Draft VCS Methodology

M0370

METHANE AVOIDANCE THROUGH SEPARATION OF SOLIDS FROM WASTEWATER OR MANURE TREATMENT SYSTEMS (REVISION TO AMS-III.Y)

Draft Version 1.0

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Sectoral Scope 13: Waste Handling and Disposal

Version 1.0 of this methodology revision was developed by Verra, based on *AMS-III.Y Methane Avoidance through Separation of Solids from Wastewater or Manure Treatment Systems, v4.0*. This methodology revision must be used with of *AMS-III.Y v4.0.*.

CONTENTS

1 SUMMARY DESCRIPTION

Additionality, Crediting Method, and Mitigation Outcome	
Additionality	Project method
Crediting Baseline	Project method
Mitigation Outcome	Reductions

This methodology revision is used in conjunction with CDM methodology *AMS-III.Y Methane Avoidance through Separation of Solids from Wastewater or Manure Treatment Systems, v4.0* (hereinafter referred to as AMS-III.Y). It applies to project activities that avoid or reduce methane emissions from anaerobic wastewater treatments and/or anaerobic manure management systems through the removal of volatile solids. The separated solids must be further treated, used, or disposed of in a manner that reduces methane emissions.

This revision incorporates the use of separated solids as bedding material, and provides criteria for projects using biofiltrations systems, such as vermicomposting. It also replaces the simplified procedures to demonstrate additionality with the VCS tool *VT0008 Additionality Assessment*.

The methodology revision is globally applicable. It is limited to projects that result in greenhouse gas (GHG) emission reductions of less than 60 000 t CO_2e annually.

Where the methodology revision refers to the *IPCC Guidelines for National Greenhouse Gas Inventories*, the most recent version must be applied.

2 SOURCES

This methodology revision applies to CDM methodology *AMS-III.Y Methane Avoidance through Separation of Solids from Wastewater or Manure Treatment Systems, v4.0*. *VMR00xx* must be used with *AMS-III.Y*. The procedures and requirements of *AMS-III.Y* must be applied unless indicated otherwise.

The methodology uses the following tools and methodologies:[1]

[1] Please note that corrections and clarifications published on the Verra website may be applicable.

- *VT0008 Additionality Assessment, v.1.0*
- *VT0010 Emissions from Electricity Consumption and Generation, v1.1*
- CDM *TOOL03 Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion*
- CDM *TOOL13 Project and leakage emissions from composting*
- CDM *TOOL14 Project and leakage emissions from anaerobic digesters*
- CDM methodology *AMS-III.D. Methane recovery in animal manure management systems*, version 22

3 DEFINITIONS

In addition to the definitions set out in the *VCS Program Definitions* and *AMS-III.Y*, the following definitions apply to this methodology. Where definitions conflict, the *VCS Program Definitions* supersedes.

Biofiltration system
A type of solids separation system that uses earthworms, insects, microorganisms, or other organisms to filter and partially degrade organic matter. These systems typically consist of layered filtration media (e.g., wood chips, sand, rocks, straw, soil) that provide a habitat for living organisms and facilitate both physical filtration and biological processing.

4 APPLICABILITY CONDITIONS

All conditions listed in paragraphs 2 to 14 of *AMS-III.Y* apply, except for paragraphs 4, 7 and 12, which must be replaced as follows:

Paragraph 4(c) in *AMS.III.Y* must be replaced with the following:

4. ...

...

(b) Mechanical solid/liquid separation technologies (e.g., stationary, vibrating or rotating screens, centrifuges, hydrocyclones, press systems/screws, biofiltration systems), operated in-line with the inflowing freshly generated wastewater or slurry manure stream so as to avoid stagnation;

7. In case of animal manure management systems, the following conditions apply:

(a) Animals must be managed in confined conditions.

(b) Where organic bedding material is used in animal barns and the separated solids are intended to be reused in the barns, all of the following conditions apply:

i) The separated solids must be further treated before their use in the barns to reduce microbial load and limit the presence of pathogens. Treatment may be through composting, drying, and/or anaerobic digestion. For composting and anaerobic digestion, a high temperature must be maintained long enough to achieve sterility. The treated solids must reach a minimum dry matter content of 35%.

ii) The recycled solids must be used on the same farm and for the same animal herd in which they were produced.

iii) All animal-derived products obtained from animals housed on recycled manure solids bedding must be treated to ensure the products are safe for human consumption before use (e.g., pasteurization of milk).

iv) A documented management plan for separated solids must be in place to ensure use of separated solids does not pose risks to the environment, animal health, or workers. The plan must indicate cleaning frequency, re-bedding frequency, monitoring of animal health, monitoring of products (e.g., milk) and other animal well-being indicators (e.g., skin problems, laying behavior). The plan and documented records must be provided during validation and verification. Mandatory requirements to be included in the Management Plan are listed in Appendix 1.

(c) Where the baseline manure slurry was treated in an anaerobic lagoon or another liquid treatment system, the outflow liquid from the lagoon was recycled as flush water or used to irrigate fields; however it was not discharged into river/lake/sea. If effluent is discharged into river/lake/sea, the system is considered as a wastewater treatment system and not a manure management system.

(d) A minimum interval of six months was observed between each removal of the solids accumulated in the lagoon.

12. This methodology applies where the baseline treatment systems have been operational for at least three years before the start of the project activity. New facilities (greenfield projects) and project activities involving a change of equipment resulting in an efficiency improvement or capacity addition of the wastewater or manure treatment system are only eligible to apply this methodology if they can demonstrate that the most plausible baseline scenario for the project is the baseline provided in paragraph 21 of *AMS.III.Y*. This demonstration must include an assessment of alternatives to the project activity that deliver a comparable level of service and comply with national and local regulations. In addition, the remaining lifetime of the existing equipment and the date

on which it would have been replaced must be considered when establishing the baseline.

5 PROJECT BOUNDARY

The project boundary must be determined following the procedure provided in the most recent version of AMS-III.Y.

6 BASELINE SCENARIO

The baseline scenario must be determined following the procedure provided in the most recent version of *AMS-III.Y*.

7 ADDITIONALITY

Paragraph 17 of *AMS-III.Y* does not apply. Instead, project proponents must demonstrate additionality by demonstrating regulatory surplus and conducting an investment analysis and a common practice analysis using *VT0008 Additionality Assessment.*

7.1 Regulatory Surplus

Project proponents must demonstrate regulatory surplus in accordance with the rules and requirements regarding regulatory surplus set out in the most recent versions of the *VCS Standard*.

Where the project proponent demonstrates regulatory surplus, proceed to Section 7.2. Otherwise, the project activity is not additional.

7.2 Investment Analysis

Project proponents must follow the procedures and requirements of *VT0008* to conduct an investment analysis.

Where the project proponent demonstrates that all conditions of the investment analysis of VT0008 are met, proceed to Section . Otherwise, the project activity is not additional.

7.3 Common Practice Analysis

Project proponents must assess whether the project activity is common practice, following the procedures and requirements of Step 4 of *VT0008*.

Where the project activity meets the conditions in Sections 7.1-7.2 and is not a common practice, it is deemed additional. Otherwise, the project activity is not additional.

8 QUANTIFICATION OF REDUCTIONS AND REMOVALS

8.1 Baseline Emissions

Baseline emissions must be determined following the procedures provided in *AMS-III.Y*, replacing paragraphs 23 and 24 as follows:

23. In case of manure stream, where the barns do not use any organic bedding materials, baseline emissions must be calculated based on the total mass of volatile solids separated, as shown in Equation (1) in *AMS-III.Y*.

    However, where projects use biofiltration systems as standalone systems or as a subsequent stage to filtration systems, that component of baseline emissions must be determined based on the liquid fractions, as it is not possible to monitor parameters $M_{ss,y}$ and $VS_{ss,y}$. This is shown in equation (1b) below.

$$BE_y = \left(B_{o,w,y} \times (VS_{y,in} - VS_{y,out}) \times Q_{y,m} \times UF_b \times GWP_{CH4} \times D_{CH4}/1000\right) \times \sum_i \left(MS_{Bl,i} \times MCF_{b,i}\right) \quad (1b)$$

Where:

BE_y	=	Baseline emissions in year y (tCO_{2e})
$B_{o,w,y}$	=	Weighted methane-producing potential of the volatile solids separated by the project in year y (m^3 CH_4 per kg of VS)
$VS_{y,in}$	=	Volatile solids content in the liquid fraction entering the biofiltration system (kg/m^3)
$VS_{y,out}$	=	Volatile solids content in the liquid fraction leaving the biofiltration system (kg/m^3)
$Q_{y,m}$	=	Total volume of liquid processed in the biofiltration system in year *y* (m^3)

UF_b = Model correction factor to account for model uncertainties (0.94)

GWP_{CH4} = Global Warming Potential of methane (CO_{2e}/tCH_4)

D_{CH4} = Conversion factor of m^3 CH_4 to kilograms (0.67 kg per m^3 at 20 °C and 1 atm pressure)

$MS_{Bl,i}$ = Fraction of the manure handled in the baseline anaerobic manure management system I (fraction, mass basis), based on historical information from previous year(s) before project implementation. If historical information is not available, the capacity (tonne/day) of each baseline management system shall be verified before the project start. During the project, it would be assumed that the management system with lower MCFs would be used up to their full capacity, and only thereafter the system with larger MCF would be used. The value of $MS_{Bl,I}$ is 1.0 if only one type of treatment system was used in the baseline.

$MCF_{b,i}$ = Methane conversion factor for the baseline anaerobic manure management system I as per 2019 IPCC Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, Chapter 10.

24. Where organic bedding material is used in the animal barns or added to the manure stream, baseline emissions must be calculated using Equation (2).

$$BE_y = \left(\sum_{LT}\left(B_{0,LT} \times N_{LT,y} \times VS_{LT,y} \times P_{LT,y}\right) \times (1 - EFF_{baseline}) \times EFF_{SS,pv,y} \times UF_b \times GWP_{CH4} \times D_{CH4}/1000\right) \times \sum_i \left(MS_{Bl,i} \times MCF_{b,i}\right) \quad (2)$$

Where:

BE_y = Baseline emissions in year y (tCO_{2e})

LT = Index for livestock type

$B_{0,LT}$ = Maximum methane-producing potential of manure generated by animal type *LT*, as per the *IPCC 2019 Refinement to the 2006 Guidelines for National Greenhouse Gas Inventories*, Volume 4, Chapter 10 (m^3 CH_4/kg volatile solids)

$N_{LT,y}$ = Number of animals of livestock type *LT* in year *y* (number)

$VS_{LT,y}$ = Volatile solids excreted by one animal of livestock type *LT* managed by the management system in year *y* (kg/year)

$P_{LT,y}$ = Average percentage of manure from animal type *LT* that is delivered to the separation system in year *y* (%)

$EFF_{baseline}$ = Separation efficiency of baseline filtration system; equal to zero where no baseline filtration system is used

$EFF_{SS,pv,y}$ = Separation efficiency of the project solid/liquid separation system in removing solids from influent manure on a dry matter basis (kg separated solids/kg influent solids)

UF_b = Model correction factor to account for model uncertainties (0.94)

GWP_{CH4} = Global Warming Potential of methane (CO_{2e}/tCH_4)

D_{CH4} = Conversion factor of m^3 CH_4 to kilograms (0.67 kg per m^3 at 20°C and 1 atm pressure)

$MS_{Bl,i}$ = Fraction of the manure handled in the baseline anaerobic manure management system I (fraction, mass basis), based on historical information from previous year(s) before project implementation. If historical information is not available, the capacity (tonne/day) of each baseline management system shall be verified before the project start. During the project, it would be assumed that the management system with lower MCFs would be used up to their full capacity, and only thereafter the system with larger MCF would be used. The value of $MS_{Bl,I}$ is 1.o if only one type of treatment system was used in the baseline.

$MCF_{b,i}$ = Methane conversion factor for the baseline anaerobic manure management system I as per 2019 IPCC Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, Chapter 10.

Where there is more than one separation system in sequence, the efficiency of *n* sequential separation devices must be determined as follows:

$1 - (1 - E_1) \times (1 - E_2) \ldots \times (1 - E_n)$, where E_1 to E_n is the efficiency of the separation devices in sequence.

When applying Equation (3), project proponents may use either total solids or volatile solids to determine the separation efficiency.

8.2 Project Emissions

Project emissions must be determined following the procedures provided in *AMS-III.Y*, replacing paragraphs 29(a) and (b) as follows:

29. Project activity emissions consist of:

    (a) *PEy,ss*: Methane emissions from storage, use, disposal or destruction of solids separated. Calculations of methane emissions from the different activities must be determined as follows:

        i) Project emissions from solid storage: Calculation must follow the requirements in paragraph 30 of this methodology revision.

ii) Project emissions from use: Calculation of methane emissions from the use of separated solids as bedding material must follow the requirements in paragraph 30 of this methodology revision.

iii) Project emissions from final disposal: Disposal may include composting or further treatment in anaerobic digesters and provisions included in paragraph 34 of this methodology revision must be followed.

iv) Project emissions from the destruction of separated solids: Projects destroying solids by combustion must follow paragraph 36 of this methodology revision.

(b) $P_{y,power}$: Emissions from electricity consumption by the solid separation technology must be determined according to the requirements of VCS tool *VT0010 Emissions from Electricity Consumption and Generation*. Emissions from fossil fuel use must be determined using CDM *TOOL03 Tool to Calculate Project or Leakage CO_2 Emissions from Fossil Fuel Combustion*.

Projects using organic components in the filtering systems (e.g., worms or wood chips in biofiltration systems) must ensure that project emissions are determined considering the total volatile solids or chemical oxygen demand values including organic components added as part of the project.

Paragraph 30 in *AMS.III.Y* must be replaced as follows:

30. In case of manure management systems, project emissions from storage and use are calculated as shown in Equation (8), adjusting parameters $VS_{TSS,y}$ and $M_{Tss,y}$ to reflect the conditions of the separated solids prior to storage or use.[2]

$$PE_{y,ss} = \frac{MCF_s \times UF_p \times B_{o,w,y} \times VS_{Tss,y} \times M_{Tss,y} \times GWP_{CH4} \times D_{CH4}}{1000} \quad (8)$$

Where:

$PE_{y,ss}$	=	Project emissions from solid storage in year *y* (t CO_2e)
MCF_S	=	Methane conversion factor for solid storage as per the *2019 IPCC Refinement to the 2006 Guidelines for National Greenhouse Gas Inventories*, Volume 4, Chapter 10, Table 10.17
UF_P	=	Model correction factor to account for uncertainties (1.06)
$B_{o,w,y}$	=	Weighted methane-producing potential of the volatile solids separated by the project in year y (m^3 CH_4 per kg of VS)
$VS_{Tss,y}$	=	Volatile solids content of the stored/treated/used separated solids, on a dry matter basis (kg/kg separated solids)

[2] $VS_{TSS,y}$ and $M_{Tss,y}$ for storage may be different than $VS_{TSS,y}$ and $M_{Tss,y}$ for use.

$M_{Tss,y}$	=	Mass of the stored/treated/used separated solids, on a dry matter basis (kg)
GWP_{CH4}	=	Global Warming Potential of methane (CO_{2e}/tCH_4)
D_{CH4}	=	Conversion factor of m^3 CH_4 to kilograms (0.67 kg per m^3 at 20°C and 1 atm pressure)

Project emissions from storage of animal manure must be accounted for where separated solids are stored for more than 24 hours and the project proponent cannot provide evidence that total solids (TS%) is less than 20%.

Project emissions from the use of separated solids as bedding material must be considered when used in a "deep bedding" system, with bedding layers exceeding 10 cm. To account for these emissions, Equation (8) must be applied using the MCF_s values for deep bedding provided in the *2019 IPCC Refinement to the 2006 Guidelines for National Greenhouse Gas Inventories*, Volume 4, Chapter 10, Table 10.17.

Paragraph 34 in *AMS.III.Y* must be replaced as follows:

34. In case the solids separated from manure or from wastewater are composted, the methane emissions from composting of solids separated by the project activity must be determined using CDM *TOOL13 Project and Leakage Emissions from Composting*. Projects disposing of the separated solids in anaerobic digesters must use CDM *TOOL14 Project and Leakage Emissions from Anaerobic Digesters*.

Paragraph 35 in *AMS-III.Y* must be replaced as follows:

35. Project activity emissions from electricity are determined as per the procedures described in *VT0010*. Project emissions from fossil fuel consumption are determined based on the procedures in CDM *TOOL03 Tool to Calculate Project or Leakage CO_2 Emissions from Fossil Fuel Combustion*. The energy consumption of all equipment/devices installed by the project activity, including all equipment to separate solids (e.g., energy used for spray drying and evaporation) must be included. For project activity emissions from fossil fuel consumption, the emission factor for the fossil fuel must be used (t CO_2/t). Local values should be used where available. Otherwise, IPCC default values may be used. Where recovered methane is used to power auxiliary equipment of the project, it must be taken into account accordingly, using zero as its emission factor.

8.3 Leakage Emissions

Leakage emissions must be determined according to the procedures provided in *AMS-III.Y*.

8.4 Net Reductions and Removals

Net reductions must be determined according to the procedures provided in *AMS-III.Y*.

9 MONITORING

9.1 Data and Parameters Available at Validation

Project proponents must follow the procedure provided in *AMS-III.Y.*

9.2 Data and Parameters Monitored

Paragraphs 42–43 in *AMS.III.Y* must be replaced as follows:

42. The following parameters must be monitored and recorded during the crediting period using peer-reviewed methods. Peer-reviewed methods and frequency of monitoring for each parameter must be described in the project description and must ensure achievement of 10% error at 90% confidence intervals.

    (a) Mass of separated solids ($M_{ss,y}$): measured by direct weighing of all separated solids and measuring dry matter content through representative sampling. Where the dry matter content of a sample is lower than the minimum value of 20%, no emission avoidance will be assigned to the amount of separated solids from which the sample is representative.

    (b) Amount of fossil fuel and/or electricity used to power separation equipment

    (c) In case of use of flocculants, amount of manufactured ingredients of flocculants used and the total amount of the flocculants used

    (d) Parameters related to transport: amount of solids transported, average transport capacity of trucks, and average incremental distance ($Q_{y,transp}$, CT_y, DT_y)

    (e) Leakage where applicable

43. For manure management systems, the following parameters must be monitored as well:

    (a) Number of animals of type *LT* expressed in numbers ($N_{LT,y}$) and their individual annual volatile solids excretion ($VS_{LT,y}$), which must be determined according to the relevant procedure in *AMS-III.D* and the corresponding VCS Program *Clarifications to AMS-III.D: Methane Recovery in Animal Manure Management*. Alternatively, average monthly count of animal herd values may be applied, where this is monitored and recorded daily.

    (b) Volatile solids content of the separated solids ($VS_{SS,y}$)

    (c) Maximum methane-producing potential of volatile solids generated by animal type *LT* ($B_{0,LT}$), which may be sourced from country-specific published sources or IPCC default values (provided in the *2019 Refinement to the 2006 IPCC*

Guidelines for National Greenhouse Gas Inventories, Volume 4, Chapter 10). Where country-specific values are used, they must be compared to IPCC default values, and any significant differences must be explained.

Paragraph 45 in AMS.III.Y must be replaced as follows:

45. Where separated solids are composted, relevant parameters for calculating project emissions from composting of separated solids must be monitored according to the relevant procedure in CDM *TOOL13 Project and Leakage Emissions from Composting*. Where separated solids are treated in an anaerobic digester, CDM *TOOL14 Project and Leakage Emissions from Anaerobic Digesters* must be applied.

Project proponents must follow the procedure provided in *AMS-III.Y*, in addition to the following tables.

Data/Parameter	$Q_{y,m}$
Data unit	m^3
Description	Total volume of liquid processed in the biofiltration system in year *y*
Equations	(1b)
Source of data	Monitored using a continuous cumulative flow meter in the biofiltration system
Description of measurement methods and procedures to be applied	N/A
Frequency of monitoring/recording	Continuous
QA/QC procedures to be applied	Flow meter must comply with industry standards.
Purpose of data	Calculation of total volatile solids separated by the biofiltration system when using Equation (1b)
Calculation method	N/A
Comments	None

Data/Parameter	$VS_{y,in}$
Data unit	kg/m^3
Description	Volatile solids content in the liquid fraction entering the biofiltration system

Equations	(1b)
Source of data	Testing by an accredited laboratory
Description of measurement methods and procedures to be applied	Measurement must be performed according to national or international standards as the difference between total solids (determined by drying a sample in an oven at 103 °C for 24 hours or until constant weight) and fixed solids (the solids left after the sample is dried at 600 °C for at least one hour).
Frequency of monitoring/recording	Must be monitored at commissioning of each separated solids treatment technology, and annually thereafter.
QA/QC procedures to be applied	Sampling and testing must be performed by an accredited laboratory.
Purpose of data	Calculation of volatile solids in the separated solids
Calculation method	N/A
Comments	None

Data/Parameter	$VS_{y,out}$
Data unit	kg/m³
Description	Volatile solids content in the liquid fraction leaving the biofiltration system
Equations	(1b)
Source of data	Testing by an accredited laboratory
Description of measurement methods and procedures to be applied	Measurement must be performed according to national or international standards as the difference between total solids (determined by drying a sample in an oven at 103 °C for 24 hours or until constant weight) and fixed solids (the solids left after the sample is dried at 600 °C for at least one hour).
Frequency of monitoring/recording	Must be monitored at commissioning of each separated solids treatment technology, and annually thereafter.
QA/QC procedures to be applied	Sampling and testing must be performed by an accredited laboratory.
Purpose of data	Calculation of volatile solids in the separated solids
Calculation method	N/A
Comments	None

Data/Parameter	$VS_{LT,y}$
Data unit	kg dry matter/animal/year
Description	Volatile solids for livestock type *LT* treated in the project system in year *y*
Equations	(2) and its adjustment for biofiltration systems
Source of data	The preferred method to determine VS_{LT} is to use data from nationally published sources. These values must be adjusted for animal weight and age category, and final values must be compared with IPCC default values and any significant differences must be explained. Where nationally published data are not available, VS_{LT} may be estimated from feed intake levels based on the Tier 2 method described in Equation 10.24 in Section 10.4 of Chapter 10, Volume 4 of the *2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Where information required to apply this option is not available, the default values provided in Table 10.13a in Chapter 10, Volume 4 of the *2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories* may be used, provided the project proponent adjusts the values based on site-specific average animal weight and assesses the suitability of the values with regards to the productivity system and geographic region. To determine average animal weight, the sampling procedure must ensure differentiation according to age, livestock type, and farm.
Description of measurement methods and procedures to be applied	N/A
Frequency of monitoring/recording	Annually
QA/QC procedures to be applied	Where values need to be adjusted for a site-specific average animal weight, the average animal weight of a defined livestock population at the project site (W_{site}) must be monitored as detailed in the table below.
Purpose of data	Determination of baseline emissions
Calculation method	Default values in the *2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories* are provided in kg volatile solids per 1000 kg of animal mass per day. Thus, values must be adjusted for animal weight and for the days for which the project system was operational.
Comments	None

Data/Parameter	$VS_{TSS,y}$
Data unit	kg/kg separated solids

Description	Volatile solids content of the stored/treated/used separated solids, including manure, any bedding material, and biofilter media, on a dry matter basis
Equations	(8)
Source of data	Testing by an accredited laboratory
Description of measurement methods and procedures to be applied	Measurement must be performed according to national or international standards as the difference between total solids (determined by drying a sample in an oven at 103 °C for 24 hours or until constant weight) and fixed solids (the solids left after the sample is dried at 600 °C for at least one hour).
Frequency of monitoring/recording	Must be monitored at commissioning of each separated solids treatment technology, and annually thereafter.
QA/QC procedures to be applied	Sampling and testing must be performed by an accredited laboratory.
Purpose of data	Calculation of volatile solids in the separated solids. This is used to determine project emissions from storage of the separated solids or use of the separated solids as bedding material.
Calculation method	N/A
Comments	$VS_{TSS,y}$ for storage may be different than $VS_{TSS,y}$ for use.

Data/Parameter	$M_{TSS,y}$
Data unit	kg
Description	Mass of the stored/treated/used separated solids, including manure, any bedding material, and biofilter media, on a dry matter basis
Equations	(8)
Source of data	Testing by an accredited laboratory
Description of measurement methods and procedures to be applied	Measurement must be performed according to national or international standards as the difference between total solids (determined by drying a sample in an oven at 103 °C for 24 hours or until constant weight) and fixed solids (the solids left after the sample is dried at 600 °C for at least one hour).
Frequency of monitoring/recording	Annually
QA/QC procedures to be applied	Sampling and testing must be performed by an accredited laboratory.

Purpose of data	Calculation of volatile solids in the separated solids. This is used to determine project emissions from storage of the separated solids or use of the separated solids as bedding material.
Calculation method	N/A
Comments	$M_{Tss,y}$ for storage may be different than $M_{Tss,y}$ for use.

Data/Parameter	W_{site}
Data unit	kg
Description	Average animal weight of a defined livestock population at the project site
Equations	N/A
Source of data	Provided by farm owners
Description of measurement methods and procedures to be applied	Project proponents must describe the measurement plan for W_{site} for each livestock type, by different age categories, and for each of the farms included in the project boundary. Where sampling procedures are applied, the CDM *Standard for Sampling and Surveys for CDM Project Activities and Programmes of Activities* may be applied. Project proponents must describe the system of random sampling applied, considering stratification of each livestock category, and follow the QA/QC procedures described below.
Frequency of monitoring/recording	Quarterly samples and averaged annually
QA/QC procedures to be applied	Where using sampling procedures, the following requirements must be met: 1) To ensure representativeness, each defined livestock population must be classified into categories representative of age and growth of the animal. 2) Where quarterly samples are not available, the project proponent must justify an adequate sampling frequency representative of each age class and for each defined livestock population. 3) Project proponents must ensure that the weigh scale is correctly calibrated following manufacturer specifications.
Purpose of data	Calculation of baseline emissions
Calculation method	N/A
Comments	Used by project proponents to adjust VS_{LT} default values to site-specific animal weight at the project site

Data/Parameter	$TS_{ss}\%$

Data unit	%
Description	Percentage of total solids in the separated solids after treatment
Equations	N/A
Source of data	Measurements at the project facility after solids are separated and treated
Description of measurement methods and procedures to be applied	Residue remaining after the sample is dried in an oven at 103 °C for 24 hours or until constant weight
Frequency of monitoring/recording	Must be monitored at commissioning of each separated solids treatment technology, and annually thereafter.
QA/QC procedures to be applied	Measuring instruments must be calibrated as per manufacturer specifications. Samples taken for measurement must be a representative sample of the separated solids.
Purpose of data	Checking conformance to requirement that separated solids have a maximum dry matter content of 35%
Calculation method	$\%TS_{ss}$ = dry weight / wet weight
Comments	This parameter is only required for projects using the separated solids in animal barns as bedding material.

9.3 Description of the Monitoring Plan

Project proponents must follow the procedure provided in *AMS-III.Y*

10 REFERENCES

N/A

APPENDIX 1: GUIDANCE ON SAFE USE OF SEPARATED MANURE SOLIDS AS BEDDING MATERIAL

This guidance outlines best practices and management requirements to ensure safe use of separated manure solids as bedding material for livestock. It addresses environmental, animal health, and human safety considerations. Project proponents must comply with all requirements in this section if the project activity includes separation of manure solids used as bedding material for livestock.

A1.1 Animal Health and Safety

- Establish a frequency for re-bedding and stall cleaning that will ensure animal health and well-being. Keep track of re-bedding and cleaning dates.

- Maintain dry bedding conditions to reduce the risk of infections such as mastitis.

- Ensure bedding has a minimum dry matter content of 35%, meaning moisture content should not exceed 65%.

- Regularly monitor animal health indicators and adjust bedding practices accordingly. Maintain records of observations on animal well-being issues and behavioral properties.

- Avoid using bedding material with many fine particles, as it compacts easily and retains more moisture.

A1.2 Human Health and Safety

- Train workers in safe handling procedures and provide appropriate personal protective equipment (PPE), such as masks and gloves.

- Ensure proper ventilation in storage and bedding application areas.

- Sanitize equipment used for handling bedding material to prevent cross-contamination.

A1.3 Environmental Safety

- Compost or dry separated solids to reduce pathogen load before use.
- Store bedding material in covered, dry areas to prevent runoff and leaching.
- Monitor soil nutrient levels to avoid over-application and environmental degradation.

A1.4 Management Requirements

- Use high-performance separation equipment to achieve desired dry matter content.
- Use dedicated equipment for handling bedding and manure.
- Periodically review and update handling and storage procedures to maintain bedding quality.

A1.5 Monitoring and Documentation

- Maintain records of bedding sources, processing methods, and usage frequency.
- Track animal health metrics (e.g., somatic cell count, infection rates).
- Update protocols based on monitoring results and emerging best practices.

DOCUMENT HISTORY

Version	Date	Comment
v1.0	06 Feb 2026	Draft version The following revisions to *AMS-III.Y* are included: • Requirements for the use of separated solids as bedding material • Criteria for the use of biofiltrations systems, such as vermicomposting • Adoption of *VT0008 Additionality Assessment*