM1 | 2009 | BLS2 | SM1_2 | 7.48 |
| SJ-02-20-0149-2009 | RAMQ M Y Q S.A. | Forest Plantation | SM1 | 2009 | BLS2 | SM1_2 | 6.81 |
| SJ-02-20-0151-2009 | CUBILLO DIAZ MINOR | Forest Plantation | SM2 | 2009 | BLS1 | SM1_2 | 10.52 |
| SJ-02-20-0169-2006 | CORDERO SANCHEZ ROSITA | Forest Plantation | SM1 | 2006 | BLS2 | SM1_2 | 7.88 |

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|---|---|---|---|---|---|---|---|
| SJ-02-20-0169-2008 | MORALES DIAZ ALEJANDRO | Forest Plantation | SM1 | 2008 | BLS2 | SM1_2 | 3.15 |
| SJ-02-20-0195-2008 | INVERSIONES AGROPECUARIAS ARAYA NARANJO REM DEL SUR S.A. | Forest Plantation | SM1 | 2008 | BLS2 | SM1_2 | 8.61 |
| SJ-02-20-0263-2009 | PESETA DEL SUR SA. | Forest Plantation | SM1 | 2009 | BLS2 | SM1_2 | 9.64 |
| SJ-02-20-0341-2007 | ALVAREZ AZOFEIFA ISIDRO | Forest Plantation | SM1 | 2007 | BLS2 | SM1_2 | 2.04 |
| SJ-02-20-0354-2007 | JIMENEZ FERNANDEZ JOSE LUIS | Forest Plantation | SM1 | 2007 | BLS2 | SM1_2 | 1.50 |
| SJ-02-20-0355-2007 | CARVAJAL ARIAS ALEXIS | Forest Plantation | SM1 | 2007 | BLS2 | SM1_2 | 1.00 |
| SJ-02-20-0358-2007 | HIDALGO NAVARRO EVANGELISTA | Forest Plantation | SM1 | 2007 | BLS2 | SM1_2 | 2.22 |
| SJ-02-23-0020-2007 | DURAN FALLAS GERMAN | Agroforestry | SM5 | 2007 | BLS2 | BLS2SM5 | 2.53 |
| SJ-02-23-0022-2007 | VARGAS MORA OSCAR | Agroforestry | SM5 | 2007 | BLS2 | BLS2SM5 | 2.97 |
| SJ-02-23-0033-2009 | CARVAJAL ARIAS EVELIA | Agroforestry | SM4 | 2009 | BLS2 | SM4 | 0.82 |
| SJ-02-23-0034-2009 | CORPORACION EFESTOS S.A. | Agroforestry | SM4 | 2009 | BLS1 | SM4 | 1.71 |
| SJ-02-23-0035-2007 | CHAVARRIA MONTERO ALICIA | Agroforestry | SM4 | 2007 | BLS2 | SM4 | 2.02 |
| SJ-02-23-0035-2009 | CAMPOS DULCE MARIA ASTUA Y PORTUGUEZ CARLOS LUIS | Agroforestry | SM5 | 2009 | BLS2 | BLS2SM5 | 1.60 |
| SJ-02-23-0036-2007 | JIMENEZ FERNANDEZ DULCELINA | Agroforestry | SM4 | 2007 | BLS1 | SM4 | 2.64 |
| SJ-02-23-0036-2009 | VARGAS MORA OSCAR | Agroforestry | SM4 | 2009 | BLS2 | SM4 | 1.80 |
| SJ-02-23-0037-2007 | SANCHEZ ROJAS EFRAIN | Agroforestry | SM5 | 2007 | BLS2 | BLS2SM5 | 1.43 |
| SJ-02-23-0037-2009 | ZUNIGA SANCHEZ LIZETH | Agroforestry | SM4 | 2009 | BLS1 | SM4 | 2.58 |
| SJ-02-23-0038-2008 | CORDERO QUIROS NELSON | Agroforestry | SM4 | 2008 | BLS2 | SM4 | 3.51 |
| SJ-02-23-0038-2009 | VILLAREVIA URENA FAUSTINO | Agroforestry | SM4 | 2009 | BLS1 | SM4 | 5.45 |
| SJ-02-23-0039-2007 | SEGURA ROBLES GLORIA ELENA | Agroforestry | SM4 | 2007 | BLS2 | SM4 | 1.27 |
| SJ-02-23-0039-2009 | RAMIREZ ACUNA ISIDRO | Agroforestry | SM4 | 2009 | BLS2 | SM4 | 0.89 |
| SJ-02-23-0040-2007 | ARGUEDAS CORDERO JOSE LUIS | Agroforestry | SM4 | 2007 | BLS2 | SM4 | 2.24 |
| SJ-02-23-0040-2009 | MONGE QUIROS MARTIN | Agroforestry | SM5 | 2009 | BLS2 | BLS2SM5 | 0.87 |
| SJ-02-23-0041-2007 | MORALES HIDALGO JOSE ROBERTINO | Agroforestry | SM4 | 2007 | BLS2 | SM4 | 1.74 |
| SJ-02-23-0041-2008 | ARIAS VARGAS EFREN | Agroforestry | SM4 | 2008 | BLS2 | SM4 | 1.04 |
| SJ-02-23-0041-2009 | PIEDADES GAMBOA JIMENEZ | Agroforestry | SM5 | 2009 | BLS2 | BLS2SM5 | 8.05 |
| SJ-02-23-0042-2007 | GONZALEZ GARCIA JOSEFA | Agroforestry | SM4 | 2007 | BLS2 | SM4 | 1.06 |
| SJ-02-23-0043-2007 | ROJAS GONZALEZ MARIBELL | Agroforestry | SM4 | 2007 | BLS2 | SM4 | 3.02 |
| SJ-02-23-0044-2009 | AMADOR NARANJO MINOR | Agroforestry | SM4 | 2009 | BLS2 | SM4 | 1.87 |
| SJ-02-23-0046-2007 | CARVAJAL ARIAS MIRTA LILLIAM | Agroforestry | SM4 | 2007 | BLS2 | SM4 | 1.03 |
| SJ-02-23-0046-2009 | NARANJO LOPEZ CARLOS | Agroforestry | SM4 | 2009 | BLS2 | SM4 | 6.44 |
| SJ-02-23-0047-2007 | CARVAJAL ARIAS MIRTA LILLIAM | Agroforestry | SM5 | 2007 | BLS2 | BLS2SM5 | 1.07 |
| SJ-02-23-0047-2008 | PADILLA SABORIO WILBERTH | Agroforestry | SM4 | 2008 | BLS2 | SM4 | 1.97 |
| SJ-02-23-0047-2009 | MACYNRI A CH S.A | Agroforestry | SM4 | 2009 | BLS2 | SM4 | 1.35 |
| SJ-02-23-0048-2009 | ESTRADA CAMPOS PABLO | Agroforestry | SM5 | 2009 | BLS2 | BLS2SM5 | 5.15 |
| SJ-02-23-0049-2007 | NAVARRO CASTRO REPARADO | Agroforestry | SM5 | 2007 | BLS2 | BLS2SM5 | 1.51 |
| SJ-02-23-0051-2006 | BARRANTES CALDERON OVIDIO | Agroforestry | SM4 | 2006 | BLS1 | SM4 | 7.59 |
| SJ-02-23-0051-2007 | PIEDRA ORTIZ ROY | Agroforestry | SM4 | 2007 | BLS1 | SM4 | 1.51 |
| SJ-02-23-0052-2006 | NARANJO URENA ORLANDO | Agroforestry | SM5 | 2006 | BLS2 | BLS2SM5 | 1.76 |
| SJ-02-23-0052-2007 | ARCE ESPINOZA SALVADOR | Agroforestry | SM5 | 2007 | BLS2 | BLS2SM5 | 1.57 |
| SJ-02-23-0052-2009 | VILLAREVIA URENA FAUSTINO | Agroforestry | SM4 | 2009 | BLS1 | SM4 | 1.98 |
| SJ-02-23-0053-2006 | DELGADO NARANJO MINOR | Agroforestry | SM4 | 2006 | BLS2 | SM4 | 1.56 |
| SJ-02-23-0053-2007 | QUESADA DUARTE SIDNEY | Agroforestry | SM4 | 2007 | BLS2 | SM4 | 2.55 |
| SJ-02-23-0053-2009 | FALLAS MORA BENJAMIN | Agroforestry | SM4 | 2009 | BLS2 | SM4 | 1.44 |
| SJ-02-23-0055-2007 | FALLAS QUESADA ROBERTO | Agroforestry | SM4 | 2007 | BLS2 | SM4 | 1.48 |

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|---|---|---|---|---|---|---|---|
| SJ-02-23-0057-2006 | VASQUEZ ARBUSTINI JOSE LUIS | Agroforestry | SM5 | 2006 | BLS2 | BLS2SM5 | 3.75 |
| SJ-02-23-0057-2007 | SIBAJA DUARTE MICHAEL | Agroforestry | SM4 | 2007 | BLS2 | SM4 | 1.56 |
| SJ-02-23-0058-2006 | ARCE ESPINOZA SALVADOR | Agroforestry | SM5 | 2006 | BLS2 | BLS2SM5 | 2.71 |
| SJ-02-23-0058-2007 | FALLAS VARGAS RODOLFO | Agroforestry | SM4 | 2007 | BLS2 | SM4 | 1.23 |
| SJ-02-23-0059-2007 | DELGADO MORA NERY MANUEL | Agroforestry | SM4 | 2007 | BLS2 | SM4 | 1.56 |
| SJ-02-23-0060-2007 | RAMIREZ QUIROS MARIO | Agroforestry | SM5 | 2007 | BLS2 | BLS2SM5 | 3.17 |
| SJ-02-23-0062-2008 | NAVARRO CASTRO REPARADO | Agroforestry | SM5 | 2008 | BLS2 | BLS2SM5 | 3.22 |
| SJ-02-23-0064-2006 | HERNANDEZ UMANA JUAN ANTONIO | Agroforestry | SM4 | 2006 | BLS2 | SM4 | 1.09 |
| SJ-02-23-0064-2008 | RETANA ELIZONDO LAURA EMILIA | Agroforestry | SM4 | 2008 | BLS1 | SM4 | 3.20 |
| SJ-02-23-0065-2008 | CORDERO QUIROS NELSON | Agroforestry | SM5 | 2008 | BLS2 | BLS2SM5 | 1.91 |
| SJ-02-23-0068-2008 | NAVARRO VARGAS DORA EMILIA | Agroforestry | SM4 | 2008 | BLS2 | SM4 | 2.80 |
| SJ-02-23-0069-2008 | ARIAS SEGURA WILSON | Agroforestry | SM4 | 2008 | BLS2 | SM4 | 1.26 |
| SJ-02-23-0070-2006 | ROJAS ARGUEDAS ELVIA | Agroforestry | SM4 | 2006 | BLS2 | SM4 | 2.14 |
| SJ-02-23-0070-2008 | CESPEDES ARIAS JOSE | Agroforestry | SM5 | 2008 | BLS2 | BLS2SM5 | 3.04 |
| SJ-02-23-0071-2007 | NARANJO MORALES WILBER AURELIO | Agroforestry | SM5 | 2007 | BLS2 | BLS2SM5 | 1.04 |
| SJ-02-23-0072-2008 | INVERSIONES LEANZU DE PEREZ ZELEDON S.A. | Agroforestry | SM4 | 2008 | BLS2 | SM4 | 2.56 |
| SJ-02-23-0073-2006 | RODRIGUEZ BADILLA ANGEL | Agroforestry | SM4 | 2006 | BLS2 | SM4 | 1.78 |
| SJ-02-23-0073-2007 | RAMIREZ ACUNA ISIDRO | Agroforestry | SM5 | 2007 | BLS2 | BLS2SM5 | 3.05 |
| SJ-02-23-0074-2006 | URENA BARRANTES HILARIO | Agroforestry | SM4 | 2006 | BLS1 | SM4 | 2.58 |
| SJ-02-23-0074-2007 | GRANADOS DUARTE MIREYA | Agroforestry | SM4 | 2007 | BLS2 | SM4 | 1.02 |
| SJ-02-23-0075-2006 | CARRANZA VARELA ELI ANGEL | Agroforestry | SM5 | 2006 | BLS2 | BLS2SM5 | 1.08 |
| SJ-02-23-0077-2006 | VENEGAS DIAZ JOSE ANGEL | Agroforestry | SM4 | 2006 | BLS1 | SM4 | 7.16 |
| SJ-02-23-0081-2006 | BARBOZA MESEN JOSE | Agroforestry | SM4 | 2006 | BLS2 | SM4 | 0.87 |
| SJ-02-23-0092-2006 | CERVANTES MOLINA HUGO | Agroforestry | SM5 | 2006 | BLS2 | BLS2SM5 | 1.38 |
| SJ-02-23-0092-2008 | BLANCO CHINCHILLA FERNANDO | Agroforestry | SM5 | 2008 | BLS2 | BLS2SM5 | 1.54 |
| SJ-02-23-0092-2009 | LEIVA MARTINEZ ELADIO | Agroforestry | SM4 | 2009 | BLS2 | SM4 | 1.32 |
| SJ-02-23-0096-2008 | VARGAS PICADO ABEL ALBERTO | Agroforestry | SM4 | 2008 | BLS1 | SM4 | 1.23 |
| SJ-02-23-0097-2008 | SOLANO CASCANTE NELLY | Agroforestry | SM4 | 2008 | BLS2 | SM4 | 1.51 |
| SJ-02-23-0101-2006 | RAMIREZ RETANA REGINALDO | Agroforestry | SM5 | 2006 | BLS2 | BLS2SM5 | 6.29 |
| SJ-02-23-0105-2006 | NARANJO URENA ORLANDO | Agroforestry | SM5 | 2006 | BLS2 | BLS2SM5 | 1.10 |
| SJ-02-23-0106-2006 | PIEDRA UMANA MARIO ALBERTO | Agroforestry | SM4 | 2006 | BLS2 | SM4 | 4.75 |
| SJ-02-23-0108-2008 | SANCHEZ MORA LUIS ABILIO | Agroforestry | SM4 | 2008 | BLS2 | SM4 | 1.58 |
| SJ-02-23-0112-2006 | HERNANDEZ CORDERO HENRY | Agroforestry | SM5 | 2006 | BLS2 | BLS2SM5 | 2.39 |
| SJ-02-23-0114-2008 | MORA BLANCO OLGER | Agroforestry | SM4 | 2008 | BLS1 | SM4 | 1.26 |
| SJ-02-23-0116-2008 | VARGAS Y GARCIA S.A. | Agroforestry | SM5 | 2008 | BLS2 | BLS2SM5 | 1.49 |
| SJ-02-23-0136-2007 | FONSECA SEGURA MIREYA | Agroforestry | SM4 | 2007 | BLS1 | SM4 | 2.27 |
| SJ-02-23-0137-2007 | TORRES MONGE DARIO | Agroforestry | SM4 | 2007 | BLS2 | SM4 | 1.75 |
| SJ-02-23-0138-2008 | JIMENEZ HERNANDEZ JULIO | Agroforestry | SM4 | 2008 | BLS2 | SM4 | 1.23 |
| SJ-02-23-0139-2008 | CAMPOS ROJAS EULOGIO | Agroforestry | SM4 | 2008 | BLS2 | SM4 | 1.26 |
| SJ-02-23-0140-2007 | TABASH MORA NEFTALI | Agroforestry | SM4 | 2007 | BLS2 | SM4 | 1.70 |
| SJ-02-23-0140-2008 | RAMIREZ ACUNA ISIDRO | Agroforestry | SM5 | 2008 | BLS2 | BLS2SM5 | 1.03 |
| SJ-02-23-0149-2007 | PORTUGUEZ ARIAS FRANCO | Agroforestry | SM4 | 2007 | BLS1 | SM4 | 2.77 |
| SJ-02-23-0155-2008 | SEGURA MENA GILBERTO | Agroforestry | SM4 | 2008 | BLS2 | SM4 | 2.93 |
| SJ-02-23-0156-2008 | RIGOBERTO ZUNIGA VARGAS | Agroforestry | SM4 | 2008 | BLS2 | SM4 | 1.73 |
| SJ-02-23-0157-2008 | ZUNIGA VARGAS RIGOBERTO | Agroforestry | SM4 | 2008 | BLS2 | SM4 | 1.18 |

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|---|---|---|---|---|---|---|---|
| SJ-02-23-0164-2007 | BORBON BORBON ADRIAN | Agroforestry | SM4 | 2007 | BLS1 | SM4 | 2.57 |
| SJ-02-23-0167-2007 | SOLIS PADILLA GERARDO | Agroforestry | SM4 | 2007 | BLS1 | SM4 | 1.07 |
| SJ-02-23-0168-2007 | SOLIS PADILLA GERARDO | Agroforestry | SM4 | 2007 | BLS1 | SM4 | 1.08 |
| SJ-02-23-0168-2008 | ELIZONDO VALVERDE ALBERTO | Agroforestry | SM4 | 2008 | BLS2 | SM4 | 7.79 |
| SJ-02-23-0169-2007 | MENA GODINEZ JUAN CARLOS | Agroforestry | SM4 | 2007 | BLS2 | SM4 | 8.39 |
| SJ-02-23-0170-2007 | CHINCHILLA NARANJO YAMILETH | Agroforestry | SM5 | 2007 | BLS2 | BLS2SM5 | 4.49 |
| SJ-02-23-0170-2008 | ZUNIGA VARGAS WILLIAN | Agroforestry | SM4 | 2008 | BLS2 | SM4 | 1.97 |
| SJ-02-23-0171-2008 | MENA VARGAS MINOR | Agroforestry | SM4 | 2008 | BLS2 | SM4 | 0.95 |
| SJ-02-23-0174-2006 | PAGUA S.A. | Agroforestry | SM5 | 2006 | BLS2 | BLS2SM5 | 1.24 |
| SJ-02-23-0174-2007 | CAMPOS MENA BENIGNO | Agroforestry | SM4 | 2007 | BLS2 | SM4 | 7.03 |
| SJ-02-23-0175-2007 | ELIZONDO CHAVEZ GREDIN | Agroforestry | SM5 | 2007 | BLS2 | BLS2SM5 | 5.02 |
| SJ-02-23-0179-2009 | BADILLA FALLAS MILTON | Agroforestry | SM4 | 2009 | BLS2 | SM4 | 0.43 |
| SJ-02-23-0181-2008 | VALVERDE ROMERO MARIA ISABEL | Agroforestry | SM4 | 2008 | BLS1 | SM4 | 2.76 |
| SJ-02-23-0181-2009 | KATTIA CARRANZA RAMIREZ | Agroforestry | SM4 | 2009 | BLS2 | SM4 | 5.13 |
| SJ-02-23-0182-2008 | FONSECA NAVARRO ALFREDO | Agroforestry | SM4 | 2008 | BLS1 | SM4 | 1.65 |
| SJ-02-23-0183-2009 | ZAMORA PEREZ HILDA | Agroforestry | SM4 | 2009 | BLS2 | SM4 | 1.58 |
| SJ-02-23-0194-2008 | FINCA VISTA DEL VALLE VERDE S.A. | Agroforestry | SM4 | 2008 | BLS2 | SM4 | 1.03 |
| SJ-02-23-0201-2008 | FLORES MONTERO BENIGNO | Agroforestry | SM4 | 2008 | BLS2 | SM4 | 5.98 |
| SJ-02-23-0203-2008 | LAS BRISAS DE LA MONTANA DE SAN AGUSTIN S.A. | Agroforestry | SM4 | 2008 | BLS2 | SM4 | 4.00 |
| SJ-02-23-0205-2007 | NARANJO URENA ORLANDO | Agroforestry | SM5 | 2007 | BLS2 | BLS2SM5 | 1.05 |
| SJ-02-23-0221-2008 | VEGA CASTRO VICTOR MANUEL | Agroforestry | SM4 | 2008 | BLS1 | SM4 | 6.51 |
| SJ-02-23-0222-2007 | MORA MORA JORGE | Agroforestry | SM4 | 2007 | BLS2 | SM4 | 1.01 |
| SJ-02-23-0224-2007 | ROJAS MENA LUIS EMILIO | Agroforestry | SM4 | 2007 | BLS2 | SM4 | 2.73 |
| SJ-02-23-0226-2007 | SIBAJA DUARTE MICHAEL | Agroforestry | SM4 | 2007 | BLS2 | SM4 | 1.26 |
| SJ-02-23-0228-2007 | JIMENEZ HERNANDEZ JULIO | Agroforestry | SM4 | 2007 | BLS2 | SM4 | 1.03 |
| SJ-02-23-0228-2008 | CALDERON FONSECA MIGUEL ANGEL | Agroforestry | SM4 | 2008 | BLS1 | SM4 | 2.84 |
| SJ-02-23-0229-2007 | CALDERON SANDI GABRIEL | Agroforestry | SM4 | 2007 | BLS2 | SM4 | 9.05 |
| SJ-02-23-0229-2008 | ELIZONDO CHAVEZ GREDIN | Agroforestry | SM5 | 2008 | BLS2 | BLS2SM5 | 3.05 |
| SJ-02-23-0229-2009 | ROMERO VALVERDE MARTA | Agroforestry | SM4 | 2009 | BLS2 | SM4 | 1.60 |
| SJ-02-23-0245-2008 | FERNANDEZ FALLAS PEDRO | Agroforestry | SM4 | 2008 | BLS2 | SM4 | 1.16 |
| SJ-02-23-0247-2007 | RAMIREZ MORALES OLGER | Agroforestry | SM4 | 2007 | BLS1 | SM4 | 1.30 |
| SJ-02-23-0249-2008 | FERNANDEZ FALLAS PEDRO | Agroforestry | SM5 | 2008 | BLS2 | BLS2SM5 | 1.25 |
| SJ-02-23-0249-2009 | LAMBO GENERAL S.A | Agroforestry | SM4 | 2009 | BLS2 | SM4 | 1.81 |
| SJ-02-23-0250-2008 | JIMENEZ LEIVA BERNAN | Agroforestry | SM4 | 2008 | BLS1 | SM4 | 3.09 |
| SJ-02-23-0251-2009 | INGENIERIA GONZALEZ S.A | Agroforestry | SM5 | 2009 | BLS2 | BLS2SM5 | 2.77 |
| SJ-02-23-0252-2007 | VASQUEZ ARBUSTINI ELIECER | Agroforestry | SM4 | 2007 | BLS2 | SM4 | 2.51 |
| SJ-02-23-0256-2008 | VENEGAS ZUNIGA FERNANDO | Agroforestry | SM4 | 2008 | BLS1 | SM4 | 1.01 |
| SJ-02-23-0257-2008 | VENEGAS ZUNIGA FERNANDO | Agroforestry | SM4 | 2008 | BLS1 | SM4 | 1.14 |
| SJ-02-23-0258-2007 | QUESADA VARGAS ARMANDO HUMBERTO | Agroforestry | SM5 | 2007 | BLS2 | BLS2SM5 | 2.50 |
| SJ-02-23-0260-2007 | MORA QUESADA CARLOS LUIS | Agroforestry | SM5 | 2007 | BLS2 | BLS2SM5 | 1.45 |
| SJ-02-23-0260-2009 | NAVARRO SANCHEZ CARLOS Y FAUSTINO NAVARRO JOBO | Agroforestry | SM4 | 2009 | BLS2 | SM4 | 2.43 |
| SJ-02-23-0263-2007 | ORTEGA CAMACHO ARNOLDO | Agroforestry | SM4 | 2007 | BLS2 | SM4 | 1.57 |
| SJ-02-23-0265-2007 | VALVERDE QUESADA GILBERT | Agroforestry | SM4 | 2007 | BLS1 | SM4 | 1.24 |
| SJ-02-23-0266-2008 | MENDEZ CASTRO WELDEL | Agroforestry | SM4 | 2008 | BLS2 | SM4 | 1.04 |
| SJ-02-23-0267-2009 | INVERSIONES Y BIENES RAICES | Agroforestry | SM4 | 2009 | BLS2 | SM4 | 4.59 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | YURIDIA DE SAN PEDRO S.A. | | | | | | |
| SJ-02-23-0268-2008 | GRUPO GEMAZA GMZ S.A. | Agroforestry | SM4 | 2008 | BLS2 | SM4 | 1.73 |
| SJ-02-23-0268-2009 | BORBON URENA DULCE MARIA | Agroforestry | SM4 | 2009 | BLS2 | SM4 | 0.90 |
| SJ-02-23-0272-2008 | SIBAJA DUARTE MICHAEL | Agroforestry | SM4 | 2008 | BLS2 | SM4 | 2.25 |
| SJ-02-23-0277-2009 | NAVARRO BARRANTES DANILO | Agroforestry | SM5 | 2009 | BLS2 | BLS2SM5 | 1.69 |
| SJ-02-23-0278-2009 | RODRIGUEZ BLANCO RONALD Y OLDEMAR | Agroforestry | SM5 | 2009 | BLS2 | BLS2SM5 | 1.86 |
| SJ-02-23-0307-2008 | INVERSIONES LEANZU DE PEREZ ZELEDON S.A. | Agroforestry | SM4 | 2008 | BLS2 | SM4 | 2.62 |
| SJ-02-23-0309-2007 | PENA MORALES LORELLY | Agroforestry | SM5 | 2007 | BLS2 | BLS2SM5 | 1.58 |
| SJ-02-23-0309-2009 | ELIA FALLAS BARRANTES | Agroforestry | SM4 | 2009 | BLS1 | SM4 | 1.31 |
| SJ-02-23-0310-2009 | FERNANDEZ Y ASOCIADOS S.A. | Agroforestry | SM4 | 2009 | BLS2 | SM4 | 3.69 |
| SJ-02-23-0311-2007 | SALAZAR ANCHIA JHONNY | Agroforestry | SM4 | 2007 | BLS2 | SM4 | 3.58 |
| SJ-02-23-0311-2009 | JOSE MANUEL RODRIGUEZ HIDALGO | Agroforestry | SM4 | 2009 | BLS2 | SM4 | 6.49 |
| SJ-02-23-0312-2009 | BUENAVENTURA VALVERDE CAMAHO | Agroforestry | SM4 | 2009 | BLS1 | SM4 | 1.88 |
| SJ-02-23-0313-2007 | QUOCUNQUE NOMINE S.A. | Agroforestry | SM4 | 2007 | BLS1 | SM4 | 5.00 |
| SJ-02-23-0314-2007 | MARIN RAMIREZ MARIA ELENA | Agroforestry | SM5 | 2007 | BLS2 | BLS2SM5 | 2.52 |
| SJ-02-23-0321-2009 | CORDERO CASTRO DIRIAN | Agroforestry | SM4 | 2009 | BLS2 | SM4 | 1.10 |
| SJ-02-23-0322-2009 | RODOLFO QUESADA NAVARRO | Agroforestry | SM4 | 2009 | BLS2 | SM4 | 2.00 |
| SJ-02-23-0323-2009 | RETANA SIBAJA GERARDO ISAIAS | Agroforestry | SM4 | 2009 | BLS2 | SM4 | 2.99 |
| SJ-02-23-0328-2007 | MORA CAMACHO DORIS | Agroforestry | SM4 | 2007 | BLS2 | SM4 | 1.55 |
| SJ-02-23-0342-2007 | UNIPELOP S.A | Agroforestry | SM4 | 2007 | BLS2 | SM4 | 2.53 |
| SJ-02-23-0350-2007 | SANCHEZ FONSECA VICTOR HUGO | Agroforestry | SM4 | 2007 | BLS2 | SM4 | 1.68 |
| SJ-02-23-0351-2007 | NARANJO LOPEZ CARLOS | Agroforestry | SM5 | 2007 | BLS2 | BLS2SM5 | 2.32 |
| SJ-02-231-0021-2009 | ANAPIAN DEL SUSR S.A | Agroforestry | SM4 | 2009 | BLS2 | SM4 | 2.22 |
| SJ-02-231-0028-2009 | GUZMAN PORTUGUEZ LUIS HUMBERTO | Agroforestry | SM4 | 2009 | BLS2 | SM4 | 0.82 |
| SJ-02-231-0042-2009 | ELIZONDO ARIAS DIMAS | Agroforestry | SM4 | 2009 | BLS2 | SM4 | 1.85 |
| SJ-02-231-0043-2009 | JOSE ALBINO BEJARANO ELIZONDO | Agroforestry | SM4 | 2009 | BLS2 | SM4 | 0.89 |
| SJ-02-231-0044-2007 | ARIAS JIMENEZ MARIO ULISES | Agroforestry | SM5 | 2007 | BLS2 | BLS2SM5 | 3.00 |
| SJ-02-231-0045-2009 | CESPEDES GAMBOA OLDEMAR | Agroforestry | SM4 | 2009 | BLS2 | SM4 | 2.34 |
| SJ-02-231-0051-2009 | MORA FONSECA OSCAR | Agroforestry | SM4 | 2009 | BLS2 | SM4 | 3.50 |
| SJ-02-231-0098-2009 | VARGAS GARITA MANUEL | Agroforestry | SM4 | 2009 | BLS1 | SM4 | 0.90 |
| SJ-02-231-0146-2009 | MARTINEZ MARIN CRISTOBAL | Agroforestry | SM4 | 2009 | BLS1 | SM4 | 1.24 |
| SJ-02-231-0253-2009 | QUESADA MORA YADIRA | Agroforestry | SM4 | 2009 | BLS2 | SM4 | 1.09 |
| SJ-02-231-0308-2009 | CORRALES CAMPOS RONALD | Agroforestry | SM4 | 2009 | BLS2 | SM4 | 2.84 |
| SJ-02-231-0325-2009 | FALLAS BLANCO XINIA | Agroforestry | SM4 | 2009 | BLS2 | SM4 | 1.69 |
| SJ-02-28-0003-2007 | ANGULO ARIAS JORGE ARTURO | Assisted Nat. Regene | SM3 | 2007 | BLS1 | BLS1SM3 | 16.99 |
| SJ-02-28-0005-2007 | LAMBERTI ROBERTO | Assisted Nat. Regene | SM3 | 2007 | BLS1 | BLS1SM3 | 18.10 |
| SJ-02-28-0029-2007 | PORTUGUEZ ARIAS FRANCO | Assisted Nat. Regene | SM3 | 2007 | BLS1 | BLS1SM3 | 16.26 |
| SJ-02-28-0032-2006 | JIMENEZ VILLALOBOS OMAR | Assisted Nat. Regene | SM3 | 2006 | BLS1 | BLS1SM3 | 96.98 |
| SJ-02-28-0033-2006 | ANGULO SERRANO SANTIAGO | Assisted Nat. Regene | SM3 | 2006 | BLS1 | BLS1SM3 | 24.31 |
| SJ-02-28-0035-2006 | VILLAREVIA ELIZONDO JOSE JOAQUIN | Assisted Nat. Regene | SM3 | 2006 | BLS1 | BLS1SM3 | 10.69 |
| SJ-02-28-0038-2006 | ROBLES SANTAMARIA ELIAN | Assisted Nat. Regene | SM3 | 2006 | BLS1 | BLS1SM3 | 61.21 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| SJ-02-28-0087-2006 | JIREH SALOM S.A. | Assisted Nat. Regene | SM3 | 2006 | BLS2 | BLS2SM3 | 10.71 |
| SJ-02-28-0088-2006 | JIREH SALOM S.A. | Assisted Nat. Regene | SM3 | 2006 | BLS2 | BLS2SM3 | 41.72 |
| SJ-02-28-0094-2009 | ANGULO ALVARADO LEDA | Assisted Nat. Regene | SM3 | 2009 | BLS1 | BLS1SM3 | 3.11 |
| SJ-02-28-0095-2008 | SALAZAR FALLAS ALEXIS | Assisted Nat. Regene | SM3 | 2008 | BLS1 | BLS1SM3 | 13.89 |
| SJ-02-28-0095-2009 | VALVERDE ZAMORA DAMARIS | Assisted Nat. Regene | SM3 | 2009 | BLS1 | BLS1SM3 | 8.15 |
| SJ-02-28-0138-2007 | BRENES BARRANTES CEMAGGO S.A. | Assisted Nat. Regene | SM3 | 2007 | BLS1 | BLS1SM3 | 17.73 |
| SJ-02-28-0168-2006 | FONSECA VALVERDE FABIO | Assisted Nat. Regene | SM3 | 2006 | BLS1 | BLS1SM3 | 25.45 |
| SJ-02-28-0170-2006 | TORRES ZUNIGA YORLENY | Assisted Nat. Regene | SM3 | 2006 | BLS1 | BLS1SM3 | 9.34 |
| SJ-02-28-0307-2009 | CASTRO CHINCHILLA MARITZA | Assisted Nat. Regene | SM3 | 2009 | BLS2 | BLS2SM3 | 22.29 |
| **TOTAL** | | | | | | | **892.42** |

### A.3. Parties and project participant(s)

| **Party involved**<br>**((host) indicates a host Party)** | **Private and/or public entity(ies) project participants (as applicable)** | **Indicate if the Party involved wishes to be considered as project participant (Yes/No)** |
|---|---|---|
| Costa Rica (host) | National Forestry Financing Fund (FONAFIFO) | No |
| | International Bank for Reconstruction and Development as Trustee for the BioCarbon Fund | |

### A.4. Reference of applied methodology

The approved methodology used has been: Reforestation or afforestation of land currently under agricultural use" (AR-AM0004/Version 04), including the following EB-approved tools and procedures as a component of the approved A/R CDM methodology and valid at the time of registration (available at: http://cdm.unfccc.int/Reference/Guidclarif):

- Procedures to demonstrate the eligibility of lands for afforestation and reforestation CDM project activities, version 1 (EB 35 report, annex 18);
- Tool for the demonstration and assessment of additionality in A/R CDM project activities, Version 02 (EB 35 report, annex 17); and
- Guidance on the application of the definition of project boundary to A/R CDM project activities, Version 01.

For the purpose of monitoring, the following EB approved guidelines, tools and procedures have been used in addition:

- Guidelines on application of specified versions of A/R CDM methodologies in verification of registered A/R CDM project activities, Version 01.1 (EB 68 report, annex 31);
- Guidelines on accounting of specified types of changes in A/R CDM project activities from the description in registered project design documents, Version 02.0 (EB 66 report, annex 24);
- A/R 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 (EB 70 report, annex 35);
- A/R Methodological tool: Demonstrating appropriateness of volume equations for estimation of aboveground tree biomass in A/R CDM project activities, Version 01.0.1 (EB 67 report, annex 24); and

- A/R Methodological tool: Demonstrating appropriateness of allometric equations for estimation of aboveground tree biomass in A/R CDM project activities, Version 01.0.0 (EB 65 report, annex 28).

### A.5. Crediting period of project activity

According to the registered PDD (see http://cdm.unfccc.int/Projects/DB/AENOR1349188271.57/view):

- **Starting date**: 01/08/2006
- **Crediting period**: 01/08/2006 – 31/07/2026
  - **Type**: Renewable
  - **Length**: 20 years

## SECTION B. Implementation of project activity

### B.1. Description of implemented registered project activity

#### *B.1.1 Technical description of the project*

The project includes a total of 892.42 ha land privately owned by small and medium farmers affiliated to COOPEAGRI, a cooperative that groups 10,162 farmers currently dedicated to agricultural activities, such as coffee, sugarcane, and cattle. Each of the cooperative associates participating in this project has a registered land title and a cadastral map. It is also important to mention that there are no large indigenous areas within the Perez Zeledon County. Project activities have not resulted in any resettlement and have not limited the access to previously used lands by indigenous people.

All the farmers included in the proposed A/R CDM project (See section B.2.) have signed a contract with FONAFIFO. This contract establishes that farmers give the rights of access of the sequestered carbon (tCERs) to FONAFIFO, and that in exchange, the farmers will receive from FONAFIFO annual payments for the forest environmental services produced by them, including the carbon sequestration.

The project has promoted the development of a diverse landscape in all two sub-regions (North Hillsides and; Valley and South Hillsides) through an improved farm organization where areas of land use optimal for cattle or crops will remain under those land uses, while areas of land use optimal for forestry will be used to establish the CDM project activities. Forest Plantations, Natural Regeneration and Agroforestry Systems have been promoted by the project to maximize social and environmental benefits, including the generation of carbon offsets.

The seedlings for all project activities, with the exception of reforestation by Assisted Natural Regeneration, have been produced at COOPEAGRI's nursery, located at "La Presa" farm in the Daniel Flores District, with certified seed (from CATIE's Seed Bank when available) or from previously selected trees to guarantee seedling quality. In general, Teak needs about 3 months in the nursery, Amarillon and Pilon need about 6 months, Cebo and Cedro need 3 to 5 months. Melina and Eucalyptus needs about 2 and half months of nursery maintenance and management. The planting stock have been produced in jiffy pellets and black polyethylene bags. Foliage fertilization (one time at 0.0043 gr/tree of complete fertilizer formula, equivalent to 18% of nitrogen / tree) has been applied in the nursery.

In the case of Forest Plantations and Agroforestry Systems, the site preparation has been done using manual methods to ensure minimum soil disturbance. It has been limited to making a hole with a tree planting shovel and keeping free of weeds in a circle around the seedlings (35 cm radius). The use of herbicides has been required in specific sites with aggressive grasses, but only during the first years.

A second fertilization has been applied in some parcels during tree planting. Weed control has been done manually in most project parcels.

Reforestation by Assisted Natural Regeneration has been recommended on deforested hillside areas with the highest slopes, in both North and South sub-regions. The remaining forest patches and the seed-soil-bank will function as seed sources. Forest species from natural regeneration have been all native species. The natural regeneration process allows the recovery of the original forest type. This project activity has included the identification of the areas, the establishment of wire-fences around them to excluded cattle (when required), the prevention of forest fires by establishing fire breaks, the signage of the area, and hunting/pouching control.

Agroforestry Systems have been promoted on two sub-regions. On the hillsides, this activity has been prioritized in lower slopes. The systems included in the proposed CDM project are plantation in small blocks,

plantation of trees in rows & fences, and trees mixed with crops (plantation in blocks and mixed with crops have been the main used systems). The species selection has been based on site conditions and farmer's preferences. *Gmelina arborea* has been the principal choice in silvopastoral systems and *Cedrela odorata* in crops. The spacing has varied depending on the technique of the agroforestry system selected by the farmer.

Reforestation through Forest Plantations has been recommended on medium to high quality sites presently covered with pasture in the Valley area.

Some recommendations on planting density and silviculture have been provided to the land owners during the implementation (see PDD table 7). Nevertheless farmers have not followed strictly the guidelines, they have adapted the implementation to the site quality and to their preferences.

### *B.1.2 Implementation status of the project activity*

All reforestation activities have been implemented in the period between 2006 and 2009, as summarized in the following table (For further details see Excel file "Project boundary").

**Table 3. Project implementation per baseline stratum, project activity and year**

| | | Year | | | | |
|---|---|---|---|---|---|---|
| | | **2006** | **2007** | **2008** | **2009** | **Total** |
| **North Hillsides** | **Total** | **247.34** | **96.28** | **38.58** | **38.80** | **421,00** |
| | **Forest plantations** | 2.05 | 5.75 | | 10.52 | **18,32** |
| | **ANR** | 227.96 | 69.08 | 13.89 | 11.25 | **322,19** |
| | **Agroforestry** | 17.33 | 21.45 | 24.68 | 17.03 | **80,49** |
| **Valley Lands and South Hillsides** | **Total** | **111.63** | **132.29** | **91.38** | **136.12** | **471,42** |
| | **Forest plantations** | 25.32 | 20.88 | 19.76 | 23.93 | **89,89** |
| | **ANR** | 52.43 | | | 22.29 | **74,71** |
| | **Agroforestry** | 33.89 | 111.41 | 71.62 | 89.90 | **306,83** |
| **Total** | | **358,97** | **228.57** | **129.96** | **174.92** | **892.42** |

## B.2. Post registration changes

### B.2.1. Temporary deviations from registered monitoring plan or applied methodology

N/A

### B.2.2. Corrections

N/A

### B.2.3. Permanent changes from registered monitoring plan or applied methodology

N/A

### B.2.4. Changes to project design of registered project activity

N/A

### B.2.5. Changes to start date of crediting period

N/A

### B.2.6. Types of changes specific to afforestation or reforestation project activity

All changes considered after the registration of the project do not require a prior approval by the Board as they are included in the Guidelines on accounting of specified types of changes in A/R CDM project activities from the description in registered project design documents, Version 02.0 (EB 66 report, annex 24).

In the following paragraphs there is a description of the occurred changes.

- **Species**

During the monitoring process it has been observed that species supposed to be used in the different strata did not correspond with what it was indicated in the PDD. Basically, new native species have been used in Agroforestry systems. Species composition did not affect substantially the baseline identification and additionality demonstration in the PDD. Therefore, a change in species composition will not contribute to a change in those topics.

Following EB 66 report, annex 24, paragraph b, this change does not require a prior approval "(b) Changes in species composition, if the changes are demonstrated at verification to be consistent with the baseline identification and additionality demonstration made at the validation stage"

- **Technology**

The five stand models proposed in the PDD have been implemented, and the main technological aspects issues have been applied. Nevertheless, some minor discrepancies have been found between the actual implementation and the projected in the PDD, basically on reforestation (plantation density, fertilization, etc) and silviculture practices (thinning, rotation period, etc).

Following EB 66 report, annex 24, paragraphs d, e, g, i and j, these changes do not require a prior approval "(d) Changes in timing and choice of silvicultural operations; (e) Changes in timing of harvest occurring before the third verification; (i) Changes in technology employed; (j) Changes in inputs (e.g. fertilizers, certified seeds, watering)"

- **Monitoring plan**
    - **Stratification:** an ex-post stratification has been done, as indicated in section E.2 of the PDD, by merging similar ex-ante strata. Ex-ante and ex-post stratification figure in the following table.

**Table 4. Ex ante and ex post stratification**

| | Ex-ante stratification | | | Ex-post stratification | | |
|---|---|---|---|---|---|---|
| **Name** | **Id** | **Area (ha)** | **Number of discrete areas** | **Id** | **Area (ha)** | **Number of discrete areas** |
| North Hillsides/ANR | BLS1-SM3 | 322.24 | 13 | BLS1-SM3 | 322.19 | 13 |
| North Hillsides/Melina | BLS1-SM1 | 18.32 | 4 | SM1_2 | 108.20 | 27 |
| Valley Lands and South Hillsides/Melina plantations | BLS2-SM1 | 72.08 | 19 | | | |
| Valley Lands and South Hillsides /Teak and/or Eucalyptus plantations | BLS2-SM2 | 17.81 | 4 | | | |
| Valley Lands and South Hillsides /Agroforestry Trees+Crops | BLS2-SM4 | 227.07 | 92 | SM4 | 284.86 | 119 |
| Valley Lands and South Hillsides /Silvopastoral Trees + Pastures | BLS2-SM5 | 160.44 | 69 | BLS2-SM5 | 102.46 | 42 |
| Valley Lands and South Hillsides/ANR | BLS2-SM3 | 74.46 | 3 | BLS2-SM3 | 74.71 | 3 |
| **Total** | | **892.42** | **204** | | **892.42** | **204** |

Following EB 66 report, annex 24, paragraph k, this change does not require a prior approval "(k) Changes in stratification for sampling"

- **Sampling design (number, location, frame, type, etc.):** as described in section D.3. the number of sample plots has decreased from 77 (in the PDD) to 59 (in the final sampling design). Also the random location system and the distribution within the strata have changed. Nevertheless the location and distribution has been performed with the main objective of obtaining unbiased and reliable estimates of the mean of tree biomass.

  Following EB 66 report, annex 24, paragraph m, this change does not require a prior approval "(m) Changes in number of sample plots and their allocation to strata".

Even this is the first monitoring report the PP suggests the change of the type of sample plots from permanent to temporary with the objective of obtaining in each monitoring process a higher accuracy in the estimations of GHG removals by sinks based on the actual heterogeneity of the measured variable.

Following EB 66 report, annex 24, paragraph l, this change does not require a prior approval "(l) Changes in type of sample plots (e.g. temporary, permanent, point-sampling)".

- **GHG calculations:** as mentioned in section E.2., in the case of *Cedrela odorata*, a species-specific allometric equation has been selected not included in the PDD. This selected equation was developed in a region with similar edapho-climatic conditions than those in the project boundary, was based on a sample of 38 trees and has an $R^2$ of 97%[1]. Therefore, according to EB 65 report, annex 28 the applicability of the equation is demonstrated.

  In the case of *Gmelina odorata* a different volume equation than the proposed in the PDD has been used. In this case the source of the equation is the same (Rojas et al. 2004, see section E) but the new equations is based only on DBH and provides less errors in the final GHG removals calculations. These are the reasons why this new equation was selected.

  Following EB 66 report, annex 24, paragraph p, this change does not require a prior approval "(p) Changes in parameters, equations, or methods used in tree biomass estimation, if the applicability of the changed parameters, equations, or methods is demonstrated at verification using the "Tool for demonstration of applicability of allometric equations and volume equations in A/R CDM project activities" when available, or if the changed parameters, equations, or methods do not result in a decrease in precision of the estimate of tree biomass".

  On the other side, as summarized in section E.2., calculations of carbon stocks and change in carbon stocks of trees have been done using the A/R 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 (EB 70 report, annex 35)".

  Following EB 66 report, annex 24, paragraph t, this change does not require a prior approval "(t) Changes in methods of estimation of changes in any carbon pool, if the method applied at verification uses the latest version of the relevant approved tool and the applicability conditions of the methodology applied are consistent with the applicability conditions of the tool".

**SECTION C. Description of monitoring system**

This section is based on a monitoring document developed by FONAFIFO containing information about the implementation of the monitoring plan (Implementación del Plan de Monitoreo).

**C.1.) Monitoring system framework**

The main issues considered during the monitoring process and the entities in charge of them are summarized in the following table:

**Table 5. Monitoring system framework**

| Monitoring items | Entity in charge |
|---|---|
| Project boundary | COOPEAGRI and FONAFIFO |
| Field survey (Stratification, sampling design and field data collection) | COOPEAGRI and FONAFIFO |
| Data analysis and storage | FONAFIFO |
| Verification and correction of data | FONAFIFO & Agresta |
| Calculations (Actual GHG removal by sinks) | FONAFIFO & Agresta |

**C.2) Data collection procedures (information flow including data generation, aggregation, recording, calculations and reporting)**

[1] Further details in tables of Section E.2.

**Project boundary**

The following activities have been done in the monitoring of the project boundary:

- Field surveys concerning the actual project boundary, within which the project activity has occurred, using the geographical information from the PSA database and cartography maps.
- Measurement of geographical positions (points and tracks) using GPS.
- Survey data on farm parcels have been included into the project GIS platform in order to calculate the eligible area of each farm parcel and area of stratum.
- Ensure consistency of actual boundary with the description in the CDM-AR-PDD using the project GIS platform.
- New measured geographical positions have been included into the GIS system and the eligible area of each stratum and stand have been calculated

Project areas have been monitored annually by a forest technician of COOPEAGRI (Regente forestal). During the annual visit to the project parcel forest technician has reported to FONAFIFO about the implementation status, indicating the presence of discrepancies between the status and the contract (Annual reports are available on request). Additionally, FONAFIFO's Monitoring and Control Department (Departamento de Control y Monitoreo) performs random field checks to confirm the information of COOPEAGRI reports.

During the first 5 years of the contract of environmental services project parcels are visited annually by the forest technician and once by FONAFIFO.

**Monitoring of forest establishment**

As abovementioned, to ensure that forest establishment activities are well-implemented and conform to the practice described in the CDM-AR-PDD, annual visits to the project parcels have been conducted by COOPEAGRI and FONAFIFO in the line with environmental services payment process. During this visit the following aspects have been confirmed/checked:

*Monitoring Natural Regeneration*

- Cattle are keep out the farm parcels due to wire fence around the parcels
- Parcels are properly signed in the field with signs containing the name, contract number, modality of A/R and the surface included.
- Parcels are protected with proper fire breaks;
- Poaching and hunting are not allowed in the farm parcels and land owners control them through periodic visits.

*Monitoring Forest Plantations and Agro-Forestry Systems.*

- Site preparation is implemented based on practice documented in the contract of environmental services;
- Approved herbicides in site preparation and container disposal have been used, as described in the CDM-AR-PDD;
- Tree species and number of trees planted on each farm parcel are in line with the CDM-AR-PDD (see Section B.2.6);
- Seedling survival
- Implementation has been as planned (any deviation has been reported).
- Parcels are properly signed in the field with signs containing the name, contract number, modality of A/R and the surface included.
- Parcels are protected with proper fire breaks

**Monitoring of forest management**

Monitoring of forest management has been done as specified in the document "Implementación del Plan de Monitoreo" and summarized in this section for Project boundary and Forest establishment. The monitoring

of forest management has been done during COOPEAGRI annual visits and check by FONAFIFO in periodical visits.

**Monitoring of net anthropogenic GHG removal by sinks**

Monitoring of GHG removals have been performed by sampling procedures based on ex-post stratification (see Sections D.3. and E.). Baseline net GHG removals by sinks, GHG emissions and leakage have not been monitored following section E of the PDD.

**Quality assurance/ quality control**

To ensure that net anthropogenic GHG removals by sinks are measured and monitored precisely, credibly, verifiably and transparently, a quality assurance and quality control (QA/QC) procedure has been implemented, as explained in the project monitoring document "Implementación del Plan de Monitoreo". The following list contains a summary of the main actions implemented:

- Collection of reliable field measurement: in this project case all members of the field team were forest experts. The team members were well aware about the specific design of the project sampling and have the necessary knowledge about the use of measure equipments and measure techniques.
- Verification of methods used to collect field data: to verify the correct measurements of sample plots 10% of them, randomly selected, have been re-measured. Three parameters have been re-measured (plot location, DBH and height of each tree) with a mean deviation from the original data of %
- Verification of data entry and analysis techniques: field data have been collected in field paper forms (See monitoring document "Implementación del Plan de Monitoreo") and transcribed into Excel spreadsheets (one worksheet per sampled plot). For data analysis, all field data has been included in one table including information per tree of: plot id, tree ID, DBH, H and species (See Excel file "Field data and calculations"). All field data collected have been reviewed by an expert. Some necessary corrections, based basically on the transcript of data form field forms to the spreadsheet, have been done in coordination between the field team and the expert.
- Data maintenance and archiving: field paper forms have been archived by the project proponent. Electronic information (Excel files, GIS geodatabase and monitoring documents) is archived in multiple locations (FONAFIFO, BioCF and Agresta).

**C.3) Organizational structure, roles and responsibilities of personnel**

FONAFIFO have overall responsibility for the project. It is the leading agency with responsibility to deliver project implementation and monitoring for the whole crediting period.

Roles and responsibilities during project implementation and monitoring are summarized below per person/entity:

**Land owner:** responsible of the compliance of the contract (Payment of environmental services contracts).

**COOPEAGRI Forest technician (Regente Forestal):**

- Technical assistance to land owners on the implementation of Project activities;
- Species selection base on site characteristics and owner's demand;
- Coordinate site preparation, planting and maintenance of plantations;
- Measurement and report to FONAFIFO of project boundary;
- Establishment of temporary sample plots specifically for the monitoring of the system of environmental services payment;
- Annual monitoring of project implementation.

**FONAFIFO:**

A Project Implementation Unit (PIU) in the Monitoring and Control Department (Departamento de Control y Monitoreo[2]) has been formed within FONAFIFO. This unit is responsible for day to day activities of the project implementation and coordination of the project monitoring plan, including verification and reporting. The PIU ensure the implementation of the Monitoring Plan, monitor the project progress and measure the impact of project activities against the baseline scenario. The PIU take on a systematic analysis of the

[2] Other departments of FONAFIFO as Regional Offices and the Management of PSA Department collaborate with the Monitoring and Control Department in this monitoring process.

project activities and the results of the monitoring activities are fed back into the implementation process. The PIU is responsible for the following activities:

- Coordinate project implementation;
- Verify the application of recommended techniques for development of the selected A/R activities;
- Establish and maintain monitoring temporary plots in the farmer parcels;
- Maintain and update project GIS system;
- Maintain project files for future verification including data collection and storage in digital format;
- Estimate net anthropogenic GHG removals by sinks;
- Facilitate verification of project progress;
- Prepare annual reports of project implementation;
- Request PSA annual payments to farmers after field verification of tree and forests growth in project parcels.

FONAFIFO have a Project Coordinator that is responsible for coordinating the project implementation.

FONAFIFO also form a Project Steering Committee, which is responsible for coordinating the activities in the field and with other local organizations. The Project Coordinator serves as the secretariat for the Committee. The tasks of the committee would include dissemination of information on project implementation and best practices, and coordination between local organizations and FONAFIFO regarding project finances and supervision.

**C.4) Emergency procedures for the monitoring system.**

Given the nature of a reforestation project, where re-measurements can easily be made and due to the data processing and storage routines described above, no emergency procedures are required and fore-seen for the monitoring system.

**SECTION D. Data and parameters**

**D.1. Data and parameters fixed ex ante or at renewal of crediting period**

| **Data / Parameter:** | $C_{BSL}$ |
|---|---|
| Unit: | $tCO_2$-e |
| Description: | Baseline net greenhouse gas removals by sinks |
| Source of data: | PDD section C.7. |
| Value(s) applied: | 0 |
| Purpose of data: | Calculation of baseline emissions or baseline net GHG removals by sinks |
| Additional comment: | - |

| **Data / Parameter:** | $\Delta C_{B,LB}$ |
|---|---|
| Unit: | $tCO_2$-e |
| Description: | Baseline sum of the changes in living biomass carbon stocks (above- and below-ground) |
| Source of data: | PDD section C.7. |
| Value(s) applied: | 0 |
| Purpose of data: | Calculation of baseline emissions or baseline net GHG removals by sinks |
| Additional comment: | - |

| **Data / Parameter:** | $E_{biomasslos}$ |
|---|---|

| | |
|---|---|
| Unit: | $tCO_2$-e |
| Description: | Decrease in the carbon stock in the living biomass carbon pools of non-tree vegetation in the year of site preparation, up to time t* |
| Source of data: | PDD section D.1. |
| Value(s) applied: | 0 |
| Purpose of data: | Calculation of project emissions or actual net GHG removals by sinks |
| Additional comment: | - |

| **Data / Parameter:** | $BEF_{2,j}$ |
|---|---|
| Unit: | dimensionless |
| Description: | Biomass expansion factor for conversion of biomass of merchantable volume to aboveground biomass for species *j.* |
| Source of data: | PDD section D.1. (Table 21) |
| Value(s) applied: | 1.315 (*Gmelina arborea)* |
| Purpose of data: | Calculation of project emissions or actual net GHG removals by sinks |
| Additional comment: | The only used BEF in this first monitoring has been for *Gmelina arborea*. For other species Allometric equation method has been used. Biomass Expansion Factor (BEF) for *Gmelina arborea* was calculated in the PDD using information from: Fuwape, J.A et al, 2001. Biomass equations and estimation for *Gmelina arborea* and *Nauclea Diderrichii* stands in Akure forest reserve. Biomass and Bioenergy No.21: 401-405. |

| **Data / Parameter:** | $R_j$ |
|---|---|
| Unit: | dimensionless |
| Description: | Root-shoot ratio for species *j.* |
| Source of data: | PDD section E.4.1. (Tables 26 and 27) |
| Value(s) applied: | 0.24 (For all tree species except *Cedrela odorata*) |
| Purpose of data: | Calculation of project emissions or actual net GHG removals by sinks |
| Additional comment: | Information from Cairns, M. A., S. Brown, E. H. Helmer, and G. A. Baumgardner. 1997. Root biomass allocation in the world's upland forests. Oecología 111, 1-11 (See page 5). In the case of *Cedrela odorata* a specific allometric equation has been used for the calculation of belowground biomass instead of the Rj. |

| **Data / Parameter:** | $D_j$ |
|---|---|
| Unit: | t d.m./$m^3$ merchantable volume |
| Description: | Volume-weighted average wood density for species *j.* |
| Source of data: | PDD section D.1. (Table 21) |
| Value(s) applied: | 0.37 (*Gmelina arborea)* |
| Purpose of data: | Calculation of project emissions or actual net GHG removals by sinks |

| | |
|---|---|
| Additional comment: | The only used in this first monitoring in the case of *Gmelina arborea*. For other species Allometric equation method has been used. Wood density for was obtained in the PDD from: Cubero, J. and Rojas, S. 1999. Carbon fixation in plantations of melina (*Gmelina arborea Roxb*), teak (*Tectona grandis L.f*) and pochote (*Bombacopsis quinata Jacq.*) in the cantons of Hojancha and Nicoya, Guanascaste, Costa Rica. Thesis Degree in Forest Sciences with concentration in Forest Handling. Faculty of Sciences of the Earth and the Sea. School of Environmental Sciences. Universidad Nacional. Heredia Costa Rica. 95 p. (see pag. 41). |

| **Data / Parameter:** | $CF_j$ |
|---|---|
| Unit: | tC/t d.m. |
| Description: | Carbon fraction |
| Source of data: | IPCC default data (See PDD section E.4.1.) |
| Value(s) applied: | 0.5 |
| Purpose of data: | Calculation of project emissions or actual net GHG removals by sinks |
| Additional comment: | - |

| **Data / Parameter:** | ***AP*** |
|---|---|
| Unit: | ha |
| Description: | Plot area |
| Source of data: | PDD section E.2. |
| Value(s) applied: | 0.05 |
| Purpose of data: | Calculation of project emissions or actual net GHG removals by sinks |
| Additional comment: | - |

| **Data / Parameter:** | $GHG_E$ |
|---|---|
| Unit: | $tCO_2$-e |
| Description: | Increase in GHG emission as a result of the implementation of the proposed A/R CDM project activity within the project boundary |
| Source of data: | PDD section E.4.2. |
| Value(s) applied: | 0 |
| Purpose of data: | Calculation of project emissions or actual net GHG removals by sinks |
| Additional comment: | - |

| **Data / Parameter:** | $E_{BiomassBurn}$ |
|---|---|
| Unit: | $tCO_2$-e |
| Description: | Increase in GHG emission as a result of biomass burning within the project boundary |
| Source of data: | PDD section E.4.2. |

| | |
|---|---|
| Value(s) applied: | 0 |
| Purpose of data: | Calculation of project emissions or actual net GHG removals by sinks |
| Additional comment: | - |

| **Data / Parameter:** | ***DLP*** |
|---|---|
| Unit: | % |
| Description: | Targeted precision level |
| Source of data: | Selected methodology (AR-AM0004 v.4.) section III |
| Value(s) applied: | 10 |
| Purpose of data: | Calculation of project emissions or actual net GHG removals by sinks |
| Additional comment: | - |

| **Data / Parameter:** | ***Confidence level*** |
|---|---|
| Unit: | % |
| Description: | Confidence level |
| Source of data: | Selected methodology (AR-AM0004 v.4.) section III. |
| Value(s) applied: | 90 |
| Purpose of data: | Calculation of project emissions or actual net GHG removals by sinks |
| Additional comment: | Used in the calculation of the uncertainty of the mean change in tree biomass per hectare within the project boundary |

| **Data / Parameter:** | $n_i$[3] |
|---|---|
| Unit: | dimensionless |
| Description: | Sample size for stratum *i* |
| Source of data: | PDD section E.4.2. and Excel file “Field data and calculations” |
| Value(s) applied: | See Excel file “Field data and calculations” |
| Purpose of data: | Calculation of project emissions or actual net GHG removals by sinks |
| Additional comment: | Data corrected during monitoring. Used also in the calculation of the uncertainty of the mean change in tree biomass per hectare within the project boundary |

| **Data / Parameter:** | $N_i$ |
|---|---|
| Unit: | dimensionless |
| Description: | Maximum possible number of sample plots in stratum *i* |
| Source of data: | Calculated based on $A_{ikt}$ and $AP$ ($A_{ikt}$/AP) |
| Value(s) applied: | See Excel file “Field data and calculations” |

[3] All the parameters related to sampling design were included in the PDD, have been subjected to changes and will be also subjected to changes in future monitoring processes. Even they do not remain fixed they do not have to be monitored therefore thy have been included in section D.1.

| | |
|---|---|
| Purpose of data: | Calculation of project emissions or actual net GHG removals by sinks |
| Additional comment: | Used in the calculation of the uncertainty of the mean change in tree biomass per hectare within the project boundary |

| **Data / Parameter:** | ***n*** |
|---|---|
| Unit: | dimensionless |
| Description: | Sample size in the project area |
| Source of data: | PDD section E.4.2. and Excel file “Field data and calculations” |
| Value(s) applied: | 59 |
| Purpose of data: | Calculation of project emissions or actual net GHG removals by sinks |
| Additional comment: | Data corrected during monitoring. Used also in the calculation of the uncertainty of the mean change in tree biomass per hectare within the project boundary |

| **Data / Parameter:** | ***XF*** |
|---|---|
| Unit: | dimensionless |
| Description: | Plot expansion factor from per plot values to per hectare values |
| Source of data: | Calculated based on equation 38 of the PDD (1/AP=1/0.05=20) |
| Value(s) applied: | 20 |
| Purpose of data: | Calculation of project emissions or actual net GHG removals by sinks |
| Additional comment: | - |

| **Data / Parameter:** | $t_{val}$ |
|---|---|
| Unit: | dimensionless |
| Description: | Value of the statistic z (normal probability density function), for α = 0.1 (implying a 90% confidence level); |
| Source of data: | Calculated |
| Value(s) applied: | 1.6711 |
| Purpose of data: | Calculation of project emissions or actual net GHG removals by sinks |
| Additional comment: | Used in the calculation of the uncertainty of the mean change in tree biomass per hectare within the project boundary |

**D.2. Data and parameters monitored**

| **Data / Parameter:** | ***t**** |
|---|---|
| Unit: | years |
| Description: | Years elapsed since the start of the A/R project activity |

| | |
|---|---|
| Measured/ Calculated / Default: | Calculated |
| Source of data: | Calculated (staring date and monitoring date) |
| Value(s) of monitored parameter: | 6.4167 |
| Monitoring equipment: | Calendar |
| Measuring/ Reading/ Recording frequency: | Every 5 years after first monitoring event for first verification (depending also on the post-Kyoto ruling) |
| Calculation method (if applicable): | N/A |
| QA/QC procedures: | N/A |
| Purpose of data: | Calculation of project emissions or actual net GHG removals by sinks |
| Additional comment: | Number of years from the starting date of the registered A/R CDM project activity (01/08/2006) to the end of the first monitoring period (31/12/2012). Equal to T in EB 70 report, Annex 35. |

| **Data / Parameter:** | ***DBH*** |
|---|---|
| Unit: | cm |
| Description: | Tree diameter at the breast height (1.3 m) |
| Measured/ Calculated / Default: | Measured |
| Source of data: | Measurement of each tree in sample plots |
| Value(s) of monitored parameter: | See Excel file “Field data and calculations” |
| Monitoring equipment: | Diameter tape (with a resolution of 1 mm) |
| Measuring/ Reading/ Recording frequency: | Every 5 years after first monitoring event for first verification (depending also on the post-Kyoto ruling) |
| Calculation method (if applicable): | N/A |
| QA/QC procedures: | See section C.3. |
| Purpose of data: | Calculation of project emissions or actual net GHG removals by sinks |
| Additional comment: | - |

| **Data / Parameter:** | ***H*** |
|---|---|
| Unit: | m |
| Description: | Tree total height |

| | |
|---|---|
| Measured/ Calculated / Default: | Measured |
| Source of data: | Measurement of each tree in sample plots |
| Value(s) of monitored parameter: | See Excel file “Field data and calculations” |
| Monitoring equipment: | Hypsometer (Vertex) |
| Measuring/ Reading/ Recording frequency: | Every 5 years after first monitoring event for first verification (depending also on the post-Kyoto ruling) |
| Calculation method (if applicable): | N/A |
| QA/QC procedures: | See section C.3. |
| Purpose of data: | Calculation of project emissions or actual net GHG removals by sinks |
| Additional comment: | - |

| **Data / Parameter:** | $A_{ikt}$ |
|---|---|
| Unit: | ha |
| Description: | Area of stratum i, sand model k, at time t |
| Measured/ Calculated / Default: | Measured |
| Source of data: | Measurement of each reforested parcel area |
| Value(s) of monitored parameter: | See Excel files “Field data and calculations; and Project boundary” |
| Monitoring equipment: | Maps and GPS |
| Measuring/ Reading/ Recording frequency: | Every 5 years after first monitoring event for first verification (depending also on the post-Kyoto ruling) |
| Calculation method (if applicable): | Once measurements have been done stratum area is calculated using a GIS tool. |
| QA/QC procedures: | Project boundary measurement is done by a forest technician (COOPEAGRI) following the procedures indicated in the document “Manual de procedimientos de PSA”. Information is verified by the experts of FOMAFIFO’s regional office and checked by FONAFIFO`s department of Monitoring and Control (by field checks and analysis of aerial photographs and forest land use cover maps. |
| Purpose of data: | Calculation of project emissions or actual net GHG removals by sinks |
| Additional comment: | In this first monitoring stratification has been performed based on baseline strata, stand models and plantation year. Finally 5 strata have been considered (See Excel file: “Project boundary”) |

| **Data / Parameter:** | ***lat/long (UTM coord Y/coord X)*** |
|---|---|
| Unit: | Degree, minutes and seconds (m) |
| Description: | Plot location |
| Measured/ Calculated / Default: | Measured |
| Source of data: | Measurement in each sample plots |
| Value(s) of monitored parameter: | See Excel file “Sample plots” |
| Monitoring equipment: | GPS |
| Measuring/ Reading/ Recording frequency: | Every 5 years after first monitoring event for first verification (depending also on the post-Kyoto ruling) |
| Calculation method (if applicable): | N/A |
| QA/QC procedures: | See section C.3. |
| Purpose of data: | Calculation of project emissions or actual net GHG removals by sinks |
| Additional comment: | - |

| **Data / Parameter:** | $nTR_{PLikt}$ |
|---|---|
| Unit: | Number |
| Description: | Number of trees in the sample plot |
| Measured/ Calculated / Default: | Measured |
| Source of data: | Measurement of reforested area |
| Value(s) of monitored parameter: | See Excel file “Field data and calculations” |
| Monitoring equipment: | N/A |
| Measuring/ Reading/ Recording frequency: | Every 5 years after first monitoring event for first verification (depending also on the post-Kyoto ruling) |
| Calculation method (if applicable): | N/A |
| QA/QC procedures: | See section C.3. |
| Purpose of data: | Calculation of project emissions or actual net GHG removals by sinks |
| Additional comment: | - |

| **Data / Parameter:** | ***i*** |
|---|---|
| Unit: | N/A |
| Description: | Tree species |
| Measured/ Calculated / Default: | Measured |
| Source of data: | Identified in each sample plot |
| Value(s) of monitored parameter: | See Excel file “Field data and calculations”<br><br>Four species or group of species have been indentified:<br>• *Gmelina arborea*<br>• *Tectona grandis*<br>• *Cedrela odorata*<br>• Other species |
| Monitoring equipment: | N/A |
| Measuring/ Reading/ Recording frequency: | Every 5 years after first monitoring event for first verification (depending also on the post-Kyoto ruling) |
| Calculation method (if applicable): | N/A |
| QA/QC procedures: | See section C.3. |
| Purpose of data: | Calculation of project emissions or actual net GHG removals by sinks |
| Additional comment: | Named i in the PDD and j in EB70 report, Annex 35. |

| **Data / Parameter:** | ***t*** |
|---|---|
| Unit: | year |
| Description: | Age of plantation |
| Measured/ Calculated / Default: | Calculated |
| Source of data: | Planting record, counted since planting year |
| Value(s) of monitored parameter: | See Excel file “Project boundary” |
| Monitoring equipment: | Calendar |
| Measuring/ Reading/ Recording frequency: | Every 5 years after first monitoring event for first verification (depending also on the post-Kyoto ruling) |
| Calculation method (if applicable): | Current year-Planting year |
| QA/QC procedures: | See section C.3. |
| Purpose of data: | Calculation of project emissions or actual net GHG removals by sinks |
| Additional comment: | - |

**D.3. Implementation of sampling plan**

The main variable in the estimation of GHG removals by sink, in this project case, is the living biomass in trees. This variable is determined by a sampling approach and calculated based on the measurements of two parameters (DBH and H) of each tree in each sample plot.

**a) Description of implemented sampling design**

- *Objectives and reliability requirements:* determining the current mean tree biomass per hectare within the project boundary with a 90/10 confidence/precision.
- *Target population:* tree vegetation inside the Project boundary.
- *Sampling method:* stratified random and systematic sampling.
- *Sample size:* 77 sample plots (finally 59 sample plot were measured inside the project boundary (see Excel file "Sample plots").
- *Sampling frame:* the specific location of sample plots inside the Project boundary is available in GIS format (*.shp file).
- *Field measurements:* DBH and H were the two parameters measured in each tree of all sample plots.
- *Quality assurance/Quality control:* QA/QC was perfomed as indicated in the PDD section E and sumarized in section C and in the document "Implementación del Plan de Monitoreo".

**b) Collected data (electronic spreadsheets may be attached and referenced)**

All field data collected have been stored in an Excel spreadsheet available for the DOE (Field data and calculations).

**c) Analysis of the collected data**

Field data have been analyzed as explained in section E.2.

**d) Demonstration on whether the required confidence/precision has been met**

The error obtained is higher than expected. Therefore, as explained in section E.2 (sub-step 2.9), a deduction has been done to final results.

**SECTION E. Calculation of emission reductions or GHG removals by sinks**

**E.1. Calculation of baseline emissions or baseline net GHG removals by sinks**

N/A (See section E.3. of the PDD)

**E.2. Calculation of project emissions or actual net GHG removals by sinks**

Calculations have been done using the equations of the PDD, of the selected methodology (AR-AM0004 v.4.) and the A/R 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 (EB 70 report, annex 35).

**Actual net GHG removals by sinks**

In accordance with the PDD and the used methodology, actual net GHG removals by sinks are calculated using the following equation:

$$C_{ACTUAL} = \Delta C_{LB} - GHG_E \quad \text{(Equation number 24 of the PDD)}$$

$C_{ACTUAL}$ = Actual net GHG removals by sinks; t $CO_2$-e

$\Delta C_{LB}$ = Sum of changes in living biomass carbon stocks (above and below ground); t $CO_2$-e

$GHG_E$ = Sum of increases in GHG emissions by sources within the project boundary as a result of the implementation of an A/R CDM project activity; t $CO_2$-e

According to project design, biomass burning is not allowed during site preparation. Furthermore, following the "Guidelines on application of specific versions of A/R CDM methodologies in verification of registered A/R CDM project activities" emissions resulting from clearance or burning of herbaceous vegetation shall be set to zero. Consequently, monitoring of data and parameters related to this source of emissions is not required in this project.

Therefore: $C_{ACTUAL}=\Delta C_{LB}$

**Sum of changes in living biomass carbon stocks**

$$\Delta C_{LB} = \Delta C_{LBT} - E_{biomassloss} \quad \text{(Equation number 25 of the PDD)}$$

$\Delta C_{LB}$ = Sum of changes in living biomass carbon stocks (above and below ground); t $CO_2$-e

$\Delta C_{LBT}$ = Sum of changes in living tree biomass carbon stocks (above and below ground); t $CO_2$-e

$E_{biomassloss}$ = Decrease in carbon stock in the living biomass carbon pools of non-tree vegetation in the year of site preparation, up to time t*; t $CO_2$-e.

Based on section D.1. (subsection A1) of the PDD and on the "Guidelines on application of specific versions of A/R CDM methodologies in verification of registered A/R CDM project activities" changes in carbon stocks resulting from clearance of herbaceous vegetation and general non-tree vegetation is set to zero.

Therefore: $\Delta C_{LB} = \Delta C_{LBT}$ and $C_{ACTUAL} = \Delta C_{LBT}$

**Sum of changes in living tree biomass carbon stocks**

The sum of changes in living tree biomass carbon stocks has been calculated based on the change in carbon stock in tree biomass within the project in year t and the time elapsed between the starting date and the first monitoring:

$\Delta C_{LBT} = \Delta C_{TREE,t} * T$

$\Delta C_{TREE,t}$ has been calculated following the indications of the A/R 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.

**Step 1. Estimation of tree biomass**

**a) BEF technique**

$B_{TREEi,p,i,t} = V_{TREEi,p,i,t} \times D_i \times BEF_{2,i} \times (1+R_i)$ (equation 1 of the tool EB 70 report, annex 35)

$B_{TREE,\ i,p,i,t}$ = Biomass of trees of species j in sample plot p of stratum i at a point of time in year t; t d.m.
$V_{TREE.\ i,p,i,t}$ = Stem volume of trees of species j in sample plot p of stratum i at a point of time in year t, estimated by using the tree dimension(s) as entry data into a volume table or volume equation; $m^3$)
$D_i$ = Density (overbark) of tree species j; t d.m./$m^3$
$BEF_{2,i}$ = Biomass expansion factor for conversion of stem biomass to above-ground tree biomass, for tree species j; dimensionless
$R_i$ = Root-shoot ratio for tree species j; dimensionless
j = 1, 2, 3, … tree species in plot p
p = 1, 2, 3, … sample plots in stratum i
i = 1, 2, 3, … tree biomass estimation strata within the project boundary
t = 1, 2, 3, … years counted from the start of the A/R CDM project activity

Note: j, p, i and t is the same in all equations of this section.

This technique has been applied only in the case of *Gmelina arborea* based on the volume equation in table 6.

**Table 6. Gmelina arborea volume equation**

| Species | Volume Equations | Reference |
|---|---|---|
| *Gmelina arborea* | $V = e^{-10,8445 + 3,0545 * Ln (DBH)}$ | Rojas F, et all. 2004. Manual para productores de *Gmelina arborea* en |

| | | |
|---|---|---|
| (Melina) | V = commercial volume with bark until a minimum diameter of 10 cm ($m^3$)<br>DBH = diameter at the breast height (1.3 m) (cm)<br>H = tree total height (m) | Costa Rica. ITCR- FONAFIFO-REFORESTA. Pp 314 (See page 192) |

According to EB 67 report, annex 24, (A/R Methodological Tool "Demonstrating appropriateness of volume equations for estimation of aboveground tree biomass in A/R CDM project activities") "a species-specific or group of species-specific volume equation derived from trees growing in edapho-climate conditions similar to those in the project area is considered appropriate, and hence can be used for ex post estimation of tree stem volume, if [as one of the sufficient conditions] (…),The equation has been used in commercial forestry sector of the host Party for 10 years or more"

The selected equation complies with these conditions, as it was developed in Costa Rica in areas with similar edapho-climatic conditions than those in the project; and it was derived from a commercial guide for *Gmelina* producers published in 2004 and based on another publication (also for forest producers) published more than 10 years ago (Burbano, S. 1998. Manual para la estimación del volumen comercial en pie de las plantaciones de Gmelina arborea Roxb. COSEFORMA-MINAE-GTZ. 31 p.).

**b) Allometric equation technique**

In the use of this technique the following equation has been used for the assessment of tree biomass:

$B_{TREEi,p,i,t} = f_j(x1_{p,i,t}, x2_{p,i,t}, x3_{p,i,t}...) \times (1+R_j)$ (equation 2 of the tool EB 70 report, annex 35)

$B_{TREE,\ i,p,i,t}$ = Biomass of trees of species j in sample plot p of stratum i at a point of time in year t; t d.m.

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

$f_{j(x_{1p,i,t};\ x2_{p,i,t};\ x3_{p,i,t}...)}$ = Function relating measured tree dimensions (x1, x2, x3, …) to above-ground biomass. Tree dimensions are measured in sample plot p of stratum i at a given point of time in year t. Tree dimensions x1, x2, x3, … could be, for example DBH, height of tree, etc.

This technique has been used for *Tectona grandis*, *Cedrela odorata* and Other species, the allometric equations used are listed in the following table:

**Table 7. Used allometric equations**

| Species | Above Ground Biomass Equation | Reference* |
|---|---|---|
| *Tectona grandis* (Teak) | **$Log_{10}\ AB_{tr} = -0.815 + 2.382\ log_{10}\ DBH$**<br><br>$AB_{tr}$ **=** aboveground biomass for each tree (kg).<br>$Log_{10}$ = base-10 logarithm.<br>DBH = diameter at the breast height (1.3 m) (cm) | Pérez et al. 2003. (see page 203).<br><br>Based on data set of 40 sampled trees<br><br>$R^2$ is 0.98 |
| *Cedrela odorata* | **$AB_{tr}$ =Bleaf+Bbole+Bbranch+Brachis**<br>**$0{,}0013*(DBH^2*H)^{0,9218}+$**<br>**$0{,}0072*(DBH^2*H)^{1,0451}+$**<br>**$0{,}0029*(DBH^2*H)^{1,0172}+$**<br>**$0{,}001*(DBH^2*H)^{0,8038}$**<br>**$BB_{tr}= 0{,}0893*(DBH^2*H)^{0,5326}$**<br><br>$AB_{tr}$ = aboveground biomass of an individual tree (kg).<br>$BB_{tr}$ = belowground biomass of an individual tree (kg).<br>B= biomass of the different tree component (kg)<br>DBH = diameter at the breast height (1.3 | Cole et al. 2006<br><br>**Tree component** / **$R^2$** / **Number of sampled trees**<br>Leaf / 0,58 / 40<br>Bole / **0,97** / 38<br>Branch / 0,67 / 39<br>Rachis / 0,59 / 36<br>Root / 0,62 / 37 |

| | | |
|---|---|---|
| | m) (cm)<br>H = tree total height (m) | |
| Other species** | **Shade – Intolerant and partial Shade Tolerant**<br>**$AB_{tr\text{-}SI} = 0.01363\ DBH^{1.8520}\ H^{1.2611}$**<br><br>$AB_{tr}$ = aboveground biomass of an individual tree (kg).<br>DBH = diameter at the breast height (1.3 m) (cm)<br>H = tree total height (m) | Ortiz. 1997.<br><br>Based on data sets of 40 sampled trees.<br><br>$R^2$ is 0.974 |

*References:

- Cole, T.G., Ewel, J.J., 2006. Allometric equations for four valuable tropical tree species. Forest Ecology and Management 229: 351-60.
- Pérez, L.D., Kanninen, M., 2003. Aboveground biomass of *Tectona grandis* plantations in Costa Rica. Journal of Tropical Forest Science 15 (1): 199-213.
- Ortiz, E. 1997. Refinement and Evaluation of two Methods to Estimate Aboveground Tree Biomass in Tropical Forest. Doctoral Dissertation. New York. Pp: 116-118

** All species measured during the monitoring process in the sample plots, in Assisted Natural Regeneration stratum, have been classified as shade-intolerant.

According to EB 65 report, annex 28, (A/R Methodological Tool "Demonstrating appropriateness of allometric equations for estimation of aboveground tree biomass in A/R CDM project activities") "a species or group of species-specific allometric equation derived from trees growing in edapho-climate conditions similar to those in the project area is considered appropriate, and hence can be used for ex post estimation of tree stem volume, if [as one of the sufficient conditions] (…), the equation was derived from a data set of at least 30 sample trees, and the value of coefficient of determination (R2) was not less than 0.85."

The selected equations were developed in Costa Rica in areas with similar edapho-climatic conditions than those in the project area and complies with mentioned conditions as shown in table 7 (data sets > 30 and $R^2$>85).

For *Cedrela odorata*, a species-specific allometric equation has been selected not included in the PDD. According to EB 66 report, annex 24, paragraph (p) (Guidelines on accounting of specific types of changes in A/R CDM project activities from the description in registered project design documents), such a change does not require prior approval by the Executive Board, "if the applicability of the changed parameters, equations, or methods is demonstrated at verification using the "Tool for demonstration of applicability of allometric equations and volume equations in A/R CDM project activities" when available (…)".

Calculations of tree biomass of every measured tree in the sampling process are available for the DOE in the Excel file: Field data and calculations.

**Step 2. Estimation of change in C stock in trees**

Change in carbon in trees is estimated by applying the stock change method.

***Sub-step 2.1. Tree biomass in sample plot p of stratum i***

$$B_{TREE,p,i,t} = \sum_j B_{TREE,j,p,i,t}$$ (equation 5 of the tool EB 70 report, annex 35)

$B_{TREE,p,i,t}$ = Tree biomass in sample plot p in stratum i at a given point of time in year t; t d.m.
$B_{TREE,j,p,i,t}$ = Biomass of trees of species j in sample plot p of stratum i at a given point of time in year t; t d.m.

***Sub-step 2.2. Tree biomass per hectare in plot p in stratum i***

$$b_{\mathrm{TREE,p,i,t}} = \frac{\mathrm{B_{TREE,p,i,t}}}{A_{\mathrm{p,i}}}$$ (equation 6 of the tool EB 70 report, annex 35)

$b_{\mathrm{TREE,p,i,t}}$ = Tree biomass per hectare in sample plot p in stratum i at a given point of time in year t; t d.m. $\mathrm{ha}^{-1}$

$\mathrm{B_{TREE,p,i,t}}$ = Tree biomass in sample plot p in stratum i at a given point of time in year t; t d.m.

$\mathrm{A_{p,i}}$ = Area of sample plot p in stratum i; ha (Equal to AP in section D.1.)

***Sub-step 2.3. Mean tree biomass per hectare in stratum i and variance of tree biomass per hectare in the stratum***

$$b_{TREE,i,t} = \frac{\sum_{p=1}^{n_i} b_{TREE,p,i,t}}{n_i}$$ (equation 7 of the tool EB 70 report, annex 35)

$$s_i^2 = \frac{n_i\, x\, \sum_{\mathrm{p=1}}^{n_i} \mathrm{b}^2{}_{TREE,p,i,t} - (\sum_{\mathrm{p=1}}^{\mathrm{n_i}} \mathrm{b}_{TREE,p,i,t})^2}{n_i\, x\, (n_i - 1)}$$ (equation 8 of the tool EB 70 report, annex 35)

$b_{\mathrm{TREE,i,t}}$ $b_{\mathrm{TREE,i,t}}$ = Mean tree biomass per hectare in stratum i at a given point of time in year t; t d.m./ha

$b_{\mathrm{TREE,p,i,t}}$ = Tree biomass per hectare in sample plot p in stratum i at a given point of time in year t; t d.m./ha

$\mathrm{n_i}$ = Number of sample plots in stratum i

$\mathrm{s_i^2}$ = Variance of tree biomass per hectare in stratum i at a given point of time in year t; (t d.m./ha)$^2$

***Sub-step 2.4. Mean tree biomass per hectare within the project boundary and its variance***

$$b_{\mathrm{TREE,t}} = \sum_{i=1}^{M} w_i\, x\, b_{\mathrm{TREE,i,t}}$$ (equation 9 of the tool EB 70 report, annex 35)

$$s^2_{b_{\mathrm{TREE,t}}} = \sum_{i=1}^{M} w_i\, x\, \frac{s_i^2}{n_i}$$ (equation 10 of the tool EB 70 report, annex 35)

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

$\mathrm{w_i}$ = Ratio of the area of stratum i to the sum of areas of biomass estimation strata; dimensionless

$\mathrm{b_{TREE,i,t}}$ = Mean tree biomass per hectare in stratum i at a given point of time in year t; t d.m./ha

$\mathrm{s^2_{b_{TREE,t}}}$ = Variance of mean tree biomass per hectare within the project boundary at a given point of time in year t; (t d.m./ha)$^2$

$\mathrm{s_i^2}$ = Variance of tree biomass per hectare in stratum i at a given point of time in year t; (t d.m./ha)$^2$

$\mathrm{n_i}$ = Number of sample plots in stratum i

M = Number of tree biomass estimation strata within the project boundary

***Sub-step 2.5. Uncertainty of the mean tree biomass per hectare within the project boundary is estimated as:***

$$u_{b_{\mathrm{TREE,t}}} = \frac{t_{VAL}\mathrm{x}\, s_{b_{\mathrm{TREE,t}}}}{b_{\mathrm{TREE,t}}}$$ (equation 11 of the tool EB 70 report, annex 35)

$u_{b_{TREE,t}}$ = 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%.

$s_{b_{\mathrm{TREE,t}}}$ = 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

***Sub-step 2.6. Total tree biomass within the project boundary at a given point of time in year t***

$$B_{\mathrm{TREE,t}} = A \text{ x } b_{\mathrm{TREE,t}}$$ (equation 12 of the tool EB 70 report, annex 35)

$B_{\mathrm{TREE,t}}$ = Total tree biomass within the project boundary at a given point of time in year t; t d.m.
A = Sum of areas of the biomass estimation strata within the project boundary (Sum of $A_{ikt}$ of section D.1.); ha
$b_{\mathrm{TREE,t}}$ = Mean tree biomass per hectare within the project boundary at a given point of time in year t; t d.m./ha

***Sub-step 2.7. Carbon stock in tree biomass within the project boundary at a given point of time in year t***

$$C_{\mathrm{TREE,t}} = \frac{44}{12} \text{ x } B_{\mathrm{TREE,t}} \text{ x } \mathrm{CF}_{TREE}$$ (equation 13 of the tool EB 70 report, annex 35)

$C_{\mathrm{TREE,t}}$ = Carbon stock in tree biomass within the project boundary at a given point of time in year t; t $CO_2$-e
$B_{\mathrm{TREE,t}}$ = Total tree biomass within the project boundary at a given point of time in year t; t d.m.
$\mathrm{CF}_{TREE}$ = Carbon fraction of tree biomass; t C/t d.m. (Equal to CF in section D.1.)

***Sub-step 2.8. Change in carbon stock in tree biomass within the project boundary in year t***

$$dC_{\mathrm{TREE}(t_1,t_2)} = \frac{C_{\mathrm{TREE},t_2} - C_{\mathrm{TREE},t_1}}{T}$$ (equation 14 of the tool EB 70 report, annex 35)

$dC_{\mathrm{TREE}(t_1,t_2)}$ = Rate of change in carbon stock in tree biomass within the project boundary during the period between a point of time in year t1 and a point of time in year t2; t $CO_2$-e/yr
$C_{\mathrm{TREE},t_2}$ = Carbon stock in tree biomass within the project boundary at a point of time in year t2; t $CO_2$-e
$C_{\mathrm{TREE},t_1}$ = Carbon stock in tree biomass within the project boundary at a point of time in year t1; t $CO_2$-e
T = Time elapsed between two successive estimations (T=$t_2 - t_1$); yr

$$\Delta C_{\mathrm{TREE,t}} = dC_{\mathrm{TREE}(t_1,t_2)} \text{ x } 1\ year\ for\ t_1 \leq t \leq t_2$$ (equation 15 of the tool EB 70 report, annex 35)

$\Delta C_{\mathrm{TREE,t}}$ = Change in carbon stock in tree biomass within the project boundary in year t; t $CO_2$-e
$dC_{TREE(t_1,t_2)}$ = Rate of change in carbon stock in tree biomass within the project boundary during the period between a point of time in year t1 and a point of time in year t2; t $CO_2$-e/yr

***Sub-step 2.9. Correction of change in carbon stock in tree biomass within the project boundary in year t based on relative error***

$$RE_{max} = u_{bTREE,t}$$ (equation 30 of the tool EB 70 report, annex 35)

$\mathrm{RE}_{\mathrm{max}}$ = Maximum relative error, %
$\mathrm{u}_{\mathrm{bTREE,t}}$ = Uncertainty of the mean tree carbon per hectare within the project boundary at time t; %

As $RE_{MAX}$ is greater than 10 % a deduction in the estimated change in carbon stocks has been done accordingly with table 8 of the tool EB 70 report, annex 35, and using the following equation.

$$\Delta \mathrm{C}_{TREE,t} = \Delta \mathrm{C}_{TREE,(t1,t2)} \text{ x } (1 - \mathrm{DR})$$ (equation 32 of the tool EB 70 report, annex 35)

$\Delta \mathrm{C}_{\mathrm{TREE,t}}$ = Change in carbon stock in tree biomass within the project boundary in year t; t $CO_2$-e

$\Delta C_{TREE,(t1,t2)}$= Change in carbon stock in tree biomass within the project boundary between the earlier verification carried out at time t1 and the later verification carried out at time t2; corrected for large maximum relative error, t $CO_2$-e

DR = Deduction Rate; %. Is equal to 6% in this project case since the relative margin of error is greater than 10 % but less than or equal to 30%.

Results of calculations performed in sub-steps 2.1 and 2.2 are available for the DOE in the Excel file: Field data and calculations.

The application of sub-step 2.3. provides the following results:

**Table 8. Results of sub-step 2.3.**

| Stratum ID | $A_{ikt}$ (ha) | $n_i$ | $N_i$ | $w_i$ | $b_{TREE,i,t}$ (t d.m./ha) | $s_i^2$ (t d.m./ha)$^2$ |
|---|---|---|---|---|---|---|
| BLS1SM3 | 322.19 | 25 | 6,444.00 | 0.36 | 11.98 | 324.07 |
| BLS2SM3 | 74.71 | 3 | 1,494.00 | 0.08 | 48.24 | 837.20 |
| BLS2SM5 | 102.46 | 11 | 2,049.00 | 0.11 | 32.12 | 1.045.08 |
| SM1_2 | 108.20 | 12 | 2,164.00 | 0.12 | 68.44 | 1.720.13 |
| SM4 | 284.86 | 8 | 5,697.00 | 0.32 | 7.33 | 119.95 |
| Total | 892.42 | 59 | 17,848.00 | 1.00 | | |

In the case of sub-steps 2.4 to 2.9., results summarized in the following table have been obtained:

**Table 9. Results of sub-steps 2.4. to 2.9.**

| Parameter | Value | |
|---|---|---|
| AP (ha) | 0.05 | |
| $b_{TREE,t}$ (t d.m./ha) | 22.69 | |
| $t_{val}$ | 1.671093033 | |
| $s^2_{bTREE,t}$ (t d.m./ha)$^2$ | 8.53 | |
| $u_{bTREE,t}$ (%) | 22% | |
| $B_{TREE,t}$ (t d.m.) | 20,249.13 | |
| $C_{TREE,t}$ (t $CO_2$-e) | 37,123.41 | |
| $RE_{max}$ (%) | 21.51% | |
| DR | 6% | |
| T (years) | 6.42 | |
| $dC_{TREE(t1,t2)}$ (t $CO_2$-e/yr) | 5,785.44 | |
| $\Delta C_{TREE,t}$ (t CO2-e) | 5,785.44 | |
| $\Delta C_{TREE,t}$ (t CO2-e) | 5,438.31 | Deducted |
| $C_{ACTUAL}$ (t CO2-e) | **34,896.00** | |

**E.3. Calculation of leakage**

N/A (See section E.5.1. of the PDD)

**E.4. Summary of calculation of emission reductions or net anthropogenic GHG removals by sinks**

| Item | Baseline emissions or baseline net GHG removals by sinks (t $CO_2e$) | Project emissions or actual net GHG removals by sinks (t $CO_2e$) | Leakage (t $CO_2e$) | Emission reductions or net anthropogenic GHG removals by sinks (t $CO_2e$) |
|---|---|---|---|---|
| **Total** | 0.00 | 34,896.00 | 0.00 | 34,896.00 |

**E.5. Comparison of actual emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD**

| Item | Values estimated in ex-ante calculation of registered PDD | Actual values achieved during this monitoring period |
|---|---|---|
| **Emission reductions or GHG removals by sinks (t $CO_2e$)** | 60,224 | 34,896.00 |

**E.6. Remarks on difference from estimated value in registered PDD**

The net anthropogenic removals by sinks as quantified ex-post are lower than the values estimated ex-ante. Therefore no further explanations are required on the difference from estimated values in the PDD.

**E.7. Actual emission reductions or net anthropogenic GHG removals by sinks during the first commitment period and the period from 1 January 2013 onwards**

| Item | Actual values achieved up to 31 December 2012 | Actual values achieved from 1 January 2013 onwards |
|---|---|---|
| **Emission reductions or GHG removals by sinks (t $CO_2e$)** | 34,896.00 | 0,00 |

## Document information

| *Version* | *Date* | *Description* |
|---|---|---|
| 03.1 | 2 January 2013 | Editorial revision to correct table in section E.5. |
| 03.0 | 3 December 2012 | Revision required to introduce a provision on reporting actual emission reductions or net anthropogenic GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB70, Annex 11). |
| 02.0 | 13 March 2012 | Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20). |
| 01 | 28 May 2010 | EB 54, Annex 34. Initial adoption. |

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