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:

The pineapple waste to energy project in Mindanao Island, Philippines
Version 1.0
Date: 1 March 2011

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

The purpose of this project activity is to replace fossil fuels through the power generation by using a renewable energy and to avoid atmospheric emissions of methane gas being generated from an existing wastewater treatment system. Therefore the project aims to produce electricity by using biogas captured through an anaerobic fermentation of pineapple waste and waste water those are being generated from the pineapple cannery owned by Del Monte Philippines, Inc. ("DMPI") located in Bugo district, Cagayan de Oro City, Misamis Oriental Province, Philippines. DMPI owns 19,577ha of pineapple plantation located in Bukidnon Province away from the cannery for 30km and 0.6milion tonnes/year of yielded pineapple are transported to the cannery.

The current conditions of pineapple waste and waste water that the project targets are as follows:

- All amount of pineapple waste (approximately 270tonnes/day) and other fruits waste (approximately 50tonnes/day, mainly consisted of papaya) generated from the cannery are transported to the plantation. And then 50tonnes/day of pineapple waste are used for feed stocks and the extra amount of pineapple waste (approximately 220tonnes/day) and other fruits waste are disposed by soil mixing because DMPI have no other disposal methods. Since those solid waste mixed into the plantation is disposed without any pre-treatment, such waste has high acidic and high moisture that adversely affect the sugar content of pineapple. Therefore, DMPI wishes the waste to be utilized by this project.

- A lot of water is now being used for the canning processing of pineapple in the cannery and that causes the generation of great amount of waste water. DMPI owns an aerobic waste water treatment system in the cannery plant area and treats approximately 11,000m3/day of waste water by that existing equipment. However, the actual inflow value of BOD (3,000mg/L) is much higher than designed value of BOD (8,000mg/L) and the condition of the existing treatment system is under overloading. Therefore, DMPI wishes this project to treat wastewater and to reduce the overload of their treatment system.

In this project, biogas will be captured from a new anaerobic digester with 220tonnes/day of pineapple waste and 50tonnes/day of other fruits waste, total 270tonnes/day of solid waste, and also captured from a new anaerobic treatment system with 11,000m3/day and that biogas will be used for maximum 10MW of power generation. This project has two project sites as mentioned in A.4.1.4. The one is in the pineapple cannery located in Cagayan de Oro city with 6MW power generation and all amount of the generated electricity will be distributed to DMPI. And other is in the pineapple plantation located in Bukidnon province with 4MW power generation. In that case, 1.5MW of generated electricity will be distributed to DMPI and excess will be distributed to a local grid. Moreover, the treatment of waste water by the anaerobic treatment system for methane recovery in the project will reduce the BOD value and will be able to avoid the overloading condition of existing treatment system and methane emission by incomplete aerobic treatment of the existing equipment.

Through the project activity, the expected greenhouse gas emission reduction is approximately 106,654tCO_2/year and total 1,066,540tCO_2 during the project period (2013～2022).

A.3. Project participants:

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)
Republic of the Philippines (Host)	Del Monte Philippines Inc.	No
Japan	EJ Business Partners Co., Ltd	No

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):

Republic of the Philippines

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

Province of Misamis Oriental

A.4.1.3. City/Town/Community etc:

Bugo District, Municipality of Cagayan de Oro

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

In the project activity, the anaerobic digester for solid waste and waste water will be installed separately. In the case of solid waste digestion, “The Project Site1” is the pineapple plantation area owned by DMPI in Province of Bukidnon, having coordinates 7° 55’ N and 125° 05’ E. On the other hand, “The project site2” for waste water treatment will be located in Bugo District, Municipality of Cagayan de Oro, Province of Misamis Oriental, having coordinates 8° 29’ N and 124° 39’ E, looking on to Macajalar Bay.

Figure 1: The Project Site1 for solid waste

Figure 2: The Project Site2 for waste water

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

"Type and category(ies)"

The project will be categorized as a small-scale project activity because the total power generation capacity will be 10MW and it is lower than 15MW. Since the project will be able to replace the electricity originated by fossil fuels through the distribution of generated electricity in this project to the regional grid and to avoid methane emission at an existing aerobic treatment system which is now under the overloading, the methodologies applied for the project are the followings:

- Type “I”: Renewable Energy Project
  Category “D”: Grid connected renewable electricity generation

- Type “III”: Other Project Activities
  Category “H”: Methane recovery in wastewater treatment

“Technology/measure”

Solid waste digestion

The project will use anaerobic digester which is called **CSTR (Continuous Stirred-Tank Reactor) system** for the power generation by using pineapple pulp and other fruits pulp at the plantation in Bukidnon. CSTR system is proven technology which is fermented organic contents of the pulps by activity of methane bacteria and this system satisfies any requirements of environment standard. The plant flow for the digestion is described as following figure 3.

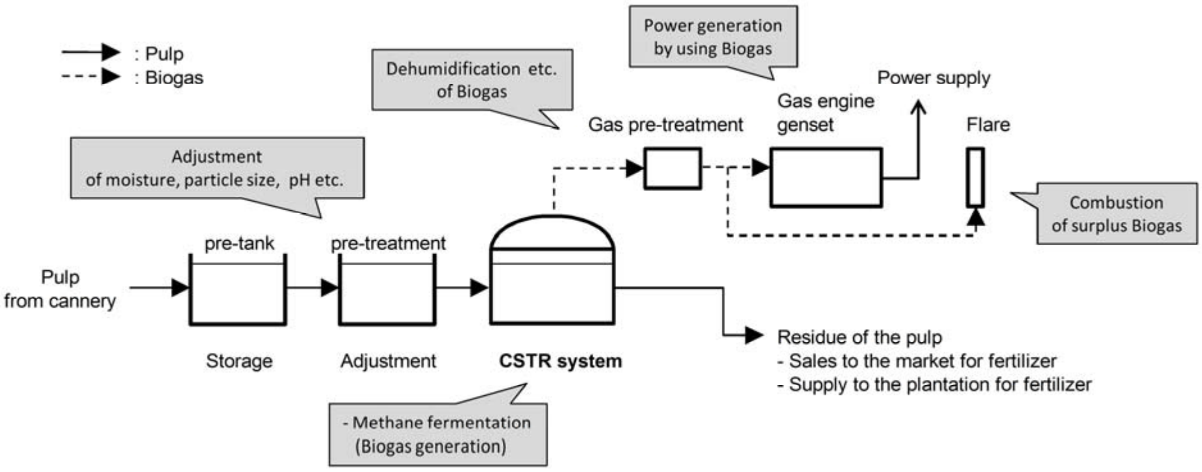

Figure 3: System flow for solid waste digestion

Waste water treatment

The project will introduce anaerobic digester at the cannery which is called **UASB (Upflow Anaerobic Sludge Blanket) system** for treatment of organic contents of the waste water from cannery and for methane fermentation for the purpose of power generation by using biogas from the UASB system. UASB system is also proven technology which is treated organic contents of the waste water by methanogenic granular sludge and reaches 85% COD removal with small space and this system satisfies any requirements of environment standard.

At the project scenario, the UASB is deemed to be the project facility together with the existing treatment facility because it is necessary to treat sequentially by the existing waste water treatment system after the UASB to meet the governmental requirement for the quality of discharged water into the sea or river. Therefore, the project plant for waste water treatment will consist of both UASB and aerobic facility, and will replace the existing aerobic waste water treatment system at the baseline scenario.

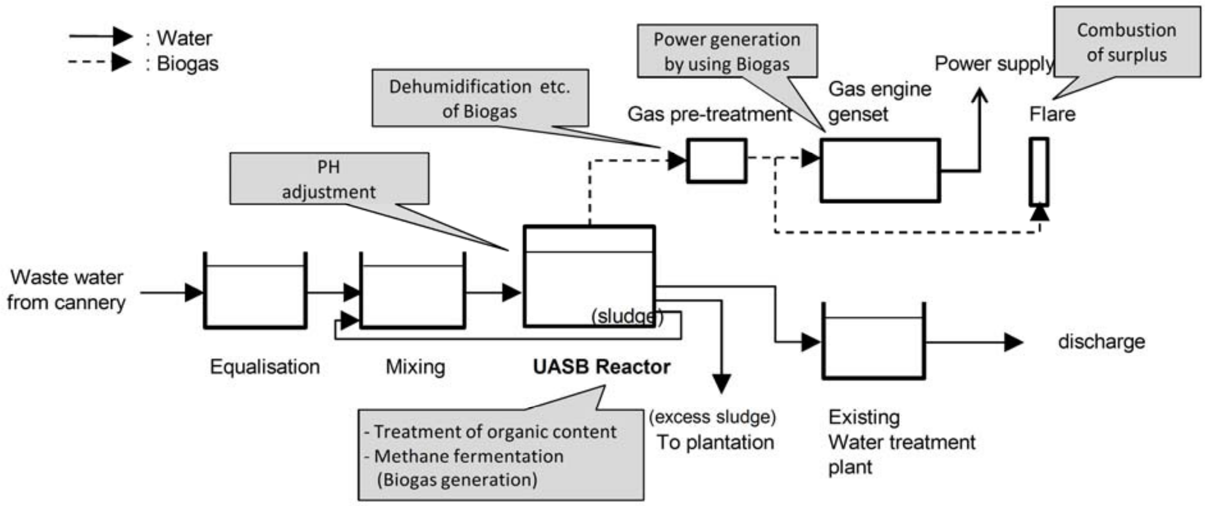

Figure 4: System flow for waste water treatment

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

Year	Annual estimation of emission reductions in tonnes of CO2 e
2013 (Jan to Dec)	106,654
2014	106,654
2015	106,654
2016	106,654
2017	106,654
2018	106,654
2019	106,654
2020	106,654
2021	106,654
2022 (Jan to Dec)	106,654
Total estimated reductions (tonnes of CO2 e)	1,066,540
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO2 e)	106,654

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

The project is not supported by any public funding from Annex I country.

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

According to Appendix C of the Simplified Modalities and Procedures for Small-Scale CDM project activities, a proposed small-scale project activity shall be deemed to be a debundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

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

The project owner has not registered and is not applying for the registration for other small-scale CDM project activities; therefore the proposed project is not a debundled component of a large-scale project.

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 following approved baseline and monitoring methodologies are applied for proposed project.

- AMS-I.D. (Version 16) “Grid connected renewable electricity generation”
- Tool to calculate the emission factor for an electricity system (Version 02)
- AMS-III.H. (Version 15) “Methane recovery in wastewater treatment”
- Tool to determine project emission from flaring gases containing methane

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

“Type I: Renewable Energy Project”

Since the project will be a power generation project by using renewable energy and the maximum generation capacity will be lower than 15MW, it is valid that the Type I is applied for the project.

The project meets all the applicability conditions of the methodology AMS-I.D. as described below.

Table 1: Applicability conditions for AMS-I.D.

	Applicability condition	Project case
1	This category comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass that supply electricity to a national or a regional grid. Project activities that displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit shall apply AMS-I.F.	Since, the project supplies electricity generated from renewable energy generation unit by using biogas to regional grid, this article is applicable.
2	This methodology is applicable to project activities that (a) install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).	The project installs a new genset at the project site in where any renewable energy generation units are not installed and started to operate prior to the project activity.
3	Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: · The project activity is implemented in an existing reservoir with no change in the volume of reservoir; · The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m2; · The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m2.	The project is biogas power generation project.

4	In the case of biomass power plants, no other biomass types than renewable biomass are to be used in the project plant.	The project is the biogas power generation project and only the pineapple waste is to be used in the project plant.
5	If the new unit has both renewable and non-renewable components (e.g., a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the new unit co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	The new unit installed in the project site have only renewable component lower than 15MW.
6	Combined heat and power (co-generation) systems are not eligible under this category.	The project is not co-generation system.
7	In the case of project activities that involve the addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.	There are not any existing renewable energy generation units.
8	In the case of retrofit or replacement, to qualify as a small scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW.	There are not any retrofits or replacements for existing unit.

"Type III: Other Project Activities"

Since the expected emission reduction of GHG by implementation of the project will be lower than 60kt-CO_2/year, it is valid that the Type III is applied for the project.

The project meets all the applicability conditions of the methodology AMS-III.H. as described below.

Table 2: Applicability conditions for AMS-III.H.

Applicability condition		Project case
1	This methodology comprises measures that recover biogas from biogenic organic matter in wastewater by means of one, or a combination, of the following options: (a) Substitution of aerobic wastewater or sludge treatment systems with anaerobic systems with biogas recovery and combustion; (b) Introduction of anaerobic sludge treatment system with biogas recovery and combustion to a wastewater treatment plant without sludge treatment; (c) Introduction of biogas recovery and combustion to a sludge treatment system; (d) Introduction of biogas recovery and combustion to an anaerobic wastewater treatment system such as anaerobic reactor, lagoon, septic tank or an on site industrial plant; (e) Introduction of anaerobic wastewater treatment with biogas recovery and combustion, with or without anaerobic sludge treatment, to an untreated wastewater stream; (f) Introduction of a sequential stage of wastewater treatment with biogas recovery and combustion, with or without sludge treatment, to an anaerobic wastewater treatment system without biogas	Since the project facility for waste water treatment (new anaerobic waste water treatment system + existing un-overloaded aerobic treatment system) will replace the existing overloaded aerobic treatment system, clause (a) is applicable.

	recovery (e.g. introduction of treatment in an anaerobic reactor with biogas recovery as a sequential treatment step for the wastewater that is presently being treated in an anaerobic lagoon without methane recovery).	
2	In cases where baseline system is anaerobic lagoon the methodology is applicable if: (a) The lagoons are ponds with a depth greater than two meters, without aeration. The value for depth is obtained from engineering design documents, or through direct measurement, or by dividing the surface area by the total volume. If the lagoon filling level varies seasonally, the average of the highest and lowest levels may be taken; (b) Ambient temperature above 15°C, at least during part of the year, on a monthly average basis; (c) The minimum interval between two consecutive sludge removal events shall be 30 days.	The baseline system of the project is over loaded aerobic treatment facility.
3	The recovered biogas from the above measures may also be utilised for the following applications instead of combustion/flaring: (a) Thermal or electrical energy generation directly; (b) Thermal or electrical energy generation after bottling of upgraded biogas; or (c) Thermal or electrical energy generation after upgrading and distribution: (i) Upgrading and injection of biogas into a natural gas distribution grid with no significant transmission constraints; (ii) Upgrading and transportation of biogas via a dedicated piped network to a group of end users; or (d) Hydrogen production.	Since, as per the project activity is done, biogas which is captured from anaerobic system installed for the project is used for power generation directly, this article is applicable.
4	If the recovered biogas is used for project activities covered under paragraph 3 (a), that component of the project activity can use a corresponding methodology under Type I.	The project applies the Type I as well.
5	If the recovered biogas is utilized for the production of hydrogen (project activities covered under paragraph 3 (d)), that component of the project activity shall use corresponding methodology AMS-III.O.	The project activity does not cover under paragraph 3 (d).
6	For project activities covered under paragraph 3 (b), if bottles with upgraded biogas are sold outside the project boundary, the end-use of the biogas shall be ensured via a contract between the bottled biogas vendor and the end-user. No emission reductions may be claimed from the displacement of fuels from the end use of bottled biogas in such situations. If however the end use of the bottled biogas is included in the project boundary and is monitored during the crediting period CO_2 emissions avoided by the displacement of fossil fuel can be claimed under the corresponding Type I methodology, e.g. AMS-I.C.	The project activity does not cover under paragraph 3 (b).
7	For project activities covered under paragraph 3 (c) (i), emission reductions from the displacement of the use of natural gas are eligible under this methodology, provided the geographical extent of the natural gas distribution grid is within the host country boundaries.	The project activity does not cover under paragraph 3 (b).

8	For project activities covered under paragraph 3 (c) (ii), emission reductions for the displacement of the use of fuels can be claimed following the provision in the corresponding Type I methodology, e.g. AMS-I.C.	The project activity does not cover under paragraph 3 (c) (ii).
9	For project activities covered under paragraph 3 (b) and (c), this methodology is applicable if the upgrade is done using one of the following technologies[2] such that the methane content of the upgraded biogas is in accordance with relevant national regulations (where these exist) or, in the absence of national regulations, a minimum of 96% (by volume). These conditions are necessary to ensure that the recovered biogas is completely destroyed through combustion in an end use: · Pressure Swing Adsorption; · Absorption with/without water circulation; · Absorption with water, with or without water recirculation (with or without recovery of methane emissions from discharge).	The project activity does not cover under paragraph 3 (b) and 3 (c).
10	New facilities (Greenfield projects) and project activities involving a change of equipment resulting in a capacity addition of the wastewater or sludge treatment system compared to the designed capacity of the baseline treatment system are only eligible to apply this methodology if they comply with the relevant requirements in the General guidelines to SSC CDM methodologies. In addition the requirements for demonstrating the remaining lifetime of the equipment replaced, as described in the general guidelines shall be followed.	The project activity complies with the relevant requirements in the General guidelines to SSC CDM methodologies.
11	For project activities covered under paragraph 3 (b) and (c), additional guidance provided in Annex 1 shall be followed for the calculations, in addition to the procedures in the relevant sections below.	The project activity does not cover under paragraph 3 (b) and 3 (c).
12	The location of the wastewater treatment plant as well as the source generating the wastewater shall be uniquely defined and described in the PDD.	The wastewater treatment plant of the project will be located in the project site and treat wastewater generated from pineapple cannery.
13	Measures are limited to those that result in aggregate emissions reductions of less than or equal to 60 kt CO_2 equivalent annually from all Type III components of the project activity.	Since amount of emission reduction achieved by the project activity will be 55kt CO2 and less than 60kt CO2, this article is applicable.

B.3. Description of the project boundary:

The project boundary encompasses The Project Site1 for power generation by using captured gas from solid waste digestion in the pineapple plantation and The Project Site2 for power generation by using captured gas from waste water treatment in the pineapple cannery, with regard to the methodologies AMS-I.D. and AMS-III.H. Moreover, since waste water after this project treatment in the pineapple cannery will be further treated by the existing aerobic waste water treatment facility to satisfy quality requirements of discharging waste water, the project boundary also includes the existing facility.

In addition, the project boundary dose not include the transportation of fertilizer to be generated after the digestion to the plantation away from the cannery for 30km because the untreated pineapple waste generated from the cannery is transported to the pineapple plantation on the present condition as well and such transport condition will not be difference between before and after the project.

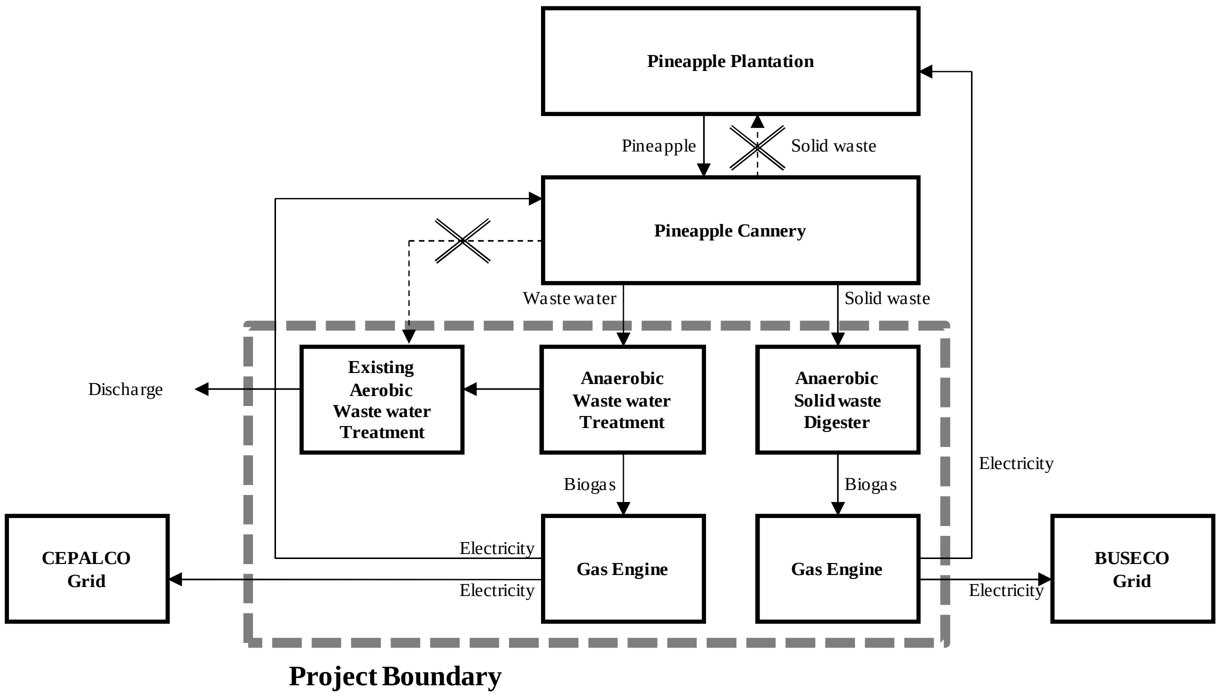

Figure 5: Diagram of project boundary

B.4. Description of baseline and its development:

"Replacement of Electricity from Public Grid"

On the present condition, the cannery is purchasing electricity from CEPALCO (Cagayan Electric Power & Light Company, Inc.) grid and the plantation is purchasing electricity from BUSECO (Bukidnon II Electric Cooperative) grid, both local grids are distributing electricity generated from fossil fuel power plant. Since the power generation from fossil fuel discharges CO2 to the atmosphere, the project activity can replace the electricity originated from fossil fuel by using renewable energy through the providing of generated electricity from the project to the cannery directly.

"Recovering of Methane from anaerobic waste water treatment system"

On the present condition, waste water generated from the cannery is treated at the existing aerobic waste water treatment system. However, the inflow value of BOD is much more than the design value and the existing treatment facility is under the over loading. Therefore, the project activity can reduce such over loaded condition of existing facility and can capture methane from new anaerobic waste water treatment system with gas recovering function.

In addition, the details of the calculation by AMS-I.D. and AMS-III.H. are described in B.6.

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:

Chronology of events taken in consideration of CDM

As mentioned below, continuing efforts and actions have been taken by the project developer for registration of the project as a CDM project.

Action/Event	Timing
First meeting with DMPI to propose implementation of the project as CDM	22 June 2010
Submission of the project proposal to GEC (Global Environmental Centre Foundation), a Japanese governmental agency, to implement feasibility study for the project as CDM	16 July 2010
Receipt approval to implement feasibility study with Japanese governmental fund support for the project by GEC	3 Oct 2010
Project developer was entrusted with "Feasibility study work for CDM project" by GEC	4 Oct 2010
Second meeting with DMPI to discuss regarding schedule of the feasibility study to clarify some project conditions	28 Sep 2010
Third meeting with DMPI to explain detail scheme and project plant of the proposed project as CDM	2 Dec 2010

Demonstration and assessment of additionality of the project activity shall be carried out following the "Attachment A to Appendix B of the simplified modalities and procedures for small-scale CDM project activities". The following barriers are presented to illustrate why the project would not have occurred in a business-as-usual case and, therefore, is additional.

(a) Investment Barrier
(b) Technological Barrier
(c) Common Barrier
(d) Other Barrier

"(a) Investment Barrier"

The result of profitability comparison for the project between having CER selling revenue and not is as follows. In this calculation, price of CER has been conservatively set as 12USD.

- Without CER revenue: the project-IRR = 6.6%
- With CER revenue : the project-IRR = 12.1%

The recent long term interest rate of the Development Bank of the Philippines is 7.8% to11.0%. If the benchmark of the project is set as more than 11.0%, the possibility of project without CER revenue will not be verified. Therefore, in the case of that the project is not CDM-project the project activity will not be realized due to the investment barrier.

Sensitivity analysis

Following table shows a sensitivity analysis of three parameters (Investment cost, O&M cost and Electricity tariff) that would critically affect financial condition of this project activity. The each parameter filled in the table expresses value under a scenario that the project IRR without CER revenue equals to the benchmark.

Table 3: Sensitivity analysis of project IRR

	Investment Cost	O&M cost	Electricity tariff
Project IRR = Bench mark	-18.0%	-60.0%	+11.0%

The above sensitivity analysis provides a valid reason supports that the proposed project is not financially attractive without CER revenue because the result seems to be in excess of reasonable range.

“(b) Technological Barrier, (c) Common Barrier”

There are no any power generation projects registered as a CDM project using pineapple waste other than this project in Philippines. In addition, avoidance of soil mixing of untreated solid waste in The Project Site1 and dissolution of overloaded condition of the existing waste water treatment facility in The Project Site2 will not be occurred if the project activity is not implemented. Therefore, the existence of technological barrier and common barrier are verified.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

“Emission reductions associated with wastewater treatment”

The baseline scenario of waste water treatment system is existing aerobic waste water treatment system without methane recovering function described in AMS-III.H. version15, Paragraph 1, Section (a). The project scenario of waste water treatment system is the replacement of the existing treatment facility by the project facility which consists of both new anaerobic facility with methane recovering function and existing aerobic facility without overloaded condition.

The amount of GHG emission reduction with reference to a treatment of waste water is calculated by using the following calculation formula described in AMS-III.H.

Emission reduction

$$ER_y = BE_y - (PE_y + LE_y)$$

Baseline

$$BE_y = (BE_{power,y} + BE_{ww,treatment,y} + BE_{s,treatment,y} + BE_{ww,discharge,y} + BE_{s,final,y})$$

BE_y	Baseline emissions in year y (tCO2)
$BE_{power,y}$	Baseline emissions from electricity or fuel consumption in year y (tCO2)
$BE_{ww,treatment,y}$	Baseline emissions of the wastewater treatment systems affected by the project activity in year y (tCO2)
$BE_{s,treatment,y}$	Baseline emissions of the sludge treatment systems affected by the project activity in year y (tCO2)
$BE_{ww,discharge,y}$	Baseline methane emissions from degradable organic carbon in treated wastewater discharged into sea/river/lake in year y (tCO2)
$BE_{s,final,y}$	Baseline methane emissions from anaerobic decay of the final sludge produced in year y (tCO2). If the sludge is controlled combusted, disposed in a landfill with biogas recovery, or used for soil application in the baseline scenario, this term shall be neglected.

Since there is no sludge treatment activity in the project, $BE_{s,treatment,y}$ and $BE_{s,final,y}$ are not relevant.

Table 4: Input values and data sources for emission reduction associated with waste water treatment

Parameter	Description	Value	Source
$BE_{ww,treatment,y} = \sum_i (Q_{ww,i,y} * COD_{removed,i,y} * MCF_{ww,treatment,BL,i}) * B_{o,ww} * UF_{BL} * GWP_{CH4}$			
$BE_{ww,treatment,y}$	Baseline emissions of the wastewater treatment systems affected by the project activity in year y (tCO2)	Calculated	-
$Q_{ww,i,y}$	Volume of wastewater treated in baseline wastewater treatment system i in year y (m3)	4,015,000	Design flow rate (11,000m3/day * 365days)
$COD_{removed,i,y}$	Chemical oxygen demand removed by baseline treatment system i in year y (t/m3), measured as the difference between inflow COD and the outflow COD in system i	0.0139	Calculation (0.0140ton/m3 of COD * 99% of removal rate)
$MCF_{ww,treatment,BL,i}$	Methane correction factor for baseline wastewater treatment systems i (MCF values as per Table III.H.1)	0.3	AMS-III.H.Ver.15, Table III.H.1. for Aerobic treatment, overloaded
i	Index for baseline wastewater treatment system	-	-
$B_{o,ww}$	Methane producing capacity on the wastewater (tCH4/tCOD)	0.25	AMS-III.H.Ver.15, default value for COD
UF_{BL}	Model correction factor to account for model uncertainties	0.89	AMS-III.H.Ver.15, Model correction factor to account for model uncertainties
GWP_{CH4}	Global warming potential for methane (tCO2/tCH4)	21	AMS-III.H.Ver.15, Global Warming Potential for methane

$BE_{ww,discharge,y} = Q_{ww,y} * GWP_{CH4} * B_{o,ww} * UF_{BL} * COD_{ww,discharge,BL,y} * MCF_{ww,BL,discharge}$			
$BE_{ww,discharge,y}$	Methane emissions from degradable organic carbon in treated wastewater discharged in e.g., a river, sea or lake in the baseline situation in year y (tCO2)	Calculated	-
$Q_{ww,y}$	Volume of wastewater treated in year y (m3)	4,015,000	Design flow rate (11,000m3/day * 365days)
$COD_{ww,discharge,BL,y}$	Chemical oxygen demand of the treated wastewater discharged into sea, river or lake in the baseline situation in the year y (t/m3). If the baseline scenario is the discharge of untreated wastewater, the COD of untreated wastewater shall be used	0.00014	Calculation (0.0140ton/m3 of COD * 1% of removal rate)
$MCF_{ww,BL,discharge}$	Methane correction factor based on discharge pathway in the baseline situation (e.g. into sea, river or lake) of the wastewater (faction) (MCF values as per Table III.H.1)	0.1	AMS-III.H.Ver.15, Table III.H.1. for Discharge of wastewater to sea, river or lake

Project scenario

$$PE_y = \begin{Bmatrix} PE_{power,y} + PE_{ww,treatment,y} + PE_{s,treatment,y} + PE_{ww,discharge,y} + PE_{s,final,y} + PE_{fugitive,y} + \\ PE_{biomass,y} + PE_{flaring,y} \end{Bmatrix}$$

PE_y	Project activity emissions in the year y (tCO2)
$PE_{power,y}$	Emissions from electricity or fuel consumption in the year y (tCO2)
$PE_{ww,treatment,y}$	Methane emissions from wastewater treatment systems affected by the project activity, and not equipped with biogas recovery, in year y (tCO2)
$PE_{s,treatment,y}$	Methane emissions from sludge treatment systems affected by the project activity, and not equipped with biogas recovery, in year y (tCO2)
$PE_{s,discharge,y}$	Methane emissions from degradable organic carbon in treated wastewater in year y (tCO2)
$PE_{s,final,y}$	Methane emissions from anaerobic decay of the final sludge produced in year y (tCO2)
$PE_{fugitive,y}$	Methane emissions from biogas release in capture systems in year y (tCO2)
$PE_{flaaring,y}$	Methane emissions due to incomplete flaring in year y as per the “Tool to determine project emissions from flaring gases containing methane” (tCO2)
$PE_{biomass,y}$	Methane emissions from biomass stored under anaerobic conditions which does not take place in the baseline situation (tCO2)

Since the sludge to be generated through the project activity will finally discharged by soil mixing at the plantation and there is no sludge treatment activity in the project, $PE_{s,treatment,y}$ and $PE_{s,discharge,y}$ and

$PE_{s,final,y}$ are not relevant. And also, since the flaring system will not be normally used in the project, $PE_{flaring,y}$ is not relevant.

Table 5: Input values and data sources for emission reduction associated with waste water treatment

Parameter	Description	Value	Source
$PE_{ww,treatment,y} = \sum_k Q_{ww,k,y} * COD_{removed,PJ,k,y} * MCF_{ww,treatment,PJ,k} * B_{o,ww} * UF_{PJ} * GWP_{CH4}$			
$PE_{ww,treatment,y}$	Methane emission from the project wastewater treatment systems affected by the project activity, and not equipped with biogas recovery in year (tCO2)	Calculated	-
$Q_{ww,k,y}$	Volume of wastewater treated in baseline wastewater treatment system k in year y (m3)	4,015,000	Design flow rate (11,000m3/day * 365days)
$COD_{removed,PJ,k,y}$	Chemical oxygen demand removed by project wastewater treatment system k in year y (t/m3), measured as the difference between inflow COD and the outflow COD in system k	0.0119	Calculation for anaerobic treatment (0.0140ton/m3 of COD * 85% of removal rate)
		0.0021	Calculation for aerobic treatment (0.0140ton/m3 of COD * (15% * 99%) of removal rate)
$MCF_{ww,treatment,PJ,k}$	Methane correction factor for project wastewater treatment systems k equipped with biogas recovery equipment	0.8	AMS-III.H.Ver.15, Table III.H.1. for anaerobic reactor without methane recovery
		0.0	AMS-III.H.Ver.15, Table III.H.1. for aerobic reactor without methane recovery
k	Index for project wastewater treatment system	-	-
$B_{o,ww}$	Methane producing capacity oh the wastewater (tCH4/tCOD)	0.25	AMS-III.H.Ver.15, default value for COD
UF_{PJ}	Model correction factor to account for model uncertainties	1.12	AMS-III.H.Ver.15, Model correction factor to account for model uncertainties
GWP_{CH4}	Global warming potential for methane (tCO2/tCH4)	21	AMS-III.H.Ver.15, Global Warming Potential for methane
$PE_{ww,discharge,y} = Q_{ww,y} * GWP_{CH4} * B_{o,ww} * UF_{PJ} * COD_{ww,discharge,PJ,y} * MCF_{ww,PJ,discharge}$			
$PE_{ww,discharge,y}$	Methane emissions from degradable organic carbon in treated wastewater in year y (tCO2)	Calculated	-

$Q_{ww,y}$	Volume of wastewater treated in year y (m3)	4,015,000	Design flow rate (11,000m3/day * 365days)
$COD_{ww,discharge,PJ,y}$	Chemical oxygen demand of the treated wastewater discharged into sea, river or lake in the project situation in the year y (t/m3)	0.00002	Calculation (0.0140ton/m3 of COD * (15% * 1%) of removal rate)
$PE_{fugitive,y} = PE_{fugitive,ww,y} + PE_{fugitive,s,y}$ $PE_{y,fugitive,ww} = (1-CFE_{ww}) * MEP_{ww,treatment,y} * GWP_{CH4}$ $MEP_{ww,treatment,y} = Q_{ww,y} * B_{o,ww} * UF_{PJ} * \sum_k COD_{removed,PJ,k,y} * MCF_{ww,treatment,PJ,k}$ $PE_{y,fugitive,s} = (1-CFE_s) * MEP_{s,treatment,y} * GWP_{CH4}$ $MEP_{s,treatment,y} = \sum_l (S_{PJ,l,y} * MCF_{s,treatment,PJ,l}) * DOC_s * UF_{PJ} * DOC_F * F * 16/12$ $PE_{y,fugitive,s}$ is not relevant, as no sludge treatment facility.			
$PE_{fugitive,y}$	Methane emissions from release in capture systems in year y (tCO2)	Calculated	-
$PE_{fugitive,ww,y}$	Fugitive emissions through capture inefficiencies in the anaerobic wastewater treatment systems in the year y (tCO2)	Calculated	-
CFE_{ww}	Capture efficiency of the biogas recovery equipment in the wastewater treatment systems	0.9	AMS-III.H.Ver.15, Capture efficiency of the biogas recovery equipment in the wastewater treatment systems
$MEP_{ww,treatment,y}$	Methane emission potential of wastewater treatment systems equipped with biogas recovery system in year y (tonnes)	Calculated	-

"Emission reductions associated with power generation component"

The baseline for power generation is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kgCO2/kWh) calculated in a transparent and conservative manner as a combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the "Tool to calculate the emission factor for an electricity system (version 02)" (hereafter referred to as "Tool")

Table 6: Input values and data sources for emission reduction associated with power generation

Parameter	Description	Value	Source
$ER_{y,power} = (EG_{y,displaced} - EG_{y,consumed}) * EF_{y,grid}$			
$ER_{y,power}$	Emission reductions due to electricity displacement in year y (tCO2/year)	Calculated	-
$EG_{y,displaced}$	Quantity of electricity that would be generatd by the project activity (MWh/year)	76,800	The project plan (10.0MW * 24hours * 320days)

$EG_{y,consumed}$	Quantity of electricity that would be consumed by the project activity (MWh/year)	3,840	The project plan (0.5MW * 24hours * 320days)
$EF_{y,grid}$	The grid CO2 emission factor in year y (tCO2/MWh)	0.709	Refer to Annex 3

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

Data / Parameter:	$Q_{ww,i,y}$
Data unit:	m3/year
Description:	Volume of wastewater treated in year y
Source of data used:	Design flow rate (11,000m3/day * 365days)
Value applied:	4,015,000
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value is all of average amount of waste water generated from the cannery based on the feasibility study.
Any comment:	-

Data / Parameter:	$COD_{removed,BL,i,y}$
Data unit:	tonnes/m3
Description:	Chemical oxygen demand removed by baseline treatment system i in year y, measured as the difference between inflow COD and the outflow COD in system i
Source of data used:	Calculation (0.0140ton/m3 of COD * 99% of removal rate)
Value applied:	0.0139
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value of COD of waste water generated from is average data in 2010 based on the feasibility study.
Any comment:	-

Data / Parameter:	$COD_{ww,discharge,BL,y}$
Data unit:	tonnes/m3
Description:	Chemical oxygen demand of the treated wastewater discharged into sea, river or lake in the baseline situation in the year y
Source of data used:	Calculation (0.0140ton/m3 of COD * 1% of removal rate)
Value applied:	0.00014
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value of COD of waste water generated from is average data in 2010 based on the feasibility study.
Any comment:	-

Data / Parameter:	$COD_{removed,PJ,k,y}$
Data unit:	tonnes/m3
Description:	Chemical oxygen demand removed by project activity treatment system k in year y, measured as the difference between inflow

	COD and the outflow COD in system k
Source of data used:	Calculation for anaerobic treatment (0.0140ton/m3 of COD * 85% of removal rate)
Value applied:	0.0119
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value of COD of waste water generated from is average data in 2010 based on the feasibility study.
Any comment:	-

Data / Parameter:	$COD_{removed,PJ,k,y}$
Data unit:	tonnes/m3
Description:	Chemical oxygen demand removed by project activity treatment system k in year y, measured as the difference between inflow COD and the outflow COD in system k
Source of data used:	Calculation for aerobic treatment (0.0140ton/m3 of COD * (15% * 99%) of removal rate)
Value applied:	0.0021
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value of COD of waste water generated from is average data in 2010 based on the feasibility study.
Any comment:	-

Data / Parameter:	$COD_{ww,discharge,PJ,y}$
Data unit:	tonnes/m3
Description:	Chemical oxygen demand of the treated wastewater discharged into sea, river or lake in the project activity situation in the year y
Source of data used:	Calculation (0.0140ton/m3 of COD * (15% * 1%) of removal rate)
Value applied:	0.00002
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value of COD of waste water generated from is average data in 2010 based on the feasibility study.
Any comment:	-

Data / Parameter:	$EG_{y,displaced}$
Data unit:	MWh
Description:	Amount of electricity produced by the project activity
Source of data used:	The project plan
Value applied:	76,800
Justification of the choice of data or description of measurement methods and procedures actually applied :	6.0MW will be generated by using biogas from UASB and 4.0MW will be generated by using biogas from CSTR. Both estimation are based on technical standard and the feasibility study for this project. (10.0MW * 24hours * 320days)
Any comment:	-

Data / Parameter:	$EF_{y,grid}$
Data unit:	tCO2/MWh
Description:	The grid CO2 emission factor in year y
Source of data used:	Refer to Annex 3
Value applied:	0.709
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value is calculated by using official data obtained from the Department of Energy of Philippines.
Any comment:	-

B.6.3 Ex-ante calculation of emission reductions:

"Emission reductions associated with wastewater treatment"

Baseline emissions

$$BE_{power,y} = 1.1_{(MW)} * 24_{(hours)} * 320_{(days)} * 0.709_{(tCO2/MWh)} = 5{,}990_{(tCO2/year)}$$

$$BE_{ww,treatment,y} = \sum_i (Q_{ww,i,y} * COD_{removed,i,y} * MCF_{ww,treatment,BL,i}) * B_{o,ww} * UF_{BL} * GWP_{CH4}$$
$$= 4{,}015{,}000_{(m3)} * 0.014_{(tCOD/m3)} * 0.3 * 0.25_{(kgCH4/kgCOD)} * 0.89 * 21_{(tCO2/tCH4)}$$
$$= 78{,}004_{(tCO2/year)}$$

$BE_{s,treatment,y}$: There is no sludge treatment system takes place in the baseline.

$$BE_{ww,discharge,y} = Q_{ww,y} * GWP_{CH4} * B_{o,ww} * UF_{BL} * COD_{ww,discharge,BL,y} * MCF_{ww,BL,discharge}$$
$$= 4{,}015{,}000_{(m3)} * 21_{(tCO2/tCH4)} * 0.25_{(kgCH4/kgCOD)} * 0.89 * 0.00014_{(tCOD/m3)} * 0.1$$
$$= 263_{(tCO2/year)}$$

$BE_{s,final,y}$: There is no sludge treatment system takes place in the baseline

Project emissions

$$PE_{power,y} = 1.25_{(MW)} * 24_{(hours)} * 320_{(days)} * 0.709_{(tCO2/MWh)} = 6{,}806_{(tCO2/year)}$$

$$PE_{ww,treatment,y} = \sum_k Q_{ww,k,y} * COD_{removed,PJ,k,y} * MCF_{ww,treatment,PJ,k} * B_{o,ww} * UF_{PJ} * GWP_{CH4}$$
$$= 4{,}015{,}000_{(m3)} * 0.0021_{(tCOD/m3)} * 0.0 * 0.25_{(kgCH4/kgCOD)} * 1.12 * 21_{(tCO2/tCH4)}$$
$$= 0_{(tCO2/year)}$$

$PE_{s,treatment,y}$: There is no sludge treatment system installed in the project and no sludge treatment takes place.

$$PE_{ww,discharge,y} = Q_{ww,y} * GWP_{CH4} * B_{o,ww} * UF_{PJ} * COD_{ww,discharge,PJ,y} * MCF_{ww,PJ,discharge}$$
$$= 4{,}015{,}000_{(m3)} * 21_{(tCO2/tCH4)} * 0.25_{(kgCH4/kgCOD)} * 1.12 * 0.00002_{(tCOD/m3)} * 0.1$$
$$= 50_{(tCO2/year)}$$

$PE_{s,final,y}$: There is no sludge treatment system takes place in the baseline

$$PE_{fugitive,y} = PE_{fugitive,ww,y} + PE_{fugitive,s,y}$$
$$= 22{,}475_{(tCO2/year)}$$

$$PE_{y,fugitive,ww} = (1 - CFE_{ww}) * MEP_{ww,treatment,y} * GWP_{CH4}$$
$$= (1 - 0.9) * 10{,}702 * 21$$
$$= 22{,}475_{(tCO2/year)}$$

$$MEP_{ww,treatment,y} = Q_{ww,y} * B_{o,ww} * UF_{PJ} * \sum_k COD_{removed,PJ,k,y} * MCF_{ww,treatment,PJ,k}$$
$$= 4{,}015{,}000_{(m3)} * 0.25_{(kgCH4/kgCOD)} * 1.12 * 0.0119_{(tCOD/m3)} * 0.8$$

$PE_{flare,y}$: In general all of the biogas produced by the project is utilized electricity generation. A flaring system will be installed by the project activity to combust excess biogas if any. For the ex-ante calculation, methane emissions from the flare are set to zero.

Leakage

There is no leakage.

Emission reduction

The emission reduction is calculated as follows.

$$ER_y = BE_y - (PE_y + LE_y)$$
$$= 84{,}257_{(tCO2/year)} - 29{,}331_{(tCO2/year)}$$
$$= 54{,}926_{(tCO2/year)}$$

"Emission reductions associated with power generation component"

Emission reduction

$$ER_{y,power} = (EG_{y,displaced} - EG_{y,consumed}) * EF_{y,grid}$$
$$= (76{,}800_{(MWh/year)} - 3{,}840_{(MWh/year)}) * 0.709_{(tCO2/MWh)}$$
$$= 51{,}728_{(tCO2/year)}$$

“Total emission reductions”

$$ER_y = ER_{ww,y} + ER_{power,y}$$
$$= 54{,}926_{(tCO2/year)} + 51{,}728_{(tCO2/year)}$$
$$= 106{,}654_{(tCO2/year)}$$

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

Table 7: Ex-ante estimation of emission reduction

Year	Estimation of project activity emissions (tCO2)	Estimation of baseline emissions (tCO2)	Estimation of leakage (tCO2)	Estimation of overall emission reductions (tCO2)
2013 (Jan to Dec)	32,054	138,708	0	106,654
2014	32,054	138,708	0	106,654
2015	32,054	138,708	0	106,654
2016	32,054	138,708	0	106,654
2017	32,054	138,708	0	106,654
2018	32,054	138,708	0	106,654
2019	32,054	138,708	0	106,654
2020	32,054	138,708	0	106,654
2021	32,054	138,708	0	106,654
2022 (Jan to Dec)	32,054	138,708	0	106,654
Total	**320,540**	**1,387,080**	**0**	**1,066,540**

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

B.7.1 Data and parameters monitored:

Data / Parameter:	$Q_{ww,i,y}$
Data unit:	m3/year
Description:	Volume of wastewater treated in year y
Source of data to be used:	On-site measurement
Value of data	4,015,000
Description of measurement methods and procedures to be applied:	To be monitored continuously by a flow meter. The flow data will be monitored and recorded daily.
QA/QC procedures to be applied:	The meter will be calibrated regularly accordance with manufacturer’s specifications.
Any comment:	-

Data / Parameter:	$COD_{ww,untreated,y}$
Data unit:	tonnes/m3
Description:	Chemical oxygen demand of wastewater entering the anaerobic treatment system with methane capture in year y

Source of data to be used:	On-site measurement
Value of data	0.014
Description of measurement methods and procedures to be applied:	By taking samples and those samples will be inspected monthly.
QA/QC procedures to be applied:	The sampling and inspection of waste water will be implemented at an existing inspection house owned by DMPI and located in the cannery plant.
Any comment:	-

Data / Parameter:	$COD_{ww,treated,y}$
Data unit:	tonnes/m3
Description:	Chemical oxygen demand outflow through the project activity treatment system equipped with biogas recovery system and existing aerobic treatment system in year y
Source of data to be used:	On-site measurement
Value of data	0.00002
Description of measurement methods and procedures to be applied:	By taking samples and those samples will be inspected monthly.
QA/QC procedures to be applied:	The sampling and inspection of waste water will be implemented at an existing inspection house owned by DMPI and located in the cannery plant.
Any comment:	-

Data / Parameter:	$COD_{removed,PJ,k,y}$
Data unit:	tonnes/m3
Description:	Chemical oxygen demand removed by project activity treatment system k in year y
Source of data to be used:	measured as the difference between inflow COD and the outflow COD in system k
Value of data	0.0139
Description of measurement methods and procedures to be applied:	By taking samples and those samples will be inspected monthly.
QA/QC procedures to be applied:	The sampling and inspection of waste water will be implemented at an existing inspection house owned by DMPI and located in the cannery plant.
Any comment:	-

Data / Parameter:	$EG_{y,generated}$
Data unit:	MWh
Description:	Amount of electricity produced by the project activity
Source of data to be used:	On-site measurement
Value of data	76,800
Description of measurement methods and procedures to be applied:	To be monitored continuously by an electricity meter. The power generation data will be monitored and recorded daily.

QA/QC procedures to be applied:	The meter will be calibrated regularly accordance with manufacturer's specifications.
Any comment:	-

Data / Parameter:	$EG_{y,displaced}$
Data unit:	MWh
Description:	Amount of electricity displaced by the project activity
Source of data to be used:	On-site measurement
Value of data	76,800
Description of measurement methods and procedures to be applied:	To be monitored continuously by an electricity meter. The power generation data will be monitored and recorded daily.
QA/QC procedures to be applied:	The meter will be calibrated regularly accordance with manufacturer's specifications.
Any comment:	-

Data / Parameter:	$EG_{y,consumed}$
Data unit:	MWh/year
Description:	Amount of electricity consumed by the project activity
Source of data to be used:	On-site measurement
Value of data	3,840
Description of measurement methods and procedures to be applied:	To be monitored continuously by an electricity meter. The power generation data will be monitored and recorded daily.
QA/QC procedures to be applied:	The meter will be calibrated regularly accordance with manufacturer's specifications.
Any comment:	-

Data / Parameter:	$BG_{burnt,y}$
Data unit:	m3/year
Description:	Amount of biogas produced by the project activity
Source of data to be used:	On-site measurement
Value of data	To be monitored
Description of measurement methods and procedures to be applied:	To be monitored continuously by a gas flow meter. The data will be monitored and recorded daily.
QA/QC procedures to be applied:	The meter will be calibrated regularly accordance with manufacturer's specifications.
Any comment:	-

Data / Parameter:	$w_{ch4,y}$
Data unit:	%
Description:	Methane content in biogas produced by the project activity
Source of data to be used:	On-site measurement
Value of data	To be monitored
Description of measurement methods and procedures to be applied:	To be monitored continuously by a gas meter. The data will be monitored and recorded daily.

QA/QC procedures to be applied:	The meter will be calibrated regularly accordance with manufacturer's specifications.
Any comment:	-

Data / Parameter:	V_{flare}
Data unit:	m3/hour
Description:	Amount of biogas sent to flare system
Source of data to be used:	On-site measurement
Value of data	To be monitored
Description of measurement methods and procedures to be applied:	To be monitored continuously by a gas flow meter. The data will be monitored and recorded daily.
QA/QC procedures to be applied:	The meter will be calibrated regularly accordance with manufacturer's specifications.
Any comment:	-

Data / Parameter:	T_{flare}
Data unit:	℃
Description:	Temperature in the exhaust gas of the flare
Source of data to be used:	On-site measurement
Value of data	To be monitored
Description of measurement methods and procedures to be applied:	To be monitored continuously by a thermometer. The data will be monitored and recorded daily.
QA/QC procedures to be applied:	The meter will be calibrated regularly accordance with manufacturer's specifications.
Any comment:	-

Data / Parameter:	TL_{flare}
Data unit:	minutes/hour
Description:	Time length of the operation
Source of data to be used:	On-site measurement
Value of data	To be monitored
Description of measurement methods and procedures to be applied:	To be monitored continuously by a monitoring and control system. The data will be monitored and recorded daily.
QA/QC procedures to be applied:	The system will be calibrated regularly accordance with manufacturer's specifications.
Any comment:	-

Data / Parameter:	H
Data unit:	Hours/year
Description:	Operating hours of the power plant
Source of data to be used:	On-site measurement
Value of data	To be monitored
Description of measurement methods and procedures to be applied:	To be monitored continuously by a monitoring and control system. The data will be monitored and recorded daily.

QA/QC procedures to be applied:	The system will be calibrated regularly accordance with manufacturer's specifications.
Any comment:	-

B.7.2 Descripti1on of the monitoring plan:

According to the methodologies AMS-I.D. and AMS-III.H., all required contents in the project will be monitored by an operation and maintenance (O&M) contractor having appropriate industry standards. The required data will be monitored accordance with the monitoring flow described in the figure 5 by the staffs from the O&M contractor. Then a project manager from the special purpose company (SPC) to be established for this project activity will gather them and prepare a report to a main office of the SPC. The monitoring by the on-site staffs will be administrated strictly by the project manager.

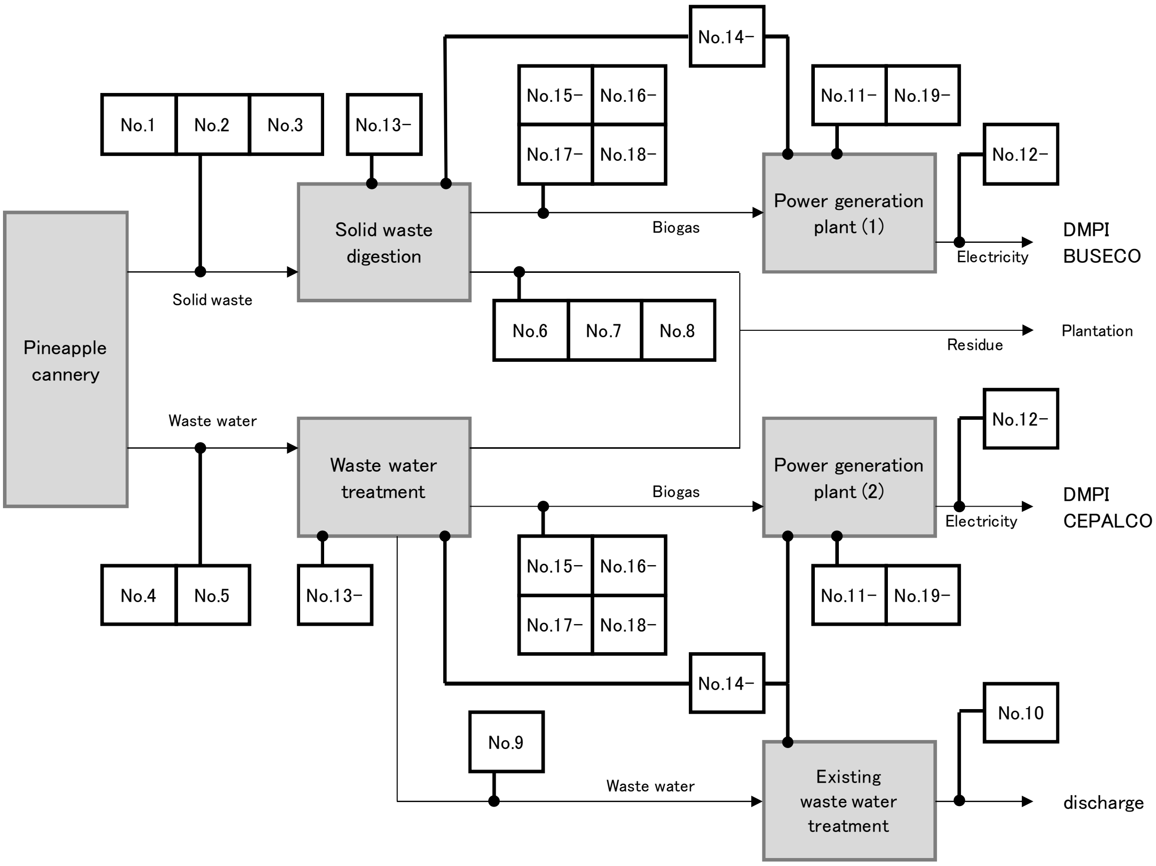

Figure 5: Monitoring flow of proposed project

Table 8: Monitoring contents of proposed project

No.	Items	Contents	Frequency
1	$Q_{sw,y}$	Generation amount of solid waste	Daily
2	$M_{sw,y}$	Moisture content of solid waste	Monthly
3	$COD_{sw,untreated,y}$	COD of untreated solid waste	Monthly
4	$Q_{ww,y}$	Generation amount of waste water	Daily
5	$COD_{ww,untreated,y}$	COD of untreated waste water	Monthly

6	$Q_{sw,treated,y}$	Amount of treated solid waste after digestion	Daily
7	$M_{sw,treated,y}$	Moisture content of treated solid waste after digestion	Monthly
8	$COD_{sw,treated,y}$	COD of treated solid waste after digestion	Monthly
9	$COD_{ww,treated,y}$	COD of waste water after anaerobic treatment	Monthly
10	$COD_{ww,discharge,y}$	COD of waste water before discharge	Monthly
11	$EG_{actual,y}$	Amount of actual power provision	Daily
12	$EG_{facility,y}$	Amount of actual power distribution to local grid	Daily
13	H	Operating hours	Daily
14	ECy	Electricity consumption	Monthly
15	$BG_{burnt,y}$	Generation amount of biogas	Daily
16	$W_{CH4,y}$	Methane content of biogas	Daily
17	P	Pressure of biogas	Daily
18	T	Temperature of biogas	Daily
19	FE	Flare efficiency (V_{flare}, T_{flare}, TL_{flare})	Daily

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

Date of completing the final draft of this baseline section: Mar/2011
Name of persons/entities determining the baseline:

Company name: Eight Japan Engineering Consultants Inc.
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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:

The project will start on 1 January 2013

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

12 years

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

C.2.1. Renewable crediting period

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

Not applicable

C.2.1.2. Length of the first crediting period:

Not applicable

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

The project will start on 1 January 2013

C.2.2.2. Length:

10 years

SECTION D. Environmental impacts

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

According to the "Revised Procedural Manual for DENR Administrative Order No.30 Series of 2003 (DAO 03-30)", the project activity is categorized as "Waste-to-energy projects including biogas projects" and applied to the category B which does not require the implementation of EIS (Environmental Impact Statement) because the expected power generation capacity of the project will be lower than 50.0MW. Therefore, the project will be required to submit IEE (Initial Environmental Examination) for issuance of ECC (Environmental Compliance Certificate).

In the case of the project, the presumable issues of environmental impact are as follows.

"Air quality"

Though the biogas to be generated from an aerobic treatment facility will have possibilities of including methane, nitric monoxide or hydrosulfuric, the biogas will be burned by gas engines or a flare and no poison fumes will be discharged into atmosphere.

"Water quality"

The existing treatment facility is under the overloading due to the inflow of high organic (BOD) waste water much more than designed value and DMPI has a possibility of water pollution because of incomplete treatment. However, in the project activity, a new anaerobic waste water treatment system will be established at the previous stage of the existing treatment facility and will reduce the organic component to the designed value. Therefore, the existing aerobic treatment system can treat waste water under the appropriate condition and avoid the possibility of water pollution.

"Nasty smell"

In the project scenario, solid waste and waste water will be treated by an anaerobic treatment system. Therefore, there is a feat of methane gas leak which causes the nasty smell around the project plant. However, the anaerobic treatment facilities for both solid waste (CSTR) and waste water (UASB) are completely closed tank and there is no place for the leak.

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:

No significant environmental impacts are expected to result by the project activity.

SECTION E. Stakeholders' comments

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

In the Philippines, a guideline "Interim Guidelines on the Conduct of Stakeholders' Consultation Under DAO 2005-17" has been established. Therefore, an explanatory meeting will be held after the establishment of the SPC for the project activity.

E.2. Summary of the comments received:

DMPI is considered as the most important stakeholder because the project activity will be implemented within the exclusive and private land owned by DMPI and no any other stakeholders that have geographical and physical connection with the project can be affected by the project. According to DMPI, they wishes that the existing treatment facility will be gotten out from overloading and the solid waste will be utilized by the project activity.

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

As no negative comments were received, no further action has been taken.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Del Monte Philippines Inc.
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E-Mail:	
URL:	
Represented by:	
Title:	OIC
Salutation:	Mr.
Last Name:	Molas
Middle Name:	T
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

The project does not involve funding from an Annex I country.

Annex 3

BASELINE INFORMATION

"The calculation of emission factor"

The emission factor is calculated accordance with the methodology described in the "Tool to calculate the emission factor for an electricity system" (version 02).

STEP 1: Identify the relevant electric power system

The electricity to be generated by the project activity in Mindanao Island will displace the electricity originated fossil fuels. Philippines owns three local grid (Luzon, Visayas and Mindanao) and the Mindanao grid will be affected by the electricity replacement of the project activity. Therefore, the emission factor for the project will be calculated as a factor of Mindanao grid.

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

Since the project will not include off-grid, Option I: Only grid power plants are included in the calculation is applied for the case.

STEP 3: Select a method to determine the operating margin (OM)

According to the "Tool to calculate the emission factor for an electricity system" (version 02), there are four options mentioned below as the methodology of operating margin (OM) and one applicable option of the four is selected accordance with the operating condition of Minadao grid.

(a) Simple OM
(b) Simple adjusted OM
(c) Dispatch data analysis OM
(d) Average OM

As described in the table 8, since the amount of power generation of low-cost/must-run resources accounts more than 50% of the total generation amount of the Mindanao grid in the most resent 5 years, the option (a) is not applicable. And also, the option (b) which is the variation of the option (a) is not applicable because there are no monitoring results of the operating hours of the low-cost/must-run resources in Mindanao grid. Moreover, the option (c) cannot be calculated because of lack of the monitoring results for the electricity provision from power plants to the Mindanao grid.

As a result, the option (d) is applied for the OM calculation of the Mindanao grid.

Table 8: Recent power generation statistics (MWh)

	2005	2006	2007	2008	2009	Average	Percentage	
Coal	0	476,245	1,570,872	1,499,380	1,562,753	1,021,850.0	13.18%	34.85%
Oil-based	2,319,927	1,671,619	1,478,868	1,275,288	1,652,415	1,679,623.4	21.67%	
Diesel	2,319,772	1,671,376	1,478,775	1,275,010	1,622,575	1,673,501.6	21.59%	
Oil	155	242	93	278	29,840	6,121.6	0.08%	
Geothermal	892,863	845,660	867,308	793,700	822,926	844,491.4	10.90%	65.15%
Hydro	4,028,352	4,419,049	3,971,927	4,402,084	4,195,934	4,203,469.2	54.23%	
Solar	1,517	1,376	1,309	1,304	1,252	1,351.6	0.02%	
Total	**7,242,659**	**7,413,949**	**7,890,284**	**7,971,756**	**8,235,280**	**7,750,785.6**	**100.00%**	**100.00%**

Source: Department of Energy, Philippines

STEP4: Calculate the operating margin emission factor according to the selected method
(d) Average OM

Option A: Based on the net electricity generation and a CO2 emission factor of each power unit, or
Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

Option B can only be used if:
(a) The necessary data for Option A is not available; and
(b) Only nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known; and
(c) Off-grid power plants are not included in the calculation (i.e., if Option I has been chosen in Step2)

There are no necessary data for the option A, the option B is applied.

Option B – Calculation based on total fuel consumption and electricity generation of the system

Under this option, the average OM emission factor is calculated based on the net electricity supplied to the grid by all power plants serving the system, including low-cost/must-run power plants/units, and based on the fuel type(s) and total fuel consumption of the project electricity system, as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_i (FC_{i,y} * NCV_{i,y} * EF_{CO2,i,y})}{EG_y}$$

Where:

$EF_{grid,OMsimple,y}$	= Simple operating margin CO2 emission factor in year y (tCO2/MWh)
$FC_{i,y}$	= Amount of fossil fuel type i consumed in the project electricity system in year y (mass or volume unit)
$NCV_{i,y}$	= Net calorific value (energy content) of fossil fuel type i in year y (GJ/mass or volume unit)
$EF_{CO2,i,y}$	= CO2 emission factor of fossil fuel type i in year y (tCO2/GJ)
EG_y	= Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost/must-run power plants/units, in year y (MWh)
i	= All fossil fuel types combusted in power sources in the project electricity system in year y
y	= The relevant year as per the data vintage chosen in Step 3

For this approach (simple OM) to calculate the operating margin, the subscript m refers to the power plants/units delivering electricity to the grid, including low-cost/must-run power plants/units, and including electricity imports to the grid. Electricity imports should be treated as one power plant m.

As shown in Table 9, average OM = 1,882,278tCO2/year / 2,505,844MWh/year = 0.751tCO2/MWh

Table 9: Calculation of operating margin

Mindanao	average (2005-2007)	Plant Efficiency	Conversion Factor	Fuel Consumption	CO2 Emission Factor of Fuel	CO2 Emissions
Source	PDOE	*	-	-	IPCC 2006	-
Unit	MWh/year	%	TJ/GWh	TJ	tCO2/TJ	tCO2/year
Coal	682,372.3	37.0	3.60	6,639.30	89.5	594,217
Oil-based	1,823,471.3	-	-	-	-	-
Diesel	1,823,307.7	37.0	3.60	17,740.29	72.6	1,287,945
Oil	163.3	37.0	3.60	1.59	72.6	115
Total Generation	2,505,843.7					1,882,278

*: Efficiencies are default efficiency factor for power plants in "Tool to calculate the emission factor for an electricity system" version02.

STEP 5: Identify the group of power units to be included in the built margin

The sample group of power unit m used to calculate the build margin (BM) consists of either:

(a) The set of five power units that have been built most recently; or
(b) The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

The plants described in the table 10 were built in Mindanao Island in the recent years. If the plants in the most recent 5 years are focused on, the amount of electricity generation of them dose not reach 20% of the total generation in Mindanao. Therefore, the option (b) is applied.

Table 10: List of recent developed power plants

Plant	Type	Commissioned Year	Net Power Generation in 2007
Source	PDOE	PDOE	NPC
Unit	-	-	MWh
Mindanao Coal II	Coal	2006	1,409,947
Mindanao Coal I	Coal	2006	
PB104	Diesel	2005	66,306
Solar Photovoltaic	Solar	2004	1,309
Bubunawan	Hydro	2001	22,215
Mindanao II	Geothermal	1999	411,319
Total of Recent Plant			1,911,096
Total of Mindanao Grid			7,890,284
			24.22%

STEP 6: Calculate the build margin emission factor

The build margin emission factor regarding the plants which are built in the recent years and comprise with more than 20% of the total generation of the Mindanao grid is calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m (EG_{m,y} * EF_{EL,m,y})}{\sum_m EG_{m,y}}$$

Where:

$EF_{grid,BM,y}$ =Build margin CO2 emission factor in year y (tCO2/MWh)

$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)

$EF_{EL,m,y}$ = CO2 emission factor of power unit m in year y (tCO2/MWh)

m = Power units included in the build margin
y = Most recent historical year for which power generation data is available

As shown in Table 11, BM = 1,274,634tCO2/year / 1,911,096MWh/year = 0.667tCO2/MWh

Table 11: Calculation of build margin

Plant	Type	Commissioned Year	Net Power Generation in 2007	Plant Efficiency	Conversion Factor	Fuel Consumption	CO2 Emission Factor of Fuel	CO2 Emissions
Source	PDOE	PDOE	NPC	*	-	-	IPCC 2006	-
Unit	-	-	MWh	%	TJ/GWh	TJ	tCO2/TJ	tCO2/year
Mindanao Coal II	Coal	2006	1,409,947	37.0	3.60	13,718.40	89.5	1,227,797
Mindanao Coal I	Coal	2006						
PB104	Diesel	2005	66,306	37.0	3.60	645.14	72.6	46,837
Solar Photovoltaic	Solar	2004	1,309	-	-	-	-	-
Bubunawan	Hydro	2001	22,215	-	-	-	-	-
Mindanao II	Geothermal	1999	411,319	-	-	-	-	-
Total of Recent Plant			1,911,096					1,274,634

*: Efficiencies are default efficiency factor for power plants in "Tool to calculate the emission factor for an electricity system" version02.

STEP 7: Calculate the combined margin emissions factor

The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} * w_{OM} + EF_{grid,BM,y} * w_{BM}$$

Where:

$EF_{grid,BM,y}$ =Build margin CO2 emission factor in year y (tCO2/MWh)
$EF_{grid,OMsimple,y}$ = Operating margin CO2 emission factor in year y (tCO2/MWh)
w_{OM} = Weighting of operating margin emissions factor (%)
w_{BM} = Weighting of build margin emissions factor (%)

The following default values should be used for w_{OM} and w_{BM}:

- Wind and solar power generation project activities: w_{OM} = 0.75 and w_{BM} = 0.25 (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods;
- All other projects: w_{OM} = 0.5 and w_{BM} = 0.5 for the first crediting period, and w_{OM} = 0.25 and w_{BM} = 0.75 for the second and third crediting period, unless otherwise specified in the approved methodology which refers to this tool.

Therefore, CM = 0.751 * 0.5 + 0.667 * 0.5 = 0.709

Annex 4

MONITORING INFORMATION

Please refer to B.7.2.

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