CLEAN DEVELOPMENT MECHANISM

AMS-III.R.

Small-scale Methodology

Methane recovery in agricultural activities at household/small farm level

Version 04.0

Sectoral scope(s): 15

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1. Introduction

1. The following table describes the key elements of the methodology:

Table 1. Methodology key elements

Typical project(s)	Recovery and destruction of methane from manure and wastes from agricultural activities through: Installation of a methane recovery and combustion system to an existing source of methane emissions; or, change of the management practice of an organic waste or raw material in order to achieve controlled anaerobic digestion that is equipped with methane recovery and combustion system
Type of GHG emissions mitigation action	GHG destruction: Fuel switch: Destruction of methane and displacement of more-GHG-intensive energy generation

2. Scope, applicability, and entry into force

2.1. Scope

2. This project category comprises recovery and destruction of methane from manure and wastes from agricultural activities that would be decaying anaerobically emitting methane to the atmosphere in the absence of the project activity. Methane emissions are prevented by:

   (a) Installing methane recovery and combustion system to an existing source of methane emissions; or

   (b) Changing the management practice of a biogenic waste or raw material in order to achieve the controlled anaerobic digestion equipped with methane recovery and combustion system.

2.2. Applicability

3. The category is limited to measures at individual households or small farms (e.g. installation of a domestic biogas digester). Methane recovery systems that achieve an annual emission reduction of less than or equal to five tonnes of CO_2e per system are included in this category. Systems with annual emission reduction higher than five tonnes of CO_2e are eligible under “AMS-III.D.: Methane recovery in animal manure management systems”.

4. This project category is only applicable in combination with “AMS-I.C.: Thermal energy production with or without electricity” and/or “AMS-I.I.: Biogas/biomass thermal applications for households/small users” and/or “AMS-I.E.: Switch from non-renewable biomass for thermal applications by the user”.

5. The project activity shall satisfy the following conditions:

   (a) The digestate must be handled aerobically. In case of soil application of the final sludge the proper conditions and procedures that ensure that there are no methane emissions must be ensured;

   (b) Measures shall be used (e.g. combusted or burnt in a biogas burner for cooking needs) to ensure that all the methane collected by the recovery system is destroyed.

6. This methodology is applicable only to the portion of the manure, which would decay anaerobically in the absence of the project activity that is established by a survey.

7. Aggregated annual emission reductions of all systems included shall be less than or equal to 60 kt CO_2 equivalent.

Commented [1]: The word sludge can be confusing. In AMS-III.D this is referred to as digestate, I recommend to use consistent terminology

Commented [EB2]: The word sludge can be confusing. Suggestion to change this to effluent/digestate or bio-slurry. Note that 'bio-slurry' implies specific application (fertiliser), whereas 'digestate' is more general.

Commented [EB3]: None of the systems will be 100% aerobic, there is always some methane emissions, even with composting, dry lot or daily spread. Perhaps what is meant here it should not be stored in slurry systems or anaerobic lagoons?

Commented [EB4]: I amended the equation 1 to reflect this

2.3. Entry into force

8. The date of entry into force is the date of the publication of the EB 110 meeting report on the 27 May 2021.

2.4. Applicability of sectoral scopes

9. For validation and verification of CDM projects and programme of activities by a designated operational entity (DOE) using this methodology, application of sectoral scope 13 is mandatory and application of sectoral scope 1 is conditional.

3. Normative references

10. Project participants shall apply the General guidelines for SSC CDM methodologies, TOOL21: Demonstration of additionality of small-scale project activities and TOOL22: Leakage in biomass small-scale project activities available at <http://cdm.unfccc.int/Reference/Guidclarif/index.html#meth> mutatis mutandis.

11. This methodology also refers to the latest approved versions of the following approved methodologies and tools:

   (a) "AMS-I.C.: "Thermal energy production with or without electricity";

   (b) "AMS-I.E.: Switch from non-renewable biomass for thermal applications by the user";

   (c) "AMS-I.I.: Biogas/biomass thermal applications for households/small users";

   (d) "AMS-III.D.: Methane recovery in animal manure management systems";

   (e) "Standard for sampling and surveys for CDM project activities and programme of activities";

   (f) "TOOL03: Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion";

   (g) "TOOL05: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation".

4. Definitions

12. The definitions contained in the Glossary of CDM terms shall apply.

5. Baseline methodology

5.1. Project boundary

13. The project boundary is the physical, geographical site of the methane recovery and combustion systems.

5.2. Project emissions

14. Project emissions due to physical leakage of biogas digester is estimated using one of the two options indicated in "AMS-III.D.: Methane recovery in animal manure management systems".

15. Project emissions consist of CO_2 emissions from use of fossil fuels or electricity for the operation of the system and the physical leakages of methane from the recovery system. The relevant methodological tools "TOOL03: Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" and "TOOL05: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" shall be followed.

5.3. Baseline

16. The baseline scenario is the situation where, in the absence of the project activity, animal manure are left to decay anaerobically within the project boundary and methane is emitted to the atmosphere.

17. The fraction of animal manure that would decay anaerobically in the absence of the project activity is determined by survey of a sample group of households/small farms with a 90% confidence interval and 10% margin of error. The survey should determine the baseline animal manure management practices applied. If the livestock is raised in shared centralized farms,[1] the project proponent shall be able to show the baseline animal manure management practices at each farm, either individually or through sampling.

18. Baseline emissions (BE_y) are calculated ex ante, using one of the following methods:

    (a) A simplified method with the most recent IPCC Tier 1 approach (please refer to the chapter 'Emissions from Livestock and Manure Management' under the volume 'Agriculture, Forestry and other Land use' of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories) that only requires livestock population data by animal species/category and climate region or temperature; or

    (b) The most recent IPCC Tier 2 approach (please refer to the chapter 'Emissions from Livestock and Manure Management' under the volume 'Agriculture, Forestry and

Commented [EB5]: This methodology only provides an approach for animal manure, not other biomass

Commented [EB6]: The fraction is material, whilst the absolute amount is not. This is because, under AMS-III.D, a default values (as a function of livestock composition) are used for VS ('Volatile Solids', expressed in kg/head/day). Thus the amount of VS that decays anaerobically in absence of the project activity, is ascertained directly from VS and the FRACTION of manure diverted from the baseline situation.

[1] In shared centralized farms systems, multiple households raise their animals in a centralized farm, e.g. in separate barns. In the project activity, each family collects the manure of animals raised by it at the centralized farm and uses the collected manures as feedstock for the biodigester situated at the household.

other Land use' of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories) to calculate the amount of the waste or raw material that would decay anaerobically in the absence of the project activity. Country/region specific values shall be used if available. The option in "AMS-III.D.: Methane recovery in animal manure management systems", shall be used to calculate baseline emissions.

19. If option in paragraph 18 (a) is chosen, baseline emissions are determined as follows:

$$BE_y = GWP_{CH4} \times UF_b \times \sum_{LT} \left(\frac{EF_{LT} \times N_{LT,y}}{10^6} \right) X\ f$$ Equation (1)

Where:

BE_y	=	Baseline emission during the year *y* (tCO_2e)
GWP_{CH4}	=	Global Warming Potential (GWP) of CH_4 applicable to the relevant period (t CO2e/t CH_4)
EF_{LT}	=	Emission factor for the defined livestock population as referred from table 10.14 and 10.15 of chapter 'Emissions from Livestock and Manure Management' under the volume 'Agriculture, Forestry and other Land use' of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (kg CH_4/head)
$N_{LT,y}$	=	Annual average number of animals of type *LT* in year *y* (numbers)
UF_b	=	Net-to-gross adjustment factor to account for uncertainties. The value applied is 0.89 [2]
f	=	The fraction of waste or raw materials that would decay anaerobically in the absence of the project activity

Commented [EB7]: Or the fraction of manure fed into the digester

5.4. Leakage

20. The applicable requirements from "TOOL22: Leakage in biomass small-scale project activities" shall be followed to calculate leakage related to use of biomass.

5.5. Emission reductions

5.5.1. Option 1

21. The emission reduction achieved by the project activity is determined as below under this option:

$$ER_y = \left(BE_y - PE_y - LE_y\right) * n_{k,y}$$ Equation (2)

Where:

ER_y	=	Emission reductions achieved by the project activity for year *y* (tCO_2e)
PE_y	=	Project emissions for year *y* (tCO_2e)

[2] This is to account for uncertainties of the method (See "Annex III Table of conservativeness factors", FCCC/SBSTA/2003/10/Add.2, page 25).

LE_y = Leakage for year *y* (tCO_2e)

$n_{k,y}$ = Fraction of units in operation (%)

Commented [EB9R8]: This is described in paragraph 4

6. Monitoring methodology

22. Emission reductions can only be applied to systems that are demonstrated to be operational and commissioned in compliance with local norms/standards and/or manufacterer's requirements

23. Survey methods are used to determine the annual average animal population (N_{LT}), the amount of waste/animal manure generated on the farm and the amount of waste/animal manure fed into the system e.g. biogas digester. It shall be verified if the manure fed to the digester is consistent with the animal population and with the capacity of the system. If the livestock is raised in the shared centralized farms, the project proponent shall also determine the number of families/households sharing the farm and the annual average animal population (N_{LT}) belonging to each household.

Commented [EB10]: Many biodigester plants are locally constructed and there is no established set of routine maintenance procedures. What is important however, that plants are installed properly. If they are maintained poorly and this leads to disuse, then this is captured in the parameter proportion in use

Commented [EB11R10]: This also links to parameter 2

Commented [EB12]: This requirement makes sense, but it is not stated what the implications are when this is not the case

24. The proper soil application (not resulting in methane emissions) of the digestateshall be verified on a sampling basis following requirements in the "Standard for sampling and surveys for CDM project activities and programme of activities".

Commented [EB13]: Ambiguous. Does it mean soil application of storage? If storage, the procedure of AMS-III.D paragraph 6.2.1 should be adopted.

In addition, there will always be some methane emissions, the MCF of daily spread for example is 1% or so, thus 1% of the methane potential will still be converted into methane. The language use here is therefore not clear. I understand that this is a simplified approach, but it does not provide sufficient guidance.

Commented [EB14]: Consistency with AMS-III.D terms

6.1. Data and parameters monitored

Data / Parameter table 1.

Data / Parameter:	$N_{LT,y}$
Data unit:	Number
Description:	Annual average number of animals of type *LT* for the year *y*
Source of data:	-
Measurement procedures (if any):	The PDD should describe the system on monitoring the number of livestock population. The consistency between the value and indirect information (records of sales, records of food purchases) should be assessed. Photographic evidence with timestamps and GIS coordinates and verified by an independent call centre could also be used to determine average number of animals
Monitoring frequency:	Annually
QA/QC procedures:	For all cases where sampling is applied, the "Standard: Sampling and surveys for CDM project activities and programme of activities" shall be used for determining the sample size to achieve 90/10 (for annual monitoring) or 95/10 (for biennial monitoring) confidence/precision levels.
Any comment:	-

Commented [EB15]: Food purchases? Very few farms at this scale buy feed or keep records of animal sales. Most animals are bred on farm.

Data / Parameter table 2.

Data / Parameter:	$N_{k,0}$
Data unit:	Number
Description:	Number of biodigesters *k* commissioned

Source of data:	Installation records
Measurement procedures (if any):	At the time of installation all project activity systems shall be inspected and undergo acceptance testing (commissioning) for proper operation in compliance with specifications. An accurate and complete sales record shall be mainainted to allow for a unambiguous identification of a boiodigester in the field by: 1. Date of sale 2. Geographic area of sale 3. Model/type of project technology sold 4. GPS coordinate (if available) 5. Name, address and telephone number (if available)
Monitoring frequency:	Once, at the time of installation
QA/QC procedures:	-
Any comment:	-

Data / Parameter table 3.

Data / Parameter:	$n_{k,y}$
Data unit:	Fraction
Description:	Proportion of $N_{k,0}$ that remain operating at year *y* (fraction)
Source of data:	-
Measurement procedures (if any):	Monitoring of operationality of the biogas systems shall be conducted using one of the following methods: (a) Census of users or survey of the users at randomly selected sample sites; (b) Based on on-going rental/lease payments or a recurring maintenance fee by users; (c) Measurement campaigns using biogas flow meters. For all cases where sampling is applied, the "Standard: Sampling and surveys for CDM project activities and programme of activities" shall be used for determining the sample size to achieve 90/10 (for annual monitoring) or 95/10 (for biennial monitoring) confidence/precision levels. For the case of measurement campaigns using biogas flow meters which record usage on a daily or more frequent interval, it may be undertaken at randomly selected sample sites. For each measurement campaign at each site, continuous measurement shall be carried out for at least 30 days. The operational rate of each system is determined by dividing the number of days in operation by the length of the campaign. An operational day is a day in which biogas is consumed
Monitoring frequency:	At least once every two years (biennial) during the crediting period
QA/QC procedures:	Net-to-gross adjustment factor of 0.89 is applicable in cases where the operationality is determined based on user reported questionnaire survey i.e. using option (a) above to account for uncertainties
Any comment:	-

Commented [EB17]: Just installing biogas flow meters will not yield day to day usage data. Biogas usage time series are to be captured.

Commented [EB19]: This factor is already applied in equation 1. If this factor is also applied to data collected for n, then the factor is applied twice in equation1. I propose to remove it.

6.2.

6.2. Project activity under a Programme of Activities

25. The methodology is applicable to a programme of activities, no additional leakage estimations are necessary other than that indicated under leakage section above.

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Document information

Version	*Date*	*Description*
04.0	27 May 2021	EB 110, Annex 7 Revision to allow the use of biogas flow meters to demonstrate operationality of the biogas system remotely.
03.0	13 September 2012	EB 69, Annex 23 To introduce the IPCC Tier 1 approach as an alternative method for calculation of baseline emissions.
02	18 February 2011	EB 59, Annex 4 • To allow the combination of this category with AMS-I.I. and/or AMS-I.E.; • To revise the guidance on calculation of project emissions from physical leakage and baseline emissions; • To revise sampling requirements; • To remove the conditions for PoA.
01	19 October 2007	EB 35, Annex 27 Initial adoption.

Decision Class: Regulatory
Document Type: Standard
Business Function: Methodology
Keywords: agriculture, animal manure management systems, biogas recovery, methane, simplified methodologies, type (iii) projects