Gold Standard for the Global Goals
Key Programme Information & Programme Design Document (PoA-DD)

July 2017, Version 1

KEY PROGRAMME INFORMATION

Title of Programme:	PoA GS2747: African Biogas Carbon Programme (ABC)
Brief description of Programme:	VPAs under the ABC PoA will install biodigesters at households currently using non-renewable biomass and fossil fuels as their main source of cooking fuel. The biodigesters will be fed with manure mixed with water, which will undergo anaerobic digestion and produce biogas that is channelled directly to a cook stove. This biogas produced replaces the combustion of biomass and fossil fuels, thereby reducing carbon dioxide (CO_2) emissions. The biodigesters also reduce methane (CH_4) emissions by diverting manure that would otherwise decompose without the capture and use of the methane. The first crediting period covered 13/06/2013 to 12/06/2020 and the second crediting period for which this PoA-DD is developed covers 13/06/2020 to 12/06/2025.
Expected duration of Programme:	28 years
Coordinating & Management Entity:	Hivos
Project Representative:	Mr. Harry Clemens
Project Participants and any communities involved:	• VPA 01 and 06: Kenya Biogas Programme. • VPA-02 and 04: Centre for Agricultural Mechanisation and Rural Technology (CAMARTEC) • VPA-03: Biogas Solutions Uganda Ltd
Version of PoA-DD: Date of Version:	8.1 29/06/2020
Host Country (ies) / Location:	Kenya (VPA01 and 06) Tanzania (VPA02, 04) Uganda (VPA03)
Certification Pathway (Project Certification/Impact Statements & Products	Impact Statements & Products - SDG 13: Gold Standard Emissions Reductions (carbon credits)
Activity Requirements applied:	GS4GG
Methodologies applied:	Technologies and Practices to Displace Decentralized Thermal Energy Consumption' (Version 3.1)
Product Requirements applied:	N/A
Regular/Retroactive:	Regular
SDG Impacts:	SDG 2: Zero Hunger SDG 3: Good Health and Well-being SDG 5: Gender Equality SDG 7: Affordable and Clean Energy SDG 8: Decent work and Economic Growth SDG 13: Climate Action

SECTION A. General description of PoA

A.1. Purpose and general description of the PoA

Policy/measure or stated goal that the PoA seeks to promote

The purpose of this small-scale Programme of Activities (PoA) is to stimulate the use of biogas systems in Africa (initially focusing on East Africa) to replace traditional thermal energy generation methods. The PoA will be able to encompass all types of biogas systems, depending on the supplier and the user of the biogas, serving both domestic and institutional users.

Biogas digesters produce biogas from human, animal or plant waste products that can be used in cooking and heating replacing the use of non-renewable biomass (NRB), either firewood or charcoal. NRB when used in the production of thermal energy produces greenhouse gas (GHG) emissions, particularly carbon dioxide. By switching from NRB to biogas, which is a renewable fuel, the PoA reduces GHG emissions.

The mission of this PoA is to make biogas systems affordable and available to households and institutions across Africa, especially for low- and medium-income households. This will be done by providing a carbon market access service to Voluntary Project Activity (VPA) implementers to help them overcome barriers to disseminating biogas systems in the host countries.

Confirmation that the PoA is a voluntary action by the CME

Each of the host countries under the PoA is actively promoting the development of biogas as an alternative modern energy source. There are no laws or mandatory requirements in Africa stipulating the adoption of biogas systems by households or institutions, nor their dissemination. This proposed PoA is a voluntary action by the CME, Hivos.

Contribution to sustainable development

According to the Policy Brief in support of the SDG7 Review at the UN High-Level Political Forum 2018[1], about one billion people live without access to electricity (13% of the global population) and almost 3 billion people live without clean cooking facilities (roughly 40% of global population). More than 95% of these people are either in sub-Saharan Africa or developing Asia and 84% are in rural areas. The world is far from being on track to achieve universal access to clean and modern cooking fuels and technologies by 2030; the International Energy Agency's (IEA's) projections estimate that 2.3 billion people will still remain without access to clean cooking facilities in 2030 under current policy and population trends[2] The PoA will meet the sustainable development criteria of each of the host countries by achieving the following sustainable development benefits:

1. Environmental:
   - Reducing deforestation and forest degradation. This contributes to the overall stability of forest ecosystems, which support biodiversity and watersheds.
   - Reducing greenhouse gas (GHG) emissions
   - Reducing the need for artificial fertilisers and improving soil conditions where digester slurry is applied to agricultural land[3].

2. Social

[1] Accelerating SDG7 Achievement Policy Briefs in support of the First SDG7 Review at the UN High-Level Political Forum 2018 [online] Available at: https://sustainabledevelopment.un.org/content/documents/18041SDG7_Policy_Brief.pdf (accessed 27 February 2020)

[2] International Energy Agency (2017) Energy Access Outlook: World Energy Outlook Special Report, as cited in Policy Brief…. Page 22

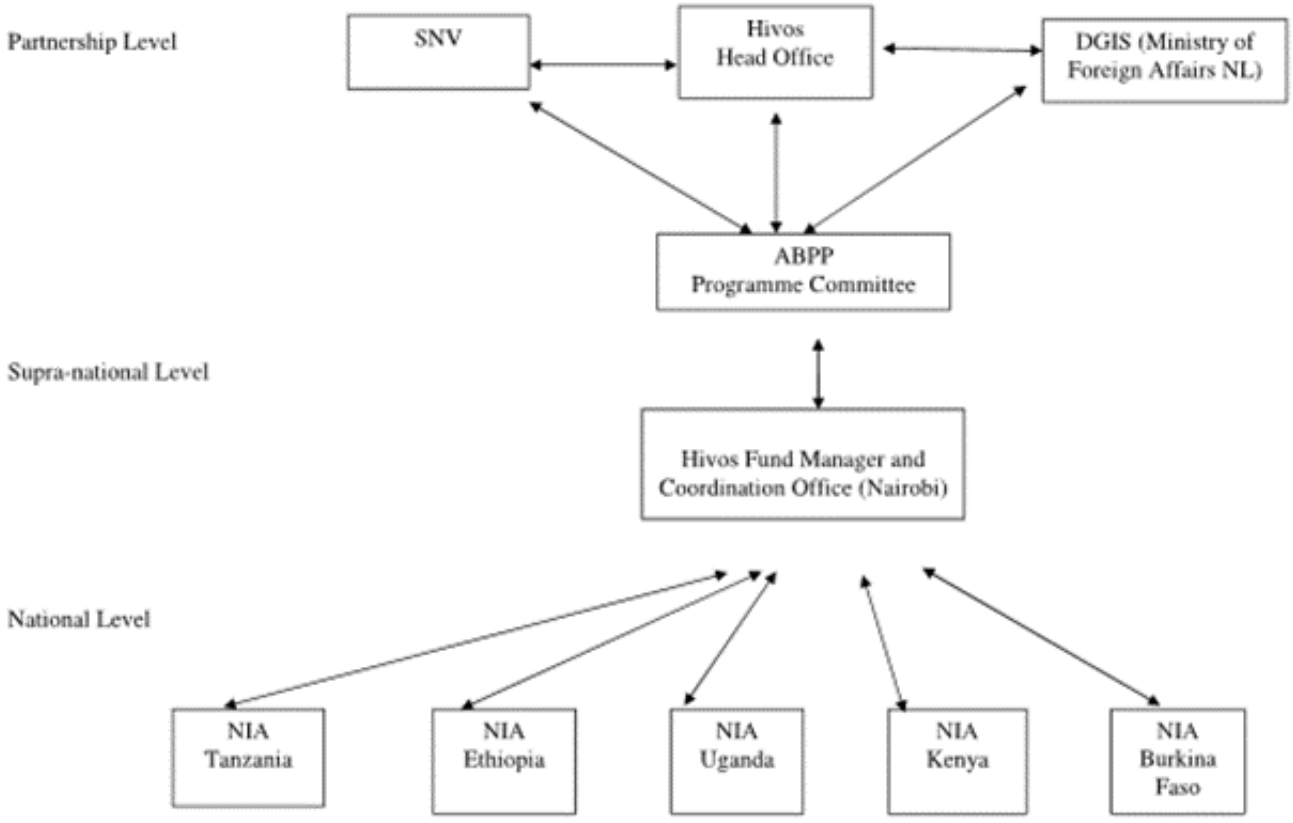
3 De Groot, L., & Bogdanski, A. (2013). Bioslurry= brown gold?. Environment and Natural Resources Management. Working Paper (FAO) eng no. 55.

- Reducing respiratory illness caused by household-air-pollution[4]
- Reduction of injuries occurring in unsafe kitchen environments
- Reduction in time spent cleaning pots and the kitchen
- Improvement of hygiene through toilet attachments reducing bad odours from manure

3. Economic
   - Reducing time/money spent obtaining biomass for cooking
   - Increasing employment opportunities in the biogas industry
   - Improving crop yields and diversity through use of bio-slurry produced by the digester

A.2. CME and participants of PoA

Hivos is the Coordinating/Managing Entity (CME) for this PoA. As such, it will coordinate the efforts from different Voluntary Project Activity (VPA) implementers to install biogas systems in Africa and comply with the requirements of this PoA. The VPA implementers will not be Project Participants to this PoA. The figure below provides an overview of the organisation structure, the NIA (National implementing Agency) are the designated VPA implementers).



4 World Health Organization (2019) 'Household Air Pollution – Health Impacts. Geneva. [online] Available at https://www.who.int/airpollution/household/health-impacts/en/ (accessed 27 February 2020)

Figure 1: Organisational structure of the PoA for the Africa Biogas Partnership Programme. Includes relationship to the National Implementing Agencies (NIAs). SNV = Netherlands Development Organisation SNV. DGIS = Directorate-General for International Cooperation.

During implementation, the CME for this PoA will be responsible for:

- Issuing and revoke the authorisation of included VPAs
- Providing technical and administrative support to VPAs to guarantee the compliance of their activities and their record keeping with the PoA's requirements
- Drafting VPA-DDs (if agreed with the VPA Implementer)
- Communicating with the Gold Standard Secretariat as required under the PoA
- Mediating VER agreements with VPAs Implementers
- May manage the execution of VER sales agreement or equivalent documents and the distribution of the benefits if requested by individual VPAs
- Supervising the monitoring activities and data management practices of VPA Implementers during the lifetime of the PoA
- Being the focal point for VER issuance

Each VPA Implementer will act individually, requesting authorisation for its VPA(s) from the CME and running the project in accordance with the demands of the local market. VPA Implementers will be involved with the dissemination of biogas systems that are sold on a commercial or a non-commercial basis. Typical VPA Implementers will either be organisations that manufacture biogas systems and disseminate them, potentially through a supply chain. Alternatively, VPA Implementers may be organisations that co-ordinate support for biogas systems to be installed. VPA Implementers will have the necessary technical and administrative resources to ensure technical compliance to the PoA requirements of the biogas systems sold, as well as accurate and complete record keeping.

During implementation, each VPA Implementer for this PoA will be responsible for:

- Ensuring compliance with PoA requirements to become an authorised VPA Implementer
- Overseeing the dissemination of biogas systems
- Ensuring all the participants in the distribution chain are aware that the sales are subscribed to the PoA and are trained to comply with the requirements
- Conducting monitoring within the VPA and producing annual Monitoring Reports in accordance with the requirements of the VPA, unless otherwise agreed with the CME
- Hiring a Designated Operational Entity (DOE) to verify the results of the monitoring effort and responding to any comments therein, unless otherwise agreed with the CME
- Keeping records of sales and users as per the monitoring plan and providing information to the CME regularly through the electronic database
- Keeping current with the Gold Standard requirements, as enforced by the CME
- Receiving audits and inspections to maintain authorisation status issued by the CME

VPA Implementers will be involved in the dissemination of biogas systems and are encouraged by the CME to make biogas more affordable to users through the VER proceeds. Affordability will be stimulated as an increasing number of VPA Implementers become a part of this PoA and compete in the market for customer choice. The end users of the biogas will benefit from having a choice of high-quality biogas systems, added investment in marketing (awareness) and research and development of products that reduce deforestation and improve health by reducing indoor air pollution. The exact technology to be employed will vary depending on VPA Implementer and will be required to meet applicable national standards.

When purchasing the biogas system, the buyer will fill an agreement with the VPA Implementer that may contain, among others, information about the biogas system, model, the name, location/address and (the Sales agreement or equivalent document). This information will allow the identification and the monitoring of the system and its usage. VPA Implementers will be encouraged to undertake additional measures to keep in close contact with the buyer through for example, guarantee schemes on the biogas system, this will help to confirm that the biogas system is in use.

The VPA Implementer may use the VER proceeds to reduce the costs of biogas systems by providing a subsidy to customers, providing free or subsidised maintenance of the biogas systems or to recoup the VPA Implementer's incurred associated costs, such as research and development, training and marketing. The exact usage of the revenues obtained from VERs will vary depending on the VPA Implementer.

A.3. Physical/ Geographical boundary of the PoA

The geographical region within which all VPAs included in this PoA will be implemented cover Tanzania, Kenya and Uganda. Other host countries may be added in future.

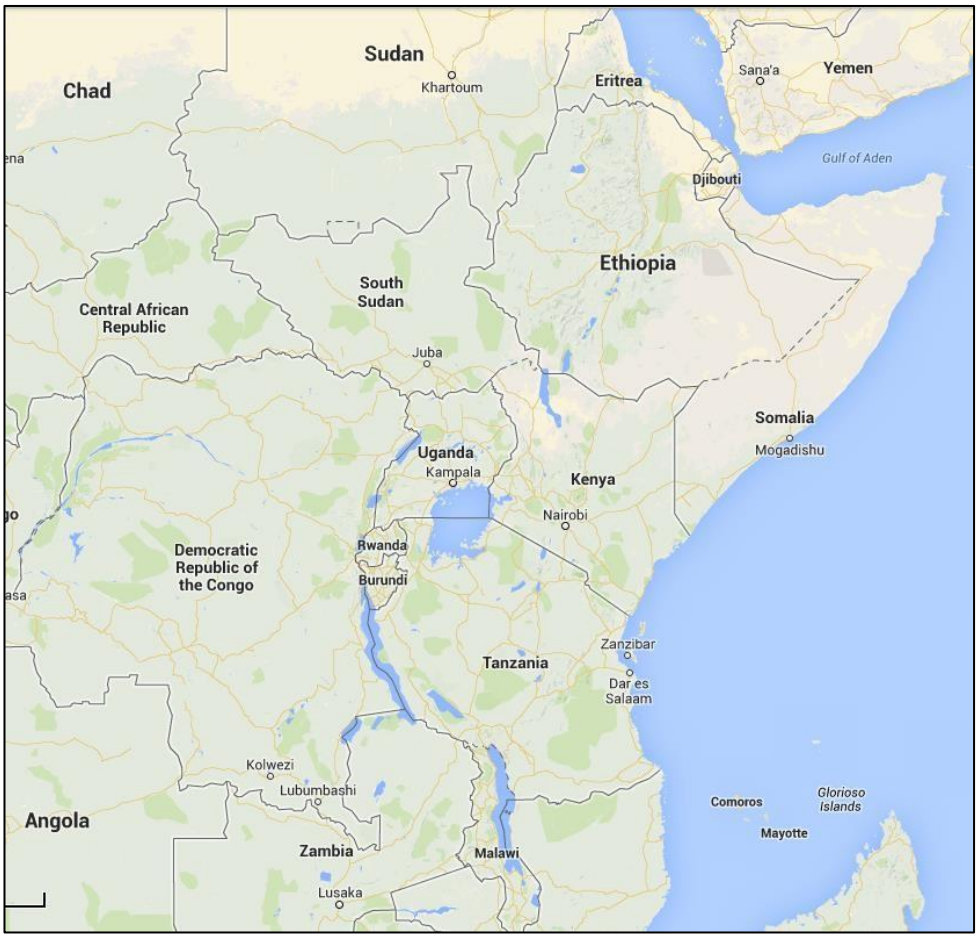


Figure 2: Map of Tanzania, Kenya and Uganda, countries within this PoA

There are at time of writing 5 VPA registered, and 1 VPA deregistered in this PoA:

VPA	GS ID	Start date of ongoing CP	Status	Country	Comment

1	2750	13/06/2013	Registered	Kenya	CPI expired; CP renewal is being considered
2	2751	07/01/2014	Registered	Tanzania	N/A
3	4236	19/04/2015	Registered	Uganda	N/A
4	5123	04/03/2017	Registered	Tanzania	N/A
5	5124	04/02/2016	deregistered	Tanzania	Discarded from registry
6	5801	14/03/2016	Registered	Kenya	N/A

A.4. Technologies/measures and eligibility under Gold Standard

Each VPA will encompass any of the different types of biogas systems covered by the PoA, depending on the VPA Implementer and the type of user of the system. The models of biogas systems covered by the PoA will vary depending on the VPA Implementer and the individual user's requirements. Details of the technology will be elaborated on VPA level. Each VPA Implementer will be required to ensure their technology meets any required standards in the respective host country. Currently there are no standards in the Host Countries. Biogas systems are constructed of materials that are readily available e.g. bricks, cement, plastic, piping and do not require any environmentally unsafe materials during either construction or operation.

The most common baseline for thermal energy use in households and institutions is firewood and charcoal, with more firewood being consumed in rural areas. These fuels are typically burned in inefficient processes such as the three stone fire or the traditional metal stove, such as the metal sigiri in Uganda or metal jiko in Kenya (Figure 3).

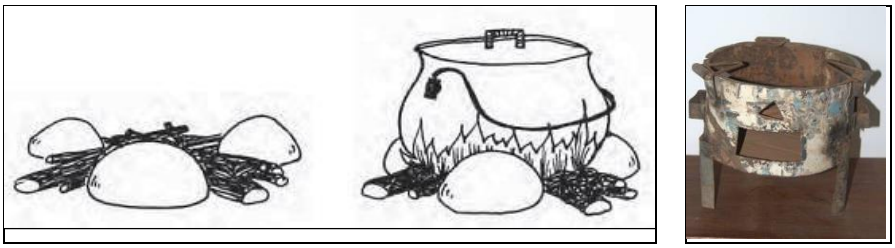


Figure 3: Three stone fire (left) and Singiri, Ugandan Traditional metal stove (right)

Biogas systems in the host countries are a fuel switch from NRB. Biogas is a renewable fuel produced by waste products of humans, animals and/or plants by placing them in a digester under anaerobic conditions. Biogas is mostly made up of methane, which is combustible and enables biogas to be used as a fuel. The methane composition of biogas varies depending on the feedstock; typical values include 65% for cattle manure, 67% pig manure and 60% poultry manure[5]. The remainder of biogas is mostly carbon dioxide with other trace gases such as hydrogen sulphide. The biogas produced in a digester is then piped to be utilised in a variety of appliances depending on the needs of the users, e.g. biogas stoves. NRB, when used in the production of thermal energy, produces greenhouse gas emissions: particularly carbon dioxide. By switching from NRB to biogas the PoA will result in the reduction of GHG emissions.

The biogas digesters allowed in this PoA, include, but are not limited to, fixed dome, floating drums, flexible balloons and portable/fixed plastic biogas digesters. The preferred design for biogas digesters in East Africa is currently the fixed dome design. A general description of these technologies is given at PoA level below, but specific technological details will be given at VPA level.

[5] Page 36 -37, Nijaguna B.T., Biogas Technology, New Age International, 2002

Fixed Dome Digesters

Fixed dome digesters have been proven in several countries that the technology is robust, reliable and requires little maintenance. The size of these plants can range typically anywhere from 2 – 16 m^3 but larger sizes are also possible.

The biogas system is made up of several interconnected parts. The specific role of each component is summarised below:

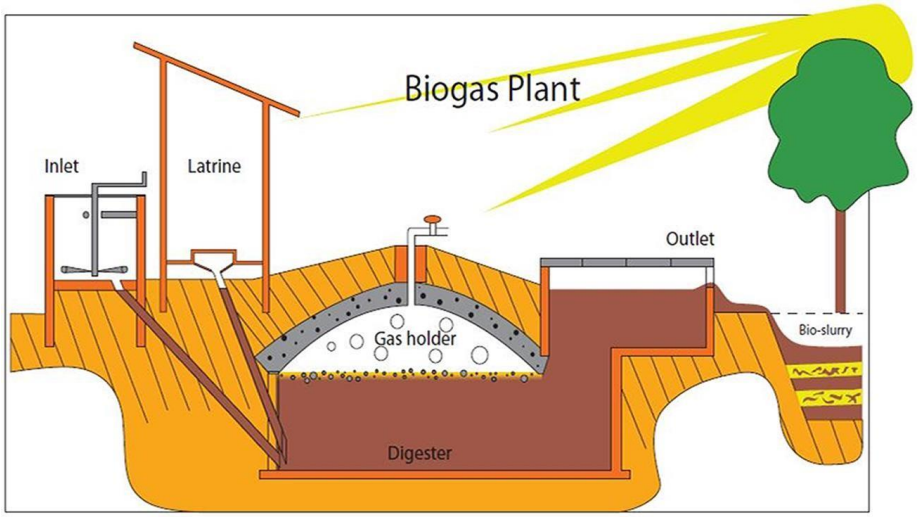


Figure 4: Schematic diagram of an archetypical fixed dome digester

- **Inlet –** The main purpose of the inlet is to mix organic material and water into a semi solid state. This mixture is fed into the digester via an inlet pipe.
- **Digester** – The digester holds the mixture of manure and water, creating a conducive environment for anaerobic digestion where microorganisms produce biogas. The digester is cylindrical in shape and is usually made of brick masonry with a concave concrete cover, or dome. Typically, the digester is built underground with only the plumbing, inlet and outlets visible.
- **Dome** - The purpose of the dome is to collect the gas produced in the digester. This is typically plastered in several layers and painted with a special paint in order to minimise gas leakage. Gas accumulates under the dome creating pressure and pushing down the level of the slurry and consequently increasing the slurry level in the connected slurry tank. It is the difference in slurry levels between the slurry tank and the inside of the dome that maintains the pressure to push the gas into the outlet pipe. The outlet valve releases the collected gas under the dome to biogas appliances such as stoves or lamps.
- **Outlet (Slurry Tank)** - The slurry tank holds the slurry that the gas pressure from under the dome displaces. This slurry overflows into a composting tank as more manure is fed into the digester. This slurry can then be used as a fertiliser.

Floating drum technology

The basic functioning of the floating drum digester is similar to the fixed dome. The key difference of this technology is a cylindrical or dome-shaped digester with a moving, floating gasholder or drum that floats depending on the amount of gas in the digester. The gasholder either floats directly in the digester slurry or in a separate water jacket. The drum in which the biogas collects will usually have an internal or external guide frame that provides stability and keeps the drum upright.

As biogas is produced and more gas is released, the drum is pushed up, indicating a rise in the amount of gas. When the gas is used up, the drum sinks. This provides a useful visual indicator of how much gas is available to users.

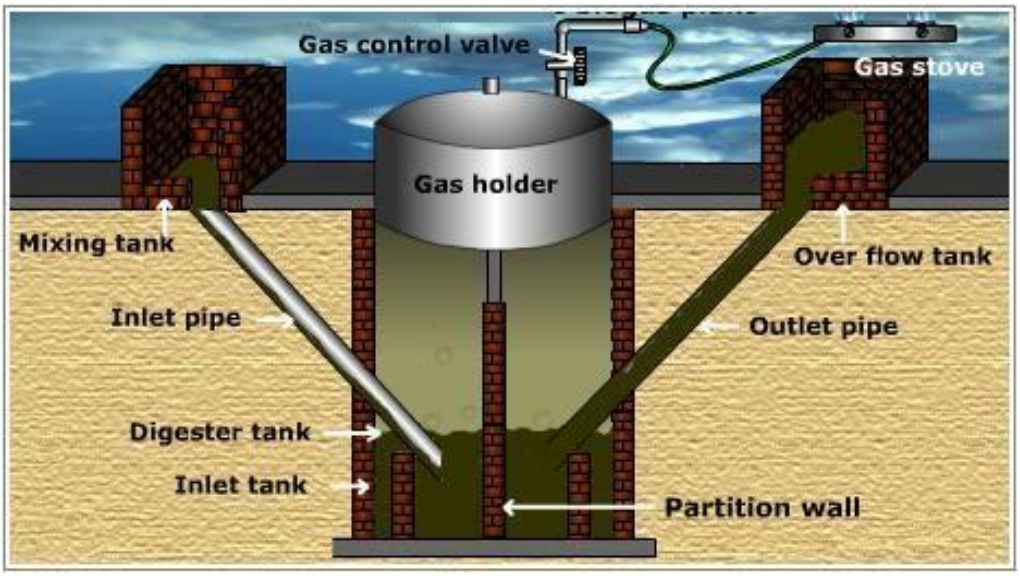


Figure 5: Floating drum biogas system

Costs of building/installing the floating drum type obviously depend upon the size, the materials used and the model of the digester. Floating drum digesters need some maintenance depending on how well they are managed. Maintenance involves cleaning, painting and fixing leaks.

The lifespan of these digesters varies widely and is dependent upon the quality of materials used in construction, as well as management and maintenance. High quality, well-managed digesters can last for over 40 years, though there are some floating drums in disuse – largely because of poor management/maintenance. On the average, it is safe to say that floating drum digesters, if built with high quality materials and well managed, can give service of around 20-30 years, the same as fixed dome digesters providing cooking gas, lighting and fertiliser.

Flexible Balloon Digesters

Flexible balloon digesters are constructed from a large plastic or rubber bag and are thus mobile, which is the main difference from the fixed dome and floating drum digesters that are constructed on site. The operation however follows largely the same principle as fixed-dome or floating drum digesters. The balloon material should be weather and UV resistant, specially stabilised reinforced plastic or rubber.

A balloon digester combines both the digester and gasholder, with the biogas stored in the upper part of the balloon which expands as biogas is produced. The gas pressure can be increased by placing weights on the balloon; however a gas pump may be required if higher gas pressures are needed. Gas safety valves are required to control the pressure inside the balloon to avoid damaging the skin of the digester. The inlet and outlet for the digester are attached directly to the skin of the balloon.

The technology is flexible and allows for standard fabrication and is suitable for use in areas with a high groundwater table. The lifespan is generally shorter than fixed dome digesters but in some VPAs the balloon plants are made of high-quality plastics, such as HDPE, with a long lifespan approaching those of fixed dome plants.

Rural/urban plastic biogas digesters

These biogas digesters have the same basic functioning as the above digester models, but are made of plastic, making them more portable and relatively quick and easy to install. Having a fixed plastic mould also allows for the quality of the biogas digesters to be more easily regulated.

Biogas Appliances

Appliances for the use of biogas can vary widely from stoves, lamps or generators. There will be no specific requirements under this PoA regarding appliances however it is expected that each VPA Implementer will ensure that all appliances, whether locally manufactured or imported, meet appropriate standards. This PoA will focus on the capacity and use of biogas overall to reduce NRB usage in cooking.

The above categorisation of biogas systems is only indicative, with further research and development expected to improve the system design, and completely new designs and models are likely to come onto the market. Details of technologies to be employed will be described at VPA level.

Contribution to at least 3 SDGs

Each VPA contributes directly to 8 out of the 15 SDGs:

Table 1: Contribution of the PoA to the Sustainable Development Goals

SDG	Explanation
1. End Poverty	Biodigester with a lifespan of over 10 years provide a free, renewable and clean energy source for cooking, which reduces fuel expenditure, addresses energy poverty and reduces health cost compared to cooking on wood and exposure to hazardous pollutants from wood stoves.
2. Zero hunger	The use of bio-slurry improves soil health and recycles nutrients which helps farmers to improve yields and makes soil more resilient against climate change
3. Good health and well-being	Significant reduction in household air pollution resulting in better health and lower medical costs.
5. Gender Equality	The workload of women to collect wood is reduced, cooking is faster, and less cleaning is required as pots are not blackened by soot. In addition, convenience is improved as biogas ignites directly and there is no need to tender the fire continuously.
7. Affordable and clean energy	Biodigester feedstock is animal manure which is available for free at the household farm. Biodigesters are generally paid back within 2-3 years and after that households have access to a free and clean source of energy for at least 10 years
8. Decent work and economic growth	The construction of biodigesters creates job opportunities for skilled workers in rural areas which improves the rural economy
13. Climate action	Biodigesters reduce GHG emissions significantly by reducing methane emissions from animal waste management systems and by displacing NRB and fossil fuels for cooking
15. Life on Land	The reduction in wood used for cooking reduces pressure on the forests for firewood and the use of bio-slurry as fertilizer reduces soil erosion and improve soil health (including soil microbial health)

Out of these 8 SDGs, 6 will be monitored. See section B3.3 for an elaboration on the monitoring.

The PoA is meeting the general eligibility criteria 3.1.1 in PRINCIPLES & REQUIREMENTS as per assessment below:

A	General eligibility criteria	Assessment
A	**Type of project:** Eligible projects shall include physical action/implementation on the ground.	the project will install biodigesters conform the requirements in TPDDTEC 3.1
B	**Location of the project:** The project may be located in any part of the world	The project is in this world, in specific in the countries Kenya, Uganda and Tanzania
C	Project Area, Project Boundary and Scale:	Project area, boundary and scale are demonstrated at VPA level and will meet TPDDTEC 3.1 requirements
D	Host Country Requirements:	This is demonstrated at VPA level
E	Contact Details	Contact details of the CME are Included in this PoA-DD, see Appendix I and contact details of the VPA implementer are included in the VPA-DD
F	Legal Ownership	See section B.2 on the assessment
G	Other Rights	Not applicable
H	Official Development Assistance (ODA) Declaration	A signed ODA declaration has been uploaded to the GS project registry

The technology implemented is also eligible as per Community Service Activity Requirements v1.2 Annex B 1.1.2, biogas up to 100 kW is on the positive list.

A.5 Funding sources of PoA

Public funding has been provided by the Directorate General for International Cooperation (DGIS) of the Netherlands Ministry of Foreign Affairs through the Humanist Institute for Cooperation with Developing Countries (Hivos) as support for the initial registration of the PoA e.g. baseline studies and project validation cost.

Official Development Assistance (ODA) is not being diverted to the implementation of the PoA as the Netherlands is not required to purchase any credits from this PoA as confirmed in the ODA Declaration Form. A written declaration of HIVOSs non-use of ODA has been issued and submitted to the Gold Standard Foundation

SECTION B. Demonstration of additionality and development of eligibility criteria

B.1. Demonstration of additionality for PoA

In accordance to the GS4GG principles and requirements section 5.1.47 it is not necessary to re-assess additionality at Design certification renewal.

On-going financial need will be demonstrated at VPA level.

B.2. Eligibility criteria for inclusion of a VPA in the PoA

VPAs to be included under this PoA must meet the following requirements which are developed based on the requirements set in:

- COMMUNITY SERVICES ACTIVITY REQUIREMENTS 1.2
- *Standard CDM project standard for programmes of activities v2.0 section 7.12.6*
- GS PROGRAMME OF ACTIVITY REQUIREMENTS v1.2

Nr.	Requirement[6]	Eligibility criteria	Evidence required
1.	The geographical boundary of the VPA including any time-induced boundary consistent with the geographical boundary set in the PoA	All biogas systems included in the VPA will demonstrate they fall within the geographical boundary of the PoA through: – Recording the address/location of the system in the Sales agreement or equivalent document – Physically marking unique identification code on the Biogas Plant which identifies it as being part of the African Biogas Partnership Programme on a national scale.	One of the following documents shall be provided: – Business plan – Implementation document – Annual plan – Contractual agreement between CME and VPA Implementer – Declaration from VPA implementer and confirmation check by CME – Sales agreement or equivalent document
2.	Conditions to avoid double counting of GHG emission reductions or net anthropogenic GHG removals, such as unique identifications of product and end-user locations (e.g. programme logo);	The VPA shall demonstrate that it does not double-count any of its appliances for the ERs estimation by confirming that: – the complete address of each biogas system will be recorded and/or GPS coordinates – the biogas systems will have unique serial numbers attached (not relevant for the retroactive digesters) the VPA implementer has not included these biogas systems in another VPA or carbon project.	One of the following documents shall be provided: – Contractual agreement between CME and VPA Implementer. – Declaration from VPA implementer – Sales agreement or equivalent document
3	Conditions to confirm that VPAs are neither registered as CDM or voluntary project activities,	The VPA shall demonstrate that project technologies included are not registered under other projects	One of the following documents shall be provided:

[6] Requirements 1-12 are taken from EB65 Annex 3 paragraph 14. Requirement 13 is taken from EB47, Annex 29, paragraph 3. Requirement 14 is a CME requirement to ensure successful implementation of the VPA.

	included in another registered PoAs, nor the project activities that have been deregistered;	and that the VPA itself is not a deregistered project activity or Included in another PoA	– Contractual agreement between CME and VPA Implementer. – Declaration from VPA implementer – Sales agreement or equivalent document
4.	Specification of the technology/measure, such as the level and type of service, as well as performance specification based on, inter alia, testing/certification.	The biogas systems disseminated are renewable energy generation units to provide thermal energy and will be required to conform to any applicable national standards.	The following documents shall be provided: – Technical documentation describing the operation of the biogas system. – Evidence of compliance with national standard (if applicable).
5.	Conditions to check the start date of the VPA through documentary evidence	The VPA implementer will demonstrate the start date of the VPA is on or after the start date of the PoA. The start date of the VPA will be defined as the date on which the first Sales agreement or equivalent document is signed under the VPA.	Sales agreement or equivalent documents and Project Database for the first digester included under the VPA.
6.	Conditions to ensure compliance with the applicability of the applied methodologies, the applied standardized baselines and the other applied methodological regulatory documents;	The VPA shall with the baseline and monitoring methodology requirements of the 'Technologies and Practices to Displace Decentralised Thermal Energy Consumption' (version 3.1) as discussed in section B.3	The following documents shall be provided as evidence: – Electronic database – KPT reports – Sales agreement or equivalent document
7.	The conditions that ensure that VPAs meet the requirements pertaining to the demonstration of additionality and demonstrate ongoing Financial Need as per the Principles & Requirements.	The VPA will prove additionality as per the CDM´s approved Positive List[7] and Tool 32[8] and demonstrate that Biogas system have a rated capacity is less than 100 kW each The VPA will provide an overview of the on-going financial Need at Design certification or renewal	The following evidences shall be provided: 1. Calculation showing the capacity of the biogas system(s) in kW 2. Business plan / Implementation document 3. Qualitative narrative supported by an overview of project finances as per 4.1.52 of GS principles and Requirements
8.	The PoA-specific requirements stipulated by the CME including any conditions related to undertaking local stakeholder consultations and environmental impact analysis	• The VPA, or a group of VPAs, organised a local stakeholder consultation (LSC) • The VPA, or a group of VPAs, got environmental clearance for the project related activities, if applicable.	The following documents shall be provided: 1. Local Stakeholder Report including comments of stakeholders and how the comments were taken into account by the VPA implementer 2. Environmental clearance letter and/or EIA if required

[7] *Asper clause 11 in "Guidelines on the Demonstration of Additionality of Small-Scale Project Activities" v13: https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-21-v13.0.pdf*

[8] *https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-32-v2.0.pdf*

9.	Conditions to provide an affirmation that funding from Annex I parties, if any, does not result in a diversion of official development assistance	VPAs will demonstrate that any Official Development Assistance received for the VPA has not occurred on the condition that the resulting credits are transferred to the donor country	Verifiable evidence: - ODA Declaration
10.	Where applicable, target group (e.g. domestic / commercial / industrial, rural/ urban, grid connected / off- grid) and distribution mechanisms (e.g. direct installation)	The VPA will demonstrate which target group(s) is/are to be targeted by the VPA and the distribution mechanism. Target groups shall include: – Households – Small/Medium Enterprises Communities	Any of the following documents shall be provided: – Sales forecast – Marketing plan – description of technology (e.g. domestic or institutional biogas system) – Implementation document
11.	Where applicable, the conditions related to sampling requirements for a PoA in accordance with the approved guidelines/standard from the Board pertaining to sampling and surveys	The VPA Implementer will agree to support the sampling and survey activities of CME in accordance with B.3 of the PoA-DD.	Contractual agreement between CME and VPA Implementer
12.	Where applicable, the conditions that ensure that every VPA in aggregate meets the small-scale threshold criteria and remains within those thresholds throughout the crediting period of the VPA	The VPA Implementer will ensure that each VPA remains below the small-scale limits. For activities falling under Type I [9], each VPA in aggregate will remain below 15 MW (45MWth) per year. For activities falling under Type III[10], each VPA will achieve below 60,000 tCO2e in emission reductions annually.	Any of the following documents shall be provided: – Contractual agreement between CME and VPA Implementer – Sales forecast – Calculation showing the capacity of the biogas system(s) – Project Database
13.	Where applicable, the requirements for the debundling check, in case VPAs belong to small-scale (SSC) or microscale project categories.	The VPA implementer will demonstrate that the VPA is not a de-bundled component via the following approach: 1. The biogas systems are less than 1% of the SSC threshold (as per Tool 04.0 Assessment of debundling for small-scale project activities[11])	The following evidence shall be provided: – Calculation showing the capacity of the biogas system(s) – Project Database showing size of systems
14.	The proposed VPA must ensure that sufficient training has been carried out to ensure the construction / installation of the biogas system is done by competent persons	The VPA implementer will provide sufficient evidence of training or qualification to implement the proposed VPA.	Any of the following documents shall be provided: – Training certificates – Training records – Qualification certificates – Planned training schedules
15.	Legal ownership: The VPA implementer shall provide a clear description of the ownership of the carbon credits generated under Gold Standard Certification all along the investment chain. In line with the	The end user of each biogas digester has been properly informed on the transfer of credit ownership and agreed to transfer all rights to any carbon credits to the VPA Implementer or CME of the PoA.	The following documents are provided: – Sales agreement or equivalent document containing a clause on the transfer of the carbon rights

[9] *Type I activities are "renewable energy project activities with a maximum output capacity of 15 MW (or an appropriate equivalent)", CDM Project Standard (version 07.0), paragraph 89 (a)*

[10] *Type III activities are "other project activities not included in Type I or Type II that result in GHG emission reductions not exceeding 60 kt CO2e per year in any year of the crediting period", CDM Project Standard, (version 07.0), paragraph 89 (b)*

[11] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-20-v1.pdf

	FPIC requirement, the proofs that end-users are aware of and willing to give up their rights on Products shall be provided. The transfer of Product ownership shall be discussed during local stakeholder consultations for projects.		– Contractual agreement between CME and the VPA Implementer – Local Stakeholder report and/or Passport
16..	Prior consideration of carbon revenues	For retroactive VPAs, prior consideration of carbon revenues shall be checked at the time of inclusion by checking that carbon revenues are considered in early project documentation before the date of VPA inclusion (e.g. in a feasibility report, a programme implementation document or similar documentation).	The following documents are provided: – Feasibility study – Business plan – Implementation document – Any other such document demonstrating compliance
17.	Credit period length	VPA Inclusion after the first crediting cycle of this PoA and completion of transition to GS4GG shall follow the GS4GG Certification Cycle (i.e. 5 years renewals). VPAs included under PoA CPI will maintain a 7 year crediting period twice renewal	- VPA-DD

B.3. Application of technologies/measures and methodologies

Applied Methodology: "Technologies and practices to displace decentralized thermal energy" (Version 3.1). Available online: https://globalgoals.goldstandard.org/2166/

This methodology is applicable to programs or activities introducing technologies and/or practices that reduce or displace greenhouse gas (GHG) emissions from the thermal energy consumption of households, communities and SMEs. This includes biodigesters. Applicability conditions applied:

#	Applicability criteria	Justification
	The project boundary needs to be clearly identified, and the technologies counted in the project are not included in any other voluntary market or CDM project activity (i.e. no double counting takes place). In some cases, there maybe another similar activity within the same target area. Project proponents must therefore have a survey mechanism in place together with appropriate mitigation measures so as to prevent any possibility of double counting.	The project boundary is the physical, geographical site of the methane recovery and combustion systems. Section C describes in the management plan how double counting is avoided and section B.2 eligibility criteria 3
2	The technologies each have continuous useful energy outputs of less than 150kW per unit (defined as the total useful energy delivered from start to end of operation of a unit divided by time of operation).	The maximum energy output of the Biodigesters implemented in the project activities is 44.77 kWth, below the indicated 450 kWth limit per unit (calculation is presented below this table)

3	Using the baseline technology as a backup or auxiliary technology in parallel with the improved technology introduced by the project activity is permitted as long as a mechanism is put into place to encourage the removal of the old technology (e.g. discounted price for the improved technology) and the definitive discontinuity of its use.	As per criteria 3 in chapter 1.0 of the applied methodology: *If an old technology remains in use in parallel with the improved technology, the corresponding emissions must be accounted for as part of the project emissions.* Monitoring will include an assessment of the continued use of the baseline stove through survey methods and biennial Kitchen Performance tests in case the baseline technology remains in use.
4	The project proponent must clearly communicate to all project participants the entity that is claiming ownership rights of and selling the emission reductions resulting from the project activity. For technology producers and the retailers of the improved technology or the renewable fuel in use, this must be communicated by contract or clear written assertions in the transaction paperwork. If the claimants are not the project technology end users, the end users will need to be informed and notified that they cannot claim for emission reductions from the project	As set out in the operational and management plan explained in Section C, each end user of a biodigester will be asked to confirm that they transfer the right and title to VERs to the VPA Implementer as part of the Sales agreement or equivalent document. Copies of these signed contracts will be kept by the VPA Implementer and made available to the CME/a DOE on request.
5	Project activities making use of a new biomass feedstock in the project situation (e.g. shift from non-renewable to green charcoal, plant oil or renewable biomass briquettes) must comply with relevant Gold Standard specific requirements for biomass related project activities, as defined in the latest version of the Gold Standard rules	This applicability criterion is not applicable as no new biomass feedstock is used in the project scenario.
a	Adequate evidence is supplied to demonstrate that indoor air pollution (IAP) levels are not worsened compared to the baseline, and greenhouse gases (as listed in section 2.1) emitted by the project fuel/stove combination are estimated with adequate precision8 . The project fuel/stove combination may include instances in which the project stove is a baseline stove.	A study conducted in Cambodia at a sister program of those supported in this PoA found that biogas reduces PM2.5 levels, with a reduction of around 36% reduction in exposure and 88% reduction in kitchen concentrations. CO levels are also much lower, but in most cases, including the baseline households lower than the 24-hour WHO guidelines [12] . The study also found that biogas kitchens are the cleanest areas in a village, which support the argument that the combustion of biogas does not result in indoor air pollution.
b	Records of renewable fuel sales may not be used as sole parameters for emission reduction calculation, but may be used as data informing the equations in section 2.0 of this methodology	This applicability criterion is not applicable as no renewal fuel sales take place

The largest biodigester type implemented in this PoA, the 100 m^3 unit, is estimated to produce up to 30 m^3 of biogas per day. This amounts to a maximum output of 44.77 kW_{th}, which is below the established threshold of 450 kW_{th}. The calculation is presented below (copied from registered CPI PoA-DD:

[12] *http://www.ccacoalition.org/en/news/report-biogas-and-household-air-quality-rural-cambodia*

$Th_{cap} = \frac{E}{t}$ *where* $E = \eta * H_b * V_b$ (1)		
Where:	Value:	Comments:
t = hours/day usage	2.15	CPI PoA-DD value
η = efficiency of stove	55%	VPA06 value - conservative
Hb = heat of combustion per unit volume of biogas	21.0 MJ/m3 [13]	Derived from IPCC defaults
Vb = volume of biogas	30 m^3/day[14]	Data provided by Hivos
E = Energy available from the biogas system	346.5 MJ/day	Calculated[15]
E_{th} =	96.26 kWh/day	1 MJ = 0.2778 kWh
Th_{cap} =	44.77 kWth	Given a 2.15 hour/day usage

B3.1 Explanation of methodological choices/approaches for estimating the SDG outcome

SDG 2: Zero hunger

- **Indicator 2.4.1: Proportion of agricultural area under productive and sustainable agriculture**

The contribution will be reported as the: **Percentage of biogas users who use slurry as a fertilizer**

The occurrence of application of slurry to agricultural land will be monitored through sampling as part of the annual monitoring effort. Stakeholders will be asked how they use the slurry, if at all. The outcome of the survey is the share of households that use bio-slurry.

SDG 3: Good Health and Wellbeing

- **Indicator 3.9.1: Mortality rate attributed to household and ambient air pollution**

The contribution will be reported as the number of users with a reduced, increased or no change in the incidence of eye problems and respiratory illness which will be capture in the parameter: Health improvement

Users of the biogas digesters will be asked if they feel the incidence of eye problems and respiratory illness have a) increased, b) stayed the same or c) decreased as a result of getting a biogas digester. The incidence will be monitored through sampling as part of the annual monitoring effort.

SDG 5: Gender Equality

- **Indicator: SDG 5.4.1 Proportion of time spent on unpaid domestic and care work, by sex, age and location**

The contribution will be reported as: (1) Percentage of women that report time-savings attributed to the installation of a biodigester and (2) usage of saved time. Time savings will be determined as follows:

1. The female member of the household in charge of cooking and/or cooking fuel collection, will be asked:
    - *Did you save time compared to before you have installed a biodigester? (yes/no/same time investment)*

[13] Methane has an energy value of 37.78 MJ/m^3; thus, biogas at 55% CH_4 has an energy value of 21 MJ/m^3

[14] Cow dung produces approximately 40 litres biogas per kg. Each m3 capacity of the biodigester needs 7.5 kg dung per day. Given a 100 m^3 biodigester, 750 kg of cow dung per day is required. This translates into 30 m^3 of gas produced per day.

*[15] Calculated as: 55% * 21 * 30*

2. The same female member will be asked
    - *What did you do with your saved time? or if no time savings were reported, the reason why will be asked*

The contribution will be monitored through sampling as part of the annual monitoring effort.

SDG 7: Affordable and Clean Energy

- **Indicator 7.1.2: Proportion of population with primary reliance on clean fuels and technology**

The contribution to this target will be determined by:

- Number of biogas units installed (captured in parameter $N_{p,y}$ (Cumulative number of project technologies included in the project database for project scenario p1 in year y). This data originates from the project database
- Number of masons and biogas enterprise staff attending training programmes. The source of data will be training records such as participants lists.

SDG 8: Decent Work and Economic growth

- **Indicator 8.3.1 Proportion of informal employment in non-agriculture employment, by sex**

The contribution to this target will be determined by calculating the number of man-days involved in the construction of biodigesters which will be captured by the parameter Employment generated

$$MD_y = \sum_{DT,S}^{1} N_{DT,S} \times MD_{DT,S} \quad (2)$$

Where

MD_y	=	Man-days of employment generated through the construction of biodigesters (days)
$N_{p,T,S}$	=	Number of biodigester constructed by type and size
$MD_{DT,S}$	=	Number of man-days required for the construction of a particular type and size of biodigester

The number of days required by digester type will be determined based on the bill of quantities (BoQ) of each digester type and size. In the case of prefabricated digesters this is will be defaulted at 0.25 days per digester irrespective of the size unless otherwise indicated by the supplier.

SDG 13: Climate action

- **Indicator 13.2.1 "Number of countries that have communicated the establishment or operationalisation of an integrated policy/strategy/plan which increases their ability to adapt to the adverse impacts of**

climate change, and foster climate resilience and low greenhouse gas emissions development in a manner that does not threaten food production

This is achieved through the roll-out of a national programme that promotes the generation of GHG emission reductions due to the displacement of fossil fuels and non-renewable biomass and improved manure management practices.

GHG emission reductions are calculated as the difference between the baseline emissions and the project emissions. This project includes two sources of emission reduction:

1. Displacement of non-renewable biomass and fossil fuels
2. Avoidance of methane emissions from AWMS.

The gases included are carbon dioxide and methane in the VPA-boundary that is the physical, geographical site of the biogas system.

Source		Gas	Included?	Justification / Explanation
Baseline	Heat delivery Treatment of manure	CO2	Yes	CO2 emissions from - fossil fuel cook stoves - cook stoves using non- renewable biomass
		CH4	Yes	CH4 emissions from the baseline treatment methods of manure
		N2O	No	Excluded, insignificant source of emissions.
Project Activity	Combustion of biogas	CO2	Yes	CO2 emissions from - fossil fuel cook stoves - cook stoves using non- renewable biomass
		CH4	Yes	Emissions due to the manure not fed into the biodigester, as per the applied methodology.
		N2O	No	Excluded, insignificant source of emissions.

1. Displacement of non-renewable biomass and fossil fuels

Emission reductions are credited by comparing fuel consumption in a project scenario to the applicable baseline scenario. When the baseline fuel and the project fuel are different and the emission factors are different, the overall GHG reductions achieved by the project activity in year *y* are calculated as follows:
(equation 2 TPDDTEC V3.1):

$$\mathbf{ER_y} = \sum_{b,p} N_{p1,y} * U_{p,y} * \left(f_{NRB,b,y} * ER_{b,p,y,CO2} + ER_{b,p,y,non-CO2}\right) - \sum LE_{p,y} \quad \textbf{(3)}$$

Where:

$\sum_{b,p}$	Sum over all relevant (Baseline b/project p) couples
$N_{p,y}$	Cumulative number of biodigesters months[16] included in the project database for project scenario p in against baseline scenario b in year y. $N_{p,y}$ applied is the value of last month to allow for a 1 month period for digester starting up. This is conservative because in most cases within 2 weeks biogas is being produced
$U_{p,y}$	Cumulative usage rate for technologies in project scenario p1 in year y, based on cumulative adoption rate and drop off rate (fraction)
$ER_{b,p,y,CO2}$	Specific CO_2 emission savings for an individual technology of project p against an individual technology of baseline bin year y, in tCO_2/year, and as derived from the statistical analysis of the data collected from the field tests
$ER_{b,p,y,non\text{-}CO2}$	Specific non-CO_2 emission savings for an individual technology of project p[17] against an individual technology of baseline b in year y, converted in tCO_2/year, and as derived from the statistical analysis of the data collected from the field tests
$f_{NRB,b,y}$	Fraction of biomass used in year y for baseline scenario b that can be established as non-renewable biomass
$LE_{p,y}$	Leakage for project scenario p in year y (tCO_2e/yr)

CO_2 and non-CO_2 emissions factors for charcoal may be estimated from project specific monitoring or alternatively by researching a conservative wood to charcoal production ratio (from IPCC, credible published literature, project-relevant measurement reports, or project-specific monitoring) and multiplying this value by the pertinent EF for wood.

The overall GHG reductions achieved by the project activity are then calculated as follows

$$\sum \mathrm{ER_y} = \sum \mathrm{BE_{b,y}} - \sum \mathrm{PE_{py}} - \sum \mathrm{LE_{p,y}} \qquad \textbf{(4)}$$

Where:

ER_{Cy}	Emission reduction for total project activity in year y (tCO2e/yr)
$BE_{b,y}$	Baseline emissions for scenario b in year y (tCO2e/yr) as calculated below under formula (**5**)
$PE_{p,y}$	Project emissions for project scenario P (tCO2e/yr) calculated below under formula (**6**)
$LE_{p,y}$	Leakage emission for project scenario p in year y (tCO2e/yr) [18]

[16] *Contrary to the methodology NBP measures this in months and not days as it takes 2 weeks before biogas is produced. In each case, the next month after installation is taken as the technology starting date of operation which is conservative.*

[17] *Project j in equation 2 of the methodology, this is a typo as it is referred to project p in parameter* $ER_{b,p,y,CO2}$

[18] *Technologies and practices to displace decentralized thermal energy – v3.1 p.20*

Applicable baseline scenarios are defined by the typical baseline fuel consumption patterns in a population that is targeted for adoption of the biodigester technology. The amount of baseline scenarios per project activity will be defined on the VPA level, whereby the different applicable baseline scenarios will be defined ex-ante through a baseline survey. The baseline survey will also serve to determine the ex-ante ratio of users that fall into each identified baseline scenario. This ratio will be monitored annually on a sampling basis as part of the monitoring survey, with the annual ratio applied during each verification. In addition to the defined pre-project situation, the methodology allows for a baseline scenario to be assessed in terms of suppressed demand if adequate evidence is provided that in the baseline scenario the target population consumes less fuel than would satisfy their human development needs. (equation 3 of TPDDTEC v3.1):

$$BE_{b,y} = B_{b,y} * ((f_{NRB,\,y} * EF_{b,fuel,\,CO2}) + EF_{b,fuel,\,nonCO2}) * NCV_{b,\,\mathbf{fuel}} \quad \textbf{(5)}$$

Where:

$BE_{b,y}$	Emissions for baseline scenario b during the year y in tCO_2e
$B_{b,y}$	Quantity of fuel consumed in baseline scenario b during year y, in tons, as per by-default factors (cases with project performance field test only)
$f_{NRB,,\,y}$	Fraction of biomass used during year y for the considered scenario that can be established as non-renewable biomass (drop this term from the equation when using a fossil fuel baseline scenario)
$NCV_{b,fuel}$	Net calorific value of the fuel that is substituted or reduced (IPCC default for wood fuel, 0.015 TJ/ton)
$EF_{b,fuel,CO2}$	CO_2 emission factor of the fuel that is substituted or reduced. 112 tCO_2/TJ for Wood/Wood Waste, or the IPCC default value of other relevant fuel
$EF_{b,fuel,nonCO2}$	Non-CO_2 emission factor of the fuel that is substituted or reduced

VPAs included under this PoA have two ways to determine the *ex-ante* baseline fuel usage *amounts*. Under Option 1baseline scenario's b shall be defined *ex-ante* on the VPA level referencing a baseline survey applicable to the target user. Prior to submission for verification, these values shall be fixed *ex-post* and will be deduced from the statistical analysis conducted on the data collected during the Baseline Performance Field Test (BFT). The BFTs will target end users representative of the baseline scenario and shall be arranged in accordance with the guidance provided by the methodology. Under Option 2 the baseline scenario's b shall be defined *ex-ante* on the VPA level through a Baseline Performance Field Test (BFT) directly.

Under either option, a separate BFT shall be conducted per baseline scenario identified in the original baseline survey. Each BFT shall comply with the 90/30 confidence/precision interval defined by the applied methodology, and the resulting fuel amounts for each identified baseline scenario will be weighted as per the ratio determined in the baseline (for ex-ante calculations) and monitoring (for ex-post calculations) surveys. Any combination of baseline fuels can constitute a separate baseline scenario. Examples of baseline scenarios allowed under the applied methodologies could include:

- Baseline scenario b1 Households using firewood only
- Baseline scenario b2 Households using charcoal only
- Baseline scenario 3 b3): Households using firewood + charcoal only

VPAs that chose not to implement separate BFTs per baseline scenario will, for the sake of conservativeness, apply the baseline emission values from the most conservative baseline scenario that is applicable to the VPA.

Unless updated IPCC guidance is published, reference shall be made to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories for the default EF_{fuel}, EF_{bio}, NCV_{fuel}, NCV_{bio} values.

Project emissions:

The project scenario is defined by the fuel consumption of end users within the targeted population that adopts the biodigester technology. This formula calculates the project emissions per household (as per equation 5 of TPDDTEC v3.1)

$$PE_{p,y} = B_{p,y} * ((f_{NRB,\,y} * EF_{p,fuel,\,CO2}) + EF_{p,fuel,\,nonCO2}) * NCV_{p,\,fuel} \quad \textbf{(6)}$$

Where:

$PE_{p,y}$	Emissions for project scenario p during year y in tCO2e
$B_{p,y}$	Quantity of fuel consumed in project scenario p during year y, in tons, and as derived from the statistical analysis conducted on the data collected during the project performance field tests (cases when no baseline performance field test are performed, e.g. by-default baseline factors)
$f_{NRB,\,y}$	Fraction of biomass used during year y that can be established as nonrenewable biomass (drop this term from the equation when using a fossil fuel baseline scenario)
$NCV_{p,fuel}$	Net calorific value of the project fuel (IPCC default for wood fuel, 0.015 TJ/ton). This is equal to the baseline fuel NCV in projects which use the same fuel.
$EF_{p,fuel,CO2}$	CO_2 emission factor of the project fuel. This is equal to the baseline fuel EF in projects which use the same fuel, 112 tCO2/TJ for Wood/Wood Waste, or the IPCC default value of other relevant fuel
$EF_{p,fuel,nonCO2}$	Non-CO_2 emission factor of the project fuel. This is equal to the baseline fuel EF in projects which use the same fuel.

Baseline Emissions from AWMS

The baseline emissions from the handling of animal waste can be determined by using one of the following approaches, as appropriate:

- IPCC TIER 1 approach
- IPCC TIER 2 approach

=Baseline emissions following Tier 1:

The relevant default methane emission factor for livestock by temperature and region shall be sourced from Tables 10.14 – 10.16 of the IPCC Guidelines for National Greenhouse Gas Inventories[19] . The baseline emissions from the handling of animal waste shall be determined by using one of the two approaches. IPCC Tier 1 or IPCC

[19] IPCC Guidelines for National Greenhouse Gas Inventories (2006) 'Chapter 10: Emissions from Livestock and Manure Management'

Tier 2. The choice of the appropriate approach shall be contingent upon the availability of baseline data for the estimation of the methane emission factor per category of livestock.

Baseline emissions following Tier 1:

The Tier 1 approach is applicable to situations where baseline data required for the estimation of the methane emission factor per category of livestock is *not* available, or where it is difficult to define a distinct practice of manure handling within the programme boundary. The following equation is applicable to calculate the baseline emissions per household:

$$BE_{awms,h} = GWP_{CH4} * \sum_{T} (EF_{awms(T)} * N_{(T),h}) \quad (7)$$

Where:

$BE_{awms,h}$	The baseline emission from handling of animal waste in premise h (tCO2e per year)
GWP_{CH4}	Global Warming Potential of methane (tCO2e per tCH4): 21 for the first commitment period. It shall be updated according to any future COP/MOP decisions.
$N_{(T),h}$	The number of animals of livestock species per category T
$EF_{awms,T}$	Emission factor for the defined livestock population category T, (ton_{CH4} per head per year). The relevant *Default methane emission factor for livestock* for default animal waste methane emission factors by temperature and region can be found in tables 10.14, 10.15 & 10.16 in Chapter 10: Emissions from Livestock and Manure Management, Volume 4 - AGRICULTURE, FORESTRY AND OTHER LAND USE, 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

IPCC TIER 2 approach

This approach is applicable to situations, where baseline data for an estimation of the methane emission factor per category of livestock are available. Examples for such a situation are when animals are kept in a confined area and the manure is collected following a specifically designed system. If animals leave the confined area, the percentage manure collected has to be estimated as a percentage of the total amount of manure they produce.

$$BE_{awms,h} = GWP_{CH4} * \sum_{T}(EF_{awms(T)} * N_{(T),h}) \quad (8)$$

Where

$BE_{awms,h}$	The baseline emission from handling of animal waste in for premise h (tCO_{2e} per year)
$N_{(T),h}$	Number of animals of livestock category T in premise h
$EF_{awms(T),}$	Emission factor for the defined livestock category T, (ton_{CH4}per animal per year)
GWP_{CH4}	Global Warming Potential (GWP) of methane (tCO_{2e} per tCH_4): 21 for the first commitment period. It shall be updated according to any future COP/MOP decisions.

The emission factor ($EF_{awms(T))}$ for tier 2 approach is calculated as follows (equation 16 of the applied methodology):

$$EF_{awms(T)} = VS_{(T)} * 365 * \left[Bo_{(T)} \times D_{CH4} \times \sum_{k} \frac{MCF_{BL,k}}{100} \times MS_{(T,s,k)} \right] \quad (9)$$

Where:

$EF_{awms(T)}$	=	CH_4 emission factor for livestock category T, (tCH_4 per animal per year)
$VS_{(T)}$	=	Daily volatile solid excreted for livestock category T, kg VS.animal $^{-1}$
365	=	Basis for calculating annual VS production, days yr^{-1}
$Bo_{(T)}$	=	Maximum methane producing capacity for manure produced by animal T m^3 CH_4 kg^{-1} of VS
D_{CH4}	=	CH_4 density (0.00067 t per m_3 at room temperature (20 ºC) and 1 atm pressure)
$MCF_{(BL,k)}$	=	Methane conversion factors for the animal waste handling system in the baseline situation by climate zone *k*, (%)
$MS_{T(T,s,k)}$	=	Fraction of livestock category *T*'s manure treated in the animal waste management system, in climate region *k* (dimensionless)

Country specific default data is not available for VS, Bo, MCF and MS. IPCC 2006 default values will be used for Bo and MCF. MS will be obtained using survey methods. IPCC 2006 default values for VS will be used or Tier II approach may be chosen to calculate VS excretion ex-post with the following equation[20]:

$$VS_{LT,y} = \left(\frac{W_{site}}{W_{default}} \right) \times VS_{default} \times nd_y \quad \textbf{(10)}$$

Where:

W_{site}	=	Average animal weight of a defined livestock population at the project site (kg)
$W_{default}$	=	Default average animal weight of a defined population, this data is sourced from IPCC 2006 guidelines (kg)
$VS_{default}$	=	Default value for the volatile solid excretion rate per day on a dry-matter basis for a defined livestock population (kg dm/animal/day)
nd_y	=	Number of days in year *y* where the animal manure management system is operational
$VS_{LT,y}$	=	Adjusted VS value for year y

[20] *As per equation 3 of AMS-III.D v21*

The average weight (Wsite) is the average of entry weight at the farm and weight when the pig leaves the farm. Farmers are often able to estimate the weight of fattening pigs reliably as the weight of birth is known and the value of selling the pigs is based on their weight. However, in the case of boars and sows this is not known as those animals are not sold and reside on the farm. In order to ascertain the weight of sows and boars, the method described on the Pig Site[21] was adopted, which is a common practice in the livestock industry and this was done during the last 4 verifications. This is possible with the following equation:

$$\boldsymbol{Pig\ weight = Hg^2 \times L \times 69.3} \qquad \textbf{(11)}$$

Where:

Hg = Hearth girth in meter
L = length in meter

The Hg and the L are explained in the figure below:

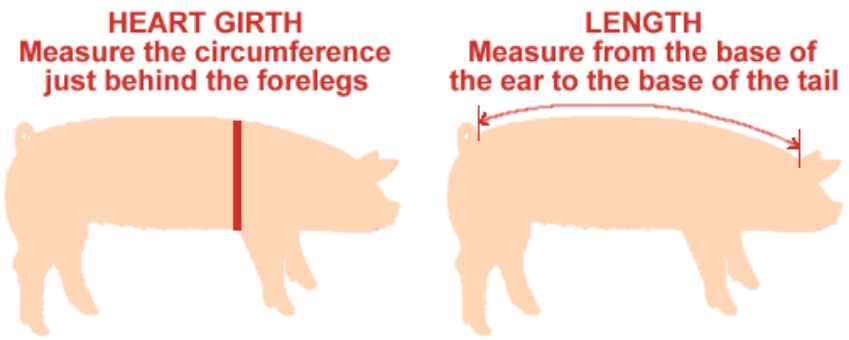


Figure 6: Hearth girth and length measurement

It is however challenging to measure sows and boars, as these are large animals weighing over 120 kg and sometimes over 180 kg and do not stand still and may behave aggressively. Previous experiences have shown that it is possible to divert attention of sows by giving them something to eat, but nevertheless, it remains a challenge. It is expected however that at least 25% of sows in the survey population can be measured.

Project emissions from AWMS

The next equation from the methodology is used to calculate the project emissions from the biodigester system, the emission resulting from physical leakage (PL_y) and resulting from incomplete combustion.

$$PE_{awms,h,y} = GWP_{CH4} \times \sum \left(N_{(T),h,y} \times EFawms_T\right).PL_y + \sum \left(N_{(T),h,y} \times EFawms_T\right) \times \left(1 - \eta_{biogasstove}\right) \times (1 - PL_y) \qquad \textbf{(12)}$$

Where:

$N_{(T),h,y}$ = Number of animals of livestock category T in year y in premise h

[21] *As per the method described on this website http://www.thepigsite.com/articles/541/weighing-a-pig-without-a-scale/*

EF_{awmsT}	=	Emission factor for the defined livestock category T, (ton CH_4 per animal per year).
PL_y	=	Physical leakage of the biodigester in year *y* (10 %)[22] Where project participants use lower values or percentage of physical leakage, they should provide measurements proving that this lower value is appropriate for the project activity.
GWP_{CH4}	=	Global Warming Potential (GWP) of methane (tCO_2eq per tCH_4): 25 for t commitment period. It shall be updated according to any future decisions.
$\eta_{biogasstove}$	=	Combustion efficiency of the biogas stove to account for incomplete combustion resulting in emission of methane post-combustion.

Project emissions from the animal waste not treated in the bio-digester in project scenario shall be calculated using equation 8 and with the following changed definition of parameters:

$MCF_{(P,S,k)}$:	Methane conversion factors for the animal waste handling system used in addition to bio-digester in the project scenario by climate zone *k*, (%)
$MS_{(P,s,k)}$	Fraction of livestock category *T*'s manure not treated in bio-digester, in climate region *k*, (dimensionless)

Leakage emissions

The methodology states that the following potential sources of leakage are to be considered:

Table 2: Leakage emission assessment

#	Leakage source
a	The displaced baseline technologies are reused outside the project boundary in place of lower emitting technology or in a manner suggesting more usage than would have occurred in the absence of the project.
b	The non-renewable biomass or fossil fuels saved under the project activity are used by non-project users who previously used lower emitting energy sources.
c	The project significantly impacts the NRB fraction within an area where other CDM or VER project activities account for NRB fraction in their baseline scenario.
d	The project population compensates for loss of the space heating effect of inefficient technology by adopting some other form of heating or by retaining some use of inefficient technology
e	By virtue of promotion and marketing of a new technology with high efficiency, the project stimulates substitution within households who commonly used a technology with relatively lower emissions, in cases where such a trend is not eligible as an evolving baseline.
F	Physical leakage emissions
G	Emissions due to continued use of baseline fuels

A leakage investigation shall be conducted every two years using relevant survey methods and will be part of the existing user surveys. Leakage risks deemed very low will be ignored where the case for their insignificance can be substantiated or in case deemed insignificant by the VVB.

[22] *Default value of the applied methodology is adopted (TPDDTEC page 68)*

Multiple VPA in the same country

BFT, PFT and AWMS baseline data from an existing VPA will be applicable to other VPAs in the same country provided the following conditions are met:

- The VPA targets the same target group
- The VPA implements the same or a similar technology (similar is a technology with equivalent performance)
- The PFT value is valid (PFT values are valid for 2 years)
- The BFT value is valid (the BFT is executed once per crediting period, the validity is thus 7 years), idem for AWMS data

B 3.2 Data and parameters fixed ex ante for monitoring contribution to each of the six SDGs

Relevant SDG	**Indicator 13.2.1 "Number of countries that have communicated the establishment or operationalisation of an integrated policy/strategy/plan which increases their ability to adapt to the adverse impacts of climate change, and foster climate resilience and low greenhouse gas emissions development in a manner that does not threaten food production".**
Data / Parameter:	$EF_{b, CO2}$
Data unit:	tCO_2/TJ
Description:	CO2 emission factor arising from use of fuels in baseline scenario
Source of data:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied:	Wood = 112 Charcoal expressed in wood equivalents = 112 Kerosene = 71.9 LPG = 63.1
Choice of data or Measurement methods and procedures:	As per requirement of the methodology and Table 2.3, Chapter 2, Volume 2 of the 2006 IPCC Guidelines. The IPCC is a standard, credible source of emissions factors.
Purpose of data	Calculation of the baseline scenario
Additional comment:	IPCC (2006); May be updated according to any future changes by the IPCC. CO_2 and non-CO_2 emissions factors for charcoal may be estimated from project specific monitoring or alternatively by researching a conservative wood to charcoal production ratio (from IPCC, credible published literature, project- relevant measurement reports, or project-specific monitoring) and multiplying this value by the pertinent EF for wood.

Relevant SDG	**Indicator 13.2.1 "Number of countries that have communicated the establishment or operationalisation of an integrated policy/strategy/plan which increases their ability to adapt to the adverse impacts of climate change, and foster climate resilience and low greenhouse gas emissions development in a manner that does not threaten food production".**
Data / Parameter:	$EF_{b, non\ CO2}$
Data unit:	tCO_2/TJ
Description:	Emission factor of the woody biomass used in baseline scenario b
Source of data:	IPCC defaults, credible published literature, project-relevant measurement reports, or project-specific field tests prior to first verification
Value(s) applied:	Determined at VPA level
Choice of data or Measurement methods and procedures:	As per requirement of the methodology and Table 2.3, Chapter 2, Volume 2 of the 2006 IPCC Guidelines. The IPCC is a standard, credible source of emissions factors.
Purpose of data	Calculation of the baseline scenario
Additional comment:	IPCC (2006); May be updated according to any future changes by the IPCC. CO_2 and non-CO_2 emissions factors for charcoal may be estimated from project specific monitoring or alternatively by researching a conservative wood to charcoal production ratio (from IPCC, credible published literature, project- relevant measurement reports, or project-specific monitoring) and multiplying this value by the pertinent EF for wood.

Relevant SDG	**Indicator 13.2.1 "Number of countries that have communicated the establishment or operationalisation of an integrated policy/strategy/plan which increases their ability to adapt to the adverse impacts of climate change, and foster climate resilience and low greenhouse gas emissions development in a manner that does not threaten food production".**
Data / Parameter:	**$EF_{p,CO2}$**
Data unit:	tCO_2/TJ
Description:	CO2 emission factor arising from use of fuels in project scenario
Source of data:	IPCC defaults, credible published literature, project-relevant measurement reports, or project-specific field tests prior to first verification
Value(s) applied:	Wood = 112 Charcoal expressed in wood equivalents = 112 Kerosene = 71.9 LPG = 63.1
Choice of data or Measurement methods and procedures:	As per requirement of the methodology and Table 2.3, Chapter 2, Volume 2 of the 2006 IPCC Guidelines. The IPCC is a standard, credible source of emissions factors.
Purpose of data	Calculation of project emissions
Additional comment:	IPCC (2006); May be updated according to any future changes by the IPCC.

Relevant SDG	**Indicator 13.2.1 "Number of countries that have communicated the establishment or operationalisation of an integrated policy/strategy/plan which increases their ability to adapt to the adverse impacts of climate change, and foster climate resilience and low greenhouse gas emissions development in a manner that does not threaten food production".**
Data / Parameter:	**$EF_{p,nonCO2}$**
Data unit:	tCO_2/TJ
Description:	Non-CO2 emission factor arising from use of fuels in project scenario
Source of data:	IPCC defaults, credible published literature, project-relevant measurement reports, or project-specific field tests prior to first verification
Value(s) applied:	Determined at VPA level
Choice of data or Measurement methods and procedures:	As per requirement of the methodology and Table 2.3, Chapter 2, Volume 2 of the 2006 IPCC Guidelines. The IPCC is a standard, credible source of emissions factors.
Purpose of data	Calculation of project emissions
Additional comment:	IPCC (2006); May be updated according to any future changes by the IPCC.

Relevant SDG	**Indicator 13.2.1 "Number of countries that have communicated the establishment or operationalisation of an integrated policy/strategy/plan which increases their ability to adapt to the adverse impacts of climate change, and foster climate resilience and low greenhouse gas emissions development in a manner that does not threaten food production".**
Data / Parameter:	**NCV_b**
Data unit:	TJ/tonne
Description:	Net calorific value of the fuels used in the baseline

Source of data:	IPCC defaults, credible published literature, project-relevant measurement reports, or project-specific field tests prior to first verification
Value(s) applied:	Wood and charcoal expressed in wood equivalents: 0.0156 Kerosene = 0.0438 LPG = 0.0473
Choice of data or Measurement methods and procedures:	As per requirement of the methodology and Table 2.3, Chapter 2, Volume 2 of the 2006 IPCC Guidelines. The IPCC is a standard, credible source of emissions factors.
Purpose of data	Calculation of baseline emissions
Additional comment:	N/A

Relevant SDG	**Indicator 13.2.1 "Number of countries that have communicated the establishment or operationalisation of an integrated policy/strategy/plan which increases their ability to adapt to the adverse impacts of climate change, and foster climate resilience and low greenhouse gas emissions development in a manner that does not threaten food production".**
Data / Parameter:	**VS_T**
Data unit:	kg/head/day
Description:	Daily volatile solid excreted for livestock category T
Source of data:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied:	Dairy cows = 1.9 Other cattle = 1.5 Market swine = 0.3 Goats = 0.3 Sheep = 0.32 Poultry = 0.02
Choice of data or Measurement methods and procedures:	As per requirement of the methodology and sourced from Tables 10. A-4 through A-9, Chapter 10, Volume 4 of the 2006 IPCC Guidelines The IPCC is a standard, credible source of emissions factors.
Purpose of data	Calculation of baseline emissions
Additional comment:	Any comment: 365 = basis for calculating annual VS production, days per year. The VS value will be proportionally adjusted when credible animal weight data is available as per equation 3 of AMS-III.D v21 and see section B.3

Relevant SDG	**Indicator 13.2.1 "Number of countries that have communicated the establishment or operationalisation of an integrated policy/strategy/plan which increases their ability to adapt to the adverse impacts of climate change, and foster climate resilience and low greenhouse gas emissions development in a manner that does not threaten food production".**
Data / Parameter:	**Bo_T**
Data unit:	m^3 CH_4/kg
Description:	Maximum methane producing capacity for manure produced by animal type T
Source of data:	2006 IPCC Guidelines for National Greenhouse Gas Inventories

Value(s) applied:	Dairy cows = 0.13 Other cattle = 0.10 Market swine = 0.29 Breeding swine = 0.29 Goats = 0.13 Sheep = 0.13 Poultry = 0.24
Choice of data or Measurement methods and procedures:	As per requirement of the methodology and sourced from Tables 10. A-4 through A-9, Chapter 10, Volume 4 of the 2006 IPCC Guidelines The IPCC is a standard, credible source of emissions factors.
Purpose of data	Calculation of baseline emissions
Additional comment:	IPCC (2006); May be updated according to any future changes by the IPCC. National data can replace the IPCC value, if available

Relevant SDG	**Indicator 13.2.1 "Number of countries that have communicated the establishment or operationalisation of an integrated policy/strategy/plan which increases their ability to adapt to the adverse impacts of climate change, and foster climate resilience and low greenhouse gas emissions development in a manner that does not threaten food production".**
Data / Parameter:	$\eta_{biogas\ stove}$
Data unit:	%
Description:	Combustion efficiency of the new biogas stove introduced by the programme
Source of data:	Determined on VPA level through reference to studies, reports, or laboratory tests.
Value(s) applied:	Determined on VPA level
Choice of data or Measurement methods and procedures:	As above
Purpose of data	Calculation of project emissions
Additional comment:	-

Relevant SDG	**Indicator 13.2.1 "Number of countries that have communicated the establishment or operationalisation of an integrated policy/strategy/plan which increases their ability to adapt to the adverse impacts of climate change, and foster climate resilience and low greenhouse gas emissions development in a manner that does not threaten food production".**
Data / Parameter:	$MCF_{(k)}$
Data unit:	%
Description:	Methane conversion factors for each manure management system by climate region k
Source of data:	Determined on VPA level referencing reports, studies or baseline surveys
Value(s) applied:	Determined on VPA level
Choice of data or Measurement methods and procedures:	As per Tables 10.A., Chapter 10, Volume 4 of the 2006 IPCC Guidelines
Purpose of data	Calculation of baseline emissions
Additional comment:	National data can replace the IPCC value, if available

Relevant SDG	**Indicator 13.2.1 "Number of countries that have communicated the establishment or operationalisation of an integrated policy/strategy/plan which increases their ability to adapt to the adverse impacts of climate change, and foster climate resilience and low greenhouse gas emissions development in a manner that does not threaten food**

	production".
Data / Parameter:	**$EF_{awms,T}$**
Data unit:	kg CH_4
Description:	Emission factor for the defined livestock population category T by average temperature
Source of data:	2006 IPCC Guidelines for National Greenhouse Gas Inventories; Indonesian Meteorological Climatological and Geophysical Agency
Value(s) applied:	Kenya and Tanzania Dairy cows = 1 Other cattle = 1 Market swine = 1 Breeding swine = 1 Goats = 0.17 Sheep = 0.15 Poultry = 0.02 Uganda Dairy cows = 1 Other cattle =0 Market swine = 0 Breeding swine = 0 Goats = 0.11 Sheep = 0.10 Poultry = 0.02
Choice of data or Measurement methods and procedures:	As per requirement of the methodology and sourced from Tables 10.A-4 through A-9., Chapter 10, Volume 4 of the 2006 IPCC Guidelines The IPCC is a standard, credible source of emissions factors.
Purpose of data	Calculation of baseline emissions
Additional comment:	IPCC (2006); May be updated according to any future changes by the IPCC

Relevant SDG Indicator	**Indicator 13.2.1 "Number of countries that have communicated the establishment or operationalisation of an integrated policy/strategy/plan which increases their ability to adapt to the adverse impacts of climate change, and foster climate resilience and low greenhouse gas emissions development in a manner that does not threaten food production".**
Data / Parameter:	**GWP_{CH4}**
Data unit:	tCO2e per tCH4
Description:	Global Warming Potential of methane
Source of data:	IPCC (2006); May be updated according to any future changes by the IPCC
Value(s) applied	25
QA/QC procedures:	As per the Gold Standard's rule update 'The application of Global Warming Potentials for Gold Standard project activities'
Purpose of data	Calculation of baseline and project emissions
Additional comment:	25 for the second commitment period. It shall be updated according to any future COP/MOP decisions.

B3.3 Data and parameters monitored

Relevant SDG	**Indicator 13.2.1 "Number of countries that have communicated the establishment or operationalisation of an integrated policy/strategy/plan which increases their ability to adapt to the adverse impacts of climate change, and foster climate resilience and low greenhouse gas emissions development in a manner that does not threaten food production".**
Data / Parameter:	**fNRB,i,y**
Data unit:	Fractional non-renewability
Description:	Physical leakage of the biodigester
Source of data:	Applicable NRB assessment
Value(s) applied:	determined at VPA level
Monitoring frequency	Fixed by baseline study for a given crediting period
QA/QC procedures	Transparent data analysis and reporting

Relevant SDG Indicator	**Indicator 13.2.1 "Number of countries that have communicated the establishment or operationalisation of an integrated policy/strategy/plan which increases their ability to adapt to the adverse impacts of climate change, and foster climate resilience and low greenhouse gas emissions development in a manner that does not threaten food production".**
Data / Parameter:	$P_{b,y}$
Data unit:	Tonnes/year
Description:	Quantity of fuel that is consumed in baseline scenario b during year y
Source of data:	Baseline FT or default baseline fuelwood consumption, baseline FT updates, and any applicable adjustment factors
Value(s) applied	Determined on VPA level
Monitoring frequency:	Updated every two years, or more frequently (if applicable)
QA/QC procedures:	To account for void responses and lack of availability of some households/communities/SMEs on the day of the survey, at least 10 additional households should be questioned.

Purpose of data	Calculation of baseline emissions
Additional comment:	In case separate baseline fuel scenarios are identified, a separate BFT will be organized for each scenario, i.e. VPA06 has 3 fuel scenarios': b1: households using firewood only b2: household using charcoal only b3: households using firewood + charcoal only b4: LPG This list of baseline scenarios is not exhaustive and may contain

Relevant SDG Indicator	**Indicator 13.2.1 "Number of countries that have communicated the establishment or operationalisation of an integrated policy/strategy/plan which increases their ability to adapt to the adverse impacts of climate change, and foster climate resilience and low greenhouse gas emissions development in a manner that does not threaten food production".**
Data / Parameter:	$P_{p,y}$
Data unit:	Tonnes/year
Description:	Quantity of fuel that is consumed in project scenario p during year y
Source of data:	Project Performance Test.
Value(s) applied	Determined on VPA level. As there is only one applicable project scenario (biogas usage), only one project scenario is applicable per user group. Separate project scenarios will need to be defined for each user group (households, communities and SMEs).
Measurement methods and procedures:	Households/communities/SMEs will both be asked how much fuel they use per week and undergo a Kitchen Performance Test as per the requirements of the TPDDTEC methodology. In the case of LPG: It is not always practical to establish LPG consumption using the KPT for reasons of safety. Instead, households were be asked how often they buy a bottle and the bottle size will be recorded. Annual consumption was be calculated as: $$Annual\ LPG\ consumption\ (\frac{kg}{year}) = \frac{Bottle\ size\ (kg)}{Usage\ period\ (days)} \times 365$$
Monitoring frequency:	Once every two years
QA/QC procedures:	To account for void responses and lack of availability of some households/communities/SMEs on the day of the survey, at least 10 additional households should be questioned.
Purpose of data	To calculate project emissions
Additional comment:	Project Performance Field Test (PFT) will be updated once every two years. The LPG method is copied from the approved PDD of GS751 The Cambodia National Biodigester programme.

<table>
<tr><td>Relevant SDG Indicator</td><td>Indicator 13.2.1 “Number of countries that have communicated the establishment or operationalisation of an integrated policy/strategy/plan which increases their ability to adapt to the adverse impacts of climate change, and foster climate resilience and low greenhouse gas emissions development in a manner that does not threaten food production”.</td></tr>
<tr><td>Data / Parameter:</td><td>$U_{p,y}$</td></tr>
<tr><td>Data unit:</td><td>Percentage</td></tr>
<tr><td>Description:</td><td>Percentage of bio-digesters in use in monitoring period y</td></tr>
<tr><td>Source of data:</td><td>Usage survey</td></tr>
<tr><td>Value(s) applied</td><td>Determined on VPA level</td></tr>
<tr><td>Measurement methods and procedures:</td><td>An assessment of the drop-off rate of usage requires that digesters of different age groups are assessed. Monitoring shall be carried out among a random sample of digesters of different ages. The minimum total sample size is 100, with at least 30 samples for biogas digesters of each age bracket (measured in annual increments) being surveyed.

The usage rate of thermal applications will be monitored annually using survey methods to satisfy the requirements put forth by the methodology ‘Technologies and practices to displace decentralized thermal energy consumption’ V3 1

U_p will be calculated as follows:

$$U_p = U_{us} \times UP_{us} \times C_y$$

Where
<table>
<tr><td>U_p</td><td>=</td><td>Percentage of biodigesters in use</td></tr>
<tr><td>U_{us}</td><td>=</td><td>Percentage of biodigesters in use during the usage survey</td></tr>
<tr><td>UP_{us}</td><td>=</td><td>Fraction of the year that digesters were temporarily out of use due to repairs or sale of animals on average in the MP</td></tr>
<tr><td>Cy</td><td>=</td><td>Correction factor of the number of days out of operation biodigesters were in operation during monitoring year y. Calculated as

$C_y = 1 - \frac{OUT_y}{TOT_y}$

Where,
OUT_y = cumulative plant years in operation of plants that went out of operation during in year y ((Total number of plants out of operation in the respective monitoring period* days in operation) / 365)
TOTy= Plant-year of all plants in operation in year y (plants in operation x years in monitoring period, e.g. times 1 year during annual monitoring)</td></tr>
</table></td></tr>
<tr><td>Monitoring frequency:</td><td>Continuous</td></tr>
</table>

QA/QC procedures:	To account for void responses and lack of availability of some households on the day of the survey, additional households within each age group should be questioned. To ensure conservativeness, participants in a usage survey with technologies in the first year of use (age 0-1) must have technologies that have been in use on average longer than 0.5 years. For technologies in the second year of use (age 1-2), the usage survey must be conducted with technologies that have been in use on average at least 1.5 years, and so on.
Purpose of data	Calculation of share of units in use
Additional comment:	The usage survey will be implemented by the VPA implementer or a third party. A single usage parameter is weighted to be representative of the quantity of project technologies of each age being credited in a given project scenario. The approach is copied from GS751 The National Biodigester Programme of Cambodia

Relevant SDG Indicator	**Indicator 13.2.1 "Number of countries that have communicated the establishment or operationalisation of an integrated policy/strategy/plan which increases their ability to adapt to the adverse impacts of climate change, and foster climate resilience and low greenhouse gas emissions development in a manner that does not threaten food production".** **7.1.2: Proportion of population with primary reliance on clean fuels and technology**
Data / Parameter:	$N_{p,y}$
Data unit:	Project technologies credited (units)
Description:	Technologies in the project database for project scenario p through year y
Source of data:	Determined on VPA level; Total sales record from the Project Database.
Value(s) applied	
Monitoring frequency:	Continuous
QA/QC procedures:	As per procedures of the Project Database.
Purpose of data	Calculation of project emissions
Additional comment:	N/A

Relevant SDG Indicator	**Indicator 13.2.1 "Number of countries that have communicated the establishment or operationalisation of an integrated policy/strategy/plan which increases their ability to adapt to the adverse impacts of climate change, and foster climate resilience and low greenhouse gas emissions development in a manner that does not threaten food production".**
Data / Parameter:	$LE_{p,y}$

Data unit:	tCO2e/year
Description:	Leakage in project scenario p during year y
Source of data:	Collected through the annual Biogas User Survey.
Value(s) applied	Determined at VPA level
Measurement methods and procedures:	As part of the user survey households will be asked what happed to their baseline stove, did the stove displace more efficient technologies and did this lead to more wood use.
Monitoring frequency:	Every two years
QA/QC procedures:	Transparent reporting
Purpose of data	Calculation of leakage
Additional comment:	As per registered GS751 PDD

Relevant SDG Indicator	**Indicator 2.4.1 "Proportion of agricultural area under productive and sustainable agriculture**
Data/parameter	**Percentage of biogas users who use slurry as a fertilizer**
Unit	%
Description	Percentage of biogas users who use slurry as a fertilizer
Source of data	Annual monitoring surveys
Value(s) applied	Not applicable, no effect on emission reductions
Choice of data or Measurement methods and procedures	Application of slurry as fertilizer on agricultural land will be monitored through sampling as part of the annual monitoring effort. Stakeholders will be asked how they use the slurry, if at all.
Purpose of data	SDG impact monitoring
Additional comment	Data/parameter was referred to as GS 3 Soil condition in the transition annex

Relevant SDG Indicator	**3.9.1: Mortality rate attributed to household and ambient air pollution**
Data/parameter	Air quality improvement
Unit	-
Description	Perceived improvement in health by the user (incidence of eye problems and respiratory illness)
Source of data	Annual monitoring surveys
Value(s) applied	E.g. in Tanzania: Current biogas users report an improvement in health since receiving a biogas digester. 71 % of respondents report a reduction in the occurrence of respiratory diseases[23] . Similar improvements are expected in the other VPAs.
Choice of data or Measurement methods and procedures	Users of the biogas digesters will be asked if they feel the incidence of eye problems and respiratory illness have a) increased, b) stayed the same or c) decreased as a result of getting a biogas digester.
Purpose of data	SDG impact monitoring
Additional comment	Data/parameter was referred to as GS-1 Air Quality in the transition annex

[23] *Tanzania Biogas User Survey 2014, Section 3.1.9.5 (page 46)*

Relevant SDG Indicator	**SDG 5.4.1 Proportion of time spent on unpaid domestic and care work, by sex, age and location**
Data/parameter	Time savings
Unit	Percentage
Description	Percentage of women that report time-savings attributed to the installation of a biodigester
Source of data	Annual monitoring surveys
Value(s) applied	N/A
Choice of data or Measurement methods and procedures	The female member of the household in charge of cooking and/or cooking fuel collection, will be asked: Did you save time compared to before you have installed a biodigester? (yes/no/same time investment)
Purpose of data	SDG impact monitoring
Additional comment	N/A

Relevant SDG Indicator	**SDG 5.4.1 Proportion of time spent on unpaid domestic and care work, by sex, age and location**
Data/parameter	Usage of saved time
Unit	[-]
Description	Usage of saved time
Source of data	Annual monitoring surveys
Value(s) applied	N/A
Choice of data or Measurement methods and procedures	The same female member will be asked – What did you do with your saved time? or if no time savings were reported, the reason why will be asked
Purpose of data	SDG impact monitoring
Additional comment	N/A

Relevant SDG Indicator	**7.1.2: Proportion of population with primary reliance on clean fuels and technology**
Data / Parameter	Number of masons and biogas enterprise staff attending training programmes
Unit	Number
Description	Refers to changes compared to the baseline in activities that build usable and sustainable know-how in a region/country for a technology, where know-how was previously lacking. The number of constructors trained will be monitored.
Source of data	Training records such as Participant lists of the trainings held
Value(s) applied	Value will be made available ex-post on an annual interval
Measurement methods and procedures	Records will be kept of attendance at the vocational training programmes, including general training extended to entities outside of the programme.
Monitoring frequency	Annually
QA/QC procedures	N/A
Purpose of data	SDG impact monitoring.

Additional comment	Data/parameter was referred to as GS-12 Technology transfer and technological self-reliance in the transition annex. In some VPAs the number of employees of the programme were monitored. This however does not reflect the impact that the program has on building local know-how. Measuring the number of masons and biogas enterprise staff trained is a better indicator as they are involved in the implementation of the program at local level.

Relevant SDG Indicator	**8.5 By 2030, achieve full and productive employment and decent work for all women and men,**
Data / Parameter	employment generated
Unit	days
Description	Man-days
Source of data	Project database
Value(s) applied	Not applicable, no effect on emission reduction calculations
Measurement methods and procedures	The contribution to this target will be determined by calculating the number of man-days involved in the construction of biodigesters which will be captured by the parameter Employment generated $$MD_y = \sum_{DT,S}^{1} N_{DT,S} \times MD_{DT,S} \quad (7)$$ Where MD_y = Man-days of employment generated through the construction of biodigesters (days) $N_{DT,S}$ = Number of biodigester constructed by type and size $MD_{DT,S}$ = Number of man-days required for the construction of a particular type and size of biodigester **The number of days required by digester type will be determined based on the bill of quantities (BoQ) of each digester type and size. In the case of prefabricated digesters this is will be defaulted at 0.25 days per digester irrespective of the size unless otherwise indicated by the supplier**
Monitoring frequency	Annual
QA/QC procedures	N/A
Purpose of data	Monitoring of sustainable development benefits
Additional comment	Data/parameter was referred to as GS-10 Technology transfer and technological self-reliance in the transition annex

Relevant SDG Indicator	**Indicator 13.2.1 "Number of countries that have communicated the establishment or operationalisation of an integrated policy/strategy/plan which increases their ability to adapt to the adverse impacts of climate change, and foster climate resilience and low greenhouse gas emissions development in a manner that does not threaten food production".**

Data / Parameter:	$MS_{(T,,S,K)}$
Data unit:	%
Description:	Fraction of livestock category T's manure fed into the bio-digester, S in climate region k
Source of data:	Collected through the annual Biogas User Survey.
Value(s) applied	Determined on VPA level
Measurement methods and procedures:	Households/communities/SMEs will be asked to estimate the fraction of their animal's manure that is fed into the biogas digester for the different relevant livestock categories.
Monitoring frequency:	Annual
QA/QC procedures:	To account for void responses and lack of availability of some households/communities/SMEs on the day of the survey, at least 10 additional households should be questioned.
Purpose of data	Calculation of project emissions
Additional comment:	N/A

Relevant SDG Indicator	**Indicator 13.2.1 "Number of countries that have communicated the establishment or operationalisation of an integrated policy/strategy/plan which increases their ability to adapt to the adverse impacts of climate change, and foster climate resilience and low greenhouse gas emissions development in a manner that does not threaten food production".**
Data / Parameter:	$MS_{(P,S,k)}$
Data unit:	%
Description:	Fraction of livestock category T's manure fed into the bio-digester, S in climate region k
Source of data:	Biogas User Survey
Value(s) applied	Determined on VPA level
Measurement methods and procedures:	Households/communities/SMEs will be asked to estimate the fraction of their animal's manure that is fed into the biogas digester for the different relevant livestock categories.
Monitoring frequency:	Annual
QA/QC procedures:	To account for void responses and lack of availability of some households/communities/SMEs on the day of the survey, at least 10 additional households should be questioned.
Purpose of data	Calculation of project emissions
Additional comment:	Applicable to VPAs applying Tier 2 only

Data / Parameter:	$N_{(T)}$
Data unit:	Number
Description:	Number of animals of livestock category T
Source of data:	Determined on VPA level; Baseline surveys
Value(s) applied	Determined on VPA level
Measurement methods and procedures:	Households/communities/SMEs will be asked how many animals of different categories they own, and the conditions under which they are kept (i.e. freely or in a confined space).
Monitoring frequency:	Annually
QA/QC procedures:	N/A
Purpose of data	Calculation of project emissions

Additional comment:	N/A

Relevant SDG	**Indicator 13.2.1 "Number of countries that have communicated the establishment or operationalisation of an integrated policy/strategy/plan which increases their ability to adapt to the adverse impacts of climate change, and foster climate resilience and low greenhouse gas emissions development in a manner that does not threaten food production".**
Data / Parameter:	**PL**
Data unit:	%
Description:	Physical leakage of the biodigester
Source of data:	IPCC
Value(s) applied:	10% or calculated value
Choice of data or Measurement methods and procedures:	The PP may opt to calculate the percentage of leakage as per section A6.3 of the applied methodology. On page 68 of section A.6.3 it is stated: *Where project participants use lower values or percentage of physical leakage, they should provide measurements proving that this lower value is appropriate for the project activity.* The measurement is as follows: In case households report that their digester leak, in case there is an obvious biogas smell, or when there is visible leakage, i.e. bubbling, it is assumed that the biodigester leaks. PL is therefore calculated as: $PL = 10\% * \%BD_{leak}$ where %BDleak = the share of households with a leaking biodigester and 10% is the IPCC default value for physical leakage. In case the PP does not measure the leakage, %BDleak is 100% meaning that all plants are assumed to leak as per IPCC estimate.
Purpose of data	Calculation of project emissions
Additional comment:	The method applied here copied from GS751, the National Biodigester Programme in Cambodia – in which this approach was approved.

Relevant SDG Indicator	**13.2.1 "Number of countries that have communicated the establishment or operationalisation of an integrated policy/strategy/plan which increases their ability to adapt to the adverse impacts of climate change, and foster climate resilience and low greenhouse gas emissions development in a manner that does not threaten food production**
Data / Parameter	W(site)
Unit	(kg)
Description	Average pig weight at the project site of sows and boars (kg)
Source of data	Carbon monitoring survey
Value(s) applied	N/A – data will become available during annual monitoring and the IPCC VS default values are adjusted for site specific animal weight as per equation 3 of AMS-III.D v21
Measurement methods and procedures	The weight of fattening pigs and piglets is the average between the weight entering the farm and leaving the farms.

	Pigs that stay for a long time at the farm, which are sows and boars, will be determined using credible methods from the literature as described in section B.6.2. In section B.6.2 it is described how based on the girth and the length of the pig the weight can be determined reliably[24].
Monitoring frequency	Annual
QA/QC procedures	See section B3.3 for more details
Purpose of data	Calculation of VS excretion
Additional comment	At least 25% of all sows shall be measured. Boars are relatively rare and in case less than 5 boars can be measured the average sow weight will be adopted as boar weight. This is conservative as male pigs attain higher weights than female pigs. In case W(site) is not monitored, the IPCC VS default values shall be applied, which is conservative.

Section B.3.4 Monitoring plan

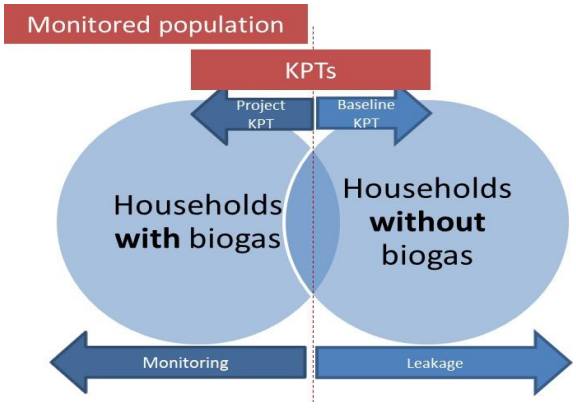
1. *Description of the monitoring plan for a generic VPA*

The monitoring plan describes how to collect, assess and archive all relevant data to be monitored according to the methodology. Data from the monitoring procedures will be recorded in the electronic project database and summarised in an annual Monitoring Report.

2. *Sampling Design*

Objectives and reliability requirements: The objective of the sampling effort is to meet the monitoring requirements set forth in the methodology '*Technologies and Practices to Displace Decentralized Thermal Energy Consumption',* as detailed in B3.3 above. Monitoring will be carried out on an annual basis, with those parameters that can be monitored on a biennial basis monitored once every two years. As the PoA progresses and the number of VPAs increases, a single monitoring plan can be applied, covering several VPAs.

Target population
The target population for the application of monitoring procedure is the households, local communities and SMEs with installed biodigesters, as identified through the Project Database managed by the CME.



[24] *As per the method described on this website http://www.thepigsite.com/articles/541/weighing-a-pig-without-a-scale/*

Figure 7: Target population of sampling efforts. (KPTs = Kitchen Performance Test

Sampling method

The VPA Implementer, with support from the CME if agreed, is responsible for the production of periodical monitoring reports for each VPA. Multi-stage sampling will be applied within the PoA, where clusters consist of regions and the subunits (biogas digesters) within them. It is more cost effective to monitor several subunits within each region. In order to account for the fact that not all regions have the same number of biogas digesters commissioned, sampling will be employed proportionate to cluster size. Clusters will be selected with a probability proportionate to the size of the target population within each cluster such that larger clusters have a greater probability of selection, and smaller clusters a lower probability. This helps to ensure that sampling remains representative of the entire population.

Sample size

In order to combine monitoring with an assessment of the drop-off rate of usage (which requires that digesters of different age groups are assessed), monitoring should be carried out on a random sample of digesters of different ages. The minimum total sample size is 100, with at least 30 samples for biogas digesters of each age bracket (measured in annual increments) being surveyed. Table 3 illustrates how the sample size can be determined. To account for void responses and lack of availability of some households on the day of the survey, additional households within each age group should be questioned.

Table 3: Example of minimum sample sizes for the usage rate survey.

Age of digesters (years)	Number digesters installed in age group	Minimum number sampled
0 - 1	200	30
1 - 2	1,500	30
2 - 3	1,000	30
3 - 4	2,000	30
	Total sampled	**120**

To ensure conservativeness, participants in a usage survey with technologies in the first year of use (age 0-1) must have technologies that have been in use on average longer than 0.5 years. For technologies in the second year of use (age 1-2), the usage survey must be conducted with technologies that have been in use on average at least 1.5 years, and so on.

Alternatively, if the VPA implementer wishes to conduct the usage survey separately from monitoring the other parameters, the following minimum sample sizes will apply to the monitoring of all other parameters (apart from the average fuel saving derived from the Kitchen Performance Test):

- Group size <300: minimum sample size 30 or population size, whichever is smaller
- Group size 300 to 1000: minimum sample size 10% of group size
- Group size > 1000: minimum sample size 100.

The sample size for the usage survey will remain as above. As per the methodology, the majority of interviews in a usage survey must be conducted in person and include observations by the interviewer within the kitchen in question. The remainder may be conducted via telephone by the same interviewers on the condition that in-kitchen observational interviews are concluded and analysed first, so that typical circumstances are well understood by telephone interviewers.

To determine the average fuel savings as per the Kitchen Performance Test, the sample size shall be determined through ensuring that the results comply with a 90/30 level of confidence/precision, as per Annex 4 of the applied methodology. A BFT will be conducted for each identified baseline scenario. VPAs that chose not to implement separate BFTs per baseline scenario will, for the sake of conservativeness, apply the baseline emission values from the most conservative baseline scenario that is applicable to the VPA. Only one PFT per target group (household/communities/SMEs) is required on the VPA level as there is only one project scenario.

Sampling frame
The sampling frame shall be defined based on the information in the Project Database, which outlines the location of each biogas digester and the number installed in each geographical region. The sample selection consists of two stages: the first step considers the larger sample units (country regions) whilst the second step involves randomly selecting biogas digesters to be monitored within these units.

3. Data to be collected

Field measurements
The VPA Implementer, with support from the CME if agreed, will collect the data necessary for the monitoring and for the emission reductions calculation. Field measurements and data to be collected are listed in section B.3.3. above.

To account for seasonal fluctuations, monitoring of fuel wood consumption (KPT) should by preference be carried out during the season in which the highest amount of fuel is used in case of the PFT or the lowest in the case of the BFT. The season which is most appropriate for the respective test will be determined at VPA level.

The parameters to be monitored within each VPA, as outlined in the applied methodology, will be collected through a Monitoring Survey. This shall be completed periodically and covers the parameters to be monitored in section B.3.3.

Quality assurance/Quality control
The CME will provide the necessary training to the VPA implementers and the parties involved in the monitoring to ensure that the data recorded is complete and accurate. Training will include going through all the data that needs to be collected and how to do this, including how to carry out the Kitchen Performance Test (KPT) and to adequately fill out the questionnaire. The VPA Implementer will prepare data collection protocols to be given to the research assistants to guide them during the data collection exercise. The qualifications and experience of personnel involved in monitoring should be as follows:

- Knowledge of local language(s)
- Prior experience in household surveys, with experience in KPTs an advantage
- At least one team member with a good understanding of statistics and statistical software
- Knowledge of technical aspects of operating a biogas digester
- Ability to identify different manure management techniques
- Prior involvement in surveys (baseline or monitoring) for other carbon projects is advantageous,

Response rates will be maximized by contacting all randomly-selected biogas digester users beforehand to arrange a practical site visit date and sampling over the minimum required number to compensate for any non-responses in case sufficient telephone numbers of users are available. In special cases where participants refuse to participate in the monitoring, the reason shall be documented. The surveyor will explain that monitoring is part of the requirements of the programme and try to arrange an alternative date for a site visit, or carryout monitoring with another member of the households, community or SME.

All data monitored and required for verification and issuance will be kept for at least five years after the end of the crediting period or the last issuance of VERs for the project activity, whichever is later.

Analysis: All the sales data and the survey data will be captured in a computerised database. The analysis will include a calculation of the proportion of biogas system in use and of the emission reductions according to the methodology applied. Outliers will be excluded using the Grubb's Test[25].

4. Implementation plan

The VPA implementer is responsible for entering user data into the Project Database, and for ensuring that the information in the Sales Agreements is complete and correct. The total number of Sales Agreements will reveal the quantity of biogas systems sold at the end of a Monitoring Period. The Project Database will record the start and end dates of each selling year *y* for each biogas system and calculate the emission reductions attributable to each Monitoring Period. Appropriate record keeping procedures will be implemented to ensure that each Monitoring Period dataset can be transparently attributed to its corresponding VPA, preventing any occurrences of double counting.

Monitoring Responsibilities

The VPA Implementer is responsible for all the monitoring activities carried out within their respective VPA, including data collection, data analysis and writing the Monitoring Report unless otherwise agreed to with the CME. It is possible for instance to outsource data collection and monitoring reporting to other qualified parties

[25] *For more information on the Grubbs' test, please refer to: https://www.itl.nist.gov/div898/handbook/eda/section3/eda35h1.htm For a cross-check of the significance of the results, please refer to an online tool available on: http://www.graphpad.com/quickcalcs/Grubbs1.cfm.*

SECTION C. Management system

The CME operational management system will ensure that the following requirements are met:

a) A clear definition of roles and responsibilities of personnel involved in the process of inclusion of VPAs, including a review of their competencies.

The CME has the competencies to review and include VPAs in the PoA. The following CME entities, and their responsibilities, are outlined below:

Table 2: Roles and responsibilities of the CME

CME Role	Responsibility
Carbon Programme Manager	The Carbon Programme Manager is responsible for - The strategic management of the CME role, preparation of annual plans and reports, and communication with Hivos Board of Directors - Overseeing compliance of the PoA with Gold Standard procedures, and ensuring that all VPAs follow the guidelines set out in the PoA-DD. - Managing the process of adding future VPAs under the programme, including negotiating any contractual agreements with the VPA Implementer and hiring a VVB to validate the inclusion, unless otherwise agreed with the VPA Implementer - Disseminating information about the PoA to VPA Implementers, including training VPA staff, supervising collection of monitoring data, the preparation of Monitoring Reports (if applicable) and any other routine CME operations.
Monitoring Specialist	The Monitoring Specialist is responsible for providing guidance to the VPA Implementers on the parameters that need to be monitored under the VPA, the frequency of monitoring and how to monitor the necessary parameters. However, each VPA Implementer is responsible for performing monitoring of the biogas digesters included under their VPA on an annual basis. The Monitoring Specialist may provide services to draft the Monitoring Report following collection of data, depending on the agreement in place with the VPA Implementer.
Carbon Marketing Manager	The Carbon Marketing Manager is responsible for marketing VERs to potential buyers, transferring any VERs to buyers and ensuring that any income from the sale of VERS is transparently tracked and transferred to the respective VPA Implementers (if agreed).

Each authorised VPA Implementer under this PoA will sign a standard contractual agreement with the CME to participate in the PoA as a VPA Implementer who is committed to the following requirements:

- Those operating the VPA are aware of and have agreed that their activity is being subscribed to this PoA.
- The VPA Implementer shall not assign a new VPA that has been already registered either as a CDM project activity or as a VPA of another PoA.

A contractual agreement is not required in the case a VPA is implemented by Hivos or legally represented by Hivos[26].

It is the responsibility of the CME to register the PoA. The CME prepares all the necessary documentation for validation to be passed to the DOE. The CME may also be responsible for organising the inclusion of VPAs and the finalisation of the respective VPA-DDs, although this will depend on the agreed arrangement with each VPA Implementer.

[26] *This is currently the case in Kenya, where Hivos is the legal representative of the Kenya Biogas Programme*

The VPA Implementers will organise the monitoring of their VPAs under the PoA through field monitoring surveys, with the CME maintaining a guidance role to ensure this is carried out in accordance with the PoA.

Finally, the CME will be the focal point with the Gold Standard Secretariat and will receive the VERs generated. Whilst the end-users transfer the rights to the VERs to the VPA Implementer, a separate agreement is in place between the VPA Implementers and the CME transferring the rights to VERs to the CME, unless Hivos is VPA Implementer of the respective VPA. The VERs will be assigned among their corresponding VPAs, and the respective VPA implementers will each decide on their sale. The VPA implementers may or may not handle the selling of their VERs themselves. In cases where the capacity of the VPA implementers to sell the VERs is limited or they have decided otherwise, the CME may offer a sales service resulting in the transfer of VERs to the respective VER buyers, and the resulting revenues to the VPA implementers.

b) Records of arrangements for training and capacity development for personnel;

It is the VPA Implementer's responsibility to ensure that their staff has received the necessary training in order to comply with the requirements of the PoA (e.g. how to complete the Sales agreement or equivalent document, who to instruct users to contact if their digester requires maintenance etc.). If agreed with the VPA Implementer, the CME may also provide training to the VPA Implementer's staff to ensure their ability to comply with all aspects of the PoA's requirements. Records of all training conducted, including a complete list of attendees, will be kept by the VPA Implementer.

c) Procedure for technical review of inclusion of VPA's

In accordance with the sequence of events described in above, the CME will conduct a technical review of each VPA prior to inclusion as part of the due diligence assessment. This will involve ensuring that each VPA meets the required eligibility criteria for compliance with the approved methodology, the baseline, additionality, double counting and de-bundling. It will also ensure that the VPA complies with all the regulatory requirements of the host country(s).

For retroactive VPAs, prior consideration of carbon revenues shall be checked at the time of inclusion by checking that carbon revenues are considered in early project documentation before the date of VPA inclusion (e.g. in a feasibility report, a programme implementation document or similar documentation).

d) Procedure to avoid double counting

Double counting will be avoided through a number of strategies:

- Checks will be performed on the electronic database via searching for repeated serial numbers, Household names and phone numbers that might indicate a double-entry. For any possible double entries identified, the hard-copy of the Sales agreement or equivalent document will be first cross-checked to ensure there was no error in data entry to the electronic database. If the issue is still not resolved, the Mason/Biogas Construction Enterprise as well as the end users will be contacted and requested to confirm the possible error (e.g. confirm the serial number of their digester). If the issue is still not resolved, a site visit to confirm details will be arranged.
- The unique serial number of each digester will avoid the same system being counted twice in different VPAs in the PoA. The database will not allow two biogas systems to have the same serial number, and each serial number will belong to only one VPA. The VPA Implementers will be aware by their contractual agreement with the CME that they must not count the same biogas system under another PoA or project activity. For the retroactive digesters, the unique user address will be used to avoid double counting.

- In the field, each digester is identified as uniquely belonging to the PoA through a plant unique serial number being painted or marked on the plant.
- The VPA Implementer must certify that the proposed VPA is not registered under another CDM or voluntary project activity. Should such a case occur the CME will not include the VPA under the PoA. If the contractual agreement between the CME and the VPA Implementer has been signed, the agreement will automatically terminate and the emission reduction crediting operations of the VPA Implementer will be suspended.
- End-users are required to confirm that they assign the rights and titles to VERs to the named VPA Implementer in the Sales agreement or equivalent document.

If the address is found to no longer comply with the database and the user is found to be different to that listed in the Sales agreement or equivalent document, the new user will be asked to sign and complete the Sales agreement or equivalent document, if willing to do so. All new details will be recorded in the database. Where the new user does not wish to sign such a contract or does not fit the criteria outlined, the system will be listed as no longer operational in the database and no emission reductions from that system will be accounted for.

e) Records and documentation control process for each VPA/CPA under the PoA;

The procedure for registering a new customer into the Programme is as follows:

1. Upon commissioning of a plant: Plant Commissioning Report (PCR) is completed through Taroworks phone Application. In addition, households fill Household Agreements or equivalent document to waive rights to VERs. The household will also be given the phone number which they can get in touch with the programme in case they need further assistance with the Biogas plant.

2. After the PCR form comes to Salesforce, the VPA Implementer sends this report (in Excel format) to Client Service Centre to independently verify whether the plant actually exists, and whether it is functional or non-functional. A client service centre report Is sent to the VPA implementer

3. The functional plants are registered into the Programme database and will be due for Aftersales service in 3 months, and thereafter 6 months after that.

4. The non-functional plants are either sent back to the Mason to attend to, or through the Programme subcontractors to trouble shoot the problems. Once issues are resolved, the plant status is updated to functional and then added to the programme database

During the sales of biogas systems, vendors shall complete Sales agreement or equivalent documents (step 1 above) with the customers containing at least the information contained in Table 1.

Table 1: Mandatory information in the Sales agreement or equivalent document

– Name of customer – (Geographical Location) and where possible with GPS Coordinates – Serial number of the digester – Name of VPA Implementer – Biogas model and size (m^3) – Confirmation that the user assigns the right and title to the VERs to the VPA Implementer (or CME in case the CME is the legal representative) – Name of Mason/BCE/Company

The name of the customer and their geographical location will be needed to track back the system during monitoring, and the serial number of the biogas systems will identify the biogas digester unit (for non-retroactive digesters). The Quality Control Forms ensure that the customer receives a digester of good quality, and records the date of completion of the digester. The Plant Commissioning Form (PCR) records the date from which biogas is produced (Commissioning date). The commissioning date is the start date based of generating VERs of the respective plant.

During the time of the VPA implementation, some aspects of this procedure may change or be amended. This will be described in the VPA-DD in case it happens.

f) Measured for continuous improvement of the PoA management system

The management of the CME is committed to identifying opportunities for improvement and supporting their implementation. Corrective measures will be taken depending on issues raised (e.g. software issues will be corrected by the software developer, operational procedures for the field staff will be modified ad hoc, etc.). In order to identify areas for improvement, besides regular feedback from staff, the following issues will be discussed during Programme Meetings which will be held on a regular basis:

- Any inefficiencies in operation and management (e.g. in recording data or transferring data to database)
- Opportunities to employ better methods
- Control of planned and unplanned changes.
- Any improvements in the management system shall be checked against the PoA-DD and VPA-DDs to ensure there is no conflict.

g) Any other elements

N/A

h) Procedures for obtaining agreements with all VPA/CPA implementers to ensure that they understand requirements of internal and external assessment

The contractual agreement between the CME and the VPA Implementer, if these are not the same, will ensure that those operating the VPA are aware of their involvement in the PoA. Each of the levels of biogas system distribution will be informed of its involvement in the PoA and its registration as a Gold Standard project.

i) Procedures for approval and removal of VPA/CPA implementers

New VPAs are included under the programme as follows:

1. Hivos initially signs a Non-Disclosure Agreement (NDA) with each applicant VPA Implementer, followed by a mutual exchange of information about the PoA and the activities of the applicant VPA Implementer. An initial review of the applicant's information is carried out to determine eligibility for inclusion under the PoA. For those proposed VPA Implementers that fall under the ABPP, a NDA will not be necessary.

2. Once the CME team has positively reviewed the initial information provided by the applicant VPA, a Memorandum of Understanding is signed between the parties whereby the CME management team undertakes a full due diligence assessment of the applicant. Shortcomings in the applicant's information and its proposed activities are communicated, and remedial actions are proposed, which the CME may mobilise support to rectify. For those proposed VPA Implementers that under the ABPP, a due diligence assessment will not be necessary.

3. Once the due diligence assessment is positive, an agreement is signed between the parties which sets out the mutual obligations of the CME and the applicant. The agreement documents the way in which the CME will work with VPAs, sets out Gold Standard and PoA requirements and agrees on rights to VERs and contracting entities for the validation/verification of the VPA.

j) The provisions to ensure that those operating the VPA are aware of and have agreed that their activity is being subscribed to the PoA.

The contractual agreement between the CME and the VPA Implementer, if these are not the same, will ensure that those operating the VPA are aware of their involvement in the PoA. Each of the levels of biogas system distribution will be informed of its involvement in the PoA and its registration as a Gold Standard project.

SECTION D. Duration of PoA

D.1. Date of first submission of PoA to Gold Standard

The start date of the PoA is retroactive, and is 06/11/2009, the earliest date at which either the implementation or construction or real action of a project began.

D.2. Duration of the PoA

28 years

SECTION E. Safeguarding principles and SDG outcome assessment

E.1. Level at which safeguarding principles and SDG outcome assessment is undertaken

The safeguarding principles and SDG outcome assessment will be executed at VPA level

E.2. Assessment of safeguarding principles, if undertaken at PoA level

N/A

E.3. SDG outcomes assessment, if undertaken at PoA level

N/A

SECTION F. Local stakeholder consultation

F.1. Level at which stakeholder consultation is undertaken

1. Local stakeholder consultation is done at PoA level ☐
2. Local stakeholder consultation is done at VPA level ✓

In CPI it has been decided to do the stakeholder consultation at the VPA level due to the different nature of the VPA Implementers in relation to the manufacturing and the supplying of biogas systems. Furthermore, due to the multiple host country locations of the PoA stakeholders may vary in their comments. One stakeholder consultation can be applied to a group of VPAs so long as it can be demonstrated that these VPAs are similar (e.g. target group).

F.2. Solicitation of comments from stakeholders, if undertaken at PoA level

The LSC is conducted at VPA level, but as per 100-GS4GG- Programme of Activity requirements v1.2 6.1.3 it is required to request feedback from stakeholders in case of a multi-country VPA. As per discussions with the GS[27], email communication suffices. The CME emailed to the original LSC participants at VPA level that the PoA is being renewed and asked their feedback on this, see the announcements below:

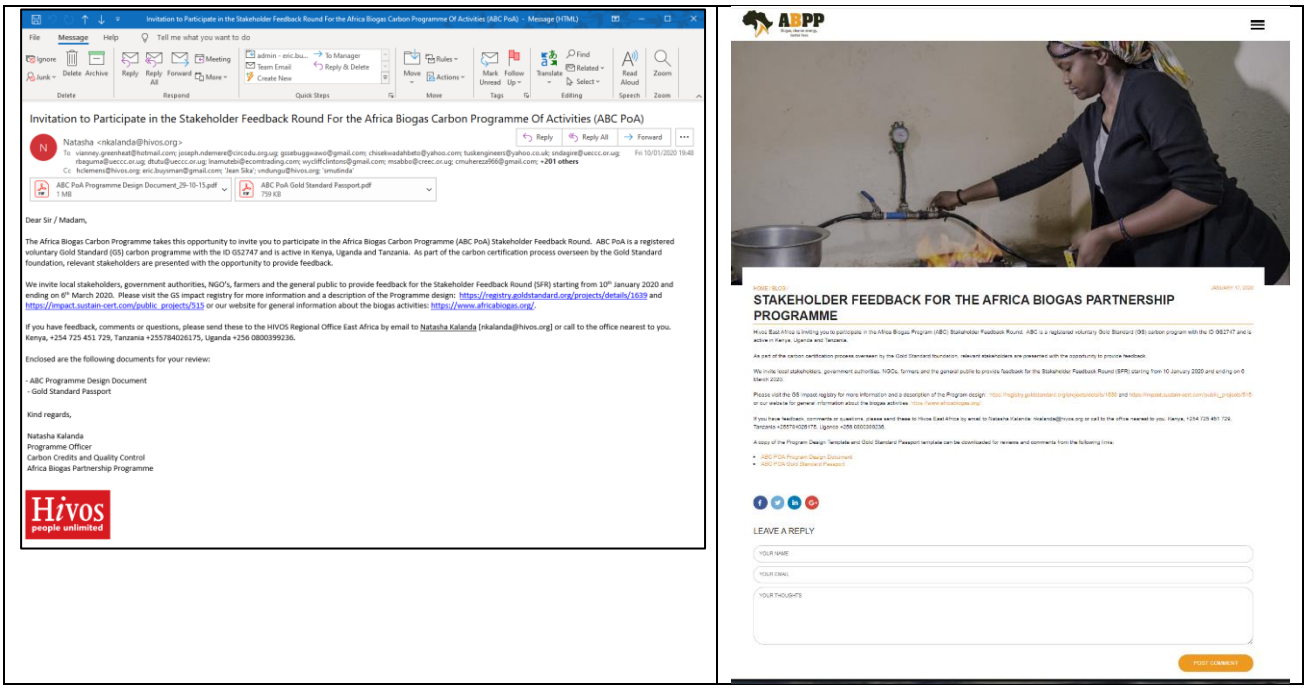


Figure 7: SFR email invitation and website announcement

[27] *2 December 2019 Skype conversation with the GS*

A count of the invitees by category is displayed in the table below:

CATEGORY	Description of GS Stakeholder category	Count
A	Local people impacted by the project or official representatives e.g. farmers, academic institutions etc	61
B	Local policy makers and representatives of local authorities	51
C	DNA	4
D	Local non-governmental organisations working on topics relevant to project	78
E	Gold Standard Representative	2
F	NGO Supporters	6
	sum	**202**

The list of stakeholders invited is available at request

F.3. Summary of comments received, if stakeholder consultation undertaken at PoA level

Two weeks and 1 week before closing of the 2 months SFR a reminder was send my email to the participants. After the closing of the SFR the list of responses was collated. In total 5 responses were received. The outcome is summarized below

Type	Number	Comment
Information request	2	Inquiry on micro-finance and inquiry on what is the feedback round
Inquiry on the type of meeting	1	Inquiry on if it was an physical meeting
Confirmation of participation / appreciation of receiving the invitation	2	Confirmation, but no feedback received.

Evidences of the email communication can be shared at request.

F.4. Report on consideration of comments received, if stakeholder consultation undertaken at PoA level

No negative impacts at PoA level design were identified by the stakeholders.

Appendix 1. Contact information of coordinating/managing entity and responsible person(s)/ entity(ies)

CME and/or responsible person/ entity	☒ CME ☐ Responsible person/ entity for application of the selected methodology(ies) and, where applicable, the selected standardized baseline(s) to the PoA
Organization	Hivos
Street/P.O. Box	Grote Marktstraat 47A
Building	Sijthoff City, 5th Floor
City	The Hague
State/Region	South Holland
Postcode	2511 BH
Country	The Netherlands
Telephone	+31 (0)70 376 55 00
Fax	+31 (0)70 362 46 00
E-mail	info@hivos.org; hclemens@hivos.org
Website	www.hivos.org
Contact person	Harry Clemens
Title	Programme Officer Carbon Finance and Green Society
Salutation	Mr.
Last name	Clemens
Middle name	Harry