XIDING AWMS GHG MITIGATION PROJECT

Document Prepared by Henan Deneng Energy&Environmental Protection Technology Co., Ltd.

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1 PROJECT DETAILS

1.1 Summary Description of the Project

The initiator of this project is Xiding Technology Group Co., Ltd. (hereinafter referred to as Xiding Technology). Ji'an Qingyuan Xiding Agriculture and Animal Husbandry Co., Ltd. (hereinafter referred to as Ji'an Xiding), Anfu Xiding Agriculture and Animal Husbandry Co., Ltd. (hereinafter referred to as Anfu Xiding), Quyang Ruida Agriculture Development Co., Ltd. (hereinafter referred to as Quyang Ruida), Yongxin Aoxi Agriculture and Animal Husbandry Co., Ltd.(hereinafter referred to as Yongxin Aoxi) are the subsidiary of Xiding Technology. The proposed project was proposed by Xiding Technology, and the projects are unanimously approved by Xiding Technology and its subsidiaries in various regions, and it was agreed to carry out the project nationwide as the initiator. The proposed project is the batch of project practice activities carried out by Xiding Technology in Hebei province and Jiangxi province.

The four sites of Xiding AWMS GHG Mitigation Project (hereinafter as “the proposed project”) are located in Baoding City in Hebei Province, and Ji'an City in Jiangxi Province, China. The proposed project introduces new animal waste management systems to treat the manure from the four swine farms. Each subsidiary swine farm will install one animal waste management system, and the manure is treated on site. The purpose of the project activity is to treat the manure and wastewater to avoid methane emissions generated in the baseline uncovered anaerobic lagoons.

The project activity uses scraper system to collect the manure automatically. All the manure and wastewater are collected and then be separated first. The separated solid will be treated in aerobic composting system to produce fertilizer. The separated liquid will be treated through UASB or USR anaerobic digestion, and the biogas generated in the UASB or USR anaerobic digestion process is collected as boiler fuel to produce hot water or generate electricity for the swine farm, and the residual biogas will be flared by internal combustion emergency flare (closed flare) if there is any surplus biogas. Almost no biogas is produced in the aerobic digestion process. The sludge produced by digestion is treated with aerobic composting together with solids, and the effluent is used as liquid organic fertilizer for agricultural irrigation.

The project will consist of 4 project activity instances as following:

No.	Name	Instance management company	Starting time
Xiding-001	Quyang Swine Farm Project	Quyang Ruida Agriculture Development Co., Ltd.	2021-Oct-16
Xiding-002	Anfu Swine Farm Project	Anfu Xiding Agriculture and Animal Husbandry Co., Ltd.	2021-Aug-19

Xiding-003	Ji'an Swine Farm Project	Ji'an Qingyuan Xiding Agriculture and Animal Husbandry Co., Ltd.	2021-Sep-14
Xiding-004	Yongxin Swine farm	Yongxin Aoxi Agriculture and Animal Husbandry Co., Ltd.	2022-Apr-12

The common practice for the swine farm owners to manage the manure is to have uncovered anaerobic lagoons/ponds at their farms in the region i.e.. Prior to the implementation of the project, the animal manure waste was left to decay in uncovered open lagoon and methane is emitted to the atmosphere directly without any methane recovery and destruction facility. In China, the uncovered anaerobic lagoons are a manure treatment method recognized by the state. In addition, since there is no legal regulation to mandate the farm owners to implement anaerobic digestion, aerobic or other biological treatment techniques and to capture and/or utilize methane generated at these lagoons, therefore the continue of this common practice to treatment the manure i.e., uncovered anaerobic lagoons is the most economic, viable and reasonable for livestock farm owners.

The proposed project is expected to avoid GHG emission of methane through recovery and destruction of biogas and to the atmosphere from biomass or other organic matter that would have otherwise been left to decay anaerobically in uncovered anaerobic lagoon. The four farms, use biogas to generate electricity or produce hot water. The total amount of biogas produced by anaerobic digesters is about 1,915 tons per year. The project is expected to generate a total emission reduction of 1,391,652 tons of CO_2e during the 10-year total entry period, with an average emission reduction of 139,165 tons of CO_2e per calendar year.

1.2 Sectoral Scope and Project Type

Sectoral Scope 13: Waste handling and disposal.

The project is a grouped project.

1.3 Project Eligibility

Project involves removing or utilizing methane produced in AWMS, recycling activities of biogas from the manure treatment system. The project uses a combination of aerobic and anaerobic processes to replace the traditional anaerobic lagoon on swine farms, which eliminates most of the methane production and achieves methane reduction through energy efficient combustion of methane, in line with the scope of the VCS program.

The scope of the VCS Program includes:

1. The six Kyoto Protocol greenhouse gases: The project activity treats organic wastes for fertilizer through controlled aerobic treatment by composting of manure and biomass residue which can avoid Methane (CH_4) emissions from uncovered anaerobic lagoons in the baseline scenario. Thus, the project applicable to this scope.

2. Ozone-depleting substances: Not Applicable.

3. Project activities supported by a methodology approved under the VCS Program through the methodology approval process: Not Applicable.

4. Project activities supported by a methodology approved under a VCS approved GHG program, unless explicitly excluded under the terms of Verra approval: The applied methodology AMS-III.F (Version 12.0) and AMS-III.D (version 21.0) of the project are methodologies approved under CDM Program, which is a VCS approved GHG program.

5. Jurisdictional REDD+ programs and nested REDD+ projects as set out in the VCS Program document Jurisdictional and Nested REDD+ (JNR) Requirements: Not Applicable.

6. Furthermore, the project does not belong to the project activities excluded in Table 1 of VCS Standard 4.4. Therefore, the proposed project activity is eligible under the scope of the VCS Program.

"AMS-III.D: Methane recovery in animal manure management systems(version 21.0)".

"AMS-III.F: Avoidance of methane emissions through composting(version 12.0)".

1.4 Project Design

These 4 farms are the first batch of emission reduction development projects, and Shandong Yangxiang will build other breeding projects with similar processes in the future. Therefore, new projects will be added on the basis of this project. So the project is a grouped project.

Eligibility Criteria

The eligibility criteria for the inclusion of new project activity instances to the project are as follows:

Grouped projects shall include one or more sets of eligibility criteria for the inclusion of new project activity instances. At least one set of eligibility criteria for the inclusion of new project activity instances shall be provided for each combination of project activity and geographic area specified in the project description. A set of eligibility criteria shall ensure that new project activity instances (VCS-Standard_v4.3 3.5.15):	Eligibility Criteria
1) Meet the applicability conditions set out in the methodology applied to the project.	Corresponding to the previous instances, a) class project activity instances meet all

	applicability of AMS-III.D (Version 21.0); b) class project activity instances meet all applicability of AMS-III.D (Version 21.0) and AMS-III.F (Version 12.0).
2) Use the technologies or measures specified in the project description.	The project activities include two situations: a) The activity of recycling biogas from the manure treatment system; b) The activity of using manure/ sludge for composting while recycling the biogas from the manure treatment system.
3) Apply the technologies or measures in the same manner as specified in the project description.	This project uses anaerobic treatment process or combined with aerobic treatment process to treat pig manure, while avoiding or destroying the methane produced by the manure treatment system. The emission reductions from type III components of the project activity instance should be less than to 60,000 tCO_2e annually.
4) Are subject to the baseline scenario determined in the project description for the specified project activity and geographic area.	The project activity instance locates in the geographic boundary for the grouped project, i.e., Jiangxi and Hebei province, and owned by Xiding Technology or its subsidiaries. The four farms which can see the table in Section 1.1 for details.
5) Have characteristics with respect to additionality that are consistent with the initial instances for the specified project activity and geographic area. For example, the new project activity instances have financial, technical and/or other parameters (such as the size/scale of the instances) consistent with the initial instances, or face the same investment, technological and/or other barriers as the initial instances.	All instances have characteristics with respect to additionality that are consistent with the initial instances for the specified project activity and geographic area.
6) Note – Where grouped projects include multiple baseline scenarios or demonstrations of additionality, such projects will require at least one set of eligibility criteria for each combination of baseline scenario and demonstration of additionality specified in the project description.	One set of eligibility criteria for each combination of baseline scenario and demonstration of additionality specified in the project description.

1.5 Project Proponent

Organization name	Xiding Technology Group Co., Ltd.
Contact person	Manager Liu
Title	Project General Manager
Address	Zirui International, No. 1366, GanJi'ang North Avenue, Honggutan District, Nanchang City, Jiangxi Province
Telephone	/
Email	esebyxm@yeah.net

1.6 Other Entities Involved in the Project

Organization name	Henan Deneng Energy&Environmental Protection Technology Co., Ltd.
Role in the project	Project Developer
Contact person	Yue Liu
Title	Deputy General Manager
Address	Room F, 9th Floor, Yibaishanshan Building, No.985 Dongfang Road, Pudong New District, Shanghai, China
Telephone	(0371)86102662
Email	jietankeji@geniuscarbon.cn

1.7 Ownership

The owners of the project are Xiding Technology and its Subsidiaries, who have the legal right to control and operate the project activities. The business license, approval of Environmental Impact Assessment (EIA) and the equipment purchasing contract are evidence for the ownership of the project. Xiding Technology, the proponent of this project, has signed authorization agreements with the owners all swine farms, which stipulate the ownership of emission reduction and/or removal (ERRs) rights, in which the owners agree to transfer all legal rights of any ERR or greenhouse gas emission reduction to Xiding Technology, including all rights to publish, forward and sell such ERRs as published units according to any applicable carbon standard.

1.8 Project Start Date

As per section 3.7 of VCS Standard (Version 4.4), the project start date of a non-AFOLU project is the date on which the project began generating GHG emission reductions or removals. The earliest operation start date of the four project activity instances is 19/08/2021 (See the table in Section 1.1 for details), i.e., the date on which the first project activity began generating GHG emission reductions or removals.

1.9 Project Crediting Period

This project adopts a 10-year fixed crediting period, from 19/08/2021 to 18/08/2031 (the start and end dates included).

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

The project is expected to generate a total emission reduction of 1,391,652 tons of CO_2e during the 10-year total entry period, with an average emission reduction of 139,165 tons of CO_2e per calendar year.

The estimated annual GHG emission reductions/removals of the project are:

☐ <20,000 tCO2e/year

☐ 20,000 – 100,000 tCO2e/year

☒ 100,001 – 1,000,000 tCO2e/year

☐ >1,000,000 tCO2e/year

Project Scale	
Project	√
Large project	

Year	Estimated GHG emission reductions or removals (tCO_2e)
19/08/2021-31/12/2021	51,444
01/01/2022-31/12/2022	139,089
01/01/2023-31/12/2023	139,089
01/01/2024-31/12/2024	139,470
01/01/2025-31/12/2025	139,089
01/01/2026-31/12/2026	139,089
01/01/2027-31/12/2027	139,089

01/01/2028-31/12/2028	139,470
01/01/2029-31/12/2029	139,089
01/01/2030-31/12/2030	139,089
01/01/2031-18/08/2031	87,645
Total estimated ERs	1,391,652
Total number of crediting years	10
Average annual ERs	139,165

1.11 Description of the Project Activity

The proposed project activity is to introduce new Manure treatment process to replace the traditional uncovered anaerobic lagoons. The implementation of the project eliminates or avoids methane emissions from the AWM.The project adopt Anaerobic and aerobic combined process. Project activities mainly include Solid-liquid separation, Anaerobic digestion process ,Biogas utilization system, Aerobic composting process. The biogas generated by the project is used to generate electricity. The process flow diagram of this project activity is shown in Figure 1-1.

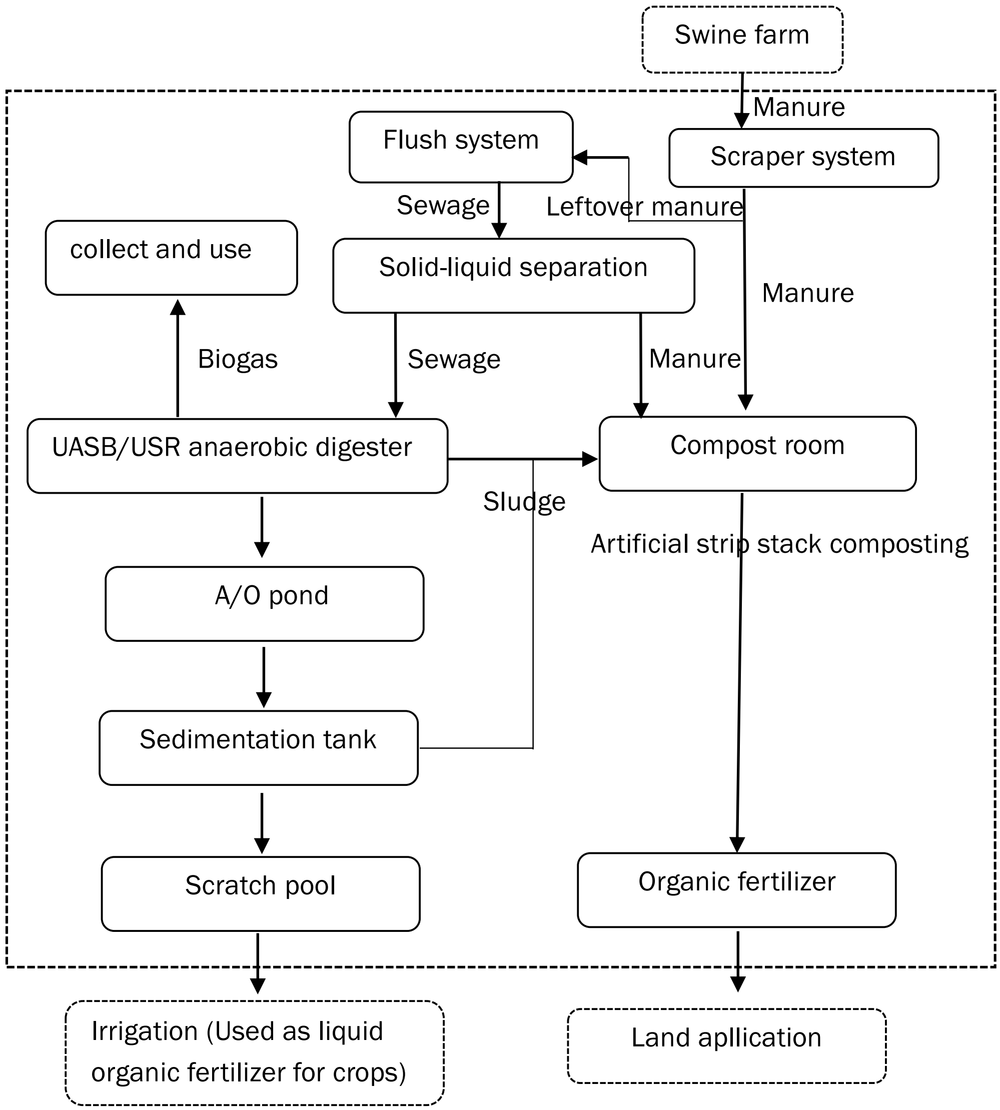

Figure 1-1 Project process flow chart(anaerobic and aerobic combined process)

The specific process is as follows:

Scraper system & Flush system

The manure is collected by scraper board under the leaky floor, the feces that cannot be collected by the scraper are washed away by the flushing system to keep the pig house clean and tidy. The manure collected by the scraper system is transported to the compost room for aerobic composting, and the sewage generated by the flushing system enters the solid-liquid separator.

Solid-liquid separation

After the manure waste was taken into the collection tanks, then manure wastes are pumped to solid-liquid separator through non-blocking slurry pump (in the process of solid-liquid separation, initial separation is done through the screen firstly, and then the water in the solid material of manure is extruded by a screw extruder). The separated solid manure will be sent to the aerobic composting system for organic fertilizers production, the liquid manure will enter the anaerobic fermentation stage to continue processing.

Anaerobic digestion process

For farm XD001, XD003, the Upflow solids reactor (USR) process is adopted, the waste liquid with a high organic solids content enters by the water distribution system at the bottom of the pool, is evenly distributed at the bottom of the reactor, and then flows upwell through a solid bed containing a high concentration of anaerobic microorganisms. The organic solids in the waste liquid are fully in contact with anaerobic microorganisms, the organic solids are liquefied fermented and anaerobically decomposed, and the organic matter is converted into biogas.For farm XD002, XD004, the Upflow anaerobic sludge bed reactor (UASB) process is adopted,a three-phase separator is installed in the UASB system, which can output the three phases of solid, liquid and gas separately. Organic matter is decomposed into biogas, low-molecular organic matter. Create favorable conditions for subsequent processing.The anaerobic digester is one of the few manure treatment options that reduces the environmental impact of manure and the biogas produced can be used for power generation.Among them: the solid phase (sludge) enters the composting room for composting, the liquid phase (sewage) enters the subsequent two-stage A/O pool for further treatment, and the gas phase (biogas) enters the biogas purification and collection and utilization system.

A/O pond

A/O pool is an advanced treatment of wastewater, which uses the metabolic effect of aerobic microorganisms to decompose ammonia, COD_{Cr}, BOD_5 and organic pollutants in sewage to achieve the purpose of sewage purification.

Biogas utilization system

For the farms, the biogas collected by anaerobic digestion will be used for power generation or produce hot water after purification. Under special circumstances such as generator failure or excessive biogas volume, the unusable biogas will be burned directly by the flare.

Aerobic composting process

Artificial strip-stack composting is adopted, and workers turn the compost according to the maturity of the fertilizer. The compost room has good ventilation conditions and maintains aerobic conditions at all times.

Table1-2 Technical parameters of main equipment

Situation	Number	Facilities and equipment	Type

Baseline	1	anaerobic lagoon	uncovered
Program	1	Grille	stainless steel
	2	Pumps	cast iron/stainless steel
	3	Solid-liquid separator	stainless steel
	4	Submersible mixer	stainless steel
	5	Extruder	stainless steel
	6	Generator set	Gas tanker
	7	Fans	cast iron
	8	Anaerobic digester	USR/UASB
	9	A/O Pond	Assemblies
	10	Dosing system	Assemblies
	11	Sedimentation tan	Assemblie

The service life of the facility is at least 20 years. The service life of the equipment is 10 years.

1.12 Project Location

The project is located in Baoding City, Hebei province, and Ji'an City Jiangxi province, China. The location of the 4 subsidiary farms are shown in Table 1-3:

Table1-3 The location of the 9 subsidiary farms in this project

Number	Swine farm	Location	North latitude	East longitude
XD001	Quyang Swine Farm Project	North of Qicun Village, Qicun Town, Quyang County, Baoding City, Hebei Province	38°42'17.92"	114°29'49.41"
XD002	Anfu Swine Farm Project	Shigang Village, Fengtian Town, Anfu County, Ji'an City, Jiangxi Province	27°20'56.5"	114°43'8.7"
XD003	Ji'an Swine Farm Project	Hengkeng Village, Futian Town, Qingyuan District, Ji'an City, Jiangxi Province	26°51'17.38"	115°14'55.07"
XD004	Yongxin Swine farm	Rongtian Village, Longtian Township, Yongxin County, Yongxin County, Ji'an City, Jiangxi Province	27°3’14.51	114°2’13.89"

The Geographic Location of the project

Figure 1-2 The location of the project activity

1.13 Conditions Prior to Project Initiation

The scenario existing prior to the start of the implementation of each project activity instance is: The animal manure waste was left to decay in anaerobic manure management system (uncovered open lagoon) at the livestock farm and methane is emitted to the atmosphere directly without any methane recovery and destruction facility.

The baseline scenario is the same as the scenario existing prior to the start of implementation of the project activity. Please refer to Section 3.4 (Baseline Scenario) for details.

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

According to the approval of Environmental Impact Assessment (EIA) of the project, the project complies with all Chinese relevant laws and regulations. Mainly include:

1. Agricultural Law of the People's Republic of China[1];
2. Environmental Protection Law of the People's Republic of China[2];
3. Administrative Licensing Law of the People's Republic of China[3];
4. Law of the People's Republic of China on Environmental Impact Assessment[4];
5. Regulations on Environmental Protection Management of Construction Projects[5];

The project obtained the EIA approval from local governmental authorities. The approval well demonstrate that local government permits the construction of the project. Consequently, the project is compliance with laws, status and other regulatory frameworks.

1.15 Participation under Other GHG Programs

1.15.1 Projects Registered (or seeking registration) under Other GHG Program(s)

The project has neither been registered nor seeking registration under any other GHG programs. The project is seeking registration only in VCS program.

[1] http://www.scio.gov.cn/XWfbh/xwbfbh/wqfbh/33978/34122/xgzc34128/Document/1466586/1466586.htm

[2] https://www.mee.gov.cn/ywgz/fgbz/fl/201404/t20140425_271040.shtml

[3] http://www.npc.gov.cn/npc/c30834/201905/64f52a065d3142ae92d95fa860e2f0e0.shtml

[4] https://www.mee.gov.cn/ywgz/fgbz/fl/201901/t20190111_689247.shtml

[5] https://www.mee.gov.cn/ywgz/fgbz/xzfg/201906/t20190628_707970.shtml

1.15.2 Projects Rejected by Other GHG Programs

The project activity is not participating in other environment credits, other GHG programs and has not been rejected by any other GHG Programs.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

The project proponent is not part of any emission trading program. The net GHG emission reductions from the project will not be used for compliance with emission trading programs or to meet binding limits on GHG emissions. The project activity has not participated under any other GHG programs.

Does the project reduce GHG emissions from activities that are included in an emissions trading program or any other mechanism that includes GHG allowance trading?

☐ Yes ☒ No

1.16.2 Other Forms of Environmental Credit

The project hasn’t sought or received another sform of environmental credits.

Has the project sought or received another form of GHG-related credit, including renewable energy certificates?

☐ Yes ☒ No

1.16.3 Supply Chain (Scope 3) Emissions

Not involved.

1.17 Sustainable Development Contributions

1.17.1 Sustainable Development Contributions Activity Description

China has adopted the 2030 Agenda for Sustainable Development and announced that the country will hit peak emissions before 2030 and for carbon neutrality by 2060. According to the latest 2021 report of Implementation of the 2030 Agenda for Sustainable Development in China, China will actively promote the integration of the 2030 Agenda with the 14th Five-Year Plan and other national development strategies, and focus on promoting high-quality development, social coordination, and harmonious coexistence between people and nature in terms of economic development, innovation drive, people's well-being, and green ecology.

The following main SDG goals are about SDG8, SDG12, SDG13:

- SDG 8: Decent Work and Economic Growth. The project can bring local employment and increase the employment population. The project activity will provide job opportunities for all locals during project implementation and monitoring activities irrespective of gender or any other status. Equal pay for work of equal value will be made to both men and women. The project is conducive to the National Council's proposal on comprehensively promoting rural revitalization and accelerating the modernization of agriculture and rural areas[6]. Project Monitoring Indicator: 1) Number of males and females employed by the project; 2) Average monthly salary.

- SDG 12: Responsible consumption and production. The amount of the organic fertilizers generation by the project can be calculated through number of animal and average excretion factor by animal type. For ex ante estimation, the annual output of organic fertilizer is about 35,000 tons/year. The government of the People's Republic of China has issued notices and measures to promote the use of organic fertilizers, and has issued relevant notices and announcements[7]. The quantity of organic fertilizer to be monitored will be achieved by recording the freight volume of organic fertilizer. Benefits of organic fertilizer instead of chemical fertilizer: Using organic fertilizer can the amount of chemical fertilizer be reduced and the production cost be reduced. The replacement of organic fertilizer not only solves the problem of soil acidification and water eutrophication caused by excessive use of chemical fertilizer, but also solves the problem of pollution caused by the ineffective utilization of livestock manure accumulation.

- SDG 13: Climate Action. The project AWMS reduces the amount of greenhouse gases emitted in the atmosphere, and the biogas generated by the project can be used for heating and power generation. The project is beneficial to China's “carbon peak” and 2060 “carbon neutral” goals[8]. Please refer to setion 5, section 3 of PD for details of monitoring and realization of GHG emission reduction.

1.17.2 Sustainable Development Contributions Activity Monitoring

The proposed project provides many benefits that will help China’s Sustainable Development Goals, In particular, the proposed project activities directly contribute to 3 goals:

SDG 8

Data / Parameter	Total number of jobs
Unit	Number of full-time jobs created

6 http://www.gov.cn/zhengce/2021-02/21/content_5588098.htm

7 http://www.gov.cn/gongbao/content/2015/content_2941167.htm

8 http://www.gov.cn/zhengce/2022-08/18/content_5705885.htm

Description	Full-time Jobs created for both male and female.
Source of data	Employment contracts
Value(s) applied	For ex ante estimation, the project increase 8 full-time jobs created (including 4 females and 4 males).
Measurement methods and procedures	The number of full-time jobs created will be recorded. Source of data is record keeping book and it will be cross checked by the labor contracts.
Monitoring frequency	Annually.
QA/QC procedures	After the first verification, only changes in employees will be reported. The results will also be cross checked with labor contract.
Purpose of data	To demonstrate contribution to SDG 8.
Additional comment	N/A

SDG 12

Data / Parameter	The amount of the organic fertilizers generated
Unit	Tons
Description	The amount of the organic fertilizers generated
Source of data	Monitoring Record
Value(s) applied	To be monitored and the amount of manure calculated from number of animal and average excretion factor by animal type. the amount of the organic fertilizers generated every year is 33,000 ton/y for ex ante estimation.
Measurement methods and procedures	Measured via electronic truck scales installed in each swine farm.
Monitoring frequency	Monthly
QA/QC procedures	Measurement equipment will be calibrated as per industry standards.
Purpose of data	To demonstrate contribution to SDG 12.
Additional comment	N/Aa

SDG 13

As described in section 1.17.1, the Net benefit of SDG13=Project outcome of SDG13 – Baseline outcome of SDG13. In baseline situation, the amount of GHGs emissions avoided or sequestered is 0 tCO_2e. Therefore, the net benefit of SDG13 is equal to Project outcome of SDG13. In project situation, the amount of GHGs emissions avoided or sequestered can be obtained by baseline emission – project emissions – leakage emissions, and the baseline emission, project emissions, leakage emissions can be determined, the specific calculation process has been described. Please refer to the PD section 5.2 for detail.

Table 1: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
1)	8.5	8.5 By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value	Implemented activities to increase the employment and gender equality.	During the first year, the number of full time jobs created can sourced from the Record keeping book and it can be cross checked with the labsor contract. Projects can increase 8 full-time jobs created (including 4 females and 4 males) per year.	Total number of jobs was 8 full-time jobs created (including 4 females and 4 males).
2)	12.5	Target 12.5 By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse	Implemented activities to increase Responsible consumption and production.	During the first year, the amount of the organic fertilizers generated every year is about 33,000 tons.	During the ten-year fixed credit period, the amount of the organic fertilizers generated every year is about 330,000 tons.
3)	13.0	Tonnes of greenhouse gas emissions avoided or removed	Implemented activities to increase the carbon emission reductions.	The amount of GHGs emission avoided or sequestered is 139,165 tCO_2e/year.	It is expected that 1,391,652 tCO_2e will beprevent from being released into the atmosphere or removed from the atmospherefrom 19/08/2021 to 18/08/2031.

1.18 Additional Information Relevant to the Project

Leakage Management

Not applicable.

Commercially Sensitive Information

Farming data of the swine farms will be considered as commercially sensitive information, and other than that all documentation is available to any stakeholder.

Further Information

Not applicable.

2 SAFEGUARDS

2.1 No Net Harm

The Environmental Impact Assessment (EIA) Report for the Project has been approved by local Ecology and Environment Bureau. Every aspect of environmental impact has been considered in the EIA report with corresponding measures during project development, the construction of the project is in line with national policies and no net harm has been detected. Meanwhile, the implementation of the project will improve local economic development through creating career opportunities.

2.2 Local Stakeholder Consultation

In order to solicit the opinions and attitudes of various stakeholders on the construction of this project, the project owner issued a stakeholder survey opinion form around each project sit to investigate the opinions of local residents on the construction of this project.

A total of 80 questionnaires were issued for this project, 80 copies were collected, 20 copies for each project site . The survey results are as follows:

Table Structure of stakeholder survey:

Number	Questions	Percentage	Reply to comments	Percentage	Reply to comments
1	Can you understand why we are doing this composting project?	95%	The respondents understand this project.	5%	Don't know much about this project.
2	What impact do you think the implementation of this project will have on the local environment and ecology?	100%	The respondents believe that the implementation of this project has reduced environmental pollution and is an environmental protection project.	0%	None
3	What impact do you think the implementation of this project will have on your life?	100%	The repondents believe that the implementation of the project will bring economic benefits to their lives, because they get free organic fertilizer.	0%	None
4	Do you think the implementation of this project is in harmony with the local ecosystem?	100%	The respondents believe that the implementation of the project is in harmony with the local ecosystem.	0%	The respondents are not sure whether it is in harmony.
5	What impact do you think the implementation of this project will have on the social economy?	97.5%	The respondents believe that the implementation of the project has a good impact on the social economy.	2.5%	The respondents are not sure whether it has a good impact.
6	What impact do you think the implementation of this project will have on local sustainable development?	100%	The respondents believe that the construction of this project can promote energy conservation and emission reduction, improve environmental quality and investment environment, and promote the sustainable development of the local economy.	0%	None
7	What impact do you think the implementation of this project will have on local employment?	94%	The respondents believe that the implementation of this project can promote employment growth.	6%	The respondents believe that it has no impact on local employment.

8	Do you think other regions should also vigorously promote this technology?	100%	The respondents believe that AWMS technology can be vigorously promoted.	0%	None
9	Do you support the construction and implementation of this project?	100%	The respondents support this project.	0%	None
10	Do you have any suggestions and opinions on this project?	100%	There is no problem. If you have any questions in the future, please ask by phone or email.	0%	None

The structure of the survey respondents is listed in Table 2-1 below.

Items		Amount
Gender stakeholders surveyed	Male	37
	female	43
Age	18~30	10
	30~55	54
	>55	16
Education	Junior high school or below	36
	Senior high school	42
	College or above	2
Occupation	Worker	58
	Farmer	16
	Management personnel	3
	Civil servant	3

The project owner carefully listened to and accepted the suggestions and opinions of stakeholders and stated that it will implement environmental protection facilities in strict accordance with the requirements in the environmental impact report form and the approval opinions of the local environmental protection bureau. Protect the environment and promote local sustainable development. There is no suggestion about the project design.

In order to investigate the impact on stakeholders during the operation of the project, during operation, the project owner conducted a stakeholder consultations meeting. The conference participants included the developer, the managers of the farms and all stakeholders of the project, with a total of 80 participants. The meeting process includes the developer introducing the project background and operation, asking questions and filling in the questionnaire. All attendees were invited to express their comments. some feedback and comments were received, however, these feedbacks mainly focus on the questions of project technology, project mechanism operation and the environmental impact. There is no comments on project design and monitoring methods. The minutes of stakeholder meeting was recorded by PP. Meeting proof materials include: stakeholder meeting invitation letter, stakeholder meeting presentation, original attendance list of the stakeholder meeting ,stakeholders survey questionnaire, etc..

In addition, the project owner established the mechanism for on-going communication with local stakeholders. That is, a continuous Input/Grievance Expression Process Telephone is prepared at the guard of each farm, and any stakeholders can express their opinions and views at any time, and their grievances or comments will be recorded in the book.

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In conclusion, all the villagers and local government attending the meeting are all supportive of the project. To date, there has no objections were received.

2.3 Environmental Impact

The Environmental Impact Assessment (EIA) Report for the project has been approved by local Ecology and Environment Bureau. A short summary of the environmental impacts is presented below.

Construction period:

Construction dust: the construction dust has a prominent impact on the ambient air in the construction area, especially on the site construction personnel. To control and control dust pollution, the construction and development unit shall strictly implement the secondary standards of Table 2 of the "Integrated emission standard of air pollutants" (GB16297-1996) and the monitoring concentration limit requirements of fugitive emissions, and take the following control and various prevention measures.

Sewage: A temporary sedimentation tank can be built in the construction site, and the sewage will be discharged into the sedimentation tank. After sedimentation, the supernatant water will be recycled for washing materials, construction machinery, etc., so it will not have a great impact on the environment.

Environmental protection measures and countermeasures of solid wastes during construction: the solid wastes generated during construction are mainly domestic wastes and construction wastes of construction workers. These wastes are relatively simple in composition and large in quantity, so they should be treated centrally, cleared and transported in time, and different treatment methods should be adopted according to different components: (1) For stable components in construction wastes, such as broken bricks and rubble, some of them should be collected uniformly and then transported to other construction sites for backfilling. (2) For unstable components such as waste paint and coating, relevant containers can be used for collection and used containers can be cleaned in time. (3) For the concentrated domestic garbage generated by the construction personnel during the construction period, it must be covered and collected because it contains more perishable components, so as to prevent leachate which is seriously harmful to the environment from being soaked by rain in rainy days.

Noise pollution: Noise pollution during construction mainly comes from noise generated by construction machinery and traffic noise generated by transport vehicles. Corresponding control measures should be taken to prevent noise from affecting the surrounding environment and people's normal life.

Ecological protection: The short-term soil and water loss caused by the disturbance of the land and the destruction of vegetation caused by the site excavation is mainly aggravated, which has adverse effects on the local ecological environment. According to the construction characteristics of the project and the present situation of the site, the evaluation requires the construction unit to strictly limit the construction scope, strengthen the influence control on the excavation, earthwork stockpiling and other influencing links, reasonably arrange the construction period, set up temporary retaining measures and drainage channels in the site, and minimize the amount of earth and stone excavation. With the completion of the construction, the hardening and greening of the project land will lead to soil and water loss.

Operation period:

Strengthen the prevention and control of wastewater pollution. The project shall implement the separation of sewage and rainwater. The waste liquid generated from gas-water separation and gas purification and plant domestic sewage will be remitted to the biogas facility for treatment. digested effluent will be used to irrigate the surrounding crops after treatment and is not allowed to be discharged to the surrounding water bodies.

Strengthen the prevention and control of waste gas pollution. The collection pond and anaerobic digestion should seal well in order to reduce emission of malodorous gases. In the process of organic fertilizer production, waste gas collection and treatment measure shall be implemented as design plan. Strengthen solid waste pollution prevention. All biogas residues are used for organic fertilizer production.

Strengthen solid waste management. All digestate is used for organic fertilizer production. Waste desulfurizers should be collected centrally and disposed of properly in accordance with the relevant regulations on solid waste management. The company's solid waste temporary storage site should be impermeable, rainwater scouring and have sewage collection measures to avoid secondary pollution.

In conclusion, the project will not have a significant negative impact on the surrounding environment during both construction and operation period. On the contrary, the implementation of the project will significantly improve the quality of the local environment, achieve environmentally sound treatment of agricultural organic waste, reduce the impact of agricultural organic waste on surface water and groundwater, and reduce greenhouse gas emissions. In addition, biogas incineration saves fossil fuels used to generate heat and contributes to sustainable development.

2.4 Public Comments

The project will be open for public comment for 30 days on the verra website.

2.5 AFOLU-Specific Safeguards

Not applicable.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

The following methodologies are applicable to the project activity.

AMS-III.D: Methane recovery in animal manure management systems（version 21.0）[9].

AMS-III.F: Avoidance of methane emissions through composting（version 12.0）[10].

The latest version of the following tools will also be used in this Project activity:

TOOL03: Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion (version03.0)[11].

TOOL05: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (Version 03.0)[12].

TOOL06: Project emissions from flaring(version04.0)[13].

TOOL13: Project and leakage emissions from composting (Version 02.0)[14].

TOOL14: Project and leakage emissions from anaerobic digesters （Version 02.0）[15].

TOOL21: Demonstration of additionality of small-scale project activities (Version 13.1)[16].

3.2 Applicability of Methodology

Justification for the choice of the selected methodology is shown in the following table:

AMS-III.D（version 21.0）:“Methane recovery in animal manure management systems”	
Applicability Criteria	Justification
This methodology covers project activities involving the replacement or modification of anaerobic animal manure management systems in livestock farms to achieve methane recovery and destruction	Each project activity instance under the grouped project involves the replacement of existing anaerobic animal manure management system (open lagoon) in livestock farm to achieve methane

[9] https://cdm.unfccc.int/methodologies/DB/H9DVSB24O7GEZQYLYNWUX23YS6G4RC
[10] https://cdm.unfccc.int/methodologies/DB/NZ83KB7YHBIA7HL2U1PCNAOCHPUQYX
[11] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v3.pdf
[12] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v3.0.pdf
[13] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-06-v3.0.pdf
[14] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-13-v2.pdf
[15] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-14-v2.pdf
[16] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-21-v13.1.pdf

by flaring/combustion or gainful use of the recovered methane. It also covers treatment of manure collected from several farms in a centralized plant.	recovery and destruction by combustion of biogas for gainful use.
This methodology is only applicable under the following conditions: (a) The livestock population in the farm is managed under confined conditions; (b) Manure or the streams obtained after treatment are not discharged into natural water resources (e.g. river or estuaries), otherwise "AMS-III.H Methane recovery in wastewater treatment" shall be applied; (c) The annual average temperature of baseline site where anaerobic manure treatment facility is located is higher than 5°C; (d) In the baseline scenario the retention time of manure waste in the anaerobic treatment system is greater than one month, and if anaerobic lagoons are used in the baseline, their depths are at least 1 m; (e) No methane recovery and destruction by flaring or combustion for gainful use takes place in the baseline scenario.	(a) This project introduces new AWMS to a group of 4 swine farms owned by Xiding Technology, is a agricultural and animal husbandry enterprises, which integrate swine breeding, slaughtering and processing. All swine farms in which swine are managed under confined conditions. (b) The swine manure is dumped into open anaerobic lagoons and it is prohibited to discharge into any natural water resources without treatment according to Regulations on Prevention and Control of Pollution from Livestock and Poultry Farming[17]. (c) The annual average ambient temperature at Quyang County site is 12.9°C[18], the annual average ambient temperature at Ji'an City site is 19-20.2°C[19], which are higher than 5°C. (d) The open anaerobic lagoons considered in the baseline scenario are designed for deep storage and has a depth of 3-5 meters in accordance with "Technical specification for waste water natural treatment project (CJJ/T54-2017)[20]". (e) In the baseline case, the open anaerobic lagoons is used to store the swine manure and no methane is recycled.
The project activity shall satisfy the following conditions: (a) The residual waste from the animal manure management system shall be handled aerobically, otherwise the related emissions shall be taken into account as per relevant procedures of "AMS-III.AO	(a) As per the design scheme of all project activity instances, the residual waste from the animal manure management systems will be handled aerobically and will not result in methane emissions; (b) The biogas will be recovered for electricity

[17] http://www.gov.cn/flfg/2013-11/26/content_2535095.htm
[18] Statistical Yearbook of Heibei Province http://tjj.hebei.gov.cn/hetj/tjnj/2021/zk/indexch.htm
[19] Jiangxi Climate Bulletin(2022) http://jx.cma.gov.cn/zfxxgk/zwgk/sjtj_1/202303/P020230317379786742128.pdf
[20] https://www.mohurd.gov.cn/gongkai/zhengce/zhengcefilelib/201706/20170628_232393.html

Methane recovery through controlled anaerobic digestion". In the case of soil application, proper conditions and procedures (not resulting in methane emissions) must be ensured; (b) Technical measures shall be used (including a flare for exigencies) to ensure that all biogas produced by the digester is used or flared; (c) The storage time of the manure after removal from the animal barns, including transportation, should not exceed 45 days before being fed into the anaerobic digester. If the project proponent can demonstrate that the dry matter content of the manure when removed from the animal barns is larger than 20%, this time constraint will not apply.	generation and the emergency flare will be installed in each project activity instance to ensure that all biogas produced by the digester is used or flared; (c) As per design scheme of all project activity instances, the storage time of the manure after removal from the animal barns, including transportation, will not exceed 45 days before being fed into the anaerobic digester.
Projects that recover methane from landfills shall use "AMS-III.G Landfill methane recovery" and projects for wastewater treatment shall use AMS-III.H. Projects for composting of animal manure shall use "AMS-III.F Avoidance of methane emissions through composting". Project activities involving co-digestion of animal manure and other organic matters shall use the methodology "AMS-III.AO Methane recovery through controlled anaerobic digestion".	The project doesn' t recover methane from landfill. The project involves two phases of anaerobic digester and composting, of which AMS-III.F will be used in the composting process.

AMS-III.F Avoidance of methane emissions through composting, version 12.0	
Applicability Criteria	Justification
1. This methodology is applicable to the composting of the organic fraction of municipal solid waste and biomass waste from agricultural or agro-industrial activities including manure.	The proposed project is designed to treat the swine manure to produce the organic fertilizers through aerobic composting.
2. This methodology includes construction and expansion of treatment facilities as well as activities that increase capacity utilization at an existing facility. For project activities that increase capacity utilization at existing facilities, project participant(s) shall	Not applicable. The project is a new facility and does not involve expansion of any existing facility.

demonstrate that special efforts are made to increase the capacity utilization, that the existing facility meets all applicable laws and regulations and that the existing facility is not included in a separate CDM project activity. The special efforts should be identified and described.	
3. This methodology is also applicable for co-composting wastewater and solid biomass waste, where wastewater would otherwise have been treated in an anaerobic wastewater treatment system without biogas recovery. The wastewater in the project scenario is used as a source of moisture and/or nutrients to the biological treatment process e.g., composting of empty fruit bunches (EFB), a residue from palm oil production, with the addition of palm oil mill effluent (POME) which is the wastewater co-produced from palm oil production.	Not applicable. The project does not involve co-composting wastewater and solid biomass waste.
4. In case of co-composting, if it cannot be demonstrated that the organic matter would otherwise been left to decay anaerobically, baseline emissions related to such organic matter shall be accounted for as zero, whereas project emissions shall be calculated according to the procedures presented in this methodology for all co-composted substrates.	Not applicable. This project activity does not involve co-composting .
5. The location and characteristics of the disposal site of the biomass, animal manure and co-composting wastewater in the baseline condition shall be known, in such a way as to allow the estimation of its methane emissions, using the provisions of AMS-III.G, AMS-III.E (concerning stockpile), AMS-III.D “Methane recovery in animal manure management systems” or AMS-III.H respectively.	The location and characteristics of the disposal site of the animal manure and biomass in the baseline condition are well known. The estimation of manure methane emissions as the latest version of AMS-III.D and the estimation of biomass methane emissions as the latest version of methodology tool “Emission from solid waste disposal sites”.
6. Blending materials may be added in the project scenario to increase the efficiency of the composting process (e.g., to achieve a desirable C/N ratio or free air space value), however, only monitored quantity of solid waste or manure or wastewater diverted from the	For this project, blending materials are not added, and swine manure is used for composting, therefore it meets the requirements of AMSIII.D, please see the table of AMSIII.D above.

baseline treatment system is used for emission reduction calculation. Project activities for composting of animal manure shall also meet the requirements under paragraphs 3 and 4(c) of the latest versions of AMS-III.D.	
7. For solid wastes diverted from a solid waste disposal site, the following requirement shall be checked ex ante at the beginning of each crediting period: （a）Establish that identified landfill(s)/stockpile(s) can be expected to accommodate the waste to be used for the project activity for the duration of the crediting period; or （b）Establish that it is common practice in the region to dispose of the waste in solid waste disposal site (landfill)/stockpile(s).	Under the baseline conditions, the manure would all be disposed of in uncovered anaerobic lagoons in 3-5 meter, which is the most common practice in the region. Prior to the project, the swine manure residue is left to decay anaerobically in stockpiles, which is the common practice in the region, And the identified stockpiles can accommodate the waste to be used for the project activity for the duration of the crediting period.
8. The project participants shall clearly define the geographical boundary of the region referred in paragraph 11(b), and document it in the CDM-PDD. In defining the geographical boundary of the region, project participants should take into account the source of the waste i.e., if waste is transported up to 50 km, the region may cover a radius of 50 km around the project activity. In addition, it should also consider the distance to which the final product after composting will be transported. In either case, the region should cover a reasonable radius around the project activity that can be justified with reference to the project circumstances but in no case, it shall be more than 200 km. Once defined, the region should not be changed during the crediting period(s).	The manure and residue of biogas used in this project comes from swine farms owned which is less than 50 km away from the project site. All the compost generated in the project activities will be donated to the villagers around the factory area, which cannot exceed 200 kilometers.
9. In case produced compost is handled aerobically and submitted to soil application, the proper conditions and procedures (not resulting in methane emissions) must be ensured.	The compost produced will be used as fertilizer for the soil. The compost will be applied to the soil similarly to the way used for chemical fertilizers. The low agglutination of the compost and the short time needed to apply it ensure that there is not enough time available to develop anaerobic conditions. Therefore, the proper

	conditions and procedures (not resulting in methane emissions) can be ensured.
10. In case produced compost is treated thermally/mechanically, the provisions in AMS-III.E related to thermal/mechanical treatment shall be applied.	Not applicable. This project activity does not involve thermal/mechanical treatment to the compost once it is produced.
11. In case produced compost is stored under anaerobic conditions and/or delivered to a landfill, emissions from the residual organic content shall to be taken into account and calculated as per the latest version of the methodological tool "Emissions from solid waste disposal sites".	The project activity will involve storage in aerobic conditions and kept in packed bags for a limited period before it is applied by the user. Thus, the project does not involve storage of produced compost in an anaerobic condition nor would it be delivered back to landfill.

Tool 03: "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion (version 03.0)"	
This tool provides procedures to calculate project and/or leakage CO_2 emissions from the combustion of fossil fuels. It can be used in cases where CO_2 emissions from fossil fuel combustion are calculated based on the quantity of fuel combusted and its properties. Methodologies using this tool should specify to which combustion process j this tool is being applied.	This project may consume fossil fuel during the composting process.

Tool 05: "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (version 03.0)"	
If emissions are calculated for electricity consumption, the tool is only applicable if one out of the following three scenarios applies to the sources of electricity consumption: (a) Scenario A: Electricity consumption from the grid. The electricity is purchased from the grid only,	All the electricity used by the project will be from North China Power Grid (NCPG)[21], which falls under scenario A of Tool 05 (Version 03.0). Therefore, emissions related to electricity consumption need to be calculated based on Tool 05.

[21] https://www.mee.gov.cn/ywgz/ydqhbh/wsqtkz/202012/t20201229_815386.shtml

and either no captive power plant(s) is/are installed at the site of electricity consumption or, if any captive power plant exists on site, it is either not operating or it is not physically able to provide electricity to the electricity consumer; （b）Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants are installed at the site of the electricity consumer and supply the consumer with electricity. The captive power plant(s) is/are not connected to the electricity grid; or （c）Scenario C: Electricity consumption from the grid and (a) fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants operate at the site of the electricity consumer. The captive power plant(s) can provide electricity to the electricity consumer. The captive power plant(s) is/are also connected to the electricity grid. Hence, the electricity consumer can be provided with electricity from the captive power plant(s) and the grid.	
This tool can be referred to in methodologies to provide procedures to monitor amount of electricity generated in the project scenario, only if one out of the following three project scenarios applies to the recipient of the electricity generated: （a）Scenario I: Electricity is supplied to the grid; （b）Scenario II: Electricity is supplied to consumers/electricity consuming facilities; or （c）Scenario III: Electricity is supplied to the grid and consumers/electricity consuming facilities.	The project use biogas to generate electricity, but the power generation is only supplied to the swine farm.So, this criterion is not applicable.
This tool is not applicable in cases where captive renewable power generation technologies are installed to provide electricity in the project activity, in the baseline scenario or to sources of leakage. The tool only accounts for CO_2 emissions.	No captive renewable power generation technologies are installed to provide electricity in the project activity, in the baseline scenario or to sources of leakage. So, this criterion is not applicable.

Tool 06: "Project emissions from flaring (version03.0)"	
This tool provides procedures to calculate project emissions from flaring of a residual gas. The tool is applicable to enclosed or open flares and project participants should document in the CDM-PDD the type of flare used in the project activity.	The biogas generated during the treatment process will be captured for electricity generation for the swine farm and the residual biogas will be flared if there is any surplus biogas.
This tool is applicable to the flaring of flammable greenhouse gases where: （a）Methane is the component with the highest concentration in the flammable residual gas; and （b）The source of the residual gas is coal mine methane or a gas from a biogenic source (e.g. biogas, landfill gas or wastewater treatment gas).	The source of the biogas of the project activity is from anaerobic treatment process of the swine manure (biogenic source). As per Project Evaluation Report of the project, methane accounts for 60% of the biogas, which is the highest concentration in the flammable residual gas.
The tool is not applicable to the use of auxiliary fuels and therefore the residual gas must have sufficient flammable gas present to sustain combustion. For the case of an enclosed flare, there shall be operating specifications provided by the manufacturer of the flare.	No auxiliary fuels will be used by the flaring system. As per Project Evaluation Report of the project, methane accounts for 60% of the biogas. And methane is a kind of flammable gas. Operating specifications were provided by the manufacturer of the flare.

Tool 13: "Project and leakage emissions from composting (version02.0)"	
Typical applications of the tool include projects composting municipal solid wastes, agricultural wastes and digestate.	Applicable. The proposed project is designed to treat the manure from 4 swine farm to produce the organic fertilizers through aerobic composting.
The following sources of project emissions are accounted for in this tool: (a) CH_4 and N2O emission from composting; (b) CO_2 emissions from consumption of fossil fuels and electricity associated with composting; and (c) CH_4 emissions from run-off wastewater	(a) CH_4 and N_2O emission from composting are accounted. (b) CO_2 emissions from consumption of fossil fuels and electricity associated with composting are accounted. (c) This project is not involving co-composting, therefore, no CH_4 emissions from run-off wastewater is generated.

associated with co-composting.	
The following source of leakage emissions is accounted for in this tool: (a) CH_4 emissions from the anaerobic decay of the residual organic content of compost disposed of in a landfill or subjected to anaerobic storage.	The compost and waste are stored in aerobic condition, not anaerobic condition. Therefore, leakage is not accounted.
Transport emissions are not accounted for in this tool because it is assumed that similar transportation activities would occur in the baseline.	Transport emissions are not accounted.
The applicability conditions of the tools referred below also apply.	The tools referred by this project is listed in following tables. This project involves composting of manure through controlled aerobic treatment. No any greenhouse gas produced during in the process of composting. Therefore, “Tool to determine the mass flow of a greenhouse gas in a gaseous Stream (verion03.0)” are not applicable for this project.

Tool 14: “Project and leakage emissions from anaerobic digesters (Version 02.0)”	
The following sources of project emissions are accounted for in this tool: （a）CO_2 emissions from consumption of electricity associated with the operation of the anaerobic digester; （b）CO_2 emissions from consumption of fossil fuels associated with the operation of the anaerobic digester; （c） CH_4 emissions from the digester (emissions during maintenance of the digester, physical leaks through the roof and side walls, and release through safety valves due to excess pressure in the digester); and	（a）The program adopt anaerobic fermentation process, and the anaerobic digester consumes electricity, so it involves electricity consumption emissions; （b）The anaerobic digester does not consume fossil fuels, so it does not involve fossil fuel emissions; （c）The anaerobic pool may be during maintenance or through the side wall, Gap and safety valve discharge biogas, so it involves the discharge of anaerobic digester; (d)The methane produced by anaerobic digesters is mainly used for power generation, and the unusable methane is burned by flare, and therefore also involves

（d） CH_4 emissions from flaring of biogas.	combustion emissions of biogas.
The following sources of leakage emissions are accounted for in this tool: （a） CH_4 and N_2O emission from composting of digestate; （b） CH_4 emissions from the anaerobic decay of digestate disposed in a SWDS or subjected to anaerobic storage, such as in a stabilization pond.	The project activity will replace the current open anaerobic lagoons with 4 new closed anaerobic digesters. The biogas generated during the treatment process will be captured and be flared. After anaerobic digestion, the fermented sludge will be treated in aerobic composting system, which will be used as fertilizer. So, leakage emissions are not taken into account.
Emission sources associated with N_2O emissions from physical leakages from the digester, transportation of feed material and digestate or any other on-site transportation, piped distribution of the biogas, aerobic treatment of liquid digestate and land application of the digestate are neglected because these are minor emission sources or because they are accounted in the methodologies referring to this tool.	Emission sources associated with N_2O emissions from physical leakages from the digester, transportation of feed material and digestate or any other on-site transportation, piped distribution of the biogas, aerobic treatment of liquid digestate and land application of the digestate are neglected because these are minor emission sources.

Tool 21: "Demonstration of additionality of small-scale project activities (version13.1)"	
This methodological tool provides a general framework for demonstrating and assessing additionality and is applicable to a wide range of project types.	The proposed project is designed to treat the swine manure to produce the organic fertilizers through aerobic composting. The applied methodology is AMS-III.F, as per applied methodology, the demonstration of additionality should apply this tool.
In validating the application of this methodological tool, Designated Operation Entities (DOEs) shall carefully assess and verify the reliability and creditability of all data, rationales, assumptions, justifications and documentation provided by project participants to support the demonstration of additionality. The elements checked during this	All the data, rationales, assumptions, justifications and documentation will be provided by project participants to DOE to support the demonstration of additionality in validating the application of this methodological tool, and the elements checked during this assessment and the conclusions will be documented transparently in the validation

assessment and the conclusions shall be documented transparently in the validation report.	report.
The use of the methodological tool "Demonstration of additionality of small-scale project activities" is not mandatory for project participants when proposing new methodologies. Project participants and coordinating/managing entities may propose alternative methods to demonstrate additionality for consideration by the Executive Board.	Project participants will not proposing new methodologies and will not propose alternative methods to demonstrate additionality. PP will use this tool to demonstration the additional of the proposed project.
Project participants and coordinating/managing entities may also apply "TOOL19: Demonstration of additionality of microscale project activities" as applicable.	The proposed is a small-scale project not a microscale project, therefore, Tool 19 cannot be used to prove the additionality of this project activity.

3.3 Project Boundary

The baseline situation is shown in figure 3- 1 below.

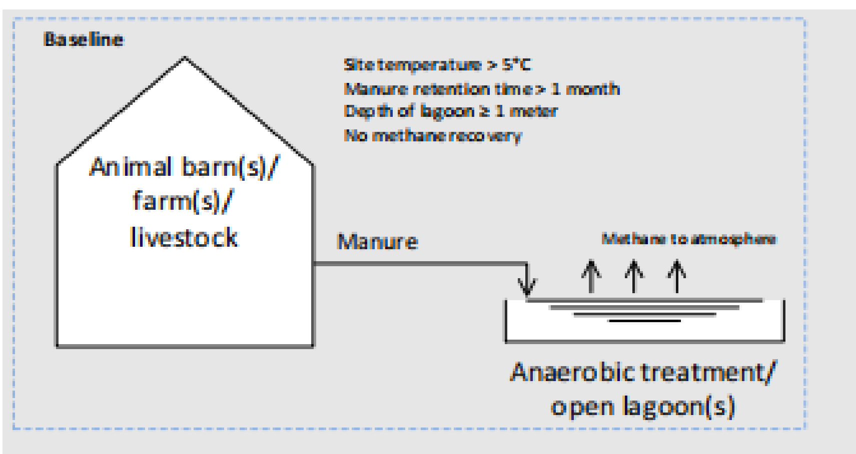

Figure 3-1 The baseline situation in the swine farms

According to the methodology AMS-III.D （version 21.0）and AMS-III.F （version 12.0）, the project boundary includes the physical, geographical site(s) of:

"AMS-III.D: Methane recovery in animal manure management systems（version 21.0）"

No.	Methodology requirement	Project activity
a	The livestock;	Included
b	Animal manure management systems (including centralised manure treatment plant where applicable);	Included
c	Facilities which recover and flare/combust or use methane.	Included

AMS-III.F: Avoidance of methane emissions through composting (version 12.0)		
No.	Methodology requirement	Project activity
a	Where the solid waste would have been disposed and the methane emission occurs in absence of the proposed project activity;	Included. The project involves swine manure and the residue of biogas for composting. all manure waste produced was left to decay in uncovered anaerobic lagoons .
b	In the case of projects co-composting wastewater, where the co-composting wastewater would have been treated anaerobically in the absence of the project activity;	The project does not involve co-composting wastewater.
c	Where the treatment of biomass through composting takes place;	Included, composting plants
d	Where the products from composting (compost) is handled, disposed, submitted to soil application, or treated thermally/mechanically;	Exclude
e	And the itineraries between them (a, b, c and d) where the transportation of waste, wastewater, where applicable manure, product of treatment (compost) occurs.	Included, Transportation of waste to the project site and transportation of composting for soil application.

The project activity boundary is defined as Figure 3-2 below.

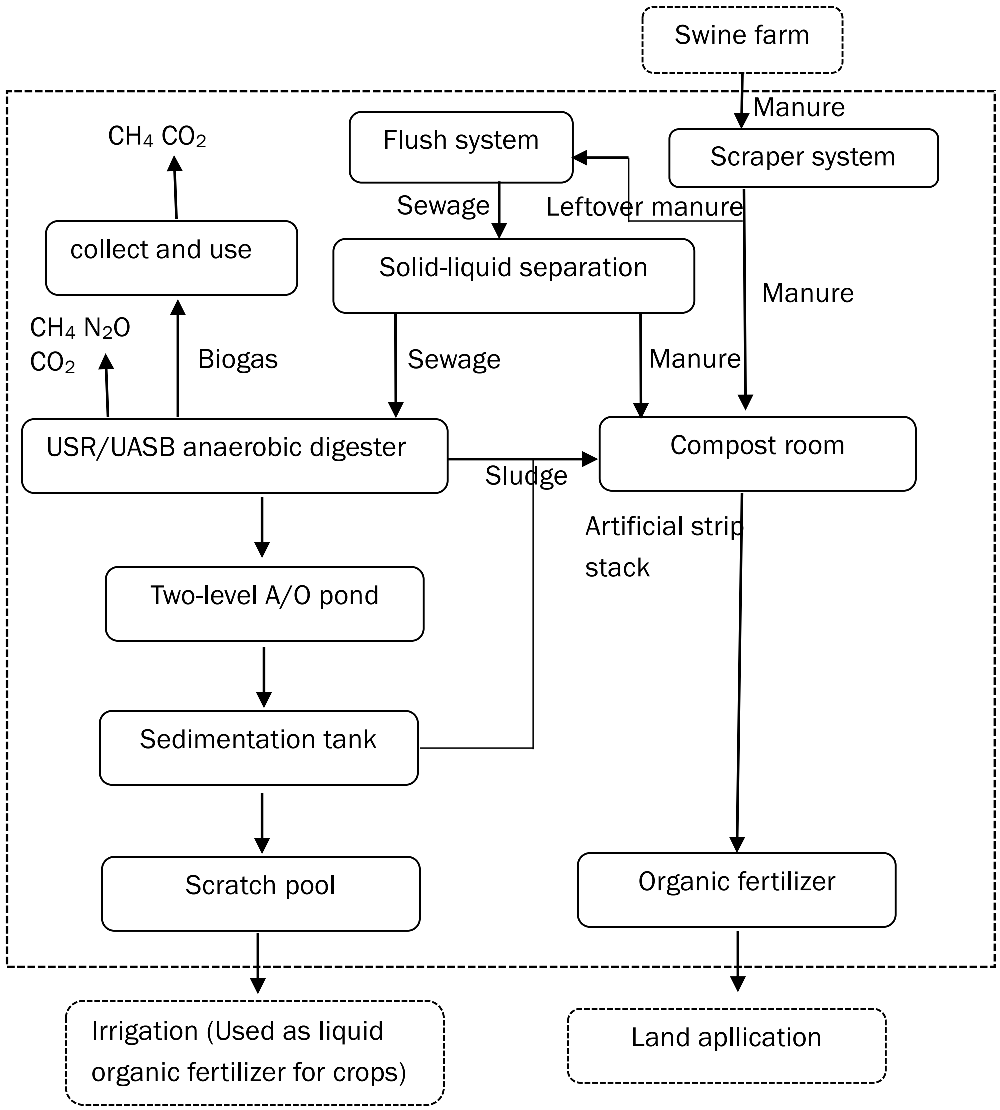

Figure3-2 project boundary

Table3-1 Emissions sources included in or excluded from the project boundary

	Source	Gas	Included?	Justification/Explanation
Baseline	Manure disposed in uncovered anaerobic lagoon	CO_2	No	CO_2 emissions from the decomposition of organic waste are not accounted
		CH_4	Yes	The major source of emissions in the baseline
		N_2O	No	Excluded for simplification This is conservative
Project	Emissions from transport	CO_2	No	According to Tool 13 “Project and leakage emission from composting(version02.0)”, transport emission is not accounted.
		CH_4	No	Excluded for simplification.
		N_2O	No	Excluded for simplification.
	Emissions from on-site electricity use	CO_2	Yes	An important emission source since the electricity consumed by the project is from the grid company.
		CH_4	No	Excluded for simplification.
		N_2O	No	Excluded for simplification.
	Emission from fossil fuel consumption	CO_2	Yes	The composting workshop uses a forklift for transportation/operation, which will consume a certain amount of diesel
		CH_4	No	Excluded for simplification.
		N_2O	No	Excluded for simplification.
	Emissions from composting processes	CO_2	No	Excluded for simplification.
		CH_4	Yes	May be an important emission source.
		N_2O	Yes	May be an important emission source.

	Emissions from run-off water	CO_2	No	Excluded. The project is not involving co-composting.
		CH_4	No	Excluded. The project is not involving co-composting.
		N_2O	No	Excluded. The project is not involving co-composting.
	Emissions from flaring or combustion of the gas stream	CO_2	No	Excluded for simplification.
		CH_4	YES	May be an important emission source
		N_2O	No	Excluded for simplification.
	Emissions from the digester	CO_2	No	Excluded for simplification.
		CH_4	YES	May be an important emission source
		N_2O	NO	Excluded for simplification.

3.4 Baseline Scenario

"AMS-III.D: Methane recovery in animal manure management systems (version 21.0)", According to "AMS-III.F: Avoidance of methane emissions through composting (version 12.0)", the baseline scenario is the situation where, in the absence of the project activity, biomass and other organic matter (including manure where applicable) are left to decay within the project boundary and methane is emitted to the atmosphere.

According to "AMS-III.F: Avoidance of methane emissions through composting (version 12.0)", the baseline scenario is the situation where, in the absence of the project activity, biomass and other organic matter (including manure where applicable) are left to decay within the project boundary and methane is emitted to the atmosphere.

The baseline scenarios described in the two methodologies are consistent.

3.5 Additionality

As this project is a small-scale project, therefore, according to TOOL 21 “Demonstration of Additionality of Small-scale Project Activities (version 13.1)”, project participant shall provide an explanation to show that the project activity would not have occurred anyway due to at least one of the following barriers:

1. Investment barrier: a financially more viable alternative to the project activity would have led to higher emissions;

2. Technological barrier: a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions;

3. Barrier due to the prevailing practice: prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions;

4. Other barriers: without the project activity, for another specific reason identifies by the project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher.

Project activity would not have occurred due to barriers analysed below.

Other Barriers

It has been identified that relevant laws and regulations in China do not require the collection and destruction of methane from livestock manure. Under existing regulations or policy requirements, all manure waste produced was left to decay in uncovered anaerobic lagoons, which is the most economic, viable, and reasonable for livestock farm owners, and methane would be emitted into the atmosphere in this treatment.

The manure treatment system of the project uses a combination of aerobic and anaerobic processes to treat animal manure. Compared with the baseline scenario, it requires more investment and higher operating costs, but this does not generate any additional benefits, because the project The organic fertilizer produced within the border will be given to surrounding farmers for free. There are no potential revenues involved in this project. There are only gative flows in this project, so the Internal Rate of Return (IRR) cannot be calculated, and the economic comparison should be based on the Net Present Value (NPV) indicator. It is expected to generate revenue of 1.9 million RMB emission reduction benefits per year, but this is too small compared to the investment cost. There are still gative flows in this project, even if we consider emission reduction income. But it can increase project owners' determination to deal with climate change.

As a result, without all these provisions of the project activity, the users would have limited capacity to absorb the new technologies, and emissions would be higher. There for the project is additional.

3.6 Methodology Deviations

There is no methodology deviation for the project.

4 IMPLEMENTATION STATUS

4.1 Implementation Status of the Project Activity

The proposed project locates in Baoding City ,Hebei Province, Ji'an City, Jiangxi province, China. The purpose of the project activity is to treat the manure and wastewater to avoid methane emissions generated in the baseline uncovered anaerobic lagoons. This project adopts a 10-year fixed crediting period, from 19/08/2021 - 18/08/2031 (the start and end dates included).

The monitoring period of this project round is 19/08/2021 - 31/12/2022. During the entire monitoring period, all plant areas operated well, and there were no emergencies affecting the normal operation of the project and monitoring activities. the monitoring facilities are running normally and there are no abnormal and other fault symptoms. Data is collected and recorded by dedicated personnel, and all electronic or paper materials are kept.

5 ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

The baseline emissions are determined as per of the AMS.III.D. Baseline emissions (BEy) are calculated by using one of the following two options:

(A) Using published country specific data.

Using the amount of the waste or raw material that would decay anaerobically in the absence of the project activity, with the most recent IPCC Tier 2 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). Baseline emissions are detemined as follows:

$$BE_y = GWP_{CH4} * D_{CH4} * UF_b * \sum_{j,LT} MCF_j * B_{0,LT} * N_{LT,y} * VS_{LT,y} * MS\%_{Bl,j}$$ (Equation 1)

Where:

BE_y	Baseline emissions in the year y (t CO_2e)
GWP_{CH4}	Global Warming Potential for CH_4 applicable to the crediting period (t CO_2e/t CH_4)
D_{CH4}	CH_4 density (0.00067 t/m^3 at room temperature (20 ºC) and 1 atm pressure)
LT	Index for all types of livestock
j	Index for animal manure management system
MCF_j	Annual methane conversion factor (MCF) for the baseline animal manure management system j
$B_{o,LT}$	Maximum methane producing potential of the volatile solid generated for animal type LT (m^3 CH_4/kg-dm)
$N_{LT,y}$	Annual average number of animals of type LT in year y (numbers)
$VS_{LT,y}$	Volatile solids production/excretion per animal of livestock LT in year y (on a dry matter weight basis, kg-dm/animal/year)
$MS\%_{Bl,j}$	Fraction of manure handled in baseline animal manure management system j
UF_b	Model correction factor to account for model uncertainties (0.94)

Estimation of various variables and parameters for above equations:

1) Maximum methane producing potential($B_{0,LT}$)

The maximum methane-producing capacity of the manure (B_o) varies by species and diet. The preferred method to obtain B_o measurement values is to use data from country-specific published sources, measured with a standardised method (B_o shall be based on total as-excreted *VS*). These values shall be compared to IPCC default values and any significant differences shall be explained. If country specific B_o values are not available, default values from tables 10 A-4 to 10 A-9 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories volume 4 Chapter 10 can be used, provided that the project participants assess the suitability of those data to the specific situation of the treatment site.

The proposed project is located in Jiangxi Province and Hebei Province, China, Asia. Since country specific B_o values are not available, according to Table 10A-7 and 10A-8 of IPCC 2006 Guidelines for National Greenhouse Gas Inventories volume 4, chapter10, the maximum methane producing potential($B_{0,LT}$) for Market swine and Breeding swine in Asia region is 0.29 m^3 CH_4/kg VS.

2)$VS_{LT,y}$ shall be determined in one of the following ways

VS are the organic material in livestock manure and consist of both biodegradable and non-biodegradable fractions. For the calculations the total *VS* excreted by each animal species is required.

Option 1:

The preferred method to obtain *VS* is to use data from nationally published sources. These values shall be compared with IPCC default values and any significant differences shall be explained.

Option 2:

If data from nationally published sources are not available, country-specific *VS* excretion rates can be estimated from feed intake levels, via the enhanced characterisation method (tier 2) described in section 10.2 in 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 chapter 10, using the equation (2) below.

$$\mathrm{VS}_{LT,y} = \left[GE_{LT} \times \left(1 - \frac{DE_{LT}}{100} \right) + \left(UE \times GE_{LT} \right) \right] \times \left[\left(\frac{1 - ASH}{ED_{LT}} \right) \right] \times nd_y \qquad \text{(Equation 2)}$$

where:

$VS_{LT,y}$	Annual volatile solid excretions for livestock LT entering all AWMS on a dry matter weight basis (kg -dm/animal/yr)
GE_{LT}	Daily average gross energy intake (MJ/animal/day)
DE_{LT}	Digestible energy of the feed (per cent)
UE	Urinary energy (fraction of GE_{LT})
ASH	Ash content of manure (fraction of the dry matter feed intake)
ED_{LT}	Energy density of the feed fed to livestock type LT (MJ/kg-dm)
nd_y	Number of days treatment plant was operational in year y

Option 3:

Project participants may adjust default IPCC values for *VS* for a site-specific average animal weight. If so, it shall be well explained and documented. The following equation shall be used:

$$\mathrm{VS}_{LT,y} = \left(\frac{W_{site}}{W_{default}} \right) \times VS_{default} \times nd_y \qquad \text{(Equation 3)}$$

where:

$VS_{LT,y}$	Annual volatile solid excretions for livestock LT entering all AWMS on a dry matter weight basis (kg -dm/animal/yr)
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 (kg)
$VS_{default}$	Default value for the volatile solid excretion per day on a dry-matter basis for a defined livestock population (kg-dm/animal/day)
nd_y	Number of days treatment plant was operational in year y

Option 4:

B_o or *VS* values applicable to developed countries can be used provided the following four conditions are satisfied:

(a) The genetic source of the livestock originates from an Annex I Party;

(b)The farm uses formulated feed rations (FFR) which are optimized for the various animal(s), stage of growth, category, weight gain/productivity and/or genetics;

(c)The use of FFR can be validated (through on-farm record keeping, feed supplier, etc.);

(d)The project specific animal weights are more similar to developed country IPCC default values.

There is no published country specific data available, so we could not use Option 1. The energy intake of the swine is not available, so we could not use Option 2. Option 3 utilizes the average weight of the swine, this data is available and therefore Option 3 is adopted to calculate $VS_{LT,y}$.

3) Annual methane conversion factor (MCF_j)

Methane Conversion Factors (*MCF)* values are determined for a specific manure management system and represent the degree to which B_o is achieved. Where available country-specific *MCF* values that reflect the specific management systems used in particular countries or regions shall be used. Alternatively, the IPCC default values provided in table 10.17 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 Chapter 10 can be used. The site annual average temperature is taken from official data at the nearest meteorological station, or from data available from historical on site observations.

4) Annual average number of animals of type LT (N_{LT})

N_{LT} determined as follows:

$$N_{\mathrm{LT,y}} = N_{\mathrm{da,y}} * \left(\frac{N_{p,y}}{365}\right) \qquad \text{(Equation 4)}$$

Where:

$N_{LT,y}$ Annual average number of animals of type *LT* for the year *y* (number)

$N_{da,y}$ Number of days animal of type *LT* is alive in the farm in the year *y* (number)

$N_{p,y}$ Number of animals of type *LT* produced annually for the year *y* (number)

(B) baseline emissions are determined based on directly measured quantity of manure and its specific volatile solids content.

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

$$BE_y = GWP_{CH4} \times D_{CH4} \times UF_b \times \sum_{j,LT} MCFj \times B_{o,LT} \times Q_{manure,j,LT,y} \times SVS_{j,LT,y} \quad \text{(Equation 5)}$$

Where:

$Q_{manure,j,LT,y}$	Quantity of manure treated from livestock type LT and animal manure management system j (tonnes/year, dry basis)
$SVS_{j,LT,y}$	Specific volatile solids content of animal manure from livestock type LT and animal manure management system j in year y (tonnes/tonnes, dry basis)
MCF_j	Annual methane conversion factor (MCF) for the baseline animal manure management system j, as per paragraph 18 above
$B_{o,LT}$	Maximum methane producing potential of the volatile solid generated for animal type LT (m^3 CH_4/kg-dm), IPCC 2006 Guidelines, table 10.17, chapter 10, volume 4

The quantity of manure and its specific volatile solids (SVS) content are not directly measured. Therefore, Equation 1 is adopted to calculate BEy.

5.2 Project Emissions

Two stages are involved in the manure treatment for the project activity: (1) liquid-phase ; (2) solid-phase.

5.2.1 Emission calculation in liquid-phase treatment of fecal sewage

PE_y is determined using the the methodology AMS.III.D "Methane recovery in animal manure management systems". Project activity emissions consist of:

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

(b)Emissions from flaring or combustion of the gas stream;

(c)CO_2 emissions from use of fossil fuels or electricity for the operation of all the installed facilities;

(d)Emissions from the storage of manure before being fed into the anaerobic digester.

$$PE_y = PE_{PL,y} + PE_{flare,y} + PE_{power,y} + PE_{transp,y} + PE_{storage,y} \quad \text{(Equation 6)}$$

where:

PE_y	Project emissions in year *y* (t CO_2e)
$PE_{PL,y}$	Emissions due to physical leakage of biaogas in year *y* (t CO_2e)
$PE_{flare,y}$	Emissions from flaring or combustion of the biogas stream in the year *y* (t CO_2e)
$PE_{power,y}$	Emissions from the use of fossil fuel or electricity for the operation of the installed facilities in the year *y* (t CO_2e)
$PE_{storage,y}$	Emissions from the storage of manure (t CO_2e)

(A)Emissions due to physical leakage of biogas($PE_{PL,y}$)

Ooption 1:

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

a) 10% of the maximum methane producing potential of the manure fed into the management systems implemented by the project activity.

(i) If the option (A) is chosen in “baseline emissions”, it is determined as:

$$PE_{PL,y} = 0.10 \times GWP_{CH4} \times D_{CH4} \times \sum_{i,LT} B_{0,LT} \times N_{LT,y} \times VS_{LT,y} \times MS\%_{i,y} \quad \text{(Equation 7)}$$

where:

$MS\%_{i,y}$ Fraction of manure handled in system i in year *y*

(ii) If the option (B) is chosen in “baseline emissions”, it is determined as:

$$PE_{PL,y} = 0.10 \times GWP_{CH4} \times D_{CH4} \times \sum_{i,LT} B_{0,LT} \times Q_{manure,LT,y} \times SVS_{LT,y} \times MS\%_{i,y} \quad \text{(Equation 8)}$$

b) Optionally, the relevant procedure in the methodological tool “Project and leakage emissions from anaerobic digesters” may be followed. In such a case, $PE_{PL,y}$ is equivalent to $PE_{CH4,y}$ in the tool.

Project emissions of methane from the anaerobic digester include emissions during maintenance of the digester, physical leaks through the roof and side walls, and release through safety valves due to excess pressure in the digester. These emissions are calculated using a default emission factor ($EF_{CH4,default}$), as follows:

$$PE_{CH4,y} = Q_{CH4,y} \times EF_{CH4,default} \times GWP_{CH4} \quad \text{(Equation 9)}$$

where:

$PE_{CH4,y}$	Project emissions of methane from the anaerobic digester in year y (t CO_2e
$Q_{CH4,y}$	Quantity of methane produced in the anaerobic digester in year y (t CH_4)
$EF_{CH4,default}$	Default emission factor for the fraction of CH_4 produced that leaks from the anaerobic digester (fraction)
GWP_{CH4}	Global warming potential of CH_4 (t CO_2 / t CH_4)

Determination of the quantity of methane produced in the digester ($Q_{CH4,y}$)

In the tool “Project and leakage emissions from anaerobic digesters”, there are two different procedures to determine the quantity of methane produced in the digester in year y ($Q_{CH4,y}$). For large scale projects only Option 1 shall be used. For small scale projects, project participants may choose between Option 1 or Option 2.

Option 1: Procedure using monitored data

$Q_{CH4,y}$ shall be measured using the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream". When applying the tool, the following applies:

(a) The gaseous stream to which the tool is applied is the biogas collected from the digester;

(b) CH_4 is the greenhouse gas i for which the mass flow should be determined; and

(c) The flow of the gaseous stream should be measured on an hourly basis or a smaller time interval; and then accumulated for the year y. Please note that units need to be converted to tons, when applying the results in this tool.

Option 2: Procedure using a default value

The flow of the biogas is measured and a default value is used for the fraction of methane in the biogas, as follows:

$$Q_{CH4,y} = Q_{biogas,y} \times f_{CH4,default} \times \rho_{CH4} \qquad \text{(Equation 10)}$$

where:

$Q_{CH4,y}$ Quantity of methane produced in the digester in year y (t CH_4)

$Q_{biogas,y}$ Amount of biogas collected at the digester outlet in year y (Nm^3 biogas)

$f_{CH4,default}$ Default value for the fraction of methane in the biogas (m^3 CH_4 / m^3 biogas)

ρ_{CH4} Density of methane at normal conditions (t CH_4 / Nm^3 CH_4)

We measured the flow rate of biogas, therefore Option 2 is adopted. Use this value for Option 2 of the step "Determination of the quantity of methane produced in the digester" ,default value for the fraction of methane in the biogas is 0.6 m^3 CH_4 / m^3 biogas corrected to reference conditions.

The option(A) is chosen in "baseline emissions", therefore Option 1 a) is adopted to calculate $PE_{PL,y}$.

(B）Calculation of project emissions from flaring($PE_{flare,y}$)

In the case of flaring of the recovered biogas, project emissions are estimated using the procedures described in the methodological tool "Project emissions from flaring". If the recovered biogas is combusted for electrical/thermal energy production or for other gainful use, the methane destruction efficiency can be considered as 100%. However, this use of the recovered biogas shall be included in the project boundary and its output shall be monitored in order to ensure that the recovered biogas is actually destroyed, even if the emission reductions from this component are not claimed.

Using the method tool "TOOL06 Project emissions from flaring".Step 3: Calculation of project emissions from flaring . Project emissions from flaring are calculated as the sum of emissions for each minute m in year y, based on the methane mass flow in the residual gas ($F_{CH4,RG,m}$) and the flare efficiency ($\eta_{flare,m}$), as follows:

$$\mathrm{PE}_{flare,y} = \mathrm{GWP}_{CH_4} \times \sum_{m=1}^{525600} F_{CH_4,RG,m} \times (1-\eta_{flare,m}) \times 10^{-3} \qquad \text{(Equation 11)}$$

Where:

$PE_{flare,y}$	Project emissions from flaring of the residual gas in year y (t CO_2e)
GWP CH_4	Global warming potential of methane valid for the commitment period (t CO_2e/t CH_4)
$F_{CH4,RG,m}$	Mass flow of methane in the residual gas in the minute m (kg)
$\eta_{flare,m}$	Flare efficiency in the minute m

(C）Emissions from the use of fossil fuel or electricity (*$PE_{Power,y}$*)

In the AMS-III.D, project emissions from electricity and fossil fuel consumption are determined by following the methodological tool “Project and leakage emissions from anaerobic digesters”, where $PE_{Power,y}$ is the sum of $PE_{EC,y}$ and $PE_{FC,y}$ in the tool.

Determination of project emissions from electricity consumption (*$PE_{EC,y}$*)

This step is applicable if the anaerobic digester consumes electricity, such as for mixing, recirculation of digestate, or processing of feed material. If the electricity consumed is generated on-site using biomass residues, wind, hydro or geothermal power, then $PE_{EC,y}$ = 0. Otherwise, the project participants may choose between the following two options to calculate $PE_{EC,y}$:

Option 1:Procedure using monitored data

$PE_{EC,y}$ shall be calculated using the “Tool to calculate baseline, project and/or leakage emissions from electricity consumption”, where the project emission source *j* referred to in the tool is the total electricity consumption associated with the anaerobic digestion facility.

Option 2:Procedure using default data

Project emissions from electricity consumption associated with the anaerobic digester are calculated as follows:

$$\mathrm{PE}_{EC,y} = Q_{CH4,y} \times F_{EC,default} \times EF_{EL,default} \qquad \text{(Equation 12)}$$

Where:

$PE_{EC,y}$	Project discharge of electricity consumption related to anaerobic digester
$Q_{CH4,y}$	Methane production in anaerobic digester
$F_{EC,default}$	Default coefficient of electricity consumption per ton of methane produced by anaerobic digester

$EF_{EL,default}$ Default emission coefficient of electric power

In Data /Parameter table 5 on page 12 of tool 14: For digesters other than those specified above, which are fed by gravity, and have no recirculation and therefore no electrical energy is required to operate, apply a value of 0 MWh/t CH_4 produced. For upflow anaerobic sludge blanket reactor (UASB)/ filter bed reactor for wastewater/fluidized bed reactor, $F_{EC,default}$ = 0.01 MWh/t CH_4 produced.

This project does not monitor the power consumption data, therefore Option 2 is adopted to calculate $PE_{EC,y}$.

Determination of project emissions from fossil fuel consumption ($PE_{FC,y}$)

Where the anaerobic digester facility uses fossil fuels, project participants shall calculate $PE_{EC,y}$ using the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion". The project emission source j referred to in the tool is fossil fuel consumption associated with the anaerobic digestion facility (not including fossil fuels consumed for transportation of feed material and digestate or any other on-site transportation)

In the method tool "TOOL03 Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion", CO_2 emissions from fossil fuel combustion in process *j* are calculated based on the quantity of fuels combusted and the CO_2 emission coefficient of those fuels, as follows:

$$\mathrm{PE}_{FC,\mathrm{j},y} = \sum_{i} FC_{i,j,y} \times COEF_{i,j} \qquad \text{(Equation 13)}$$

Where:

$PE_{FC,j,y}$	Are the CO_2 emissions from fossil fuel combustion in process j during the year y (tCO_2/yr)
$FC_{i,j,y}$	Is the quantity of fuel type i combusted in process j during the year y (mass or volume unit/yr)
$COEF_{i,y}$	Is the CO_2 emission coefficient of fuel type i in year y (tCO_2/mass or volume unit)
i	Are the fuel types combusted in process j during the year y

Option 1:

The CO_2 emission coefficient $COEF_{i,y}$ can be calculated using one of the following two Options, depending on the availability of data on the fossil fuel type *i*, as follows:

If $FC_{i,j,y}$ is measured in a mass unit:

$$\mathrm{COEF}_{i,y} = w_{c,i,y} \times 44/12 \qquad \text{(Equation 14)}$$

If $FC_{i,j,y}$ is measured in a volume unit:

$$\mathrm{COEF}_{i,y} = w_{c,i,y} \times \rho_{\mathrm{i},y} \times 44/12 \qquad \text{(Equation 15)}$$

Where:

$COEF_{i,y}$	Is the CO_2 emission coefficient of fuel type i (t CO_2/mass or volume unit)
$W_{c,i,y}$	Is the weighted average mass fraction of carbon in fuel type i in year y (tC/mass unit of the fuel)
$P_{i,y}$	Is the weighted average density of fuel type i in year y (mass unit/volume unit of the fuel)
i	Are the fuel types combusted in process j during the year y

Option 2:

The CO_2 emission coefficient $COEF_{i,y}$ is calculated based on net calorific value and CO_2 emission factor of the fuel type *i*, as follows:

$$\mathrm{COEF}_{i,y} = NCV_{i,y} \times EF_{CO2,i,y} \qquad \text{(Equation 16)}$$

Where:

$COEF_{i,y}$	Is the CO_2 emission coefficient of fuel type i in year y (tCO_2/mass or volume unit)
$NCV_{i,y}$	Is the weighted average net calorific value of the fuel type i in year y (GJ/mass or volume unit)
$EFCO_{2,i,y}$	Is the weighted average CO_2 emission factor of fuel type i in year y (tCO_2/GJ)
i	Are the fuel types combusted in process j during the year y

There is no the availability of data on the fossil fuel , therefore Option 2 is adopted to calculate $PE_{FC,y}$.

There is no need to calculate the values of $PE_{transp,y}$ and $PE_{storage,y}$, because the swine manure will be transported and fed into the anaerobic digester in 24 hours.

For a well-managed aerobic treatment system, its emissions are 0.

5.2.2 Emission calculation in solid-phase treatment of fecal sewage

In the AMS-III.F, project emissions from composting process (PE_y) shall be determined as per the latest version of the methodological tool "Project and leakage emissions from composting".PE_y is equivalent to parameter $PE_{COMP,y}$ in the tool.The project emissions from composting ($PE_{COMP,y}$) are determined as follows:

$$\mathrm{PE}_{COMP,y} = PE_{EC,y} + PE_{FC,y} + PE_{CH4,y} + PE_{N2O,y} + PE_{RO,y} \qquad \text{(Equation 17)}$$

Where:

$PE_{COMP,y}$	Project emissions associated with composting in year y (t CO_2e/yr)
$PE_{EC,y}$	Project emissions from electricity consumption associated with composting in year y (t CO_2/yr)
$PE_{FC,y}$	Project emissions from fossil fuel consumption associated with composting in year y

(t CO_2/yr)

$PE_{CH4,y}$ Project emissions of methane from the composting process in year y (t CO_2e/yr)

$PE_{N2O,y}$ Project emissions of nitrous oxide from the composting process in year y (t CO_2e/yr)

$PE_{RO,y}$ Project emissions of methane from run-off wastewater associated with co-composting in year y (t CO_2e/yr)

(A)Determination of the quantity of waste composted(*Q_y*)

The quantity of waste composted is a parameter required in the determination of emissions associated with each source of project emissions. There are two options to determine the quantity of waste composted in year y (Q_y). In case of co-composting, wastewater is not accounted for in the estimation of Q_y.

Option 1:Procedure using a weighing device

Monitor the weight of waste delivered to the composting installation using an on-site weighbridge or any other applicable and calibrated weighing device.

Option 2:Procedure without using a weighing device

This procedure shall only be applied in the case that there is no weighbridge or any other applicable and calibrated weighing device available on site. Under this procedure, Q_y is calculated based on the carrying capacity of each truck delivering waste to the composting installation in year y (CT_y), as follows:

$$Q_y = \sum_i CT_{t,y} \qquad \text{(Equation 18)}$$

Where:

Q_y Quantity of waste composted in year y (t / yr)

$CT_{t,y}$ Carrying capacity of truck t used in year y to deliver waste to the composting installation (t)

t Waste deliveries in trucks to the composting installation in year y

The project uses a forklift to transport the manure to the composting workshop. The transportation range is controlled within the factory area, and does not involve the transportation of manure from outside the plant area. All manure comes from pigs in the breeding area. The number of transports is recorded by the worker and the forklift load is determined using the technical parameters provided by the supplier. Due to the short transport distances and no long-distance transport, transport-related emissions are included in the calculation of fossil fuel emissions consumed by the composting system.

(B)Determination of project emissions from electricity consumption(*$PE_{EC,y}$*)

Option 1:

Where the composting activity involves electricity consumption from the grid or from a fossil fuel fired on-site power plant, $PE_{EC,y}$ shall be calculated using the latest approved version of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation", where the project emission source j referred to in the tool is composting, as follows:

$$\mathrm{PE}_{EC,y} = \sum_j EC_{PJ,j,y} \times EF_{EF,j,y} \times \left(1 + TDL_{j,y}\right) \qquad \text{(Equation 19)}$$

Where:

$PE_{EC,y}$	Project emissions from electricity consumption in year y (t CO_2 / yr)
$EC_{PJ,j,y}$	Quantity of electricity consumed by the project electricity consumption source j in year y (MWh/yr)
$EF_{EF,j,y}$	Emission factor for electricity generation for source j in year y (t CO_2/MWh)
$TDL_{j,y}$	Average technical transmission and distribution losses for providing electricity to source j in year y
j	Sources of electricity consumption in the project
k	Sources of electricity consumption in the baseline
l	Leakage sources of electricity consumption

Option 2:

If monitored data for electricity consumption is not available, electricity consumption from composting ($EC_{pj,comp,y}$) may be determined based on a default value for the specific quantity of electricity consumed per tonne of waste composted ($SEC_{comp,default}$), according to equation 3. Note that the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" also provides options to calculate emission based on nonmonitored parameters, including a default emission factor for the emissions per MWh of electricity consumed and an option to estimate electricity consumption based on the rated capacity of the captive power plant (if applicable).

$$\mathrm{EC}_{PJ,comp,y} = Q_y \times SEC_{comp,default} \qquad \text{(Equation 20)}$$

Where:

$PE_{EC,y}$	Quantity of electricity consumed for composting in year y (MWh/yr)
Q_y	Quantity of waste composted in year y (t/yr)
$SEC_{comp,default}$	Default value for the specific quantity of electricity consumed per tonne of waste composted (MWh/t)

The proposed project does not monitor power consumption data, therefore Option1 is adopted to calculate $PE_{EC,y}$.

(C)Determination of project emissions from fossil fuel consumption($PE_{FC,y}$)

Where the composting activity involves fossil fuel consumption, project participants may choose between the following two options to calculate $PE_{FC,y}$:

Option 1: Procedure using monitored data

$PE_{FC,y}$ shall be calculated using the latest approved version of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion", where the project emission source j referred to in the tool is composting.

Option 2:Procedure using a default value

Project emissions from fossil fuel consumption associated with composting are calculated as follows:

$$\mathrm{PE}_{FC,y} = Q_y \times EF_{FC,default} \qquad \text{(Equation 21)}$$

Where:

$PE_{FC,y}$	Project emissions from fossil fuel consumption associated with composting in year y (t CO_2 / yr)
Q_y	Quantity of waste composted in year y (t/yr)
$EF_{FC,default}$	Default emission factor for fossil fuels consumed by the composting activity per tonne of waste (t CO_2/t)

(D)Determination of project emissions of methane($PE_{CH4,y}$)

Project emissions of methane from composting ($PE_{CH4,y}$) are determined as follows:

$$\mathrm{PE}_{CH4,y} = Q_y \times EF_{CH4,y} \times GWP_{CH4} \qquad \text{(Equation 22)}$$

Where:

$PE_{CH4,y}$	Project emissions of methane from the composting process in year y (t CO_2e / yr)
Q_y	Quantity of waste composted in year y (t / yr)
$EF_{CH4,y}$	Emission factor of methane per tonne of waste composted valid for year y (t CH_4 / t)
GWP_{CH4}	Global Warming Potential of CH_4 (t CO_2e / t CH_4)

Option 1 Procedure using monitored data

$EF_{CH4,y}$ is determined based on measurements of the methane emissions during a composting cycle ($ECC_{CH4,c}$), as follows:

$$\mathrm{EF}_{CH4,y} = \frac{\sum_{c=1}^{x} ECC_{CH4,c} / Q_c}{x} \qquad \text{(Equation 23)}$$

Where:

$EF\ CH_{4,y}$	Emission factor of methane per tonne of waste composted valid for year y (t CH_4/t)
$ECC\ CH_{4,c}$	Methane emissions from composting during the composting cycle c (t CH_4)
Q_c	Quantity of waste composted in composting cycle c (t)
c	Composting cycles for which measurements were undertaken
x	Number of composting cycles c for which emissions were measured in year y (at least three)

Option 2: Procedure using default values

Use default of "TOOL13:Project and leakage emissions from composting （Version 02.0）"： $EF\ CH_{4,y}=EF\ CH_{4,default}$. The default value is provided in the "Data and parameters not monitored" section of this tool.

This project does not monitor methane emissions from composting during the composting cycle, therefore,The value of $EF\ CH_{4,y}$ is 0.002 t CH_4/t.

(E)Determination of project emissions of nitrous oxide($PE_{N2O,y}$)

Project emissions of nitrous oxide from composting ($PE_{N2O,y}$) are determined as follows:

$$PE_{N2O,y} = Q_y \times EF_{N2O,y} \times GWP_{N2O} \qquad \text{(Equation 24)}$$

Where:

$PE_{N2O,y}$	Project emissions of nitrous oxide from composting in year y (t CO_2e/yr)
Q_y	Quantity of waste composted in year y (t / yr)
$EF_{N2O,y}$	Emission factor of nitrous oxide per tonne of waste composted valid for year y (t N_2O/t)
GWP_{N2O}	Global Warming Potential of N_2O (t CO_2e/t N_2O)

Option 1: Procedure using monitored data

$EF_{N2O,y}$ is determined based on measurements of the emissions during a composting cycle ($ECC_{N2O,c}$), as follows:

$$EF_{N2O,y} = \frac{\sum_{c=1}^{x} ECC_{N2O,c} / Q_c}{x} \qquad \text{(Equation 25)}$$

Where:

$EF_{N2O,y}$	Emission factor of nitrous oxide per tonne of waste composted valid for year y (t N_2O/t)
$ECC_{N2O,c}$	Nitrous oxide emissions from composting during the composting cycle c (t N_2O)
Qc	Quantity of waste composted in composting cycle c (t)
c	Composting cycles for which measurements were undertaken

x Number of composting cycles c for which emissions were measured in year y (at least three)

Option 2: Procedure using default values

Use default of “TOOL13:Project and leakage emissions from composting （Version 02.0）” : $EF_{N2O,y} = EF_{N2O,default}$. The default value is provided in the “Data and parameters not monitored” section of this tool.

This project does not monitor N_2O emissions from composting during the composting cycle, therefore,The value of $EF_{N2O,y}$ is 0.0002 t N_2O/t.

(F)Determination of project emissions from run-off wastewater($PE_{RO,y}$)

Project emissions of methane from run-off wastewater ($PE_{RO,y}$) are calculated only for the case of co-composting. Moreover, if run-off wastewater is collected and re-circulated to the composting process, then $PE_{RO,y}$ is assumed to be zero (for example, this is the case for tunnel co-composting technology). Otherwise, $PE_{RO,y}$ is calculated based on the quantity and chemical oxygen demand (COD) of run-off wastewater as follows:

$$\mathrm{PE}_{RO,y} = Q_{COD,y} \times B_{o,ww} \times MCF_{ww,treatment} \times \varphi \times GWP_{CH4} \quad \text{(Equation 26)}$$

Where:

$PE_{RO,y}$	Project emissions of methane from run-off wastewater associated with co-composting in year y (t CO_2e / yr)
$Q_{COD,y}$	Quantity of COD of the run-off wastewater from the co-composting installation in year y (t COD / yr)
$B_{0,ww}$	Default methane producing capacity of the run-off wastewater (t CH_4 / t COD)
$MCF_{ww,treatment}$	Default methane correction factor for the wastewater treatment system where the run-off wastewater is treated
φ	Default model correction factor to account for model uncertainties of methane emissions from run-off wastewater
GWP CH_4	Default model correction factor to account for model uncertainties of methane emissions from run-off wastewater

1) Quantity of COD of the run-off wastewater from the co-composting installation

Option 1: Procedure monitoring quantity and COD of the run-off wastewater

$$\mathrm{Q}_{COD,y} = Q_{RO,y} \times COD_{RO,y} \quad \text{(Equation 27)}$$

Where:

$Q_{COD,y}$ Quantity of COD of the run-off wastewater from the co-composting installation in year y (t COD / yr)

$Q_{RO,y}$ Volume of run-off wastewater from the co-composting installation in year y (m^3 / yr)

$COD_{RO,y}$	Average COD of the run-off wastewater from the co-composting installation valid for year y (t COD / m^3)

Option 2: Procedure monitoring quantity and COD of the wastewater co-composted

$Q_{COD,y}$ is estimated using a default factor and monitoring the quantity and COD of the wastewater co-composted. This option is given as a potential simplification, because the quantity and COD of the wastewater may already be monitored due to requirements in the methodology that is referring to this tool.

$$Q_{COD,y} = Q_{wastewater,y} \times COD_{wastewater,y} \times DF_{COD,RO} \quad \text{(Equation 28)}$$

Where:

$Q_{COD,y}$	Quantity of COD of the run-off wastewater from the co-composting installation in year y (t COD / yr)
$Q_{wastewater,y}$	Volume of wastewater co-composted in year y (m^3 / yr)
$COD_{wastewater,y}$	Average COD of the wastewater co-composted valid for year y (t COD / m^3)
$DF_{COD,RO}$	Default factor for the ratio of the amount of COD in run-off wastewater and wastewater co-composted

Project emissions of methane from run-off wastewater ($PE_{RO,y}$) are calculated only for the case of co-composting. The project adopts the strip-stack composting process, which does not involve combined composting of wastewater, and no wastewater runoff is generated, so there is no runoff discharge. Therefore, this project is not involved.

5.3 Leakage

5.3.1 The calculation of leakage (liquid phase)

In method tool “TOOL14 Project and leakage emissions from anaerobic digesters” ,The leakage emissions associated with the anaerobic digester ($LE_{AD,y}$) depend on how the digestate is managed. They include emissions associated with storage and composting of the digestate and are determined as follows:

$$LE_{AD,y} = LE_{storage,y} + LE_{comp,y} \quad \text{(Equation 29)}$$

Where:

$LE_{AD,y}$	Leakage emissions associated with the anaerobic digester in year y (t CO_2e)
$LE_{storage,y}$	Leakage emissions associated with storage of digestate in year y (t CO_2e)
$LE_{comp,y}$	Leakage emissions associated with composting digestate in year y (t CO_2e)

Step1:Determination of leakage emissions associated with storage of digestatee($LE_{storage,y}$)

This step applies in the case that the digestate is stored under the following anaerobic conditions:

(a) In an un-aerated lagoon that has a depth of more than one meter; or

(b) In a SWDS, including stockpiles that are considered a SWDS as per the definitions section

Storage of digestate under anaerobic conditions can cause CH_4 emissions due to further anaerobic digestion of the residual biodegradable organic matter. The procedure for determining $LE_{storage,y}$ is distinguished for liquid digestate and solid digestate.

(A)Determining $LE_{storage,y}$ for liquid digestate

Where digestate is liquid, as per the definitions section, or where a liquid fraction of mechanically separated digestate is stored, then choose between Options 1 or 2 below to determine $LE_{storage,y}$.

Option 1: Procedure using monitored data

$$\mathrm{LE}_{storage,y} = Q_{stored,y} \times P_{COD,y} \times B_o \times MCF_p \times GWP_{CH4} \quad \text{(Equation 30)}$$

Where:

$LE_{storage,y}$	Leakage emissions associated with storage of digestate in year y (t CO_2e)
$Q_{stored,y}$	Amount of liquid digestate stored anaerobically in year y (m^3)
$P_{COD,y}$	Average chemical oxygen demand (COD) of the liquid digestate in year y (t COD / m^3)
B_0	Maximum methane producing capacity of the COD applied (t CH_4 / t COD)
MCF	Methane conversion factor (fraction)
GWP CH_4	Global warming potential of CH_4 (t CO_2 / t CH_4)

Option 2: Procedure using a default value

$$\mathrm{LE}_{storage,y} = F_{ww,CH4,default} \times Q_{CH4,y} \times GWP_{CH4} \quad \text{(Equation 31)}$$

Where:

$LE_{storage,y}$	Leakage emissions associated with storage of digestate in year y (t CO_2e)
$F_{ww,CH4,default}$	Default factor representing the remaining methane production capacity of liquid digestate (fraction)
$Q_{CH4,y}$	Quantity of methane produced in the digester in year y (t CH_4)
GWP CH_4	Global warming potential of CH_4 (t CO_2 / t CH_4)

The project has not monitored the COD value, therefore, we used ,Option 2 to calculate $LE_{storage,y}$.

(B)Determining $LE_{storage,y}$ for solid digestate

Option 1:Procedure using monitored data

$LE_{storage,}$ is determined using the methodological tool "Emissions from solid waste disposal sites". In this case, $LE_{storage,}$ corresponds to the parameter $LE\ CH_{4,SWDS,y,}$ in the tool and j represents the digestate that is disposed at a SWDS.

Option 2: Procedure using default values

$$LE_{storage,y} = F_{ww,CH4,default} \times Q_{CH4,y} \times GWP_{CH4} \qquad \text{(Equation 32)}$$

Where:

$LE_{storage,y}$	Leakage emissions associated with storage of digestate in year y (t CO_2e)
$F_{ww,}$ $CH_{4,default}$	Default factor representing the remaining methane production capacity of liquid digestate (fraction)
$Q\ CH_4$	Quantity of methane produced in the digester in year y (t CH_4)
$GWP\ CH_4$	Global warming potential of CH_4 (t CO_2 / t CH_4)

The swine mature and digestate are not transported to the solid waste disposal site,so there is no need to calculate the value of determining $LE_{storage,y}$

Step 2:Determination of leakage emissions associate with composting digestate(*$LE_{comp,y}$*)

$LE_{comp,y}$ shall be calculated using the methodological tool "Project and leakage emissions from composting". The term ***$PE_{comp,y}$***+ *$LE_{comp,y}$* in the methodological tool "Project and leakage emissions from composting" provides the value for ***$LE_{comp,y}$*** of this tool.

The organic fertilizer produced by the proposed project will be applied to the surrounding farmland, and there will be no long-term anaerobic storage and disposal to SWDS. According to paragraph 33 of TOOL13, there is no need to calculate the leakage of compost.

5.3.2 The calculation of leakage (solid phase)

Anaerobic storage is not carried out or disposed in SWDS in the composting process of the project, therefore, leakage calculation is not required.

5.4 Estimated Net GHG Emission Reductions and Removals

Regarding AMS-III.D, Page 13 - "MD_y - $PE_{power,y,expos}$", as determined in Eq. 10, will not be considered. Reason is:

AMS-III.D., page 13, Article 27 states: "The Methane-converting factor (*MCF*) of the active manure treatment system is highly likely to be higher than the *MCF* of the baseline manure treatment system, so the emission reduction adopted by the project activity is the minimum of the measured and simulated data". For this project, the total amount of methane produced by the anaerobic treatment system used in the project scenario must be higher than in the baseline scenario for the same manure treatment. Because the anaerobic system of the project activity is fully enclosed, it has more anaerobic conditions than the baseline scenario, and has better insulation effect. The internal methanogens are more active, and the organic components in the manure are more fully decomposed, resulting in more methane production.

Therefore, we believe that using "BE-PE-LE" method to calculate the emission reduction in the anaerobic part will be more conservative.

$$\mathrm{ER}_y = BE_y - PE_{y,\mathrm{solid}} - PE_{y,\mathrm{liquid}} - LE_{y,\mathrm{solid}} - LE_{y,\mathrm{liquid}} \quad \text{(Equation 33)}$$

Where:

ER_y	Emission reduction in the year y (t CO_2e)
BE_y	Baseline emissions(t CO_2e)
$PE_{y,solid}$	Project emissions(solid phase) (t CO_2e)
$PE_{y,liquid}$	Project emissions（liquid phase）(t CO_2e)
$LE_{y,solid}$	The calculation of leakage (solid phase)(t CO_2e)
$LE_{y,liquid}$	Project and leakage emissions from anaerobic digesters(t CO_2e)

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
19/08/2021-31/12/2021	61,640	7,221	2,975	51,444
01/01/2022-31/12/2022	166,655	19,523	8,043	139,089
01/01/2023-31/12/2023	166,655	19,523	8,043	139,089
01/01/2024-31/12/2024	167,112	19,576	8,065	139,470
01/01/2025-31/12/2025	166,655	19,523	8,043	139,089
01/01/2026-31/12/2026	166,655	19,523	8,043	139,089
01/01/2027-31/12/2027	166,655	19,523	8,043	139,089
01/01/2028-	167,112	19,576	8,065	139,470

31/12/2028				
01/01/2029-31/12/2029	166,655	19,523	8,043	139,089
01/01/2030-31/12/2030	166,655	19,523	8,043	139,089
01/01/2031-18/08/2031	105,015	12,302	5,068	87,645
Total(tCO_2e)	**1,667,463**	**195,337**	**80,474**	**1,391,652**
Average(tCO_2e /year)	**166,746**	**19,534**	**8,047**	**139,165**

Fram	year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
XD001	2021	11,771	1,525	629	9,617
	2022	31,826	4,123	1,701	26,002
XD002	2021	19,680	2,254	931	16,495
	2022	53,208	6,094	2,516	44,598
XD003	2021	19,935	2,254	931	16,750
	2022	53,899	6,094	2,516	45,289
XD004	2021	10,253	1,188	485	8,580
	2022	27,722	3,212	1,310	23,200
Total(tCO_2e)	2021	61,639	7,221	2,975	51,443
	2022	166,655	19,523	8,043	139,089

6 MONITORING

6.1 Data and Parameters Available at Validation\

Data / Parameter	GWP_{CH4}
Data unit	$t\ CO_2 / t\ CH_4$
Description	Global Warming Potential of CH_4
Source of data	IPCC Fifth Assessment Report
Value applied	28
Justification of choice of data or description of measurement methods and procedures applied	100-year values are adopted from Box 3.2, table 1, IPCC Fifth Assessment Report, 2014[22]
Purpose of Data	Calculation of baseline emissions and project emissions

Data / Parameter	GWP_{N2O}
Data unit	$t\ CO_2e / t\ N_2O$
Description	Global Warming Potential of N_2O
Source of data	IPCC Fifth Assessment Report
Value applied	265
Justification of choice of data or description of measurement methods and procedures applied	100-year values are adopted from Box 3.2, table 1, IPCC Fifth Assessment Report, 2014
Purpose of Data	Calculation of baseline emissions and project emissions
Comments	N/A

[22] https://www.ipcc.ch/site/assets/uploads/2018/02/SYR_AR5_FINAL_full.pdf

Data / Parameter	D_{CH4}
Data unit	t/m^3
Description	Density of CH_4
Source of data	AMS-III.D Version 21.0
Value applied	0.00067
Justification of choice of data or description of measurement methods and procedures applied	room temperature 20℃ and 1 atm pressure are adopted
Purpose of Data	Calculation of baseline emissions and project emissions
Comments	N/A

Data / Parameter	MCF_j
Data unit	-
Description	Methane conversion factor for the baseline AWMSj
Source of data	MCF_j : From IPCC 2006 table 10.17, chapter 10, volume 4. Average temperature: From the Statistical Yearbook of Hebei Province[23] and Jiangxi Climate Bulletin[24]
Value applied	see table below

NO.	City	Average temperature ℃	MCF %
XD001	Baoding City	12.9	68%
XD002	Anfu County	19.3	78%
XD003	Ji'an City	20.2	78%
XD004	Yongxin County	19	78%

[23] Statistical Yearbook of Heibei Province http://tjj.hebei.gov.cn/hetj/tjnj/2021/zk/indexch.htm

[24] Jiangxi Climate Bulletin http://jx.cma.gov.cn/zfxxgk/zwgk/sjtj_1/202303/P020230317379786742128.pdf

Justification of choice of data or description of measurement methods and procedures applied	MCF_j value for uncovered anaerobic lagoon (baseline AWMS) is chosen. A conservativeness factor needs to be applied by multiplying MCF_j value with a value of 0.94, to account for the 20 per cent uncertainty in the MCF_j values as reported by IPCC 2006.
Purpose of Data	Calculation of baseline emissions
Comments	N/A

Data / Parameter	$B_{0,\ LT}$
Data unit	m^3 CH_4/kg-dm
Description	Maximum methane producing potential of the volatile solid generated by animal type LT
Source of data	IPCC 2006 table 10A-7&8, chapter 10, volume 4
Value applied	0.29 for Market swine and Breeding swine
Justification of choice of data or description of measurement methods and procedures applied	Asia Value are adopted
Purpose of Data	Calculation of baseline emissions and project emissions
Comments	N/A

Data / Parameter Data unit	UF_b -
Description	Model correction factor to account for model uncertainties
Source of data	AMS-III.D.: “Methane recovery in animal manure management systems (Version 21.0)”
Value applied	0.94
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	Calculation of baseline emissions

Comments	N/A

Data / Parameter	$W_{default}$
Data unit	Kg
Description	Default average animal weight of a defined population
Source of data	IPCC 2006 table 10A-7 and 10A-8, chapter 10, volume 4
Value applied	28 kg for Market swine and Breeding swine
Justification of choice of data or description of measurement methods and procedures applied	Asia Value are adopted
Purpose of Data	Calculation of baseline emissions and project emissions
Comments	N/A

Data / Parameter	$VS_{default}$
Data unit	kg-dm/animal/day
Description	Default value for the volatile solid excretion per day on a dry-matter basis for a defined livestock population
Source of data	IPCC 2006 table 10A-7 and 10A-8, chapter 10, volume 4
Value applied	0.3 for Market swine and Breeding swine
Justification of choice of data or description of measurement methods and procedures applied	Since the 3 sites of the project activity are located in Ji'an City, Jiangxi Province, China, Asia. And 1 site of the project activity is located in Quyang County, Baoding City, Hebei Province, China, Asia. Asia Value are adopted.
Purpose of Data	Calculation of baseline emissions and project emissions

Comments	N/A

Data / Parameter	$\eta_{flare,m}$
Data unit	%
Description	methane destruction efficiency
Source of data	TOOL06.: "Project emissions from flaring (Version 04.0)" AMS-III.D.: "Methane recovery in animal manure management systems (Version 21.0)"
Value applied	80%
Justification of choice of data or description of measurement methods and procedures applied	The flares in this project belongs to enclosed flare. According to TOOL 06 :" Project emissions from flaring (Version 04.0)" paragraph 21: The technical solution provided by the flare supplier will be used as evidence to prove that the project uses a closed flare. So for enclosed flare, $\eta_{flare,m}$ is 90%. The default value applied shall be 80%, rather than 90%.
Purpose of Data	Calculation of project emission
Comments	N/A

Data / Parameter	$f_{CH4,default}$
Data unit	m^3 CH_4 / m^3 biogas corrected to reference conditions
Description	Methane content in biogas in the year y
Source of data	TOOL14 : "Project and leakage emissions from anaerobic digesters (Version 02.0)"
Value applied	0.6

Justification of choice of data or description of measurement methods and procedures applied	default value
Purpose of Data	Calculation of project emissions
Comments	N/A

Data / Parameter	$F_{EC,default}$
Data unit	MWh / t CH_4 produced
Description	Default factor for the electricity consumption associated with the anaerobic digester per ton of CH_4 generated.
Source of data	TOOL14: Project and leakage emissions from anaerobic digesters --- Version 02.0
Value applied	0.01.
Justification of choice of data or description of measurement methods and procedures applied	•0 - Covered anaerobic lagoons (gravity fed) / conventional digesters; • 0.01 - upflow anaerobic sludge blanket reactor (UASB) / filter bed reactor for wastewater / fluidized bed reactor; •1.02 - Conventional digesters with continuously stirred tank reactor type for wastewater; •1.54 - Any anaerobic digester for solid waste with pre-processing of wastes (e.g. pulverizing).
Purpose of Data	Calculation of project emission
Comments	N/A

Data / Parameter	$EF_{EL, default}$
Data unit	tCO_2/MWh
Description	The emission factors for electricity generation

Source of data	"Tool to calculate baseline, project and/or leakage emissions from electricity consumption"
Value applied	1.3
Justification of choice of data or description of measurement methods and procedures applied	Data/Parameter table 5 on page 13 of tool 14: Project and leakage emissions from anaerobic digesters(Version 02.0)
Purpose of Data	Calculation of project emission
Comments	N/A

Data / Parameter	$EF_{EF,\,j,\,y}$
Data unit	tCO_2/MWh
Description	The emission factors for electricity generation
Source of data	"Tool to calculate baseline, project and/or leakage emissions from electricity consumption"
Value applied	1.3
Justification of choice of data or description of measurement methods and procedures applied	Data/Parameter table 5 on page 13 of tool 14: Project and leakage emissions from anaerobic digesters (Version 02.0)
Purpose of Data	Calculation of project emission
Comments	N/A

Data / Parameter	$TDL_{j,y}$
Data unit	-
Description	Average technical transmission and distribution losses for providing electricity to source j in year y

Source of data	Published by analysis of line loss and line loss rate in China's power industry[25]
Value applied	0.056
Justification of choice of data or description of measurement methods and procedures applied	According to tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation”
Purpose of Data	Calculation of project emission
Comments	N/A

Data / Parameter	$SEC_{comp,default}$
Data unit	MWh/t
Description	Default value for the specific quantity of electricity consumed per tonne of waste composted
Source of data	TOOL13: Project and leakage emissions from composting (Version 02.0)
Value applied	0.01
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	Calculation of project emission
Comments	N/A

Data / Parameter	$EF_{FC, default}$
Data unit	tCO_2 / t

25 https://www.chyxx.com/industry/202112/991278.html

Description	Default emission factor for fossil fuel consumed by the composting activity per tonne of waste composted (wet basis)
Source of data	TOOL13: Project and leakage emissions from composting (Version 02.0)
Value applied:	0.0207
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	Calculation of project emission
Comments	N/A

Data / Parameter	$EF_{NO2,\ default}$
Data unit	tN_2O / t
Description	Default emission factor of nitrous oxide per tonne of waste composted (wet basis)
Source of data	TOOL13: Project and leakage emissions from composting (Version 02.0)
Value applied:	0.0002
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	Calculation of project emission
Comments	N/A

Data / Parameter	$EF_{CH4,\ default}$

Data unit	tCH_4 / t
Description	Default emission factor of methane per tonne of waste composted (wet basis)
Source of data	TOOL13: Project and leakage emissions from composting --- Version 02.0
Value applied:	0.002
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	Calculation of project emission
Comments	N/A

Data / Parameter	$F_{ww, CH4, default}$
Data unit	Fraction
Description	Default factor representing the remaining CH_4 production capacity of liquid digestate
Source of data	TOOL14: Project and leakage emissions from anaerobic digesters --- Version 02.0
Value applied:	0.15
Justification of choice of data or description of measurement methods and procedures applied	0.10: Covered anaerobic lagoons; 0.15: UASB type digesters / Anaerobic filter bed digesters / Anaerobic fluidized bed digesters; 0.20: Conventional digesters; 0.05: Two stage digesters
Purpose of Data	Calculation of project emission

Comments	N/A

6.2 Data and Parameters Monitored

Data unit	$N_{p,y}$
Data unit	Number
Description	Number of animals produced annually of type LT for the year y
Source of data	Estimated in advance, from the EIA design scale, and in the monitoring stage, the project sponsor monitors
Description of measurement methods and procedures to be applied	To be collected for each swine population in all of the swine barns. The number of swine produced in the farm will be recorded by the responsible staff.
Frequency of monitoring/recording	Monitored monthly
Value applied	Annual inventory about 98,630 (sell about 200,000) heads of market swine Annual inventory about 23,000 heads of breeding swine
Monitoring equipment	Manual record
QA/QC procedures to be applied	When the data is missing due to human factors and other factors, the sales records are given priority for determination. If none of them are available, it is conservatively regarded as 0. Archive electronically during project plus 5 years.
Purpose of data	Calculation of baseline emissions and project emissions
Calculation method	$N_{LT,y} = N_{da,y} * \left(\frac{N_{p,y}}{365}\right)$
Comments	N/A

Data / Parameter	$N_{da, y}$
Data unit	Number
Description	Number of days animal of type LT is alive in the farm in the year y
Source of data	Estimated in advance, the project sponsor predicts, and in the monitoring stage, the project sponsor monitors
Description of measurement methods and procedures to be applied	The days of swine alive in the farm will be recorded by the responsible staff.
Frequency of monitoring/recording	Monitored monthly
Value applied	About 365 days for breeding swine About 180 days for market swine
Monitoring equipment	Manual record
QA/QC procedures to be applied	When the data is missing due to human factors and other factors, the sales records are given priority for determination. If none of them are available, it is conservatively regarded as 0. Archive electronically during project plus 5 years.
Purpose of data	Calculation of baseline emissions and project emissions
Calculation method	$N_{LT,y} = N_{da,y} * \left(\frac{N_{p,y}}{365}\right)$
Comments	N/A

Data / Parameter	W_{site}
Data unit	kg

Description	Average animal weight of a defined livestock population at the project site
Source of data	Estimated in advance, the project sponsor predicts, and in the monitoring stage, the project sponsor monitors.
Description of measurement methods and procedures to be applied	Measured by the weight measurer
Frequency of monitoring/recording	monthly
Value applied	About 180 kg for breeding swine About 70 kg for market swine Since nursery pigs are easily frightened and weighed, it is difficult to monitor their body weight and treat them as 0, which is conservative.
Monitoring equipment	weight measurer
QA/QC procedures to be applied	This parameter is used in equation 4 for estimating VSLT,y using option 3, and in equation 2 (appendix 2) for estimating NEXLT,y when using IPCC 2006 default values. Sampling procedures can be used to estimate this variable, taking into account the following guidance: Sampling procedures can be used to estimate this variable as per the “Standard for sampling and surveys for CDM project activities and Programmes of Activities”. The project is sampled by simple random sampling with a confidence level of 95/10. At the same time, the coefficient of variation V is set to 1, and a 10% margin is considered in the result to ensure the accuracy of the sampling results. A detailed sampling plan will be provided to VVB for verification.
Purpose of data	Used for estimating $VS_{LT,y}$
Calculation method	Arithmetic mean of weight of all pigs drawn
Comments	N/A

Data / Parameter	n_{dy}
Data unit	Days
Description	Number of days that the animal manure management system was operational
Source of data	Estimated in advance, the project sponsor predicts, and in the monitoring stage, the project sponsor monitors.
Description of measurement methods and procedures to be applied	If any farm has no operations on a given day it needs to be documented (e.g. logbook) and taken into account for the calculation of *BEex post*
Frequency of monitoring/recording	Annually, based on monthly records
Value applied	365 days for ex ante estimation. The actual number of days treatment plant was operational used in the monitoring periods will be monitored by project proponents.
Monitoring equipment	Manual record
QA/QC procedures to be applied	When the farm stops production due to human factors, market factors or force majeure, the time of production stoppage and the time of resumption of work shall be recorded in time. Farm operating records can be used for cross-checking.
Purpose of data	Calculation of Baseline emissions
Calculation method	n_{dy} = 365 - Downtime
Comments	N/A

Data / Parameter	$MS_{\%j}$
Data unit	Fraction

Description	Fraction of manure handled in system j in project activity
Source of data	Equipment suppliers and related research
Description of measurement methods and procedures to be applied	Compare the solid-liquid separation efficiency provided by equipment suppliers with the dry matter separation efficiency given by relevant literature research, and select the most conservative value.
Frequency of monitoring/recording	Annually
Value applied	76% for water flushes manure process 22.8% for dry manure cleaning process
Monitoring equipment	Manual record
QA/QC procedures to be applied	The data statistician should go to the site at least once a year to confirm and record the manure cleaning and solid-liquid separation process to ensure that the MS% of the year has not changed. When the process is changed, the on-site workers shall record the time of process change in time, and the data statistician/consulting unit shall re-determine the MS% after the change, and retain relevant evidence for VVB review.
Purpose of data	Calculation of project emissions
Calculation method	$MS_{\%j}$= (1- Fecal clearance rate of scraper board) * Dry matter clearance rate of solid-liquid separator
Comments	VVB can get more detailed information in the parameter calculation description

Data / Parameter	$Q_{biogas,y}$
Data unit	Nm^3 biogas
Description	Amount of biogas collected at the digester outlet in year y
Source of data	The methane emission model is used to estimate in advance; the monitoring period is continuously measured by flow meters.

Description of measurement methods and procedures to be applied	After a series of purification measures such as dehydration and desulfurization, the biogas generated by the project is monitored by a gas flow meter (01) installed at the main pipeline, which has its own temperature and pressure sensor, and manually records the meter reading regularly (once a month). A gas flow meter is installed at the branch line conveyed to the power generation devices (02), and a gas flow meter is installed at the branch line conveyed to the flare (03), both flowmeters have their own temperature and pressure sensors, and the monitoring data will be recorded in real time through the PLC system and transmitted to the monitoring room of the breeding area. Under normal circumstances, the sum of the readings of flow meter(02) and flow meter(03) is the total biogas flow Q, when the data is missing due to the damage of flow meter(02) or flow meter(03), record the reading of the flow meter (FM01) before and after the failure, and use the most conservative temperature and pressure monitored during the stable operation of the adjacent month as the standard volume of gas during the accident as the total biogas flow during the accident.
Frequency of monitoring/recording	Continuously measurement by the flow meter. Data to be aggregated monthly and yearly
Value applied	About 2,900,000 Nm3/year
Monitoring equipment	Flow meters
QA/QC procedures to be applied	The calibration of flow meters, including the frequency of calibration, should be done per two years in accordance with national standards or requirements.
Purpose of data	Calculation of project emissions
Calculation method	(P1 * V1) / t1 = (P2 * V2) / t2 P1, V1 and T1 are the pressure, volume and temperature under the standard state, the units are MPa, Nm^3 and K respectively; P2, V2 and T2 are the pressure, volume and temperature in the actual state, and the units are MPa, m^3 and K respectively.
Comments	N/A

Data / Parameter	EGy
Data unit	MWh
Description	Total electricity generated from the recovered biogas in year y
Source of data	Estimated in advance, the project sponsor predicts, and in the monitoring stage, the project sponsor monitors.
Description of measurement methods and procedures to be applied	Workers regularly copy the readings of the power meters every month, and calculate and summarize the total power generation every year. When the data is missing due to meter damage or human factors, it should be treated as 0 to be conservative.
Frequency of monitoring/recording	Metered monthly
Value applied	About 5,800 MWh .
Monitoring equipment	electricity meter
QA/QC procedures to be applied	The electric meter shall be calibrated at least once a year according to relevant national requirements.
Purpose of data	Calculation of project emissions
Calculation method	N/A
Comments	N/A

Data / Parameter	Qy
Data unit	Tonnes
Description	Total quantity of waste composted in year y at the facility
Source of data	Estimated in advance, the project sponsor predicts, and in the monitoring stage, the project sponsor monitors.
Description of measurement methods and procedures to be	The feces are transferred to the composting workshop by the forklift, and the workers will record the number of times the vehicle is transported. The load of the forklift is calculated

applied	according to the parameters provided by the equipment supplier. To be conservative, if it is less than 0.5 shovel, it will be counted as 0.5 shovel, and if it is greater than 0.5 shovel but less than 1 The shovel is counted as 1 shovel.
Frequency of monitoring/recording	Annually, based on daily measurement
Value applied	About 10,900 t..
Monitoring equipment	Forklift and manual record
QA/QC procedures to be applied	The transportation times of the forklift will be recorded. If some data are missing due to human reasons, the missing data will be estimated in proportion to the highest monthly transportation volume of the year. The volume of the forklift is determined by the parameters provided by the equipment supplier. If the forklift is replaced, its volume will be re-verified at the time of certification.
Purpose of data	Calculation of project emissions
Calculation method	$$Q_y = \sum_t CT_{t,y}$$ $CT_{t,y}$: Carrying capacity of truck t used in year y to deliver waste to the composting installation (t) t: Waste deliveries in trucks to the composting installation in year y
Comments	N/A

Data / Parameter	Total number of jobs
Data unit	Number of full-time jobs created
Description	Full-time Jobs created for nearby villagers.
Source of data	Project proponents
Description of	The number of full-time jobs created will be recorded. Source of

measurement methods and procedures applied	data is record keeping book and it will be cross checked by the labor contracts.
Frequency of monitoring/recording	Annually
Value applied:	The project increase 8 full-time jobs created (including 4 females and 4 males)
Monitoring equipment	Manual record
QA/QC procedures applied	After the first verification, only changes in employees will be reported. The results will also be cross checked with labor contract.
Purpose of data	To demonstrate contribution to SDG 8
Calculation method	N/A
Comments	N/A

Data / Parameter	Organic fertilizers
Data unit	Tons
Description	The amount of the organic fertilizers generated
Source of data	Estimated in advance, the project sponsor predicts, and in the monitoring stage, the project sponsor monitors.
Description of measurement methods and procedures applied	As per the relevant provisions in AMS-III.F. The weighbridge at the gate of the field will be used to weigh the output of organic fertilizer. When the organic fertilizer is needed by the farmers, the farmer will weigh the empty weight of the transport vehicle at the gate of the factory. Weigh the full load weight of the transport vehicle, and subtract the two to get the weight of the organic fertilizer, which will be recorded by the guard or worker and summarized every month. When the truck scale is damaged, the organic fertilizer taken away by the farmer will be regarded as 0.
Frequency of monitoring/recording	Monthly

Value applied:	About 33,000 tons
Monitoring equipment	Electronic truck scale
QA/QC procedures applied	Measurement equipment will be calibrated as per industry standards The operating environment of the composting workshop and the turning conditions will be recorded to ensure the aerobic conditions of the composting process. The final use scene of the organic fertilizer will be recorded, and this information will be provided by the farmer who received the organic fertilizer, and will be recorded in the composting workshop operation log by the workers of the composting workshop. The factory area regularly applies self-produced organic fertilizers on its own consumption land in order to observe the soil and environmental conditions in the area and ensure that the distributed organic fertilizers are applied under aerobic conditions.
Purpose of data	To demonstrate contribution to SDG 12
Calculation method	Organic fertilizers = full load vehicle weight - empty load vehicle weight
Comments	N/A

6.3 Monitoring Plan

The monitoring plan presented in this PD assures that real, measurable, long term GHG emission reductions can be monitored, recorded and reported. It is a crucial procedure to identify the final VCUs of the project. This monitoring plan will be implemented by the project owner during the project operation. The details of the monitoring plan are specified as follows:

Monitoring framework

The project owner will be responsible for the whole monitoring work. The VCS Monitoring Team will be established to collect and record monitoring data within the project boundary. The VCS monitoring team will be responsible for the normal operation of the manure treatment system and the collection and record of all the monitoring data. All the data will be reviewed by the project developer and VVB. Each member of the VCS monitoring team will be trained by the project owner at least once a year. The overall monitoring system structure of the project shows as below:

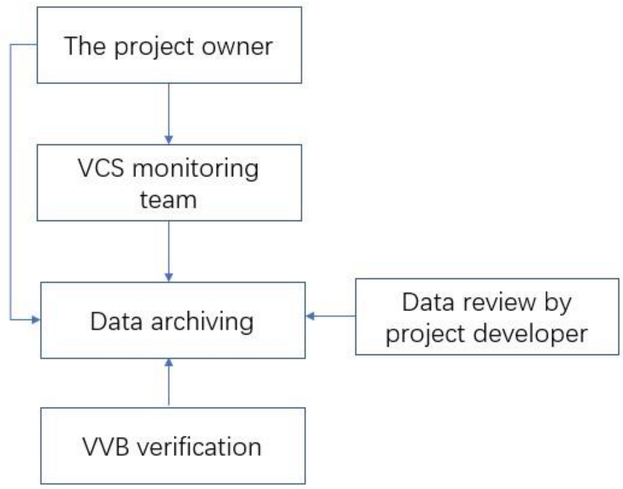

Figure 6-1 The Organization Structure of the Monitoring Team

Monitoring equipment and installation

Installation and configuration of monitoring equipment are shown as Figure 6-2. In order to ensure measurements with a low degree of uncertainty, the data monitoring equipment will be calibrated and checked by an appropriately qualified third party according to an appropriate national standard. The calibration records will be appropriately maintained and made available for review by VVB. During this monitoring period (Aug 19, 2021 to Dec 31, 2022), all measuring equipment has been calibrated in time, the calibration result is passed, and all equipment is within the validity period.

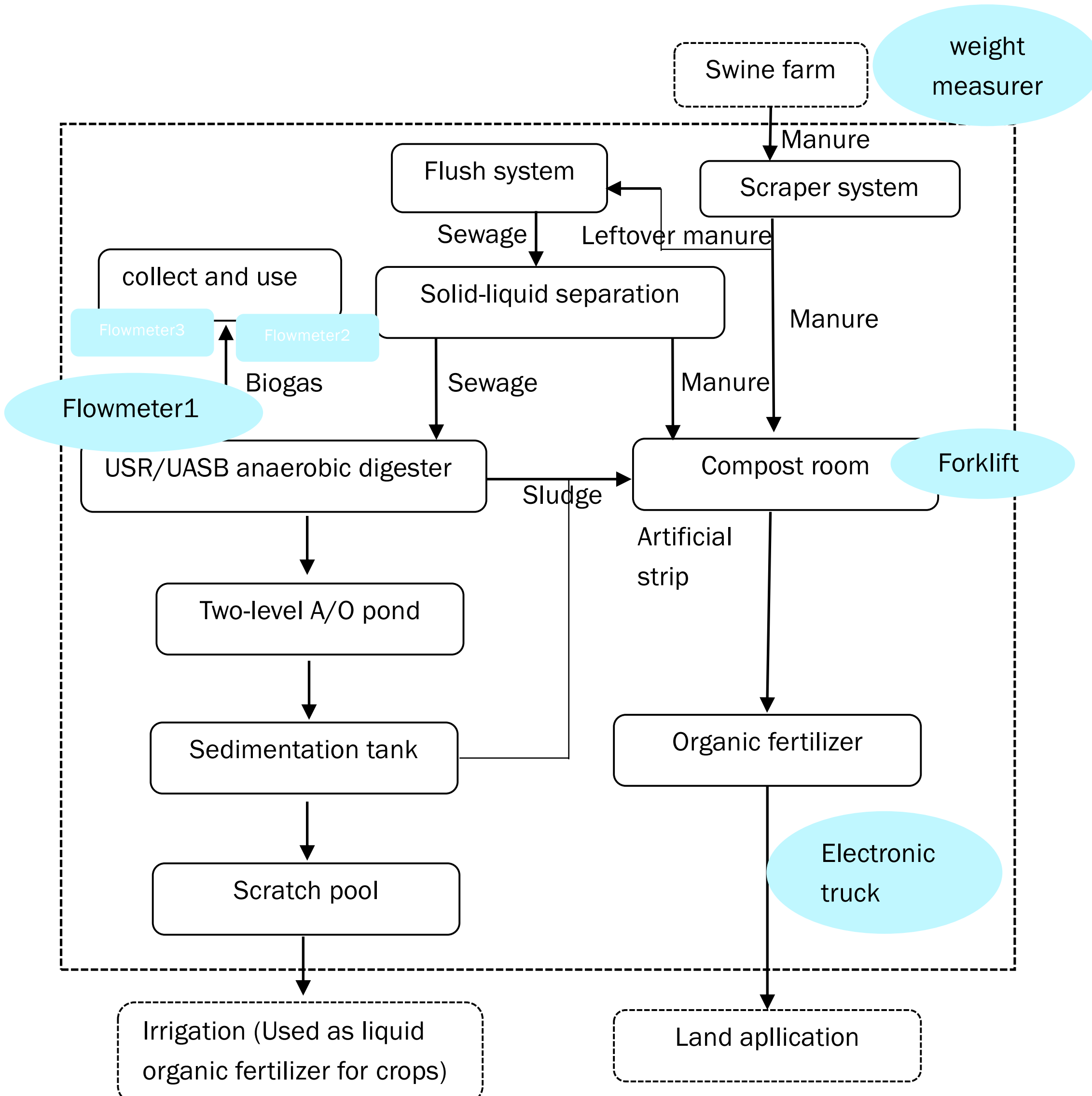

Figure 6-2 Installation and Configuration of Meters

Quality control and quality assurance procedures

A quality management system will be established, which ensures the quality and accuracy of the measured data.

Flowmeter: In the field, flowmeters are installed at the biogas outlet (L1) and the flare inlet (L2). Usually, L2 shall prevail (real-time measurement): when L2 fails, it will be recorded manually For L1 (not less than 1 time/month), the temperature and pressure adopt the monthly weighted average of adjacent months; when L1 and L2 are damaged at the same time, the flow rate is regarded as 0 for conservative reasons. Usually, the biogas volume deduced from the reading of L3 is added to L2 to obtain the total flow of biogas. When L2 is faulty, L2 is regarded as 0, and when L3 is faulty, L3 is regarded as 0.

Meter: When the meter is damaged, the power generation is regarded as 0.

Truck scale: a weighbridge used to weigh the output of organic fertilizer, the amount of organic fertilizer is regarded as 0 during the fault

Electronic scale: The electronic scale used to weigh pigs should be repaired and put into use as soon as possible due to the low frequency of monitoring (once per month) in case of failure. If data for a month is missing due to a failure, the lowest value for the entire year is used as the month's value.

Training

For all members involved in the project, necessary trainings will be provided by the project owner. Besides, the project owner should ensure that only skilled employees are allowed to undertake the monitoring work. The training contents should be regard to the general and technical aspects of the project to the extent appropriate, as well as basic understandings of VCS Standard and climate change.

Data management

All data collected as part of monitoring plan should be saved with at least 1 backup copy until the end of the crediting period. After the crediting period ends, the data should be archived electronically on hard disks and be kept at least 2 years after the end of the last crediting period. Corrective actions.

The project will sign an agreement that it will not participate in other environment credits, other GHG programs and has not been rejected by any other GHG Programs. The whole VCS monitoring team will follow recognized standard data evaluation methods to guarantee that the data is reliable and accurate. The quality control and quality assurance procedures include the handling and correction of nonconformities in the implementation of the project or the monitoring plan. In case such nonconformities are observed:

- An analysis of the nonconformity and its causes will be carried out immediately by the project owner, with the help of external experts if necessary.
- A corrective action plan should then be developed to eliminate the non-conformity and its causes to prevent its recurrence.
- Corrective actions are implemented and reported back to the VCS monitoring team.
- Relative information will be included in the monitoring report and reported to VVB during the verification.

If the data record is missing or damaged during the monitoring periods, the following makeup process will be conducted:

-The general principle is that Conservative value will be used for the missing or damaged data. This is most conservative approach. The monitoring personnel will be trained before the starting of the project operation to ensure that each team member is fully aware of and able to strictly follow this conservative principle. During the monitoring process, the monitoring personnel will be required to strictly abide by the above conservative principle in data recording, i.e., use Conservative value for all the missing or damaged data.

-If this is due to the working error of the monitoring personnel, further train the person until he or she can perform the job properly. And in the meantime, use Conservative value for the missing or damaged data;

-If this is due to the inability or attitude of a particular worker in monitoring team, dismiss such worker and re-hire those with proper ability and attitude. And in the meantime, use Conservative value for the missing or damaged data;

-If some data recorded are significantly higher than the normal range, the monitoring personnel should ask for the reason. If the measurement is high due to the damage of measurement equipment, Conservative value will be used for that day's data. And need to calibrate and maintain the measuring equipment immediately and avoid this situation in the future.

If the monitoring results are satisfactory in terms of correct reporting, data completeness and correct analysis, the data will be accepted for the monitoring report.

7 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

7.1 Data and Parameters Monitored

Information will be made available at Validation/Registration

The following monitored data sets are provided for the first issuance related to the first project activity instance (01/04/2021-31/12/2022).

Data / Parameter	$N_{LT,y}$
Data unit	Number
Description	Number of animals of type LT produced annually for the year y
Value applied	<table><tr><td>Time</td><td>XD001</td><td>XD002</td><td>XD003</td><td>XD004</td></tr><tr><td>2021</td><td>13,000</td><td>49,315</td><td>49,315</td><td>0</td></tr><tr><td>2022</td><td>13,000</td><td>49,315</td><td>49,315</td><td>10,000</td></tr></table>

Comments	-

Data / Parameter	Nd, y
Data unit	Number
Description	Number of days treatment plant was operational in year y.
Value applied	<table><tr><td>Time</td><td>XD001</td><td>XD002</td><td>XD003</td><td>XD004</td></tr><tr><td>2021</td><td>76</td><td>134</td><td>108</td><td>0</td></tr><tr><td>2022</td><td>365</td><td>365</td><td>365</td><td>263</td></tr></table>
Comments	-

Data / Parameter	W_{site}
Data unit	kg
Description	Average animal weight of a defined livestock population at the project
Value applied	<table><tr><td>Time</td><td>XD001</td><td>XD002</td><td>XD003</td><td>XD004</td></tr><tr><td>2021</td><td>180</td><td>70</td><td>70</td><td>0</td></tr><tr><td>2022</td><td>180</td><td>70</td><td>70</td><td>180</td></tr></table>
Comments	-

Data / Parameter	MS%j
Data unit	Fraction
Description	Fraction of manure handled in system j in project activity
Value applied	<table><tr><td>Time</td><td>XD001</td><td>XD002</td><td>XD003</td><td>XD004</td></tr><tr><td>2021</td><td>22.8%</td><td>22.8%</td><td>22.8%</td><td>/</td></tr><tr><td>2022</td><td>22.8%</td><td>22.8%</td><td>22.8%</td><td>22.8%</td></tr></table>

Comments	-

Data / Parameter	$Q_{biogas,y}$
Data unit	Nm^3 biogas
Description	Amount of biogas collected at the digester outlet in year y
Value applied	<table><tr><td>Time</td><td>$Q_{biogas,y}$</td></tr><tr><td>2021</td><td>2,400,000</td></tr><tr><td>2022</td><td>2,900,000</td></tr></table>
Comments	-

Data / Parameter	EG_y
Data unit	MWh
Description	Total electricity generated from the recovered biogas in year y
Value applied	<table><tr><td>Time</td><td>EG_y</td></tr><tr><td>2021</td><td>4,800</td></tr><tr><td>2022</td><td>5,800</td></tr></table>
Comments	-

Data / Parameter	Q_y
Data unit	Tonnes/year
Description	Total quantity of waste composted in year y at the facility
Value applied	<table><tr><td>Time</td><td>Q_y</td></tr><tr><td>2021</td><td>9,100</td></tr><tr><td>2022</td><td>10,900</td></tr></table>

Comments	-

Data / Parameter	Total number of jobs
Data unit	Number of full-time jobs created
Description	Full-time Jobs created for both male and female
Value applied:	Year: Number of full-time jobs created 2021: The project increase 6 full-time jobs created (including 3 females and 3 males) 2022: The project increase 8 full-time jobs created (including 2 females and 2 males)
Comments	N/A

Data / Parameter	Organic fertilizers
Data unit	Tons
Description	The amount of the organic fertilizers generated
Value applied:	Year: Organic fertilizers 2021: 27,300 2022: 30,300
Comments	N/A

7.2 Baseline Emissions

As per section 4.1 of this report, baseline emission is calculated as per equation (1) as below:

$$BE_y = GWP_{CH4} \times D_{CH4} \times UF_b \times \sum_{j,LT} MCF_j \times B_{0,LT} \times N_{LT,y} \times VS_{LT,y} \times MS\%_{Bl,j}$$

Parameter	Value				Unit
	Quyang Swine Farm Project	Anfu Swine Farm Project	Ji'an Swine Farm Project	Yongxin Swine farm	

	Breeding swine	Market Swine	Market Swine	Breeding swine	
GWP_{CH4}	28	28	28	28	tCO_2e/tCH_4
D_{CH4}	0.00067	0.00067	0.00067	0.00067	t/m^3
LT	-	-	-	-	-
j	-	-	-	-	-
MCF_j	68%	77%	78%	77%	-
$B_{0, LT}$	0.29	0.29	0.29	0.29	$m^3CH_4/kg\text{-}dm$
$VS_{LT, y}$	704	274	274	704	kg-dm/animal/year
$N_{da, LT}$	365	180	180	365	head
$N_{p,y}$	13,000	100,000	100,000	10,000	head
$N_{LT,y}$	13,000	49,315	49,315	10,000	head
$MS\%_{Bl, j}$	100%	100%	100%	100%	-
UF_b	0.94	0.94	0.94	0.94	-
W_{site}	180	70	70	180	kg
$W_{default}$	28	28	28	28	kg
$VS_{default}$	0.3	0.3	0.3	0.3	kg/hd/day
n_{dy}	365	365	365	365	days
Subtotal	**31,826**	**53,208**	**53,899**	**27,722**	**tCO_2e**
BE_y	**166,655**				**tCO_2e**

7.3 Project Emissions

Two stages are involved in the manure treatment for the project activity: (1) liquid-phase ; (2) solid-phase. As per section 4.2 of this report, project emission is calculated as per equation (6) and equation (17).

(1) liquid-phase: Emission calculation in liquid-phase treatment of fecal sewag is calculated as below:

$$\mathrm{PE}_{y} = PE_{PL,y} + PE_{flare,y} + PE_{power,y} + PE_{transp,y} + PE_{storage,y}$$

$$PE_{PL,y} = 0.10 \times GWP_{CH4} \times D_{CH4} \times \sum_{i,LT} B_{0,LT} \times N_{LT,y} \times VS_{LT,y} \times MS\%_{i,y}$$

Parameter	Value				Unit
	Quyang Swine Farm Project	Anfu Swine Farm Project	Ji'an Swine Farm Project	Yongxin Swine farm	
	Breeding swine	Market Swine	Market Swine	Breeding swine	
GWP_{CH4}	28	28	28	28	tCO_2e/tCH_4
D_{CH4}	0.00067	0.00067	0.00067	0.00067	t/m^3
LT	-	-	-	-	-
j	-	-	-	-	-
$B_{0,LT}$	0.29	0.29	0.29	0.29	$m^3CH_4/kg\text{-}dm$
$VS_{LT,y}$	704	274	274	704	kg-dm/animal/year
$N_{LT,y}$	13,000	49,315	49,315	10,000	No of heads
$MS\%_{i,j}$	22.8%	22.8%	22.8%	22.8%	-
Subtotal	**1,135**	**1,676**	**1,676**	**873**	**tCO_2e**
$PE_{PL,y}$	***5,360***				

$$\mathrm{PE}_{flare,y} = \mathrm{GWP}_{CH_4} \times \sum_{m=1}^{525600} F_{CH_4,RG,m} \times \left(1-\eta_{flare,m}\right) \times 10^{-3}$$

Parameter	Value				Unit
	Quyang Swine Farm Project	Anfu Swine Farm Project	Ji'an Swine Farm Project	Yongxin Swine farm	
	Breeding swine	Market Swine	Market Swine	Breeding swine	

GWP_{CH4}	28	28	28	28	tCO_2e/tCH_4
$F_{CH4,RG,m}$	0	0	0	0	kg
$\eta_{flare,m}$	80%	0.8	80%	80%	-
Subtotal	0	0	0	0	tCO_2e
$PE_{flare,y}$	0				tCO_2e

If the recovered biogas is combusted for electrical/thermal energy production or for other gainful use, the methane destruction efficiency can be considered as 100% which is shown on .paragraph 22 on page11 of AMS-III.D Version 21.0:Methane recovery in animal manure management systems (Version 21.0) .So $PE_{flare,y}$=0.

$$PE_{power,y} = PE_{EC,y} + PE_{FC,j,y}$$

$$PE_{EC,y} = Q_{CH4,y} \times F_{EC,default} \times EF_{EL,default}$$

$$MD_y = \frac{EG_y \times 3600}{NCV_{CH4} \times EE_y} \times D_{CH4} \times GWP_{CH4}$$

Parameter	Value				Unit
	Quyang Swine Farm Project	Anfu Swine Farm Project	Ji'an Swine Farm Project	Yongxin Swine farm	
	Breeding swine	Market Swine	Market Swine	Breeding swine	
$Q_{CH4,y}$	405	599	599	312	t
$F_{EC,default}$	0.01	0.01	0.01	0.01	MWh / t CH_4
$EF_{(EL,default)}$	1.3	1.3	1.3	1.3	tCO_2/MWh
Subtotal	*5*	*8*	*8*	*4*	tCO_2e
$PE_{EC,y}$	*25*				tCO_2e

The value of $F_{EC,default}$=0 in the situation of covered anaerobic lagoons on page 12 of tool 14: Project and leakage emissions from anaerobic digesters(Version 02.0).So $PE_{EC,y}$=0.

Parameter	Value				Unit
	Quyang Swine Farm Project	Anfu Swine Farm Project	Ji'an Swine Farm Project	Yongxin Swine farm	

	Market Swine	Market Swine	Market Swine	Breeding swine	
$PE_{PL,y}$	1,135	1,676	1,676	873	tCO_2e
$PE_{flare,y}$	0	0	0	0	tCO_2e
$PE_{power,y}$	5	8	8	4	tCO_2e
$PE_{transp,y}$	0	0	0	0	tCO_2e
$PE_{storage,y}$	0	0	0	0	tCO_2e
Subtotal	***1,140***	***1,684***	***1,684***	***877***	tCO_2e
PE_y	***5,385***				tCO_2e

Project emissions from Transportation and storage and power consumption are not applicable to the project and fall outside the project boundary. These emission sources are therefore assumed as zero.

(2) solid-phase: Emission calculation in solid-phase treatment of fecal sewage is calculated as below:

$$\mathrm{PE}_{COMP,y} = PE_{EC,y} + PE_{FC,y} + PE_{CH4,y} + PE_{N2O,y} + PE_{RO,y}$$

Project emissions from fossil fuel and combined composting are not applicable to the project. These emission sources are therefore assumed as zero.The emissions associated with electricity consumption were calculated using:

$$\mathrm{PE}_{EC,y} = \sum EC_{PJ,j,y} \times EF_{EF,j,y} \times \left(1 + TDL_{j,y}\right)$$

Parameter	Value				Unit
	Quyang Swine Farm Project	Anfu Swine Farm Project	Ji'an Swine Farm Project	Yongxin Swine farm	
	Breeding swine	Market Swine	Market Swine	Breeding swine	
Q_y	23,000	34,000	34,000	18,000	t
$SEC_{comp,default}$	0.01	0.01	0.01	0.01	MWh/t
$EF_{EF,j,y}$	1.3	1.3	1.3	1.3	tCO_2/MWh
$TDL_{j,y}$	0.056	0.056	0.056	0.056	-
$EC_{PJ,j,y}$	0	0	0	0	MWh
Subtotal	***0***	***0***	***0***	***0***	tCO_2e

$PE_{EC,y}$	0		tCO_2e

The project emissions associated with methane and nitrous oxide from composting were calculated using Tool 13:

$$PE_{FC,y} = Q_y \times EF_{FC,default}$$

Parameter	Value				Unit
	Quyang Swine Farm Project	Anfu Swine Farm Project	Ji'an Swine Farm Project	Yongxin Swine farm	
	Breeding swine	Market Swine	Market Swine	Breeding swine	
Qy	23,000	34,000	34,000	18,000	t
$EF_{FC,default}$	0.0207	0.0207	0.0207	0.0207	tCO_2/t
Subtotal	476	704	704	373	tCO_2e
$PE_{FC,y}$	2,257				tCO_2e

$$PE_{CH4,y} = Q_y \times EF_{CH4,y} \times GWP_{CH4}$$

Parameter	Value				Unit
	Quyang Swine Farm Project	Anfu Swine Farm Project	Ji'an Swine Farm Project	Yongxin Swine farm	
	Breeding swine	Market Swine	Market Swine	Breeding swine	
Qy	23,000	34,000	34,000	18,000	t
$EF_{CH4,y}$	0.002	0.002	0.002	0.002	$t\ CH_4 / t$
GWP_{CH4}	28	28	28	28	tCO_2e/tCH_4
Subtotal	1,288	1,904	1,904	1,008	tCO_2e
$PE_{CH4,y}$	6,104				tCO_2e

$$PE_{N_2O,y} = Q_y \times EF_{N_2O,y} \times GWP_{N_2O}$$

Parameter	Value				Unit
	Quyang Swine Farm Project	Anfu Swine Farm Project	Ji'an Swine Farm Project	Yongxin Swine farm	
	Breeding swine	Market Swine	Market Swine	Breeding swine	

Qy	23,000	34,000	34,000	18,000	t
$EF_{N2O,y}$	0.0002	0.0002	0.0002	0.0002	t N_2O/t
GWP_{N2O}	265	265	265	265	t CO_2e/t N_2O
Subtotal	**1,219**	**1,802**	**1,802**	**954**	tCO_2e
$PE_{N2O,y}$	*5,777*				tCO_2e

Parameter	Value				Unit
	Quyang Swine Farm Project	Anfu Swine Farm Project	Ji'an Swine Farm Project	Yongxin Swine farm	
	Breeding swine	Market Swine	Market Swine	Breeding swine	
$PE_{EC,y}$	*0*	*0*	*0*	*0*	tCO_2e
$PE_{FC,y}$	*476*	*704*	*704*	*373*	tCO_2e
$PE_{CH4,y}$	*1,288*	*1,904*	*1,904*	*1,008*	tCO_2e
$PE_{N2O,y}$	*1,219*	*1,802*	*1,802*	*954*	tCO_2e
$PE_{RO,y}$	*0*	*0*	*0*	*0*	tCO_2e
Subtotal	*2,983*	*4,410*	*4,410*	*2,335*	tCO_2e
$PE_{COMP,y}$	***14,138***				tCO_2e

7.4 Leakage

Information will be made available at Validation/Registration

$$\mathrm{LE}_{AD,y} = LE_{storage,y} + LE_{comp,y}$$

Determination of leakage emissions associate with composting digestate have been calculated in the composting process of the project.LEcomp,y=0.

Jiaozhou swine farm and Jiaozhou Fattening Farm are aerobic treatmeng system. For a well-managed aerobic treatment system, its emissions are 0.

The project leakage emissions associated with Digestion tank were calculated using Tool 14:

$$\mathrm{LE}_{storage,y} = F_{ww,CH4,default} \times Q_{CH4,y} \times GWP_{CH4}$$

Parameter	Value				Unit
	Quyang Swine Farm Project	Anfu Swine Farm Project	Ji'an Swine Farm Project	Yongxin Swine farm	
	Breeding swine	Market Swine	Market Swine	Breeding swine	
$F_{ww,CH4,default}$	0.15	0.15	0.15	0.15	-
$Q_{CH4,y}$	405	599	599	312	tCH_4
GWP_{CH4}	28	28	28	28	tCO_2e/tCH_4
Subtotal	***1,701***	***2,516***	***2,516***	***1,310***	***t*** CO_2e
$LE_{storage,y}$	***8,043***				***t*** CO_2e

7.5 Net GHG Emission Reductions and Removals

As per section 5.4 of this report, net GHG emission reduction if calculated as:

$$\mathrm{ER}_y = BE_y - PE_{y,\mathrm{solid}} - PE_{y,\mathrm{liquid}} - LE_{y,\mathrm{solid}} - LE_{y,\mathrm{liquid}}$$

Farm	year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
XD001	2021	11,771	1,525	629	9,617
	2022	31,826	4,123	1,701	26,002

XD002	2021	19,680	2,254	931	16,495
	2022	53,208	6,094	2,516	44,598
XD003	2021	19,935	2,254	931	16,750
	2022	53,899	6,094	2,516	45,289
XD004	2021	10,253	1,188	485	8,580
	2022	27,722	3,212	1,310	23,200
Subtotal(tCO_2e)	2021	61,639	7,221	2,975	51,443
	2022	166,655	19,523	8,043	139,089
Total(tCO_2e)		228,294	26,744	11,018	190,532

APPENDIX X: <TITLE OF APPENDIX>

Use appendices for supporting information. Delete this appendix (title and instructions) where no appendix is required.