CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

CONTENTS

Annexes

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

Palmeras POME Co-composting Project
(hereinafter Palmeras Project or Project)
version 1, 17 May 2010

A.2. Description of the small-scale project activity:

This project activity is a co-composting project in Palmeras de la Costa, S.A., located in the region of Cesar, Colombia. Palmeras' palm oil mill was built in 1974 and processes the production of approximately 9,500 hectares of African palm plantations.

The process of crude palm oil production generates 3 types of solid waste: Empty Fruit Bunches (EFB), Mesocarp Fibres, and Palm Kernel Shells (PKS). Also, the liquid Palm Oil Mill Effluent (POME) with a high chemical oxygen demand is generated.

EFB is currently mulched and applied in the plantation, where it undergoes anaerobic and aerobic decomposition. Fibres and PKS are used in the palm oil mill's energy plant to generate electricity and steam. The mill is connected to the power grid; power requirements that are not generated through these renewable source onsite are purchased through the grid.

POME is currently treated in series of open lagoons before being discharged. During the anaerobic digestion in lagoons, methane gas is generated and emitted into the atmosphere. The lagoons are required to provide enough retention time to bring the COD of the wastewater down to the level of the local discharge standards.

The main objective of the project is to reduce the pollution potential of EFB and POME by implementing an aerobic composting process of its waste streams. It consists of co-composting EFB that would have been left to decay along with POME. The project activity will result in the avoidance of large quantity of methane that would have been released in an uncontrolled manner into the atmosphere from the anaerobic decay of EFB and POME.

EFB will be composted utilizing the Windrow technology in an onsite, covered composting plant. POME is added to the composting process to maintain adequate moisture level throughout the process cycle and provide additional nitrogen content for a compost rich in nutrients. Aerobic composting conditions will be assured through frequent turning of the compost piles with the Windrow turners and will be monitored through the compost quality control plan. The entire quantity of compost produced will be applied in the plantation.

This project contributes to sustainable development in various manners, including:

Environment
- Avoidance of methane emissions from anaerobic decay of EFB and POME.
- Contribution to Colombia's national waste management strategy that places high priority in converting wastes into useful products.
- Potential reduction in the use of chemical fertilisers and their life-cycle environmental impacts.
- Sustainable soil management on the plantation.

Social
- Reduction of odours from the anaerobic decay of EFB and POME.
- Job creation at the compost plant.

Economic
- New private investment in the compost plant.
- New ongoing economic activity through composting.

A.3. Project participants:

Please list project participants and Party(ies) involved and provide contact information in Annex 1. Information shall be indicated using the following tabular format.

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Colombia (host)	• Palmeras de la Costa, S.A. (Private Company) • Aretech Cambio Climático, S.A. (Private Company)	No

(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

A.4.1.1. Host Party(ies):

Colombia

A.4.1.2. Region/State/Province etc.:

Cesar

A.4.1.3. City/Town/Community etc:

El Copey

A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity :

The new composting plant will be located on Palmeras' agro-industrial facility in the municipality of El Copey within the Department of Cesar. The map at the right shows the location of El Copey within Cesar and the location of Cesar within Colombia.

The mailing address for Palmeras' industrial facility is:

Palmeras de la Costa, S.A.
Carretera Vieja de Palmeras
El Copey
Cesar
COLOMBIA

The coordinates of the industrial facility are:

10º 2' 31" N
74º 2' 37" W

A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:

The project is a small scale project activity and falls under the category **III.F** according to the Appendix B of the Simplified Modalities and Procedures for Small-Scale CDM project activities. It is an "***Avoidance of methane production from decay of biomass through composting***" project, diverting POME from anaerobic open lagoons without methane recovery to be used in an aerobic co-composting process with solid biomass waste.

The co-composting of EFB and POME will be carried out in a newly built composting plant adjacent to the existing wastewater treatment lagoons. The plant will occupy approximately 20 thousand square meters. The entire composting site will be protected from leachate by installing an impermeable membrane. Runoff water will be collected in concrete channels and pumped to one of the existing wastewater treatment lagoons for treatment and/or application to the compost piles. Because it can accommodate large volumes of wastes, "turned windrow" composting has been selected for the project activity. With this technique, the

waste is arranged with mechanical loaders in long narrow piles called “windrows”. The windrows are turned regularly with specialized equipment to ensure aerobic composting conditions.

The compost plant design includes:

- Site preparation and impermeabilization
- Composting plant roofing
- Windrow compost pile turners
- POME spray system
- Runoff water management system
- Plant monitoring and auxiliary equipment

The aerobic composting is a controlled biological process in which a succession of microbial populations converts organic material into a biologically stable product. Composting is characterized by a microbially active thermophilic (high temperature of 45-65 ºC) period (called “active phase”) while easily digestible materials are available, followed by a lower temperature period (called “curing phase”) as more complex material are slowly digested. Under the presence of oxygen, micro-organisms, including bacteria and fungi, break down the organic matter into simpler substances. The effectiveness of the composting process is influenced by the environmental conditions present within the compost (temperature, moisture, organic matter, oxygen and the size and activity of microbial populations). The entire composting process lasts 10 to 12 weeks.

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

Year	Estimation of annual emission reductions in tonnes of CO_2 e
Year 1*	34,078
Year 2	37,441
Year 3	40,278
Year 4	42,672
Year 5	44,691
Year 6	46,395
Year 7	47,832
Total estimated reductions (tonnes of CO_2 e)	293,386
Total number of crediting years	7
Annual average of the estimated Reductions over the crediting period	41,912

*Please refer to section C.2.1.1 for the estimated starting date of the crediting period.
The basis for the estimated amount of emission reductions is described in section B.6.3.

A.4.4. Public funding of the small-scale project activity:

The project activity does not involve the use of public funding or official development aid.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

Based on paragraph 2 of Appendix C of the Simplified Modalities and Procedures for Small-Scale CDM project activities, we confirm that the project activity is not a debundled component of a large project activity as the project participants did not register or apply for another small-scale CDM project activity:

- In the same project category and technology/measure; and
- Registered within the previous 2 years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the small-scale project activity:

The Project uses "Small-Scale Methodology III.F: Avoidance of methane emissions through controlled biological treatment of biomass", version 08. This methodology uses the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site", version 04. Also, the project activity uses other CDM tools for indirect project emissions from incremental power consumption.

B.2 Justification of the choice of the project category:

The project activity meets all of the relevant applicability criteria of AMS III.F:

AMS III.F	*Applicability Criteria*	*Project Activity*
Point 1	This methodology comprises measures to avoid the emissions of methane to the atmosphere from biomass or other organic matter that would have otherwise been left to decay anaerobically in a solid waste disposal site (SWDS).	The project activity will manage EFB that otherwise would have decayed anaerobically in a SWDS.
Point 1	In the project activity, controlled biological treatment of biomass is introduced through aerobic treatment by composting and proper soil application of the compost.	The project activity involves composting and proper soil application of the compost.
Point 2	The project activity does not recover or combust landfill gas from the disposal site, and does not undertake controlled combustion of the waste	The project activity does not include recovery or combustion of landfill gas nor does it include combustion of the waste.
Point 3	Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO_2 equivalent annually.	Estimated emission reductions are less that 60 kt CO_{2eq} annually. Please see sections B.6.3 and B.6.4.

AMS III.F	*Applicability Criteria*	*Project Activity*
Point 4	This methodology is applicable to the treatment of the organic fraction of municipal solid waste and biomass waste from agricultural or agro-industrial activities including manure.	The EFP and POME treated by this project activity is generated by an agro-industrial activity.
Point 5	This methodology includes construction and expansion of treatment facilities as well as activities that increase capacity utilization at an existing facility.	This project activity involves the construction of a new treatment facility.
Point 6	This methodology is also applicable for co-treating wastewater and solid biomass waste, where wastewater would otherwise have been treated in an anaerobic wastewater treatment system without biogas recovery. The wastewater in the project scenario is used as a source of moisture and/or nutrients to the biological treatment process e.g., composting of empty fruit bunches (EFB), a residue from palm oil production, with the addition of palm oil mill effluent (POME) which is the wastewater co-produced from palm oil production.	This project activity comprises the example in this applicability criterion: co-composting of EFB with POME.
Point 7	The location and characteristics of the disposal site of the biomass in the baseline condition shall be known, in such a way as to allow the estimation of its methane emissions.	Biomass is disposed of onsite in the baseline condition. The SWDS is included in the project boundary. Please see section B.3.
Point 8	In case residual waste from the biological treatment (slurry, compost or products from those treatments) are handled aerobically and submitted to soil application, the proper conditions and procedures (not resulting in methane emissions) must be ensured.	As per point 34 of AMS III.F, this project activity includes in situ verification of the proper soil application of the compost. Please see section B.7.

The remaining applicability criteria of AMS III.F apply to biogas recovery, manure management, or other technologies that are not part of this project activity.

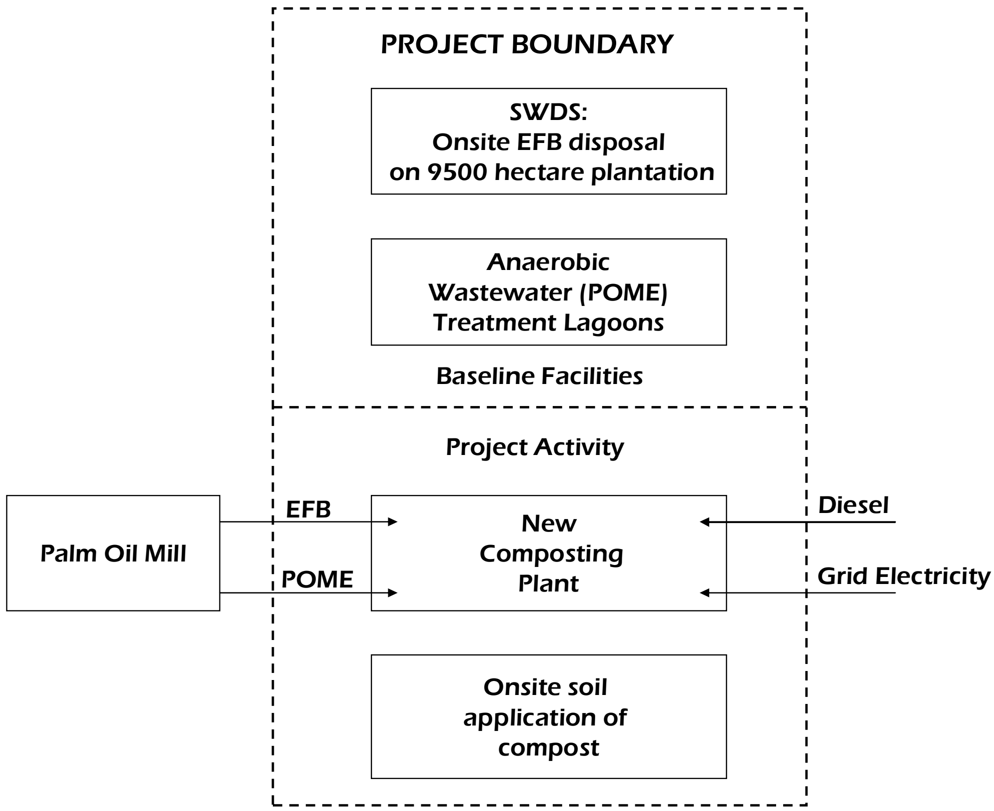
B.3. Description of the project boundary:

As per part 16 of AMS III.F, the project boundary includes the following physical, geographical sites:

Project Boundary Requirement as per AMS III.F	*This Project Activity*
Where the solid waste would have been disposed and the methane emission occurs in absence of the proposed project activity;	EFB has been disposed of historically within the 9,500 hectares of plantation associated with Palmeras' mill.
In the case of projects co-composting wastewater, where the co-composting wastewater would have been treated anaerobically in the absence of the project activity;	Wastewater has been treated historically in Palmeras' anaerobic treatment lagoons.

Where the treatment of biomass through composting or anaerobic digestion takes place;	Composting will take place on Palmeras' agro-industrial facility, adjacent to the wastewater treatment lagoons.
Where the residual waste from biological treatment or products from those treatments, like compost and slurry, are handled, disposed, submitted to soil application, or treated thermally/mechanically;	Compost will be applied within the 9,500 hectares of plantation associated with Palmeras' mill. Compost will not be sold.
Where biogas is burned/flared or gainfully used;	No biogas in generated in this project activity.
And the itineraries between them (a, b, c, d and e), where the transportation of waste, wastewater, where applicable manure, compost/slurry/products of treatment or biogas occurs.	All of these itineraries are located within the Palmeras' agro-industrial facilities and the 9,500 hectares of plantations associated with the mill.

Therefore, the project boundary is delimited by the 9,500 hectares of plantations, the new composting plant, and the wastewater treatment lagoons:



The sources of emissions within the project boundary and its baseline are described in the following table:

	Source	Gas	Included?	Justification / Explanation
Baseline	Biomass disposed in unmanaged landfills	CO_2	No	CO_2 emissions from biomass decay in landfills is considered GHG neutral.
		CH_4	Yes	Methane emission from biomass decay in the landfills
		N_2O	No	Not significant. Excluded for simplification and conservativeness.
	Open Lagoons	CO_2	No	CO_2 emissions from biomass source are considered GHG neutral.
		CH_4	Yes	Methane emission from anaerobic process
		N_2O	No	Not significant. Excluded for simplification and conservativeness.
	Transportation	CO_2	No	Methodology AMS III.F considers incremental transport emissions under the project activity, thus they should be ignored in the basline
		CH_4	No	
		N_2O	No	
	Auxiliary Equipment	CO_2	No	Use of auxiliary equipment in the baseline is ignored, to be considervative.
		CH_4	No	
		N_2O	No	
Project Activity	Composting process	CO_2	No	CO_2 emissions from composting process is considered GHG neutral.
		CH_4	Yes	Methane emissions from anaerobic pockets during composting process.
		N_2O	No	Proper onsite soil application of the compost will prevent these emissions and be monitored.
	Runoff Water	CO_2	No	CO_2 emission from biomass source and considered GHG neutral.
		CH_4	Yes	Methane emission from anaerobic process of runoff water collected after the project activity.
		N_2O	No	Not significant, excluded by AMS III.F
	Additional Transportation due to Project Activity	CO_2	No	Composting will reduce waste volumes approximately 30% and hence decrease transportation requirements. It is conservative to exclude these emissions.
		CH_4	No	
		N_2O	No	
	Auxiliary Equipment	CO_2	Yes	Incremental emissions from grid electricity and fossil fuel
		CH_4	No	Not significant, excluded for simplification
		N_2O	No	Not significant, excluded for simplification

B.4. Description of baseline and its development:

AMS III.F defines the baseline as *the situation where, in the absence of the project activity, biomass and other organic matter are left to decay within the project boundary and methane is emitted to the atmosphere.* For this project activity, the baseline scenario is the continuation of current practices based on the following considerations:

A. Current practice for managing EFB
B. Current practice for managing POME
C. Common practices for managing EFB and POME in the Colombian palm oil sector
D. Compliance with legal and regulatory requirements
E. Feasibility

A) EFB from the Palmeras' mill is sometimes crushed at the plant, hauled to the plantation either whole or crushed, and piled on the ground. Once piled, they receive no handling, and decay naturally. This practice is classified as unmanaged-shallow solid waste disposal as per the SWDS tool. Palmeras has pilot-tested composting of some EFB, in order to remove technical risk from this project activity.

B) POME from the Palmeras' mill is treated in a series of treatment lagoons. The principal treatment lagoons operate anaerobically and have a design depth of 3 metres. The operating lagoons were constructed in 2004, upgrading the prior onsite wastewater treatment facility.

C) Common practices for managing EFB and POME wastes in Colombia are documented in a recent report commissioned by the industry association[1]. Mulching of EFB as practiced by Palmeras is reported as the most common practice in Colombia. Some 99% of the country's palm oil mills are reported to have wastewater treatment systems for their POME.

D) Compliance with applicable laws and regulations at the Palmeras' facility is demonstrated in the environmental license. The POME treatment system has sufficient capacity to treat present and expected future POME volumes. Current practice of onsite dumping of EFB complies with the license.

E) The mill´s POME treatment system was upgraded in 2004 to fully comply with applicable regulations at present and expected future production capacity. Any alternative treatment scheme would require additional investment, and thus is not considered economically feasible.

[1] CENIPALMA and FEDEPALMA. Prospective Agenda for Research and Development in the Value Chain for Palm Oil. February 2009.

Current practices are shown in the following photos:

Anaerobic wastewater treatment lagoon for POME at the Palmeras' mill

EFB piled on the Palmeras' plantation

The key data and parameters for quantifying this baseline scenario are:

Data/Parameter	Units	Value	Source/Explanation
FFB Processed	t/yr	220,000	Projected 2012 production
EFB	% of FFB	23%	Historic average at the Palmeras mill
Effluent	m^3/tFFB	0.8	Historic average at the Palmeras mill
Effluent COD	kg/m^3	55	Historic average at the Palmeras mill

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

To demonstrate and assess additionality, a barrier analysis is carried out in accordance with Attachment A of the Appendix B of the simplified modalities and procedures for small-scale CDM Project activities. According to the Attachment A, project participants shall provide an explanation to show that the project activity would not have occurred anyway due to at least one of the following barriers:

a) Investment barrier: a financially more viable alternative to the project activity would have led to higher emissions
b) Technological barrier: a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or lo market share of the new technology adopted for the project activity and so would have led to higher emissions;
c) Barrier due to prevailing practice: prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions;
d) Other barriers

In this proposed Project, the investment and prevailing practice barriers are analyzed in order to determine additionality.

1. Investment Barrier Analysis

CER sales will be the only revenue stream for this project activity, since the compost will be used onsite and not sold. Therefore, a simple cost analysis follows, as per the guidelines in the non-binding best practice examples. The simple cost analysis contemplates both investment costs and annual operating costs.

The investment costs associated with this project activity include:

- Site preparation and impermeabilization
- Co-composting plant roofing
- Windrow compost pile turners
- POME spray system
- Runoff water management system

The total investment cost, according to the turn-key vender quotation approved by Palmeras' board of directors, is approximately 2.5 billion Colombian Pesos.

The principal direct operating costs associated with this project activity include:

- Labour to operate the compost plant and equipment
- Maintenance of Windrow turners and other systems
- Energy consumption (diesel and electric power)

These direct operating costs are estimated to be 1.1 billion Colombian Pesos annually.

To be conservative, the operating costs that would be forgone to operate the compost plant should be deducted from the above amount. These forgone costs are the variable cost savings from not operating the POME anaerobic treatment lagoons. These variable costs have been identified from historical accounting records to represent less than 5% of the new direct operating costs associated with the compost plant.

As a result, the compost plant represents both a new investment cost plus an increase in annual operating costs. According to the "Combined tool to identify the baseline scenario and demonstrate additionality", when a simple cost analysis can be applied, an investment barrier exists when the proposed project activity undertaken without being registered as a CDM project incurs costs.

Demonstration of Investment Barrier

Guideline 6 of the "Guidelines for Objective Demonstration and Assessment of Barriers" states;

> In case the PPs make the claim for investment barriers, they should demonstrate in the PDD that the financing of the project was assured only due to the benefit of the CDM.

The financing of this Project is carried out entirely by Palmeras. While the Project was in the planning stage, Palmeras' board of directors agreed to seek the benefit of the CDM for this Project. Several months later the board authorized the investment in the Project. Since the project is financed on balance sheet by Palmeras, these board meetings demonstrate how the financing of the project was assured by CDM benefits.

As a result of the investment barrier analysis, the Project is considered additional.

2. Prevailing Practice Barrier Analysis

As per the non-binding best practice examples, following is a listing of the evidence known to the project participants that the proposed project activity is among the first of its kind.

- The recent technical reference cited in section B.4 indicates that 99% of the palm oil mills in Colombia treat POME in anaerobic lagoons and that mulching is prevailing practice for managing EFB.
- Many of Colombia's palm oil mills are included in registered CDM project 1942. All of the mills listed in this project treat POME in anaerobic lagoons, thus none of them co-compost POME with EFB.
- Only one other palm oil mill in Colombia has published a PDD for global stakeholder review to co-compost POME and EFB.
- Consultations with two leading composting equipment suppliers indicated that palm oil mills are not composting in Colombia.

The non-binding best practice for small-scale CDM project activities indicates that the prevailing practice barrier is satisfied when a project is "among" the first of its kind. The above evidence (documental and testimonial) supports that this project activity is certainly among the first of its kind in Colombia. As a result of the analysis of the prevailing practice barrier, the Project is considered additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

According to part 17 of methodology AMS III.F, baseline emissions are to be calculated as follows:

$$BE_y = BE_{CH4,SWDS,y} - (MD_{y,reg} * GWP\_CH_4) + (MEP_{y,ww} * GWP\_CH_4) + BE_{CH4,manure,y}$$

(Equation 1)

Where:

BE_y	Baseline emissions associated with the project activity in the year y (tCO_2e)
$BE_{CH4,SWDS,y}$	Yearly methane generation potential of the solid waste composted or anaerobically digested by the project activity during the years "x" from the beginning of the project activity (x=1) up to the year *y* (tCO_2e)

$MD_{y,reg}$	Amount of methane that would have to be captured and combusted in the year *y* to comply with the prevailing regulations (tonne)
$MEP_{y,ww}$	Methane emission potential in the year *y* of the wastewater co-composted (tonne)
GWP_CH_4	*GWP* for CH_4
$BE_{CH4,manure,y}$	Where applicable, baseline emissions from manure composted by the project activities, as per the procedures of AMS-III.D

The term $BE_{CH4,manure,y}$ does not apply, since manure is not composted in this project activity.

Part 17 of methodology requires that the term $BE_{CH4,SWDS,y}$ be calculated according to the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site", as follows:

$$BE_{CH4,SWDS,y} = \varphi * (1-f) * GWP_{CH4} * (1-OX) * \frac{16}{12} * F * DOC_f * MCF * \sum_{x=1}^{y} \sum_{j} W_{j,x} * DOC_j * e^{-k_j *(y-x)} * \left(1-e^{-k_j}\right)$$

(Equation 2)

Where:

φ	Model correction factor to account for model uncertainties
f	Fraction of methane captured at the SWDS and flared, combusted or used in another manner
GWP_{CH4}	Global Warming Potential (GWP) of methane, valid for the relevant commitment period
OX	Oxidation factor (reflecting the amount of methane from SWDS that is oxidised in the soil or other material covering the waste)
F	Fraction of methane in the SWDS gas (volume fraction)
DOC_f	Fraction of degradable organic carbon (DOC) that can decompose
MCF	Methane correction factor
$W_{j,x}$	Amount of organic waste type *j* prevented from disposal in the SWDS in the year *x* (tons)
DOC_j	Fraction of degradable organic carbon (by weight) in the waste type *j*
k_j	Decay rate for the waste type *j*
j	Waste type category (index)
x	Year during the calculation period: x runs from the beginning of the project activity (x = 1) to the year y for which avoided emissions are calculated (x = y)
y	Year for which methane emissions are calculated

Part 18 of methodology AMS III F requires that the term $MEP_{y,ww}$ be calculated as follows:

$$MEP_{y,ww} = Q_{y,ww,in} * COD_{y,ww,untreated} * B_{o,ww} * MCF_{ww,treatment} * UF_{b,ww}$$

(Equation 3)

Where:

$Q_{y,ww,in}$	Volume of wastewater entering the co-composting facility in the year *y* (m^3)

$COD_{y,ww,untreated}$	Chemical oxygen demand of the wastewater entering the co-composting facility in the year y (tonnes/m^3)
$B_{o,ww}$	Methane producing capacity for the wastewater (kg CH_4/kg COD)
$MCF_{ww,treatment}$	Methane correction factor for the wastewater treatment system in the baseline scenario
$UF_{b,ww}$	Model correction factor to account for model uncertainties for wastewater

According to part 20 of methodology AMS III.F, project emissions are to be calculated as follows:

$$PE_y = PE_{y,transp} + PE_{y,power} + PE_{y,phy\ leakage} + PE_{y,comp} + PE_{y,runoff} + PE_{y,res\ waste}$$

(Equation 4)

Where:

PE_y	Project activity emissions in the year y (tCO_2e)
$PE_{y,transp}$	Emissions from incremental transportation in the year y (tCO_2e)
$PE_{y,power}$	Emissions from electricity or fossil fuel consumption in the year y (tCO_2e)
$PE_{y,phy\ leakage}$	In case of anaerobic digestion: methane emissions from physical leakages of the anaerobic digester in year y (tCO_2e)
$PE_{y,comp}$	In case of composting: methane emissions during composting process in the year y (tCO_2e)
$PE_{y,runoff}$	In case of composting: methane emissions from runoff water in the year y (tCO_2e)
$PE_{y,res\ waste}$	In case residual waste/slurry/products are subjected to anaerobic storage or disposed in a landfill: methane emissions from the anaerobic decay of the residual waste/products (tCO_2e)

As described in section B.3, the project activity does not involve incremental transport, anaerobic digestion or residual waste/slurry/products storage under anaerobic conditions. Therefore the terms $PE_{y,transp}$, $PE_{y,phy\ leakage}$, and $PE_{y,res\ waste}$ do not apply.

According to part 22 of methodology AMS III.F, the term $PE_{y,power}$ is to be calculated as follows:

$$PE_{y,power} = EC_y * EF_{CO2,ELEC,y} + FC_{Diesel,y} * NCV_{Diesel} * EF_{Diesel}$$

(Equation 5)

Where:

EC_y	Electricity consumption from Project equipment items in the year y (MWh)
$EF_{CO2,ELEC,y}$	CO_2 emission factor for electricity (tCO2e/MWh)
$FC_{Diesel,y}$	Consumption of diesel fuel in the year y (t)
NCV_{Diesel}	Net calorific value of diesel fuel (GJ/t)
EF_{Diesel}	CO_2 emission factor for diesel fuel (tCO_2e/GJ)

Electric power is generated onsite from biomass residues at the Palmeras facility, and the facility is connected to the grid to sell surplus power as well as to purchase grid power to cover any potential deficit. To be conservative, all incremental power consumption from this Project is assumed to be supplied by grid power, not by onsite renewable generation. Therefore, the applicable emission factor is for grid electricity.

Part 22 of methodology AMS III.F refers to methodology AMS I.D for the emission factor applicable to grid electricity. Part 10 of methodology AMS I.D version 14 refers to the "Tool to calculate the Emission Factor for an electricity system". The "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" also introduces the term to cover transmission and distribution losses. The electricity consumption emission factor is thus calculated as follows:

$$EF_{CO2,ELEC,y} = \left(w_{OM} * EF_{grid,OM,y} + w_{BM} * EF_{grid,BM,y}\right) * \left(1 + TDL_y\right)$$

(Equation 6)

Where:

w_{OM}	Weighting of operating margin emissions factor (%)
$EF_{grid,OM,y}$	Operating margin emission factor for electricity in year y (tCO_2e/MWh)
w_{BM}	Weighting of build margin emissions factor (%)
$EF_{grid,BM,y}$	Build margin emission factor for electricity in year y (tCO_2e/MWh)
TDL_y	Average technical transmission and distribution losses in year y

The determination of the first four terms defined above is specified within the "Tool to calculate the emission factor for an electricity system", Version 02. The application of the seven steps of the tool to this project activity is as follows:

STEP 1. Identify the relevant electric power system.

As per the default in the tool, the project activity is connected to the Colombian national grid, known as the SIN.

STEP 2. Choose whether to include off-grid power plants in the project electricity system (optional)

This project activity selects Option I, only grid power plants are included in the calculation.

STEP 3. Select an operating margin (OM) method.

The project activity uses method d) average OM. Within this method, the project activity will apply the ex-ante option, based on the most recent data available from official sources at the time of submission for validation, being the period 2006-2008.

STEP 4. Calculate the operating margin emission factor according to the selected method.

Option A, based on the net electricity generation and a CO_2 emission factor of each power unit is the preferred option and is used:

$$EF_{grid,OM,y} = \frac{\sum_{m} EG_{m,y} * EF_{EL,m,y}}{\sum_{m} EG_{m,y}}$$

(Equation 7)

Where:

$EG_{m,y}$	Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$	CO_2 emission factor of power unit m in year y (tCO_2/MWh)
m	Power plant
y	Year

The emission factors have been calculated according to the "Tool to calculate the emission factor for an electricity system" by the Mining and Energy Planning Unit (UPME) of the Colombian Ministry of Mines and Energy for 2008[2] and are used for this project activity.

STEP 5. Identify the cohort of power units to be included in the build margin (BM).

The project activity uses method b) to identify the sample group of power plants to calculate the build margin. This method produces a set of power units that comprises a larger generation than the five most recent plants (method a).

In terms of vintage of data, the project activity will apply option 1, ex ante determination of BM.

STEP 6. Calculate the build margin emission factor.

The build margin emission factor has been calculated according to the "Tool to calculate the emission factor for an electricity system" by the Mining and Energy Planning Unit (UPME) of the Colombian Ministry of Mines and Energy for 2008[3] and is used for this project activity.

STEP 7. Calculate the combined margin (CM) emissions factor.

As per the tool, the following default values apply for the first crediting period:

$w_{OM} = 0.5$
$w_{BM} = 0.5$

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[2] Mining and Energy Planning Unit (UPME), Calculation of Emission Factors for the Colombian Interconnected National System, version 0.1

[3] UPME, idem

According to part 24 of methodology AMS III.F, the term $PE_{y,comp}$ is to be calculated as follows:

$$PE_{y,comp} = Q_y * EF_{composting} * GWP\_CH_4$$

(Equation 8)

Where:

Q_y	Total weight of wastes be composted in year y on a wet basis (tonne)
$EF_{composting}$	Emission factor for composting of organic waste and/or manure (t CH_4/ton waste treated)

The methodology also states that these emissions can be adjusted to zero for the portions of waste that are composted in the presence of at least 8% oxygen. As a result, the term Q_y will be determined as follows:

$$Q_y = (1 - f_{dry,y}) * \left(W_y + \frac{Q_{y,ww,in} * TSS_{ww,y}}{1 - h_d} \right)$$

(Equation 9)

Where:

$f_{dry,y}$	Fraction of compost that is produced in the presence of at least 8% oxygen
W_y	Amount of organic waste prevented from disposal at SWDS in year y (t)
$Q_{y,ww,in}$	Volume of wastewater entering the co-composting facility in year y (m^3)
$TSS_{ww,y}$	Total suspended solids in wastewater (t/m^3)
h_d	Humidity of wet waste

According to part 25 of methodology AMS III.F, the term $PE_{y,runoff}$ is to be calculated as follows:

$$PE_{y,runoff} = Q_{y,ww,runoff} * COD_{y,ww,runoff} * B_{o,ww,runoff} * MCF_{ww,runoff} * UF_{b,runoff} * GWP\_CH_4$$

(Equation 10)

Where:

$Q_{y,ww,runoff}$	Volume of runoff water in the year *y* (m^3)
$COD_{y,ww,runoff}$	Chemical oxygen demand of the runoff water leaving the composting facility in the year *y* ($tonnes/m^3$)
$B_{o,ww,runoff}$	Methane producing capacity of the wastewater (kg CH_4/kgCOD)
$MCF_{ww,runoff}$	Methane correction factor for the wastewater treatment system where the runoff water is treated
$UF_{b,runoff}$	Model correction factor to account for model uncertainties for runoff

B.6.2. Data and parameters that are available at validation:

(Copy this table for each data and parameter)

Data / Parameter:	**φ**
Data unit:	-
Description:	Model correction factor to account for model uncertainties
Source of data used:	Tool to determine methane emission avoided from disposal of waste at a solid waste disposal site
Value applied:	0.9
Justification of the choice of data or description of measurement methods and procedures actually applied :	Value required by tool
Any comment:	

Data / Parameter:	**OX**
Data unit:	-
Description:	Oxidation factor (reflecting the amount of methane from SWDS that is oxidised in the soil or other material covering the waste)
Source of data used:	Tool to determine methane emission avoided from disposal of waste at a solid waste disposal site
Value applied:	0
Justification of the choice of data or description of measurement methods and procedures actually applied :	Wastes have never been covered by oxidizing material such as soil or compost. Therefore, the value of 0 applies.
Any comment:	

Data / Parameter:	**F**
Data unit:	Volume fraction
Description:	Fraction of methane in the SWDS gas
Source of data used:	Tool to determine methane emission avoided from disposal of waste at a solid waste disposal site
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	Value required by tool
Any comment:	

Data / Parameter:	**DOC_f**
Data unit:	-
Description:	Fraction of degradable organic carbon (DOC) that can decompose
Source of data used:	Tool to determine methane emission avoided from disposal of waste at a solid waste disposal site
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	Value required by tool
Any comment:	

Data / Parameter:	**MCF**
Data unit:	-
Description:	Methane correction factor
Source of data used:	Tool to determine methane emission avoided from disposal of waste at a solid waste disposal site
Value applied:	0.4
Justification of the choice of data or description of measurement methods and procedures actually applied :	This is the lowest (most conservative) possible value and applies to unmanaged-shallow SWDS. Baseline waste management can be classified as unmanaged and as shallow.
Any comment:	

Data / Parameter:	**DOC_j**
Data unit:	-
Description:	Fraction of degradable organic carbon (by weight) in the waste type *j*
Source of data used:	Tool to determine methane emission avoided from disposal of waste at a solid waste disposal site
Value applied:	0.2
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value applied corresponds to garden, yard and park waste. The EFB being composted in this project activity is similar to garden waste, as per the tool.
Any comment:	Waste quantities and waste characteristics will be measured and reported on a wet basis

Data / Parameter:	k_j
Data unit:	-
Description:	Decay rate for the waste type *j*
Source of data used:	Tool to determine methane emission avoided from disposal of waste at a solid waste disposal site
Value applied:	0.17
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value applied corresponds to garden, yard and park waste. The EFB being composted in this project activity is similar to garden waste, as per the tool. The value corresponds to tropical, wet conditions. Mean temperature en El Copey is 32°C[4]. Annual rainfall averages 1182 mm[5]. Both of these values are above the 20°C and 1000 mm respective thresholds.
Any comment:	

Data / Parameter:	$B_{o,ww}$
Data unit:	kg CH_4/kg COD
Description:	Methane producing capacity for the wastewater
Source of data used:	AMS III.F version 08
Value applied:	0.21
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default value in methodology, based on the IPCC default value of 0.25.
Any comment:	

Data / Parameter:	$MCF_{ww,treatment}$
Data unit:	-
Description:	Methane correction factor for the wastewater treatment system in the baseline scenario
Source of data used:	AMS III.F version 08 Table III.F.1
Value applied:	0.8
Justification of the choice of data or description of measurement methods and procedures actually applied :	Palmeras has two anaerobic deep lagoons (3 meters deep). This value applies to anaerobic lagoons with a depth over 2 meters.
Any comment:	

4 As reported by the El Copey municipal government: http://www.elcopey-cesar.gov.co/nuestromunicipio.shtml?apc=m1I1--&m=f

5 14 year average rainfall as measured by Palmeras' met station

Data / Parameter:	**$UF_{b,ww}$**
Data unit:	-
Description:	Model correction factor to account for model uncertainties for wastewater
Source of data used:	AMS III.F version 08
Value applied:	0.94
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default value in methodology
Any comment:	

Data / Parameter:	**w_{OM}**
Data unit:	%
Description:	Weighting of operating margin emissions factor
Source of data used:	Tool to calculate the emission factor for an electricity system
Value applied:	50%
Justification of the choice of data or description of measurement methods and procedures actually applied :	Applies to the first crediting period for all project types except wind or solar generation.
Any comment:	

Data / Parameter:	**$EF_{grid,OM,y}$**
Data unit:	tCO_2e/MWh
Description:	Operating margin emission factor for electricity in year
Source of data used:	Annual generation of power units as reported in the NEON database for system and market operation. Emission factors as calculated and reported by the Energy Planning Unit (UPME).
Value applied:	0.1114
Justification of the choice of data or description of measurement methods and procedures actually applied :	Detailed calculation is shown in Annex 3, arriving at the following annual values: 2006: 0.1205 2007: 0.1131 2008: 0.1005
Any comment:	

Data / Parameter:	$\mathbf{w_{BM}}$
Data unit:	%
Description:	Weighting of build margin emissions factor
Source of data used:	Tool to calculate the emission factor for an electricity system
Value applied:	50%
Justification of the choice of data or description of measurement methods and procedures actually applied :	Applies to the first crediting period for all project types except wind or solar generation.
Any comment:	

Data / Parameter:	$\mathbf{EF_{grid,BM,y}}$
Data unit:	tCO_2e/MWh
Description:	Build margin emission factor for electricity in year y
Source of data used:	Mining and Energy Planning Unit (UPME) of the Colombian Ministry of Mines and Energy; Emission Factor for the Colombian Interconnected Power System, version 0.1
Value applied:	0.2129
Justification of the choice of data or description of measurement methods and procedures actually applied :	This UPME report utilizes the “Tool to calculate the emission factor for an electricity system” and official data on all generators in the system..
Any comment:	

Data / Parameter:	**TDL**
Data unit:	- -
Description:	Average technical transmission and distribution losses for the power grid
Source of data used:	Tool to calculate baseline, project and/or leakage from electricity consumption, version 01
Value applied:	0.2
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default value as per tool
Any comment:	

Data / Parameter:	NCV_{Diesel}
Data unit:	GJ/t
Description:	Net calorific value of diesel fuel
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2, Energy, Table 1.2
Value applied:	43.0
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC default value as per methodology AMS III.F
Any comment:	

Data / Parameter:	D
Data unit:	kg/l
Description:	Density of diesel fuel
Source of data used:	Reece, Mieke. Densities of Oil Products. IEA, Paris. Nov 2004
Value applied:	0.8397
Justification of the choice of data or description of measurement methods and procedures actually applied :	Diesel fuel consumption will be monitored on a volumetric basis
Any comment:	

Data / Parameter:	EF_{Diesel}
Data unit:	tCO_2e/GJ
Description:	CO_2 emission factor for diesel fuel
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2, Energy, Table 2.2
Value applied:	0.0741
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC default value as per methodology AMS III.F
Any comment:	

Data / Parameter:	**$EF_{composting}$**
Data unit:	T CH_4/ton waste treated
Description:	Emission factor for composting of organic waste and/or manure
Source of data used:	AMS III.F version 08
Value applied:	0.004
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC default values. wet weight basis
Any comment:	Waste quantities and waste characteristics will be measured and reported on a wet basis

Data / Parameter:	**h_d**
Data unit:	%
Description:	Humidity of wet waste
Source of data used:	Calculated, based on AMS III.F version 08 paragraph 24
Value applied:	60%
Justification of the choice of data or description of measurement methods and procedures actually applied :	This parameter converts dry weight basis measurements to wet weight basis. It is implicitly derived from the 10 g CH_4 / kg emission factor on a dry weight basis and the 4 g CH_4 / kg emission factor on a wet weight basis.
Any comment:	

Data / Parameter:	**$B_{o,ww,runoff}$**
Data unit:	kg CH_4/kg COD
Description:	Methane producing capacity of the wastewater
Source of data used:	AMS III.F version 08
Value applied:	0.21
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default value in methodology, based on the IPCC default value of 0.25.
Any comment:	

Data / Parameter:	$MCF_{ww,runoff}$
Data unit:	-
Description:	Methane correction factor for the wastewater treatment system where the runoff water is treated
Source of data used:	AMS III.F version 08 Table III.F.1
Value applied:	0.2
Justification of the choice of data or description of measurement methods and procedures actually applied :	Runoff water will be treated in lagoons that will no longer be in use. Depth will be maintained less than 2 meters. This value applies to anaerobic shallow lagoons (depth less than 2 meters)
Any comment:	The subscripts for this variable have been modified for clarity.

Data / Parameter:	$UF_{b,runoff}$
Data unit:	-
Description:	Model correction factor to account for model uncertainties for runoff
Source of data used:	AMS III.F version 08
Value applied:	1.06
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default value in methodology.
Any comment:	The subscripts for this variable have been modified for clarity.

B.6.3 Ex-ante calculation of emission reductions:

The ex-ante calculation of emission reductions is carried out in the attached spreadsheet. This section describes all equations and parameters used in the ex-ante calculation.

Ex-ante Calculation of Baseline Emissions

Baseline emissions for the methane generation potential of solid waste (EFB) are calculated from equation 2 using the following parameters:

Parameter	*Data Unit*	*Value*	*Source/Explanation*
φ	- -	0.9	Fixed value (please see section B.6.2)
f	- -	0	No methane capture at SWDS
GWP_{CH4}	- -	21	Tool default value
OX	- -	0	Fixed value (please see section B.6.2)
F	Volume fraction	0.5	Fixed value (please see section B.6.2)
DOC_f	- -	0.5	Fixed value (please see section B.6.2)
MCF	- -	0.4	Fixed value (please see section B.6.2)

$W_{j,x}$	tons	50,600	Estimated EFB production 2012
DOC_j	- -	0.2	Fixed value (please see section B.6.2)
k_j	yr^{-1}	0.17	Fixed value (please see section B.6.2)

The result of introducing these parameters into equation 2 for year one is:

$BE_{CH4,SWDS,1}$ = 3,986 ton CO_2e

Baseline emissions for the methane generation potential of wastewater (POME) are calculated from equation 3 using the following parameters:

Parameter	***Data Unit***	***Value***	***Source/Explanation***
$Q_{y,ww,in}$	m^3	176,000	Estimated POME production 2012
$COD_{y,ww,untreated}$	$tonnes/m^3$	0.055	Typical historic measured value
$B_{o,ww}$	kg CH_4/kg COD	0.21	Fixed value (please see section B.6.2)
$MCF_{ww,treatment}$	- -	0.8	Fixed value (please see section B.6.2)
$UF_{b,ww}$	- -	0.94	Fixed value (please see section B.6.2)

The result of introducing these parameters into equation 3 for year one is:

$MEP_{1,ww}$ = 1,529 ton CH_4

Equation 1 is simplified to reflect that no methane capture from the anaerobic treatment lagoons or the SWDS is required under prevailing regulations and that manure is not included in this project activity:

$$BE_y = BE_{CH4,SWDS,y} + (MEP_{y,ww} * GWP\_CH_4)$$

Baseline emissions for year 1 are thus calculated to be:

BE_1 = 36,088 ton CO_2e

<u>Ex-ante Calculation of Project Emissions</u>

Project emissions from incremental fuel use and power consumption are calculated from equations 5 and 6 using the following parameters:

Parameter	***Data Unit***	***Value***	***Source/Explanation***
EC_y	MWh	1,728	Estimated project power consumption
$FC_{Diesel, y}$	t	124	Estimated project diesel consumption
NCV_{Diesel}	GJ/t	43.0	Fixed value (please see section B.6.2)
EF_{Diesel}	tCO_2e/GJ	0.0741	Fixed value (please see section B.6.2)
W_{OM}	- -	0.50	Fixed value (please see section B.6.2)
$EF_{grid,OM,y}$	tCO_2e/MWh	0.1114	Fixed value (please see section B.6.2)
w_{BM}	- -	0.50	Fixed value (please see section B.6.2)
$EF_{grid,BM,y}$	tCO_2e/MWh	0.2129	Fixed value (please see section B.6.2)
TDL_y	- -	0.20	Fixed value (please see section B.6.2)

The result of introducing these parameters into equations 5 and 6 is:

$PE_{1,power}$ = 731 ton CO_2e

Project emissions from composting activities are calculated from equations 8 and 9 using the following parameters:

Parameter	***Data Unit***	***Value***	***Source/Explanation***
$EF_{composting}$	tCH_4/t waste treated	0.004	Fixed value (please see section B.6.2)
GWP_CH_4		21	AMS III.F default value
$f_{dry,y}$		0.80	Initial estimate; will be monitored
W_y	t	50,600	Estimated EFP production 2012
$Q_{y,ww,in}$	m^3	176,000	Estimated POME production 2012
$TSS_{ww,y}$	t/m^3	0.02	Typical historic measured value
h_d		0.60	Fixed value (please see section B.6.2)

The result of introducing these parameters into equations 8 and 9 is:

$PE_{1,comp}$ = 998 ton CO_2e

Project emissions from runoff are calculated from equation 10 using the following parameters:

Parameter	***Data Unit***	***Value***	***Source/Explanation***
$Q_{y,ww,runoff}$	m^3	30,000	Estimated based on annual rainfall
$COD_{y,ww,runoff}$	tonnes/m^3	0.01	Estimated based on similar CDM projects
$B_{o,ww,runoff}$	kg CH_4/kg COD	0.21	Fixed value (please see section B.6.2)
$MCF_{ww,runoff}$	- -	0.20	Fixed value (please see section B.6.2)
$UF_{b,runoff}$	- -	1.06	Fixed value (please see section B.6.2)
GWP_CH_4		21	AMS III.F default value

The result of introducing these parameters into equation 10 is:

$PE_{1,runoff}$ = 280 ton CO_2e

Equation 4 is simplified to reflect that no incremental emissions occur due to waste transport, leakage or anaerobic decomposition of residual waste:

$$PE_y = PE_{y,power} + PE_{y,comp} + PE_{y,runoff}$$

Project emissions for year 1 are thus calculated to be:

PE_1 = 2,010 ton CO_2e

B.6.4 Summary of the ex-ante estimation of emission reductions:

Year	Estimation of project activity emissions (tCO_2 e)	Estimation of baseline emissions (tCO_2 e)	Estimation of leakage (tCO_2 e)	Estimation of overall emission reductions (tCO_2 e)
Year 1*	2,010	36,088	0	34,078
Year 2	2,010	39,451	0	37,441
Year 3	2,010	42,288	0	40,278
Year 4	2,010	44,681	0	42,672
Year 5	2,010	46,701	0	44,691
Year 6	2,010	48,404	0	46,395
Year 7	2,010	49,842	0	47,832
Total (Tonnes of CO_2 e)	**14,070**	**307,454**	**0**	**293,386**

*Please refer to section C.2.1 for the estimated start date of the crediting period

B.7 Application of a monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

Data / Parameter:	**$MD_{y,reg}$**
Data unit:	tons
Description:	Amount of methane that would have to be captured and combusted in the year y to comply with the prevailing regulations
Source of data to be used:	Published regulation regarding waste management practices
Value of data	0 (at validation)
Description of measurement methods and procedures to be applied:	Literature review of promulgated regulations
QA/QC procedures to be applied:	Informal consultation with regional regulator
Any comment:	

Data / Parameter:	**GWP_CH_4**
Data unit:	
Description:	GWP for CH_4
Source of data to be used:	UNFCCC
Value of data	21 (at validation)
Description of measurement methods and procedures to be applied:	Literature review for CDM requirements
QA/QC procedures to be applied:	N/A
Any comment:	

Data / Parameter:	**f**
Data unit:	
Description:	Fraction of methane captured at the SWDS and flared, combusted or used in another manner
Source of data to be used:	Onsite inspection
Value of data	0 (at validation)
Description of measurement methods and procedures to be applied:	Photographic records of onsite SWDS
QA/QC procedures to be applied:	N/A
Any comment:	

Data / Parameter:	**$W_{j,x}$**	
Data unit:	Tons	
Description:	Amount of organic waste type *j* prevented form disposal in the SWDS in the year *x (EFB)*	
Source of data to be used:	Onsite weigh scale	
Value of data	50,600 (estimated annual value at validation)	
Description of measurement methods and procedures to be applied:	Method	Direct measurement
	Frequency	Each lot
	Equipment	Vehicle weigh scale
	Calibration	Onsite calibration and certification annually
	Accuracy	High
	Responsibility	Plant operators
QA/QC procedures to be applied:	Measurement to be included within the plant's integrated management system (certified to ISO 9001) EFB weight will be cross-checked with Fresh Fruit Bunch (FFB) within the plant's data management system. EFB is expected to be in the range of 23% to 24% of FFB, subject to seasonal variation	
Any comment:		

Data / Parameter:	**$Q_{y,ww,in}$**	
Data unit:	m^3	
Description:	Volume of wastewater entering the co-composting facility in the year *y (POME)*	
Source of data to be used:	Onsite flow meter	
Value of data	176,000 (estimated at validation)	
Description of measurement methods and procedures to be applied:	Method	Direct measurement
	Frequency	Continuous monitoring; monthly recordings
	Equipment	Flow meter with totalizer
	Calibration	Offsite calibration every three years
	Accuracy	High
	Responsibility	Environmental coordinator
QA/QC procedures to be applied:	Measurement to be included within the plant's integrated management system (certified to ISO 9001) POME volume will be cross-checked with Fresh Fruit Bunch (FFB) within the plant's data management system. POME is expected to be in the range of 0.7 to 0.8 m^3/t FFB, subject to seasonal variation.	
Any comment:		

Data / Parameter:	**$COD_{y,ww,untreated}$**	
Data unit:	tonnes/m^3	
Description:	Chemical oxygen demand of the wastewater entering the co-composting facility in the year *y*	
Source of data to be used:	Offsite laboratory	
Value of data	0.055 (estimated at validation based on historical data)	
Description of measurement methods and procedures to be applied:	Method	Grab sampling and laboratory analysis
	Frequency	Quarterly
	Equipment	External laboratory accredited nationally for environmental control and certified to the standard ISO 17025
	Calibration	As per laboratory protocol for COD measurement
	Accuracy	High
	Responsibility	Environmental coordinator
QA/QC procedures to be applied:	Measurement to be included within the plant's integrated management system (certified to ISO 9001)	
Any comment:		

Data / Parameter:	**EC_y**	
Data unit:	MWh	
Description:	Electricity consumption from project equipment items in the year y	
Source of data to be used:	Onsite power meter	
Value of data	1,728 (estimated at validation)	
Description of measurement methods and procedures to be applied:	Method	Direct measurement
	Frequency	Continuous monitoring; monthly recordings
	Equipment	Power meter with totalizer
	Calibration	Offsite calibration every three years
	Accuracy	High
	Responsibility	Environmental coordinator
QA/QC procedures to be applied:	Measurement to be included within the plant's integrated management system (certified to ISO 9001)	
Any comment:		

Data / Parameter:	**$FC_{Diesel,y}$**	
Data unit:	l	
Description:	Consumption of diesel fuel from project equipment in the year y	
Source of data to be used:	Onsite fuel pump	
Value of data	124t (estimated at validation)	
Description of measurement methods and procedures to be applied:	Method	Direct measurement of fuelling of project activity equipment
	Frequency	Each fuelling event
	Equipment	Onsite fuel pump
	Calibration	Annually
	Accuracy	High
	Responsibility	Plant operators
QA/QC procedures to be applied:	Measurement to be included within the plant's integrated management system (certified to ISO 9001) All onsite diesel consumption is measured and assigned to operational cost centres. This data can be cross-checked through accounting records.	
Any comment:	The project might install a diesel tank at the compost plant. If so, the filling of this tank will be dispatched by the onsite fuel pump.	

Data / Parameter:	**$f_{dry,y}$**	
Data unit:		
Description:	Fraction of compost that is produced in the presence of at least 8% oxygen	
Source of data to be used:	Onsite oxygen sampling and analysis	
Value of data	0.8 (conservative estimate at validation)	
Description of measurement methods and procedures to be applied:	Method	Spot sampling of oxygen content in compost piles and statistical determination of $f_{dry,y}$ as per the General guidelines for samples and surveys for SSC project activities.
	Frequency	Monthly
	Equipment	Portable oxygen meter with a 1m lance
	Calibration	Self-calibrating oxygen probe (zero and full-scale)
	Accuracy	High
	Responsibility	Plant operators
QA/QC procedures to be applied:	Measurement to be included within the plant's integrated management system (certified to ISO 9001)	
Any comment:	Measurement to be included within the Compost Quality Control Program (described below)	

Data / Parameter:	**$TSS_{ww,y}$**	
Data unit:	t/m^3	
Description:	Total suspended solids in wastewater	
Source of data to be used:	Offsite laboratory	
Value of data	0.02 (estimated at validation based on historical records)	
Description of measurement methods and procedures to be applied:	Method	Grab sampling and laboratory analysis
	Frequency	Quarterly
	Equipment	External laboratory accredited nationally for environmental control and certified to the standard ISO 17025
	Calibration	As per laboratory protocol for TSS measurement
	Accuracy	High
	Responsibility	Environmental coordinator
QA/QC procedures to be applied:	Measurement to be included within the plant's integrated management system (certified to ISO 9001)	
Any comment:		

Data / Parameter:	**$Q_{y,ww,runoff}$**	
Data unit:	m^3	
Description:	Volume of runoff water in the year *y*	
Source of data to be used:	Onsite flow meter	
Value of data	30,000 (estimated at validation based on annual rainfall)	
Description of measurement methods and procedures to be applied:	Method	Direct measurement
	Frequency	Continuous monitoring; monthly recordings
	Equipment	Flow meter with totalizer
	Calibration	Offsite calibration every three years
	Accuracy	High
	Responsibility	Environmental Coordinator
QA/QC procedures to be applied:	Measurement to be included within the plant's integrated management system (certified to ISO 9001)	
Any comment:		

Data / Parameter:	**$COD_{y,ww,runoff}$**	
Data unit:	tonnes/m^3	
Description:	Chemical oxygen demand of the runoff water leaving the composting facility in the year *y*	
Source of data to be used:	Offsite laboratory	
Value of data	0.01 (estimated at validation based on monitoring reports of similar projects)	
Description of measurement methods and procedures to be applied:	Method	Grab sampling and laboratory analysis
	Frequency	Quarterly
	Equipment	External laboratory accredited nationally for environmental control and certified to the standard ISO 17025
	Calibration	As per laboratory protocol for COD measurement
	Accuracy	High
	Responsibility	Environmental coordinator
QA/QC procedures to be applied:	Measurement to be included within the plant's integrated management system (certified to ISO 9001)	
Any comment:		

Data / Parameter:	**Compost Quality Control Program**
Data unit:	- -
Description:	The operation of the co-composting facilities will be documented in a quality control program, monitoring the conditions and establishing the procedures that ensure the aerobic condition of the waste during the composting process (pile geometry, turning frequency, oxygen, moisture, temperature, etc.).
Source of data to be used:	Record keeping of onsite measurements as per the quality management system.
Value of data	- -
Description of measurement methods and procedures to be applied:	The compost quality control program will be included within the scope of Palmeras' quality management system, certified to the ISO 9001 standard. These technical specifications are subject to modification, based on the commitment to continuous improvement under the ISO 9001 standard.
QA/QC procedures to be applied:	Incorporated within the quality management system.
Any comment:	The initial technical specifications for this system are included in Annex 4.

Data / Parameter:	**Adequate Soil Application of Compost**
Data unit:	- -
Description:	Soil application of the compost will be monitored
Source of data to be used:	Onsite inspection
Value of data	- -
Description of measurement methods and procedures to be applied:	The compost will be applied to Palmeras' plantation in thin layers to assure aerobic decomposition. Photographic evidence will be collected annually to document the adequate soil application of compost.
QA/QC procedures to be applied:	N/A
Any comment:	

B.7.2 Description of the monitoring plan:

The monitoring plan has been designed to integrate the measurement and record keeping of the 14 data and parameters listed above within the Palmeras' management system, certified to the ISO 9001 standard.

Classification of Data and Parameters

Type of Monitoring	*Data and Parameters*
Continuous automated monitoring with monthly register by the environmental coordinator	$Q_{y,ww,in}$ EC_y $Q_{y,ww,runoff}$
Continuous monitoring by lots with manual register by operators	$W_{i,y}$ FC_{Diesel}
Monthly monitoring onsite with manual register by operators	$f_{dry,y}$
Quarterly monitoring offsite	$COD_{y,ww,untreated}$ $TSS_{ww,y}$ $COD_{y,ww,runoff}$
Annual photographic monitoring	Adequate Soil Application of Compost
Annual monitoring of CDM variables	$MD_{y,reg}$ GWP_CH_4 f
Integrated QA/QC	Compost Quality Control Program

Monitoring Equipment

Monitoring equipment will be inventoried and included within Palmeras' registry of measurement equipment items.

Maintenance and calibration requirements for monitoring equipment will be included within Palmeras' schedule for maintenance and calibration of measurement equipment items. Maintenance will be carried out by preventative maintenance services. Calibration will be contracted with registered service providers.

Existing onsite monitoring equipment items are:

- Truck scale
- Diesel fuel pump

Newly purchased monitoring equipment items for this project activity are:

- Wastewater flow meter
- Compost plant runoff water flow meter
- Compost plant power meter
- Portable oxygen probe with 1m lance
- Temperature and humidity probes for the Compost Quality Control Program

Operational and Management Structure

The operational and management structure for monitoring emission reductions assimilates into Palmeras' integrated management system (comprising both quality and environmental management), certified to the ISO 9001 standard:

- This project activity falls within the scope of the management structure for the production processes, overseen by the plant manager.
- The scope of Palmeras' quality control plan will be enlarged to include the Compost Quality Control Program.
- Monitoring equipment for this project activity and their maintenance and calibration requirements will be added to their respective registers within the integrated management system.
- Formats for recording data and data registers will be listed within the integrated management system.

The responsibilities of Palermas' personnel for monitoring activities are as follows:

Plant Manager	Global responsibility for operating the compost plant and monitoring operational data
Quality Coordinator	Record keeping of monitoring data
Environmental Coordinator	Recording of monitoring data except those by lots and CDM variables
Operators	Recording of monitoring by lots
Preventative Maintenance Services	Maintenance and calibration of monitoring equipment

Aretech Cambio Climático will carry out monitoring of CDM variables and prepare the monitoring reports.

Data Collection and Archiving

Within the integrated management system, data collection and archiving is managed as follows:

- Global procedure for document control and registry

- Predesigned formats for data collection
- Control of individual data registers (including access rights and data retention schedules)

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

B.8 Date of completion of the application of the baseline and monitoring methodology and the name of the responsible person(s)/entity(ies)

30 April 2010, completed by:

Aretech Cambio Climático, S.A.
La Estrada, 12
28034 Madrid

tel. +34 598 0196
fax. +34 556 7255

Contact:

Laurence W. (Larry) Philp
Managing Director

lphilp@aretechgroup.com

Aretech Cambio Climático is a project participant.

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

1 August 2010 (estimated date for ordering major equipment items and for contracting construction activities).

C.1.2. Expected operational lifetime of the project activity:

25 years (minimum)

C.2 Choice of the crediting period and related information:

This project activity has chosen a renewable crediting period.

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

1 November 2010 or registration date, if later.

C.2.1.2. Length of the first crediting period:

7 years, 0 months

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

Not applicable

C.2.2.2. Length:

Not applicable

SECTION D. Environmental impacts

D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

Environmental impact analysis is mandatory for certain types of activities since 1993[6]. This legal framework distinguishes three classes of activities and their respective requirements:

- Highest impact activities: These undergo a two-phase environmental impact analysis. The first phase is an environmental evaluation of all alternatives. A subset of these is chosen by the authority to undergo a full environmental impact analysis. If approved, the environmental licence is issued at the national level by the Ministry of Environment.
- High impact activities: These undergo a full environmental impact analysis. If approved, the environmental licence is issued at the national level by the Ministry of Environment.
- Moderate impact activities: These undergo a full environmental impact analysis. If approved, the environmental licence is issued at the regional level by the authorized agency.

Activities that are not listed within the regulatory framework are considered to be low impact, and thus do not require environmental impact analysis or an environmental licence to operate.

Composting is not listed in either Law 99/1993 or Decree 1220/2005. Therefore, the host Party does not require an analysis of the environmental impacts of this project activity.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

The environmental impacts of the project are considered negligible, whereas the environmental benefits are substantial. Therefore the net impacts of the project are considered beneficial.

Transforming wastes into useful products, such as compost in this project activity, is deemed high priority within the Colombian government's waste management policies[7].

[6] Law 99/1993. The listing of activities subject to environmental impact analysis and licensing is fully developed by regulation under Decree 1220/2005.

[7] National waste management policy is published in various documents and summarized at http://www.minambiente.gov.co/contenido/contenido.aspx?catID=355&conID=595

SECTION E. Stakeholders' comments

E.1. Brief description how comments by local stakeholders have been invited and compiled:

Local stakeholders were invited to a public meeting that was held in the El Copey Labour Union Hall on April 28, 2010. The meeting was announced previously in the El Copey Town Hall, as per Colombian CDM requirements[8]. A total of 50 persons attended the public meeting, representing:

- Local and regional government agencies
- NGOs and associations
- Private enterprises
- Local farmers
- Educators and university students
- Other interested members of the local community

All attendees were handed out a hard copy of the Spanish project summary at the meeting. This same project summary had been deposited in the town hall one month prior to the meeting, for consultation. After the project sponsors explained the project and the CDM process, the meeting was opened for comments, observations, and questions. Notes were taken during the meeting's commenting round. The entire meeting was recorded on DVD. A summary of the meeting with an inventory of the comments was prepared in Spanish by the Project participants.

E.2. Summary of the comments received:

No negative comments have been received in the context of the project. Many participants offered positive comments, recognizing the contribution of the Project to the region's sustainable development. A total of 21 comments were registered during the meeting and are summarized below:

Number of Comments	Summary of Comments
7	Congratulations to the Project.
4	Questions about the CDM process and other potential regional opportunities for CDM projects.
3	Questions about specific aspects of the Project and its compost technology.
3	General comments about regional environmental management issues, above and beyond the scope of the Project
1	Question about regional environmental and water resource management
1	Question about environmental management at Palmeras, above and beyond the scope of the Project.
1	Request for more public meetings of this nature about regional environmental management issues

[8] Resolution 551 / 2009 of the Ministry of Environment, Housing, and Territorial Development

1	Prayer for meeting attendees and the environment in general

E.3. Report on how due account was taken of any comments received:

No negative comments were received and hence, there was no need to take due account of the comments.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Palmeras de la Costa S.A.
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URL:	
Represented by:	
Title:	Gerente General
Salutation:	Dr.
Last Name:	Lopez Duran
Middle Name:	
First Name:	Jaime
Department:	
Mobile:	
Direct FAX:	
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Personal E-Mail:	

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Direct tel:	
Personal E-Mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

This project activity does not involve public funding or official development aid.

Annex 3

BASELINE INFORMATION

Calculation of Operating Margin Emission Factor

Power Unit	*Gen 06 MWh*	*Gen 07 MWh*	*Gen 08 MWh*	*EF tCO_2/MWh*
MENOR LA CASCADA-ABEJORRAL	0	1,516	5,116	
MENOR AGUA FRESCA	0	0	41,960	
ALBAN	1,767,628	2,001,691	1,888,970	
MENOR AMALFI	0	2,079	4,824	
MENOR AMERICA	528	342	225	
MENOR ASNAZU	3,814	3,840	4,095	
MENOR AYURA	101,643	114,959	113,928	
COGEN. BIOAISE	3,534	3,261	3,534	0.8163
MENOR BELLO	2,021	1,901	2,020	
MENOR BELMONTE	9,030	13,865	13,449	
MENOR EL BOSQUE	5,020	7,291	12,680	
MENOR BAYONA	3,636	3,343	876	
COGEN. CENTRAL CASTILLA	3,854	4,518	3,216	0.2860
MENOR COCONUCO	13,095	13,821	15,044	
BETANIA	2,204,844	2,013,310	2,359,955	
MENOR CALICHAL	323	423	561	
CHIVOR	4,714,234	3,997,677	3,760,240	
MENOR CIMARRON	0	31,525	71,270	0.8077
MENOR CALDERAS	47,825	92,321	98,520	
CALIMA	168,523	159,090	266,863	
COGEN. COLTEJER	2,765	3	1	1.0276
MENOR CEMENTOS DEL NARE	36,482	42,806	38,717	
MENOR CAMPESTRE (EPM)	2,271	2,231	1,677	
MENOR CAMPESTRE (CALARCA)	5,003	5,368	5,789	
MENOR CHARQUITO	65,540	53,666	95,099	
MENOR CARACOLI	17,621	19,545	18,544	
COROZO - SAN MATEO 2 230 KV	0	0	0	
MENOR CASCADA	4,408	20,854	22,746	
TERMOCARTAGENA 1	327	18,206	6,196	0.6896
TERMOCARTAGENA 2	0	0	19,599	0.6896
TERMOCARTAGENA 3	9,572	18,277	4,835	0.6726
MENOR MORRO 1	0	107,611	172,796	0.8884
MENOR MORRO 2	0	7,268	91,893	0.8884
COGEN. TUMACO	0	31	324	0.2860
MENOR DOLORES EPM	30,361	46,233	46,781	
ECUADOR-TULCÁN (ENLACE)	46	153	0	
ECUADOR-POMASQUI (ENLACE)	1,024	38,240	37,533	
ESMERALDA	212,968	189,713	220,253	

Power Unit	*Gen 06 MWh*	*Gen 07 MWh*	*Gen 08 MWh*	*EF tCO_2/MWh*
MENOR FLORIDA	99,814	88,639	95,100	
MENOR GUACAICA	6,175	6,459	4,621	
MENOR GRANADA	0	1,389	0	
GUATAPE	2,823,158	3,570,427	4,037,609	
GUATRON	2,618,565	2,822,998	2,384,184	
GUAVIO	6,110,795	5,339,818	5,409,098	
MIEL	1,492,197	1,461,814	1,600,479	
MENOR LA HERRADURA	113,188	124,066	110,932	
COGEN. INCAUCA	61,846	42,833	26,005	0.2860
COGEN. INGENIO PROVIDENCIA	1,311	1,511	1,706	0.2860
MENOR INSULA	121,261	126,705	63,508	
MENOR INTERMEDIA	5,113	6,762	6,252	
MENOR IQUIRA 1	18,122	17,197	18,857	
MENOR IQUIRA 2	9,807	8,763	12,259	
COGEN. INGENIO RISARALDA	12,033	8,661	7,577	0.2860
JAGUAS	716,755	848,160	978,628	
MENOR JULIO BRAVO	4,645	6,452	5,216	
MENOR LA JUNCA	142,082	126,056	134,060	
PARQUE EOLICO JEPIRACHI	62,981	49,891	53,918	
MENOR LIBARE	9,802	23,830	22,800	
MENOR LA CASCADA	0	7,834	15,428	
MENOR EL LIMON	3,299	5,732	226	
MENOR EL LIMONAR	117,612	87,555	103,275	
MENOR EL PALO	8,158	8,332	8,179	
LA TASAJERA	1,787,559	1,790,490	1,852,648	
MENOR MIROLINDO	16,922	17,990	18,073	
MENOR MUNICIPAL	8,351	8,621	8,633	
MENOR MONDOMO	2,927	2,441	1,567	
MENOR MANANTIALES	11,035	13,348	15,121	
MERILECTRICA 1	125,615	55,704	25,353	0.5629
MENOR NIMA	44,858	36,891	50,018	
MENOR NIQUIA	97,270	98,820	105,319	
MENOR NUTIBARA	3,306	2,726	2,158	
MENOR OVEJAS	6,091	7,028	5,003	
MENOR PIEDRAS BLANCAS	15,230	17,468	13,081	
MENOR PIEDRAS	2,475	2,730	137	
PARAISO GUACA	3,307,239	3,565,166	4,088,926	
MENOR PAJARITO	27,995	29,463	29,949	
MENOR PALMAS SAN GIL	77,642	73,435	82,514	
PALENQUE 3	2,588	607	396	0.8361
MENOR URRAO	0	2,532	5,937	
PLAYAS	1,437,975	1,648,935	1,552,705	
MENOR REMEDIOS	0	982	2,986	
COGEN. PROENCA	5,982	7,335	5,139	0.2860
PAIPA 1	69,240	62,726	0	1.1890

Power Unit	*Gen 06 MWh*	*Gen 07 MWh*	*Gen 08 MWh*	*EF tCO_2/MWh*
PAIPA 2	246,659	301,821	281,247	1.1890
PAIPA 3	302,605	295,753	277,498	1.1938
PAIPA 4	889,600	1,003,020	764,270	0.9000
PORCE II	1,929,505	2,037,517	2,191,913	
MENOR PRADO 4	35,962	30,958	44,173	
PRADO	200,030	156,885	272,942	
PROELECTRICA 1	50,241	41,657	21,705	0.4769
PROELECTRICA 2	49,773	44,768	34,322	0.4769
MENOR PASTALES 1	3,721	2,669	5,212	
MENOR LA PITA	10,346	10,577	10,651	
MENOR PATICO - LA CABRERA	6,556	5,847	7,305	
MENOR PUENTE GUILLERMO	6,776	5,673	7,225	
MENOR PTAR	0	0	0	
MENOR PROVIDENCIA	12,887	15,252	9,800	
MENOR RIO BOBO	20,800	13,485	23,359	
MENOR LA REBUSCA	2,878	3,085	162	
MENOR RIO ABAJO	5,585	6,085	5,169	
MENOR RIO RECIO	2,335	2,668	2,578	
MENOR RIO CALI	14,388	13,422	16,089	
MENOR RIO FRIO I	8,087	7,024	9,815	
MENOR RIO FRIO II	60,221	59,813	64,351	
MENOR RIO GRANDE	3,042	2,816	3,219	
RIOGRANDE	35,545	70,661	94,088	
MENOR RIO INGENIO	260	71	0	
MENOR RUMOR	12,003	15,282	16,587	
MENOR RIO MAYO	109,536	113,586	111,615	
MENOR RIONEGRO	0	29,840	46,216	
MENOR RIO PIEDRAS	148,407	152,131	173,659	
COGEN. INGENIO RIOPAILA	2,738	4,450	4,387	0.2860
MENOR SAN JOSE DE LA MONTAÑA	0	1,343	2,756	
MENOR SAJANDI	14,735	16,578	13,086	
MENOR SAN JOSE	2,197	2,284	2,227	
MENOR SILVIA	2,744	2,459	2,854	
SALVAJINA	1,102,790	1,176,789	1,574,292	
MENOR SAN CANCIO	9,334	12,948	14,836	
SAN CARLOS	5,929,878	7,216,390	7,396,189	
SAN FRANCISCO	295,502	261,651	326,892	
MENOR SONSON	123,678	93,095	58,970	
MENOR SANTA ANA	53,803	49,921	31,014	
MENOR RIO SAPUYES	6,297	9,765	10,464	
MENOR SERVITA	3,211	3,035	2,771	
MENOR SUEVA 2	34,080	30,919	32,207	
TERMOBARRANQUILLA 3	48,612	25,585	25,667	0.5664
TERMOBARRANQUILLA 4	37,120	23,994	26,306	0.5821
TEBSA TOTAL	4,164,731	3,894,720	3,441,495	0.4554

Power Unit	*Gen 06 MWh*	*Gen 07 MWh*	*Gen 08 MWh*	*EF tCO_2/MWh*
TERMOCANDELARIA 1	127,009	156,139	6,127	0.5576
TERMOCANDELARIA 2	34,506	8,756	3,526	0.5652
TERMODORADA 1	8,347	14,403	17,305	0.5669
TERMOEMCALI 1	18,208	11,060	7,949	0.4111
TERMOFLORES 1	647,025	531,514	682,747	0.4554
TERMOFLORES 2	189,748	49,855	53,224	0.5839
TERMOFLORES 3	292,569	58,295	60,869	0.5605
GUAJIRA 1	284,545	121,184	169,534	1.1590
GUAJIRA 2	179,264	89,582	160,650	1.3222
MENOR LA TINTA	141,544	114,867	95,632	
MENOR TAMESIS	7,438	8,940	7,806	
MENOR TERMOPIEDRAS	0	12	5	0.8634
MENOR TEQUENDAMA	140,916	113,864	128,066	
TERMOCENTRO 1	229,283	408,882	31,270	0.4505
TASAJERO 1	758,816	762,308	691,144	0.9147
TERMO SIERRA 1	110,773	386,747	234,543	0.3719
TERMOVALLE 1	75,134	19,840	56,623	
TERMOYOPAL 1	151,091	73,588	59,155	0.8884
TERMOYOPAL 2	201,012	158,043	156,858	0.8077
MENOR UNION	2,416	3,282	1,995	
URRA	1,299,618	1,466,594	1,357,205	
MENOR LA VUELTA	42,849	50,498	66,727	
MENOR VENTANA 2	7,481	11,712	9,851	
MENOR VENTANA 1	16,887	16,233	16,298	
CUESTECITAS - CUATRICENTENARIO 1 230 KV	27,022	1,147	0	
ZIPAEMG 2	53,903	111,361	50,575	1.2282
ZIPAEMG 3	61,559	97	115,521	0.9240
ZIPAEMG 4	70,547	77,607	215,874	0.8672
ZIPAEMG 5	135,093	289,017	89,958	0.8355
MENOR ZARAGOZA	7,382	7,650	8,197	
Total, MWh	**52,368,141**	**53,665,663**	**54,432,531**	
CO_2 Emissions, tons	***6,312,393***	***6,070,740***	***5,469,908***	
Average OM, tCO_2/MWh	**0,1205**	**0,1131**	**0,1005**	

Data sources (as indicated in section B.6.2):

Annual generation of power units as reported in the NEON database for system and market operation. http://sv04.xm.com.co/neonweb/

Emission factors as calculated and reported by the Energy Planning Unit (UPME).

Annex 4

MONITORING INFORMATION

IQNet

THE INTERNATIONAL CERTIFICATION NETWORK

CERTIFICATE

IQNet and
ICONTEC
hereby certify that the organization

PALMERAS DE LA COSTA S.A.

Calle 75 No. 59-69 Barranquilla, Atlántico
Planta de Fabricación El Copey, Cesar
(Colombia)

for the following field of activities:

Producción y entrega de aceite crudo de palma, aceite crudo de palmiste y torta de palmaste

Production and delivery of crude palm oil, crude palm kernel oil and palm kernel meal

has implemented and maintains a

Quality Management System

which fulfills the requirements of the following standard

ISO 9001:2008

Issued on: 2009 08 19
Validity date: 2012 09 28

Registration Number: CO-SC 1680-1

René Wasmer
President of IQNet

Fabio Tobón
Executive Director of ICONTEC

ICONTEC INTERNATIONAL

IQNet Partners*:
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CQM *China* CQS *Czech Republic* Cro Cert *Croatia* DQS *Germany* DS *Denmark* ELOT *Greece* FCAV *Brazil*
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Quality Austria *Austria* RR *Russia* SAI Global *Australia* SII *Israel* SIQ *Slovenia* SIRIM QAS International *Malaysia*
SQS *Switzerland* SRAC *Romania* TEST St Petersburg *Russia* YUQS *Serbia*
IQNet is represented in the USA by: AFAQ AFNOR, CISQ, DQS, NSAI Inc. and SAI Global
* The list of IQNet partners is valid at the time of issue of this certificate. Updated information is available under www.iqnet-certification.com

Indicative Preliminary Compost Quality Control Program

Process step	**Process description**	**Parameter to monitor**	**Specification limit**	**Recording Frequency**	**Trigger point**	**Inspection method**	**Routine procedure**
Making of windrows/mixing of feedstock	➢ Reception of EFB	Type of feedstock	EFB only	Daily	Non EFB	Visual	Identify foreign feedstock and discard
	➢ Eventually mixing with boiler ash ➢ Continuous discharge of EFB and transfer for composting heap building process	Heap height (m)	2.3 m ± 10%		<2.0 m	Visual	Increase height of heaps by adding more material on the top
					>2.5 m	Visual	Decrease height of heaps by removing excess material
		Heap width (m)	6.0 m ± 5%		>6.5 m	Visual	Decrease width of heaps by removing excess more material
					<5.5 m	Visual	Increase width of heaps by adding more material
	➢ Spraying of POME on the compost heap ➢ Mixing by turning of heaps with windrow turner	Moisture	50-65%		>65%	Portable Moisture Probe	Cease POME spraying
					<50%	Portable Moisture Probe	Increase POME spraying
Composting process: active phase	➢ Regular turning of windrows and spraying of POME up to day 55 (indicative time) ➢ Maintaining high decomposition rate under aerobic conditions ➢ Regular monitoring to measure the benchmark of the composting process	Temperature (ºC)	45-65ºC	Daily	>65ºC	Portable Temperature Probe	Turn windrow
		Oxygen(%)	10-15%	Weekly	<10%	Portable Oxygen Probe	Turn windrow
		Moisture(%)	50-65%	Daily	>65%	Portable Moisture Probe	Cease POME spraying
					<50%	Portable Moisture Probe	Increase POME spraying

Indicative Preliminary Compost Quality Control Program

Process step	**Process description**	**Parameter to monitor**	**Specification limit**	**Recording Frequency**	**Trigger point**	**Inspection method**	**Routine procedure**
Curing phase	➢ Reception of composted material for curing process ➢ A minimum of 15 days period to cool down and dry the active material ➢ Curing inspection process to ensure material is suitable to be released	Moisture (%)	25-30%	Weekly	>35%	Portable Moisture Probe	Extend curing period to air dry the material
		Temperature (ºC)	Ambient (~34ºC) + 10ºC	Weekly	>45ºC	Portable Temperature Probe	Extend curing process; pending for rework/corrective action
		C: N Ratio	20:1 – 40:1	6 per year	<20:1	Lab analysis	Change mixing / additive guidelines
					>40:1	Lab analysis	Change mixing / additive guidelines