

TEMPLATE

MONITORING REPORT

PUBLICATION DATE **14.10.2020**

VERSION **v. 1.1**

RELATED SUPPORT – **TEMPLATE GUIDE Monitoring Report v. 1.1**

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Key Project Information

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KEY PROJECT INFORMATION

GS ID (s) of Project (s)	GS11238
Title of the project (s) covered by monitoring report	Ji'an Swine Farm Animal Manure Management System GHG Mitigation Project
Version number of the PDD/VPA-DD (s) applicable to this monitoring report	05
Version number of the monitoring report	03
Completion date of the monitoring report	13/01/2022
Date of project design certification	11/01/2022
Date of Last Annual Report	N/A
Monitoring period number	01
Duration of this monitoring period	The 1 st monitoring period from 01/10/2020 to 31/07/2021 (first and last days included)
Project Representative	The official focal point and project developer: Profit Carbon Environmental Energy Technology (Shanghai) Co., Ltd. The project owner: Jiangxi Zhengbang Breeding Co. Ltd
Host Country	People's Republic of China
Activity Requirements applied	☒ Community Services Activities ☐ Renewable Energy Activities ☐ Land Use and Forestry Activities/Risks & Capacities ☐ N/A
Methodology (ies) applied and version number	<i>ACM0010 GHG emission reductions from manure management systems (Version 08.0)</i>
Product Requirements applied	☒ GHG Emissions Reduction & Sequestration ☐ Renewable Energy Label ☐ N/A

Table 1 - Sustainable Development Contributions Achieved

Sustainable Development Goals Targeted	SDG Impact	Amount Achieved	Units/ Products
SDG 13: Climate Action	Emission reductions	287,730	tCO ₂ e
SDG 8: Decent Work and Economic Growth	The number of males and females employed by the project	18 jobs created including 9 females and 9 males	Number
	the Average monthly salary	5,000	RMB/person
SDG 7: Affordable and Clean Energy	Quantity of electricity generation by capturing biogas	47,913.09	MWh

Table 2 – Product Vintages

SDG 7 Affordable and Clean Energy		Amount Achieved
Start Dates	End Dates	Quantity of electricity generation by capturing biogas (MWh)
01/10/2020	31/12/2020	13,808.30
01/01/2021	31/07/2021	34,104.99
01/10/2020	31/07/2021	47,913.09

SDG 8 Decent Work and Economic Growth		Amount Achieved	
Start Dates	End Dates	The number of males and females employed by the project	Average monthly earnings of employees
01/10/2020	31/12/2020	18 jobs created including 9 males and 9 females	5,000 RMB/person, the salary for men and women was the same.
01/01/2021	31/07/2021	18 jobs created including 9 males and 9 females	5,000 RMB/person, the salary for men and women was the same.

01/10/2020	31/07/2021	18 jobs created including 9 males and 9 females	5,000 RMB/person, the salary for men and women was the same.
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SDG 13 Climate Action		Amount Achieved
Start Dates	End Dates	GHG emission reductions (tCO ₂ e)
01/10/2020	31/12/2020	79,424
01/01/2021	31/07/2021	208,306
01/10/2020	31/07/2020	287,730

SECTION A. DESCRIPTION OF PROJECT

A.1. General description of project

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The project introduces 9 sets of Animal Waste Management Systems (AWMSs) in 9 existing swine farms in Ji'an City of Jiangxi Province. The purpose of the project activity is to treat the manure and wastewater from the 9 swine farms to avoid methane emissions.

The project activity replaces the current open anaerobic lagoons with new AWMSs, and Each subsidiary swine farm installs one AWMS. The manure and waster are collected into the anaerobic digesters and then biogas generated during the anaerobic treatment process is captured and total $6,396.4127 \times 10^4 \text{m}^3$ biogas are expected to be generated annually. And then the biogas is sent into the biogas generating system for power generation. Each generator is installed in each subsidiary swine farm, total installed capacity of the proposed project is 13.6MW. The electricity generated are all used by the AWMSs and the swine farms, and the Residual biogas (if any) is flared. After anaerobic digestion, the fermented sludge is treated in aerobic composting system, which is used as fertilizer. Wastewater from the anaerobic digesters is treated aerobically and then used for agriculture irrigation.

The scenario prior to the implementation of the proposed project activity is that the manure and wastewater from the 9 swine farms would be treated in uncovered anaerobic lagoons.

The project activity reduces GHG in the atmosphere through avoiding methane emissions from anaerobic treatment of swine manure and wastewater. The annual average CO₂ emission reductions are estimated as 471,385 tCO₂e.

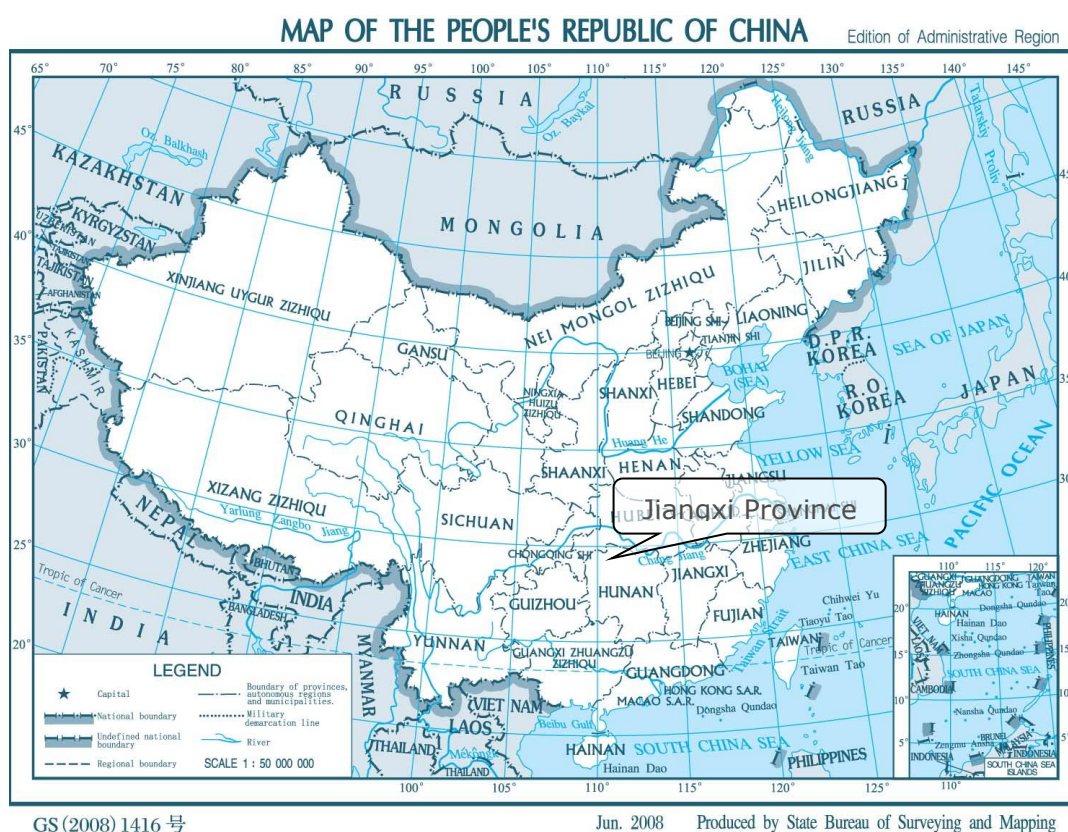
The project has been put into operation on 01/10/2020. This monitoring report is for the 1st monitoring period, which is from 01/10/2020 to 31/07/2021. Total emission reductions achieved in this monitoring period are 287,730 tCO₂e.

A.2. Location of project

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The project activity is located in Ji'an City, Jiangxi Province. There are nine subsidiary farms involved in the project, including 8 fattening farms: Deglong, Fenghuang, Litian, Jinchuan, Tanqiu, Zhouhu, Xingan and Qiqin and 1 Breeding farm: Caolu. The location of the nine subsidiary farms is shown below:

Swine farm	Address	East longitude	North latitude
Denglong	Denglong Village, ji'an County, Ji'an City	114°44'52"	27°01'10"
Fenghuang	Fenghuang Town, ji'an County, Ji'an City	114°31'32"	27°10'49"
Litian	Litian Town, ji'an County, Ji'an City	114°40'50"	27°12'13"
Jinchuan	Jinchuan Town, Xingan County, Ji'an City	115°24'06"	27°40'24"
Tanqiu	Tanqiu Village, Xingan County, Ji'an City	115°35'49"	27°36'19"
Zhouhu	Zhouhu Town, Anfu County, Ji'an City	114°31'31"	27°10'47"
Xingan	Xingan County, Ji'an City	114°54'18"	26°56'05"
Qiqin	Qiqin Town, Xingan County, Ji'an City	115°35'15"	27°43'04"
Caolu	Liujiaqiao Village, Chongren County, Fuzhou City	116°12'42"	27°51'30"



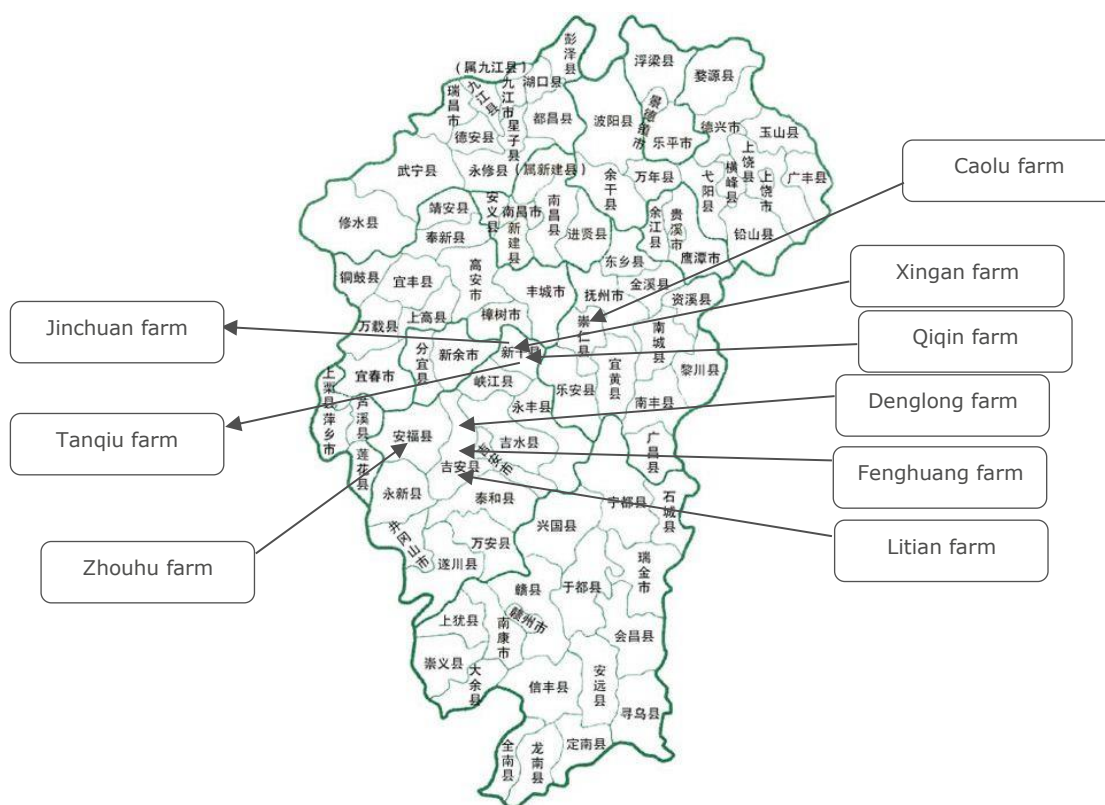


Figure 1 The Geographic Location of the project

A.3. Reference of applied methodology

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The approved methodology applied by this project is referenced as ACM0010" GHG emission reductions from manure management systems (Version 08.0)".

https://cdm.unfccc.int/filestorage/O/J/W/OJW9BM0HFSPXNGVD1KER3C2QU86I5T/EB%2075_r epan14_ACM0010_ver%2008.0.pdf?t=U2x8cXlxcWZqfDAeA1TM6bDy5KQgFxHcnd1j

Tool applied:

Tool 02: "Combined tool to identify the baseline scenario and demonstrate additionality(version07.0)"

Tool 05 "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (Version 03.0)"

Tool 06" Project emissions from flaring (Version 03.0)"

Tool 08 "Tool to determine the mass flow of a greenhouse gas in a gaseous stream (version03.0)"

Tool 14 "Project and leakage emissions from anaerobic digesters (Version 02.0)"

Tool 24 Common practice (Version 03.1)

All above tools can be find through <https://cdm.unfccc.int/Reference/tools/index.html>

A.4. Crediting period of project

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Start date of crediting period: 01/10/2020.

Total length of crediting period: 01/10/2020 to 30/09/2025 (first and last days included) for the first crediting period (two renewal cycles and in total 15 years). The 1st monitoring period is from

01/10/2020 to 31/07/2021 (first and last days included), which belong to the first crediting period.

Expected lifetime of the project: 15 years¹.

¹ As per manufacturer specifications of the power generator, the lifetime of the equipment is up to 30 years, which is greater than 15 years (<https://www.zjtcn.com/baike/kdHxlrqfdjzxxjscs>).

SECTION B. IMPLEMENTATION OF PROJECT

B.1. Description of implemented project

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9 sets of AWMs in 9 swine farms have been implemented. The raw materials such as pig manure, urine and washing water are collected, and then put into the homogenate regulating tank. After further hydrolysis and grit settling, all were put into the anaerobic tank for fermentation.

Anaerobic tanks adopt Upflow Anaerobic Sludge Bed Reactor (UASB) as its anaerobic digester technology, and the biogas generated from the anaerobic digesters enter the biogas generator set after biological desulfurization and dehydration purification. The generated electricity is used for daily operation of AWMs and the swine farms, and the waste heat of the generator is recycled for increasing the temperature of the anaerobic reactor. At the same time, and the residual biogas is flared if there is any surplus biogas.

After anaerobic fermentation, the fermentation liquid is separated by solid and liquid, and the biogas residue is used to produce solid organic fertilizer. The biogas slurry is used as liquid organic fertilizer to irrigate the crops. The sludge produced during the aerobic treatment process is used as high-quality fertilizer. Only a small portion of organic fertilizers are supplied to the farmers living around for free. And the surplus fertilizes are sold to the end-users at below-market prices. The technical flow of the project activity is shown below:

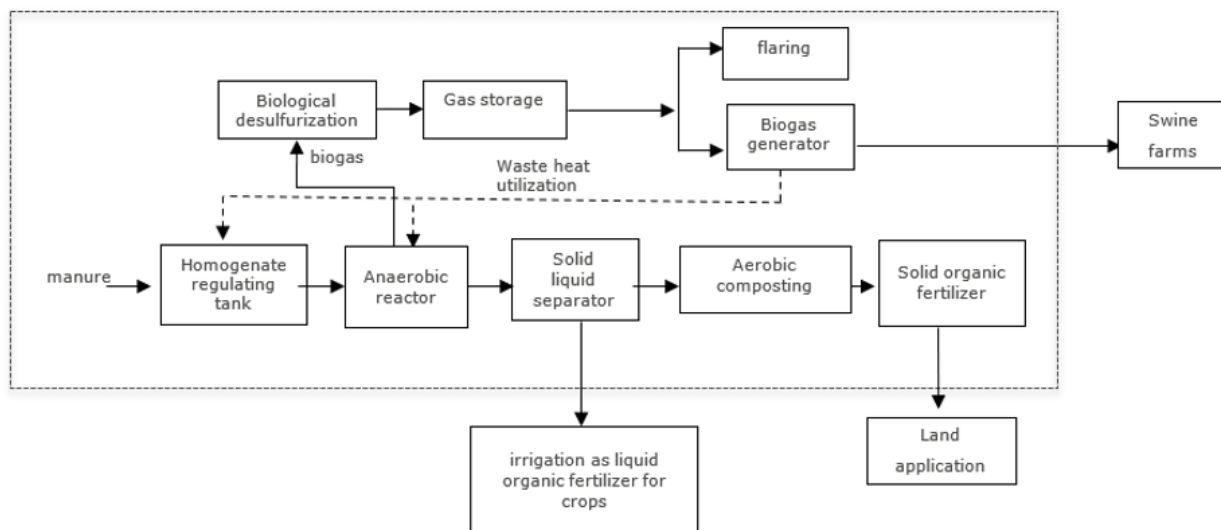


Figure 2 Process flow of biogas project in the swine farms

The project was implemented in 9 existing swine farms and the technology implemented at each swine farm was same. while the treatment capacities of each AWMs and the size of each swine farm and corresponding design of the AWMs was different. The processing capacity and equipment of the system are designed according to the size of the farm. The construction date, commissioning date and start date of operation of each farm are summarized in Table2. The other mainly milestone for implementation of the project are summarized in Table3. The volume for original uncovered anaerobic lagoons and the equipment parameters used of each swine farm are shown in the following Table 4:

Table 2 The construction, commissioning and start operation date of swine farms involved in this project

Swine farm name	Construction date	Commissioning date	start Operation date
Denglong	03/07/2020	20/09/2020	01/10/2020
Fenghuang	04/07/2020	21/09/2020	01/10/2020
Litian	05/07/2020	22/09/2020	01/10/2020
Jinchuan	06/07/2020	22/09/2020	01/10/2020
Tanqiu	03/07/2020	20/09/2020	01/10/2020
Zhouhu	02/07/2020	23/09/2020	01/10/2020
Xingan	04/07/2020	21/09/2020	01/10/2020
Qiqin	07/07/2020	24/09/2020	01/10/2020
Caolu	06/07/2020	25/09/2020	01/10/2020

Table 3 Milestone for implementation of the project

Time	Main actions
20/10/2019	Completion of Project evaluation report
15/04/2020	EIA Approval by local Ecology and Environment Department
01/07/2020	Start date of the project, the date on signing the equipment purchase contract
03/09/2020	Training for the GS monitoring plan and biogas safety operation
25/06/2021	Submission for preliminary review
02/08/2021	Local stakeholder consulting physical meeting

There are no deviations or delays compared to information in approved PDD.

During this monitoring period, there was no special event occurred, such as overhaul and downtimes of biogas digesters and power generators. All the equipment operated well and no equipment was under maintenance during this monitoring period.

Table 4 technical parameters of main equipment and uncovered anaerobic lagoons

Farm name	Denglong	Fenghuan g	Litian	Jinchuan	Tanqiu	Zhouhu	Xingan	Qiqin	Caolu
Treatment capacities of AWMS(t/d)	450	400	320	320	300	380	280	200	310
Baseline anaerobic lagoon									
Size of baseline anaerobic lagoon(length*width*dep th) (m³)	100*100*4.5	100*80*4. 5	80*80*4.5	80*80*4. 5	80*80*4.5	100*80*4.5	80*80*4. 5	80*80*3. 5	80*80*4. 5
technical life	No Less than 15 years								
Biogas Generator									
Type	KDGH-2000G	KDGH- 1800G	KDGH- 1500G	KDGH- 1500G	KDGH- 1500G	KDGH- 1800G	KDGH- 1200G	KDGH- 800G	KDGH- 1500G
Unit power(kw/kvA)	2000	1800	1500	1500	1500	1800	1200	800	1500
Frequency (Hz)	50	50	50	50	50	50	50	50	50
Rated speed (rpm)	1500	1500	1500	1500	1500	1500	1500	1500	1500
Equipment Quantity	1	1	1	1	1	1	1	1	1
Equipment technical life	No Less than 30 years								
Anaerobic tank									
Design capacity (m³)	3000*2+1000 *1	3000+300 0	3000+2000	3000+200 0	2500+2000	3000+3000	2000+250 0	2000+100 0	2500+250 0
Anaerobic technology	UASB	UASB	UASB	UASB	UASB	UASB	UASB	UASB	UASB
Stay time(day)	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8
Fermentation temperature(℃)	38	38	38	38	38	38	38	38	38
Equipment Quantity	3	2	2	2	2	2	2	2	2
Equipment technical life	No Less than 30 years								

Turnover machine									
Type	FJL 6000*1350	FJL 6000*1350	FJL6000*1050	FJL 6000*1050	FJL6000*1050	FJL6000*1350	FJL 6000*1050	FJL 6000*1050	FJL 6000*1050
Supporting power(kw)	41.5	41.5	25.74	25.74	25.74	41.5	25.74	25.74	25.74
Speed of work(m/h)	50	50	50	50	50	50	50	50	50
No-load speed(m/h)	100	100	100	100	100	100	100	100	100
Height of mixing rod(mm)	4500	4500	3400	3400	3400	4500	3400	3400	3400
Turning depth(mm)	1500-1800	1500-1800	1500-1800	1500-1800	1500-1800	1500-1800	1500-1800	1500-1800	1500-1800
Equipment Quantity	1	1	1	1	1	1	1	1	1
Equipment technical life	No Less than 15 years								
Flared system									
Type	Open flare	Open flare	Open flare	Open flare	Open flare	Open flare	Open flare	Open flare	Open flare
Treatment capacities (m³/h)	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90
Material	304 stainless steel	304 stainless steel	304 stainless steel	304 stainless steel	304 stainless steel	304 stainless steel	304 stainless steel	304 stainless steel	304 stainless steel
Height (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Main wall thickness (mm)	3	3	3	3	3	3	3	3	3
Equipment technical life	No Less than 15 years								

B.1.1. Forward Action Requests

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For monitored parameters including F_{Aer} , $MS\%_{oj}$, and $B_{0,LT}$ are not monitored in the monitoring period.

Reply: For parameter of F_{Aer} , $MS\%_{oj}$, $B_{0,LT}$, the conservative values are applied for calculation emission reduction, therefore the parameters not monitored will not impact the emission reduction.

B.2. Post-Design Certification changes

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B.2.1. Temporary deviations from the approved Monitoring & Reporting Plan, methodology or standardized baseline

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NA

B.2.2. Corrections

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NA

B.2.3. Changes to start date of crediting period

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NA

B.2.4. Permanent changes from the Design Certified monitoring plan, applied methodology or applied standardized baseline

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NA

B.2.5. Changes to project design of approved project

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NA

SECTION C. DESCRIPTION OF MONITORING SYSTEM APPLIED BY THE PROJECT

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Parameters to be monitored

According to section B.7.1 of the PDD, parameters need to be monitored is as following,

Table 5 The details Monitoring Process of the monitoring parameters engaged in the project

parameter	Measurement methods and procedures
For Mitigation Measure for Safeguarding Principles	
Employee Training of biogas safety operation	Determined by the training record which was held once a year. For this monitoring period, biogas safety operation training was held on 03/09/2020, which can be proved by training notice and meeting attendance record.
SDG 7	
EG _{d,y}	Measured continuously by the meters installed at the outlet of generator in each farm. Total 9 meters were installed. The meter reading was recorded by the staff and the electricity generation is not included during the commissioning period. The readout records of electricity meter have been recorded at 24:00 of every day by the staff during the monitoring period. The daily electricity generation is equal to the difference between the previous day's and the next day's readings. Monthly value is the sum of the daily electricity generation. The electricity meter was calibrated periodically by an officially accredited entity. Collected data is archived in both electronic and printed copies. Detailed information on meters including accuracy, calibration date, calibration agency and calibration standard etc can be obtained in below Table 6.
SDG 8	
Number of males and females employed by the project; Average monthly salary;	Parameters for SDG 8 were determined based on record keeping book, labor contract and Payroll. 18 jobs for local people were created and the average monthly salary were 5,000 RMB/person in this monitoring period.
SDG 13	
Number of animals of type LT produced annually for the year y, N _{p,LT}	Each pig involved in this project has a unique electronic ear tag when was born, which is an electronic device dedicated to the identification and electronic management of animals, can track automatically. This electronic ear tag can be connected to the Data Collection System (DCS), which can store and read information. Therefore, the number of swine produced in the farm can be monitored through the auto tracking devices of electronic ear tag once pig slaughter monthly and obtained by the DCS. At the same time, the technicians in farms record manually the number

	of swine produced in the farms monthly and this parameter is sourced from the data logged in each swine farm. Monthly sale records for each farm can be crosschecked during this monitoring period.
Number of days animal of type LT is alive in the farm in the year y , $N_{da,LT}$	The days of swine alive in the farm can be traced through the electronic ear tag by the technical staff in each farm and obtained by the DCS. At the same time recorded manually by the technicians in farms and sourced from the data logged in each swine farm.
Daily stock of animals in the farm, discounting dead and discarded animals, $N_{AA,LT}$	Traced through the electronic ear tag by the technical staff in each farm and obtained by the DCS. At the same time recorded daily by the technicians in farms and sourced from the data logged in each swine farm. The technicians in farms begin to record the daily stock number of animals from the first day of monitoring period, and this record data including the new imported animal and discounting dead and discharge animals. The annual average number of animals ($N_{AA,LT}$) was calculated as an average of the daily stock of breeding swine in the farms without considering dead animals and discarded animals.
Average animal weight of a defined livestock population at the project site, W_{site}	Measured by the weight measurers on a certain day of every month. One weight measure was equipped for each farm at least, total 9 weight measures were included for this project. W_{site} was conducted by sampling in the three age groups of Nursery phase, Growing phase and Mature phase in each swine farm monthly. The weight data is recorded by the technicians in farms and then average animal weight of a defined livestock population at the project site was calculated based on these data. The weight measures were calibrated periodically by an officially accredited entity. Detailed information on weight measures including accuracy, calibration date, calibration agency and calibration standard etc can be obtained in below Table 6.
Number of days treatment plant was operational in year y , n_{dy}	Monitored by PP and sourced from data logged in each of the manure treatment plant.
Quantity of electricity consumed by the proposed project in year y , $EC_{PJ,j,y}$	Measured continuously by the meters installed in project site in each farm. Total 9 meters were installed. The meter reading was recorded daily by the staff and the electricity consumption is not included during commissioning period. The readout records of electricity meter have been recorded at 24:00 of every day by the staff during the monitoring period. The daily electricity consumption is the difference between the reading value at the 24:00 of first day of each month and the reading value at 24:00 of the next day of each month. Monthly data is the sum of the daily electricity consumption. The electricity meter was calibrated periodically by an officially accredited entity. Collected data is archived in both electronic and printed copies.

	Detailed information on meters including accuracy, calibration date, calibration agency and calibration standard etc can be obtained in below Table 6. During this monitoring period, all electricity consumption was sourced from the electricity generated by biogas capturing through AWMSs, no electricity consumed from the grid company or other external sources.
Average technical transmission and distribution losses for providing electricity to source j in year y , $TDL_{j,y}$	Sourced from Tool 05" Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (version 03.0)", the value is 20% in this monitoring period. This value will be renewed once the tool is updated.
Biogas flow, V_f	Continuously measured by the biogas flow meters (biogas flow meter 1 installed at the outlet of the anaerobic digestion, biogas flow meter 2 installed at the inlet of the power generator and biogas flow meter 3 installed in inlet of flare) continuously and record daily. There were three flow meters in each farm and total 27 flowmeters were included for this project. The monthly biogas production, biogas flow to the power generator and biogas flow to flare system is the sum of the daily output, The biogas flow meters used were calibrated periodically by an officially accredited entity. In addition, the biogas flow meter automatically measured the instantaneous flow rate, temperature and pressure pear hour, it is not necessary to separately measure the instantaneous flow rate ($V_{t,db}$), the biogas temperature (T_t) and pressure (P_t). Collected data is archived in both electronic and printed copies. Detailed information on flowmeters including accuracy, calibration date, calibration agency and Calibration standard etc can be obtained in below Table 3.
Volumetric flow of the gaseous stream in time interval t on a dry basis, $V_{t,db}$	Continuously measured by flowmeters, which can record hourly and saved automatically in the DCS system. As per described in monitoring parameter V_f, the flowmeters to monitor $V_{t,db}$ are the same as the flowmeters that monitor V_f since the flowmeter can monitor other parameter such as $V_{t,db}$, T_t and P_t simultaneously so the data can be obtained from system and the monthly data was exported by the staff at the beginning of next month. Daily biogas flow is equal to the cumulative value of 24 hours, and monthly biogas flow can be accumulated on daily basis. Original collected data can be exported through the system and is archived in electronic.
Volumetric fraction of greenhouse gas i in a time interval t on a dry basis, m^3 gas i/m^3 dry gas, $V_{i,t,db}$	Measured continuously and record hourly by online gas analyser installed at the outlet of the anaerobic digester and saved automatically in the DCS system. One gas analyser was equipped in each farm and there are 9 gas analysers totally. Therefore, the data can be obtained from system and the monthly data was exported by the staff at the beginning of next month. Daily and monthly CH_4 concentration was calculated based on the 24-

	hour average and daily average CH ₄ concentration. Gas analysers were calibrated periodically by an officially accredited entity. Original collected data can be exported through the system and is archived in electronic. Detailed information on gas analysers including accuracy, calibration date, calibration agency and calibration standard etc can be obtained in below Table 6.
Temperature of the gaseous stream in time interval t , T_t ; Pressure of the gaseous stream in time interval t , P_t .	Measured continuously by the biogas flow meter, which can record hourly and saved automatically in the DCS system. As per described in monitoring parameter V_f , the flowmeters to monitor T_t and P_t are the same as the flowmeters that monitor V_f since the flowmeter can monitor other parameter such as $V_{t,db}$, T_t and P_t simultaneously. so the data can be obtained from system and the monthly data was exported by the staff at the beginning of next month. Daily and Monthly Temperature and Pressure of the biogas flow was calculated based on the 24-hour average and daily average values. Original collected data can be exported through the system and is archived in electronic. Detailed information on Flow meters including accuracy, calibration date, calibration agency and calibration standard etc can be obtained in below Table 6.
Fraction of volatile solids directed to aerobic treatment F_{Aer}	According to the methodology, F_{Aer} should be monitored annually. However, there is no equip install in the project activity to monitor the influent into anaerobic digestion and aerobic system during this monitoring period, therefore the value of F_{Aer} is applied as 100%, which is conservative.
Fraction of manure handled in system j in project activity $MS\%_j$	As there is no equipment installed to monitor this parameter in the actual operation. so, in the monitoring period, to be conservative, the value of this parameter in the emission reduction calculation is 100% or total $MS\%_j$ in different treatment system is 100% since the treatment process of this project is an anaerobic-aerobic combined treatment technology, main including anaerobic fermentation, and aerobic composting.
Maximum methane producing potential of the volatile solid generated by animal type LT , B_0 , LT	Not monitored during this MR since the value is taken from IPCC 2006, which is a published source. The parameter value will be updated on latest available public data source.
Type of the barn and AWMS	The type of barn and AWMS was not changed as the design.
Annual average ambient temperature at project site	As this project is located in Ji'an city, Jiangxi Province, so the project site temperature is sourced from the Ji'an Meteorological Bureau and cross check with the public website. In this monitoring period, the average project site temperature sourced from Ji'an Meteorological Bureau is 18.01 °C and the Annual average ambient temperature from public website is 18.5°C, so the Annual average ambient temperature at project site in this monitoring period is 18.01°C and the

	MCF applied in the ER calculations is 77%, which is Conservative.
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Monitoring framework

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

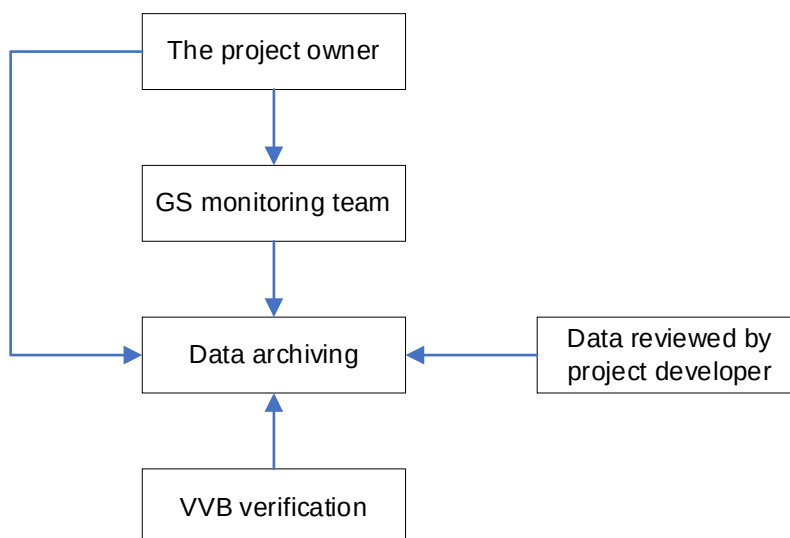


Figure 3 The Organization Structure of the Monitoring Team

Monitoring equipment and installation

Installation and configuration of monitoring equipment are shown as Figure 4. In order to ensure measurements with a low degree of uncertainty, the data monitoring equipment have been calibrated and checked by appropriately qualified third party according to appropriate national standard.

For this monitoring period, all the monitoring equipment were calibrated according to relevant regulations.

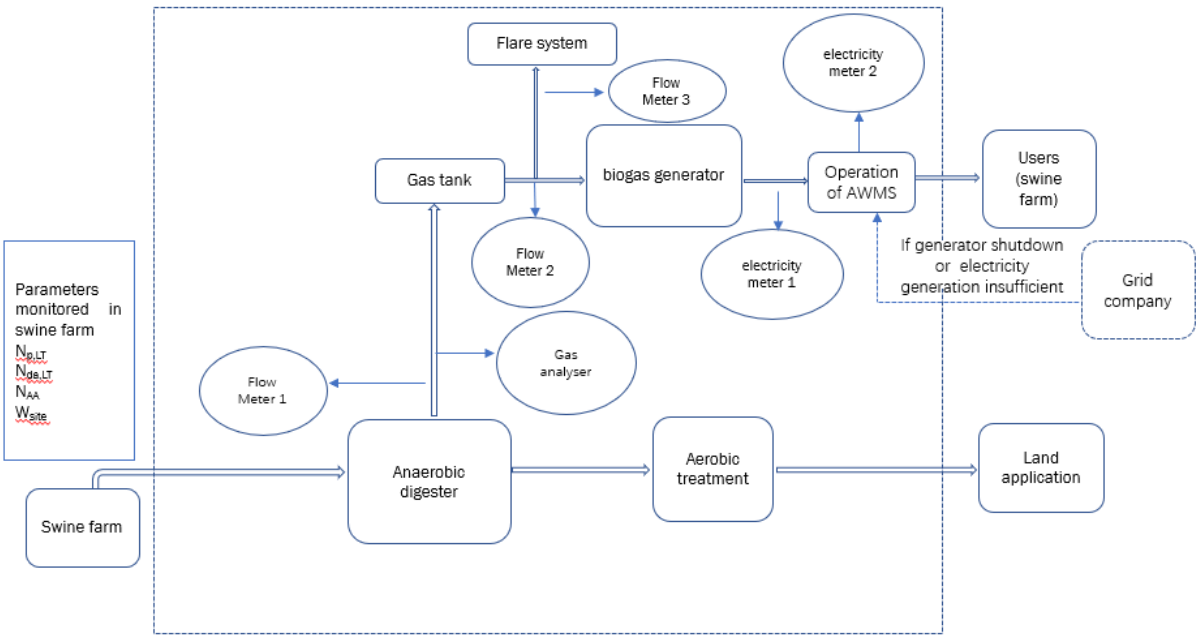


Figure 4 The monitoring system of the project (Same monitoring system for each farm)

Table 6 General description of monitoring equipment

Monitoring equipment	Parameter to be monitored	Installed location	Type	Series number			Accuracy	Date of calibration	Calibration standard	Validity	Calibration agency
Flow meter 1	V _f T _t P _t	at the outlet of the anaerobic digestion	LUGB	1908290	Denglong farm		1.5	17/09/2020	JJG1029-2007(Verification Regulation of Vortex-shedding Flowmeter)	16/09/2022	Henan Institute of Metrology
				1908292	Fenghuang farm						
				1908294	Litian farm						
				1908296	Jinchuan farm						
				1908298	Tanqiu farm						
				1908300	Zhouhu farm						
				1908302	Xingan farm						
				1908304	Qiqin farm						
				1908306	Caolu farm						
Flow meter 2	V _f T _t P _t	at the inlet of generator	LUGB	1908291	Denglong farm		1.5	17/09/2020	JJG1029-2007(Verification Regulation of Vortex-shedding Flowmeter)	16/09/2022	Henan Institute of Metrology
				1908293	Fenghuang farm						
				1908295	Litian farm						
				1908297	Jinchuan farm						
				1908299	Tanqiu farm						
				1908301	Zhouhu farm						
				1908303	Xingan farm						
				1908305	Qiqin farm						
				1908307	Caolu farm						
Flow meter 3	V _f T _t P _t	in inlet of flare	LUGB	1908350	Denglong farm		1.5	17/09/2020	JJG1029-2007(Verification Regulation of Vortex-shedding Flowmeter)	16/09/2022	Henan Institute of Metrology
				1908351	Fenghuang farm						
				1908352	Litian farm						
				1908353	Jinchuan farm						
				1908354	Tanqiu farm						
				1908355	Zhouhu farm						
				1908356	Xingan farm						
				1908357	Qiqin farm						
				1908358	Caolu farm						

TEMPLATE-

Electricity meter 1	EG _{d,y}	at the outlet of generator	DSSD 331	1912133876000124	Denglong farm	0.5S	17/09/2020	JJG596-2012(Electrical Meters for Measuring Alternating-current Electrical Energy)	16/09/2025	State Grid Jiangxi Electric Power Research Institute
				1911084006000026	Fenghuang farm					
				1911084006000028	Litian farm					
				1909163046000210	Jinchuan farm					
				1909163046000213	Tanqiu farm					
				1910204028000191	Zhouhu farm					
				1910204028000193	Xingan farm					
				2001235021000016	Qiqin farm					
				2001235021000018	Caolu farm					
Electricity meter 2	EC _{p,y}	in the project site	DSSD 331	1912133876000125	Denglong farm	0.5S	19/09/2020	JJG596-2012 (Electrical Meters for Measuring Alternating-current Electrical Energy)	18/09/2025	State Grid Jiangxi Electric Power Research Institute
				1911084006000027	Fenghuang farm					
				1911084006000029	Litian farm					
				1909163046000212	Jinchuan farm					
				1909163046000214	Tanqiu farm					
				1910204028000192	Zhouhu farm					
				1910204028000194	Xingan farm					
				2001235021000017	Qiqin farm					
				2001235021000019	Caolu farm					
weight measurer	W _{site}	in each pig farm	SCS	19043026	Denglong farm	III level	14/08/2020	JJG539-2016(Digital Indicator Scale Verification Regulations)	13/08/2021	Jiangxi Institute of Metrology & Testing
				19050235	Fenghuang farm					
				19051613	Litian farm					
				19064187	Jinchuan farm					
				19062349	Tanqiu farm					
				19070024	Zhouhu farm					
				19073218	Xingan farm					
				19082016	Qiqin farm					
				19080027	Caolu farm					
Gas analyser	V _{i,t,db}	at the outlet of the	ADOS Biogas 401	56578	Denglong farm	Lower than 1%	11/09/2020	JJG693-2011(Verification Regulation of Alarmers Detectors)	10/09/2021	Jiangxi Institute of Metrology & Testing
				56579	Fenghuang farm					
				56580	Litian farm					
				56880	Jinchuan farm					

TEMPLATE-

		anaerobic digesters		56881	Tanqiu farm				of Combustible Gas)		
				56882	Zhouhu farm						
				57001	Xingan farm						
				57002	Qiqin farm						
				57112	Caolu farm						

Corrective actions

The whole GS monitoring team fellow recognized standard data evaluation methods to guarantee that the data was reliable and accurate. There was no correction of nonconformities occurred in implementation of the project or the monitoring plan during the 1st monitoring period. For QA/QC procedure, please refer to QA/QC procedures in section D.2 of the monitoring report.

Data management

Records are the most important exercise in relation to the monitoring process. Without accurate and efficient record keeping, project emission reductions cannot be verified.

Once missing data on a certain day or a certain period of time happened, the most appropriate values such as daily average or monthly average will be used for calculation, which is to ensure that emission reductions are conservative.

All data collected as part of the monitoring plan shall be archived in electronic form and paper until at least two years after the entry period.

Emergency procedure

Employees need to be familiar with the process flow and emergency situations that may occur during project operation and operate in strict accordance with the technical specifications of each process treatment equipment and monitoring equipment. During the operation of the project, all equipment and related instruments shall be checked regularly according to the manufacturer's recommendations. If necessary, calibration and/or proper repair have to be carried out immediately.

In case of malfunction and/or damage of any system or piece of the process, it may cause damage to the operation of the system, especially serious damage to the biogas generation system and combustion system it must be dealt with as soon as possible and reported to the responsible technician immediately.

There was no emergency happened during this monitoring period.

Avoiding of double counting

All swine farms involved in this project can be identified through its GPS coordinates, which will prevent the farms counted in the project activity to be part of any other voluntary market or emission reduction mechanism (CDM, CCER, VCS etc.) as well. Besides, the project owner has signed the Declaration of No Double Counting Statement and Declaration of not involved in other GHG scheme on 12/01/2022. The emission reductions were not double counted during the 1st monitoring period.

SECTION D. DATA AND PARAMETERS

D.1. Data and parameters fixed ex ante or at renewal of crediting period

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SDG13

Data/parameter	GWP_{CH4}
Unit	tCO ₂ e/tCH ₄
Description	Global Warming Potential of CH ₄
Source of data	IPCC Fourth/Fifth Assessment Report
Value(s) applied	25/28
Choice of data or Measurement methods and procedures	100-year values are adopted from Box 3.2, table 1, IPCC Fifth Assessment Report, 2014 ²
Purpose of data	Used in project emission/baseline calculations
Additional comment	All monitoring, verifications and requests for performance certification of Certified products and / or Impact Statements for the period starting 01 January 2021 shall use the AR5 GWP values (28) for calculating emission reductions and removals according to applicability of global warming potential for gold standard for the global goals projects.

Data/parameter	GWP_{N2O}
Unit	tCO ₂ e/tN ₂ O
Description	Global Warming Potential of N ₂ O
Source of data	IPCC Fourth/ Fifth Assessment Report
Value(s) applied	298/265
Choice of data or Measurement methods and procedures	100-year values are adopted from Box 3.2, table 1, IPCC Fifth Assessment Report, 2014 ³
Purpose of data	Used in project emission/baseline calculations

² https://www.ipcc.ch/site/assets/uploads/2018/02/SYR_AR5_FINAL_full.pdf

³ https://www.ipcc.ch/site/assets/uploads/2018/02/SYR_AR5_FINAL_full.pdf

Additional comment	All monitoring, verifications and requests for performance certification of Certified products and / or Impact Statements for the period starting 01 January 2021 shall use the AR5 GWP values (265) for calculating emission reductions and removals according to applicability of global warming potential for gold standard for the global goals projects.
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Data/parameter	D_{CH4}
Unit	t/m ³
Description	Density of CH ₄
Source of data	ACM0010 Version 08.0
Value(s) applied	0.00067
Choice of data or Measurement methods and procedures	0.00067 t/m ³ at room temperature 20°C and 1 atm pressure.
Purpose of data	Used in project emission/baseline calculations
Additional comment	N/A

Data/parameter	MCF_j
Unit	-
Description	Methane conversion factor for the baseline AWMS _j
Source of data	IPCC 2006 table 10.17, chapter 10, volume 4
Value(s) applied	72.38%
Choice of data or Measurement methods and procedures	MCF _j value for uncovered anaerobic lagoon (baseline AWMS) is chosen. A conservativeness factor has been applied by multiplying MCF _j value (i.e. 77%) with a value of 0.94, to account for the 20 per cent uncertainty in the MCF _j values as reported by IPCC 2006. For this project, the annual average temperature is 18.5°C and the value of 77 % is applied. Therefore, MCF _j value of 72.38% will be applied.
Purpose of data	project/baseline emission calculations
Additional comment	N/A

Data/parameter	MS%_{BI,j}
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Unit	Fraction
Description	Fraction of manure handled in system j in the baseline.
Source of data	Project proponents
Value(s) applied	100%
Choice of data or Measurement methods and procedures	In this project, the baseline manure management system is uncovered anaerobic lagoon only. The amount of manure handled by the anaerobic lagoon is 100%.
Purpose of data	Calculation of baseline emissions
Additional comment	N/A

Data/parameter	W_{default}
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(s) applied	W _{default} (Market swine)=28kg W _{default} (Breeding swine)=28kg
Choice of data or Measurement methods and procedures	The values in IPCC 2006 and US-EPA are compared and the lower value from IPCC 2006 is applied.
Purpose of data	Calculation of Baseline emissions
Additional comment	N/A

Data/parameter	VS_{default}
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(s) applied	VS _{default} (Market swine)=0.3 VS _{default} (Breeding swine)=0.3

Choice of data or Measurement methods and procedures	The values in IPCC 2006 and US-EPA are compared and the lower value from IPCC 2006 is applied.
Purpose of data	Used in project emission/baseline calculations
Additional comment	N/A

Data/parameter	NEX _{IPCC default}																																			
Unit	kg N/ animal/year																																			
Description	Default value for the nitrogen excretion per head of a defined livestock population																																			
Source of data	Calculated by the equation: NEX _{IPCC default} =N _{rate(T)} * TAM/1000*365 ⁴																																			
Value(s) applied	<table><tr><th>Period</th><th>Market Swine</th><th>Breeding Swine</th></tr><tr><td>01/10/2020-31/10/2020</td><td>0.36</td><td>0.21</td></tr><tr><td>01/11/2020-30/11/2020</td><td>0.35</td><td>0.20</td></tr><tr><td>01/12/2020-31/12/2020</td><td>0.36</td><td>0.21</td></tr><tr><td>01/01/2021-31/01/2021</td><td>0.36</td><td>0.21</td></tr><tr><td>01/02/2021-28/02/2021</td><td>0.33</td><td>0.19</td></tr><tr><td>01/03/2021-31/03/2021</td><td>0.36</td><td>0.21</td></tr><tr><td>01/04/2021-30/04/2021</td><td>0.35</td><td>0.20</td></tr><tr><td>01/05/2021-31/05/2021</td><td>0.36</td><td>0.21</td></tr><tr><td>01/06/2021-30/06/2021</td><td>0.35</td><td>0.20</td></tr><tr><td>01/07/2021-31/07/2021</td><td>0.36</td><td>0.21</td></tr></table>			Period	Market Swine	Breeding Swine	01/10/2020-31/10/2020	0.36	0.21	01/11/2020-30/11/2020	0.35	0.20	01/12/2020-31/12/2020	0.36	0.21	01/01/2021-31/01/2021	0.36	0.21	01/02/2021-28/02/2021	0.33	0.19	01/03/2021-31/03/2021	0.36	0.21	01/04/2021-30/04/2021	0.35	0.20	01/05/2021-31/05/2021	0.36	0.21	01/06/2021-30/06/2021	0.35	0.20	01/07/2021-31/07/2021	0.36	0.21
Period	Market Swine	Breeding Swine																																		
01/10/2020-31/10/2020	0.36	0.21																																		
01/11/2020-30/11/2020	0.35	0.20																																		
01/12/2020-31/12/2020	0.36	0.21																																		
01/01/2021-31/01/2021	0.36	0.21																																		
01/02/2021-28/02/2021	0.33	0.19																																		
01/03/2021-31/03/2021	0.36	0.21																																		
01/04/2021-30/04/2021	0.35	0.20																																		
01/05/2021-31/05/2021	0.36	0.21																																		
01/06/2021-30/06/2021	0.35	0.20																																		
01/07/2021-31/07/2021	0.36	0.21																																		
Choice of data or Measurement methods and procedures	NEX _{IPCC default} is calculated as equation 10.30 in IPCC2006, N _{rate(T)} and TAM are default value from IPCC 2006																																			
Purpose of data	Baseline, Project and leakage emissions calculations																																			
Additional comment	N/A																																			

Data/parameter	N_{rate(T)}
Unit	kg N (1000 kg animal mass) ⁻¹ day ⁻¹

⁴ 365 in this formula represents 365 days per year, which corresponds to the unit of this parameter: kg N / animal / year and N_{rate(T)} means the default N excretion rate with the unit of kg N/ (1000 kg animal mass)/ day However, this monitoring period is 01/10/2020-31/07/2021, only 304 days, less than one year. Therefore, this parameter should be calculated according to the actual number of days.

Description	default N excretion rate
Source of data	IPCC 2006 table 10.19, chapter 10, volume 4
Value(s) applied	$N_{rate(T)}$ (Market swine) =0.42 $N_{rate(T)}$ (Breeding swine) =0.24
Choice of data or Measurement methods and procedures	Default value from IPCC 2006 is applied.
Purpose of data	$NEX_{IPCC\ default}$ calculations
Additional comment	N/A

Data/parameter	TAM
Unit	kg animal ⁻¹
Description	typical animal mass for livestock category
Source of data	IPCC 2006 table 10A-7 and 10A-8, chapter 10, volume 4
Value(s) applied	TAM (Market swine) =28 TAM (Breeding swine) =28
Choice of data or Measurement methods and procedures	Default value from IPCC 2006 is applied.
Purpose of data	$NEX_{IPCC\ default}$ calculations
Additional comment	N/A

Data/parameter	$F_{gas\ MS,j,LT}$
Unit	Fraction
Description	Default values for nitrogen loss due to volatilisation of NH_3 and NO_x from manure management
Source of data	IPCC 2006 table 10.22, chapter 10, volume 4
Value(s) applied	$F_{gasMS,j,LT}$, (anaerobic lagoon) : 40% $F_{gasMS,j,LT}$, (solid storage) : 45%

Choice of data or Measurement methods and procedures	Site specific data is unavailable therefore default values are opted for.
Purpose of data	Used in project/baseline emission calculations
Additional comment	N/A

Data/parameter	EF_{N2O,D,j}
Unit	Kg N ₂ O-N/kg N
Description	Direct N ₂ O emission factor for the treatment system j of the manure management system
Source of data	IPCC 2006 table 10.21, chapter 10, volume 4
Value(s) applied	EF _{N2O, D} =0 for anaerobic lagoon and digester, EF _{N2O, D} =0.01 for aerobic system
Choice of data or Measurement methods and procedures	Site specific data is unavailable therefore default values are opted for.
Purpose of data	Used in project/baseline emission calculations
Additional comment	N/A

Data/parameter	EF_{N2O,ID}
Unit	kgN ₂ O-N/kg NH ₃ -N and NO _x -N
Description	Indirect N ₂ O emission factor for the treatment system j of the manure management system
Source of data	IPCC 2006 table 11.3, chapter 11, volume 4
Value(s) applied	0.01
Choice of data or Measurement methods and procedures	Site specific data is unavailable therefore default values are opted for.
Purpose of data	Used in project/baseline emission calculations
Additional comment	N/A

Data/parameter	EF_{CH4,default}
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Unit	t CH ₄ leaked / t CH ₄ produced
Description	Default emission factor for the fraction of CH ₄ produced that leaks from the anaerobic digester (fraction)
Source of data	Tool 14:" Project and leakage emissions from anaerobic digesters (version02.0)
Value(s) applied	0.05
Choice of data or Measurement methods and procedures	UASB type digesters, floating gas holders with no external water seal
Purpose of data	Calculation of project emissions
Additional comment	PE _{CH₄,y} for ex ante estimation adopted equation(4) of Methodological tool " Project and leakage emissions from anaerobic digesters". In this monitor period, the amount of biogas collected at the digester was monitored by flowmeters.

Data/parameter	R_{VS,n}
Unit	Fraction
Description	Fraction of volatile solid degraded in AWMS treatment method n of the N treatment steps prior to waste being treated
Source of data	Refer to Appendix 1 of methodology ACM0010 and project evaluation report
Value(s) applied	R _{VS,n} , aerobic treatment anaerobic digester: 2%,45% and 35% for leakage N ₂ O emission released during project activity R _{VS,n} , one cell lagoon :85% for leakage N ₂ O emission released during baseline scenario
Choice of data or Measurement methods and procedures	For this project, values from Table provided in Appendix 1 of ACM0010 and Project evaluation report are compared in order to adopt the most conservative value for the given technology.
Purpose of data	Project emission/ leakage calculation
Additional comment	N/A

Data/parameter	R_{N,n}
Unit	Fraction
Description	Nitrogen reduction factor
Source of data	Refer to Appendix 1 of methodology ACM0010

Value(s) applied	$R_{N,n}$, project activity (anaerobic digester) : 0.25 $R_{N,n}$, baseline (uncovered anaerobic lagoon) : 0.80
Choice of data or Measurement methods and procedures	Anaerobic digester has been assumed as a covered first cell of two cell lagoon. Uncovered anaerobic lagoon has been assumed as one cell lagoon. The most conservative value for the given technology has been used.
Purpose of data	Calculation of leakage emission
Additional comment	N/A

Data/parameter	EF₁, EF₄, EF₅
Unit	kg N ₂ O-N/kg N for EF ₁ , EF ₅ and [kg N ₂ O-N/(kg NH ₃ -N and NO _x -N) for EF ₄
Description	Emission factor for N ₂ O emissions from N inputs; from N leaching and runoff; from atmospheric deposition of N on soils and water surfaces
Source of data	IPCC 2006 Guidelines default values are be used, since country specific or region specific data are not available. EF ₁ from table 11.1, chapter 11, volume 4. EF ₄ and EF ₅ from table 11.3, chapter 11, volume 4
Value(s) applied	EF ₁ = 0.010 EF ₄ = 0.010 EF ₅ = 0.0075
Choice of data or Measurement methods and procedures	Site specific data is unavailable therefore default values are opted for.
Purpose of data	Calculation of leakage emission
Additional comment	N/A

Data/parameter	F_{gasm}
Unit	Fraction
Description	Fraction of N lost due to volatilization
Source of data	Default values from table 11.3, chapter 11, volume 4 of IPCC 2006 guidelines
Value(s) applied	0.2
Choice of data or Measurement methods and procedures	Site specific data is unavailable therefore default values are opted for.
Purpose of data	Used in project/baseline emission calculations

Additional comment	N/A
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Data/parameter	F_{leach}
Unit	Fraction
Description	Fraction of all N added to/mineralised in managed soils in regions where leaching/runoff occurs that is lost through leaching and runoff
Source of data	Default values from table 11.3, chapter 11, volume 4 of IPCC 2006 guidelines
Value(s) applied	0.3
Choice of data or Measurement methods and procedures	Site specific data is unavailable therefore default values are opted for.
Purpose of data	Calculation of leakage emission
Additional comment	N/A

Data/parameter	MCF_d
Unit	-
Description	Methane conversion factor for leakage calculation
Source of data	Methodology ACM0010(version 08.0)
Value(s) applied	1
Choice of data or Measurement methods and procedures	According to paragraph 51 of the methodology ACM0010" GHG emission reductions from manure management systems (version08.0)", Methane conversion factor for leakage calculation assumed to be equal 1
Purpose of data	Calculation of leakage emission
Additional comment	N/A

Data/parameter	EF_{EF,j,y}
Unit	tCO ₂ /MWh
Description	Emission factor for electricity generation
Source of data	Published by Ministry of Ecology and Environment of the People's Republic of China, which is the DNA of China

Value(s) applied	0.57205
Choice of data or Measurement methods and procedures	According to tool" Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation"
Purpose of data	Calculation of project emission
Additional comment	N/A

Data/parameter	R_u
Unit	Pa.m ³ /kmol.K
Description	Universal ideal gases constant
Source of data	Tool 08:" Tool to determine the mass flow of a greenhouse gas in a gaseous stream (version 03.0)"
Value(s) applied	8,314
Choice of data or Measurement methods and procedures	Value is fixed as Tool 08
Purpose of data	Calculation of project emission
Additional comment	/

Data/parameter	MM_i
Unit	kg/kmol
Description	Molecular mass of greenhouse gas i
Source of data	Tool 08:" Tool to determine the mass flow of a greenhouse gas in a gaseous stream (version 03.0)"
Value(s) applied	16.04 kg/mol for methane
Choice of data or Measurement methods and procedures	Value is fixed as Tool 08
Purpose of data	Calculation of project emission
Additional comment	/

Data/parameter	$\eta_{\text{flare},m}$
Unit	%
Description	Flare efficiency in minute m
Source of data	Tool 06" Project emissions from flaring (Version 03.0)"
Value(s) applied	0%
Choice of data or Measurement methods and procedures	0% is the conservative value.
Purpose of data	Calculation of project emission
Additional comment	/

D.2. Data and parameters monitored

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SDG 13

Data / Parameter	$N_{p,LT}$	
Unit	Number	
Description	Number of animals of type LT produced annually for the year y	
Source of data	Production record of Commercial Pig	
Value(s) of monitored parameter	01/10/2020-31/10/2020	95,759heads of commercial pigs
	01/11/2020-30/11/2020	94,785heads of commercial pigs
	01/12/2020-31/12/2020	93,808heads of commercial pigs
	01/01/2021-31/01/2021	92,828heads of commercial pigs
	01/02/2021-28/02/2021	91,855heads of commercial pigs
	01/03/2021-31/03/2021	90,881heads of commercial pigs
	01/04/2021-30/04/2021	93,611heads of commercial pigs
	01/05/2021-31/05/2021	89,914heads of commercial pigs
	01/06/2021-30/06/2021	92,437heads of commercial pigs
	01/07/2021-31/07/2021	90,782heads of commercial pigs

	01/10/2020-31/07/2021	926,660 heads of commercial pigs
Measurement methods and procedures	To be collected for each swine population in all of the pig barns. The number of swine produced in the swine farm had been recorded manually by the responsible staff. Please refer to Section C of MR for more details.	
Monitoring frequency	Monitored monthly.	
QA/QC procedures	Archive electronically during project plus 5 years.	
Purpose of data	Use for the calculation of N_{LT}	
Additional comment	$N_{p,LT}$ has been crosschecked through the monthly sale records of 9 swine farms during this monitoring period. And according to the Equation 4 and Equation 5 in PDD, the calculated N_{LT} is 456,983 ($926,660 * 180/365$) heads, which is consistent with the value applied in MR, therefore, $N_{p,LT}$ is reasonable and credible.	

Data / Parameter	N_{da,LT}																							
Unit	Number																							
Description	Number of days animal of type LT is alive in the farm in the year y																							
Source of data	Production record of Commercial Pig																							
Value(s) of monitored parameter	<table><tr><td>01/10/2020-31/10/2020</td><td>180days</td></tr><tr><td>01/11/2020-30/11/2020</td><td>180days</td></tr><tr><td>01/12/2020-31/12/2020</td><td>180days</td></tr><tr><td>01/01/2021-31/01/2021</td><td>180days</td></tr><tr><td>01/02/2021-28/02/2021</td><td>180days</td></tr><tr><td>01/03/2021-31/03/2021</td><td>180days</td></tr><tr><td>01/04/2021-30/04/2021</td><td>180days</td></tr><tr><td>01/05/2021-31/05/2021</td><td>180days</td></tr><tr><td>01/06/2021-30/06/2021</td><td>180days</td></tr><tr><td>01/07/2021-31/07/2021</td><td>180days</td></tr><tr><td>01/10/2020-31/07/2021</td><td>180days</td></tr></table>		01/10/2020-31/10/2020	180days	01/11/2020-30/11/2020	180days	01/12/2020-31/12/2020	180days	01/01/2021-31/01/2021	180days	01/02/2021-28/02/2021	180days	01/03/2021-31/03/2021	180days	01/04/2021-30/04/2021	180days	01/05/2021-31/05/2021	180days	01/06/2021-30/06/2021	180days	01/07/2021-31/07/2021	180days	01/10/2020-31/07/2021	180days
01/10/2020-31/10/2020	180days																							
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01/02/2021-28/02/2021	180days																							
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01/04/2021-30/04/2021	180days																							
01/05/2021-31/05/2021	180days																							
01/06/2021-30/06/2021	180days																							
01/07/2021-31/07/2021	180days																							
01/10/2020-31/07/2021	180days																							
Measurement methods and procedures	The days of swine alive in the farm was recorded manually by the responsible staff.																							
Monitoring frequency	Monitored monthly.																							
QA/QC procedures	Archive electronically during project plus 5 years.																							
Purpose of data	Use for the calculation of N _{LT}																							
Additional comment	The number of days the animal alive in the farm is crosschecked through the monthly sale records of nine swine farms during this monitoring period. and it can be concluded that the data is consistent.																							

Data / Parameter	$N_{AA,LT}$
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Unit	Number																						
Description	Daily stock of animals in the farm, discounting dead and discarded animals																						
Source of data	Breeding Pig stock record																						
Value(s) of monitored parameter	<table> <tr><td>01/10/2020-31/10/2020</td><td>55,432heads of breeding pigs</td></tr> <tr><td>01/11/2020-30/11/2020</td><td>55,258heads of breeding pigs</td></tr> <tr><td>01/12/2020-31/12/2020</td><td>55,216heads of breeding pigs</td></tr> <tr><td>01/01/2021-31/01/2021</td><td>55,469heads of breeding pigs</td></tr> <tr><td>01/02/2021-28/02/2021</td><td>55,358heads of breeding pigs</td></tr> <tr><td>01/03/2021-31/03/2021</td><td>55,575heads of breeding pigs</td></tr> <tr><td>01/04/2021-30/04/2021</td><td>55,438heads of breeding pigs</td></tr> <tr><td>01/05/2021-31/05/2021</td><td>55,227heads of breeding pigs</td></tr> <tr><td>01/06/2021-30/06/2021</td><td>55,463heads of breeding pigs</td></tr> <tr><td>01/07/2021-31/07/2021</td><td>55,454heads of breeding pigs</td></tr> <tr><td>01/10/2020-31/07/2021(Average)</td><td>55,389 heads of breeding pigs</td></tr> </table>	01/10/2020-31/10/2020	55,432heads of breeding pigs	01/11/2020-30/11/2020	55,258heads of breeding pigs	01/12/2020-31/12/2020	55,216heads of breeding pigs	01/01/2021-31/01/2021	55,469heads of breeding pigs	01/02/2021-28/02/2021	55,358heads of breeding pigs	01/03/2021-31/03/2021	55,575heads of breeding pigs	01/04/2021-30/04/2021	55,438heads of breeding pigs	01/05/2021-31/05/2021	55,227heads of breeding pigs	01/06/2021-30/06/2021	55,463heads of breeding pigs	01/07/2021-31/07/2021	55,454heads of breeding pigs	01/10/2020-31/07/2021(Average)	55,389 heads of breeding pigs
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01/07/2021-31/07/2021	55,454heads of breeding pigs																						
01/10/2020-31/07/2021(Average)	55,389 heads of breeding pigs																						
Measurement methods and procedures	Monitored daily through the auto tracking devices of electronic ear tag and the data can be obtained from DCS. The technicians in farms record the daily stock number of animals, and this record data including the new imported animal and discounting dead and discharge animals. Archive electronically during project plus 5 years Please see the Section C of MR for details.																						
Monitoring frequency	daily																						
QA/QC procedures	The system on monitoring the number of livestock population was described in the PDD.																						
Purpose of data	Use for the calculation of baseline/project emission and leakage																						
Additional comment	The system on monitoring the daily stock of breeding swine in the farm was described in Section C of MR.																						

Data / Parameter	W_{site}		
Unit	kg		
Description	Average animal weight of a defined livestock population at the project site		
Source of data	Weight record table		
Value(s) of monitored parameter	Period	commercial pig	breeding pigs
	01/10/2020-31/10/2020	72.1	79.5
	01/11/2020-30/11/2020	71.5	81.6
	01/12/2020-31/12/2020	72.0	78.3
	01/01/2021-31/01/2021	71.6	80.1
	01/02/2021-28/02/2021	71.8	77.2

Measurement methods and procedures	01/03/2021-31/03/2021	72.4	81.6
	01/04/2021-30/04/2021	70.9	78.9
	01/05/2021-31/05/2021	71.1	82.3
	01/06/2021-30/06/2021	70.9	79.0
	01/07/2021-31/07/2021	71.3	82.2
	01/10/2020-31/07/2021(Average)	71.6	80.1
	Measured by the weight measurers and record by the technical staff in each farm monthly		
Monitoring frequency	monthly		
QA/QC procedures	As this project involved 9 swine farms and two types of swine i.e., Market swine and Breeding swine, and as per applied methodology, each defined livestock population should be classified into a minimum of three age categories, so the sampling method is Stratified random sampling. The specific sampling methods are as follows: The sampling method is followed as PDD and described as below during this monitoring period. 1. the overall sample size based on the actual population of pigs in stock firstly is calculated. 2. As the project involved 9 swine farms, then the sample size in each swine farm is determined based on the proportion of the number of each farm in the total number of 9 farms. 3. Similarly, the sample size of each age group of Market swine and Breeding swine in a farm is also calculated based on the proportion of the number of each age group of Market swine and Breeding swine to the total number of swine in the farm. 4. After the sample size in each age group of Market swine and Breeding swine of each swine farm determined, the sample is conducted in every swine farm. Since swine in different age are kept in the different pig houses, samples can be randomly selected from pig houses of this age group. 5. After the samples are selected, the weight is measured in each farm monthly by weight measurers and recorded in the weight record table. 6. The sample will be marked after weighting and if the sample swine is still drawn next month, then this sample swine needs to be discarded and a new sample swine is drawn. This will be done every month until the end of the monitoring period.		
Purpose of data	Used for estimating $VS_{LT,y}$		
Additional comment	Please see section D.4 for detail about sampling.		

Data/parameter	n_{dy}
Unit	number
Description	Number of days treatment plant was operational in year y.
Source of data	Daily operation report

Value(s) of monitored parameter	The actual number of days 9 treatment plants that was operational are 304 days during this monitoring periods <table> <tr> <th>Period</th><th>n_{dy}(days)</th></tr> <tr> <td>01/10/2020-31/10/2020</td><td>31</td></tr> <tr> <td>01/11/2020-30/11/2020</td><td>30</td></tr> <tr> <td>01/12/2020-31/12/2020</td><td>31</td></tr> <tr> <td>01/01/2021-31/01/2021</td><td>31</td></tr> <tr> <td>01/02/2021-28/02/2021</td><td>28</td></tr> <tr> <td>01/03/2021-31/03/2021</td><td>31</td></tr> <tr> <td>01/04/2021-30/04/2021</td><td>30</td></tr> <tr> <td>01/05/2021-31/05/2021</td><td>31</td></tr> <tr> <td>01/06/2021-30/06/2021</td><td>30</td></tr> <tr> <td>01/07/2021-31/07/2021</td><td>31</td></tr> <tr> <td>01/10/2020-31/07/2021</td><td>304</td></tr> </table>	Period	n _{dy} (days)	01/10/2020-31/10/2020	31	01/11/2020-30/11/2020	30	01/12/2020-31/12/2020	31	01/01/2021-31/01/2021	31	01/02/2021-28/02/2021	28	01/03/2021-31/03/2021	31	01/04/2021-30/04/2021	30	01/05/2021-31/05/2021	31	01/06/2021-30/06/2021	30	01/07/2021-31/07/2021	31	01/10/2020-31/07/2021	304
Period	n _{dy} (days)																								
01/10/2020-31/10/2020	31																								
01/11/2020-30/11/2020	30																								
01/12/2020-31/12/2020	31																								
01/01/2021-31/01/2021	31																								
01/02/2021-28/02/2021	28																								
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01/07/2021-31/07/2021	31																								
01/10/2020-31/07/2021	304																								
Measurement methods and procedures	The staff in each manure treatment plant record the number of operation days daily and then record the total monthly number of operation days in end of each month through monthly operation report.																								
Monitoring frequency	Daily																								
QA/QC procedures	The accumulated meter reading of flowmeters installed in the outlet of anaerobic digesters daily can be demonstrated that the AWMSs are actually running on a daily basis.																								
Purpose of data	Calculation of Baseline emissions																								
Additional comment	N/A																								

Data/parameter	EC _{PJ,j,y}		
Unit	MWh		
Description	Quantity of electricity consumed by the proposed project in year y		
Source of data	Daily operation report		
Value(s) of monitored parameter	Period	Electricity from biogas captured	Electricity supplied by the grid company
	01/10/2020-31/10/2020	996.06 MWh	183.6MWh
	01/11/2020-30/11/2020	989.78 MWh	236.05 MWh
	01/12/2020-31/12/2020	1,048.04 MWh	249.17 MWh
	01/01/2021-31/01/2021	1,074.78 MWh	236.05 MWh
	01/02/2021-28/02/2021	1,001.04 MWh	170.48 MWh
	01/03/2021-31/03/2021	1,127.85 MWh	196.71 MWh

	01/04/2021-30/04/2021	949.03 MWh	170.48 MWh
	01/05/2021-31/05/2021	1,011.66 MWh	118.03 MWh
	01/06/2021-30/06/2021	1,002.55 MWh	65.57 MWh
	01/07/2021-31/07/2021	1,067.51 MWh	52.46 MWh
	01/10/2020-31/07/2021	10,268.30 MWh	1,678.60 MWh
Measurement methods and procedures	Use electricity meter 2⁵ installed in the 9 manure treatment plants. The readout records of electricity meter have been recorded at 24:00 of every day by the staff during the monitoring period. The daily electricity consumption is equal to the difference between the previous day's and the next day's readings. Monthly value is the sum of the daily electricity consumption. And during this monitoring period, most of the electricity consumed by the project came from the electricity generated by the biogas generated from the anaerobic fermentation process of the project, which is belongs to self-generated and self-consumed. The electricity consumption of AWMSs were sourced from the grid company when the biogas generators were not operation.		
Monitoring frequency	Continuous measurement and daily recording		
QA/QC procedures	Total 9 meters were calibrated on 17/09/2020 by an officially accredited entity in compliance with JJG596-2012" Electrical Meters for Measuring Alternating-current Electrical Energy" in China. The electricity sourced from the grid company was cross-checked with the grid statement. Please refer to Section C of the MR for more details.		
Purpose of data	Calculation of project emissions		
Additional comment	N/A		

Data/parameter	TDL_{j,y}
Unit	%
Description	Average technical transmission and distribution losses for providing electricity to source <i>j</i> in year <i>y</i>
Source of data	tool" Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation"
Value(s) of monitored parameter	20
Measurement methods and procedures	If the generator set is in a shutdown state or the electricity is insufficient for the operation of AWMSs, then the electricity consumption shall be from the power grid. Scenario A: Electricity consumption from the grid

⁵ The installed electricity meter has a two-way metering function, which can separately measure the electricity consumption from the grid and the electricity consumption from biogas captured.

	is applied to the project. During this monitoring period, all the electricity consumed by the project is comes from the electricity generated by the biogas generated from the anaerobic fermentation process of the project, therefore $TDL_{j,y}$ is not applicable.
Monitoring frequency	The value can be changed once the tool is updated.
QA/QC procedures	Default value of 20% is applied, which is the maximum value as per Methodology tool 05 Version 03.0 and conservative
Purpose of data	Calculation of project emission
Additional comment	N/A

Data / Parameter	F_{Aer}
Unit	Fraction
Description	Fraction of volatile solids directed to aerobic treatment
Source of data	PDD
Value(s) of monitored parameter	100%
Measurement methods and procedures	As this parameter is not monitored in the actual operation. So in the monitoring period, to be conservative, the value of this parameter in the emission reduction calculation is 100%.
Monitoring frequency	Annually
QA/QC procedures	Value of F_{Aer} is applied as 100%, which is conservative.
Purpose of data	Calculation of project emission
Additional comment	During this monitoring period, there is no equip install in the project activity to monitor the influent into anaerobic digestion and aerobic system, therefore the value of F_{Aer} is applied as 100%, which is conservative.

Data/parameter	$MS\%_j$
Unit	Fraction
Description	Fraction of manure handled in system j in project activity
Source of data	PDD
Value(s) of monitored parameter	100%. As this parameter is not monitored during this monitoring period. so, to be conservative, the value of this parameter in the emission reduction calculation is 100% or total $MS\%_j$ in different treatment system is 100% since the treatment process of this project is an anaerobic-aerobic combined treatment technology, main including anaerobic fermentation, and aerobic composting.

Measurement methods and procedures	All the manure flow into AWMSs to be treated, therefore, value of 100% is applied.
Monitoring frequency	Annually
QA/QC procedures	All the manure flow into AWMSs to be treated; no any manure will be discharged outside. Therefore, the value of this parameter is 100% or total MS% _j in different treatment system is 100%.
Purpose of data	Calculation of project emissions
Additional comment	NA

Data/parameter	V_f			
Unit	m ³			
Description	Biogas flow			
Source of data	Daily operation record			
Value(s) of monitored parameter	period	V _f at outlet of the anaerobic digestion (m ³)	V _f at the inlet of generator (m ³)	V _f in inlet of flare system (m ³)
	01/10/2020-31/10/2020	4,193,604.00	4,151,667.81	0.00
	01/11/2020-30/11/2020	4,056,949.80	4,016,380.41	0.00
	01/12/2020-31/12/2020	4,191,836.40	4,149,918.01	0.00
	01/01/2021-31/01/2021	4,193,907.00	4,151,967.50	0.00
	01/02/2021-28/02/2021	3,787,224.60	3,749,352.32	0.00
	01/03/2021-31/03/2021	4,194,774.60	4,152,826.92	0.00
	01/04/2021-30/04/2021	4,058,375.40	4,017,791.30	0.00
	01/05/2021-31/05/2021	4,191,926.40	4,150,006.79	0.00
	01/06/2021-30/06/2021	4,058,573.40	4,017,987.98	0.00
	01/07/2021-31/07/2021	4,193,784.60	4,151,846.91s	0.00
	01/10/2020-31/07/2021	41,120,956.20	40,709,745.95	0.00
Measurement methods and procedures	Monitored continuously, record hourly and saved automatically in the Data Collection System (DCS). The data can be obtained from this system and the monthly data was exported by the staff at the beginning of next month and then recorded in daily operation record.			
Monitoring frequency	Continuously measured by flow meter 1, flowmeter 2 and flowmeter 3			

QA/QC procedures	Total 27 flow meters were calibrated on 17/09/2020 by an officially accredited entity in compliance with JJG1029-2007" Verification Regulation of Vortex-shedding Flowmeter" in China. Please refer to Section C of the MR for more details.
Purpose of data	Calculation of project emission
Additional comment	For this monitoring period, all the biogas produced is used for power generation, no surplus biogas for the flaring system.

Data/parameter	$V_{t,db}$									
Unit	m ³ dry gas/h									
Description	Volumetric flow of the gaseous stream in time interval t on a dry basis									
Source of data	Daily operation record									
Value(s) of monitored parameter	period	average (m ³ dry gas/h)								
		Denglong farm	Fenghuang farm	Litian farm	Jinchuan farm	Tanqiu farm	Zhouhu farm	Xing'an farm	Qiqin farm	Caolu farm
	01/10/2020-31/07/2021	861.33	801.93	629.78	629.41	552.83	715.55	511.53	324.45	609.75
Measurement methods and procedures	Monitored continuously, record hourly and saved automatically in the Data Collection System (DCS). The data can be obtained from this system and the monthly data was exported by the staff at the beginning of next month and then recorded in daily operation record. Daily biogas flow is equal to the cumulative value of 24 hours, and monthly biogas flow can be accumulated on daily basis.									
Monitoring frequency	Continuous measurement									
QA/QC procedures	Total 27 flow meters were calibrated on 17/09/2020 by an officially accredited entity in compliance with JJG1029-2007" Verification Regulation of Vortex-shedding Flowmeter" in China. Please refer to Section C of the MR for more details.									
Purpose of data	Calculation of project emissions									
Additional comment	N/A									

Data/parameter	$V_{i,t,db}$
Unit	m ³ gas i/m ³ dry gas
Description	Volumetric fraction of greenhouse gas i in a time interval t on a dry basis

Source of data	Daily operation record	
Value(s) of monitored parameter	period	Average CH₄ Concentration
	01/10/2020-31/10/2020	62.37%
	01/11/2020-30/11/2020	62.35%
	01/12/2020-31/12/2020	62.47%
	01/01/2021-31/01/2021	63.28%
	01/02/2021-28/02/2021	63.58%
	01/03/2021-31/03/2021	62.09%
	01/04/2021-30/04/2021	62.57%
	01/05/2021-31/05/2021	63.02%
	01/06/2021-30/06/2021	61.48%
	01/07/2021-31/07/2021	63.32%
Measurement methods and procedures	Measured continuously and record hourly by online gas analysers installed at the outlet of the anaerobic digesters and saved automatically in the DCS (Data Collection System). The data can be obtained from this system and the monthly data was exported by the staff at the beginning of next month and then recorded in daily operation record. Daily and Monthly CH₄ concentration was calculated based on the 24-hour average and daily average CH₄ concentration.	
Monitoring frequency	Continuous measurement	
QA/QC procedures	All the gas analysers were calibrated on 11/09/2020 by an officially accredited entity in compliance with JJG693-2011" Verification Regulation of Alarmer Detectors of Combustible Gas" in China. And the zero verification with an inert gas (N₂) and one reading verification with a standard gas (single calibration gas) are implemented in the process of calibration, which is in accordance with JJG693-2011. All calibration gases are from Nanjing Changyuan Industrial Gas Co.Ltd, which is a qualified reference materials manufacturer issued by the General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China on 06/09/2017. Please refer to Section C of the MR for more details.	
Purpose of data	Calculation of project emissions	
Additional comment	N/A	

Data/parameter	T _t	
Unit	K	
Description	Temperature of the gaseous stream in time interval t	
Source of data	Daily operation record	
Value(s) of monitored parameter	period	Average Temperature
	01/10/2020-31/10/2020	310.05 k
	01/11/2020-30/11/2020	310.45 k
	01/12/2020-31/12/2020	310.95 k
	01/01/2021-31/01/2021	311.05 k
	01/02/2021-28/02/2021	309.85 k
	01/03/2021-31/03/2021	310.65 k

	01/04/2021-30/04/2021	310.95 k
	01/05/2021-31/05/2021	311.05 k
	01/06/2021-30/06/2021	309.55 k
	01/07/2021-31/07/2021	310.35 k
Measurement methods and procedures	Measured continuously by the biogas flow meters, since the flowmeters can monitor other parameter such as $V_{t,db}$, T_t and P_t simultaneously. And record hourly and saved automatically in the DCS system. The readout of flowmeter was indicated degrees Celsius ($^{\circ}\text{C}$). Therefore, the temperature $T_t(\text{K})$ is calculated as the equation $T(\text{K})=t(^{\circ}\text{C}) + 273.15$ The data can be obtained from this system and the monthly data was exported by the staff at the beginning of next month and then recorded in daily operation record. Daily and Monthly temperature was calculated based on the 24-hour average and daily average temperature.	
Monitoring frequency	Continuous measurement	
QA/QC procedures	Total 27 flow meters were calibrated on 17/09/2020 by an officially accredited entity in compliance with JJG1029-2007" Verification Regulation of Vortex-shedding Flowmeter" in China. Please refer to Section C of the MR for more details.	
Purpose of data	Calculation of project emissions	
Additional comment	N/A	

Data/parameter	P_t																						
Unit	Pa																						
Description	Pressure of the gaseous stream in time interval t																						
Source of data	Daily operation record																						
Value(s) of monitored parameter	<table> <tr> <th>period</th><th>Average Pressure</th></tr> <tr> <td>01/10/2020-31/10/2020</td><td>101.325kpa</td></tr> <tr> <td>01/11/2020-30/11/2020</td><td>101.325kpa</td></tr> <tr> <td>01/12/2020-31/12/2020</td><td>101.325kpa</td></tr> <tr> <td>01/01/2021-31/01/2021</td><td>101.325kpa</td></tr> <tr> <td>01/02/2021-28/02/2021</td><td>101.325kpa</td></tr> <tr> <td>01/03/2021-31/03/2021</td><td>101.325kpa</td></tr> <tr> <td>01/04/2021-30/04/2021</td><td>101.325kpa</td></tr> <tr> <td>01/05/2021-31/05/2021</td><td>101.325kpa</td></tr> <tr> <td>01/06/2021-30/06/2021</td><td>101.325kpa</td></tr> <tr> <td>01/07/2021-31/07/2021</td><td>101.325kpa</td></tr> </table>	period	Average Pressure	01/10/2020-31/10/2020	101.325kpa	01/11/2020-30/11/2020	101.325kpa	01/12/2020-31/12/2020	101.325kpa	01/01/2021-31/01/2021	101.325kpa	01/02/2021-28/02/2021	101.325kpa	01/03/2021-31/03/2021	101.325kpa	01/04/2021-30/04/2021	101.325kpa	01/05/2021-31/05/2021	101.325kpa	01/06/2021-30/06/2021	101.325kpa	01/07/2021-31/07/2021	101.325kpa
period	Average Pressure																						
01/10/2020-31/10/2020	101.325kpa																						
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01/02/2021-28/02/2021	101.325kpa																						
01/03/2021-31/03/2021	101.325kpa																						
01/04/2021-30/04/2021	101.325kpa																						
01/05/2021-31/05/2021	101.325kpa																						
01/06/2021-30/06/2021	101.325kpa																						
01/07/2021-31/07/2021	101.325kpa																						
Measurement methods and procedures	Measured continuously by the biogas flow meters since the flowmeters can monitor other parameter such as $V_{t,db}$, T_t and P_t simultaneously. And record hourly and saved automatically in the DCS system. The data can be obtained from this system and the monthly data was exported by the staff at the beginning of next month and then recorded in daily operation record. Daily and Monthly pressure was calculated based on the 24-hour average and daily average pressure.																						
Monitoring frequency	Continuous measurement																						

QA/QC procedures	Total 27 flow meters were calibrated on 17/09/2020 by an officially accredited entity in compliance with JJG1029-2007" Verification Regulation of Vortex-shedding Flowmeter" in China. Please refer to Section C of the MR for more details.
Purpose of data	Calculation of project emissions
Additional comment	N/A

Data/parameter	$\rho_{i,t}$																						
Unit	kg gas i/m ³ gas i																						
Description	Density of greenhouse gas i in the gaseous stream in time interval t																						
Source of data	Calculated																						
Value(s) of monitored parameter	<table> <tr> <th>Period</th><th>$\rho_{i,t}$</th></tr> <tr> <td>01/10/2020-31/10/2020</td><td>0.00063 t/m³</td></tr> <tr> <td>01/11/2020-30/11/2020</td><td>0.00063 t/m³</td></tr> <tr> <td>01/12/2020-31/12/2020</td><td>0.00063 t/m³</td></tr> <tr> <td>01/01/2021-31/01/2021</td><td>0.00063 t/m³</td></tr> <tr> <td>01/02/2021-28/02/2021</td><td>0.00063 t/m³</td></tr> <tr> <td>01/03/2021-31/03/2021</td><td>0.00063 t/m³</td></tr> <tr> <td>01/04/2021-30/04/2021</td><td>0.00063 t/m³</td></tr> <tr> <td>01/05/2021-31/05/2021</td><td>0.00063 t/m³</td></tr> <tr> <td>01/06/2021-30/06/2021</td><td>0.00063 t/m³</td></tr> <tr> <td>01/07/2021-31/07/2021</td><td>0.00063 t/m³</td></tr> </table>	Period	$\rho_{i,t}$	01/10/2020-31/10/2020	0.00063 t/m ³	01/11/2020-30/11/2020	0.00063 t/m ³	01/12/2020-31/12/2020	0.00063 t/m ³	01/01/2021-31/01/2021	0.00063 t/m ³	01/02/2021-28/02/2021	0.00063 t/m ³	01/03/2021-31/03/2021	0.00063 t/m ³	01/04/2021-30/04/2021	0.00063 t/m ³	01/05/2021-31/05/2021	0.00063 t/m ³	01/06/2021-30/06/2021	0.00063 t/m ³	01/07/2021-31/07/2021	0.00063 t/m ³
Period	$\rho_{i,t}$																						
01/10/2020-31/10/2020	0.00063 t/m ³																						
01/11/2020-30/11/2020	0.00063 t/m ³																						
01/12/2020-31/12/2020	0.00063 t/m ³																						
01/01/2021-31/01/2021	0.00063 t/m ³																						
01/02/2021-28/02/2021	0.00063 t/m ³																						
01/03/2021-31/03/2021	0.00063 t/m ³																						
01/04/2021-30/04/2021	0.00063 t/m ³																						
01/05/2021-31/05/2021	0.00063 t/m ³																						
01/06/2021-30/06/2021	0.00063 t/m ³																						
01/07/2021-31/07/2021	0.00063 t/m ³																						
Measurement methods and procedures	Calculated based on temperature of the gaseous stream in time interval t and pressure of the gaseous stream in time interval t.																						
Monitoring frequency	Pressure and temperature are measured continuously by the biogas flow meters																						
QA/QC procedures	Calculated value according to the pressure and temperature																						
Purpose of data	Calculation of project emissions																						
Additional comment	NA																						

Data/parameter	$B_{0,LT}$
Unit	m ³ CH ₄ /kg -dm
Description	Maximum methane producing potential of the volatile solid generated by animal type <i>LT</i>
Source of data	IPCC 2006 table 10A-7 and 10A-8, chapter 10, volume 4

Value(s) applied	$B_{0,LT}$ (Market swine) =0.29 ⁶ $B_{0,LT}$ (Breeding swine) =0.29
Measurement methods and procedures	$B_{0,LT}$ can be measured as per ISO 11734:1995. As this parameter is not monitored in the actual operation. so, in the monitoring period 0.29 m ³ CH ₄ /kg -dm is still applied. While the actual methane producing potential of the volatile solid generated by swine manure is 479.4ml/g VS according to the public literature ⁷ ,which is higher. Therefore 0.29 m ³ CH ₄ /kg -dm applied in monitoring period is conservative.
Monitoring frequency	Annually
QA/QC procedures	The value is taken from published sources. The parameter value should be updated on latest available public data source.
Purpose of data	Used in project emission/baseline calculations
Additional comment	N/A

Data/parameter	Type
Unit	/
Description	Type of barn and AWMS
Source of data	Project proponent
Value(s) applied	NA
Measurement methods and procedures	The swine barn and AWMS layout and configuration are collected. Archive electronically during project plus 5 years.
Monitoring frequency	- Once for each monitoring period
QA/QC procedures	After the first verification, only changes in the type of barn and AWMS will be reported.
Purpose of data	Confirm whether the implementation of project as design
Additional comment	Swine barn and AWMS layout and configuration.

⁶ The proposed project is located in Ji'an, Jiangxi Province, China, Asia. 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 m³ CH₄/kg VS.

⁷ <http://www.doc88.com/p-9902182440715.html>

Data/parameter	T																															
Unit	°C																															
Description	Annual average ambient temperature at project site																															
Source of data	Ji'an Meteorological Bureau																															
Value(s) applied	<table><tr><td>Time</td><td>T (°C)</td><td>Time</td><td>T (°C)</td></tr><tr><td>Oct-2020</td><td>19.5</td><td>Mar-2021</td><td>15.5</td></tr><tr><td>Nov-2020</td><td>16.0</td><td>Apr-2021</td><td>17.5</td></tr><tr><td>Dec-2020</td><td>8.0</td><td>May-2021</td><td>23.0</td></tr><tr><td>Jan-2021</td><td>8.5</td><td>Jun-2021</td><td>28.0</td></tr><tr><td>Feb-2021</td><td>13.5</td><td>Jul-2021</td><td>31.0</td></tr><tr><td colspan="2">Average ambient temperature in this monitoring period (°C)</td><td colspan="2">18.01</td></tr></table>				Time	T (°C)	Time	T (°C)	Oct-2020	19.5	Mar-2021	15.5	Nov-2020	16.0	Apr-2021	17.5	Dec-2020	8.0	May-2021	23.0	Jan-2021	8.5	Jun-2021	28.0	Feb-2021	13.5	Jul-2021	31.0	Average ambient temperature in this monitoring period (°C)		18.01	
Time	T (°C)	Time	T (°C)																													
Oct-2020	19.5	Mar-2021	15.5																													
Nov-2020	16.0	Apr-2021	17.5																													
Dec-2020	8.0	May-2021	23.0																													
Jan-2021	8.5	Jun-2021	28.0																													
Feb-2021	13.5	Jul-2021	31.0																													
Average ambient temperature in this monitoring period (°C)		18.01																														
Measurement methods and procedures	Data Sourced from Ji'an Meteorological Bureau In this monitoring Period, the average ambient temperature at Ji'an Meteorological Observatory nearby project site is 18.01°C, the Annual average ambient temperature at project site from public website is 18.5°C, so the applied annual average ambient temperature at project site is 18.01, and the MCF should be applied 77%.																															
Monitoring frequency	monthly																															
QA/QC procedures	Cross-Check with the Annual average ambient temperature at project site from public website monthly (http://www.tianqihoubao.com/qihou/jian.htm).																															
Purpose of data	Used to select the annual MCF from IPCC 2006 Guidelines																															
Additional comment	NA																															

SDG 8

Data / Parameter	Number of males and females employed by the project
Unit	Number
Description	Jobs created for both men and women.
Source of data	Record keeping book and labor contract
Value(s) of monitored parameter	18 jobs are created including 9 males and 9 females
Measurement methods and procedures	Source of data was record keeping book and cross checked by the labor contracts.
Monitoring frequency	Once for each monitoring period.
QA/QC procedures	After the first verification, only changes in employees will be reported. For this monitoring period, there is no change for employees. The results shall be cross checked with training records of employees.
Purpose of data	To demonstrate contribution to SDG 8.
Additional comment	N/A

Data / Parameter	Average monthly salary
Unit	RMB/person
Description	This parameter states the payment conditions of the people employed within the project. Equal pay for work of equal value regardless of gender.
Source of data	Payroll
Value(s) of monitored parameter	5,000 RMB/person with equal salaries for men and women in the same post.
Measurement methods and procedures	The average monthly salary will be determined by the Payroll and cross checked by the labor contract.
Monitoring frequency	Once for each monitoring period.
QA/QC procedures	The results shall be also cross checked with labor contracts.
Purpose of data	To demonstrate contribution to SDG 8.
Additional comment	N/A

SDG 7

Data / Parameter	EGd,y																						
Unit	MWh																						
Description	Quantity of electricity generation by capturing biogas																						
Source of data	Daily operation report																						
Value(s) of monitored parameter	<table border="1"> <tr><td>01/10/2020-31/10/2020</td><td>4,587.12 MWh</td></tr> <tr><td>01/11/2020-30/11/2020</td><td>4,504.79 MWh</td></tr> <tr><td>01/12/2020-31/12/2020</td><td>4,716.19 MWh</td></tr> <tr><td>01/01/2021-31/01/2021</td><td>4,784.07 MWh</td></tr> <tr><td>01/02/2021-28/02/2021</td><td>4,409.32 MWh</td></tr> <tr><td>01/03/2021-31/03/2021</td><td>4,917.95 MWh</td></tr> <tr><td>01/04/2021-30/04/2021</td><td>4,948.13 MWh</td></tr> <tr><td>01/05/2021-31/05/2021</td><td>5,176.22 MWh</td></tr> <tr><td>01/06/2021-30/06/2021</td><td>4,885.87 MWh</td></tr> <tr><td>01/07/2021-31/07/2021</td><td>4,983.43 MWh</td></tr> <tr><td>01/10/2020-31/07/2021</td><td>47,913.09 MWh</td></tr> </table>	01/10/2020-31/10/2020	4,587.12 MWh	01/11/2020-30/11/2020	4,504.79 MWh	01/12/2020-31/12/2020	4,716.19 MWh	01/01/2021-31/01/2021	4,784.07 MWh	01/02/2021-28/02/2021	4,409.32 MWh	01/03/2021-31/03/2021	4,917.95 MWh	01/04/2021-30/04/2021	4,948.13 MWh	01/05/2021-31/05/2021	5,176.22 MWh	01/06/2021-30/06/2021	4,885.87 MWh	01/07/2021-31/07/2021	4,983.43 MWh	01/10/2020-31/07/2021	47,913.09 MWh
01/10/2020-31/10/2020	4,587.12 MWh																						
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01/03/2021-31/03/2021	4,917.95 MWh																						
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01/05/2021-31/05/2021	5,176.22 MWh																						
01/06/2021-30/06/2021	4,885.87 MWh																						
01/07/2021-31/07/2021	4,983.43 MWh																						
01/10/2020-31/07/2021	47,913.09 MWh																						
Measurement methods and procedures	Use electricity meters 1 installed at the outlet of generator. The readout records of electricity meter have been recorded at 24:00 of every day by the staff during the monitoring period. The daily electricity generation is equal to the difference between the previous day's and the next day's readings. Monthly value is the sum of the daily electricity generation.																						
Monitoring frequency	Continuous measurement and daily recording																						
QA/QC procedures	total 9 meters were calibrated on 17/09/2020 by an officially accredited entity in compliance with JJG596-2012" Electrical Meters for Measuring Alternating-current Electrical Energy" in China. Please refer to Section C of the MR for more details.																						
Purpose of data	To demonstrate contribution to SDG 7.																						
Additional comment	N/A																						

Mitigation Measure for Safeguarding Principles

Data / Parameter	Employee Training of biogas safety operation
Unit	/
Description	Employees was trained on the safety operation of the biogas
Source of data	Training notice
Value(s) of monitored parameter	Training for the biogas safety operation was held on 03/09/2020
Measurement methods and procedures	Training once a year The training content includes basic biogas knowledge, Operating condition control, operating procedure, patrol inspection, Operation management and failure process. All 18 staff in manure treatment plants and 9 technicians from these 9 swine farms attended this training. All staff strictly follow the operation procedures in the process of operation and there are no safety accidents occurred during this monitoring period. Therefore, the training is effective.
Monitoring frequency	once a year
QA/QC procedures	Attendance list can be proved that the training is held.
Purpose of data	To demonstrate Mitigation Measure for Safeguarding Principles
Additional comment	N/A

D.3. Comparison of monitored parameters with last monitoring period

NA. This is the 1st monitoring period, no last monitoring period can be compared.

D.4. Implementation of sampling plan

>>

According to the PDD, the sample size will be recalculated due to the number of swine is changed during the monitoring period. During this monitoring period, the sampling is implemented according to the stratified sampling method for the monitoring of W_{site} described in Section C of MR. The detailed steps are as following:

1. The overall sample size based on the actual population of pigs in stock firstly is calculated.
2. As the project involved 9 swine farms (including 8 fattening farms and 1 breeding farms), then the sample size in each swine farm is adjusted based on the proportion of the number of each farm in the total number of 9 farms.
3. Similarly, the sample size of each age group of Market swine and Breeding swine in a farm is also calculated based on the proportion of the number of each age group of Market swine and Breeding swine to the total number of swine in two kinds of farms.
4. After the sample size in each age group of Market swine and Breeding swine of each swine farm determined, the sample is conducted in every swine farm. Since swine in different age are kept in the different pig houses, samples can be randomly selected from pig houses of this age group.
5. After the samples are selected, the weight is measured in each farm monthly by weight measurers and recorded in the weight record table.
6. The sample will be marked after weighting and if the sample swine is still drawn next month, then this sample swine needs to be discarded and a new sample swine is drawn, this will be done every month until the end of the monitoring period.

Step 1 overall sample size calculation

According to "Standard: Sampling and surveys for CDM project activities and programmes of activities (Version 09.0)", the desired confidence level is 95% and the desired precision is 10%. According to statistical principles and sampling survey method, 423 samples should be sufficient to satisfy the desired confidence and precision. For mean value sampling, the required sampling quantity is calculated by the following steps:

$$n_1 = \frac{Z^2 \sigma^2}{d^2} = \frac{Z^2 (\sigma^2 / X^2)}{d^2 / X^2} = Z^2 V^2 / e^2$$

$$n_2 = n_1 N / (N + n_1)$$

$$n_3 = B n_2$$

$$n_4 = n_3 / r$$

$$n = n_4 (110\%)$$

Where:

Z the Z-statistic and the value taken is 1.96 (corresponding to 95% confidence level);

σ the standard deviation;

d the maximum error of estimate;

X the mean value of samples;

V the coefficient of variation, $V = \sigma / X \leq 1$ and its maximum value 1 is taken;

e the allowed relative sampling error ("precision") and the value taken is 10%

N the total number of swine population 512,372⁸;

B the survey design effect and the B value taken is 1 because for stratification sampling the B value is less than or equal to 1;

r the survey reply rate and the value taken is 100%;

110% 10% contingency was added to produce the final sample size;

n_1, n_2, n_3, n_4, n the adjusted values after each step with n being the final number of samples to be taken. Actually, n_4 is the required number of samples based on calculation, 10% contingency was added to n_4 to produce n in this sampling.

Z	V	e	N	B	r
1.96	1	10%	512,372	1	100%
n_1	$Z^2 V^2 / e^2$	384			
n_2	$n_1 N / (N + n_1)$	384			
n_3	$B n_2$	384			

⁸ This value is the total of stock of animals in the farms in this monitoring period, including market swine and breeding swine. According the monitored parameter of $N_{p,LT}$ and $N_{AA,LT}$, the average stock of animals in the farms is 55,389 heads of breeding swine. The annual average number of animals is 456,983 heads of market swine in the farms as calculation of Equation 4. Therefore 55,389heads+456,983heads=512,372 head

n_4	n_3/r	384
n	$n_4 (110\%)$	423

Step 2 adjust sample size based on the proportion of the number of each farm in the total number of 9 farms

Stratified sampling (with samples of 423) was used for the monitoring of Wsite. However, the samples number in the ten subsidiary farms is decimals according to proportion of the number of each farm in the total number of 9 farms. To be conservative, both the samples number of the ten subsidiary farms is adjusted to be integer value. As a result, 428 samples of swine population were selected within the project boundary using Excel to ensure conservation.

The distribution of the samples in each swine farm shows as follow:

NO.	Swine farm	Sample number
1	Denglong	65
2	Fenghuang	61
3	Litian	48
4	Jinchuan	48
5	Tanqiu	42
6	Zhouhu	54
7	Xingan	39
8	Qiqin	25
9	Caolu	46
Total		428

Step 3 Determine sample size based on the proportion of the number of each age group of Market swine and Breeding swine to the total number of swine in two kinds of farms.

According to the methodology ACM0010, each defined livestock population should be classified into a minimum of three age categories. Nursery phase, Growing phase and Mature phase in fattening farms and breeding farms was selected through the proportion of swine population in three age categories during this monitoring period. At the same time, to be conservative, both the samples number of the three age categories is adjusted to be integer value.

In conclusion, 442 samples of swine population are fixed and the distribution of the samples for three age categories in each swine farm shows as follow:

NO.	Swine farm	Sample number	Nursery phase	Growing phase	Mature phase
1	Denglong	67	22	23	22
2	Fenghuang	63	20	22	21
3	Litian	50	16	17	17
4	Jinchuan	49	15	17	17
5	Tanqiu	44	14	15	15
6	Zhouhu	55	20	18	17

7	Xingan	40	15	14	11
8	Qiqin	27	10	8	9
9	Caolu	47	14	16	17
Total		442	146	150	146

Step 4 sampling and measure

After the sample size in each age group of Market swine and Breeding swine of each swine farm determined, the sample and measure are conducted in every swine farm. Since swine in different age are kept in the different pig houses, samples can be randomly selected from pig houses of this age group. After the samples are selected, the weight is measured in each farm monthly by weight measurers and recorded in the weight record table. If the same sample is taken the following month, then a new sample will be taken. This will be done every month until the end of the monitoring period.

For this monitoring period, the sample size is determined at the beginning of the monitoring period, then samples are selected randomly from pig houses of this age group by the technicians in the swine farms and then be measured by weight measures in the middle of each month. At the same time, the measured value is recorded in the weight record table by the technicians in the swine farms.

At last, monthly average W_{site} of market swine and breeding swine was calculated based on W_{site} of all market swine sample and breeding swine sample.

All of the sample size will be changed at the beginning of the next monitoring period during the credit periods according to the actual population of pigs in stock, a new round of sampling will be conducted as this sampling method.

The Monitoring Team implemented the sampling investigation strictly follow the guidance. The monitoring data will be collected throughout the entire crediting period of the project.

According to Standard: Sampling and surveys of CDM project activities and programmes of activities (Version 09.0), confidence/precision have been calculated and checked as follows:

1. The stratified estimated overall mean

The sample estimate of the overall mean operation hour is calculated with the equation below:

$$m_{strat} = \sum_{i=a}^k \frac{g_i}{N} \times m_i \quad (1)$$

Where:

m_{strat} The stratified estimated overall mean

g_i Size of the i^{th} district where $i=a, \dots, k$

N Population total (512,372)

m_i Mean of the i^{th} district where $i=a, \dots, k$

2. The standard error of the stratified estimated overall mean

The standard error of the stratified estimated overall mean is calculated as follows:

(2)

$$s.e.(m_{Strat}) = \sqrt{\sum_{i=a}^k \left(\frac{g_i}{N}\right)^2 \times \left(1 - \frac{n_i}{g_i}\right) \times \frac{SD_i^2}{n_i}}$$

Where:

s.e.(m_{Strat}) Standard error of the stratified estimated overall mean

g_i Size of the ith district where i=a,...,k

N Population total (512,372)

n_i Number of sampled units the ith district where i=a,...,k

SD_i² Variance of the ith district where i=a,...,k

3. t-value

t-value is depending on:

(i) The level of confidence, and

(ii) The size of the sample.

The t-value associated with 95% confidence and the sample size of 442 is 1.9653 as derived in Microsoft Excel using the TINV function.

4. Precision

The precision associated with an estimate is:

t-value × standard error of the mean

5. Calculation results

For W_{site}, according to "Sampling and surveys for CDM project activities and programmes of activities (Version 09.0)", the desired confidence level is 95% and the desired precision is 10%. According to statistical principles and sampling survey method, 442 samples should be sufficient to satisfy the desired confidence and precision.

The calculation results are shown below. For more details of these calculations, please refer to the ER calculation spread sheet.

Period	t-value	m _{Strat}	s.e.(m _{Strat})	Precision	Relative Precision
01/10/2020 - 30/10/2020	1.9653	72.90	1.1829	2.3247	3.19%
01/11/2020 - 30/11/2020	1.9653	72.59	1.2072	2.3726	3.27%
01/12/2020 - 31/12/2020	1.9653	72.65	1.2080	2.3741	3.27%
01/01/2021 - 31/01/2021	1.9653	72.49	1.2023	2.3629	3.26%
01/02/2021 - 29/02/2021	1.9653	72.36	1.2192	2.3962	3.31%
01/03/2021 - 31/03/2021	1.9653	73.41	1.2039	2.3660	3.22%
01/04/2021 - 30/04/2021	1.9653	71.79	1.1914	2.3415	3.26%
01/05/2021 - 31/05/2021	1.9653	72.29	1.2074	2.3729	3.28%
01/06/2021 - 30/06/2021	1.9653	71.80	1.2169	2.3916	3.33%
01/07/2021 - 31/07/2021	1.9653	72.52	1.2074	2.3729	3.27%

In conclusion, the 442 samples are sufficient to satisfy the desired confidence and precision.

SECTION E. CALCULATION OF SDG IMPACTS

E.1. Calculation of baseline value or estimation of baseline situation of each SDG Impact

>>

SDG 7 Impact of baseline situation

From 01/10/2020 to 31/12/2020, 0 MWh of electricity can be generated through capturing biogas without the project activity.

From 01/01/2021 to 31/07/2021, 0 MWh of electricity can be generated through capturing biogas Without the project activity.

Without the project activity, 0 MWh of electricity can be generated through capturing biogas during the 1st monitoring period from 01/10/2020 to 31/07/2021.

SDG 8 Impact of baseline situation

From 01/10/2020 to 31/12/2020, SDG 8 baseline impact was 0 job created and 0 monthly earning got without the project activity.

From 01/01/2021 to 31/07/2021, SDG 8 baseline impact was 0 job created and 0 monthly earning got without the project activity.

Without the project activity, SDG 8 baseline impact was 0 job created and 0 monthly earning got during the 1st monitoring period from 01/10/2020 to 31/07/2021.

SDG 13 Impact of baseline situation

As per section B.6 of the PDD, baseline emissions in year y (BE_y) can be calculated as follows, Baseline emissions are:

$$BE_y = BE_{CH_4,y} + BE_{N_2O,y} + BE_{elec/heat,y} \quad (\text{Equation 1})$$

where:

BE_y	Baseline emissions in year y (t CO ₂ /yr)
$BE_{CH_4,y}$	Baseline CH ₄ emissions in year y (t CO ₂ /yr)
$BE_{N_2O,y}$	Baseline N ₂ O emissions in year y (t CO ₂ /yr)
$BE_{elec/heat,y}$	Baseline CO ₂ emissions from electricity and/or heat used in the baseline (t CO ₂ /yr)

i) Baseline CH₄ emissions ($BE_{CH_4,y}$)

$$BE_{CH_4,y} = GWP_{CH_4} * D_{CH_4} * \sum_{j,LT} (MCF_j * B_{0,LT} * N_{LT} * VS_{LT,y} * MS\%_{BL,j}) \quad (\text{Equation 2})$$

where:

$BE_{CH_4,y}$	Baseline CH ₄ emissions in year y (t CO ₂ /yr)
GWP_{CH_4}	Global Warming Potential (GWP) of CH ₄ (t CO ₂ e/t CH ₄)
D_{CH_4}	Density of CH ₄ (t/m ³). 0.00067t/m ³ at room temperature(20°C)and 1am pressure.
MCF_j	Annual methane conversion factor (MCF) for the baseline AWMS _j . IPCC 2006, table 10.17, chapter 10,volume 4.
$B_{0,LT}$	Maximum methane producing potential of the volatile solid generated by animal type LT (m ³ CH ₄ /kg -dm)
N_{LT}	Annual average number of animals of type LT for the year y (number)
$VS_{LT,y}$	Annual volatile solid excretions for livestock LT entering all AWMS on a dry matter weight basis (kg -dm/animal/yr)

MS% _{BL,j}	Fraction of manure handled in system j in the baseline. In this project, the baseline manure management system is uncovered anaerobic lagoon only. The amount of manure handled by the anaerobic lagoon is 100%. MS% _{BL,j} = 100%
LT	Type of livestock
j	Type of treatment system

Estimation of various variables and parameters for above equations:

(A) As per PDD, VS_{LT,y} shall be determined in following way.

$$VS_{LT,y} = \left(\frac{W_{site}}{W_{default}} \right) * VS_{default} * nd_y \quad (\text{Equation 3})$$

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

(B) Annual average number of animals of type LT (N_{LT}) shall be determined in one of the following ways, presented in order of preference

Option 1:

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

where:

N _{LT}	Annual average number of animals of type LT for the year y (number)
N _{da,LT}	Number of days animal of type LT is alive in the farm in the year y (number)
N _{p,LT}	Number of animals of type LT produced annually for the year y (number)

Option 2:

If the project developer can monitor in a reliable and traceable way the daily stock of animals in the farm, discounting dead animals and animals discarded from the productive process from the daily stock, then the annual average number of animals (N_{LT}) may be calculated as follows:

$$N_{LT} = \frac{\sum_1^{365} N_{AA,LT}}{365} \quad (\text{Equation 5})$$

where:

N _{LT}	Annual average number of animals of type LT for the year y (number)
N _{AA,LT}	Daily stock of animals of type LT in the farm, discounting dead and discarded animals (number)

There are two types of swine in this project, i.e., Market swine and Breeding swine. For Market swine, since there is no way to trace the daily stock, so the Option 1 is adopted to calculate N_{LT} for Market swine. For Breeding swine, the PP can monitor the daily stock of breeding swine in a reliable way, discounting dead breeding swine and discarded them from the productive process from the daily stock. So, the Option 2 is adopted to calculate N_{LT} for Breeding swine.

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

According to applied methodology ACM0010 (Version 08.0), this value varies by species and diet. Default values are used, and they are taken from tables 10A-4 through 10A-9 (IPCC 2006 Guidelines for National Greenhouse Gas Inventories volume 4, chapter 10).

The proposed project is located in Ji'an city, Jiangxi Province, China, Asia. According to Table 10A-7 and 10A-8 of IPCC 2006 Guidelines for National Greenhouse Gas Inventories volume 4, chapter 10, the maximum methane producing potential ($B_{0,LT}$) for Market swine and Breeding swine in Asia region is $0.29 \text{ m}^3 \text{ CH}_4/\text{kg VS}$.

(D) Annual methane conversion factor (MCF_j) for the baseline AWMS_j

(a) The MCF_j values given in table 10.17, chapter 10, volume 4, IPCC 2006 Guidelines should be used. MCF_j values depend on the annual average temperature where the anaerobic manure treatment facility in the baseline existed. For this project, the annual average temperature is 18.5°C ⁹ and the value of 77% is applied.

(b) A conservativeness factor should be applied by multiplying MCF_j values (estimated as per above bullet) with a value of 0.94, to account for the 20% uncertainty in the MCF_j values as reported by IPCC 2006.

ii) Baseline N_2O emissions ($\text{BE}_{\text{N}_2\text{O},y}$)

$$\text{BE}_{\text{N}_2\text{O},y} = \text{GWP}_{\text{N}_2\text{O}} * \text{CF}_{\text{N}_2\text{O}-\text{N},\text{N}} * \frac{1}{1000} * (E_{\text{N}_2\text{O},\text{D},y} + E_{\text{N}_2\text{O},\text{ID},y}) \quad (\text{Equation 6})$$

where:

$\text{BE}_{\text{N}_2\text{O},y}$	Annual baseline N_2O emissions in (t $\text{CO}_2\text{e}/\text{yr}$)
$\text{GWP}_{\text{N}_2\text{O}}$	Global Warming Potential (GWP) for N_2O (t $\text{CO}_2\text{e}/\text{tN}_2\text{O}$)
$\text{CF}_{\text{N}_2\text{O}-\text{N},\text{N}}$	Conversion factor $\text{N}_2\text{O}-\text{N}$ to N_2O (44/28)
$E_{\text{N}_2\text{O},\text{D},y}$	Direct N_2O emission in year y (kg $\text{N}_2\text{O}-\text{N}/\text{year}$)
$E_{\text{N}_2\text{O},\text{ID},y}$	Indirect N_2O emission in year y (kg $\text{N}_2\text{O}-\text{N}/\text{year}$)

$$E_{\text{N}_2\text{O},\text{D},y} = \sum_{j,LT} EF_{\text{N}_2\text{O},\text{D},j} * \text{NEX}_{\text{LT},y} * N_{\text{LT}} * \text{MS}\%_{\text{Bl},j} \quad (\text{Equation 7})$$

where:

$E_{\text{N}_2\text{O},\text{D},y}$	Direct N_2O emission in year y (kg $\text{N}_2\text{O}-\text{N}/\text{yr}$)
$EF_{\text{N}_2\text{O},\text{D},j}$	Direct N_2O emission factor for the treatment system j of the manure management system (kg $\text{N}_2\text{O}-\text{N}/\text{kg N}$). (Estimated with site-specific, regional or national data if such data is available, otherwise use default EF_3 from table 10.21, chapter 10, volume 4, in the IPCC 2006 Guidelines for National Greenhouse Gas Inventories). The site-specific, regional or national data are not available, so this project activity adopts default EF_3 .
$\text{NEX}_{\text{LT},y}$	Annual average nitrogen excretion per head of a defined livestock population (kg N/animal/yr) estimated as described in appendix 2
$\text{MS}\%_{\text{Bl},j}$	Fraction of manure handled in system j (fraction)
N_{LT}	Annual Average number of animals of type LT for the year y estimated as per equation (4) or (5) (number)

⁹ <https://www.3rxing.org/question/adf521729669509232.html>

$$E_{N2O,ID,y} = \sum_{j,LT} EF_{N2O,ID} * F_{gasMS,j,LT} * NEX_{LT,y} * N_{LT} * MS\%_{Bl,j} \quad (\text{Equation 8})$$

where:

$E_{N2O,ID,y}$	Indirect N ₂ O emission in year y (kg N ₂ O-N/year)
$EF_{N2O,ID}$	Indirect N ₂ O emission factor for N ₂ O emissions from atmospheric deposition of nitrogen on soils and water surfaces (kgN ₂ O-N/kg NH ₃ -N and NO _x -N). (Estimated with site-specific, regional or national data if such data is available. Otherwise, default values for EF ₄ from table 11.3, chapter 11, volume 4 of IPCC 2006 Guidelines for National Greenhouse Gas Inventories can be used). The site-specific, regional or national data are not available, so this project activity adopts default EF ₄ .
$NEX_{LT,y}$	Annual average nitrogen excretion per head of a defined livestock population (kg N/animal/yr) estimated as described in appendix 2
$MS\%_{Bl,j}$	Fraction of manure handled in system j (fraction)
$F_{gasMS,j,LT}$	Default values for nitrogen loss due to volatilisation of NH ₃ and NO _x from manure management (fraction)
N_{LT}	Annual Average number of animals of type LT for the year y estimated as per equation (4) or (5) (number)

Estimation of various variables and parameters for above equations:

(A) As per PDD, the procedure for estimating $NEX_{LT,y}$ in following way:

In the absence of availability of project specific information on protein intake, which should be justified in the CDM-PDD, national or regional data should be used for the nitrogen excretion $NEX_{LT,y}$, if available. In the absence of such data, default values from Table 10.19 of the IPCC 2006, volume 4, chapter 10) may be used and should be corrected for the animal weight at the project site in the following way:

$$NEX_{LT,y} = \frac{W_{site}}{W_{default}} * NEX_{IPCC\ default} \quad (\text{Equation 9})$$

where:

$NEX_{LT,y}$	Annual average nitrogen excretion per head of a defined livestock population (kg N/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)
$NEX_{IPCC\ default}$	Default value for the nitrogen excretion per head of a defined livestock population (kg N/animal/year)

$$NEX_{IPCC\ default} = N_{rate(T)} * \frac{TAM}{1000} * 365^{10} \quad (\text{Equation 10})$$

where:

$N_{rate(T)}$	the default N excretion rate, kg N/ (1000 kg animal mass)/ day, Table 10.19, chapter 10, volume 4 of IPCC 2006 Guidelines
TAM	Typical animal mass for livestock in kg/animal

¹⁰ This formula refers to the formula 10.30 in chapter 10 volume IPCC2006.

iii) Baseline CO₂ emission from electricity and/or heat used in the baseline

$$BE_{elec/heat,y} = BE_{EC,y} + BE_{HG,y} \quad (\text{Equation 11})$$

where:

$BE_{elec/heat,y}$	Baseline CO ₂ emissions from electricity and/or heat used in the baseline (t CO ₂ /yr)
$BE_{EC,y}$	Baseline emissions associated with electricity generation in year y (t CO ₂ /yr)
$BE_{HG,y}$	Baseline emissions associated with heat generation in year y (t CO ₂ /yr)

As described in PDD, the baseline scenario of this project is uncovered anaerobic lagoon, and no heat used in the baseline, only minor electricity is used, so the emission can be excluded for simplification. In addition, the biogas generated during the treatment process in this project will be captured for power generation and all the electricity generated from this project is used by the AWMS and 9 swine farms. The electricity generated is connected to another user or to the regional power grid. So, the baseline CO₂ emission from electricity and/or heat used in the baseline is 0, which is conservative.

Table 7 Basic parameter

Time	N _{LT}	N _{AA}	W _{site} (kg)		VS _{LT,y} (kg-dm/ animal/year)		n _{dy} (day)	NEX _{IPCC} (kg N/animal/year)		NEX _{LT,y} (kg N/animal/year)	
	Market swine	Breeding swine	Market swine	Breeding swine	Market swine	Breeding swine		Market swine	Breeding swine	Market swine	Breeding swine
01/10/2020- 31/10/2020	456,983	55,432	72.1	79.5	23.95	26.39	31	0.36	0.21	0.94	0.59
01/11/2020- 30/11/2020	456,983	55,258	71.5	81.6	22.98	26.23	30	0.35	0.20	0.90	0.59
01/12/2020- 31/12/2020	456,983	55,216	72.0	78.3	23.90	25.99	31	0.36	0.21	0.94	0.58
01/01/2021- 31/01/2021	456,983	55,469	71.6	80.1	23.77	26.61	31	0.36	0.21	0.93	0.60
01/02/2021- 28/02/2021	456,983	55,358	71.8	77.2	21.53	23.15	28	0.33	0.19	0.84	0.52
01/03/2021- 31/03/2021	456,983	55,575	72.4	81.6	24.05	27.09	31	0.36	0.21	0.94	0.61
01/04/2021- 30/04/2021	456,983	55,438	70.9	78.9	22.80	25.37	30	0.35	0.20	0.89	0.57
01/05/2021- 31/05/2021	456,983	55,227	71.1	82.3	23.61	27.34	31	0.36	0.21	0.93	0.61
01/06/2021- 30/06/2021	456,983	55,463	70.9	79.0	22.80	25.38	30	0.35	0.20	0.89	0.57
01/07/2021- 31/07/2021	456,983	55,454	71.3	82.2	23.69	27.31	31	0.36	0.21	0.93	0.61

Table 8 The calculation result of BE_{CH4}

Parameter	Value		Unit
species	Market Swine	Breeding Swine	
GWP _{CH4}	25/28	25/28	tCO ₂ /tCH ₄
D _{CH4}	0.00067	0.00067	t/m ³
MCF _j	77%	77%	%
Conservative Factor	0.94	0.94	/
MCF with cons. Factor	0.7238	0.7238	/
B _{0,LT}	0.29	0.29	m ³ CH ₄ /kg_dm
N _{LT}	Refer to Table 7		
W _{site}	Refer to Table 7		
W _{default}	28	28	kg
VS _{default}	0.3	0.3	Kg-dm/animal/day
VS _{LT,y}	Refer to Table 7		
MS% _{BI,j}	100%	100%	%
n _{dy}	Refer to Table 7		
01/10/2020-31/12/2020	129,076		tCO ₂ e
01/01/2021-31/07/2021	331,739		tCO ₂ e
BE_{CH4,y}	460,816		tCO ₂ e

Table 9 The calculation result of BE_{N2O,y}

Parameter	Value		Unit
species	Market Swine	Breeding Swine	
EF _{N2O,D,j}	0	0	kg N ₂ O-N/kg N
EF _{N2O,ID,j}	0.01	0.01	kg N ₂ O-N/kg N
N _{rate(T)}	0.42	0.24	kg N/1000kg animal mass/day
NEX _{IPCC default}	Refer to Table 7		
W _{site}	Refer to Table 7		
TAM	28.00	28.00	kg
W _{default}	28	28	kg
NEX _{LT,y}	Refer to Table 7		
N _{LT}	Refer to Table 7		
MS% _{BI,j}	100%	100%	/
F _{gasm}	40%	40%	/
GWP _{N2O}	298/265	298/265	tCO ₂ /t N ₂ O
CF _{N2O,N-N}	1.57	1.57	Conversion Factor N ₂ O-N to N ₂ O
01/10/2020-31/12/2020	2,559		tCO ₂ e
01/01/2021-31/07/2021	5,218		tCO ₂ e
BE_{N2O,y}	7,777		tCO ₂ e

Table 10 The calculation results of baseline emissions for SDG 13

Period	BE _{CH4} (tCO ₂ e)	BE _{N2O,y} (tCO ₂ e)	BE _y (tCO ₂ e)
01/10/2020-31/12/2020	129,076	2,559	131,635
01/01/2021-31/07/2021	331,739	5,218	336,957
1st monitoring period	460,816	7,777	468,592

Total SDG 13 baseline impact (baseline emissions) of the 1st monitoring period was 483,798 tCO₂e.

E.2. Calculation of project value or estimation of project situation of each SDG Impact

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SDG 7 Impact of project situation

From 01/10/2020 to 31/12/2020, 13,808.30MWh of electricity was generated through capturing biogas.

From 01/01/2021 to 31/07/2021, 34,104.99MWh of electricity was generated through capturing biogas.

For the 1st monitoring period from 01/10/2020 to 31/07/2021, total 47,913.09MWh of electricity was generated through capturing biogas.

SDG 8 Impact of project situation

From 01/10/2020 to 31/12/2020, 18 jobs for local people were created (including 9 females and 9 males), the average monthly earnings of employees were 5,000 RMB/person. Equal salaries were paid for men and women in the same position.

From 01/01/2021 to 31/07/2021, 18 jobs for local people were created (including 9 females and 9 males), the average monthly earnings of employees were 5,000 RMB/person. Equal salaries were paid for men and women in the same position.

For the 1st monitoring period from 01/10/2020 to 31/07/2021, 18 jobs for local people were created (including 9 females and 9 males), the average monthly earnings of employees were 5,000 RMB/person. Equal salaries were paid for men and women in the same position.

SDG 13 Impact of project situation

As per section B.6 of the PDD, project emissions can be calculated as follows,

$$PE_y = PE_{AD,y} + PE_{Aer,y} + PE_{N2O,y} + PE_{EC/FC,y} \quad (\text{Equation 12})$$

where:

- PE_y Project emissions in year y
- PE_{AD,y} Project emissions associated with the anaerobic digester in year y (t CO₂e/yr)
- PE_{Aer,y} Project CH₄ emissions from aerobic AWMS treatment (t CO₂e/yr)
- PE_{N2O,y} Project N₂O emissions in year y (t CO₂/yr)
- PE_{EC/FC,y} Project emissions from electricity consumption and fossil fuel combustion (t CO₂e/yr)

i) Project emissions associated with the anaerobic digester in year y (PE_{AD,y})

Based on the methodology ACM0010" GHG emission reductions from manure management systems (Version 08.0)". $PE_{AD,y}$ is determined using the methodological tool "Project and leakage emissions from anaerobic digesters".

According to the TOOL14" Project and leakage emissions from anaerobic digesters (Version 02.0)", the project emissions associated with the anaerobic digester ($PE_{AD,y}$) are determined as follows:

$$PE_{AD,y} = PE_{EC,y} + PE_{FC,y} + PE_{CH_4,y} + PE_{flare,y} \quad (\text{Equation 13})$$

where:

$PE_{AD,y}$	Project emissions associated with the anaerobic digester in year y (t CO ₂ e)
$PE_{EC,y}$	Project emissions from electricity consumption associated with the anaerobic digester in year y (t CO ₂ e)
$PE_{FC,y}$	Project emissions from fossil fuel consumption associated with the anaerobic digester in year y (t CO ₂ e)
$PE_{CH_4,y}$	Project emissions of methane from the anaerobic digester in year y (t CO ₂ e)
$PE_{flare,y}$	Project emissions from flaring of biogas in year y (t CO ₂ e)

The biogas generated during the treatment process in this project will be captured for power generation and all the electricity generated from this project will be used by the AWMSs and 9 swine farms. The electricity generated will not be connected to another user or the regional power grid. As the electricity consumption of the anaerobic digestion system cannot be measured separately from the entire AWMSs, so the Project emissions from electricity consumption associated with the anaerobic digester and that is not related to the anaerobic digester is calculated together.

The project emissions from electricity consumption calculated according to the "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation",

$$PE_{EC,y} = \sum_{j,L,T} EC_{PJ,j,y} * EF_{EF,j,y} * (1 + TDL_{j,y}) \quad (\text{Equation 14})$$

Where

$PE_{EC,y}$	Project emissions from electricity consumption in year y (t CO ₂ e)
$EC_{PJ,j,y}$	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

During this monitoring period, most of the electricity consumed by the project came from the electricity generated by the biogas generated from the anaerobic fermentation process of the project, which is belongs to self-generated and self-consumed. The electricity consumption of AWMSs were sourced from the grid company when the biogas generators were not operation.

The anaerobic digestion process of this project does not involve the use of fossil fuels, so the project emissions from fossil fuel consumption associated with the anaerobic digester is 0, i.e., $PE_{FC,y}=0$

The residual gas is sent to flare system (if any) and project emissions from flaring of biogas ($PE_{flare,y}$) shall be estimated using the tool " Project emissions from flaring". For this monitoring period, there is no residual gas to be flared, so $PE_{flare,y}=0$.

In summary, the Project emissions associated with the anaerobic digester in year y (t CO₂e) is the Project emissions of methane from the anaerobic digester in year y (t CO₂e). i.e., $PE_{AD,y} = PE_{CH_4,y}$.

Determination of project emissions of methane from the anaerobic digester ($PE_{CH_4,y}$)

$PE_{CH_4,y}$ was determined following the step 4 of the applied tool "Project and leakage emissions from anaerobic digesters (Version 02.0)". 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 ($EF_{CH_4, default}$), as follows:

$$PE_{CH_4,y} = Q_{CH_4,y} * EF_{CH_4, default} * GWP_{CH_4} \quad (\text{Equation 15})$$

where:

$PE_{CH_4,y}$	Project emissions of methane from the anaerobic digester in year y (t CO ₂ e)
$Q_{CH_4,y}$	Quantity of methane produced in the anaerobic digester in year y (t CH ₄)
$EF_{CH_4, default}$	Default emission factor for the fraction of CH ₄ produced that leaks from the anaerobic digester (fraction)
GWP_{CH_4}	Global warming potential of CH ₄ (t CO ₂ / t CH ₄)

Estimation of various variables and parameters for above equations:

(A) Quantity of methane produced in the anaerobic digester $Q_{CH_4,y}$

As per PDD, the biogas is produced and collected from anaerobic digestion process. The flowmeters are installed at the outlet of the biogas digesters and the measured on an hourly basis time interval. So the quantity of methane produced in the digester in year y ($Q_{CH_4,y}$) is the accumulation of the mass flow of methane in the gaseous stream in an hourly basis time interval. i.e., $Q_{CH_4,y} = \sum_{i=1}^{8760} F_{i,t}$

The mass flow of greenhouse gas i ($F_{i,t}$) is determined as follows:

$$F_{i,t} = V_{t,db} * v_{i,t,db} * \rho_{i,t} \quad (\text{Equation 16})$$

$$\rho_{i,t} = \frac{P_t * MM_i}{R_u * T_t} \quad (\text{Equation 17})$$

where:

$F_{i,t}$	Mass flow of greenhouse gas i in the gaseous stream in time interval t (kg gas/h)
$V_{t,db}$	Volumetric flow of the gaseous stream in time interval t on a dry basis (m ³ dry gas/h)
$v_{i,t,db}$	Volumetric fraction of greenhouse gas i in the gaseous stream in a time interval t on a dry basis (m ³ gas i /m ³ dry gas)
$\rho_{i,t}$	Density of greenhouse gas i in the gaseous stream in time interval t (kg gas i /m ³ gas i)
P_t	Absolute pressure of the gaseous stream in time interval t (Pa)
MM_i	Molecular mass of greenhouse gas i (kg/kmol)
R_u	Universal ideal gases constant (Pa.m ³ /kmol.K)
T_t	Temperature of the gaseous stream in time interval t (K)

ii) Project CH₄ emissions from aerobic AWMS treatment ($PE_{Aer,y}$)

IPCC guidelines specify emissions from aerobic lagoons as 0.1 per cent of total methane generating potential of the waste processed, which can be used as a default for all types of

aerobic AWMS treatment.

$$PE_{Aer,y} = GWP_{CH_4} * D_{CH_4} * 0.001 * F_{Aer} * \left[\prod_{n=1}^N (1 - R_{VS,n}) \right] * \sum_{j,LT} (B_{0,LT} * N_{LT} * VS_{LT,y} * MS\%_j) + PE_{sl,y}$$

(Equation 18)

where:

GWP_{CH_4}	Global Warming Potential (GWP) of CH_4 (t CO_2e/tCH_4)
$R_{VS,n}$	Fraction of volatile solid degraded in AWMS treatment method n of the N treatment steps prior to waste being treated (fraction)
D_{CH_4}	Density of CH_4 (t/m ³)
F_{Aer}	Fraction of volatile solid directed to aerobic system (fraction)
LT	Type of livestock
$B_{0,LT}$	Maximum methane producing potential of the volatile solid generated by animal type LT (m ³ CH_4/kg dm)
$VS_{LT,y}$	Annual volatile solid excretion livestock type LT entering all AWMS on a dry matter weight basis in (kg -dm/animal/yr)
N_{LT}	Annual average number of animals of type LT for the year y (number) as estimated in equation (4) or (5)
$PE_{sl,y}$	Project CH_4 emissions from sludge disposed of in storage pit prior to disposal during the year y (t CO_2e/yr)
$MS\%_j$	Fraction of manure handled in system j in the project activity (fraction)

All sludge produced from the aerobic composting will be used for land application, which is calculated as leakage emission, so the $PE_{sl,y}=0$.

$$\text{So, } PE_{Aer,y} = GWP_{CH_4} * D_{CH_4} * 0.001 * F_{Aer} * \left[\prod_{n=1}^N (1 - R_{VS,n}) \right] * \sum_{j,LT} (B_{0,LT} * N_{LT} * VS_{LT,y} * MS\%_j)$$

(Equation 19)

where:

GWP_{CH_4}	Global Warming Potential (GWP) of CH_4 (t CO_2e/tCH_4)
$R_{VS,n}$	Fraction of volatile solid degraded in AWMS treatment method n of the N treatment steps prior to waste being treated (fraction)
D_{CH_4}	Density of CH_4 (t/m ³)
F_{Aer}	Fraction of volatile solid directed to aerobic system (fraction)
LT	Type of livestock
$B_{0,LT}$	Maximum methane producing potential of the volatile solid generated by animal type LT (m ³ CH_4/kg dm)
$VS_{LT,y}$	Annual volatile solid excretion livestock type LT entering all AWMS on a dry matter weight basis in (kg -dm/animal/yr)
N_{LT}	Annual average number of animals of type LT for the year y (number) as estimated in equation (4) or (5)
$MS\%_j$	Fraction of manure handled in system j in the project activity (fraction)

iii) Project N_2O emissions in year y ($PE_{N_2O,y}$)

$$PE_{N_2O,y} = GWP_{N_2O} * CF_{N_2O-N,N} * \frac{1}{1000} * (E_{N_2O,D,y} + E_{N_2O,ID,y})$$

(Equation 20)

where:

$PE_{N_2O,y}$	Project N_2O emissions in year y (t CO_2/yr)
GWP_{N_2O}	Global Warming Potential (GWP) for N_2O (t CO_2e/tN_2O)
$CF_{N_2O-N,N}$	Conversion factor N_2O-N to N_2O (44/28)
$E_{N_2O,D,y}$	Direct N_2O emission in year y (kg $N_2O-N/year$)
$E_{N_2O,ID,y}$	Indirect N_2O emission in year y (kg $N_2O-N/year$)

$$E_{N_2O,D,y} = \sum_{j,LT} EF_{N_2O,D,j} * NEX_{LT,y} * N_{LT} * MS\%_j \quad (\text{Equation 21})$$

where:

$E_{N_2O,D,y}$	Direct N_2O emission in year y (kg N_2O-N/yr)
$EF_{N_2O,D,j}$	Direct N_2O emission factor for the treatment system j of the manure management system (kg N_2O-N/kg N)
$NEX_{LT,y}$	Annual average nitrogen excretion per head of a defined livestock population (kg N/animal/yr) estimated as described in appendix 2
$MS\%_j$	Fraction of manure handled in system j (fraction)
N_{LT}	Annual Average number of animals of type LT for the year y estimated as per equation (4) or (5) (number)

$$E_{N_2O,ID,y} = \sum_{j,LT} EF_{N_2O,ID} * F_{gasMS,j,LT} * NEX_{LT,y} * N_{LT} * MS\%_j \quad (\text{Equation 22})$$

where:

$E_{N_2O,ID,y}$	Indirect N_2O emission in year y (kg $N_2O-N/year$)
$EF_{N_2O,ID}$	Indirect N_2O emission factor for N_2O emissions from atmospheric deposition of nitrogen on soils and water surfaces (kg N_2O-N/kg NH_3-N and NO_x-N)
$NEX_{LT,y}$	Annual average nitrogen excretion per head of a defined livestock population (kg N/animal/yr) estimated as described in appendix 2
$MS\%_j$	Fraction of manure handled in system j (fraction)
$F_{gasMS,j,LT}$	Default values for nitrogen loss due to volatilisation of NH_3 and NO_x from manure management (fraction)
N_{LT}	Annual Average number of animals of type LT for the year y estimated as per equation (4) or (5) (number)

iv) Project emissions from use of heat and/or electricity ($PE_{elec/heat}$)

$$PE_{EC/FC,y} = PE_{EC,y} + \sum_j PE_{FC,j,y} \quad (\text{Equation 23})$$

where:

$PE_{EC,y}$	Project emissions from electricity consumption in year y . The project emissions from electricity consumption will be calculated following the latest version of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption". In case, the electricity consumption is not measured then the electricity consumption shall be estimated as follows $EC_{PJ,y} = \sum_i CP_{i,y} * 8760$, where $CP_{i,y}$ is the rated capacity (in MW) of electrical equipment i used for the project activity.
$PE_{FC,y}$	Project emissions from fossil fuel combustion in process j during the year y . The project emissions from fossil fuel combustion will be calculated following the latest version of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion". For this

purpose, the processes j in the tool corresponds to all fossil fuel combustion in the AWMS (not including fossil fuels consumed for transportation of feed material and sludge or any other on-site transportation).

These emissions should only be considered for consumption of electricity or heat that is not related to the anaerobic digester. As described in above, since the electricity consumption that is not related to the anaerobic digester cannot be separated from the total electricity consumption, therefore the emission for consumption of electricity is calculated in $PE_{EC,y}$.

No fossil fuel was consumed in process that is not related to the anaerobic digester, so $PE_{FC,y}=0$

Therefore, $PE_{elec/heat}$ that is not related to the anaerobic digester =0

Table 11 The calculation result of $PE_{EC,y}$

Time	$EC_{PJ,j,y}$ (MWh)	$EF_{EF,j,y}$ (tCO ₂ /MWh)	$TDL_{j,y}$	$PE_{EC,y}$ (tCO ₂ e)
01/10/2020-31/10/2020	183.6	0.57205	20%	126.03
01/11/2020-30/11/2020	236.05	0.57205	20%	162.04
01/12/2020-31/12/2020	249.17	0.57205	20%	171.05
01/01/2021-31/01/2021	236.05	0.57205	20%	162.04
01/02/2021-28/02/2021	170.48	0.57205	20%	117.03
01/03/2021-31/03/2021	196.71	0.57205	20%	135.03
01/04/2021-30/04/2021	170.48	0.57205	20%	117.03
01/05/2021-31/05/2021	118.03	0.57205	20%	81.02
01/06/2021-30/06/2021	65.57	0.57205	20%	45.01
01/07/2021-31/07/2021	52.46	0.57205	20%	36.01
01/10/2020-31/12/2020	-	-	-	459
01/01/2021-31/07/2021	-	-	-	693

Table 12 The calculation result of $PE_{CH_4,y}$

Time	GWP_{CH_4} (tCO ₂ /tCH ₄)	$EF_{CH_4,default}$ (tCH ₄ leaked / tCH ₄ produced)	$Q_{CH_4,y}$ (tCH ₄)	$PE_{CH_4,y}$ (tCO ₂ e)
01/10/2020-31/10/2020	25	0.05	1647.80	2059.746
01/11/2020-30/11/2020	25	0.05	1593.59	1991.988
01/12/2020-31/12/2020	25	0.05	1649.74	2062.179
01/01/2021-31/01/2021	28	0.05	1671.96	2340.744
01/02/2021-28/02/2021	28	0.05	1516.99	2123.783
01/03/2021-31/03/2021	28	0.05	1640.86	2297.2
01/04/2021-30/04/2021	28	0.05	1599.78	2239.685
01/05/2021-31/05/2021	28	0.05	1664.30	2330.025
01/06/2021-30/06/2021	28	0.05	1571.98	2200.776
01/07/2021-31/07/2021	28	0.05	1672.97	2342.155
01/10/2020-31/12/2020	-	-	-	6,114

01/01/2021-31/07/2021	-	-	-	15,874
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Table 13 The calculation result of $PE_{AD,y}$

Period	$PE_{EC,y}$ (tCO ₂ e)	$PE_{CH_4,y}$ (tCO ₂ e)	$PE_{AD,y}$ (tCO ₂ e)
01/10/2020-31/12/2020	459	6,114	6,573
01/01/2021-31/07/2021	693	15,874	16,568
1 st monitoring period	1,152	21,988	23,141

Table 14 The calculation result of $PE_{Aer,y}$

Parameter	Value		Unit
species	Market Swine	Breeding Swine	
GWP_{CH_4}	25/28	25/28	tCO ₂ /tCH ₄
D_{CH_4}	0.00067	0.00067	t/m ³
	0.001	0.001	kg N/1000kg animal mass/day
F_{Aer}	100%	100%	/
$1-R_{vs,1}$	54%	54%	/
$B_{0,LT}$	0.29	0.29	m ³ CH ₄ /kg-dm
N_{LT}	Refer to Table 7		
$VS_{LT,y}$	Refer to Table 7		
$MS\%_j$	100%	100%	
01/10/2020-31/12/2020	96		tCO ₂ e
01/01/2021-31/07/2021	247		tCO ₂ e
$PE_{Aer,y}$	343		tCO ₂ e

Table 15 The calculation result of $PE_{N_2O,y}$

Parameter	Value		Unit
species	Market Swine	Breeding Swine	
$EF_{N_2O,D,j}$	0	0	kg N ₂ O-N/kg N
$NEX_{LT,y}$	Refer to Table 7		
N_{LT}	Refer to Table 7		
$MS\%_j$	46%	46%	/
01/10/2020-31/12/2020	0		kg N ₂ O-N/year
01/01/2021-31/07/2021	0		kg N ₂ O-N/year
$E_{N_2O,D,y}$	0.00		kg N ₂ O-N/year
$EF_{N_2O,D,j}$	0.006	0.006	kg N ₂ O-N/kg N
$NEX_{LT,y}$	Refer to Table 7		
N_{LT}	Refer to Table 7		
$MS\%_j$	54%	54%	/
01/10/2020-31/12/2020	4,414		kg N ₂ O-N/year

01/01/2021-31/07/2021	10,121		kg N ₂ O-N/year
E_{N20,D,y}	14,535		kg N ₂ O-N/year
EF _{N20,iD,j}	0.01	0.01	kg N ₂ O-N/kg NH ₃ and NO _x -N
F _{gasMS,j,LT}	0.4	0.4	/
NEX _{LT,y}	Refer to Table 7		
N _{LT}	Refer to Table 7		
MS% _j	46%	46%	%
GWP _{N2O}	298/265	298/265	tCO ₂ /tN ₂ O
01/10/2020-31/12/2020	2,522		kg N ₂ O-N/year
01/01/2021-31/07/2021	5,784		kg N ₂ O-N/year
E_{N20,ID,y}	8,306		kg N ₂ O-N/year
EF _{N20,iD,j}	0.01	0.01	kg N ₂ O/kg N
F _{gasMS,j,LT}	0.45	0.45	/
NEX _{LT,y}	Refer to Table 7		
N _{LT}	Refer to Table 7		
MS% _j	54%	54%	%
GWP _{N2O}	298/265	298/265	tCO ₂ /t N ₂ O
01/10/2020-31/12/2020	3,310		kg N ₂ O-N/year
01/01/2021-31/07/2021	7,591		kg N ₂ O-N/year
E_{N20,ID,y}	10,901		kg N ₂ O-N/year
01/10/2020-31/12/2020	4,798		tCO ₂ e
01/01/2021-31/07/2021	9,784		tCO ₂ e
PE_{N20,y}	14,582		tCO ₂ e

Table 16 Calculation results of project emissions for SDG 13

Period	PE _{AD,y} (tCO ₂ e)	PE _{Aer,y} (tCO ₂ e)	PE _{N₂O,y} (tCO ₂ e)	PE _y (tCO ₂ e)
01/10/2020-31/12/2020	6,573	96	4,798	11,468
01/01/2021-31/07/2021	16,568	247	9,784	26,600
1 st monitoring period	23,141	343	14,582	38,068

E.3. Calculation of leakage

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As per section B.6.1 of the PDD, Leakage can be calculated as follows,

$$LE_y = (LE_{PJ,N_2O,y} - LE_{BL,N_2O,y}) + (LE_{PJ,CH_4,y} - LE_{BL,CH_4,y}) + LE_{AD,y} \quad (\text{Equation 24})$$

Where:

LE_{PJ, N₂O, y} Leakage N₂O emissions released during project activity from land application of the treated manure in year y (t CO₂e/yr)

$LE_{BL, N_2O, y}$	Leakage N_2O emissions released during baseline scenario from land application of the treated manure in year y (t CO_2e/yr)
$LE_{PJ, CH_4, y}$	Leakage CH_4 emissions released during project activity from land application of the treated manure in year y (t CO_2e/yr)
$LE_{BL, CH_4, y}$	Leakage CH_4 emissions released during baseline scenario from land application of the treated manure in year y (t CO_2e/yr)
$LE_{AD, y}$	Leakage emissions associated with the anaerobic digester in year y (t CO_2e)

i) Estimation of leakage N_2O emissions released during baseline scenario from land application of the treated manure in year y , $LE_{BL, N_2O, y}$

$$LE_{BL, N_2O, y} = GWP_{N_2O} * CF_{N_2O-N, N} * \frac{1}{1000} * (LE_{N_2O, land, y} + LE_{N_2O, runoff, y} + LE_{N_2O, vol, y}) \quad (\text{Equation 25})$$

$$LE_{N_2O, land, y} = EF_1 * \prod_{n=1}^N (1 - R_{N, n}) * \sum_{LT} NEX_{LT, y} * N_{LT} \quad (\text{Equation 26})$$

$$LE_{N_2O, runoff, y} = EF_5 * F_{leach} * \prod_{n=1}^N (1 - R_{N, n}) * \sum_{LT} NEX_{LT, y} * N_{LT} \quad (\text{Equation 27})$$

$$LE_{N_2O, vol, y} = EF_4 * \prod_{n=1}^N (1 - R_{N, n}) * F_{gasm} * \sum_{LT} NEX_{LT, y} * N_{LT} \quad (\text{Equation 28})$$

where:

GWP_{N_2O}	Global Warming Potential (GWP) for N_2O (t CO_2e/tN_2O)
$CF_{N_2O-N, N}$	Conversion factor N_2O-N to N_2O (44/28)
$LE_{N_2O, land, y}$	Leakage N_2O emissions from application of manure waste in year y (kg $N_2O-N/year$)
$LE_{N_2O, runoff, y}$	Leakage N_2O emissions due to leaching and run-off in year y (kg $N_2O-N/year$)
$LE_{N_2O, vol, y}$	Leakage N_2O emissions due to volatilisation in year y (kg $N_2O-N/year$)
F_{gasm}	Fraction of N lost due to volatilization (fraction)
N_{LT}	Annual average number of animals of type LT estimated as per equation (4) or (5) (number)
$NEX_{LT, y}$	Annual average nitrogen excretion per head of a defined livestock population (kg N/animal/year) estimated as described in appendix 2
EF_1	Emission factor for N_2O emissions from N inputs (kg N_2O-N/kg N input)
EF_5	Emission factor for N_2O emissions from N leaching and runoff in (kg N_2O-N/kg N leached and runoff)
EF_4	Emission factor for N_2O emissions from atmospheric deposition of N on soils and water surfaces, [kg N- $N_2O/$ (kg NH_3-N + NO_x-N volatilized)]
F_{leach}	Fraction of all N added to/mineralised in managed soils in regions where leaching/runoff occurs that is lost through leaching and runoff (fraction)
$R_{N, n}$	Nitrogen reduction factor (fraction)

ii) Estimation of leakage N_2O emissions released during project activity from land application of the treated manure in year y , LE_{PJ, N_2O}

$$LE_{PJ, N_2O} = GWP_{N_2O} * CF_{N_2O-N, N} * \frac{1}{1000} * (LE_{N_2O, land, y} + LE_{N_2O, runoff, y} + LE_{N_2O, vol, y}) \quad (\text{Equation 29})$$

$$LE_{N_2O, land, y} = EF_1 * \prod_{n=1}^N (1 - R_{N, n}) * \sum_{LT} NEX_{LT, y} * N_{LT} \quad (\text{Equation 30})$$

$$LE_{N_2O, runoff, y} = EF_5 * F_{leach} * \prod_{n=1}^N (1 - R_{N, n}) * \sum_{LT} NEX_{LT, y} * N_{LT} \quad (\text{Equation 31})$$

$$LE_{N_2O, vol, y} = EF_4 * \prod_{n=1}^N (1 - R_{N, n}) * F_{gasm} * \sum_{LT} NEX_{LT, y} * N_{LT} \quad (\text{Equation 32})$$

where:

GWP_{N_2O}	Global Warming Potential (GWP) for N_2O (t CO_2e/tN_2O)
$CF_{N_2O-N,N}$	Conversion factor N_2O-N to N_2O (44/28)
$LE_{N_2O,land,y}$	Leakage N_2O emissions from application of manure waste in year y (kg $N_2O-N/year$)
$LE_{N_2O,runoff,y}$	Leakage N_2O emissions due to leaching and run-off in year y (kg $N_2O-N/year$)
$LE_{N_2O,vol,y}$	Leakage N_2O emissions due to volatilisation in year y (kg $N_2O-N/year$)
F_{gasm}	Fraction of N lost due to volatilization (fraction)
N_{LT}	Annual average number of animals of type LT estimated as per equation (4) or (5) (number)
$NEX_{LT,y}$	Annual average nitrogen excretion per head of a defined livestock population (kg N/animal/year) estimated as described in appendix 2
EF_1	Emission factor for N_2O emissions from N inputs (kg N_2O-N/kg N input)
EF_5	Emission factor for N_2O emissions from N leaching and runoff in (kg N_2O-N/kg N leached and runoff)
EF_4	Emission factor for N_2O emissions from atmospheric deposition of N on soils and water surfaces, [kg N- N_2O / (kg NH_3-N + NO_x-N volatilized)]
F_{leach}	Fraction of all N added to/mineralised in managed soils in regions where leaching/runoff occurs that is lost through leaching and runoff (fraction)
$R_{N,n}$	Nitrogen reduction factor (fraction)

It is possible to measure the quantity of manure applied to land in kg manure/yr (Q_{DM}) and the nitrogen concentration in kg N/kg manure (N_{DM}) in the manure to estimate the total quantity of nitrogen applied to land. In this case, $\prod_{n=1}^N (1 - R_{N,n}) * \sum_{LT} NEX_{LT,y} * N_{LT}$ should be substituted by $Q_{DM} * N_{DM}$.

iii) Estimation of leakage CH_4 emissions from land application of the treated manure

The calculation of methane emissions from land application of manure in the baseline and project cases are estimated as below:

$$LE_{BL,CH_4,y} = GWP_{CH_4} * D_{CH_4} * MCF_d * \left[\prod_{n=1}^N (1 - R_{VS,n}) \right] * \sum_{j,LT} (B_{0,LT} * N_{LT} * VS_{LT,y} * MS\%_j) \quad (\text{Equation 33})$$

$$LE_{PJ,CH_4,y} = GWP_{CH_4} * D_{CH_4} * MCF_d * \left[\prod_{n=1}^N (1 - R_{VS,n}) \right] * \sum_{j,LT} (B_{0,LT} * N_{LT} * VS_{LT,y} * MS\%_j) \quad (\text{Equation 34})$$

where:

$LE_{BL,CH_4,y}$	Leakage CH_4 emissions released during baseline scenario from land application of the treated manure in year y (t CO_2e/yr)
$LE_{PJ,CH_4,y}$	Leakage CH_4 emissions released during project activity from land application of the treated manure in year y (t CO_2e/yr)
$R_{VS,n}$	Fraction of volatile solid degraded in AWMS treatment method n of the N treatment steps prior to sludge being treated
GWP_{CH_4}	Global Warming Potential (GWP) of CH_4 (t CO_2e/tCH_4)
D_{CH_4}	Density of CH_4 (t/ m^3)
$B_{0,LT}$	Maximum methane producing potential of the volatile solid generated by animal type LT (m^3CH_4/kg dm)
N_{LT}	Annual average number of animals of type LT estimated as per equation (4) or (5), expressed (number)
$VS_{LT,y}$	Annual volatile solid excretions for livestock LT entering all AWMS on a dry matter weight basis (kg -dm/animal/yr)

MS% _j	Fraction of manure handled in system <i>j</i> in the project activity (fraction)
MCF _d	Methane conversion factor (MCF) assumed to be equal to 1

iv) Estimation of leakage emissions associated with the anaerobic digester

LE_{AD,y} is determined using the methodological tool "Project and leakage emissions from anaerobic digesters (Version 02.0)".

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:

$$LE_{AD,y} = LE_{storage,y} + LE_{comp,y} \quad (\text{Equation 35})$$

where:

LE _{AD,y}	Leakage emissions associated with the anaerobic digester in year <i>y</i> (t CO ₂ e)
LE _{storage,y}	Leakage emissions associated with storage of digestate in year <i>y</i> (t CO ₂ e)
LE _{comp,y}	Leakage emissions associated with composting digestate in year <i>y</i> (t CO ₂ e)

For subsequent treatment stages, the reduction of the nitrogen during a treatment stage is estimated based on referenced data for different treatment types. Emissions from the next treatment stage are then calculated following the approach outlined above, but with nitrogen adjusted for the reduction from the previous treatment stages by multiplying by (1-R_N), where R_N is the relative reduction of nitrogen from the previous stage. The relative reduction (R_N) of nitrogen depends on the treatment technology and should be estimated in a conservative manner. Default values for different treatment technologies can be found in appendix 1 (values for TN).

The anaerobic digestion process of this project is carried out in a fully enclosed system, the flaring will be not taken into account as the equipment will only be used when there will be surplus biogas, normally there will be no surplus biogas during the operational period of the project. After anaerobic digestion, the fermented sludge will be treated in aerobic composting system, which will be used as fertilizer. Wastewater from the new animal waste management systems will be treated aerobically and then used for agriculture irrigation. so, the Estimation of leakage emissions associated with the anaerobic digester is 0. i.e., LE_{AD,y} = 0.

Table 17 The calculation results of LE_{B,CH4}, LE_{p,CH4}, LE_{B,N2O} and LE_{p,N2O}

Parameter	Value		Unit
species	Market Swine	Breeding Swine	
N _{LT}	Refer to Table 7		
NEX _{LT,y}	Refer to Table 7		
R _{N,n}	80%	80%	/
EF ₁	0.01	0.01	kg N ₂ O-N/kg N
EF ₅	0.0075	0.0075	kg N ₂ O-N/kg N
EF ₄	0.01	0.01	KgN-N ₂ O-N/kg NH ₃ -N+NO _x -N
F _{leach}	0.3	0.3	/
F _{gasm}	0.2	0.2	/
GWP _{N2O}	298/265	298/265	tCO ₂ /t N ₂ O

01/10/2020-31/12/2020	2,732		kg N ₂ O-N/year
01/01/2021-31/07/2021	6,265		kg N ₂ O-N/year
LE_{N2O,land,y}	8,998		kg N ₂ O-N/year
01/10/2020-31/12/2020	615		kg N ₂ O-N/year
01/01/2021-31/07/2021	1,410		kg N ₂ O-N/year
LE_{N2O,runoff,y}	2,024		kg N ₂ O-N/year
01/10/2020-31/12/2020	546		kg N ₂ O-N/year
01/01/2021-31/07/2021	1,253		kg N ₂ O-N/year
LE_{N2O,vol,y}	1,800		kg N ₂ O-N/year
01/10/2020-31/12/2020	1,823		tCO ₂ e
01/01/2021-31/07/2021	3,718		tCO ₂ e
LE_{BJ,N2O,y}	5,541		tCO ₂ e
N _{LT}	Refer to Table 7		
NEX _{LT}	Refer to Table 7		
R _N	25%	25%	/
EF ₁	0.01	0.01	kg N ₂ O-N/kg N
EF ₅	0.0075	0.0075	kg N ₂ O-N/kg N
EF ₄	0.01	0.01	KgN-N ₂ O-N/kg NH ₃ -N+NO _x -N
F _{leach}	0.3	0.3	/
F _{gasm}	0.2	0.2	/
01/10/2020-31/12/2020	10,246		kg N ₂ O-N/year
01/01/2021-31/07/2021	23,496		kg N ₂ O-N/year
LE_{N2O,land,y}	33,741		kg N ₂ O-N/year
01/10/2020-31/12/2020	2,305		kg N ₂ O-N/year
01/01/2021-31/07/2021	5,286		kg N ₂ O-N/year
LE_{N2O,runoff,y}	7,592		kg N ₂ O-N/year
01/10/2020-31/12/2020	2,049		kg N ₂ O-N/year
01/01/2021-31/07/2021	4,699		kg N ₂ O-N/year
LE_{N2O,vol,y}	6,748		kg N ₂ O-N/year
01/10/2020-31/12/2020	6,837		tCO ₂ e
01/01/2021-31/07/2021	13,942		tCO ₂ e
LE_{PJ,N2O}	20,780		tCO ₂ e
GWP _{CH4}	25/28	25/28	tCO ₂ e/t CH ₄
D _{CH4}	0.00067	0.00067	t/m ³
MCF _d	1	1	/
VS _{LT,y}	Refer to Table 7		
N _{LT}	Refer to Table 7		
B _{0,LT}	0.29	0.29	m ³ CH ₄ /kg-VS
R _{VS}	85%	85%	/
MS% _j	100%	100%	/
01/10/2020-31/12/2020	26,750		tCO ₂ e

01/01/2021-31/07/2021	68,749		tCO ₂ e
LE_{B,CH4,y}	95,499		tCO ₂ e
GWP _{CH4}	28	28	tCO ₂ /tCH ₄
D _{CH4}	0.00067	0.00067	t/m ³
MCF _d	1	1	/
VS _{LT,y}	Refer to Table 7		
NLT	Refer to Table 7		
B ₀	0.29	0.29	m ³ CH ₄ /kg-VS
R _{VS}	2%	2%	/
R _{VS}	45%	45%	/
R _{VS}	35%	35%	/
MS% _j	100%	100%	/
01/10/2020-31/12/2020	62,478		tCO ₂ e
01/01/2021-31/07/2021	160,576		tCO ₂ e
LE_{PJ,CH4}	223,054		tCO ₂ e

Table 18 Calculation results of leakage for SDG 13

Period	LE _{PJ,CH4,y} (tCO ₂ e)	LE _{BL,CH4,y} (tCO ₂ e)	LE _{BL,N2O,y} (tCO ₂ e)	LE _{PJ,N2O,y} (tCO ₂ e)	LE _y (tCO ₂ e/yr)
01/10/2020-31/12/2020	62,478	26,750	1,823	6,837	40,743
01/01/2021-31/07/2021	160,576	68,749	3,718	13,942	102,051
1 st monitoring period	223,054	95,499	5,541	20,780	142,794

E.4. Calculation of net benefits or direct calculation for each SDG Impact

SDG	SDG Impact	Baseline estimate	Project estimate	Leakage estimate	Net benefit
13	Emission Reductions	2020/10/01-2020/12/31:	2020/10/01-2020/12/31:	2020/10/01-2020/12/31:	2020/10/01-2020/12/31:
		131,635tCO ₂ e	11,468tCO ₂ e	40,743tCO ₂ e	79,424tCO ₂ e
		2021/01/01-2021/07/31:	2021/01/01-2021/07/31:	2021/01/01-2021/07/31:	2021/01/01-2021/07/31:
		336,957tCO ₂ e	26,600tCO ₂ e	102,051tCO ₂ e	208,306tCO ₂ e

		2020/10/01- 2021/07/31: 468,592tCO ₂ e	2020/10/01- 2021/07/31:38,068 tCO ₂ e	2020/10/01- 2021/07/31: 142,794tCO ₂ e	2020/10/01- 2021/07/31: 287,730tCO ₂ e
		2020/10/01- 2020/12/31: 0MWh	2020/10/01- 2020/12/31: 13,808.30MWh	NA	2020/10/01- 2020/12/31: 13,808.30MWh
7	EGd,y	2021/01/01- 2021/07/31: 0MWh	2021/01/01- 2021/07/31: 34,104.99MWh	NA	2021/01/01- 2021/07/31: 34,104.99MWh
		2020/10/01- 2021/07/31: 0MWh	2020/10/01- 2021/07/31: 47,913.09MWh	NA	2020/10/01- 2021/07/31: 47,913.09MWh
	Number of males and females employed by the project	2020/10/01- 2020/12/31: 0 people were created	2020/10/01- 2020/12/31: 18 jobs for local people were created (including 9 females and 9 males)	NA	2020/10/01- 2020/12/31: 18 jobs for local people were created (including 9 females and 9 males)
8					
	Number of males and females employed by the project	2021/01/01- 2021/07/31: 0 people were created	2021/01/01- 2021/07/31: 18 jobs for local people were created (including 9 females and 9 males)	NA	2021/01/01- 2021/07/31: 18 jobs for local people were created (including 9 females and 9 males)

Number of males and females employed by the project	2020/10/01-2021/07/31: 0 jobs for local people were created	2020/10/01-2021/07/31: 18 jobs for local people were created (including 9 females and 9 males)	NA	2020/10/01-2021/07/31: 18 jobs for local people were created (including 9 females and 9 males)
Average monthly salary	2020/10/01-2020/12/31: 0 RMB/person, and equal income	2020/10/01-2020/12/31: 5,000 RMB/person, and equal salaries were paid for men and women in the same position.	NA	2020/10/01-2020/12/31: 5,000 RMB/person, and equal salaries were paid for men and women in the same position.
Average monthly salary	2021/01/01-2021/07/31: 0 RMB/person, and equal income	2021/01/01-2021/07/31: 5,000 RMB/person, and equal salaries were paid for men and women in the same position.	NA	2021/01/01-2021/07/31: 5,000 RMB/person, and equal salaries were paid for men and women in the same position.
Average monthly salary	2020/10/01-2021/07/31: 0 RMB/person, and equal income	2020/10/01-2021/07/31: 5,000 RMB/person, and equal salaries were paid for men and women in the same position.	NA	2020/10/01-2021/07/31: 5,000 RMB/person, and equal salaries were paid for men and women in the same position.

Furthermore, if the actual methane captured from anaerobic digesters in project activity is lower than $(BE_{CH_4,y} - PE_{AD,y})$, then $(BE_{CH_4,y} - PE_{AD,y})$ is replaced by actual methane captured $Q_{CH_4,y}$.

Biogas captured during monitoring period is 41,120,956.20m³, which equals to 454,439 tCO₂e. Baseline methane emission (BE_{CH₄,y}) is 460,815 tCO₂e. project emissions associated with anaerobic digester is (PE_{AD,y}) is 23,141 tCO₂e. Actual methane captured from anaerobic digesters is higher than the difference of BE_{CH₄,y} and PE_{AD,y}. Therefore, the equation (BE_{CH₄,y} - PE_{AD,y}) can be used to calculate emission reduction.

E.5. Comparison of actual SDG Impacts with estimates in approved PDD

SDG	Values estimated in ex ante calculation of approved PDD for this monitoring period	Actual values ¹¹ achieved during this monitoring period
13	1 st monitoring period: 392,605tCO ₂ e ¹²	2020/10/01-2021/07/31:287,730 tCO ₂ e
7	1 st monitoring period: 75,010.12MWh ¹³ of electricity generation by capturing biogas	2020/10/01-2021/07/31: 47,913.09MWh of electricity generation by capturing biogas
	1 st monitoring period:18 jobs for local people created (including 9 females and 9 males).	2020/10/01-2021/07/31: 18 jobs for local people created (including 9 females and 9 males).
8	Average monthly salary 5,000 RMB/person, and equal salaries paid for men and women in the same position.	Average monthly salary 5,000 RMB/person, and equal salaries paid for men and women in the same position.

E.5.1. Explanation of calculation of value estimated ex ante calculation of approved PDD for this monitoring period

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According to PDD, the estimated outcomes of SDG 7 for the 1st monitoring period are 75,010.12MWh of electricity generation which is calculated according to the amount of biogas produced theoretically and the assumed electricity to methane ratio of 1.6 kWh/m³ of biogas in project evaluation report. while the actual outcomes of SDG7 is 47,913.09MWh of electricity generation in the 1st monitoring period, which is sourced from the meter readings.

The estimated value of the outcomes of SDG 13 for the 1st monitoring period is 392,605 tCO₂e, while the actual outcomes of SDG13 is 287,730tCO₂e. the calculation of the estimated and actual value of SDG 13 is based on methodology ACM0010" GHG emission reductions from manure management systems" (version 08.0). The mainly difference between the estimated value and actual value is due to the changes of the number of animals in the swine farm (N_{LT}), the average animal weight (W_{site}) and the actual biogas captured from anaerobic digester.

11 Whenever emission reductions are capped, both the original and capped values used for calculations must be transparently reported. Use brackets to denote original values.

12 Yearly total amount estimated emission reduction in PDD is 471,385 tCO₂e, so the values estimated emission reduction from 01/10/2020-31/07/2021 is 471,385 tCO₂e/365d*304 d=392,605 tCO₂e.

13 Annually electricity generation in PDD is 90,061.49MWh, so the values estimated emission reduction from 01/10/2020-31/07/2021 is 90,061.49MWh /365d*304 d=75,010.12 MWh.

Number of males and females employed by the project and average monthly salary during the 1st monitoring period were determined by the Record Keeping Book and Labor contracts and Payrolls. 18 jobs for local people were created (including 9 females and 9 males). The average monthly salary was 5,000 RMB/person (equal salaries paid for men and women in the same position). Outcomes of SDG 8 are consistent with the estimated outcomes in the PDD.

E.6. E.6. Remarks on increase in achieved SDG Impacts from estimated value in approved PDD

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The actual outcomes of SDG 7 are much lower than the estimated value in the PDD. The main reason for the difference is that the actual electricity generation through capturing biogas is related to the amount of biogas produced, the methane concentration and the efficiency of generator etc.

The estimated value of the outcomes of SDG 13 for the 1st monitoring period is 392,605 tCO₂e, and the actual value is 287,730 tCO₂e, which is lower than the estimated value in PDD. the difference between the estimated value and actual values is mainly due to the number of animals in the swine farm and the average animal weight is lower than the estimated values in the PDD.

Outcomes of SDG 8 are consistent with the estimated outcomes in the PDD.

SECTION F. SAFEGUARDS REPORTING

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According to the Section D.1 and Appendix 1 in PDD, only one assessment question answered 'Potentially' i.e., in case of biogas is not handled properly during the operation period of the project, methane explosion may be caused. Therefore, mitigation measure for safeguarding principles is required and the parameter of Employee Training of biogas safety operation during the operation period shall be monitored, which is described in section D.2 of this MR.

During this monitoring period, no biogas explosion or leakage was happened. The monitoring of this parameters was fully implemented in accordance with the monitoring plan in PDD and the monitoring activities was successful, so there is no need to update the mitigation measures.

SECTION G. STAKEHOLDER INPUTS AND LEGAL DISPUTES

G.1. List all Inputs and Grievances which have been received via the Continuous Input and Grievance Mechanism together with their respective responses/mitigations.

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Method	Include all details of Chosen Method (s) so that they may be understood and, where relevant, used by readers.
Continuous Input / Grievance Expression Process Book (mandatory)	A grievance book was put in Front Desk Administration of the project owner. All stakeholders are allowed to record their grievances or comments in the book. The project owner will assign specific person to deal with related issues. When assessing the relevance and appropriateness of the stakeholders' comments, the project owner will apply a gender lens.
GS Contact (mandatory)	help@goldstandard.org
Other	Feedback can be made directly through visiting Jiangxi Zhengbang Breeding Co. Ltd. (north of Hu Dong 4th Road and east of Chanye Road) or through e-mail 57566640@qq.com.

No inputs/grievances received during the 1st monitoring period through all the methods.

G.2. Report on any stakeholder mitigations that were agreed to be monitored.

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No inputs/grievances received during the 1st monitoring period; therefore, stakeholder mitigations do not need to be reported.

G.3. Provide details of any legal contest that has arisen with the project during the monitoring period

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No legal contest or dispute has been arisen with the project during the 1st monitoring period.

Revision History

Version	Date	Remarks
1.1	14 October 2020	Hyperlinked section summary to enable quick access to key sections Improved clarity on Key Project Information Section for POA monitoring Forward action request section Improved Clarity on SDG contribution/SDG Impact term used throughout Clarity on safeguard reporting Clarity on design changes Leakage section added for VER/CER projects Addition of Comparison of monitored parameters with last monitoring period Provision of an accompanying Guide to help the user understand detailed rules and requirements
1.0	10 July 2017	Initial adoption