

Irmãos Fredi Ceramic Fuel Switching Project



Document Prepared By Sustainable Carbon – Projetos Ambientais Ltda.

Project Title	<i>Irmãos Fredi</i> Ceramic Fuel Switching Project
Version	04
Report ID	05
Date of Issue	30-September-2014
Project ID	60
Monitoring Period	01-October-2011 to 28-February-2014
Prepared By	Sustainable Carbon – Projetos Ambientais Ltda
Contact	Rua Doutor Bacelar 368 Conjunto 131 Vila Clementino - São Paulo. SP CEP: 04026-001 Brazil T: +55 (11) 2649-0036 F: +55 (11) 2649-0042 denis@sustainablecarbon.com

Table of Contents

1	Project Details	3
1.1	Summary Description of the Implementation Status of the Project	3
1.2	Sectoral Scope and Project Type.....	4
1.3	Project Proponent	4
1.4	Other Entities Involved in the Project.....	5
1.5	Project Start Date	5
1.6	Project Crediting Period	5
1.7	Project Location.....	5
1.8	Title and Reference of Methodology	7
1.9	Other Programs.....	7
2	Implementation Status.....	7
2.1	Implementation Status of the Project Activity.....	7
2.2	Deviations.....	8
2.2.1	Methodology Deviations	8
2.2.2	Project Description Deviations	8
2.3	Grouped Project	8
3	Data and Parameters	8
3.1	Data and Parameters Available at Validation	8
3.2	Data and Parameters Monitored	11
3.3	Monitoring Plan	18
4	Quantification of GHG Emission Reductions and Removals	19
4.1	Baseline Emissions	19
4.2	Project Emissions.....	22
4.3	Leakage.....	22
4.4	Net GHG Emission Reductions and Removals.....	27
	APPENDIX I: Amount of renewable biomass consumed per month on <i>irmãos fredí</i> ceramic.....	28

1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

This project activity was developed by *Carbono Social Serviços Ambientais LTDA*. (Social Carbon Company), which has recently changed its company name to *Sustainable Carbon – Projetos Ambientais LTDA*.

The project activity promotes a fuel switch at *Irmãos Fredi Ceramic*, a ceramic industry located in the municipality of *Presidente Epitácio*, in the southeast region of Brazil. *Irmãos Fredi* ceramic produces structural ceramic units, particularly ceramic bricks, mainly for supply the local market of *Presidente Epitácio* and the municipality of *São Paulo* which is the biggest municipality in the region and the Capital of *São Paulo* State.

The purpose of this project activity is to utilize renewable biomass available in the region for effective generation of thermal energy for captive consumption. The project activity is indirectly helping to reduce the Brazilian deforestation rates, the main source of greenhouse gas emissions in Brazil¹.

In the baseline scenario, the ceramic company utilized wood from areas without sustainable forest management, which was a common practice in the region. This type of wood is considered a non-renewable woody biomass, once it is not originated in areas with reforestation activities or with sustainable management practices.

The main difficulties for the ceramic due to the fuel-switch were the lack of experience to operate with renewable biomasses, as well as the internal logistic modification involved in the project.

The ceramic lost quality production due to the adaptation to the use of biomasses and to the new machineries, as they added significant differences to the production process. Besides, these new equipments acquired as well as the construction of sheds to stock the biomass, added an additional cost for the ceramic, as the new fuel must be stored in covered sites in order to improve the kiln's efficiency.

By diverging significantly from the identified baseline scenario, with the implementation of this project, the ceramic now generate thermal energy minimizing the damages caused by the deforestation of the *Cerrado* Biome.

The production process of the *Irmãos Fredi Ceramic Company* utilized fourteen "Round Kiln" during all this monitoring period (2011 to 2014) with four openings each in order to burn the fuel and cook the products. Each one can produce 19,000 devices per month.

The emission reductions due to the switching of non-renewable fuel (non-renewable wood) to renewable biomasses resulted in **57,931 tCO₂e** during the monitoring period from 01/10/2011 to 28/02/2014. The contribution to sustainability is being monitored applying the SOCIALCARBON® Standard, which is based in six main pointers: Technology; Natural; Financial; Human; Social and Carbon Resources.

¹ *Second National Communication of Brazil to the United Nations Framework Convention on Climate Change*. — Brasília: Ministério da Ciência e Tecnologia, 2010. Available at: <http://www.mct.gov.br/upd_blob/0214/214054.pdf>. Visited on January 31st, 2011.

1.2 Sectoral Scope and Project Type

The project is associated to the following scope, as per UNFCCC definitions:

1 - Energy industries (renewable / non-renewable sources);

This is not an AFOLU project. This is not a grouped project.

1.3 Project Proponent

The project proponents contributed to the current report by assigning the following roles and responsibilities to:

Organization name	<i>Irmãos Fredi</i> LTDA
Contact person	Ms. <i>Cristina Maia</i> and Mr. <i>José Ettore Fredi</i>
Title	Ms. <i>Cristina Maia</i> , Monitoring data responsible: General data, information on inputs and outputs of the ceramic, detailed information and numbers on sales, how output data is handled, and how data is stored and kept by the <i>Irmãos Fredi's</i> office. Mr. <i>José Ettore Fredi</i> , Director: Information and visit of the ceramic, detailed information on process and production lines, environmental challenges, technological challenges, research and development history, ceramic devices market challenges.
Address	<i>Rodovia Raposo Tavares</i> , KM 651 - V. Progresso - Presidente Epitácio/SP
Telephone	+55 (18) 3281-2144
Email	cer.romana@uol.com.br

As the project authorized contact, Sustainable Carbon was given the responsibility of preparing the present project report and to accompany the proponents until the end of the crediting period.

Organization name	Sustainable Carbon – Projetos Ambientais Ltda
Role in the project	Project developer, Project participant and Project idealizer.
Contact person	Beatriz Rovere Dênis Gonçalves dos Santos Larissa Tega da Fonseca Marcelo Hector Sabbagh Haddad Mariana Fieri Thiago de Ávila Othero Victor Moller

Title	Thiago de Ávila Othero: Technical coordinator Marcelo Hector Sabbagh Haddad: Technical coordinator Mariana Fieri: Technical coordinator Beatriz Rovere: Technical analyst Dênis Gonçalves dos Santos: Technical analyst Larissa Tega da Fonseca: Technical analyst Victor Moller : Technical analyst
Address	R. Doutor Bacelar. 368 – Conj. 131 – Vila Clementino Postal Code: 04.026-001 São Paulo – SP. Brazil
Telephone	+55 11 2649 0036
Email	thiago.othero@sustainablecarbon.com marcelo@sustainablecarbon.com larissa@sustainablecarbon.com beatriz@sustainablecarbon.com denis@sustainablecarbon.com mariana@sustainablecarbon.com victor@sustainablecarbon.com

1.4 Other Entities Involved in the Project

No other entity was involved in the project.

1.5 Project Start Date

According to version 04 of the VCS PD², project start date was defined as 01/12/2004. On this date, the project began reducing GHG emissions, i.e. the ceramic started using renewable biomass as fuel.

1.6 Project Crediting Period

The crediting period for this project started on 01/04/2006 and ends on 31/03/2016.

VCS project crediting period: 10 years, two times renewable.

1.7 Project Location

According to the applied methodology, the project boundaries for the project are the physical, geographical areas of the renewable energy generation, thus, the ceramic limits. *Irmãos Fredi* ceramic is located in *Brazil*, in the state of *São Paulo*, in the southeast region of the country. The geographic location is illustrated in Figure 1. The proposed project activity has the following location coordinates:

Latitude: 21°46' 57.06"S.

Longitude: 52°08'46.84"W.

² Document available at: <https://products.markit.com/br-reg/PublicReport.action?getDocumentById=true&document_id=100000000006903>. Last visited on 11/04/2014

The project site has the following postal addresses:

Irmãos Fredi Ceramic Factory

Rodovia Raposo Tavares, km 651.

Presidente Epitácio/São Paulo - Brazil.

Postal Code: 19470-000



Figure 1. GPS project boundaries – Spot A: 21°47' 43.33"S; 52° 07'33.81"W. Spot B: 21° 47'46.75"S; 52° 07'27.17"W. Spot C: 21° 47'52.22"S; 52°07'30.27"W. Spot D: 21° 47'48.11"S; 52° 07'36.80"W.

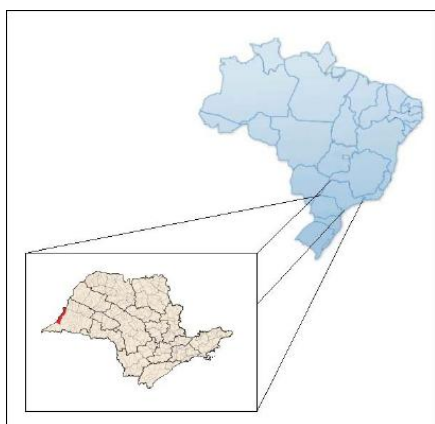


Figure 2. Geographic location of the project activity that has the following coordinates:
latitude: 21°46' 57.06"S, longitude: 52°08'46.84"W.

1.8 Title and Reference of Methodology

The project applies a small scale methodology approved under the Clean Development Mechanism, as follows:

Category AMS-I.E.: Switch from Non-Renewable Biomass for Thermal Applications by the User – Version 01, valid from 01/02/2008 to 08/04/2010³. This category comprises small thermal appliances that displace the use of non-renewable biomass by introducing new renewable energy end-user technologies.

1.9 Other Programs

- Emission Trading Programs and Other Binding Limits: The project activity is not included in an emission trading program or any other mechanism that includes GHG allowance trading.
- Other Forms of Environmental Credit: The project activity is not creating any other form of environmental credit under any specific program.
- Participation under Other GHG Programs: The project activity is not registered under any other GHG program.

2 IMPLEMENTATION STATUS

2.1 Implementation Status of the Project Activity

The VCS PD project was validated by the Designated Operational Entity TÜV Nord CERT GmbH and this present monitoring report will be verified by Instituto Brasileiro de Opinião Pública e Estatística Ltda. (IBOPE).

The project has been fully operational since the starting date of the crediting period. This means the ceramic factory is operating using exclusively renewable biomass, thus mitigating their baseline emissions.

Since validation *Irmãos Fredi* Ceramic operates using 14 Round kilns with four openings each and 2 semi-continuous dryers. To implement the project activity the ceramic also has 28 mechanical burners, the process is totally automated with treadmills that transport biomass, feeders that feed the biomass to treadmills, a wood chipper responsible for cutting the bigger pieces of wood chips, a panel from which the temperature are controlled and two trucks that transport the biomasses from the providers to the ceramic. A shed was built in the local where to biomasses are stored and a biomass selector was also developed in order to prevent damage to the biomass injector once diameters larger than 50mm obstruct the insertion of the biomass.

During the current monitoring period, *Irmãos Fredi* ceramic made no significant changes that could affect the capacity of the project activity in mitigate emission reductions. The monitoring data was kept according to the monitoring plan described in the project description document. This Monitoring Report refers to the fifth monitoring period of this project, and includes data from 01-October-2011 to 28-February-2014

³ This version of the methodology is available at:

<http://cdm.unfccc.int/UserManagement/FileStorage/CDM_AMSP4VBBO5G54RXDE9KQ6FJWMGHZLHFA5>. Last visited on 19/08/2011.

2.2 Deviations

2.2.1 Methodology Deviations

There were no methodology deviations during this monitoring period.

2.2.2 Project Description Deviations

The registered VCS PD version 04 establishes that the project developer would measure the amount of renewable biomasses used (parameter $Q_{renbiomass}$). However, during the entire monitored period, this parameter was monitored by the ceramic owners through all the receipts and invoices of biomass received by the ceramic industry. This means the amount of renewable biomass is measured by each provider and controlled by the ceramic owners, by storing receipts and invoices.

This approach was chosen considering that it is the responsibility of the provider to measure the amount of biomass, since this information needs to be available in the sale invoice or receipt. As this information is used for commercial purposes (to calculate due financial compensations), it is considered that data from the suppliers are a reliable source for this parameter.

Project Proponents consider this deviation is a minor change to the project, as it has no impact on the applicability of the methodology, additionality or the appropriateness of the baseline scenario. The outcome of such deviation is solely that parameter $Q_{renbiomass}$ is being monitored with the use of reliable third party information instead of being measured by ceramic personnel.

2.3 Grouped Project

Not applicable. This is not a grouped project.

3 DATA AND PARAMETERS

3.1 Data and Parameters Available at Validation

Data / Parameter	$EF_{\text{projected fossil fuel}}$
Data unit	tCO ₂ /TJ
Description	CO ₂ Emission factor of residual fuel oil
Source of data	IPCC 2006 Guidelines for National Greenhouse Gas Inventories. Source: http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf . Page 2.18. Table 2.3. IPCC. Last visited on 21/03/2014
Value applied	77.4 tCO ₂ /TJ
Justification of choice of data or description of measurement methods and procedures applied	In the baseline scenario, the probable fossil fuel that would be consumed in the absence of native wood without sustainable forest management would be the heavy oil. This fuel is more expensive than wood, however it can be a more plausible of substitute of wood than natural gas due to risks involving natural gas distribution.

Purpose of the data	Calculation of baseline emissions. In the baseline scenario, the probable fossil fuel that would be consumed in the absence of native wood without sustainable forest management would be the heavy oil. This fuel is more expensive than wood, however it can be a more plausible of substitute of wood than natural gas due to risks involving natural gas distribution.
Comments	Applicable for stationary combustion in the manufacturing industries and construction. The fossil fuel likely to be used by similar consumers is taken the IPCC default value of residual fossil fuel. Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits income for this project activity, whichever occurs later.

Data / Parameter	NCV_{biomass}
Data unit	TJ/tonne of wood
Description	Net Calorific Value
Source of data	Brazilian study carried out with Cerrado wood: VALE, A.T; BRASIL, M.A.M; LEÃO, A.L. Quantificação e caracterização energética da madeira e casca de espécies de Cerrado. Table 2, p.77. Available at: < http://cascavel.ufsm.br/revistas/ojs-2.2.2/index.php/cienciaflorestal/article/view/1702 >. Last visit on: 31-July-2014.
Value applied	0.0186
Justification of choice of data or description of measurement methods and procedures applied	This value will provide the energy generated by the amount of wood that would be used in the absence of the project.
Purpose of the data	Calculation of baseline emissions. This value provides the energy generated by the amount of wood that would be used in the absence of the project. It differs from the IPCC value because represents the net calorific value of the local biome.
Comments	The species used to calculate the average value are typical trees of <i>Cerrado</i> Biome that are usually employed as fuel in the ceramic industries of the region. IPCC default values shall be used only when country or project specific data are not available or difficult to obtain, according to "Guidance on IPCC default values" (Extract of the report of the twenty-fifth meeting of the Executive Board, paragraph 59).

Data / Parameter	ρ_{wood}
Data unit	tonne/m ³
Description	Specific gravity
Source of data	Brazilian study carried out with <i>Cerrado</i> wood: VALE, A.T; BRASIL, M.A.M; LEÃO, A.L. Quantificação e caracterização energética da madeira e casca de espécies de Cerrado. Table 2, p.77. Available at: < http://cascavel.ufsm.br/revistas/ojs-2.2.2/index.php/cienciaflorestal/article/view/1702 >. Last visit on: 31-July-2014.
Value applied	0.5702 tonne/m ³ .
Justification of choice of data or description of measurement methods and procedures applied	The amount of wood used in the baseline was measured by volume units, so this data is used to the unity conversion.
Purpose of the data	Calculation of baseline emissions. The amount of wood used in the baseline was measured in volume units. This datum was used for the unit conversion.
Comments	Not applicable.

Data / Parameter	BF_y
Data unit	Tonnes of wood per thousand of devices
Description	Consumption of non-renewable biomass per thousand of ceramic devices produced per year.
Source of data	Historical data from the project developer.
Value applied	1.4255
Justification of choice of data or description of measurement methods and procedures applied	The value was acquired through the average consumption of non-renewable biomass per thousand of ceramic devices during the years when the ceramic used to consume non sustainable wood. This value is in accordance with the data acquired in other ceramics that employ the same type of kilns
Purpose of the data	Calculation of baseline emissions.. The value is employed to calculate the real amount of wood displaced to maintain the ceramic production in the baseline scenario.
Comments	Not applicable.

3.2 Data and Parameters Monitored

Data / Parameter	Q _{renbiomass}								
Data unit	m³ per month.								
Description	Amount of renewable biomass employed.								
Source of data	Measured by the biomass providers and controlled by the ceramic owner. The registered VCS PD v.04 establishes that the project developer would measure this parameter; however, during the entire monitored period, this parameter was monitored through all the receipts and invoices of biomass received by the ceramic industry.								
Description of measurement methods and procedures to be applied	The amount of biomasses was monitored in accordance to the weight or volume described in the receipts from the providers. The values in the receipts may be described in m³, therefore it is necessary the conversion to tonnes through the specific gravity of each biomass. The specific gravity values of the renewable biomasses utilized in this project is: <table><tr><th colspan="2">Specific Gravity (tonne/m³)</th></tr><tr><td>Sawdust</td><td>0.3500</td></tr><tr><td>Sugar Cane Bagasse</td><td>0.1500</td></tr></table> The sources of these data are: Residues from sawdust: SIMIONI, F. J. Análise diagnóstica e prospectiva da cadeia produtiva de energia de biomassa de origem florestal no planalto sul de Santa Catarina. Tese de doutorado pela Universidade Federal do Paraná. Available at: http://hdl.handle.net/1884/10294. Last visit on: October 11th, 2011. Sugar Cane Bagasse available at : TEIXEIRA, A. F. Bagaço de cana-de-açúcar na alimentação de bovinos. REDVET - Revista Electrónica de Veterinaria. Vol. VIII, Nº 6, Junho, 2007. Available at: http://www.veterinaria.org/revistas/redvet/n060607/060708.pdf. Last visit on: October, 11th, 2011.			Specific Gravity (tonne/m³)		Sawdust	0.3500	Sugar Cane Bagasse	0.1500
Specific Gravity (tonne/m³)									
Sawdust	0.3500								
Sugar Cane Bagasse	0.1500								
Frequency of monitoring/recording	Monthly								
Value monitored	Total amount during the this monitoring period m³:								
	<table><tr><th>Period</th><th>Sawdust</th><th>Sugar Cane Bagasse</th></tr><tr><td></td><th>Total (m³)</th><th>Total (m³)</th></tr></table>	Period	Sawdust	Sugar Cane Bagasse		Total (m³)	Total (m³)		
Period	Sawdust	Sugar Cane Bagasse							
	Total (m³)	Total (m³)							

	October	2,558.00	957.53
	November	1,474.00	138.53
	December	1,474.86	0.00
	Total 2011	5,506.86	1,096.07
	January	2,268.00	0.00
	February	2,284.00	0.00
	March	4,400.00	0.00
	April	2,590.00	0.00
	May	3,120.00	0.00
	June	3,980.00	0.00
	July	2,921.00	0.00
	August	3,580.00	0.00
	September	3,420.00	0.00
	October	2,698.00	0.00
	November	2,710.00	0.00
	December	1,355.00	0.00
	Total 2012	35,326.00	0.00
	January	1,900.00	0.00
	February	1,900.00	0.00
	March	1,601.00	0.00
	April	1,555.00	0.00
	May	1,501.00	0.00
	June	1,200.00	0.00
	July	5,295.00	0.00
	August	2,685.00	0.00
	September	2,500.00	0.00
	October	2,400.00	0.00
	November	400.00	0.00
	December	300.00	0.00
	Total 2013	23,237.00	0.00
	January	2,710.00	0.00
	February	2,500.00	0.00
	Total 2014	5,210.00	0.00
	Total Monitoring period	69,279.86	1,096.07
More detailed information (per month) is available in Appendix I.			
Monitoring equipment	No monitoring equipment was used to determine this parameter		
QA/QC procedures to be applied	It was monitored through receipts of purchase from the biomass providers. The ceramic factory controls the quantity of biomass through an internal spreadsheet, which is fed with the measured values of all the biomass that arrive from the providers. These internal spreadsheets were double checked with all the receipts and invoices of biomass employed. The energy balance was verified according to the amount of		

	biomass applied.
Purpose of the data	This parameter was used to : - Compare the total energy produced in the current monitoring period to the thermal energy that would be necessary according to the VCS PD estimates (QA/QC table); - Demonstrate that the Project fits in small scale category (<45MWth/year); - Calculation of leakage emissions due to competing use of biomass.
Calculation method	Not applicable.
Comments	Data was measured for each purchase/acquisition of biomass and aggregated monthly. Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Data / Parameter	PR_y																								
Data unit	Unity of ceramic devices																								
Description	Production of ceramic pieces																								
Source of data	Controlled by the project developer.																								
Description of measurement methods and procedures to be applied	The amount was acquired by counting the total production. The measurement was done by an internal control sheet monitored by the project proponent, which controls the amount of ceramic units that enter in the molding machine.																								
Frequency of monitoring/recording	Monthly																								
Value monitored	Total amount during the this monitoring period: <table> <tr> <th></th><th>Period</th><th>Total production in ceramic devices</th></tr> <tr> <td rowspan="4">2011</td><td>October</td><td>1,099,750</td></tr> <tr> <td>November</td><td>1,029,200</td></tr> <tr> <td>December</td><td>635,920</td></tr> <tr> <td>Total 2011</td><td>2,764,870</td></tr> <tr> <td rowspan="5">2012</td><td>January</td><td>1,011,816</td></tr> <tr> <td>February</td><td>1,011,428</td></tr> <tr> <td>March</td><td>1,251,306</td></tr> <tr> <td>April</td><td>967,160</td></tr> <tr> <td>May</td><td>1,232,210</td></tr> </table>			Period	Total production in ceramic devices	2011	October	1,099,750	November	1,029,200	December	635,920	Total 2011	2,764,870	2012	January	1,011,816	February	1,011,428	March	1,251,306	April	967,160	May	1,232,210
	Period	Total production in ceramic devices																							
2011	October	1,099,750																							
	November	1,029,200																							
	December	635,920																							
	Total 2011	2,764,870																							
2012	January	1,011,816																							
	February	1,011,428																							
	March	1,251,306																							
	April	967,160																							
	May	1,232,210																							

		June	1,277,608		
		July	1,167,888		
		August	1,197,492		
		September	1,193,234		
		October	1,121,304		
		November	1,045,938		
		December	685,532		
		Total 2012	13,162,916		
	2013	January	926,406		
		February	869,504		
		March	1,013,824		
		April	969,896		
		May	938,424		
		June	880,128		
		July	947,528		
		August	1,057,520		
		September	1,026,072		
		October	965,924		
		November	925,136		
		December	677,168		
		Total 2013	11,197,530		
	2014	January	815,224		
		February	853,226		
		Total 2014	1,668,450		
	Total in monitoring period		28,793,766		
	More detailed information, please see VCS MR Calculation Irmãos Fredi spreadsheet.				
	Monitoring equipment	No monitoring equipment is used to determine this parameter. Production is counted by trained personnel in the ceramic.			
	QA/QC procedures to be applied	The ceramics have an internal control of the quantity of pieces produced. It was rechecked according to the biomass employed and the kiln consumption of renewable biomass. This notebook is organized per month and daily filled according to data based on ceramic tonnes burned in the kilns.			
	Purpose of the data	This parameter is used to calculate baseline emissions and the total energy produced in the current monitoring period in order to compare to the thermal energy necessary in the VCS PD (QA/QC table).			
	Calculation method	Not applicable.			
	Comments	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever			

	occurs later. There are no significant losses in molding machine, all the pieces that fail on the quality test go back to the clay storage shed. Furthermore, there are no significant losses on the drying and loading of the kilns because the steps that involves transportation are automated.
--	--

Data / Parameter:	Origin of renewable biomass
Data unit	Not applicable
Description	Renewable origin of the biomass
Source of data	Controlled by the project developers
Description of measurement methods and procedures to be applied	This information was given by the biomass providers. The guarantee of acquiring sawdust/wood chips from renewable wood was achieved by invoices from the providers, which can provide the tracking to its afforestation origin. As stated in the section 2.2, the biomasses (Elephant grass, Peanut shells and Sugar Cane bagasse) are considered renewable as fulfilling the options described in the methodology applied. The main provider of sawdust/wood chips is Roberto Matsuura, he provides wood chips and nowadays is the only provider. Roberto Matsuura provides wood chips from Eucalypt and the origin of the seedling was sent to the verification team. Evidences were collected regarding the purchase of seedlings by this provider, demonstrating the plantation on operation.
Frequency of monitoring/recording	Each crediting period
Value monitored	Not directly applied for the calculation. It is considered that all biomass used is renewable.
Monitoring equipment	No monitoring equipment was used to determine this parameter.
QA/QC procedures to be applied	The biomass was considered renewable if it is according to the definition given by Methodology AMS-I.E: Switch from Non – Renewable Biomass for Thermal Application by the User – Version 01 valid from 01-February-2008 to 08-April-2010.
Purpose of the data	Not directly applied for the calculation. This parameter is used to guarantee that the amount of biomass acquired by the project proponent has a renewable origin. It is also necessary to comply with procedures required by the methodology AMS-I.E, Version 01.
Calculation method	Not applicable.
Comments	All the renewable biomasses utilized in the monitoring period are in accordance with definitions of renewable biomass set in the applied methodology. All these biomasses were already described in the project description document.

	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.
--	---

Data / Parameter:	Renewable biomass surplus												
Data unit	Tonnes or m³												
Description	Amount of renewable biomass available												
Source of data	Monitored												
Description of measurement methods and procedures to be applied	It is used to calculate the leakage of renewable biomass. The sources of leakages predicted in “General guidance on leakage in biomass project activities” of Indicative Simplified Baseline and Monitoring Methodologies for Selected Small-Scale CDM Project Activity Categories were monitored. The measurement of the leakage was based in national and international articles and database every monitoring period. The sources provided information about the biomass availability in the project activity’s region. The bibliographic references are described on the section 4.3 “Leakage”.												
Frequency of monitoring/recording	Annually												
Value monitored		<table><tr><th>Biomass</th><th>Renewable Biomass Surplus</th><th>Year</th></tr><tr><td>Sugar Cane Bagasse (in thousands of tonnes)</td><td>50,576</td><td>2009/2010</td></tr><tr><td>Sawdust (thousand of m³)</td><td>7,674</td><td>2007/2008</td></tr></table>	Biomass	Renewable Biomass Surplus	Year	Sugar Cane Bagasse (in thousands of tonnes)	50,576	2009/2010	Sawdust (thousand of m³)	7,674	2007/2008		
Biomass	Renewable Biomass Surplus	Year											
Sugar Cane Bagasse (in thousands of tonnes)	50,576	2009/2010											
Sawdust (thousand of m³)	7,674	2007/2008											
	Detailed information in Leakage, Section 4.3.												
Monitoring equipment	No monitoring equipment is used to determine this parameter.												
QA/QC procedures to be applied	Data available regarding the ceramic industries fuel consumption was employed to monitor the leakage												
Purpose of the data	Calculation of leakage emissions due to competing use of biomass.												
Calculation method	The amount of biomass used by the project activity in each year of the crediting period is compared to total biomass available, as estimated on the VCS PD.												
Comments	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.												

Data / Parameter	Leakage of non-renewable biomass
Data unit	tCO ₂ e

Description	Leakage resulted from the non-renewable biomass
Source of data	Monitored
Description of measurement methods and procedures to be applied	The three sources of leakages predicted in the applied methodology were monitored. Scientific articles official statistical data regional and national surveys were provided in order to ensure that there was no leakage from non-renewable biomass (or to estimate the leakage). Please see Section 4.3: "Leakage".
Frequency of monitoring/recording	Annually
Value monitored	0
Monitoring equipment	No monitoring equipment is used to determine this parameter.
QA/QC procedures to be applied	Data available regarding the ceramic industries fuel consumption were utilized to monitor the leakage.
Purpose of the data	Calculation of leakage emissions. This parameter is used to evaluate if there is any source of indirect emission related to non-renewable biomass. If applicable, leakage emissions are used to adjust emission reductions resulting from the project.
Calculation method	Not applicable.
Comments	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Data / Parameter	$f_{NRB,y}$
Data unit	Fraction of biomass or percentage
Description	Fraction of biomass (wood) used in the absence of the project activity in year y that can be established as non-renewable biomass using survey methods. It was also discounted the amount of wood saved by similar projects in the same biome.
Source of data	Survey methods
Description of measurement methods and procedures to be applied	Before the project activity, wood from areas without forest management was offered with low prices and high viability to the ceramic owner. Thus, the totality of fuel employed in the baseline scenario is from non-renewable origin. However, according to Klink (2005), <i>Cerrado Biome</i> has only 1.9% of its total area with sustainable use. .
Frequency of monitoring/recording	Annually
Value monitored:	0.9806 or 98.06%
Monitoring equipment	No monitoring equipment was used to determine this parameter.

QA/QC procedures to be applied	The monitoring of this parameter was based in national and international articles and database every monitoring period. The sources provided information about the sustainable use of <i>Cerrado</i> biome. Wood saved from projects located in the same biome and that applied the same methodology developed by <i>Sustainable Carbon</i> was considered in this fraction. CDM or VCS registered projects with the same methodology were also included in this fraction if placed in the same region.
Purpose of the data	This parameter is used to calculate Baseline emissions. The $f_{NRB,y}$ determines the fraction of biomass (wood) used in the absence of the project activity that can be established as non-renewable biomass.
Calculation method	Calculation methods are described under the description of the measurement methods and procedures to be applied.
Comments	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

3.3 Monitoring Plan

The monitoring is done with the aim of determining the most approximate quantity of non-renewable wood that in the absence of the project would be used in the ceramics' kilns and consequently the amount of GHG that would be emitted in tonnes of CO₂e. Section 3.2 describes data and parameters monitored, as well as the procedures involved on the monitoring plan.

Ceramic personnel are responsible to monitor the operating conditions on the factory, including the amount of renewable biomass consumed and the monthly production of ceramic devices (parameters $Q_{renbiomass}$ and PR_y). Ceramic personnel are also responsible to store invoices, receipts of sales and other documents related to purchase or acquisition of biomass.

Ceramic personnel register monitoring data regarding parameters $Q_{renbiomass}$ and PR_y on electronic spreadsheets, which are shared with Sustainable Carbon team using a internet cloud service (Dropbox). This gives Sustainable Carbon real time access to monitoring data.

The origin of renewable biomass is given by the biomass providers. The guarantee of acquiring sawdust/wood chips from renewable wood is achieved by invoices from the providers. The amount of biomasses is monitored in accordance to the weight or volume described in the receipts from the providers.

The amount of product produced per year in ceramic units fired is acquired by counting the total production. The measurement is made by an internal control sheet monitored by the project proponent, which controls the amount of ceramic units that enters in the molding machine.

The three sources of leakages predicted in the applied methodology are monitored. Scientific articles, official statistical data, regional and national surveys are provided in order to ensure that there is no leakage from non-renewable biomass (or to estimate the leakage).

Based on this information, Sustainable Carbon is responsible to assess if the biomasses are from renewable origin, to evaluate if there is a surplus of renewable biomass and to calculate emission reductions, including an assessment of leakage emissions and the determination of parameter $f_{NRB,y}$. Sustainable Carbon also assists the Ceramic personnel to double check the monitored data on biomass consumption and ceramic units production.

In the currently monitoring period Sustainable Carbon performed an analysis to verify if biomass and production data are being correctly filled in the monitoring spreadsheets.

Analysis on production data is performed by a series of comparisons between different measurement points of production (molding machine, kiln loading and kiln unloading) to detect inconsistencies or suspicious data. Analysis on biomass data is performed by a series of comparisons between the amount of biomass and the cost over months to identify inconsistencies or unexpected variations in these parameters.

Sustainable Carbon is responsible for providing the required guidance to the ceramic factory, to register Biomass and Production data, in order to minimize errors, including assisting the ceramic in case the person in charge of the project monitoring is replaced.

The responsible for the monitoring plan are Ms. *Cristina Maia* and Mr. *José Ettore Fredi*, from *Irmãos Fredi* ceramic. Sustainable Carbon technical team (including those members described on Section 1.3) was also involved in the project monitoring.

Sustainable Carbon personnel involved on this monitoring report (as described on Section 1.3) Includes holders of undergraduate degrees on Environmental Management, Environmental Engineering and Biological Sciences. All member of Sustainable Carbon technical team have significant experience with similar projects, having developed many monitoring reports in the past three years.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

Baseline emissions are estimated following procedures of the applied methodology: AMS-I.E.: Switch from Non-Renewable Biomass for Thermal Applications by the User – Version 01, valid from 01/02/2008 to 08/04/2010. The project activity in this monitoring period (29 months) generated 147.51 TJ per year. Converting this number to MWh, it was generated 40,973.81 MWh per year, which corresponds to the use of 4.68 MW_{thermal} on average of the kilns capacity during the monitored period, which is less than the limits of 45 MW_{thermal} for Type I Small scale project activities

Baseline emissions

$$ER_y = B_y \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected_fossilfuel} \quad (\text{Equation 01})$$

Where:

ER_y: Emission reductions during the year y in tCO₂e

- B_y:** Quantity of biomass that is substituted or displaced in tonnes of ceramic units
- f_{NRB,y}:** Fraction of non-renewable biomass (wood) used in the absence of the project activity in year y
- NCV_{biomass}:** Net calorific value of non-renewable biomass in TJ/tonne
- EF_{projected fossil fuel}:** Emission factor for the projected fossil fuel consumption in the baseline in tCO₂e/TJ⁴.

B_y is determined using option (b) of the applied methodology, as follows:

Calculated from the thermal energy generated in the project activity as:

$$B_y = \frac{HG_{p,y}}{\eta_{old} \times NCV_{biomass}} \quad (\text{Equation 02})$$

Where:

HG_{p,y}: Quantity of thermal energy generated by the renewable energy in the project in year y in TJ.

η_{old}: Efficiency of the system being replaced.

$$HG_{p,y} = SGE \times PR_y \quad (\text{Equation 03})$$

Where:

SGE: Specific energy which has to be generated in the process to produce a certain amount of ceramic devices in TJ/thousand of ceramic devices.

PR_y: Production of ceramic pieces in thousand of ceramic devices

$$\eta_{old} = \frac{SGE}{SFE} \quad (\text{Equation 04})$$

Where:

SFE: Specific fuel energy needed for the process to produce a certain amount of ceramic devices in TJ/ thousand of ceramic devices.

$$SFE = BF_y \times NCV_{biomass} \quad (\text{Equation 05})$$

Where:

BF_y: Consumption of non-renewable biomass (tonnes) per thousand of ceramic devices produced per year

⁴ The fossil fuel likely to be used by similar consumers is taken the IPCC default value of residual fossil fuel.

Using the Equations 3, 4 and 5 in the Equation 1 it results to:

$$B_y = PR_y \times BF_y \quad (\text{Equation 06})$$

Baseline emissions during the monitored period are summarized in the following table:

Period	ER _y (tCO ₂ e)
October	2,213
November	2,071
December	1,279
Total 2011	5,563
January	2,036
February	2,035
March	2,518
April	1,946
May	2,479
June	2,571
July	2,350
August	2,409
September	2,401
October	2,256
November	2,104
December	1,379
Total 2012	26,484
January	1,864
February	1,749
March	2,040
April	1,951
May	1,888
June	1,771
July	1,906
August	2,128
September	2,064
October	1,943
November	1,861
December	1,362
Total 2013	22,527
January	1,640
February	1,717
Total 2014	3,357

Total in the monitoring period	57,931
---------------------------------------	---------------

4.2 Project Emissions

The applied methodology does not include any source of project emissions.

4.3 Leakage

Leakage is estimated to be 0 (zero) tCO₂e during the entire monitoring period.

The Category AMS-I.E predicts the following possible three sources of leakage:

A) If the project activity includes substitution of non-renewable biomass by renewable biomass, leakage in the production of renewable biomass must be considered.

The leakage from biomass projects, like this project activity, should also be estimated according to the “General guidance on leakage in biomass project activities” (attachment C of appendix B) of Indicative Simplified Baseline and Monitoring Methodologies for Selected Small-Scale CDM Project Activity Categories, which identifies different emission sources based on the type of biomass considered (described in the table below).

Table 1. Sources of leakage according to the type of the biomass

Biomass Type	Activity/ Source	Shift of pre project activities	Emissions from biomass generation/ cultivation	Competing use of biomass
Biomass from forests	Existing forests	-	-	X
	New forests	X	X	-
Biomass from croplands or grasslands (woody or non-woody)	In the absence of the project the land would be used as a cropland/wetland	X	X	-
	In the absence of the project the land will be abandoned	-	X	-
Biomass residues or waste	Biomass residues or wastes are collected and use.	-	-	X

Observing table 1, the possible sources of leakage of the present project activity is the competing use of residues or waste, once in this monitoring period *Irmãos Fredi* ceramic utilized sawdust and sugar cane bagasse as renewable biomasses.

Sawdust

The production of wood generates a large amount of residues, which can be reused to generate thermal energy. As can be observed in the figure 3, the potential of energy generation in the state of *São Paulo* is extremely high, which means that there is an enormous availability of this kind of fuel to be employed in the project activity. This way, this biomass does not have potential to generate leakage emissions due to its high availability.

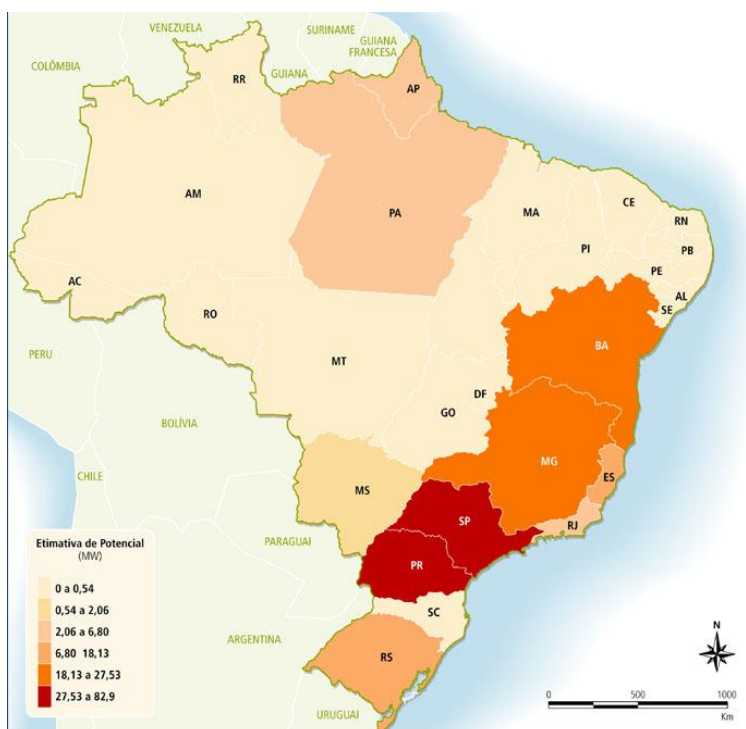


Figure 3. Forest Residues Potential for Energy Generation⁵

According to IBGE 2007, the production of log of wood and firewood in the State of *São Paulo*⁶ and *Mato Grosso do Sul*⁷ totalizes 34.8 millions of m³ of wood, which will generate more than 7.5 millions of m³ of residues, considering that around 22% of this total will generate sawdust⁸.

⁵ Source: CENTRO NACIONAL DE REFERÊNCIA EM BIOMASSA - CENBIO. *Panorama do potencial de biomassa no Brasil*. Brasília; Dupligráfica, 2003. 80 p.

⁶ Available at: <<http://www.ibge.gov.br/estadosat/temas.php?sigla=sp&tema=extracaovegetal2008>>. Last visit on: December 23th, 2009.

⁷ Available at: <<http://www.ibge.gov.br/estadosat/temas.php?sigla=ms&tema=extracaovegetal2008>>. Last visit on: December 23th, 2009.

⁸ BRITO EO. *Estimativa da produção de Resíduos na Indústria Brasileira de Serraria e Laminação de Madeira*. Rev. da Madeira. v.4. n.26. 1995, pp. 34-39.

Table 2. Production of log of wood and firewood

Production State	São Paulo	Mato Grosso do Sul	Residues Generated
Log of wood (m ³)	25,966,464	1,042,639	5,942,003
Firewood (m ³)	7,407,385	468,143	1,732,616
Total (m ³)	34,884,631		7,676,619

The project activity utilized approximately an average of 28,667 m³ of sawdust per year during the monitoring period, which represented less than 1% of the total of residues generated in both States.

Sugar Cane Bagasse

A study made by *Universidade Estadual de Campinas* and *Universidade de São Paulo* (two of the most respected universities in Brazil) showed that in Brazil there are around three hundred sugar cane plants. Only in the state of *São Paulo*, there are located more than 40% of this total. Each plant produces around 1.5 million tonnes of cane yearly⁹. One tonne of cane produces about 140 kilograms of cane bagasse and finally 90% of this amount can be used to energy production¹⁰. Table 3 shows the production of sugar cane in the state of *São Paulo*. According to this information, the amount of sugar cane bagasse generated in the year of 2009/2010 was 361,261,000 tonnes, thus, the amount that could be used to energy production was 45,518,886 tonnes. The consumption of sugar cane bagasse by this project activity was around 68.03 tonnes per year in this monitoring period, which represented less than 1% of the total of sugar cane bagasse produced in the year of 2009/2010.

Table 3. Production of Sugar Cane in the State of São Paulo. Text adapted from:
<http://www.unica.com.br/downloads/estatisticas/processcanabrasil.xls>

Harvest ¹¹	05/06	06/07	07/08	08/09	09/10 ¹²
Production of Sugar Cane (tonnes)	242,829,000	264,339,000	296,243,000	346,293,000	361,261,000
Sugar Cane	33,996,060	37,007,460	41,474,020	48,481,020	50,576,540 ¹³

⁹ Triangulo Mineiro.com - Universidades unem pesquisas sobre biomassa da cana. Available at: <http://www.triangulomineiro.com/noticia.aspx?catNot=59&id=3097&nomeCatNot=Ci%C3%Aancia> . Visited on: December 12th, 2008.

¹⁰ Source: www.cgee.org.br/arquivos/estudo003_02.pdf

¹¹ <http://www.unicadata.com.br/historico-de-producao-e-moagem.php?idMn=31&tipoHistorico=2&acao=visualizar&idTabela=1601&produto=cana&safralni=2004%2F2005&safralFim=2009%2F2010&estado=SP> last visit on 28/08/2014

¹² <http://www.unicadata.com.br/historico-de-producao-e-moagem.php?idMn=31&tipoHistorico=2&acao=visualizar&idTabela=1581&produto=cana&safralni=2008%2F2009&safralFim=2009%2F2010&estado=SP> last visit on 22/07/2014

Bagasse (tonnes)					
------------------	--	--	--	--	--

Sugar cane bagasse is also utilized for cogeneration systems. However, Figure 4 presents the excess of energy in Brazil from sugar cane bagasse. Please observe that the State of *São Paulo* has the largest surplus of this biomass.

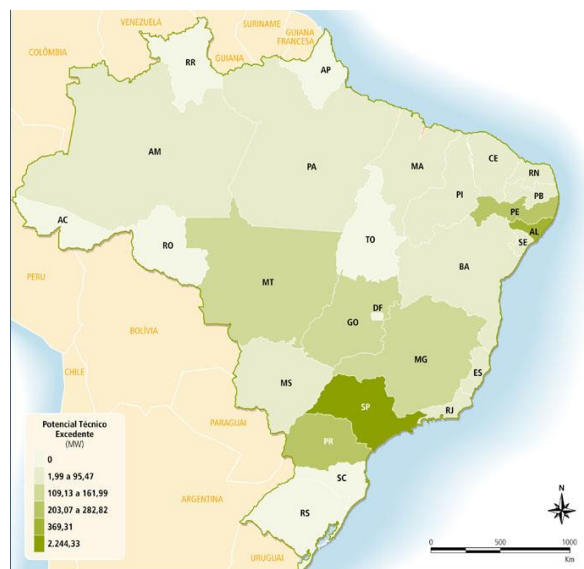


Figure 4. Sugar Cane Residue Potential for Energy Generation¹⁴

B) Leakage relating to the non-renewable biomass shall be assessed from ex-post surveys of users and areas from where biomass is sourced.

The following potential sources of this type of leakage could be identified:

- Use/diversion of non-renewable biomass saved under the project activity by non-project households/users who previously used renewable energy sources. If this leakage assessment quantifies an increase in the use of non-renewable biomass used by the non-project households/users attributable to the project activity then baseline is adjusted to account for the quantified leakage.
- Use of non-renewable biomass saved under the project activity to justify the baseline of other project activities can also be potential source of leakage. If this leakage assessment quantifies a portion of non-renewable biomass saved under the project activity that is used as the baseline of other project activity then baseline is adjusted to account for the quantified leakage.

Increase in the use of non-renewable biomass outside the project boundary to create non-renewable biomass baselines can also be potential source of leakage. If this leakage assessment quantifies an increase in use of non-renewable biomass outside the project boundary then baseline is adjusted to account for the quantified leakage

¹⁴ Source: CENTRO NACIONAL DE REFERÊNCIA EM BIOMASSA - CENBIO. *Panorama do potencial de biomassa no Brasil*. Brasília; Dupligráfica, 2003. 80 p.

The carbon credits incomes stimulate the use of renewable biomass to other ceramic companies presenting a huge possibility for sustainable development in the region. Therefore, the sources of leakages mentioned above are not applicable as the project activity does not displace the use of renewable biomass of a non-project user, due to the likely decrease in the use of non-renewable biomass in the region and there is current great amount of renewable biomasses available locally as described before. The non-renewable biomass employed which would be employed in this project activity is not being saved for other project activity, since other ceramics were already consuming wood from non sustainable forest management (common practice).

The project will likely decrease the use of non-renewable biomass, especially due to the incentive of carbon credits. Therefore, it can be concluded that this source of leakage, until the date of this monitoring report, is not considered in this project activity.

This leakage was monitored in order to guarantee the project conservativeness.

C) If the equipment is transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered.

The leakage is not applicable for this project activity as there was no transference of equipment, in spite of new equipments had to be acquired.

Due to all the explanations described above, the present project activity does not encompass any type of leakage.

Table 4. Production - $Q_{renbiomass}$ QA/QC Procedure

	VCS PD	Monitoring Period	Double Check (QA/QC Procedure)
Production (Thousand of ceramic units)	34,800.00	28,793.77	The thermal energy generated per thousand of ceramic pieces produced at <i>Irmãos Fredi</i> Ceramic during the monitored period was higher than the VCS PD.
Sugar Cane Bagasse Consumption (tonnes)	6,090	164	
Sawdust Consumption (tonnes)	16,240	24,248	
Thermal Energy (TJ)	284	356	
Thermal energy per thousand of pieces produced (TJ/thousand of units)	0.0082	0.0124	
Total of months in this monitoring reoprt	29		

As can be verified on Table 4, the thermal energy generated with the use of renewable biomass per tonne of ceramic units produced during the current monitoring period was higher than estimated on the VCS PD.

Therefore, based on Category AMS-I.E: Switch from Non – Renewable Biomass for Thermal Application by the User (Version 01. valid from February 01st. 2008 to April 08th. 2010) this project

activity contributes to sustainable development once the ceramic company is using renewable biomass and applying the SOCIALCARBON methodology.

4.4 Net GHG Emission Reductions and Removals

Table below summarizes the emission reductions for this monitoring period¹⁵.

Table 5. Emission reductions for the monitoring period

<i>Irmãos Fredi Ceramic</i>				
	Period	PR _y - Production (Ceramic devices)	B _y (tons)	ER _y (tCO ₂ e)
2011	October	1,099,750	1,568	2,213
	November	1,029,200	1,467	2,071
	December	635,920	907	1,279
	Total 2011	2,764,870	3,941	5,563
2012	January	1,011,816	1,442	2,036
	February	1,011,428	1,442	2,035
	March	1,251,306	1,784	2,518
	April	967,160	1,379	1,946
	May	1,232,210	1,757	2,479
	June	1,277,608	1,821	2,571
	July	1,167,888	1,665	2,350
	August	1,197,492	1,707	2,409
	September	1,193,234	1,701	2,401
	October	1,121,304	1,598	2,256
	November	1,045,938	1,491	2,104
	December	685,532	977	1,379
	Total 2012	13,162,916	18,764	26,484
2013	January	926,406	1,321	1,864
	February	869,504	1,239	1,749
	March	1,013,824	1,445	2,040
	April	969,896	1,383	1,951
	May	938,424	1,338	1,888
	June	880,128	1,255	1,771
	July	947,528	1,351	1,906
	August	1,057,520	1,507	2,128
	September	1,026,072	1,463	2,064
	October	965,924	1,377	1,943
	November	925,136	1,319	1,861
	December	677,168	965	1,362
	Total 2013	11,197,530	15,962	22,527
2014	January	815,224	1,162	1,640
	February	853,226	1,216	1,717
	Total 2014	1,668,450	2,378	3,357

¹⁵ Emission reductions are equal to the baseline emissions, since there are no project emissions according to the applied methodology and since leakage emissions are estimated at zero tCO₂e.

Total in the monitoring period	28,793,766	41,046	57,931
---------------------------------------	-------------------	---------------	---------------

Table 6. Emission reductions for the monitoring period

Year	Month	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
2011	October	2,213	0	0	2,213
	November	2,071	0	0	2,071
	December	1,279	0	0	1,279
	Total 2011	5,563	0	0	5,563
2012	January	2,036	0	0	2,036
	February	2,035	0	0	2,035
	March	2,518	0	0	2,518
	April	1,946	0	0	1,946
	May	2,479	0	0	2,479
	June	2,571	0	0	2,571
	July	2,350	0	0	2,350
	August	2,409	0	0	2,409
	September	2,401	0	0	2,401
	October	2,256	0	0	2,256
	November	2,104	0	0	2,104
	December	1,379	0	0	1,379
	Total 2012	26,484	0	0	26,484
2013	January	1,864	0	0	1,864
	February	1,749	0	0	1,749
	March	2,040	0	0	2,040
	April	1,951	0	0	1,951
	May	1,888	0	0	1,888
	June	1,771	0	0	1,771
	July	1,906	0	0	1,906
	August	2,128	0	0	2,128
	September	2,064	0	0	2,064
	October	1,943	0	0	1,943
	November	1,861	0	0	1,861
	December	1,362	0	0	1,362
	Total 2013	22,527	0	0	22,527
2014	January	1,640	0	0	1,640
	February	1,717	0	0	1,717
	Total 2014	3,357	0	0	3,357
Total in monitoring period		57,931	0	0	57,931

APPENDIX I: AMOUNT OF RENEWABLE BIOMASS CONSUMED PER MONTH ON IRMÃOS FREDI CERAMIC

Table 7. Amount of renewable biomass consumed per month.

Period	Sawdust	
	Total (tonnes)	Total (m³)
October	895.30	2,558.00
November	515.90	1,474.00
December	516.20	1,474.86
Total 2011	1,927.40	5,506.86
January	793.80	2,268.00
February	799.40	2,284.00
March	1,540.00	4,400.00
April	906.50	2,590.00
May	1,092.00	3,120.00
June	1,393.00	3,980.00
July	1,022.35	2,921.00
August	1,253.00	3,580.00
September	1,197.00	3,420.00
October	944.30	2,698.00
November	948.50	2,710.00
December	474.25	1,355.00
Total 2012	12,364.10	35,326.00
January	665.00	1,900.00
February	665.00	1,900.00
March	560.35	1,601.00
April	544.25	1,555.00
May	525.35	1,501.00
June	420.00	1,200.00
July	1,853.25	5,295.00
August	939.75	2,685.00
September	875.00	2,500.00
October	840.00	2,400.00
November	140.00	400.00
December	105.00	300.00
Total 2013	8,132.95	23,237.00
January	948.50	2,710.00
February	875.00	2,500.00
Total 2014	1,823.50	5,210.00
Total Monitoring period	24,247.95	69,279.86

Period	Sugar Cane Bagasse	
	Total (tonnes)	Total (m³)
October	143.63	957.53
November	20.78	138.53
December		0.00
Total 2011	164.41	1,096.07
January		0.00
February		0.00
March		0.00
April		0.00
May		0.00
June		0.00
July		0.00
August		0.00
September		0.00
October		0.00
November		0.00
December		0.00
Total 2012	0.00	0.00
January		0.00
February		0.00
March		0.00
April		0.00
May		0.00
June		0.00
July		0.00
August		0.00
September		0.00
October		0.00
November		0.00
December		0.00
Total 2013	0.00	0.00
January		0.00
February		0.00
Total 2014	0.00	0.00
Total Monitoring period	164.41	1,096.07