CLEAN DEVELOPMENT MECHANISM
SMALL-SCALE PROGRAM ACTIVITY DESIGN DOCUMENT FORM (CDM-SSC-CPA-DD)
Version 01

CONTENTS

Annexes

NOTE:

(i) This form is for submission of CPAs that apply a small scale approved methodology using the provision of the proposed small scale CDM PoA.

(ii) The coordinating/managing entity shall prepare a CDM Small Scale Programme Activity Design Document (CDM-SSC-CPA-DD)[1,2] that is specified to the proposed PoA by using the provisions stated in the SSC PoA DD. At the time of requesting registration the SSC PoA DD must be accompanied by a CDM-SSC CPA-DD form that has been specified for the proposed SSC PoA, as well as by one completed CDM-SSC CPA-DD (using a real case). After the first CPA, every CPA that is added over time to the SSC PoA must submit a completed CDM-SSC CPA-DD.

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[1] The latest version of the template form CDM-CPA-DD is available on the UNFCCC CDM web site in the reference/document section.

[2] At the time of requesting validation/registration, the coordinating managing entity is required to submit a completed CDM-POA-DD, the PoA specific CDM-CPA-DD, as well as one of such CDM-CPA-DD completed (using a real case).

SECTION A. General description of small scale CDM programme activity (CPA)

A.1. Title of the small-scale CPA:

CPA Name POME and EFB Co-Composting Project
CPA Number XXX
Generic CDM-SSC-CPA-DD Version 2
15/12/2012

A.2. Description of the small-scale CPA:

Project Overview

This project activity is a co-composting project of CPA Implementer of palm oil mill wastes located in the region of CPA region, Ecuador. The wastes are generated by the palm oil mill Palm Oil Mill Name that was built in YYYY / will be operative in YYYY. The production capacity of the mill is XXX tons/hour of fresh fruit bunches (FFB).

The process of crude palm oil production generates 2 types of solid waste: Empty Fruit Bunches (EFB), and mesocarp fibres. Also, the liquid Palm Oil Mill Effluent (POME) with a high chemical and biological oxygen demand is generated.

POME is currently / in the absence of this project activity would be 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 contaminant levels 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 these 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.

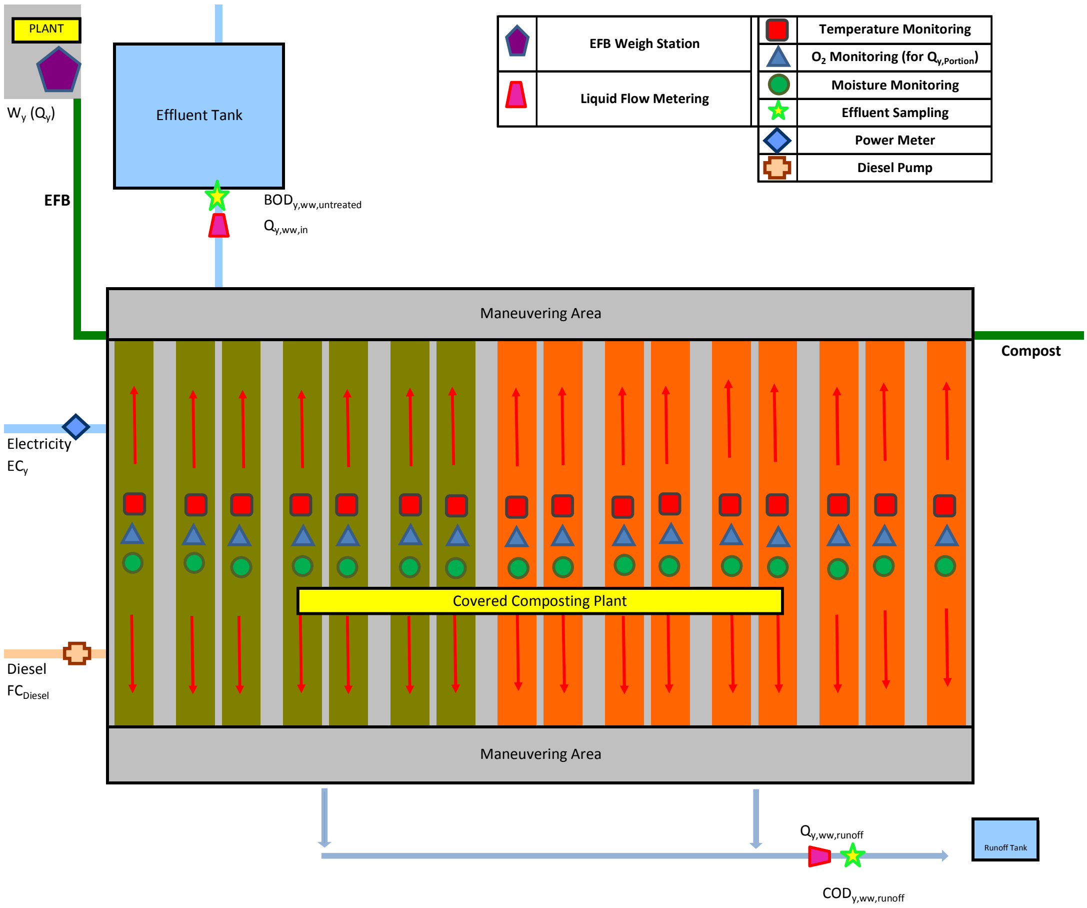
EFB will be composted utilizing the Windrow technology in onsite, covered composting plants. POME is added to the composting process to maintain adequate moisture level throughout the process cycle and provide additional nitrogen content for a compost rich in nutrients. Aerobic composting conditions 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 on the plantations that supply the mill.

Technology to be Employed

The co-composting of EFB and POME will be carried out in a newly built composting plant. The composting site will be protected from rainwater infiltration by installing a roofing system. Runoff water will be collected and either treated or applied to the compost piles. Because it can accommodate large volumes of wastes, “turned windrow” composting has been selected for this PoA. 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.

Following is a schematic diagram of the composting plant and its monitoring variables.



The compost plant design includes:

- Site preparation and soil protection method
- Composting plant roofing
- Windrow compost pile turner
- 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 8 to 12 weeks.

The operation of the composting plant will generate number new employment positions. CPA Implementer will recruit qualified personnel for these jobs. Specialized training will be arranged with the provider of the Windrow technology.

Describe any unique site-specific features of the compost plant.

Contribution to Sustainable Development

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

Environment
- Avoidance of methane emissions from anaerobic decay of EFB and POME.
- Contribution to the national waste management strategies that place 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.
- Farmers receive compost at cost

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

A.3. Entity/individual responsible for the small-scale CPA:

CPA Implementer Full Name (referred to as CPA Implementer) is the entity responsible for this small-scale CPA. CPA Implementer has signed an agreement with Gestora de Programa Marco Palma, S.L., the CME, for the inclusion of this CPA within the PoA. CPA Implementer is a private entity registered in Ecuador.

The mailing address for the CPA Implementer is:

CPA Implementer
CPA Implementer Street Address
CPA Implementer City / Town
CPA Implementer Region / Province
Ecuador

Contact details for CPA Implementer are found in Annex 1.

A.4. Technical description of the small-scale CPA:

A.4.1. Identification of the small-scale CPA:

Under the CME's data management system, the CPA is identified as follows:

CPA Number (unique, consecutive)	CPA Number
CPA Name	CPA Name
CPA Implementer Full Name	CPA Implementer Full Name
CPA Street Address	CPA Street Address
CPA City / Town	CPA City / Town
CPA Region / Province	CPA Region / Province
CPA Host Country	Ecuador

The CME will ensure that this identification is unique, thus avoiding potential double accounting.

A.4.1.1. Host Party:

Ecuador

A.4.1.2. Geographic reference or other means of identification allowing the unique identification of the small-scale CPA (maximum one page):

The coordinates of the CPA Name industrial facility are:

Lat°
Lon°

The following maps show the location of Region / Province within Ecuador and the location of City / Town within Region / Province.

A.4.2. Duration of the small-scale CPA:

A.4.2.1. Starting date of the small-scale CPA:

DD/MM/YYYY

The starting date of this SSC-CPA has not occurred. It will be / is defined by the firm purchase order of the Windrow turner / the contract to commence compost plant construction / other evidence of the earliest date real action began or is expected to begin.

This CPA starting date is after the starting date of this PoA / justify compliance with applicable CDM requirements.

A.4.2.2. Expected operational lifetime of the small-scale CPA:

25 years, 0 months.

The technical lifetime of the investment in fixed plant and equipment for a composting facility is expected to be some 25 years. The technical lifetime of the major mobile equipment item (Windrow turner) is expected to be 10 years, although its accounting lifetime is less. This CPA compost plant will remain operational for the stated lifetime if the Windrow turners are replaced at the end of their technical lifetime.

A.4.3. Choice of the crediting period and related information:

Renewable crediting period;

A.4.3.1. Starting date of the crediting period:

DD/MM/YYYY

A.4.3.2. Length of the crediting period, first crediting period if the choice is renewable CP:

7 years, being limited to the end date of the registered PoA

A.4.4. Estimated amount of emission reductions over the chosen crediting period:

Year	Estimation of annual emission reductions in tonnes of CO_2 e
DD/MM/YYYY-31/12/YYYY	XXX
YYYY	XXX
YYYY	XXX
YYYY	XXX
YYYY	XXX
YYYY	XXX
YYYY	XXX
01/01/YYYY-DD/MM/YYYY	XXX
Total estimated reductions (tonnes of CO_2 e)	XXX
Total number of crediting years	7
Annual average of the estimated Reductions over the crediting period	XXX

A.4.5. Public funding of the CPA:

The project activity does not involve the use of public funding or official development aid / explain any public funding and offer evidence of why it does not divert ODA from an Annex I country.

A.4.6. Information to confirm that the proposed small-scale CPA is not a de-bundled component

The following information confirms that this SSC-CPA is not a de-bundled component:

- The CME of this PoA does not manage a large-scale PoA under sectoral scope 13 in Ecuador.
- CPA Name is not involved in any related CPAs or CDM Project Activities / CPA Name is involved in other related CPAs or CDM Project Activities but this CPA is not a debundled component for the following reasons:
    - Explanation 1
    - Explanation 2

Therefore, as per the "Guidelines on assessment of de-bundling for SSC project activities" Version 03, the proposed SSC-CPA is not a de-bundled component.

A.4.7. Confirmation that small-scale CPA is neither registered as an individual CDM project activity or is part of another Registered PoA:

The present CPA is not registered as an individual CDM project activity nor is it part of another Registered PoA.

SECTION B. Eligibility of small-scale CPA and Estimation of emissions reductions

B.1. Title and reference of the Registered PoA to which small-scale CPA is added:

Promotion of POME and EFB Co-Composting

CDM Ref: XXX
Registration Date: DD/MM/YYYY

B.2. Justification of the why the small-scale CPA is eligible to be included in the Registered PoA :

The following table shows the PoA eligibility criteria and the sources of documentary evidence that demonstrates CPA eligibility.

Number	*Eligibility Criteria*	*Documentary Evidence*
1	POME will be co-composted with EFB utilizing the Windrow technology.	Compost plant design documentation (technology description and equipment specifications)
2	The compost plant is newly built, not an expansion of an existing compost plant, excluding those for research, development or demonstration.	Compost plant design documentation (site description and layout); and Site visit and/or photographic evidence of compost plant site

Number	*Eligibility Criteria*	*Documentary Evidence*
3	The compost plant is constructed within the physical boundaries of a host palm oil mill or on a nearby waste management facility within the host country (Ecuador). The host palm oil mill can be either an existing facility or a new (greenfield) facility.	Compost plant design documentation (site description and layout); or Site visit and/or photographic evidence of compost plant site
4	The EFB and POME for the CPA is not involved in another composting project that is registered or under validation as a CDM project activity or as a CPA under another PoA. The SSC CPA is not a debundled component of a large project activity, as defined by applicable CDM guidelines.	Signed declaration by CPA Implementer; and Confirmation by CME through comparison with the CDM web site
5	Emission reductions will be accrued only for methane avoidance from POME, not for EFB or any other biomass that co-composted.	CDM-CPA-DD; and Emission reduction calculation spreadsheet
6	The ex-ante estimate of emission reductions is less than 60 kt CO2e for each year of the crediting period.	CDM-CPA-DD; and Emission reduction calculation spreadsheet
7	[Except Greenfield Palm Oil Mills] POME is currently treated in anaerobic wastewater treatment lagoons. The physical characteristics, operational design, and precise location of the lagoons are documented.	WWTP design documentation
8	[Greenfield Palm Oil Mills] In the absence of this CPA, POME would be treated in onsite, anaerobic wastewater treatment lagoons. Engineering studies document the physical characteristics and associated costs of such lagoons. This baseline is confirmed through the 4-step process for SSC project activities.	WWTP design documentation
9	The compost will be sold to at cost and applied on the plantations that supply the mill.	Signed declaration by CPA Implementer; Note: this parameter is also included in the monitoring plan
10	The additionality of the CPA is demonstrated via the investment barrier as per the "Guidelines on the demonstration of additionality of small-scale project activities" v09 as follows: An investment comparison analysis carried out according to applicable guidelines for the CPA's site specific conditions demonstrates that the net present value of cash flows from the CPA compost plant, in the absence of CER income, is less than the net present value of cash flows for POME treatment in anaerobic lagoons.	CDM-CPA-DD; and Investment analysis spreadsheet

Number	*Eligibility Criteria*	*Documentary Evidence*
11	[Except Greenfield Palm Oil Mills] The POME treated by the CPA is included in a valid discharge permit, environmental license, or equivalent.	Valid wastewater discharge permit / environmental license
12	The host palm oil mill or waste management facility has carried out an Environmental Impact Assessment (EIA) or can demonstrate that it is not required under national law.	EIA and official notification of EIA approval; or Written demonstration that EIA is not required
13	The project activity is a voluntary action by the CPA participants and not required by national law.	Signed declaration by CPA Implementer
14	The design of the composting plant satisfies all of the following criteria:	- -
	a) It will be covered to avoid infiltration of rainwater.	Compost plant design documentation
	b) Rainwater, if not segregated from leachate, will be treated as leachate.	Compost plant design documentation
	c) All leachate will be collected and treated to meet discharge standards or recycled to the composting plant.	Compost plant design documentation
	d) Leachate permeation from composting plants will be avoided through an impermeable top layer (i.e. concrete), inner layer (i.e. geomembrane) and/or soil compaction. If compaction is used, potential soil contamination should be monitored in a down-gradient well.	Compost plant design documentation
	e) Compost, once produced, will not undergo thermal / mechanical treatment	Compost plant design documentation
15	The operation of the composting plant will satisfy all of the following criteria:	- -
	a) Aerobic composting conditions will be demonstrated through a quality control program.	Compost quality control program initial specifications
	b) Process variables will be monitored as per the monitoring protocol.	Monitoring protocol between CPA Implementer and CME
	c) The adequate soil application of compost on the plantations will be monitored as per the monitoring protocol.	Monitoring protocol between CPA Implementer and CME
	d) Compost, once produced, will not be stored in anaerobic conditions.	Compost plant design documentation
16	The CPA participant has carried out a local stakeholder consultation in accordance with national CDM requirements and CME guidelines.	Local stakeholder consultation report

Number	*Eligibility Criteria*	*Documentary Evidence*
17	[Greenfield Palm Oil Mills] The palm oil plantations that are under long-term relationships (either contractually or through ownership with the palm oil mill or any of its shareholders) were previously farmlands (either agriculture or livestock) or were classified as degraded lands by national or international agencies. New palm oil mills that are associated with plantations on recently deforested lands or peatlands are expressly ineligible for CPAs under this PoA.	List of palm plantations under long-term relationships Maps showing locations of palm plantations under long-term relationships Maps or studies by national or international agencies showing land use and/or land degradation
18	The sources of financing the investment in the CPA are known. There is neither ODA/public funding from Annex I Parties of UNFCCC nor bilateral or multilateral funding under concessionary terms involved in the CPA.	Signed declaration by CPA Implementer
19	The Windrow turner purchase order and the civil works contract, if they exist at inclusion, demonstrate that the CPA start date is not prior to 20/12/2011.	Windrow turner purchase order; and Civil works contract
20	The CPA has submitted all information required by the DNA.	Specifications of information required by the DNA (either in published regulations or through a specific agreement between the CME and the DNA); and Written evidence of submission
21	The CPA has supplied one of the following documents to establish the baseline WWTP removal efficiency:	- -
	a) Historical records of at least one year.	Evidence for one option a) to d)
	b) If the WWTP does not have one year of historical records, then all historical records of removal efficiency plus a 10-day measurement campaign of removal efficiency.	Evidence for one option a) to d)
	c) [Greenfield Palm Oil Mills] A 10-day measurement campaign of removal efficiency of the WWTP at another palm oil mill that uses the same process technology and has a hydraulic retention time of ±20% of that specified in the documentation for criteria 8.	Evidence for one option a) to d)

Number	*Eligibility Criteria*	*Documentary Evidence*
	d) [Greenfield Palm Oil Mills] Value provided by the manufacturer /designer of a Greenfield wastewater treatment plant using the same technology, demonstrated to be conservative, e.g. average values from the top 20 percent plants with lowest emission rate per ton COD removed among the plants installed in the last five years designed for the same country /region to treat the same type of wastewaters as the project activity.	Evidence for one option a) to d)

B.3. Assessment and demonstration of additionality of the small-scale CPA , as per eligibility criteria listed in the Registered PoA:

Section E.5.1 of the SSC-PoA-DD v2 requires that an investment analysis be carried out for each CPA in order to assess and demonstrate its additionality. Following is the investment analysis for this CPA.

The analysis is carried out according to the "Guidelines on the assessment of investment analysis" v05. The two scenarios analyzed are:

a) Baseline: anaerobic treatment lagoons for POME
b) Project: Co-composting of EFB and POME without CER revenue

The financial indicator chosen is net present value (NPV) of the net cash flows for both scenarios[3]. Additionality is demonstrated through investment comparison for each CPA if the NPV net cash flows of the project scenario are lower than the NPV net cash flows of the baseline scenario.

The following table shows the application of the key criteria from the "Guidelines on the assessment of investment analysis" v05:

Part	*Key Criteria*	*Application for each CPA in this PoA*
3	Period of Assessment	A 10-year assessment period is used. This coincides with the expected technical lifetime of the major equipment item (Windrow turner), although it's accounting lifetime is less. At the end of this period, a CPA could remain operational if a new Windrow turner is purchased, since the investment in fixed plant is expected to have a life of some 25 years. A residual value is applied to assets that are not fully depreciated at the end of the assessment period.

[3] As is common convention for cash flow analysis, cash inflows are assigned a positive value (+) and cash outflows are assigned a negative value (-).

Part	*Key Criteria*	*Application for each CPA in this PoA*
4	Residual Value	Book value of assets is applied at the end of the period of assessment, in accordance with local accounting regulations. This is conservative, since regulatory assets are sunk costs and their fair value could be argued to be zero.
5	Taxation and Depreciation	The discount rates applied to calculate NPV are after tax. Therefore, taxation is included as a cost but depreciation is not considered as a cash flow.
6	Input Values	All input values are listed below and are valid at the time of decision
7	Implementation Restart	To be applied only to CPAs that restart implementation
8	Spreadsheet	An investment analysis spreadsheet is annexed to this CDM-SSC-CPA-DD
9-11	Project versus Equity Basis	The NPV analysis is carried out considering any specific loan or other financing vehicle as a cost only for the composting scenario (b). To be conservative, the baseline scenario considers only equity financing. Therefore, the basis of the analysis is equity cash flow (after tax, after interest and loan repayment, considering equipment depreciation for tax purposes but not as a cash flow).
12, 18	Appropriate Benchmarks	Since the analysis is carried out on an equity basis, the appropriate discount rate should be on the same basis. WACC considerations do not apply to an analysis based on equity investment and equity cash flows.
13	Standard versus company-specific discount rate	Composting plants could be developed by the host palm oil mill owner or by a third-party waste manager. Therefore, the discount rate should be a standard value in the market. The values from the appendix to the guidelines are thus chosen. The values are consistent with the basis of the financial analysis (after tax, equity basis, and real).
15	Equity Discount Rate	Since standard in the market discount rates apply, the values from the appendix to the guidelines are used. These values are after tax and real, and thus consistent with the equity basis of the analysis.
14, 16, 17	Internal Company Benchmarks	Do not apply, since the investment analysis must use standard in the market benchmarks

Part	*Key Criteria*	*Application for each CPA in this PoA*
19	Method of Analysis	The investment analysis calculates the NPV of both the project and baseline scenarios. Investment comparison is chosen since it is the indicated analysis method for cases where the baseline requires investment and is more conservative than a benchmark analysis for cases where the baseline scenario includes costs but not investment[4]. The investment analysis demonstrates additionality if the NPV of the project scenario is lower than the NPV of the baseline scenario.
20-21	Sensitivity Analysis	Sensitivity analyses are carried out for investment costs (±10%) and operating costs (±10%) for both the baseline and project scenarios. Such variations in cost could occur due to differences in physical volumes (i.e. effluents) or in unit prices. An additional sensitivity analysis is carried out in order to identify under what conditions variations in the result would occur (i.e. the project scenario becomes more attractive than the baseline).

The following data sets and sources are used in the investment comparison spreadsheet of this CPA. Justify the appropriateness of the source of data with respect to the timing of the investment decision.

1. *Project Material Flows*

Year	1	2	3	4	5	6	7	8	9	10
FFB,kt	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
EFB,kt	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
Effluent,km^3	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
Compost,kt	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX

Source: Identical basis as that used to estimate ex-ante emission reductions.

2. *WWTP Costs*

Data Item	*Value*	*Source / Comments*
Investment Cost - Land	XXX	CCC[5]
Investment Cost - Site preparation and civil works	XXX	

[4] The baseline scenarios for all CPAs will include POME management costs. Some CPAs might also require investment in their baseline scenarios (Greenfield palm oil mills and existing mills that require additional treatment capacity). Therefore, the NPV of all baseline scenarios will be negative. Investment comparison is thus more conservative than a benchmark analysis, since the former requires the project scenario NPV to be less than a negative number, whereas the latter would only require the project scenario NPV to be less than zero.

[5] As justified in the PoA-DD, the present book value for WWTP assets is ignored for the investment analysis. An existing mill might have a net asset value for lagoons on the books, pending depreciation. Depreciation is not a cash flow, but could affect the tax calculation, that is a cash flow. Such a net asset value of the lagoons can be ignored,

Investment Cost - Buildings	XXX	
Investment Cost - Fixed Equipment and Installations	XXX	
Operating Cost	XXX	CCC

3. ***Compost Plant Investment Cost***

Data Item	*Value*	*Source / Comments*
Land	XXX	CCC
Site preparation and civil works	XXX	
Buildings	XXX	
Fixed Equipment and Installations	XXX	
Mobile Equipment	XXX	

4. ***Compost Plant Operating Costs***

Data Item	*Value*	*Source / Comments*
Electricity consumption	XXX	Please see ex-ante emission reduction calculation
Diesel fuel consumption	XXX	
Electricity price	XXX	CCC
Diesel fuel price	XXX	
Personnel	XXX	CCC
Other Fixed Operating Costs	XXX	
Other Variable Operating Costs	XXX	

5. ***Depreciation Periods***

Data Item	*Value*	*Source / Comments*
Land	- -	Depreciation periods for for Ecuador in Executive Decree 1051 of 2008
Site preparation and civil works	20	
Buildings	20	
Fixed Equipment and Installations	10	
Mobile Equipment	5	

6. ***Compost selling price***

As per PoA eligibility criteria No. 9, compost is to be sold at cost. The compost selling price is determined in the investment comparison spreadsheet by summing the operating costs, annual depreciation, and taxes, and then dividing the result by the expected compost production. This represents the full accounting cost of the compost.

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since it would affect both the baseline and project scenarios, and thus not impact the investment comparison between the two scenarios. Furthermore, in the project scenario, such a net asset value of the lagoons might be eligible for write-down, thus providing an earlier cash flow in terms of a tax benefit. Therefore, ignoring this concept is conservative.

7. *Financial Data*

Data Item	***Value***	***Source / Comments***
Effective corporate income tax rate[6]	33.7%	The Ecuadorian Production Code of 2010 and Workers'Code of 2005[7]
Discount Rate	17.0%	Attachment to EB62, Annex 05 for sectoral scope 13

8. *External Financing*

Data Item	***Value***	***Source / Comments***
Loan Principal	XXX	CCC
Loan Duration	XXX	CCC
Grace Period	XXX	CCC
Interest Rate (APR)	XXX	CCC

The result of the investment comparison analysis is a lower NPV cash flow for the project scenario than the baseline scenario. In both scenarios the NPV cash flows are negative, reflecting the fact that management of POME incurs costs.

The attached spreadsheet includes sensitivity analysis for investment uncertainty (±10%) as well as operation and maintenance cost uncertainty (again, ±10%). In all cases, the NPV cash flow of the project, in the absence of CER revenue, is always lower than the baseline scenario, as shown in the following table:

Analysis Case	***Baseline NPV CF***	***Project NPV CF***
Base Case	XXX	XXX
Sensitivity +10% investment	XXX	XXX
Sensitivity -10% investment	XXX	XXX
Sensitivity +10% cost	XXX	XXX
Sensitivity -10% cost	XXX	XXX

[6] In the baseline scenario, anaerobic lagoons, wastewater treatment costs are associated with a new or existing palm oil mill. Wastewater treatment costs would be deductible against income from vegetable oil revenues, thus providing a tax credit. For existing palm oil mills, CPAs could either demonstrate that pre-tax profits are greater than wastewater treatment costs from accounting records over the most recent three years and thus apply the effective corporate income tax rate as a credit, or apply a conservative tax rate of zero in the baseline scenario, thus ignoring the tax credit. For new (Greenfield) palm oil mills, the tax credit will be considered in the baseline scenario at the effective corporate income tax rate, since it would form part of the investment decision basis to construct the new mill.

[7] The effective corporate income tax rate in Ecuador includes a mandatory, deductible entitlement of 15% of pre-tax profits and a 22% rate on the balance of profits as per the Workers' Code of 2005 and the Production Code of 2010, respectively. The consideration of the mandatory entitlement as an effective corporate tax is established by the World Bank 2010 Report No. 46551 EC entitled "Ecuador: Diversification and Sustainable Growth in an Oil-Dependent Country".

A further sensitivity analysis in the attached spreadsheet is used to identify the range of project scenario values under which the investment comparison is robust. The project scenario NPV cash flow does not change when operating costs are modified (since the compost selling price is based on its cost). Therefore, the result is the same for any value of project operating costs. The project scenario NPV becomes more attractive with a lower investment figure. The attached spreadsheet shows that the investment amount would need to be reduced by more than XX% for the project scenario to become more attractive than the baseline scenario. A XX% reduction in the investment figure is consideration. As a result, the investment comparison analysis is considered qualifier robust.

The baseline scenario has higher emissions and is financially more attractive. The investment comparison analysis is shown to be robust through sensitivity analysis. Hence the investment barrier is demonstrated robustly through the investment comparison analysis.

Demonstration of Investment Barrier

Guideline 6 of the "Guidelines for objective demonstration and assessment of barriers" (version 01) 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 CPA is carried out entirely/partly by CPA Name. Since the project is financed on balance sheet by CPA Name, the decision to be included in this PoA demonstrates how the financing of the project was assured by CDM benefits.

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

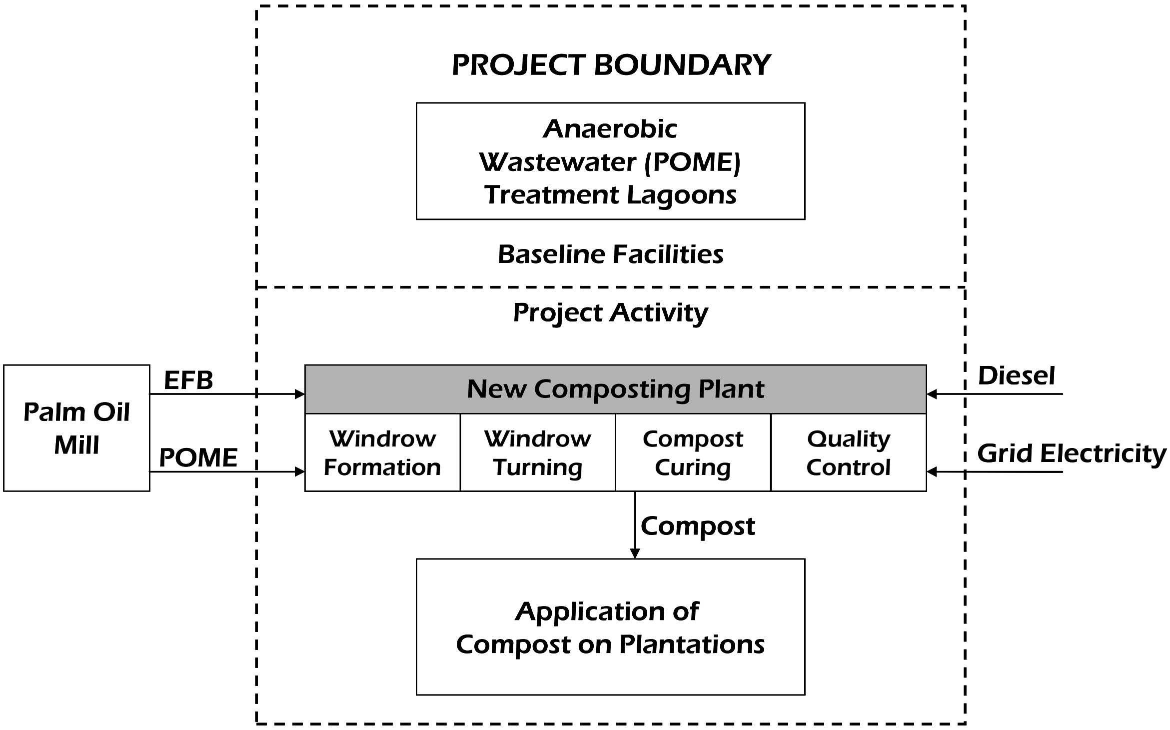
B.4. Description of the sources and gases included in the project boundary and proof that the small-scale CPA is located within the geographical boundary of the registered PoA.

As per part 14 of AMS III.F v10.0, the project boundary includes the following physical, geographical sites:

Project Boundary Requirement as per AMS III.F	*CPAs included in this PoA*
Where the solid waste would have been disposed and the methane emission occurs in absence of the proposed project activity;	To be conservative, baseline emission from EFB decay are ignored, and thus excluded from the project boundary
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;	Baseline treatment for co-composting wastewater is defined as onsite anaerobic treatment lagoons.
Where the treatment of biomass through composting takes place;	Composting will take place onsite at all CPAs.
Where the products from composting (compost) is handled, disposed, submitted to soil application, or treated thermally/mechanically;	Compost will be applied on the plantations associated with the mills that host each CPA. Compost will not be sold for other uses.

And the itineraries between them (a, b, c, and d), where the transportation of waste, wastewater, where applicable manure, product of treatment (compost) occurs.	All of these itineraries are included within the project boundary

Therefore, the project boundary is delimited by the new composting plant, the host palm oil mill wastewater treatment lagoons, and the plantations that serve the host palm oil mill:



The GHG emission sources included and excluded in the project boundary are as follows:

	Source	Gas	Included?	Justification / Explanation
Baseline	Biomass disposed in unmanaged landfills	CO_2	No	CO_2 emissions from biomass decay in landfills are considered GHG neutral.
		CH_4	No	To be conservative, eligibility criteria 5 excludes methane emissions from biomass decay
		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 v10.0 considers incremental transport emissions under the project activity, thus they
		CH_4	No	

		N_2O	No	
	Auxiliary Equipment	CO_2	No	Use of auxiliary equipment in the baseline is ignored, to be conservative.
		CH_4	No	
		N_2O	No	
Project Activity	Composting process	CO_2	No	CO_2 emissions from composting process are considered GHG neutral.
		CH_4	Yes	Methane emissions from anaerobic pockets during composting process.
	Runoff Water	CO_2	No	CO_2 emissions from biomass sources are 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 v10.0
	Additional Transportation due to Project Activity	CO_2	No	Under baseline practice, EFB is hauled to the plantation, piled, and then mulched. In the project activity, composting will reduce waste mass by nearly 50%. This weight reduction is attributed to both moisture reduction and decay in the composting process. The itineraries for hauling the compost will be identical as those in the baseline mulching. Since transport distances are identical in the baseline and project scenarios but waste mass is less in the project scenario, transport fuel consumption can be expected to decrease due to the project activity. Thus incremental transport emissions will be negative. To be conservative, these emissions are ignored
		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 by AMS III.F v10.0
		N_2O	No	

The CPA Name POME and EFB Co-Composting Project is located in the host country (Ecuador) as shown in section A.4.1.2.

B.5. Emission reductions:

B.5.1. Data and parameters that are available at validation:

Data / Parameter:	$\eta_{BOD,BL}$
Data unit:	-
Description:	BOD removal efficiency of the baseline treatment system
Source of data used:	CCC
Value applied:	XXX
Justification of the choice of data or	CCC, in compliance with paragraphs 26-28 of AMS III.H v16.0

description of measurement methods and procedures actually applied :	
Any comment:	The subscripts for this variable have been modified for clarity.

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.H version 16.0 Table III.H.1
Value applied:	XXX
Justification of the choice of data or description of measurement methods and procedures actually applied :	CCC, clearly indicating the depth(s) of the lagoons
Any comment:	

Data / Parameter:	**$B_{o,ww}$**
Data unit:	kg CH_4/kg BOD
Description:	Methane producing capacity for the wastewater
Source of data used:	AMS III.H version 16.0
Value applied:	0.60
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. This PoA has chosen to measure BOD directly, not COD, as per the option provided in part 20 of AMS III.H v16.0
Any comment:	

Data / Parameter:	**UF_{BL}**
Data unit:	-
Description:	Model correction factor to account for model uncertainties for wastewater
Source of data used:	AMS III.H version 16.0
Value applied:	0.89
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default value in methodology
Any comment:	

Data / Parameter:	**$EF_{CO2, Elec}$**
Data unit:	tCO_2e/MWh
Description:	Emission factor for electricity consumed
Source of data used:	Tool to calculate baseline, project and/or leakage from electricity consumption, version 01
Value applied:	1.3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Conservative default value as per tool, applicable to either grid power or self-generation.
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
Description of measurement methods and procedures to be applied:	Default value as per tool
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 10.0
Value applied:	0.004
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. Wet weight basis
Any comment:	Waste quantities and waste characteristics will be measured and reported on a wet basis

Data / Parameter:	**$B_{o,ww,runoff}$**
Data unit:	kg CH_4/kg COD
Description:	Methane producing capacity of the runoff water
Source of data used:	AMS III.F version 10.0
Value applied:	0.25
Justification of the	Default value in methodology, based on the IPCC default value.

choice of data or description of measurement methods and procedures actually applied :	
Any comment:	The subscripts for this variable have been modified to avoid confusion with the parameter $B_{o,ww}$ introduced in AMS III.H v16.0

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.H version 16.0 Table III.H.1
Value applied:	XXX
Justification of the choice of data or description of measurement methods and procedures actually applied :	CCC, based on the lagoon depth for runoff water treatment
Any comment:	The subscripts for this variable have been modified to avoid confusion with the parameter $MCF_{ww,treatment}$ introduced in AMS III.H v16.0

Data / Parameter:	**UF_b**
Data unit:	-
Description:	Model correction factor to account for model uncertainties for runoff
Source of data used:	AMS III.F version 10.0
Value applied:	1.12
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default value in methodology.
Any comment:	

B.5.2. 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.

Methodological Choices

Emission reductions are calculated by applying the following methodological choices that are explained and justified in the SSC-PoA-DD (version 2):

Citation	*Methodological Choice*
par6 AMS III.F v10.0	Wastewater is co-composted with biomass (EFB)
par7 AMS III.F v10.0	To be conservative, avoided methane emissions from the decay of solid biomass are ignored
par14 AMS III.F v10.0	Baseline emissions for wastewater are calculated according to par20, AMS III.H v16.0
par20 AMS III.H v16.0	Project activities may monitor either COD or BOD and use the corresponding emission factors. This PoA selects the BOD option, as justified in section E.6.2 of the SSC-PoA-DD
par17 AMS III.F v10.0	The fossil fuel emission factor may be based on local values or IPCC default values. This PoA selects the IPCC option, as justified in section E.6.2 of the SSC-PoA-DD
par18 AMS III.F v10.0	The emission factor for methane from composting may be selected on a dry or wet (as-is) basis. This PoA selects the wet (as-is) basis to be consistent with the monitoring methods. The emission factor for methane from composting may be set to zero subject to specific monitoring requirements via sampling. This PoA selects this option, proposing and justifying the indicated sampling and monitoring (section E.6.2 and Annex 4.1 of the SSC-PoA-DD).
par27-8 AMS III.F v10.0	Parameters related to electricity consumption are calculated according to the “Tool to calculate baseline, project and/or leakage emissions from electricity consumption” v01. Parameters related to fossil fuel consumption are calculated according to the “Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion” v2 This PoA selects a more conservative grid loss factor than the 10% supplied in this specification.
am-tool-05 v1[8]	The conservative default emission factor value of 1.3 tCO_2/MWh is used, thus covering all three generation scenarios supported by the tool (options A2 and B2, as well as cases C.I, C.II and C.III) The conservative default grid loss value of 20% is used
am-tool-03 v2[9]	Fuel consumption can be monitored en either mass or volume units. This PoA selects volume units as justified in section E.6.2 of the SSC-PoA-DD
am-tool-03 v2	Option B (net calorific value and fuel-specific emission factor) is chosen over Option A (carbon content of fuel) since the project uses only a commercial liquid fuel (diesel) and the carbon content is not available.

<u>Equations Used for Calculating Emission Reductions</u>

[8] “Tool to calculate project, baseline and/or leakage from electricity consumption”, version 01.

[9] “Tool to calculate project or leakage CO2 emissions from fossil fuel combustion”, version 02.

Emission reductions are calculated by applying the following equations that are explained and justified in the SSC-PoA-DD (version 2):

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

(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 by the project activity during the years "x" from the beginning of the project activity (x=1) up to the year *y* (tCO_2e)
$BE_{ww,y}$	Where applicable, baseline emissions from the wastewater co-composted, calculated as per the procedures in AMS III.H (tonne)
$BE_{CH4,manure,y}$	Where applicable, baseline emissions from manure composted by the project activities, as per the procedures of AMS-III.D
$MD_{y,reg}$	Amount of methane that would have to be captured and combusted in the year *y* to comply with the prevailing regulations (tonne)
GWP_CH_4	*GWP* for CH_4

$$BE_{ww,y} = Q_{ww,y} * BOD_{\inf low,y} * \eta_{BOD,y} * MCF_{ww,treatment} * B_{o,ww} * UF_{BL} * GWP_{CH4}$$

(Equation 2)

Where:

$Q_{ww,y}$	Volume of wastewater entering the co-composting facility in the year *y* (m^3)
$BOD_{\inf low,y}$	Biological oxygen demand of the wastewater entering the co-composting facility in the year *y* ($tonnes/m^3$)
$\eta_{BOD,y}$	BOD removal efficiency of the baseline WWTS
$MCF_{ww,treatment}$	Methane correction factor for the wastewater treatment system in the baseline scenario
$B_{o,ww}$	Methane producing capacity for the wastewater (kg CH_4/kg BOD)
UF_{BL}	Model correction factor to account for model uncertainties for wastewater

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

(Equation 3)

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)
$PE_{y,comp}$	Methane emissions during composting process in the year *y* (tCO_2e)
$PE_{y,runoff}$	Methane emissions from runoff water in the year *y* (tCO_2e)

$PE_{y,res\ waste}$	In case produced compost is subject to anaerobic storage or disposed in a landfill: methane emissions from the anaerobic decay of the residual organic content (tCO_2e)

$$PE_{y,power} = EC_y * EF_{CO2,ELEC} * (1 + TDL) + FC_{Diesel,y} * NCV_{Diesel} * EF_{CO2,Diesel}$$

(Equation 4)

Where:

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

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

(Equation 5)

Where:

$Q_{y,Portion}$	The portion of the total weight of wastes to be composted in year y on a wet basis (tonne), that is produced with a monitored oxygen content below 8%.
$EF_{composting}$	Emission factor for composting of organic waste and/or manure (t CH_4/ton waste treated)

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

(Equation 6)

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

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

Baseline emissions for the methane generation potential of wastewater (POME) are calculated from equation 2 using the following parameters:

Parameter	***Data Unit***	***Value***	***Source/Explanation***

$Q_{ww,y}$	m^3	XXX	POME Production in year 1
$BOD_{inflow,y}$	$tonnes/m^3$	XXX	CCC
$\eta_{BOD,BL}$	- -	XXX	Fixed value (please see section B.5.1)
$MCF_{ww,treatment}$	- -	XXX	Fixed value (please see section B.5.1)
$B_{o,ww}$	kg CH_4/kg BOD	0.6	Fixed value (please see section B.5.1)
UF_{BL}	- -	0.89	Fixed value (please see section B.5.1)
GWP_{CH4}	- -	21	AMS III.H v16.0 default value

The result of introducing these parameters into equation 2 is:

$BE_{ww,treatment,1}$ = XXX ton CO_2e

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

$$BE_y = BE_{ww,treatment,i}$$

Baseline emissions for year 1 are thus calculated to be:

BE_1 = XXX ton CO_2e

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

Project emissions from incremental fuel use and power consumption are calculated from equation 4 using the following parameters:

Parameter	***Data Unit***	***Value***	***Source/Explanation***
EC_y	MWh	XXX	Estimated project power consumption
$FC_{Diesel,y}$	kl	XXX	Estimated project diesel consumption
NCV_{Diesel}	GJ/kl	36.359	IPCC value (please see section B.6.1)
$EF_{CO2,Diesel}$	tCO_2e/GJ	0.0748	IPCC value (please see section B.6.1)
$EF_{CO2,Elec}$	tCO_2e/MWh	1.3	Fixed value (please see section B.5.1)
TDL_y	- -	0.20	Fixed value (please see section B.5.1)

The result of introducing these parameters into equation 4 is:

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

Project emissions from composting activities are calculated from equation 5 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.5.1)
GWP_CH_4		21	AMS III.F v10.0 default value
$Q_{y,Portion}$	t	XXX	20% of estimated EFB production year 1

The result of introducing these parameters into equation 5 is:

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

Project emissions from runoff are calculated from equation 6 using the following parameters:

Parameter	***Data Unit***	***Value***	***Source/Explanation***
$Q_{y,ww,runoff}$	m^3	XXX	Estimated based on compost plant area and annual rainfall
$COD_{y,ww,runoff}$	$tonnes/m^3$	0.001	Handbook value for domestic wastewater
$B_{o,ww}$	kg CH_4/kg COD	0.25	Fixed value (please see section B.5.1)
$MCF_{ww,runoff}$	- -	0.20	Fixed value (please see section B.5.1)
UF_b	- -	1.12	Fixed value (please see section B.5.1)
GWP_CH_4		21	AMS III.F v10.0 default value

The result of introducing these parameters into equation 6 is:

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

Equation 4 is simplified to reflect that no incremental emissions occur due to leakage and that incremental transport emissions are ignored since they would be negative:

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

Project emissions for year 1 are thus calculated to be:

PE_1 = XXX ton CO_2e

<u>Leakage</u>

The project technology does not include any equipment transferred from other activities nor will any existing equipment is transferred to another activity. Therefore, as per paragraph 21 of AMS III.F v10.0, leakage does not apply.

Paragraph 26 of AMS III.F v10.0 does not apply, since the CPA is a new facility and does no involve equipment replacement.

<u>Competing uses for the biomass</u>

The following applies the procedures for competing uses for the biomass.

The sources cited in the SSC-PoA-DD v2 regarding common practice for managing EFB clearly demonstrate:

- No EFB is used in Ecuador for co-products or as an energy source

- All EFB generated in Ecuador is disposed of in SWDS: dedicated landfills or piled on the plantations and, after decomposing, mulched.

Therefore, competing uses for EFB do not exist in Ecuador. Furthermore, since the EFB would have been left to decay, clarification SSC_236 establishes that competing uses are absent and need not be assessed.

Leakage is thus assigned a value of zero for this CPA and the ex-ante estimation of emission reductions.

Overall Emission Reductions

Overall emission reductions, since leakage is zero, are calculated by subtracting project emissions from the baseline emission. For year 1 they are estimated to be:

XXX – XXX = XXX tCO_2e/y

B.5.3. 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)
DD/MM/YYYY-31/12/YYYY	XXX	XXX	0	XXX
YYYY	XXX	XXX	0	XXX
YYYY	XXX	XXX	0	XXX
YYYY	XXX	XXX	0	XXX
YYYY	XXX	XXX	0	XXX
YYYY	XXX	XXX	0	XXX
YYYY	XXX	XXX	0	XXX
01/01/YYYY-DD/MM/YYYY	XXX	XXX	0	XXX
Total (Tonnes of CO_2 e)	**XXX**	**XXX**	**0**	**XXX**

B.6. Application of the monitoring methodology and description of the monitoring plan

B.6.1. Description of the monitoring plan:

Data and parameters to be 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:	Compilation of environmental laws and regulations published on the web page of the environmental ministry
Value of data applied for the purpose of calculating expected emission reductions in section B.5	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 environmental ministry to confirm regulatory analysis
Any comment:	

Data / Parameter:	**GWP_CH$_4$ / GWP$_{CH4}$**
Data unit:	
Description:	GWP for CH_4
Source of data to be used:	UNFCCC
Value of data applied for the purpose of calculating expected emission reductions in section B.5	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:	As per the “Standard for application of the global warming potential to Clean Development Mechanism project activities and programmes of activities for the second commitment period of the Kyoto Protocol” version 01.0, this value will be updated effective 01/01/2013 to be in accordance with decision 4/CMP.7.

Data / Parameter:	**$W_{j,y}$**
Data unit:	Tons
Description:	Amount of organic waste type *j* composted in year *y*, including j = compost produced.
Source of data to be used:	Onsite weigh scale
Value of data applied for the purpose of calculating expected emission reductions in	XXX (based on XXX t FFB in year 1 and XX% EFB, estimated at validation)

section B.5		
Description of measurement methods and procedures to be applied:	Method	Direct measurement
	Frequency	Continuous
	Equipment	Vehicle weigh scale
	Calibration	Onsite calibration and certification annually
	Accuracy	High
	Responsibility	CCC
QA/QC procedures to be applied:	Site specific QA/QC procedures EFB weight will be tracked against Fresh Fruit Bunch (FFB). Compost production per unit EFB will be tracked monthly as well.	
Any comment:	not defined in equations but necessary for monitoring	

Data / Parameter:	$Q_{ww,y}$	
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 applied for the purpose of calculating expected emission reductions in section B.5	XXX (based on XXX t FFB in year 1 and XX m^3/tFFB, estimated at validation)	
Description of measurement methods and procedures to be applied:	Method	Direct measurement
	Frequency	Continuous monitoring; frequency of recordings
	Equipment	Flow meter with totalizer
	Calibration	Offsite calibration yearly
	Accuracy	High
	Responsibility	CCC
QA/QC procedures to be applied:	Site specific QA/QC procedures POME volume will be tracked against Fresh Fruit Bunch (FFB).	
Any comment:		

Data / Parameter:	$BOD_{inflow,y}$
Data unit:	tonnes/m^3
Description:	Biological 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 applied for the purpose of calculating expected emission reductions in section B.5	XXX

Description of measurement methods and procedures to be applied:	Method	Grab sampling and laboratory analysis
	Frequency	CCC to be determined through the sampling plan, Annex A4.2
	Equipment	External laboratory accredited nationally for environmental control
	Calibration	As per laboratory protocol for BOD measurement
	Accuracy	High
	Responsibility	CCC
QA/QC procedures to be applied:	As per laboratory protocol for BOD measurement	
Any comment:	Sampling plan according to the "Standard for sampling and surveys for CDM project activities and programme of activities" v03.0 is included in Annex A4.2 This PoA has selected the BOD option instead of COD measurement. Variable names and subscripts have been modified for clarity to reflect this methodological choice.	

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 applied for the purpose of calculating expected emission reductions in section B.5	XXX	
Description of measurement methods and procedures to be applied:	Method	Direct measurement
	Frequency	Continuous monitoring; frequency of recordings
	Equipment	Power meter with totalizer
	Calibration	Offsite calibration every three years
	Accuracy	High
	Responsibility	CCC
QA/QC procedures to be applied:	Site specific QA/QC procedures Electricity consumption will be tracked against compost production	
Any comment:		

Data / Parameter:	**$FC_{Diesel,y}$**
Data unit:	kl
Description:	Consumption of diesel fuel from project equipment in the year y
Source of data to be used:	Onsite fuel pump
Value of data applied for the purpose of calculating expected emission reductions in	XXX

section B.5		
Description of measurement methods and procedures to be applied:	Method	Direct measurement of fuelling of project activity equipment
	Frequency	Continuous
	Equipment	Onsite fuel pump
	Calibration	Annually
	Accuracy	High
	Responsibility	CCC
QA/QC procedures to be applied:	Site specific QA/QC procedures All onsite diesel consumption is measured and assigned to operational cost centres. This data can be cross-checked through accounting records.	
Any comment:	The CPA might install diesel tanks at the compost plants. If so, the filling of this tank will be dispatched by the onsite fuel pump.	

Data / Parameter:	**NCV_{Diesel}**
Data unit:	GJ/kl
Description:	Net calorific value of diesel fuel in volumetric units
Source of data to be used:	IPCC Guidelines (version 2006 at validation)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	36.359 (at validation)
Description of measurement methods and procedures to be applied:	Review of IPCC guidelines
QA/QC procedures to be applied:	N/A
Any comment:	Data source d) for this parameter is chosen since NCVs are not reported on purchases of commercial liquid fuels, only volumes. The IPCC value of 43.3 GJ/t (95% confidence level upper value, table 1.2, Volume 2, 2006 Guidelines) is converted to volumetric units as required by the applicable tool (am-tool-03-v2) using 0.8397 kg/l (Reece, Mieke. Densities of Oil Products. IEA, Paris. Nov 2004), published by the International Energy Agency and thus well-documented and reliable as per data source c) for density within the referenced tool.

Data / Parameter:	**$EF_{CO2,Diesel}$**
Data unit:	tCO_2/GJ
Description:	Emission factor for diesel fuel
Source of data to be used:	IPCC Guidelines (version 2006 at validation)
Value of data applied for the purpose of calculating expected	0.0748 (at validation)

emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Review of IPCC Guidelines
QA/QC procedures to be applied:	N/A
Any comment:	Data source d) for this parameter is chosen since EFs are not reported on purchases of commercial liquid fuels, only volumes. The IPCC value at validation is 0.0748 tCO_2/GJ (95% confidence level upper value, table 1.4, Volume 2, 2006 Guidelines).

Data / Parameter:	**$Q_{y,Portion}$**	
Data unit:	t	
Description:	Portion of waste material that is composted in the presence of less than 8% oxygen	
Source of data to be used:	Continuous measurement of waste material (please see variable W) Onsite oxygen sampling and analysis	
Value of data applied for the purpose of calculating expected emission reductions in section B.5	XXX (Conservative estimate at validation, assuming that 20% of compost is produced in the presence of less than 8% oxygen).	
Description of measurement methods and procedures to be applied:	Method	Spot sampling of oxygen content in compost piles and statistical determination as per the "Standard for sampling and surveys for CDM project activities and programme of activities" v03.0.
	Frequency	Minimum 271 samples as per the sampling plan, Annex A4.1
	Equipment	Portable oxygen meter with a 1m lance
	Calibration	Self-calibrating oxygen probe (zero and full-scale)
	Accuracy	High
	Responsibility	Compost plant operators
QA/QC procedures to be applied:	Measurement to be included within the CPAs Compost Quality Control Program	
Any comment:	Sampling plan according to the "Standard for sampling and surveys for CDM project activities and programme of activities" v03.0 is included in Annex A4.1 This variable is determined by multiplying the total volume of waste to be composted (W) by the fraction produced in the presence of less than 8% oxygen.	

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 applied for the purpose of calculating expected emission reductions in section B.5	XXX (Estimated at validation based XXX m^2 compost plant area and XXX mm annual rainfall)	
Description of measurement methods and procedures to be applied:	Method	Direct measurement
	Frequency	Continuous monitoring; frequency of recordings
	Equipment	Flow meter with totalizer
	Calibration	Offsite calibration every three years
	Accuracy	High
	Responsibility	CCC
QA/QC procedures to be applied:	Site specific QA/QC procedures	
Any comment:		

Data / Parameter:	**$COD_{y,ww,runoff}$**	
Data unit:	tonnes/m^3	
Description:	Chemical oxygen demand of the composting facility's runoff water in the year *y*	
Source of data to be used:	Offsite laboratory	
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.001 (only to be used for the ex-ante emission reduction calculation, based on handbook value for domestic wastewater as per part 19 of AMS III.F v10.0[10])	
Description of measurement methods and procedures to be applied:	Method	Grab sampling and laboratory analysis
	Frequency	CCC to be determined through the sampling plan, Annex A4.2
	Equipment	External laboratory accredited nationally for environmental control
	Calibration	As per laboratory protocol for COD measurement
	Accuracy	High
	Responsibility	CCC
QA/QC procedures to be applied:	As per laboratory protocol for COD measurement	
Any comment:	Sampling plan according to the "Standard for sampling and surveys for CDM project activities and programme of activities" v03.0 is included in Annex A4.2	

Data / Parameter:	**Compost Quality Control Programme**
Data unit:	- -
Description:	The operation of the co-composting facilities will be documented in a quality control programme, 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.).

[10] Davis, Mackenzie, L. Water and Wastewater Engineering – Design Principals and Practice. McGraw-Hill. 2010

Source of data to be used:	Record keeping of onsite measurements as per the quality management system.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	- -
Description of measurement methods and procedures to be applied:	These technical specifications are subject to modification, based on the commitment to continuous improvement.
QA/QC procedures to be applied:	Site specific QA/QC considerations This is a QC procedure.
Any comment:	Draft initial specifications in Annex A4.3

Data / Parameter:	**Adequate Soil Application of Compost**
Data unit:	- -
Description:	Soil application of the compost will be monitored
Source of data to be used:	Delivery records and onsite inspection
Value of data applied for the purpose of calculating expected emission reductions in section B.5	- -
Description of measurement methods and procedures to be applied:	Dispatch of compost will be measured on the mill's truck scale (please see variable $W_{j,y}$ for the monitoring of compost produced). All lots will be weighed (sampling not applicable) The compost will be applied to plantations in thin layers to assure aerobic decomposition. Photographic evidence will be collected annually on a "representative sample of user sites" (as per part 25 of AMS III.F v10.0) to document the adequate soil application of compost.
QA/QC procedures to be applied:	Compost yields (as a percentage of EFB) will be tracked monthly
Any comment:	

Data / Parameter:	**Compost Price**
Data unit:	- -
Description:	The price of compost will be monitored
Source of data to be used:	Accounting records
Value of data applied for the purpose of calculating expected	Not applicable since this parameter is not used to determine ex-ante emission reductions.

emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Eligibility criteria No. 9 requires that compost be sold at cost to the plantations. The CME publishes guidelines to calculate the compost selling price. This cost will be calculated periodically by CPA Name accountants. The financial auditor of CPA Name will provide annual assurance that this cost is correctly calculated.
QA/QC procedures to be applied:	As per financial auditing procedures.
Any comment:	

Key elements of the monitoring plan

Specify the means of achieving that the monitoring plan for the SSC-CPA will be integrated into the measurement and record keeping of the data and parameters listed above within each CPA's internal systems, such as plant information management system or quality management system.

Classification of Data and Parameters

Type of Monitoring	***Data and Parameters***
Continuous automated monitoring with monthly register of totalized values	$Q_{ww,y}$ EC_y $Q_{y,ww,runoff}$
Continuous monitoring by lots with manual register	$W_{j,y}$ FC_{Diesel}
Monthly monitoring onsite with manual register	$Q_{y,Portion}$
Periodic monitoring offsite	$BOD_{inflow,y}$ $COD_{y,ww,runoff}$
Annual photographic monitoring	Adequate Soil Application of Compost
Annual monitoring of CDM variable	$MD_{y,reg}$ GWP_CH4 NCV_{Diesel} $EF_{CO2,Diesel}$
Annual financial audit	Compost Price
Integrated QA/QC	Compost Quality Control Program

Monitoring Equipment

Onsite monitoring equipment items for the CPA are:

- Truck scale (existing / to be purchased)
- Diesel fuel pump (existing / to be purchased)
- Wastewater flow meter (existing / to be purchased)
- Compost plant runoff water flow meter (existing / to be purchased)
- Compost plant power meter (existing / to be purchased)
- Portable, self-calibrating oxygen probe with 1m lance (existing / to be purchased)
- Measurement equipment for the Compost Quality Control Programme (portable temperature and humidity probes) (existing / to be purchased)

Specify how monitoring equipment maintenance and calibration will be carried out.

Operational and Management Structure

Specify how the operational and management structure for monitoring emission reductions is designed specifically for the CPA, considering the CPA's organizational structure and internal management systems. Include training considerations.

CME will carry out monitoring of CDM variables and prepare the monitoring reports. CME will also review the monitoring data compiled by each CPA.

Data Collection and Archiving

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

Additional Monitoring Considerations

Erroneous or missing measurements

Provisions for erroneous or missing measurements will only apply to those parameters that are monitored continuously ($W_{j,y}$, $Q_{ww,y}$, EC_y, FC_{Diesel}, and $Q_{y,ww,runoff}$). If specific CDM guidelines for erroneous or missing measurements are published, they will be applied. Otherwise, this PoA will use the following conservative procedures.

Missing data that are used to calculate baseline emissions will be set to the 10th percentile of their observed values, prorated if necessary by instrument downtime. Missing data that are used to calculate project emissions will be set to the 90th percentile of their observed values.

Erroneous measurements will be detected through the periodic calibration of the respective instruments if the error determined through calibration exceeds the precision limits specified by the manufacturer. A correction factor will be defined based upon the error determined at calibration and the most conservative of the upper or lower bound of the instrument precision. This correction factor will be applied to all data points from the previous calibration, including, if applicable, a retroactive correction for previous monitoring periods.

Emergency Conditions

Protection of worker safety during emergency conditions at a host palm oil mill could lead to abandonment of the compost plant, thus halting windrow turning and possibly leading to unintentional emissions if compost piles decompose anaerobically. In case a compost plant is abandoned due to an emergency condition, a measurement campaign to determine oxygen content (as per parameter $Q_{y,Portion}$) will be carried out within three working days after having achieved process normalcy.

C.1. Please indicate the level at which environmental analysis as per requirements of the CDM modalities and procedures is undertaken. Justify the choice of level at which the environmental analysis is undertaken:

☐ Please tick if this information is provided at the PoA level. In this case sections C.2. and C.3. need not be completed in this form.

Site-specific environmental conditions at individual CPAs could affect an EIA. Therefore, environmental analysis is carried out at the CPA level and reported in each CDM-SSC-CPA-DD.

C.2. Documentation on the analysis of the environmental impacts, including transboundary impacts:

The environmental impacts of this CPA are considered negligible or minor, whereas the environmental benefits are substantial. Therefore the net impacts of the project are considered beneficial:

- POME, instead of being treated (generating methane and odours) and then discharged is utilized as a raw material for compost.
- EFB, instead of being dumped or mulched is utilized as a raw material for compost.
- Compost is applied on the plantations, thus recycling nutrients and organic matter to the land where they were generated originally.
- A reduction in chemical fertilizer can be expected, thus reducing the life-cycle environmental impact from its use.
- Soil properties in the plantations are enhanced, contributing to sustainable agriculture.

Transforming wastes into useful products, such as compost in this PoA, is deemed high priority within the waste management policies of the host country, Ecuador[11].

Include any site-specific environmental impacts, sensitive receptors, or transboundary issues.

C.3. Please state whether an environmental impact assessment is required for a typical CPA, included in the programme of activities (PoA), in accordance with the host Party laws/regulations:

Describe and provide documentary references regarding the environmental compliance of the composting plant and as relevant, either of the host palm oil mill or the independent waste management facility.

SECTION D. Stakeholders' comments

D.1. Please indicate the level at which local stakeholder comments are invited. Justify the choice:

☐ Please tick if this information is provided at the PoA level. In this case sections D.2. to D.4. need not be completed in this form.

[11] Ecuador's National Environmental Policy

The geographical region covered by this PoA is deemed too large to correctly identify all potential local stakeholders. Therefore, local stakeholder consultations are carried out for each CPA prior to its inclusion in this PoA. Due account of any comments received is considered as well at the CPA level.

D.2. Brief description how comments by local stakeholders have been invited and compiled:

Local stakeholders were invited to a public meeting held at the CPA Name mill / other location on DD/MM/YYY, registering an attendance of XX persons. Explain invitation process and applicable DNA requirements. Meeting attendees represented:

- 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. 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 meeting was recorded on DVD. A summary of the meeting with an inventory of the comments were prepared in Spanish by the Project sponsors.

D.3. Summary of the comments received:

Some participants offered positive comments, recognizing the contribution of the Project to the region's sustainable development.

A total of XXX comments were registered during the meeting for local stakeholders and are summarized below:

Number of Comments	**Summary of Comments**
XX	Questions and comments about CCC1
XX	Questions and comments about CCC2

The following / No negative comments have been received in the context of the project:

- CCC

D.4. 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 / explain how due account was taken of any comments received.

Annex 1

CONTACT INFORMATION ON ENTITY/INDIVIDUAL RESPONSIBLE FOR THE SMALL-SCALE CPA

Organization:	CCC
Street/P.O.Box:	CCC
Building:	CCC
City:	CCC
State/Region:	CCC
Postfix/ZIP:	CCC
Country:	CCC
Telephone:	CCC
FAX:	CCC
E-Mail:	CCC
URL:	CCC
Represented by:	CCC
Title:	CCC
Salutation:	CCC
Last Name:	CCC
Middle Name:	CCC
First Name:	CCC
Department:	CCC
Mobile:	CCC
Direct FAX:	CCC
Direct tel:	CCC
Personal E-Mail:	CCC

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

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

Annex 3

BASELINE INFORMATION

Include any sectoral or historical baseline data that is used to establish fixed parameters or values of parameters for ex-ante emission reduction calculations.

Annex 4

MONITORING INFORMATION

A4.1 Sampling Plan for Compost Pile Oxygen Content

A4.1.A Sampling Design

Objectives and reliability requirements

The objective is to determine the fraction of the compost pile over the crediting period that is produced in the presence of less than 8% oxygen with 90% confidence and 10% precision.

Target population

The target population is the oxygen content within the production of the compost at all points in time over the crediting period.

Sampling method

Simple random sampling will be used, since the compost piles are expected to be homogeneous.

Sample size

Since the population is a continuous medium (oxygen within the compost piles), the population size is infinite, and the approximate equation can be used (part 56, "Guidelines for sampling and surveys for CDM project activities and programme of activities" version 02.0):

$$n \geq \frac{1.645^2(1-p)}{0.1^2 \times p}$$

Where p is the percentage of compost that is produced in the presence of less than 8% oxygen. According to the compost quality management plan (appendix A4.3), the oxygen content should always be above 10%. Therefore, the process target is that this fraction is zero. Since composting is a biological process, upsets might occur due to a number of reasons. The ex-ante emission reduction calculation assumes a conservative value of 20%. The sample size is calculated based on the most conservative assumption possible for a proportion: 50%. This value of 50% is introduced in the above equation to yield:

$n \geq 271$

Sampling frame

The sampling frame is the set of compost piles each time sampling is carried out.

A4.1.B Data to be Collected

Field measurements

Each sampling campaign will be carried out by measuring the oxygen content with a portable, self-calibrating probe, in all compost piles. Sampling campaigns will be carried out throughout the year to avoid any seasonal bias. The readings will be recorded manually and entered into a spreadsheet.

Quality assurance / Quality control

The overall quality control and assurance strategy is based on two key elements:

- Data quality is assured through the self-calibration of the portable oxygen meter.
- Data collection and management will be handled through the compost quality control system.

Non-sampling errors such as refusals and non-response do not apply to this sampling plan. No outlier data will be excluded from the dataset.

Analysis

The fraction *(p)* will be determined by dividing the number of readings under 8% by the total number of samples taken. The standard error for *p* will be determined by the conservative equation (part 256, "Guidelines for sampling and surveys for CDM project activities and programme of activities" version 02.0) as:

$$se = \sqrt{p \; * (1 - p \;) / n}$$

The check on meeting the reliability requirement will be based on the larger of the two proportions (part 9, "Standard for sampling and surveys for CDM project activities and programme of activities" version 03.0). This check will determine the precision (1.645 * standard error), the 90% confidence level (± precision), and the relative precision (precision divided by the larger of the two proportions). The relative precision will be compared to the objective of 10%.

A4.1.C Implementation

Implementation plan

Data collection will be carried out by the compost plant operators. They will be trained in the use of the self-calibrating, portable oxygen probe and the manual recording formats.

Failure to achieve the target precision level

This sampling plan, overdesigned by assuming a 50% proportion value to determine sample size, assures that the target precision level will always be achieved.

A4.2 Sampling Plan for Biological and Chemical Oxygen Demand

A4.2.A Sampling Design

Objectives and reliability requirements

The objective is to determine the biological or chemical oxygen demand (BOD / COD) of the wastewater used in composting and the runoff water with 90% confidence and 10% precision.

Target population

The target population is the BOD in the wastewater as well as the COD in the runoff water.

Sampling method

Simple random sampling will be used, since the wastewater and runoff water streams are expected to be homogeneous.

Sample size

Since the population is a continuous medium (BOD/COD within the wastewater and runoff water streams), the population size is infinite, and the approximate equation can be used (part 88, "Guidelines for sampling and surveys for CDM project activities and programme of activities" version 02.0):

$$n \geq \frac{1.645^2 V}{0.1^2}$$

Where V is the relative variance $(SD/mean)^2$.

Explain the historic or sectoral source of wastewater BOD or COD statistics

Sample Mean	XXX	g/l
Sample Variance	XXX	g^2/l^2

Based on the above data, V is calculated to be XXX. Substituting this value in the above equation yields:

$n \geq$ XXX

This value is less than 30. According to part 12, "Standard for sampling and surveys for CDM project activities and programme of activities" version 03.0, the minimum sample size of 30 is chosen.

Sampling frame

The sampling frame is determined by the grab samples taken of wastewater and runoff water.

A4.2.B Data to be Collected

Field measurements

Measurements and data will be generated through the analysis of the grab samples in a certified laboratory. The field objective is to obtain grab samples periodically. Sampling campaigns will be carried out throughout the year to avoid any seasonal bias.

Field data will document the time and location of the grab samples.

Analytical results of the BOD and COD determinations for wastewater and runoff water will be documented in laboratory results.

Quality assurance / Quality control

The overall quality control and assurance strategy is based on two key elements:

- Data quality is assured through the standardized procedures of the accredited laboratory.
- Data collection and management will be handled through CPA Name's process control system.

Non-sampling errors such as refusals and non-response do not apply to this sampling plan. No outlier data will be excluded from the dataset.

Analysis

The reported values for wastewater and runoff water in monitoring reports will be the average of all values taken during the monitoring period. The standard error (se) of the samples will be determined statistically.

The check on meeting the reliability requirement will determine the precision (1.645 * standard error), the 90% confidence level (± precision), and the relative precision (precision divided by the mean). The relative precision will be compared to the objective of 10%.

A4.2.C Implementation

Implementation plan

Grab sampling will be carried out by qualified technicians from CPA Name's process control laboratory. Analytical determinations of BOD and COD will be carried out by an external laboratory that is accredited for regulatory compliance in the host country.

Failure to achieve the target precision level

In case the target precision level is not achieved during a monitoring period, additional sampling would not be possible, since the wastewater and runoff water generated over the monitoring period would no longer exist. Therefore, discounting of emission reduction estimates would be the only recourse available to the project proponents.

This PoA applies the following conservative procedure for such a situation:

In case the actual precision has a higher bound than the target level, the value of BOD_{ww} will be taken to be 10% more than the lower bound of the confidence interval. For example, if BOD_{ww} is determined by sampling to be 40 g/l with a 90% confidence interval between 34 and 46 (15% precision), the value to be used in the monitoring report would be 37.8 (34 ÷ 0.9) and its precision at 90% confidence would be reported as +22%/-10%. The converse would be applied in the case of COD_{runoff}. Under the same numerical example, its value to be used in the monitoring report would be 41.8 (46÷ 1.1) and its precision at 90% confidence would be reported as +10%/-19%.

A4.3 Initial Guidelines for Compost Quality Control Programme

Process step	Process description	Parameter to monitor	Specification limit	Recording Frequency	Trigger point	Inspection method	Routine procedure
Windrow formation	Reception of EFB	Type of feedstock	EFB, fibre, ash and organic sludges	Daily	Non-authorized	Visual	Identify foreign feedstock and discard
	Configuration of windrows	Heap height (m)	XXX	each heap	XXX	Visual	Add more material
					XXX	Visual	Remove excess material
		Heap width (m)	XXX	each heap	XXX	Visual	Add more material
					XXX	Visual	Remove excess material
Active phase	Spraying POME on windrows	Moisture	50-65%	Daily	>65%	Hygrometer	Cease POME spraying
				Daily	<50%	Hygrometer	Increase POME spraying
	Regular turning of windrows	Temperature (°C)	45-65°C	Daily	>65°C	Thermometer	Turn windrow to assure aerobic conditions
		Oxygen	10-15%	Weekly	<10%	Portable Oxygen probe	Turn windrow to assure aerobic conditions
Curing phase	Adequate curing	Moisture	30-40%	Weekly	>40%	Hygrometer	Extend curing period
		Temperature (°C)	Ambient + 10°C	Weekly	>45°C	Thermometer	Extend curing period
		C:N ratio	15:1 to 40:1	6 / year	>40:1	Laboratory	Change mixture
				6 / year	<15:1	Laboratory	Change mixture

Note: these initial specifications can be modified by the CPA at any point in time