MUYUAN WJZ AWMS GHG MITIGATION PROJECT IN HENAN PROVINCE

Document Prepared by Profit Carbon Environmental Energy Technology (Shanghai) Co., Ltd.

Project Title	*Muyuan WJZ AWMS GHG Mitigation Project in Henan Province*
Version	01
Date of Issue	18-July-2022
Project Location	China, Henan Province
Project Proponent(s)	Profit Carbon Environmental Energy Technology (Shanghai) Co., Ltd. Joanna Zhu Room 302, 2815 Longteng Avenue, Xuhui District, Shanghai, China +86 021 6127 2386 yanan.zhu@profitcarbon.com
Assessor Contact	N/A

Project Lifetime	15-July-2020 to 14-July-2035; 15-year lifetime
Monitoring Period of this Report	15-July-2020 to 31-March-2022
History of SD VISta Status	N/A
Other Certification Programs	Verified Carbon Standard with project ID 2876
Expected Future Assessment Schedule	Initial validation: October 2022

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1 SUMMARY OF SDG CONTRIBUTIONS

Table 1: Summary of SDG Contributions

Row number	Quantitative Project Contributions during Monitoring Period	Contributions during Project Lifetime	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Section Reference	Claim, Asset or Label
1)	4,6129,68*$10^4 m^3$ of biogas is generated by the project for heat generation during the first monitoring period.	This is the 1st monitoring period, therefore, from the operation start date of the project activity to the end of this monitoring period, 4,6129,68*$10^4 m^3$ of biogas is generated by the project.	7.2	7.2.1 renewable energy share in the total final energy consumption	Implemented activities to increase	4.2 #3,4	Claim
2)	During this monitoring period, total 14 jobs for local people were created (including 7 females and 7 males) by the project	The project activity generates permanent job opportunities for 14 persons including 7 females and 7 males during the operation period. From the operation start date of the project activity to the end of this monitoring period, 14 jobs for local people were created (including 7 females and 7 males) by the project.	8.5	8.5.2 Unemployment rate, by sex, age and persons with disabilities	Implemented activities to increase	3.2 #1,2,3	Claim

3)	115,215tons of organic fertilizers is produced during the first monitoring period.	This is the 1st monitoring period, therefore, from the operation start date of the project activity to the end of this monitoring period, 115,215tons of organic fertilizers is produced.	12.5	12.5.1 National recycling rate, tons of material recycled	Implemented activities to increase	4.2 #2	Claim
4)	The project has avoided methane emissions of greenhouse gases (GHG) of 444,807tCO_2e during the first monitoring period.	This is the 1st monitoring period, therefore, from the operation start date of the project activity to the end of this monitoring period, the project has achieved GHG emission reductions of 444,807 tCO_2e.	13.0	Tonnes of greenhouse gas emissions avoided or removed	Increase	4.2 #1, VCS JPM and Joint validation& 1st periodical verification report	SD VISta-labeled VCU

2 PROJECT DESIGN

2.1 Project Objectives, Context and Long-term Viability

2.1.1 Summary of Project Sustainable Development Objective(s)

Before the project, the animal waste generated by the swine farms were usually treated in the uncovered anaerobic lagoons at the project site. It is a kind of harmless treatment process for manure and permitted by laws and regulations of China[1]. However, the methane generated in the anaerobic lagoons is emitted to the atmosphere directly without any recovery or reuse facilities. Besides, it is not mandatory by the local policy to take resourceful treatment technology for the animal manure. Therefore, uncovered anaerobic lagoon is still the most economic, viable and reasonable measures to treat the animal manure.

The project activity installs 7 new sets of animal waste management systems (AWMSs) to replace the previous uncovered anaerobic lagoons for the manure treatment. All the manure and wastewater of the 7 existing swine farms are collected into the collection tanks and then be separated firstly by solid and liquid separators. The solid is treated in aerobic composting system and the organic fertilizers can be produced, part of the fertilizer is distributed to local farmers for free and the others would be sold on the domestic market. The liquid is treated through anaerobic digestion and the biogas generated during the treatment process is captured for heat generation. If there is surplus biogas, then the biogas would be flared through the flaring system. After anaerobic digestion, the sludge produced from anaerobic digestion is treated through aerobic composting together with the separated solid, the effluent is used for agricultural irrigation. Sustainable development objectives of the project can be summarized as follows,

SDG 7 Affordable and Clean Energy

The biogas generated during the treatment process is captured for heat generation, the heat generated are all used by the operation of AWMSs and the 7 swine farms, which was provided by the coal-fired boiler without the project. Prior to the implementation of the project, all manure waste produced from the existing 7 swine farms was left to decay in 7 uncovered anaerobic lagoons at the livestock farms and methane is emitted to the atmosphere directly without any methane recovery and destruction facility. The project activity reduces of GHG and provides clean energy. $3{,}287.1575*10^4 m^3$ of biogas are expected to produce annually. Compared with coal, biogas is a kind of clean and renewable energy. The project provides useful reference for the resourceful treatment technology of animal manure.

SDG 8 Decent Work and Economic Growth

It plans to create 14 permanent jobs for the local residents during operation period of the project. The job opportunities are provided to the local residents fairly regardless of gender, age,

[1] https://oss.baigongbao.com/2020/12/14/MRyhTKQcWC.pdf

education and other possible aspects of discrimination. The project provides welfare and salary higher than the average level of local farmers. Equal salary is paid for work of equal value.

SDG 12 Responsible Consumption and Production

The project activity is designed to install new AWMSs to treat the manure. After liquid-solid separation, the solid is treated in aerobic composting system and the organic fertilizers is produced, which partly can be supplied to the farmers living around free and partly can be sold as fertilizer. In the baseline uncovered anaerobic lagoons, no organic fertilizers can be generated. It *is esti*mated that 77,693tons of organic fertilizers can be produced annually.

SDG 13 Climate Action

The project installs 7 sets of animal waste management system (AWMSs) to avoid methane emissions generated in the previous manure treatment process of uncovered anaerobic lagoons, which is the baseline scenario of the project. It is estimated that the annually emission reductions of the project is 321,663 tCO_2e. Besides, it helps to raise the awareness of climate change and GHG emissions for the local villagers.

2.1.2 Description of the Project Activity

The project activity installs 7 sets of new AWMSs to replace the traditional uncovered anaerobic lagoons to treat the swine manure from the 7 existing swine farms. All the swine farms were put into operation before implementation of the project activity. The total design scale of the 7 swine farms is to accommodate 370,860 heads of market swine and 38,500 heads of breeding swine.

The AWMS installed at each swine uses the same technology, and the treatment capacities of each AWMS, the capacity of the boiler and the scale of the composting process can be adjusted based on the daily stock of animals and related manure generated. 1,637 tons of manure can be treated daily by the 7 sets of AWMSs. It is estimated that $3,287.1575*10^4$ m^3 of biogas is produced annually through the anaerobic digestion process. The heat production is estimated to be 657,340GJ annually. Also, the generated heat is only used for daily operation of AWMSs and 7 swine farms themselves and cannot be connected to other users. The process flow chart of the project is shown as Figure1.

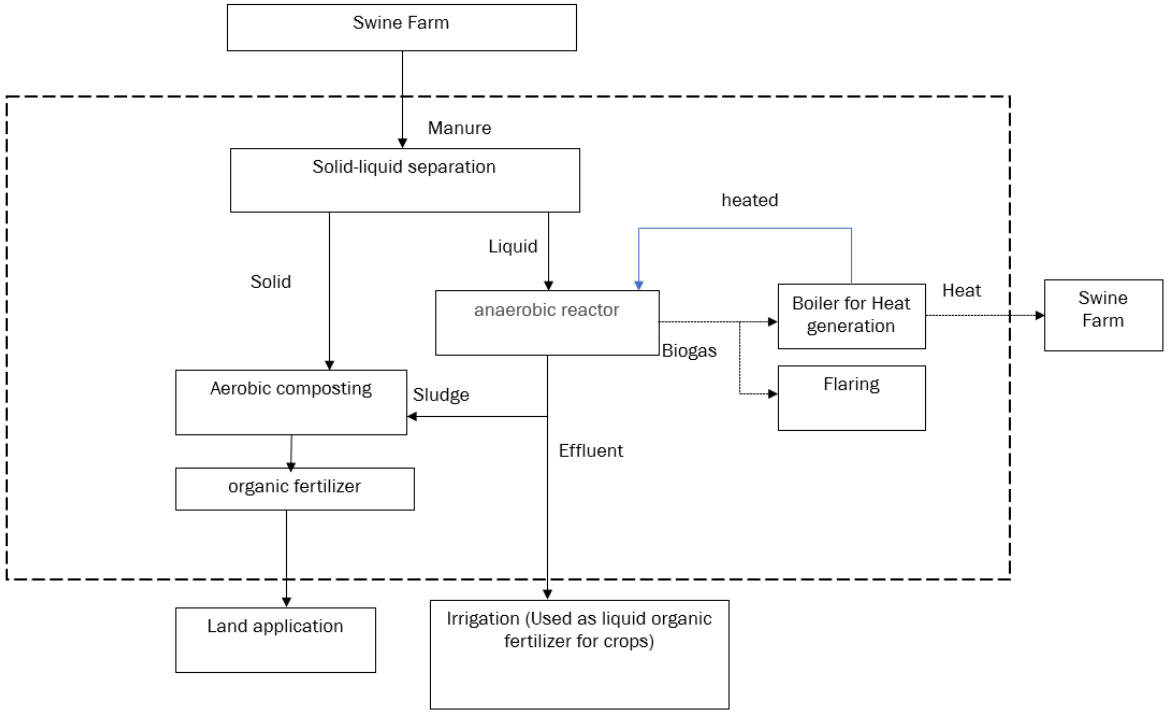

Figure 2-1 Process Flow Chart of the Project

Solid-liquid separation

All the manure and wastewater of the 7 existing swine farms is collected and then be separated firstly by solid-liquid separator. the separated solid manure is sent to the aerobic composting system for organic fertilizers production, the liquid manure enters the anaerobic fermentation stage to continue processing.

Anaerobic digestion process

Fully Geo-membrane enclosed anaerobic tanks are adopted to treat the manure anaerobically. High-density polyethylene (HDPE) geomembranes are integrated into the base and top membranes through anchor trenches, with anaerobic fermentation and gas storage functions therefore, fully Geo-membrane enclosed anaerobic tanks integrate fermentation and gas storage, and impermeable and high-density polyethylene HDPE geomembrane to seal the whole anaerobic tanks is applied in order to capture GHG and keep anaerobic conditions within the digester. Its manure treatment principle is the same as other anaerobic fermentation processes, relying on the metabolic function of anaerobic bacteria to degrade the organic matter in the manure and produce biogas. In cold season, fully enclosed biogas digester would be heated through boilers. Therefore, it is possible to state that the external environment does not affect digester treatment, i.e., it operates independently from meteorological factors. The temperature of the anaerobic treatment unit of the project is designed as medium temperature i.e. 30 ~ 35 ˚C.

Comprehensive utilization of captured biogas

The biogas generated during the anaerobic digestion process is a kind of mixed gas, which includes CH_4, CO_2, H_2S, saturated steam and suspended granular impurities. Therefore, desulfurization and purification treatments are required. The purified biogas will enter the boilers for heat generation. The heat generated is used by the AWMS and the 7 swine farms. Surplus biogas would be flared (if any).

Aerobic composting process

The solid part of the manure separated and the sludge generated from anaerobic digestion process will be treated in aerobic composting system. The aerobic composting process of this project adopts trough composting technology. The trough composting system is generally equipped with a vent pipe or a gas distribution device installed on the trough. When turning over, the air blower is used to supply the oxygen required for fermentation. The composting cycle of the blast trough composting system is 2-4 weeks.

For this monitoring period covering 625 days, total 333,770 heads of market swine, 34,650 heads of breeding swine are included in these 7 swine farms and total 4,6129,68*$10^4 m^3$ of biogas has been captured for heat generation.

2.1.3 Implementation Schedule

Date	Milestone(s) in the Project's Development and Implementation
November -2018	Accomplished environmental impact assessment registration form
22-March-2019	Completion of project evaluation report
30-May-2019	Obtained official approval for the environmental impact assessment registration form
24-October-2019	Signed the general construction contract
10- November -2019	Start date of the first swine farm (Wolong 2nd farm) to construct the AWMS
15-November-2019	Signed the purchase contract of boiler
08-Decemer-2019	Start date of the last swine farm (Zhengyang 13th farm) to construct the AWMS
12-June-2020	Training for the employees before commissioning date of the AWMSs.
17-June-2020	Commissioning date of the AWMS for the first swine farm (Zhengyang 13th farm)
25-June-2020	Commissioning date of the AWMS for the last swine farm (Wolong 2nd farm)

15-July-2020	Formally put into operation of all the 7 sets of AWMSs
23-July -2021	Training for the employees in 2021

2.1.4 Project Proponent

Organization Name	Muyuan Foods Co., Ltd.
Role in the Project	Project Owner
Contact Person	Lu Chang
Title	Project Manager
Address	Longsheng Industrial Park, Wolong District, Nanyang City, Henan Province, P.R China
Telephone	+86 199 6296 0254
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2.1.5 Other Entities Involved in the Project

Organization Name	Profit Carbon Environmental Energy Technology (Shanghai) Co., Ltd.
Role in the Project	Consultation
Contact Person	Joanna Zhu
Title	Project Director
Address	Room 302, 2815 Longteng Avenue, Xuhui District, Shanghai, China
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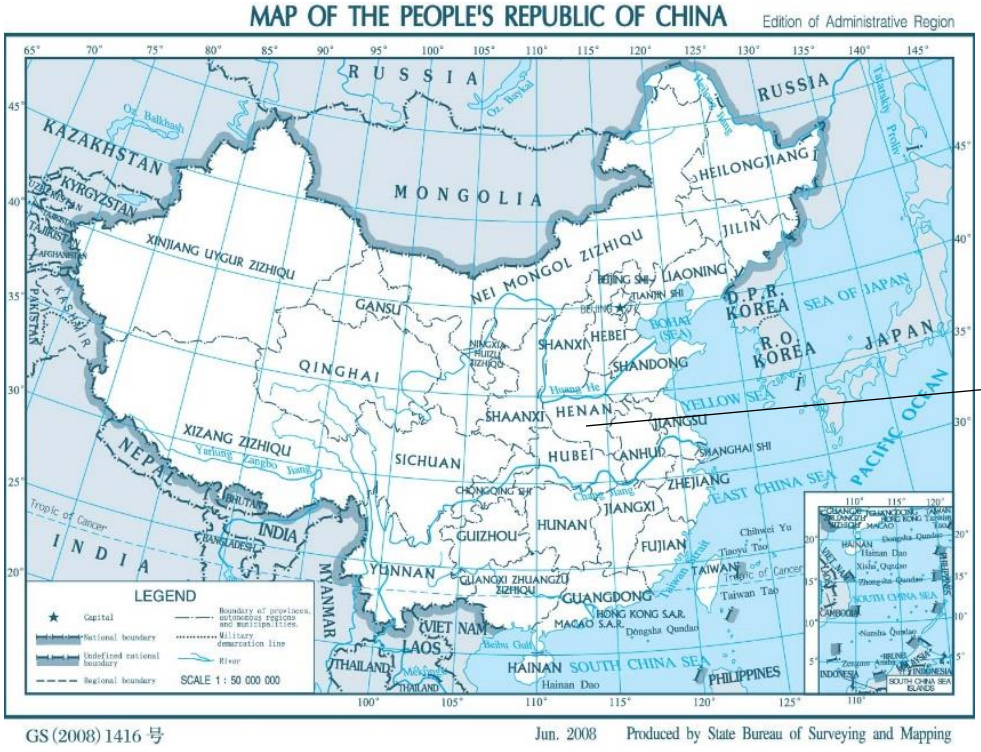
2.1.6 Project Location

The project is located in Henan Province, China. The location of the seven swine farms is shown in Table 2 and Figure 2-2.

Table 2 The location of swine farms involved in the project

Swine farm	Location	North latitude	East longitude
Wolong 2nd farm	Shaozhuang Village, Luying township, Wolong District, Nanyang City	32° 52′9.05″	112°27′15.77″

Junzhang 26th farm	Junzhang Village, Wangdian Township, Neixiang County, Nanyang City	33° 7′55.24″	111°54′37.62″
Zhengyang 1st farm	Laodian Village, Pengqiao Township, Zhengyang County, Zhumadian City	32° 26′42.00″	114°23′13.20″
Zhengyang 4th farm	Liwa Village, Lanqing Township, Zhengyang County, Zhumadian City	32° 28′25.36″	114°13′14.56″
Zhengyang 6th farm	Liwa Village, Lanqing Township, Zhengyang County, Zhumadian City	32° 29′19.54″	114°18′12.82″
Zhengyang 9th farm	Lanqing Village, Lanqing Township, Zhengyang County, Zhumadian City	32°23'54.43"	114°36'10.94"
Zhengyang 13th farm	Xiemiao Village, Dougou Township, Zhengyang County, Zhumadian City	32° 26′37.43″	114°18′20.30″



Henan Province

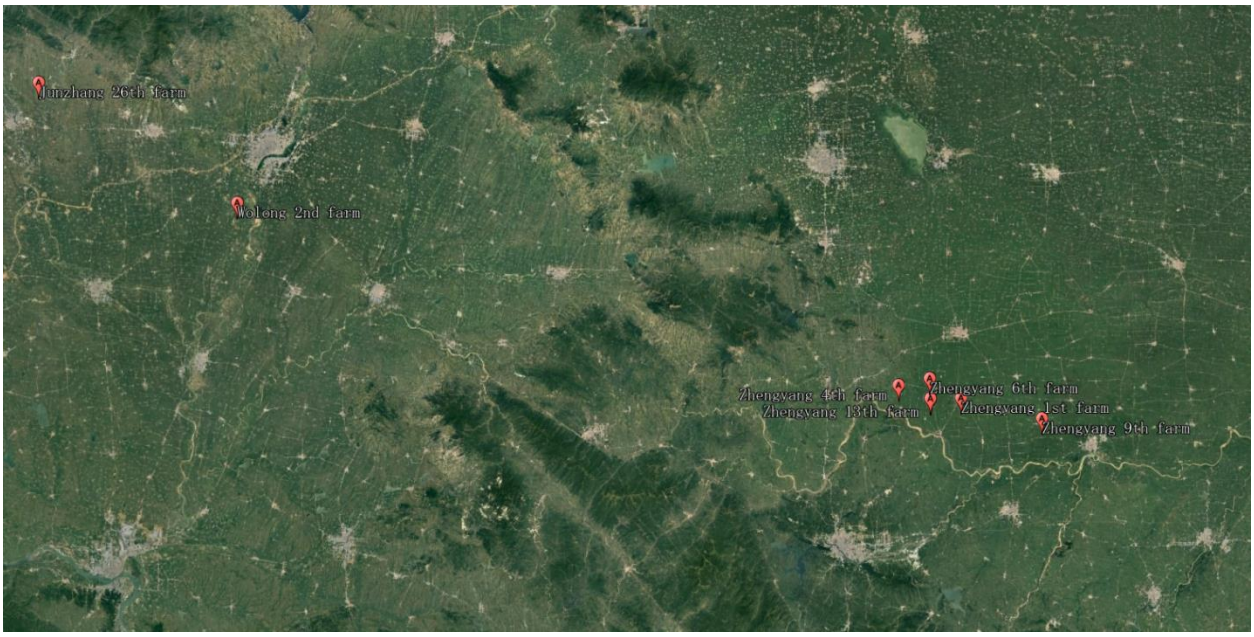


Figure 2-2 The geographic location of swine farms involved in the project

2.1.7 Project Description Deviations

There is no project description deviation for the project.

2.1.8 Threats to the Project

Type of Risk	Main Threats	Solution
Natural	Classical swine fever virus (CSF)	• All the project swine farms have established adequate biosecurity measures, which includes but not limit to regular disinfection, health monitoring, disease recognition and etc. • In order to restrict strictly the transfer of live pigs and their products across regions, only those that meet related epidemic prevention policy can be circulated in the market. • To avoid kitchen waste feeding. If food waste is contaminated by CSF, the healthy pigs can be infected.

	COVID-19	The COVID-19 pandemic might impact the feedback and monitoring process of project. All the epidemic prevention policy related to COVID-19 are followed by the project owner. For the employees of swine farms carrying out project monitoring, epidemic prevention and control measures are taken, which include strict disinfection, wearing masks and other protective gear, regular nucleic acid testing, controlling the social safety distance, and providing dormitories for employees on the farm, etc. to ensure that the infection and spread of new crowns are controlled at source. If it is necessary, the feedback process will be conducted online. Invitations and related information will be sent to the local stakeholders through email, telephone or We Chat.
Human-induced	Fire or explosion caused by leakage of biogas.	All the related employees are trained on safety operation of the AWMS. All employees must strictly implement the safety procedures during the operation period of AMWSs, which are set by the company. Portable gas detection alarm is equipped in each swine farm to detect gas concentrations in different locations, audible and visual alarm will be issued if it exceeds the normal range.
	Leakage of manure waste into ground water.	The project obtained the EIA approval from local governmental authorities. The project activity is compliance with environmental laws and regulations. Fully Geo-membrane enclosed anaerobic tanks applied in the project is sealed by HDPE geomembrane, which is impermeable and leak-proof, and laying HDPE impermeable membranes inside the excavated soil pit. Therefore, the anaerobic

		tanks are impermeable and will not cause leakage of manure waste into ground water. During construction period of the project, sedimentation tanks are built and the wastewater generated can be reused. Digested effluent generated during the operation period of the AWMS will be irrigated to the surrounding crops after treatment.

2.1.9 Benefit Permanence

The project installs new AWMSs to 7 existing swine farms. The purpose of the project activity is to treat the manure and wastewater to avoid methane emissions generated in the baseline uncovered anaerobic lagoons. It can contribute to local sustainable development in the following aspects:

The project activity reduces of GHG in the atmosphere through avoiding methane emissions from anaerobic treatment of swine manure and wastewater.

Capture of methane can significantly reduce the odor nuisance in the vicinity of the facility.

As a kind of renewable energy, the biogas generated is used for heat generation, which can help to lessen the reliance on fossil fuels.

Decent and fair job opportunities are provided to local residents, which helps to reduce the local unemployment rate.

The effluent and fermented sludge are ecological organic fertilizers which are partly supplied to the farmers living around for free, which can be used to yield organic products and improve the living conditions of the farmers.

2.2 Stakeholder Engagement

2.2.1 Stakeholder Consultation and Adaptive Management

During monitoring period of the project, questionnaire survey was conducted for stakeholder consultation from 30-August-2020 to 03-September-2020. The project proponent put up public announcements at the villages near the project site, and contacted the local authorities (mainly the ecology and environment bureau, agriculture and rural affairs bureau) by phone. The general information about the introduction of project, the date and the purpose of the questionnaire survey as well as the project proponent's phone number and email address were clearly conveyed via these public announcements and phone calls. The basic information about the survey respondents is listed in Table 3. Responses and comments from these questionnaires are summarized in Table 4. All the stakeholders replied to the questionnaires are supportive of the project.

Table 3 Structure of Stakeholder Survey

Items		Amount
Gender	Male	37
	female	33
Age	<25	7
	25-55	53
	>55	10
Education	Junior high school or below	8
	Senior high school	51
	College or above	11
Occupation	Worker	14
	Farmer	36
	Management personnel	12
	Civil servant	8

Table 4 Summary of the Survey Results

No	Question	Response	Amount	Percentage
1	Do you know the purpose of this project?	Very much	65	93%
		A little	5	7%
		Not at all	0	0%
2		Reduce odor	42	60%

	What do you think is the impact of the implementation of this project on the local environment?	Improve water quality	16	23%
		Reduce waste pollution	12	17%
		none	0	0%
3	What impact do you think the implementation of this project will have on your life?	Improve the quality of surrounding environment	23	33%
		providing employment opportunities	25	36%
		Free use of fertilizer	22	31%
4	Are you satisfied with the environmental protection measures that the proposed project has made?	Satisfied	70	100%
		Dissatisfied	0	0%
		Indifferent	0	0%
5	What do you think is the impact of the proposed project on local employment?	Positive	66	94%
		Negative	0	0%
		None	4	6%
6	What do you think is the impact of the proposed project on local economy?	Positive	66	94%
		Negative	0	0%
		None	4	6%
7	In general, what is your attitude towards the Project construction?	Supportive	70	100%
		Against	0	0%
		Indifferent	0	0%
8		Yes	60	86%

	Do you think other regions should also vigorously promote this type of technology?	No	0	0%
		No idea	10	14%

In order to set up the mechanism for on-going communication with local stakeholders, a grievance book was put at the entrance of each swine farm. All stakeholders are allowed to record their grievances or comments in the book at any time.

Due to the impact of COVID-19, consultation can be conducted online, such as email, telephone, We Chat or video conference. No any grievances or comments were received during this monitoring period.

2.2.2 Anti-Discrimination

The project does not involve and is not complicit in any form of discrimination based on gender, race, religion, sexual orientation or any other basis. The project respects all the rights to the women conferred to them by the *Constitution of the People's Republic of China*, *the Labour Law of the People's Republic of China*, *Special provisions on labour protection of female employees* and other related regulation and policies. The project cannot directly or indirectly reinforce gender-based discrimination and shall not lead to/contribute to adverse impacts. Gender equality was attained by ensuring that both men and women have equal opportunities to jobs created and trainings. The project further ensures equal pay for equal value of work.

2.2.3 Worker Training

Capacity building and training for the employees is necessary for normal operation of the AWMSs. Trainings is accessible to all the employees, with emphasis on those recruited from local residents. All the staff working in the swine farms is informed of risks and trained on measures to avoid it. Generally, the training covers the following topics,

- Background of carbon emission reductions and climate change.
- Basic requirements of Verra for issuance of carbon credits.
- Safety operation process of the AWMSs, especially for avoidance of fire and leakage of biogas.
- Parameters monitored and methodology.

2.2.4 Equal Work Opportunities

The project provides equal job opportunities for local residents regardless of gender, race, religion, sexual orientation or any other basis. All the project policy on human resource, including but not limit to recruitment, salary and benefits, takes into account the labour laws of China to build an inclusive workplace and culture.

2.2.5 Workers' Rights

Contract is signed with each employee to state specific rights, obligations and benefits of the job. Forced labour and child labour are forbidden by the project. Everyone is free to join or the leave the project swine farm. The project owner abides labour laws and local requirements of China to provide a safe and fair work environment for the employees.

2.2.6 Occupational Safety Assessment

The project activity does not adversely affect the health of the employees or other stakeholders. It is in compliance with local and national laws on Environmental, Health and Safety. Adequate training is provided to the employees constantly, which covers the safety instructions. Besides, necessary safety instruments such as portable gas detection alarm are equipped in each swine farm to detect gas concentrations in different locations, audible and visual alarm can be issued if it exceeds the normal range. Fire and leakage of biogas can be prevented effectively.

2.2.7 Feedback and Grievance Redress Procedure

In order to document the project's feedback and grievance redress procedure, the project set up the mechanism for on-going communication with local stakeholders, a grievance book is put at the entrance of each swine farm. All stakeholders are allowed to record their grievances or comments in the book at any time.

Due to the effect of COVID-19, the input and grievance expression process could be reflected via telephone, email or WeChat. All the contact information is announced to the stakeholders during the local stakeholder consultation process. The project owner takes necessary action on the issue raised by the stakeholder within 48 hours.

2.2.8 Stakeholder Access to Project Documentation

Key project information was sent to the stakeholders before the stakeholder consultation process. The project documentation is uploaded on website of Verra and the related link has also been informed to the stakeholders. On the request of stakeholders, the project document, monitoring reports and other relevant documents can be provided as requested in a timely manner. All the stakeholders can contact the project owner via telephone, email or WeChat.

2.2.9 Information to Stakeholders on Assessment Process

The detailed process for registration of carbon reduction project under Verra has been explained to the stakeholders during local stakeholder consultation. The stakeholders is informed of the SD Vista assessment process via email, telephone or We Chat as requested. All the periodical achievement of the assessment can be communicated with the stakeholders, such as the start date of 30 days public comment period, ways to submit comments on the project, as well as on-site results of validation and verification of the VVB.

2.3 Project Management

2.3.1 Avoidance of Corruption

China has strict laws to prevent corruption. The proponent of the project also established relevant code of conduct and business ethics to avoid corruption of the management and employees. These policies are in line with all legal requirements and are held to the highest standards of operation. As per public information listed in National Enterprise Credit Information Publicity System[2], neither of the project proponent were involved in nor complicit in any form of corruption such as bribery, embezzlement, fraud, favouritism, cronyism, nepotism, extortion, and collusion.

2.3.2 Recognition of Property Rights

All the AWMSs were invested by the project owner, who has the legal right to control and operate the project activity. The business license, approval of Environmental Impact Assessment (EIA) and the main equipment (anaerobic tank, biogas generator) purchasing contracts are evidence for the ownership of the project and credits or label issued. All property rights are recognized, respected and supported.

2.3.3 Free, Prior and Informed Consent

The project does not require any change to property or land tenure arrangements. The project owner holds the land title for all swine farms covered in the project activity. All the relevant arrangements are agreed with free, prior and informed consent of the stakeholders.

2.3.4 Restitution and/or Compensation for Affected Resources

There are no negative effects on the land or resources due to the project activity, and allocation of restitution or compensation to any parties is not required.

2.3.5 Property Rights Removal/Relocation of Property Rights Holders

No removal or relocation will occur as a result of this project.

2.3.6 Identification of Illegal Activities

There are no illegal activities identified and associated that could affect the project's impacts, and measures needed and designed to reduce these activities are not required.

2.3.7 Ongoing Conflicts or Disputes

There are no ongoing or unresolved conflicts or disputes over rights to lands, territories and resources that will impact the operation and outcomes of the project.

2.3.8 National and Local Laws and Regulations

As per approval of Environmental Impact Assessment (EIA) of the project, the project complies with all relevant laws and regulations of China, mainly includes,

1. Environmental Protection Law of the People's Republic of China.

[2] http://www.gsxt.gov.cn/index.html

2. Administrative Licensing Law of the People's Republic of China.

3. Law of the People's Republic of China on Environmental Impact Assessment.

4. Regulations on Environmental Protection Management of Construction Projects.

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

2.4 Grouped Projects

The project is not a grouped project.

3 BENEFITS FOR PEOPLE AND PROSPERITY

3.1 Impacts on Stakeholders

Impact #1	Increase employment rate in the project area (SDG Indicator: 8.5.2).
Type of Impact	Total 14 jobs for local people were created during the monitoring period, it is positive without cost or a risk to the local residents. The impact is an actual impact which is a direct consequence of the project activity.
Affected Stakeholder Group(s)	Local residents around the project site, and the local government.
Resulting Change in Well-being	The job opportunities are available to the all the local residents around the project site equally which improves the living conditions of the local residents.

Impact #2	Promote justice in job recruitment (SDG Indicator: 8.5.2).
Type of Impact	During the implementation of the project, a total of 7 male and 7 female employees has been recruited regardless of gender, which improve the equality in employment. The impact is an actual impact which is a direct consequence of the project activity.
Affected Stakeholder Group(s)	Local residents around the project site.
Resulting Change in Well-being	The project has promoted the employment of women and other vulnerable members. Decent job opportunities are available to them equally.

Impact #3	Improve personal skills and environmental awareness (SDG Indicator: 8.5.2).

Type of Impact	Employee training has been carried out since the entry, the training content covers the general and technical aspects of the project to the extent appropriate, as well as basic understandings of VCS Standard and climate change. The impact is an actual impact which is a direct consequence of the project activity.
Affected Stakeholder Group(s)	Local residents around the project site, and original staff of the swine farm
Resulting Change in Well-being	Through the staff trainings, all the employees working in the swine farms has been informed of risks and trained on measures to avoid it, and the personal skills of the employees has been improved to adapt to sustainable development better.

3.2 Stakeholder Impact Monitoring

From the operation start date of the project activity to the end of this monitoring period, 14 jobs for local people were created (including 7 females and 7 males), and necessary training has been carried out for all the members involved in the project. The stakeholder impact monitoring for the variables linked to the identified project impacts and the claims are described as follows:

SDG Claim	**Target**: 8.5 By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value **Indicator**: 8.5.2 Unemployment rate, by sex, age and persons with disabilities
Parameter monitored	*Number of jobs for local people created by gender*
Affected stakeholder group	Local residents around the project site, and the local government. All the monitoring work can be monitored by the project proponent.
Measurement methods and procedures	Number of jobs for local people created by gender can be determined by the employee list and cross-checked by the labor contract.
Monitoring results	14 local residents (7 females and 7 males) are employed for project implementation and monitoring activities during the operation period of the project
Monitoring frequency	Once for each monitoring period. After the first verification, only changes in employees will be reported.

SDG Claim	**Target**: 8.5 By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value **Indicator**: 8.5.2 Unemployment rate, by sex, age and persons with disabilities
Parameter monitored	*Training times*
Affected stakeholder group	Local residents around the project site, and original staff of the swine farm. All the monitoring work can be monitored by the project proponent.
Measurement methods and procedures	Training times will be determined based on the training notice and cross-checked by the training attendance form.
Monitoring results	Employees was trained for the biogas safety operation and monitoring plan on 23-July -2021.
Monitoring frequency	Once for each monitoring period.

3.3 Net Positive Stakeholder Well-being Impacts

Impact	Affected Stakeholder Group	Baseline Scenario	Project Scenario	Net Impact
Increase employment rate in the project area.	Local residents around the project site, and the local government.	No related job positions are available in the project site	14 permanent jobs (including 7 females and 7 males) for the local residents are created during operation period of the project, which contributes to reducing unemployment rate.	Positive

Promote justice in job recruitment.	Local residents around the project site.	Some job opportunities are not available to women and other vulnerable members.	Equal job opportunities are provided for the local residents regardless of gender.	Positive
Improve personal skills and environmental awareness.	Local residents around the project site, and original staff of the swine farm.	Lack of training on resource reuse on biogas generated from animal waste.	Training on the following aspects is provided to the employees as needed, • Background of carbon emission reductions and climate change. • Basic requirements of Verra for issuance of carbon credits. • Safety operation process of the AWMSs, especially for avoidance of fire and leakage of biogas. • Parameters monitored and methodology.	Positive

4 BENEFITS FOR THE PLANET

4.1 Impacts on Natural Capital and Ecosystem Services

Impact #1	Avoid methane emissions direct to the atmosphere (Goal 13.0)
Type of Impact	All the 7 original uncovered anaerobic lagoons were removed and 7 new sets of AWMSs has been constructed and operated to treat the manure in each swine farm. The impact is positive, actual and direct. Furthermore, there is no cost or risk to natural capital and ecosystem services.
Affected Natural Capital and/or Ecosystem Service(s)	Carbon emissions and climate change.
Resulting Change in Condition	7 new sets of AWMSs are installed to the 7 existing swine farms to treat the manure and wastewater. Methane emissions generated in the baseline uncovered anaerobic lagoons has been avoided.

Impact #2	Increase the recycling rate of resources (SDG Indicator: 12.5.1)
Type of Impact	The solid is treated in aerobic composting system and the organic fertilizers can be produced, part of the fertilizer is distributed to local farmers for free. The impact is positive, actual and direct. Furthermore, there is no cost or risk to natural capital and ecosystem services.
Affected Natural Capital and/or Ecosystem Service(s)	Waste recycling and usage of renewable energy.
Resulting Change in Condition	In the baseline uncovered anaerobic lagoons, no organic fertilizers can be generated, the generation of organic fertilizer which helps to increase the recycling rate of resources.

Impact #3	Reduce demand for fossil fuels (SDG Indicator: 7.2.1)
Type of Impact	The impact is positive, actual and direct. Furthermore, there is no cost or risk to natural capital and ecosystem services.
Affected Natural Capital and/or Ecosystem Service(s)	Usage of renewable energy.
Resulting Change in Condition	Biogas is a kind of renewable energy. The biogas that was burned or emitted directly to the atmosphere has been be captured for heat generation, which was provided by the coal-fired boiler without the project. Therefore, it can help to reduce demand for fossil fuels.

Impact #4	Promote the use of renewable energy (SDG Indicator: 7.2.1)
Type of Impact	During the monitoring period, all the heat generated in this project is used by the daily operation of AWMSs and 7 swine farms the impact is positive, actual and direct. Furthermore, there is no cost or risk to natural capital and ecosystem services.
Affected Natural Capital and/or Ecosystem Service(s)	Usage of renewable energy.
Resulting Change in Condition	Biogas is a kind of renewable energy. All the heat generated is used by the 7 swine farms, which was provided by the coal-fired boiler without the project. The project activity helps to promote the use of renewable energy.

4.2 Natural Capital and Ecosystem Services Impact Monitoring

The following three parameters have been monitored during the monitoring period and the results are showing below.

SDG Claim	**Goal 13.0**: Take urgent action to combat climate change and its impacts

Parameter monitored	*GHG emission reductions*
Monitoring results	During the monitoring period from 15-July-2020 to 31-March-2022, the totally baseline methane emission is 553,574tCO_2e, project emission is 84,733 tCO_2e, leakage emission is 24,034 tCO_2e. Therefore, the Net GHG emission reduction is 444,807 tCO_2e.

SDG Claim	**SDG Target**: 12.5 By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse **SDG Indicator**: 12.5.1 National recycling rate, tons of material recycled
Parameter monitored	The amount of the organic fertilizers generated
Monitoring results	Monitored monthly by electronic truck scale installed in each swine farm, and recorded monthly by the staff in monthly operation report. The amount of the organic fertilizers generated is 115,215tons during the monitoring period from 15-July-2020 to 31-March-2022.

SDG Claim	**SDG Target**: 7.2 By 2030, increase substantially the share of renewable energy in the global energy mix **SDG Indicator**: 7.2.1 Renewable energy share in the total final energy consumption
Parameter monitored	The amount of biogas recycled
Monitoring results	The flow meter installed at the inlet of boiler in each swine farm is used to measure the amount of biogas recycled. The reading of flow meter can be recorded hourly and saved automatically in the Data Collection System (DCS). The biogas captured during monitoring period is 4,6129,68*10^4 m^3, all the biogas produced is used for heat generation.

4.3 Net Positive Natural Capital and Ecosystem Services Impacts

SDG Claim	Parameters Monitored	Net Benefit
Goal 13.0	*GHG emission reductions and removals*	GHG emission reductions 444,807 tCO_2e during the monitoring period
SDG Indicator 12.5.1	The amount of the organic fertilizers generated	115,215tons of organic fertilizers has been generated during the monitoring period
SDG Indicator 7.2.1	The amount of biogas recycled	4,6129,68*10^4 m^3 of biogas has been captured for heat generation during the monitoring period