COMPONENT PROJECT DESIGN DOCUMENT FORM FOR SMALL-SCALE COMPONENT PROJECT ACTIVITIES (F-CDM-SSC-CPA-DD) Version 02.0

COMPONENT PROJECT ACTIVITIES DESIGN DOCUMENT (CPA-DD)

SECTION A. General description of CPA

A.1. Title of the proposed or registered PoA

>> **Botswana Biogas Projects**

A.2. Title of the CPA

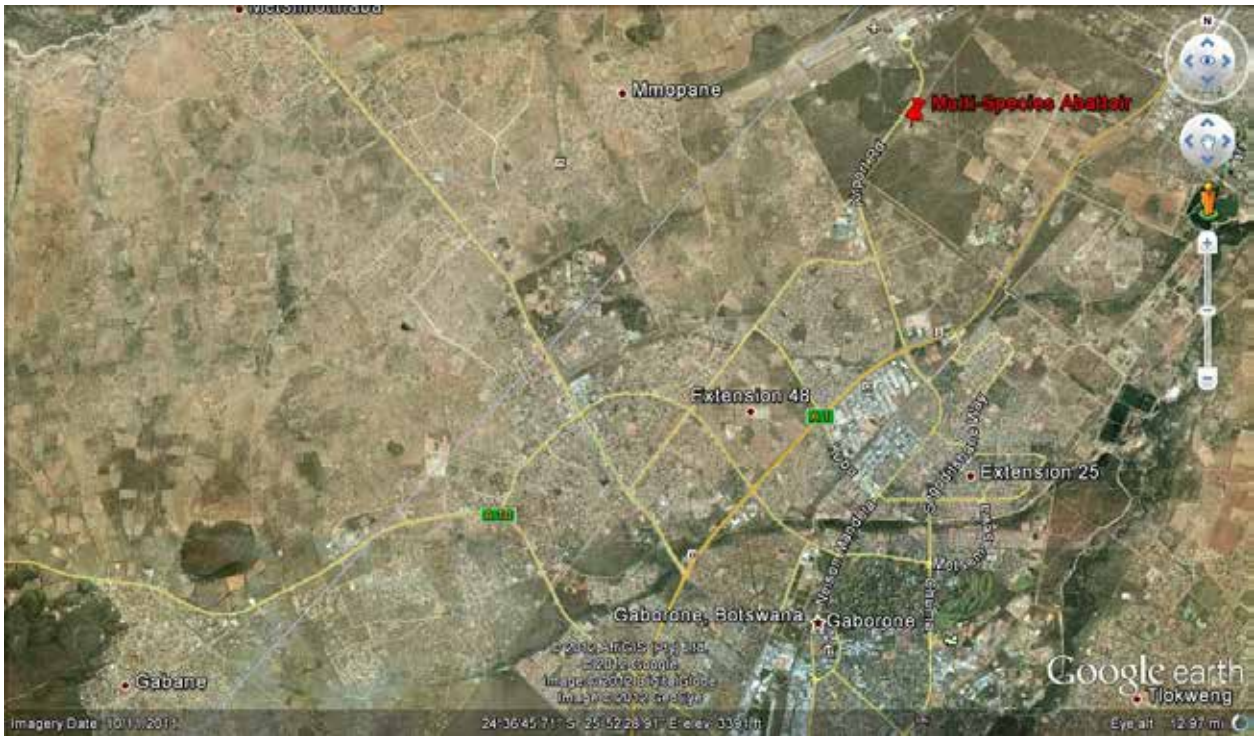
>>

Biogas production from Abattoir waste and Chicken Manure for process heat and electricity production at the Multispecies Abattoir in Gaborone Botswana herein referred to as CPA1.

A.3. Description of the CPA

>>

This CPA is for a biogas generation project at the Multi-Species Abattoir in Gaborone. The Abattoir is situated along the airport road about 10 km from the Gaborone City Centre in a north western direction. 24°34'21.04"South; 25°55'31.74"Eest.



The Abattoir was built to European Union standards in the mid-90s with the aim to slaughter Ostriches. The abattoir stopped slaughtering ostriches around 2010 due to the erratic supply of ostriches and the seasonal slaughter cycle of ostriches, which only covers 6 months of the year. The Abattoir has now been covered to a multi-species abattoir under new management since the beginning of 2012. The abattoir is

currently slaughtering an average of 100 cattle per day. There are plans to increase the slaughter rate to 200 cattle per day in the coming 2 years.

Currently the abattoir produces an average of 119kgs of waste (i.e. offals, stomach contents and slaughter waste) and about $2m^3$ of wastewater per beast. The dung is heaped at a designated site within the Abattoir premises. The waste water is rich in blood, fats and solids and is pumped into the municipal sewerage system. Additional waste from the abattoir includes condemned carcasses, offals, hinds and horns. The condemned carcasses are milled and disposed into large bins, from where they are dumped at the Gamodubu landfill together with the offals and hinds. The landfill is situated about 40km from Gaborone. Process water used at the abattoir is maintained at 54^oC through the use of a large 1500 litre electric geyser.

The objective of this CPA is to produce biogas using the waste generated at the abattoir and chicken waste from a chicken farm by using an Eko-Gea digester. Biogas produced will be used for process water heating as well as generate electricity using a generator.

The proposed CPA1 is expected to reduce 16042 tCO_2 over a 10 year fixed period. The PoA under which CPA1 falls is a voluntary action, not required by law of Botswana and is being promoted and undertaken by Bostrich Products International that is in the business of promoting biogas technology in Botswana. Bostrich Products International is the CME and also the proponent for CPA1.

The CPA1 will meet sustainable development criteria set by the Department of Meteorological Services of Botswana which is the DNA for the country. Sustainable development dimensions that CPA1 will meet are as follows:

Social dimension
The production of biogas from animal waste will result in the formation of a new renewable energy industry in Botswana that will lead to employment creation. The project will also raise awareness on biogas and provides practical lessons for the promotion of household digesters that will reduce the energy burden of rural communities.

Environmental dimension
The project will capture and destroy methane, which is a very potent greenhouse gas (GHG) and avoid methane emission. Furthermore the project will displace fossil based electricity, which is currently being used to supply process heat and to meet the electricity demand of the Abattoir where the project will be situated.

Economic dimension
Botswana currently depends on imported electricity to meet its demand and hence avoided electricity demand from the abattoir will also contribute to reducing demand thus reducing costs of investment of power imports and local electricity generation for the country.

The PoA is necessary to move away from the current dependence on coal-based electricity to cost effective renewable energy alternatives, which currently are not commonly used in Botswana. This presents an opportunity for wide adoption of a new technology in the country.

A.4. Entity/individual responsible for CPA

>>

Bostrich Products International, a company duly registered and operating in Botswana will be the coordinating and managing entity (CME) of the PoA and will be responsible for ensuring that all eligible CPA project activities are installed in accordance to the PoA. Bostrich Products International will also ensure development, implementation and execution of the Monitoring Plan for the PoA.

A.5. Technical description of the CPA1

>>

Bostrich Products International will produce biogas from abattoir waste at the Multispecies Abattoir and chicken manure from Chicken farms in and around Gaborone. The abattoir waste generated at the Multispecies Abattoir will be feed into the digester on site at the abattoir, whereas the chicken manure will be transported to the abattoir from surrounding farms.

For this CPA, Bostrich Products International has chosen NewGen bio-digesters. The biogas digesters have been selected for their efficiency, compactness and high throughput. They require no external heating or continuous mixing, have a residence time of 24 hours compared to conventional digesters, which have a residence time of 20 days and require continuous heating and mixing. Due to the short residence time they have a lower footprint therefore requiring less space.

The digesters degrade 98% of the biodegradable component to produce 1m³ of methane rich biogas (containing 70% methane) for every 1kg of organic dry matter. Traditional biogas reactors will only be able to digest between 40% and 60% of the organic material therefore yielding only 40-60% of the gas potential and with reduced purity. High through put and yields are achieved through the addition of a naturally derived accelerating agent. The biogas produced contains no hydrogen sulphide due to the removal of elemental Sulphur in the biological ion exchange process.

The produced biogas will be combusted in a core-generation to generate electricity and heat process water. The generated electricity and process heat will replace fossil based electricity, which is currently being used to power up the abattoir and to heat the process water.

A.6. Party(ies)

The entity responsible for CPA1 is Bostrich Products International which is also the CME.

Name of Party involved (host) indicates a host Party	**Private and/or public entity(ies) project participants (as applicable)**	**Indicate if the Party involved wishes to be considered as project participant (Yes/No)**
Botswana	Bostrich Products International	No

A.7. Geographic reference or other means of identification

>>

The Abattoir is situated along the airport road about 10 km from the Gaborone City Centre in a north western direction. 24°34'21.03"S 25°55'31.74"E. The boundary of the CPA1 is the Multispecies Abattoir and chicken farms and waste dumping sites situated within a radius of 80km of the abattoir.

A.8. Duration of the CPA

A.8.1. Start date of the CPA

>>

The starting date for the CPA1 is when Bostrich Products installs and operates the biodigester.

A.8.2. Expected operational lifetime of the CPA

>>

20 years

A.9. Choice of the crediting period and related information

>> A Fixed Crediting Period of 10 years

A.9.1. Start date of the crediting period

>>

1st January, 2013, this is the expected date by which Registration will have been completed

A.9.2. Length of the crediting period

>> 10 years

A.10. Estimated amount of GHG emission reduction

For the fixed crediting period of 10 years adopted, CPA1 is expected to generate 16042 tCO2 as per the table below

Year	Emission reductions (t CO_2e)
Year 1	367
Year 2	367
Year 3	1,914
Year4	1,914
Year 5	1,914
Year 6	1,914
Year 7	1,914
Year 8	1,914
Year 9	1,914
Year 10	1,914
Total	16,042
Annual average over crediting period	1604

A.11. Public funding of the CPA

>>

CPA1 has received a €200,000 grant for a feasibility study through public funding from Parties included in Annex 1 of the UNFCCC and will not be seeking further funding for investment in the project.

A.12. Debundling of small-scale component project activities

>>

The CPA is not a debundled component of another project activity as this is a unique contract by the Multispecies Abattoir. CPA1 in accordance with Modalities for Small Scale CDM project does not exceed 60GWh per year for heat energy and 15MW for electricity.

A.13. Confirmation for CPA

>>

CPA1 is not registered as part of another PoA nor is it part of a registered CDM project activity. Bostrich Products International that is the only company applying this technology in Botswana has no record of CPA1 as having been implemented before as a CDM project activity of PoA component project activity at the time of preparing the CPA.

SECTION B. Environmental analysis

B.1. Analysis of the environmental impacts

>>

Bostrich Products International has finalised an Environmental Impact Assessment (EIA) as required under the EIA Act of 2010. The preliminary findings and recommendations so far have *"revealed that the magnitude of most of the impacts is low and if properly managed and mitigation measures followed, the environmental impacts can be reduced to acceptable levels.*

There were no objections from the majority of stakeholders for the proposed development to go ahead. The stakeholders consulted regard the construction of the Biogas Power Plant as important in terms of development, waste management good practice and employment opportunities and therefore feel the project should be allowed to proceed but ensuring that the burden on the environment is lessened.

The proposed development should be done with minimal destruction to the existing vegetation. Replanting and landscaping should be considered as part of restoration of lost habitat. With regards to the Archaeological Impact Assessment, the proposed area has some developments already existing on it hence are deemed to have already disturbed the place beyond any possibility of rescuing or discovering any findings. Thus, a waiver was granted for the project by the Department of National Museum and Monuments (DNMM)."

SECTION C. Local stakeholder comments

C.1. Solicitation of comments from local stakeholders

>>

Stakeholder consultations were done as part of the EIA process and there were no objections to the construction of the biogas project.

C.2. Summary of comments received

>>

During the consultation meeting most of the stakeholders wanted to know how a bio gas plant works and if will not produce a foul smell. The stakeholders also emphasised that priority for employment should be skilled people from communities surrounding the biogas plant. Some of the comments received are listed below:-

1. How biogas is going to be produced from cow dung and other decomposing material and end up being used for cooking because it sounded complicated for an ordinary person.
2. The job opportunities for the members of the public
3. The types of cow dung most suitable for biogas production (wet or dry cow dung).
4. If Bostrich Products International will teach surrounding communities how to use the bio-digester to produce biogas as part of its cooperate social responsibilities.
5. How the project is going to benefit the members of the community.
6. Capacity building should be made priority so that everybody can benefit from the project.
7. Recommended to include community leaders during community capacity building.
8. Members of the surrounding community were encouraged to take advantage of this opportunity to save them money from buying liquid petroleum gas (LPG).

C.3. Report on consideration of comments received

>>

The responses to the key issues raised above are listed below:-

1. An explanation was given on what biogas is, how it is produced and how the bio-digester works.
2. It was explained that the project is going to start small so it will not employ a large number of people but as it grows more people will get jobs.
3. Stakeholders were told that the fresh biodegradeable materials such as wet cow dung which is not more than 3 days old.
4. Bostrich Products International will educate surrounding communities on how to use the bio-digester to produce their own biogas
5. In conclusion the stakeholders agreed that the project should go ahead.

SECTION D. Eligibility of CPA and Estimation of emissions reductions

D.1. Title and reference of the approved baseline and monitoring methodology(ies) selected:

>>

The small scale baseline and monitoring methodology used for the CPA is AMS- III.D: **"Methane recovery in animal manure management systems"** (Version 18)

D.2. Application of methodology(ies)

>>

The CPA falling under the category of projects where the methodology AMS- III.D is applicable will typically be a cattle feedlot, chicken farm, dairy farm or livestock abattoir, where livestock population in the farm is managed under confined conditions and that currently has a waste water management system that does not capture biogas. The recovered biogas will be combusted through flaring, combustion heat applications, and electricity generation or for cogeneration system to meet the electricity and thermal requirement of the project activity.

D.3. Sources and GHGs

>>

The main sources and GHGs of the project are shown in the table below and the leakages from the CPA will be accounted for according to the baseline monitoring methodologies.

	Source	GHG	Inclusion	Justification
Baseline	Emissions from Abattoir Waste	CO_2	No	Because it is generated from organic matter
		CH_4	Yes	Main Source
		N_2O	No	Because it's negligible
	Emissions from Electricity Generation	CO_2	Yes	Catered for in the grid emission factor
		CH_4	Yes	Catered for in the grid emission factor[1]
		N_2O	Yes	Catered for in the grid emission factor
Project Activity	Biogas recovery system	CO_2	No	Because it's negligible
		CH_4	Yes	Main Source
		N_2O	No	Excluded for simplicity
	Waste treatment system with biogas recovery	CO_2	No	Because it's negligible
		CH_4	Yes	Main Source
		N_2O	No	Excluded for simplicity
	Emissions from Cogeneration plant	CO_2	Yes	Main Source
		CH_4	No	Excluded for simplicity
		N_2O	No	Excluded for simplicity

[1] Contribution of CH4 and N2O from combustion not significant

D.4. Description of the baseline scenario

>>

In the baseline scenario waste at livestock abattoirs, cattle feedlots, dairy farms and chicken farms in Botswana is currently subject to various treatment processes which do not capture methane. The abattoirs and chicken farms use fossil based electricity or coal to supply their energy and process heat requirements. For the case of the Multispecies Abattoir, it generates both solid and liquid waste through the slaughter of livestock, which includes cattle, game and ostriches. The solid waste generated consists mostly of biodegradable offal material and its contents and rejected animal carcasses. The biodegradable stomach contents are either heaped at the abattoir where until they are sold as manure or disposed of at landfills together with other offal materials and rejected meat. The manure from chicken farms is collected periodically and either disposed of at landfills or sold as manure.

Tools for Baseline calculations

The baseline emissions in the situation where, in the absence of the project activity, animal manure is left to decay anaerobically within the project boundary and methane is emitted to the atmosphere and the project continues to use grid based electricity. Baseline emissions (BE_y) have been calculated according to option two in AMS- III.D i.e.:-

2) Using the amount of manure that would decay anaerobically in the absence of the project activity based on direct measurement of the quantity of manure treated together with its specific volatile solids (*SVS*) content.

$$BE_y = GWP_{CH4} * D_{CH4} * UF_b * \sum_{j,LT} MCF_j * B_{0,LT} * Q_{manure,j,LT,y} * SVS_{j,LT,y} \quad \textbf{(4)}$$

Where:

$Q_{manure,j,LT,y}$	Quantity of manure treated from livestock type *LT* and animal manure management system *j* (tonnes/year, dry basis)
$SVS_{j,LT,y}$	Specific volatile solids content of animal manure from livestock type *LT* and animal manure management system *j* in year *y* (tonnes DM/year, dry basis)
MCF_j	Annual methane conversion factor (*MCF*) for the baseline animal manure management system *j*,
$B_{0,LT}$	Maximum methane producing potential of the volatile solid generated for animal type *LT* (m^3 CH_4/kg dm),

Baseline emissions from electricity consumption are determined as per the procedures described in AMS-I.D "Grid connected renewable electricity generation". The grid emission factor ($EF_{CO2,grid,y}$,) that will be used in this procedure has been calculated in a transparent and conservative manner as follows:

A combined margin (CM), consists of the combination of operating margin (OM) and build margin (BM) contributions according to the procedures prescribed in the "Tool to calculate the Emission Factor for an electricity system (version 2.2.1)". Table 1 summarizes the OM, BM and CM values that were calculated

for the SAPP grid to which Botswana belongs (UNEP study)[2]. The grid emission factor (GEF) has been validated by Carbon Check of South Africa and is on the UNFCCC website. The value to be adopted for this PoA and CPA1 is 0.9644 tCO_2/MWh. This SAPP GEF is conservative for Botswana that individually has a higher emission factor of 1.0824 t-CO_2/MWh[3].

Table 1: Summary of the Regional SAPP GEF[4]			
OM Emission Factor (in t-CO_2/MWh)	**0.9958**		
BM Emission Factor (in t-CO_2/MWh)	**0.9331**		
	Weight of the OM	Weight of the BM	CM Emission Factor (in t-CO2/MWh)
Wind and solar power generation project activities for the first crediting period and for subsequent crediting periods	0.75	0.25	**0.9801**
All other projects for the first crediting period	0.5	0.5	**0.9644**
All other projects for the second and third crediting period	0.25	0.75	**0.9488**

D.5. Demonstration of eligibility for a CPA

>>

The objective of project activities proposed in this CPA is to produce methane in a biogas digester so as to achieve methane recovery and destruction by combustion or electricity production for process heat and electricity. The CPA will include treatment of manure collected at the Multispecies Abattoir, which will be complimented by manure from several chicken farms around Gaborone in a centralized plant. The CPA also meets the following criteria stipulated in AMS- III.D:-

Eligibility Criteria	**Status of CPA1**
1. Manure or the streams obtained after treatment are not discharged into natural water resources;	Yes
2. The annual average temperature of baseline site where anaerobic manure treatment facility is located is higher than 5°C,	Averages 25°C in summer and 15°C in winter;
3. The retention time of manure waste in the current anaerobic treatment system is greater than one month;	Yes
4. No methane recovery and destruction by flaring, combustion or gainful use is taking place at the abattoir.	Yes
5. The residual waste from the animal manure management system shall be handled aerobically	Yes
6. The storage time of the manure after removal from the animal barns, including transportation, will not exceed 45 days before being fed into the anaerobic digester.	Will not exceed 24 hours before being fed into digester
7. The CPA project activities will result in emission reductions of less than or equal to 60 kt CO_2 equivalent annually.	Yes

Contribution of CH4 and N2O from combustion not significant

[4] Grid Emission Factor approved by the CDM Executive Board **(CDM-EB73-A03)**.

[4] Grid Emission Factor approved by the CDM Executive Board **(CDM-EB73-A03)**.

Bostrich Products International as the CME has ensured that the CPA1 complies with the full eligibility criteria.

The barriers for individual CPA1 are identical to the PoA. The following barriers have been identified for the CPAs:

Barrier Analysis

Prevailing Practice
Prevailing practice or existing regulatory or policy requirements in Botswana do not require the installation of the technologies proposed in this CPA but rather have led to the implementation of low cost practices such as dumping waste at landfills, which result in high GHG emissions. The proposed project is the first of its kind technologically, and to be installed at an abattoir in Botswana.

Investment barrier

The Government of Botswana does not provide financial incentives[5] for potential CPAs to invest in the types of technologies promoted in this CPA. There is also long-term return on investments from electricity generation and process heat derived from such small scale project activities. The CPA is expected to meet the upfront investment costs, which are high, compared to alternatives and cannot easily attract investment.

Access-to-finance barrier
Financial institutions in Botswana are risk averse when it comes to investing in renewable energy projects and hence such as project will not easily get funding.

Technological barrier
Biogas technologies are not common in Botswana and there is no local capacity to develop and operate commercial facilities in Botswana. The technology which has been chosen for this CPA is not readily available in Botswana and not widely adopted and had to be imported from a South African company, which is a regional agent of a Slovenian technology supplier. Also due to lack of local capacity, there is limited understanding about the technology and therefore there is a high risk of failure. The proposed project activity requires special expertise with respect to design of the facility, operation, process control maintenance and repair. Project activity monitoring is also crucial and equipment will often need to be calibrated and local facilities are not well equipped to carry out such calibrations.

[5] Such as tax holiday, feed in tariffs have been established but not yet implemented.

D.6. Estimation of emission reductions

D.6.1. Explanation of methodological choices

>>

The baseline emissions are calculated as in equation (4) and annex 3 shows the calculations for grid electricity.

Project activity emissions consist of:

(a) Physical leakage of biogas in the manure management systems which includes production, collection and transport of biogas to the point of flaring/combustion or gainful use ($PE_{PL,y}$);

(b) Emissions from flaring or combustion of the gas stream ($PE_{flare,y}$);

(c) CO_2 emissions from use of fossil fuels or electricity for the operation of all the installed facilities ($PE_{power,y}$);

(d) CO_2 emissions from incremental transportation distances;

(e) Emissions from the storage of manure before being fed into the anaerobic digester ($PE_{storage,y}$).

$$PE_y = PE_{PL,y} + PE_{flare,y} + PE_{power,y} + PE_{transp,y} + PE_{storage,y} \quad \textbf{(5)}$$

Where:

PE_y	Project emissions in year y (tCO_2e)
$PE_{PL,y}$	Emissions due to physical leakage of biogas in year y (tCO_2e)
$PE_{flare,y}$	Emissions from flaring or combustion of the biogas stream in the year y (tCO_2e). Assumed to be zero since no methane will be flared but will be used for electricity and heat production through cogeneration.
$PE_{power,y}$	Emissions from the use of fossil fuel or electricity for the operation of the installed facilities in the year y (tCO_2e) assumed to be zero as auxiliary equipment will be powered through methane generated electricity.
$PE_{transp,y}$	Emissions from incremental transportation in the year y (tCO_2e), as per relevant paragraph in AMS-III.F
$PE_{storage,y}$	Emissions from the storage of manure (tCO_2e). Assumed to be zero as manure will be fed directly in digester within 24hrs.

Project emissions due to physical leakage of biogas from the animal manure management systems used to produce, collect and transport the biogas to the point of flaring or gainful use is estimated as:

(a) 10% of the maximum methane producing potential of the manure fed into the management systems implemented by the project activity:[6]

[6] 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 Chapter 10 guidelines specify a default value of 10% of the maximum methane producing potential (Bo) for the physical leakages from anaerobic digesters.

$$PE_{PL,y} = 0.10 * GWP_{CH4} * D_{CH4} * \sum_{i,LT} B_{0,LT} * Q_{manure,LT,y} \times SVS_{LT,y} * MS\%_{i,y} \quad (7)$$

Leakage

No leakage calculation is required.

Emission reductions

In determining the Emission Reductions of the CPA project activities the following steps have been followed:-

The emission reductions achieved by the project activity will be determined *ex post* through direct measurement of the amount of methane fuelled, flared or gainfully used. It is likely that the project activity involves manure treatment steps with higher methane conversion factors (*MCF*) than the *MCF* for the manure treatment systems used in the baseline situation, therefore the emission reductions achieved by the project activity is based on the *ex post* calculated baseline emissions minus project emissions using the actual monitored data for the project activity ($Q_{manure,j,LT,y}$, $SVS_{j,LT,y}$,). The emission reductions achieved in any year are the lowest value of the following:

$$ER_{y,ex\ post} = \min[(BE_{y,ex\ post} - PE_{y,ex\ post}),(MD_y - PE_{power,y,ex\ post})] \quad (9)$$

Where:

$ER_{y,ex\ post}$	Emission reductions achieved by the project activity based on monitored values for year *y* (tCO_2e)
$BE_{y,ex\ post}$	Baseline emissions calculated using equation (4) and using the *ex post* monitored values for $Q_{manure,j,LT,y}$ and $SVS_{j,LT,y}$
$PE_{y,ex\ post}$	Project emissions calculated using equation 5 using *ex post* monitored values of , $Q_{res\ waste,y}$ and if applicable $VS_{LT,y}$
MD_y	Methane captured and destroyed or used gainfully by the project activity in year *y* (tCO_2e)
$PE_{power,y,ex\ post}$	Emissions from the use of fossil fuel or electricity for the operation of the installed facilities based on monitored values in the year *y* (tCO_2e)

D.6.2. Data and parameters that are to be reported ex-ante
(Copy this table for each data and parameter.)

Data / Parameter	GWP_{CH4}
Unit	Fraction
Description	Global Warming Potential for methane
Source of data	IPCC value in AMS III.H./Version 16
Value(s) applied	21
Choice of data or Measurement methods and procedures	Based on IPCC value in AMS III.H./Version 16
Purpose of data	Value used to calculate global warming potential of methane
Additional comment	

Data / Parameter	D_{CH4}
Unit	t/m^3
Description	Density of methane
Source of data	IPCC value in AMS III.D./Version 18
Value(s) applied	0.00067 t/m^3 at room temperature (20 ºC) and 1 atm pressure
Choice of data or Measurement methods and procedures	Based on IPCC value in AMS III.D./Version 18
Purpose of data	Value used to calculate baseline/project emissions
Additional comment	

Data / Parameter	$Q_{manure,j,LT,y}$
Unit	Tonnes DM/year
Description	Quantity of manure treated from cattle
Source of data	1. Based on daily measurement and monthly aggregation
Value(s) applied	857
Choice of data or Measurement methods and procedures	Manure weight shall be directly measured or alternatively manure volume can be measured together with the density determined from representative sample (90/10 precision). The quantity of animal manure from different farms and different animal types shall be recorded separately for crosscheck. Recording of the baseline animal manure management system where the animal manure would have been treated anaerobically is also required
Purpose of data	Used to calculate baseline/project emissions
Additional comment	

Data / Parameter	$Q_{manure,\,j,\,LT,\,y}$
Unit	Tonnes DM/year
Description	Quantity of manure treated from chicken
Source of data	1. Based on daily measurement and monthly aggregation
Value(s) applied	1369
Choice of data or Measurement methods and procedures	Manure weight shall be directly measured or alternatively manure volume can be measured together with the density determined from representative sample (90/10 precision). The quantity of animal manure from different farms and different animal types shall be recorded separately for crosscheck. Recording of the baseline animal manure management system where the animal manure would have been treated anaerobically is also required
Purpose of data	Used to calculate baseline/project emissions
Additional comment	

Data / Parameter	$SVS_{j,LT,y}$
Unit	tonnes DM/year, dry basis
Description	Specific volatile solids content of cattle manure
Source of data	IPCC Default Values
Value(s) applied	1.5
Choice of data or Measurement methods and procedures	In case animal manure is treated in a centralized plant, as the case in option (2), testing shall be performed according to the guideline in annex 2 of AM0073. It can be on sample basis by following General guidelines for sampling and surveys for SSC project activities, with a maximum margin of error of 10% at a 90% confidence level. Since project has not yet started and no national data are available IPCC default values have been used.
Purpose of data	Used for calculating baseline/project emissions
Additional comment	

Data / Parameter	$SVS_{j,LT,y}$
Unit	tonnes DM/year, dry basis
Description	Specific volatile solids content of chicken manure
Source of data	IPCC Default Values
Value(s) applied	0.5
Choice of data or Measurement methods and procedures	In case animal manure is treated in a centralized plant, as the case in option (2), testing shall be performed according to the guideline in annex 2 of AM0073. It can be on sample basis by following General guidelines for sampling and surveys for SSC project activities, with a maximum margin of error of 10% at a 90% confidence level. Since project has not yet started and no national data are available IPCC default values have been used.
Purpose of data	Used for calculating baseline/project emissions
Additional comment	

Data / Parameter	MCF_j
Unit	Fraction
Description	Annual methane conversion factor (*MCF*) for the baseline cattle manure management system *j*
Source of data	IPCC default values
Value(s) applied	0.04
Choice of data or Measurement methods and procedures	No National data is available therefore IPCC default values provided in table 10.17 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 Chapter 10 have been used.
Purpose of data	Used for calculating Baseline/project emissions
Additional comment	

Data / Parameter	MCF_j
Unit	Fraction
Description	Annual methane conversion factor (*MCF*) for the baseline chicken manure management system *j*
Source of data	IPCC default values
Value(s) applied	0.02
Choice of data or Measurement methods and procedures	No National data is available therefore IPCC default values provided in table 10.17 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 Chapter 10 have been used.
Purpose of data	Used for calculating Baseline/project emissions
Additional comment	

Data / Parameter	$B_{0,LT}$
Unit	m^3 CH_4/kg dm
Description	Maximum methane producing potential of the volatile solid generated for cattle
Source of data	IPCC default values
Value(s) applied	100
Choice of data or Measurement methods and procedures	Country specific B_o values are not available and default values from tables 10 A-4 to 10 A-9 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories volume 4 Chapter 10 have been used for the this calculation
Purpose of data	Used for calculating Baseline/project emissions
Additional comment	

Data / Parameter	$B_{0,LT}$
Unit	$m^3 CH_4$/kg dm
Description	Maximum methane producing potential of the volatile solid generated for chicken
Source of data	IPCC default values
Value(s) applied	240
Choice of data or Measurement methods and procedures	Country specific B_o values are not available and default values from tables 10 A-4 to 10 A-9 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories volume 4 Chapter 10 have been used for the this calculation
Purpose of data	Used for calculating Baseline/project emissions
Additional comment	

D.6.3. Ex-ante calculations of emission reductions

>>For an adopted fixed period of 10 years, the table below shows the estimated annual emission reductions for each CPA.

	Year	Emission Reductions
1	2013	367
2	2014	367
3	2015	1,914
4	2016	1,914
5	2017	1,914
6	2018	1,914
7	2019	1,914
8	2020	1,914
9	2021	1,914
10	2022	1,914
Total estimated Reductions (tonnes CO2)e		16,042
Total number of Crediting years		10
Annual average of the estimated reductions over the crediting period		1604

D.7. Application of the monitoring methodology and description of the monitoring plan
D.7.1. Data and parameters to be monitored by each generic CPA
(Copy this table for each data and parameter)

Data / Parameter	$Q_{manure,\,j,\,LT,\,y}$
Unit	Tonnes DM/year
Description	Quantity of manure treated from cattle
Source of data	2. Based on daily measurement and monthly aggregation
Value(s) applied	857
Choice of data or Measurement methods and procedures	Manure weight shall be directly measured or alternatively manure volume can be measured together with the density determined from representative sample (90/10 precision). The quantity of animal manure from different farms and different animal types shall be recorded separately for crosscheck. Recording of the baseline animal manure management system where the animal manure would have been treated anaerobically is also required
Purpose of data	Used to calculate baseline/project emissions
Additional comment	

Data / Parameter	$Q_{manure,\,j,\,LT,\,y}$
Unit	Tonnes DM/year
Description	Quantity of manure treated from chicken
Source of data	2. Based on daily measurement and monthly aggregation
Value(s) applied	1369
Choice of data or Measurement methods and procedures	Manure weight shall be directly measured or alternatively manure volume can be measured together with the density determined from representative sample (90/10 precision). The quantity of animal manure from different farms and different animal types shall be recorded separately for crosscheck. Recording of the baseline animal manure management system where the animal manure would have been treated anaerobically is also required
Purpose of data	Used to calculate baseline/project emissions
Additional comment	

Data / Parameter	$SVS_{j,LT,y}$
Unit	tonnes DM/year, dry basis
Description	Specific volatile solids content of cattle manure
Source of data	IPCC Default Values
Value(s) applied	1.5
Choice of data or Measurement methods and procedures	In case animal manure is treated in a centralized plant, as the case in option (2), testing shall be performed according to the guideline in annex 2 of AM0073. It can be on sample basis by following General guidelines for sampling and surveys for SSC project activities, with a maximum margin of error of 10% at a 90% confidence level. Since project has not yet started and no national data are available IPCC default values have been used.
Purpose of data	Used for calculating baseline/project emissions
Additional comment	

Data / Parameter	$SVS_{j,LT,y}$
Unit	tonnes DM/year, dry basis
Description	Specific volatile solids content of chicken manure
Source of data	IPCC Default Values
Value(s) applied	0.5
Choice of data or Measurement methods and procedures	In case animal manure is treated in a centralized plant, as the case in option (2), testing shall be performed according to the guideline in annex 2 of AM0073. It can be on sample basis by following General guidelines for sampling and surveys for SSC project activities, with a maximum margin of error of 10% at a 90% confidence level. Since project has not yet started and no national data are available IPCC default values have been used.
Purpose of data	Used for calculating baseline/project emissions
Additional comment	

Data / Parameter	MCF_j
Unit	Fraction
Description	Annual methane conversion factor (*MCF*) for the baseline cattle manure management system *j*
Source of data	IPCC default values
Value(s) applied	0.04
Choice of data or Measurement methods and procedures	No National data is available therefore IPCC default values provided in table 10.17 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 Chapter 10 have been used.
Purpose of data	Used for calculating Baseline/project emissions
Additional comment	

Data / Parameter	MCF_j
Unit	Fraction
Description	Annual methane conversion factor (*MCF*) for the baseline chicken manure management system *j*
Source of data	IPCC default values
Value(s) applied	0.02
Choice of data or Measurement methods and procedures	No National data is available therefore IPCC default values provided in table 10.17 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 Chapter 10 have been used.
Purpose of data	Used for calculating Baseline/project emissions
Additional comment	

Data / Parameter	$B_{0,LT}$
Unit	m^3 CH_4/kg dm
Description	Maximum methane producing potential of the volatile solid generated for cattle
Source of data	IPCC default values
Value(s) applied	100
Choice of data or Measurement methods and procedures	Country specific B_o values are not available and default values from tables 10 A-4 to 10 A-9 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories volume 4 Chapter 10 have been used for the this calculation
Purpose of data	Used for calculating Baseline/project emissions
Additional comment	

Data / Parameter	$B_{0,LT}$
Unit	m^3 CH_4/kg dm
Description	Maximum methane producing potential of the volatile solid generated for chicken
Source of data	IPCC default values
Value(s) applied	240
Choice of data or Measurement methods and procedures	Country specific B_o values are not available and default values from tables 10 A-4 to 10 A-9 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories volume 4 Chapter 10 have been used for the this calculation
Purpose of data	Used for calculating Baseline/project emissions
Additional comment	

D.7.2. Description of the monitoring plan for a generic CPA
>>

This Monitoring Plan (MP) provides a standard monitoring plan for all the CPAs covered under this PoA submitted by Bostrich Products International (BPI) to the UNFCCC. The managing entity, BPI, will manage the monitoring done by CPA1 to ensure its compliance with data collection, processing and reporting requirements. The MP shall comply with all the relevant rules and regulations of the CDM. CPA1 shall make reference to this MP to facilitate accurate and consistent monitoring of the Certified Emission Reductions. This MP shall be followed during the project duration and be used for project verification in quantifying the CERs achieved by CPA1 and aims to achieve the following:

- Establishing and maintaining a suitable monitoring system,
- Establishing and maintaining a reliable and accurate monitoring system,
- Guide the implementation of necessary measurement and management operations,
- Guide for meeting CDM requirements for verification and certification.

CPA1 has been assigned a unique identification number and GPS coordinates of project location for verification and as reference to ensure single counting of the CPA i.e. 24°34'21.04"South 25°55'31.74"Eest.

Monitoring Obligations

To facilitate the accurate determination of CERs, each CPA1 will need to fulfil certain operation and data collection obligations. A CDM Operations and Monitoring Manual will be prepared before the start of the first crediting period. The objective of the manual is to ensure the accurate and transparent calculation and monitoring of CERs. CPA1 will monitor and maintain records of the following information:-

1. Number of cattle slaughtered
2. Amount of waste generated at abattoir
3. Quantity of waste fed into the biogas digester
4. Length of time before waste is fed into the digester
5. Amount of chicken manure fed into the digester
6. Distance travelled to transport the chicken manure
7. Size of truck used to transport the manure
8. Amount of electricity consumed by the Abattoir
9. Amount of electricity consumed by the biogas plant
10. Amount of biogas generated
11. Amount of biogas used for electricity and heat production
12. The specific volatile solids of the cattle waste
13. The specific volatile solids of the chicken waste
14. There will also be an effort to measure the country specific values of MCF, B_o

The management entity, BPI, will maintain all monitoring reports for the CPAs in accordance to the records keeping system and shall ensure that monitoring reports are available upon request by the DOE for verification purposes. BPI shall also carryout onsite inspections for each individual farm included in the project boundary where of CPA1for each verification period.

Management and Operational Systems

CPA1 shall have a well-defined management and operational system that meets the specific requirements of the project activities. The system should ensure successful execution of the CPA and the credibility and verifiability of the CERs achieved and should include the following:-

Data Handling

- CPA1 will develop, implement and maintain a transparent system for the collection, computation and storage of data, which includes adequate records keeping and data monitoring system fit for independent monitoring auditing and verification.
- BPI as the management entity will oversee and ensure that CPA1 will maintain standard records documentation and keep the monitored data in a secure data for the crediting period and up to two years after the crediting period.
- Data (soft and hard copy) will be transmitted to BPI who is responsible for the compilation of the monitoring reports and BPI will conduct a data audit and compliance review with the MP at least bi-annually for CPA1.

Quality Assurance

- Key quality assurance personnel will be assigned for overall project management, operation, monitoring and reporting required by the project activity
- A competent manager responsible and accountable for the generation of CERs including monitoring, records keeping, computation of ERs, audits and verification. The manager will sign off on all GHG Emission worksheets.
- Well defined quality control procedures will be encouraged to enhance data archiving and integrity of ERs.

Training

- Training for new staff will be done to enable them to implement the requirements of this MP. Initial training will be done for all staff involved in the implementation of the MP before the start of the project and generation of CERs.
- Environment, health and safety issues will also be given priority.

CPA1 will inform the management entity about the need for any corrective and enhancement measures.

SECTION E. Approval and authorization

>>

- - - - -

Appendix 1: Contact information on entity/individual responsible for the CPA

Organization	Bostrich Products International
Street/P.O. Box	Unit C3; Plot 61128-61130, Block 8
Building	BEDIA Factory Shells
City	Gaborone
State/Region	
Postcode	
Country	Botswana
Telephone	
Fax	
E-mail	bostrich2@gmail.com
Website	
Contact person	Carlie de Bruyn
Title	Mr
Salutation	Mr
Last name	de Bruyn
Middle name	
First name	Carlie
Department	
Mobile	+267-72333155
Direct fax	
Direct tel.	
Personal e-mail	bostrich2@gmail.com

Appendix 2: Affirmation regarding public funding

The project has obtained funding for the feasibility study through the Energy, Environment Partnership Program for Southern and East Africa (EEP-SEA) being financed by the Ministry of Foreign Affairs of Finland. This PoA has also been developed with financial assistance from UNEP-RISOE. The project will however be seeking no further assistance form Annex 1 countries.

Appendix 3: Applicability of the selected methodology(ies)

Input Data

Cattle

240	Number of Operational Days per year
100	Number of Cattle Slaughter per day
24000	Number of Cattle Slaughter per year
119	Amount of Biodegradable waste generated per cow
2856	Total mount of Manure per year (tonnes)
70	Moisture Content of Waste (%)
857	Bone Dry Weight of manure per year (tonnes/year)

Chicken

500,000	Total number of Chicken
0.03	Daily manure production per chicken (kg/dy)
75	Moisture content of manure (%)
365	Number of operational days per year
1369	Total born dry weight per year (tonnes/year)

GWP_{CH4}	21	Global Warming Potential (GWP) of CH_4 (21)
D_{CH4}	0.00067	CH_4 density (0.00067 t/m^3 at room temperature (20 ºC) and 1 atm pressure)
LT		Index for all types of livestock
j		Index for animal manure management system
MCF_j	0.04	Annual methane conversion factor (MCF) for the baseline animal manure management system j
$B_{0,LT}$	0.1	Maximum methane producing potential of the volatile solid generated for animal type LT (m^3 CH_4/kg dm)
$N_{LT,y}$	24000	Annual average number of animals of type LT in year y (numbers)
$\sim VS_{LT,y}$	1.5	Volatile solids for livestock LT entering the animal manure management system in year y (on a dry matter weight basis, kg dm/animal/year)
$MS\%_{Bl,j}$	100%	Fraction of manure handled in baseline animal manure management system j
UF_b	0.94	Model correction factor to account for model uncertainties (0.94

Baseline Emissions from displaced electricity

$$BE_y = EG_{BL,y} * EF_{CO_2,grid,y}$$

BE_y	1,813	Baseline Emissions in year y (t CO2)
$EG_{BL,y}$	1,881	Quantity of net electricity offset from the grid as a result of the implementation of the CPA in year y (MWh)
$EF_{CO2,grid,y}$	0.964	CO2 emission factor of the grid in year y (t CO2/MWh)

Baseline Manure Emissions

Option 2 Cattle

BE_y	111.44	tCO_2e Baseline Emissions
$Q_{manure,j,LT,y}$	857	Quantity of cattle manure treated from cattle slaughtered at the abattoir (tonnes/year, dry basis)
$SVS_{j,LT,y}$	1.5	Specific volatile solids content of cattle manure from livestock type LT and animal manure management system j in year y (tonnes DM/year, dry basis)
MCF_j	0.04	Annual methane conversion factor (MCF) for the baseline cattle manure management system j,
$B_{0,LT}$	100	Maximum methane producing potential of the volatile solid generated for cattle manure (m3 CH4/ton dm),

Chicken Manure

$Q_{manure,j,LT,y}$	1369	Quantity of manure treated from chicken manure and animal manure management system j (tonnes/year, dry basis)
$SVS_{j,LT,y}$	0.5	Specific volatile solids content of chicken manure from livestock type LT and chicken farms in year y (tonnes DM/year, dry basis)
MCF_j	0.02	Annual methane conversion factor (MCF) for the baseline chicken manure management system j,
$B_{0,LT}$	240	Maximum methane producing potential of the volatile solid generated for chicken (m3 CH4/ton dm),

Total Baseline Emissions
Total BE = BE (Electricity) + BE (Manure managements system)

Total BE 1,925

Project Emissions

$PE_{PL,y}$	11.3	
$PE_{PL,y}$	11.1	Project Emissions due to usage at plant

Emissions due to transportation of chicken waste

PE	0.1095	
Q_y	1368.75	Quantity of raw waste/manure treated and/or wastewater co-digested in the year *y* (tonnes)
CT_y	30	Average truck capacity for transportation (tonnes/truck)
DAF_w	80	Average incremental distance for raw solid waste/manure and/or wastewater transportation (km/truck)
$EF_{CO2,transport}$	0.00003	CO_2 emission factor from fuel use due to transportation ($kgCO_2$/km, IPCC default values or local values may be used)
$Q_{res\times waste,y}$	0	Quantity of residual waste produced in year *y* (tonnes)
$CT_{res\times waste,y}$	40	Average truck capacity for residual waste transportation (tonnes/truck)
$DAF_{res\times waste}$	30	Average distance for residual waste transportation (km/truck)

$PE_{flare,y}$	Assumed to be zero since no methane will be flared but will be used for electricity and heat production through cogeneration.
$PE_{power,y}$	
$PE_{storage,y}$	Assumed to be zero as auxiliary equipment will be powered through methane generated electricity.
	Assumed to be zero as manure will be fed directly in digester within 24hrs.

Emission Reduction

Emission Reductions (ER) = Total Baseline Emissions - Project Emissions ($PE_{PL,y}$)

ER	1,914	tCO_2 e/year

Appendix 4: Further background information on ex ante calculation of emission reductions.

Appendix 5: Further background information on monitoring plan

- - - - -

History of the document

Version	Date	Nature of revision(s)
02.0	EB 66 13 March 2012	Revision required ensuring consistency with the "Guidelines for completing the component project design document form for small-scale component project activities" (EB 66, Annex 17).
01	EB33, Annex44 27 July 2007	Initial adoption.
Decision Class: Regulatory **Document Type:** Form **Business Function:** Registration		