MONITORING REPORT FORM (CDM-MR) *
Version 01 - in effect as of: 28/09/2010

CONTENTS

* as contained within the document entitled "Guidelines for completing the monitoring report form (CDM-MR)" (EB 54 meeting report, annex 34).

MONITORING REPORT
version 01 dated 15/11/2010

ANIMAL MANURE MANAGEMENT SYSTEM (AMMS) GHG MITIGATION PROJECT , SHANDONG MINHE LIVESTOCK CO. LTD., PENGLAI, SHANDONG PROVINCE, P.R. OF CHINA
REF NUMBER 1891
First Monitoring period (27/04/2009 - 30/04/2010)

SECTION A. General description of the project activity

A.1. Brief description of the project activity: >>

1. Purpose of the project activity and the measures taken to reduce greenhouse gas emissions

Animal Manure Management System (AMMS) GHG Mitigation Project is lactated in Penglai city. The purpose of this project is to mitigate greenhouse gas (GHG) emissions from chicken manure by improving AMMS at chicken farms and utilizing a biogas co- generation system to supply electricity and displace electricity from a grid-based conventional energy source.

2. Brief description of the installed technology and equipments

The technology employed by the project activity includes installation of new mesophilic temperature anaerobic digesters with biogas capture and power generation. The total volume of the anaerobic digesters is of 26,400 m3 and three sets of 1063 KW co-generators were installed; the annual electricity generated from biogas was 22.96 million kWh. The Total mixed reactor (CSTR) anaerobic reactors have sufficient capacity and hydraulic retention time to eliminate the volatile solids loading in the effluent. Processed effluent was applied to the land with aerobic condition. The electricity that was produced based on captured biogas, was supplied to the China North Grid.

3. Relevant dates for the project activity (e.g. construction, commissioning, continued operation periods, etc.).

Construction of the project started with the breaking ground of digesters in December 16 2007; the whole system was put into operation on February 15, 2009.

4. Total emission reductions achieved in this monitoring period.

This monitoring report is for the 1st monitoring period, which is from 27/04/2009 to 30/04/2010. Total emission reductions achieved in this monitoring period are 56,803 tCO2e.

A.2. Project Participants

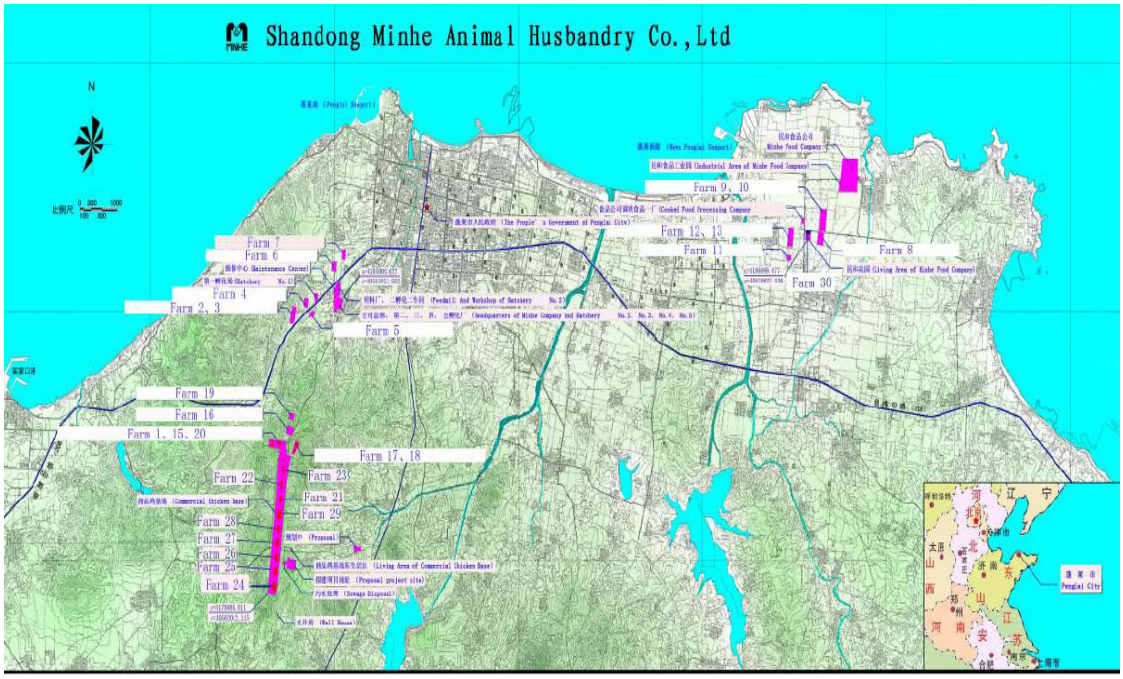
Table A1 Project participants

Name of Party involved (*) (host) indicates a host Party)	**Private and/or public entity(ies) project participants (*) (as applicable)**	**Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)**
The People's Republic of China (host)	Shandong Minhe Livestock Co. Ltd.	No
Netherlands	The State of the Netherlands, acting through the Netherlands' Ministry of Housing, Spatial Planning and the Environment (VROM)	Yes
Belgium	Kingdom of Belgium – Walloon Region Ministry of the Environment	Yes
Canada	Government of Canada – Ministry of Foreign Affairs and International Trade	Yes
Denmark	Aalborg Portland A/S ; Danish Ministry of Climate and Energy/Danish Energy Agency ;	Yes

	Dong Naturgas A/S ; Maersk Olie og Gas A/S ; Nordjysk Elhandel A/S	
Luxembourg	Government of Luxembourg – Ministry of the Environment	Yes
Spain	Endesa Generación S.A. ; Hidroeléctrica del Cantábrico, S.A. ; Gas Natural SDG, S.A. ; Kingdom of Spain - Ministry of Environment and Rural and Marine Affairs ; Ministry of Economy and Finance ; EDP-Energias de Portugal, S.A.	Yes
Italy	Italy - Ministry for the Environment, Land and Sea	Yes
Japan	Daiwa Securities Capital Markets Co. Ltd. ; FUJIFILM Corporation ; Idemitsu Kosan Co., Ltd. ; Nippon Oil Corporation ; The Okinawa Electric Power Corporation, Incorporated	No
Germany	BASF SE ; KfW Bankengruppe	No
Sweden	Göteborg Energi AB	No
Finland	Rautaruukki Oyj	No
Norway	Stratkraft Carbon Invest AS	No

A.3. Location of the project activity:

All the project activities are located in the area of Minhe, Penglai, Shandong Province, People's Republic of China , which is located 120°35' E -121°08' E, 37°25'N-37°50'N. There are 16 farms located in 120°42' 33.92435E , 37°44'46.22138N'. There are 2,764,043 chickens included in farms numbered No.15~ No.29. The biogas digesters and power station are located within the farms.



A.4. Technical description of the project

As per the registered PDD, the project activity includes total replacement of uncovered anaerobic lagoons that result in high GHG emissions at the project activities sites, with centralized mesophilic temperature anaerobic digesters with biogas-based power generation. Manure from 16 farms will be transported through underground pipes same as current practice to the biogas-based power generation

facility. The project activity is defined in FigureA-1.

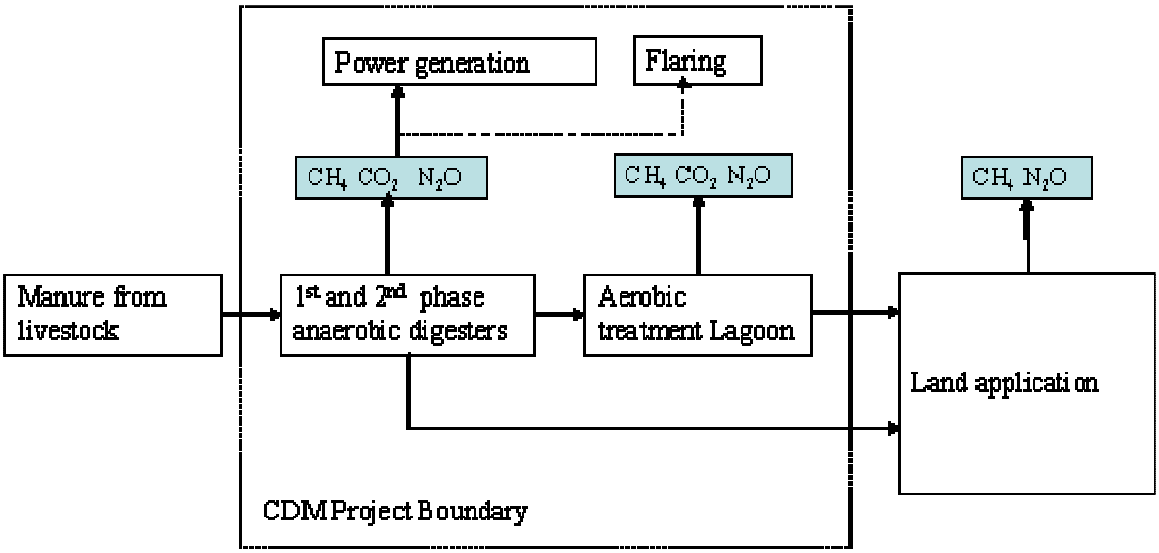


Figure A-1 Project activity

The project activity system is comprised of 3 stages with sufficient capacity to eliminate the volatile solids load in the effluent and reduce GHG emissions. The first stage is mesophilic temperature anaerobic digesters with biogas capture. The second stage is biogas power generation. The third stage is aerobic treatment of biogas liquid in aerobic lagoon.

Sealed anaerobic digesters: Sealed anaerobic digesters (AD) are one of the most important processes in animal waste treatment. The anaerobic digesters receive the animal manure and maintain a steady –state population of methanogenic bacteria for degradation. Methanogenic bacteria convert organic manure into biogas in the environment without oxygen. Captured biogas then will be used to generate electricity, which will be supplied to the grid and replace electricity that would otherwise be generated from coal-fired power plants. In addition, AD could reduce offensive odors, pathogens from the manure slurry, and GHG emissions during the storage.

Total mixed reactor (CSTR) anaerobic reactors will be used in the project to treat the chicken manure and flushing water about 1150 m3. To increase the efficiency of anaerobic digesters (AD), two phase anaerobic digesters will be applied. For phase one, the reactor will work comfortably under an internal fermenting temperature about 38℃. Each anaerobic reactor shall have a size of Φ16.0m×16.5m, with a usable volume of 3300 m3. In this context, the total usable volume of 6 anaerobic reactors shall be 19,800 m3. In Phase two, there are three anaerobic digesters. Each has a size ofΦ16.0m×16.5 m, with a usable volume of 3300 m3. The total retention time in two phases biogas digesters is about 23 days. The biogas production is estimated to be 9.38 million m3. The methane concentration is about 60%.

To ensure the air-tightness of the anaerobic reactor, measures will be adopted to reduce possible leakages from the anaerobic fermenting process. Apart from the seal that is comprised of multi-layers of material, several reactors will be put into parallel operation, in an attempt to reduce the possible leakage from the maintenance process. In doing so, the maintenance of one reactor will not affect the operation of the others. In addition, the anaerobic digesters have been designed to enable solid residues to be removed without breaking the seal.

Biogas purification and collection: the biogas derived from the sealed anaerobic digesters is a mixed gas. In addition to its toxicity, H2S may shorten the life of the generator. In this project, a biological stream, water vapor separator, and dry desulfurizing tower will be used for biogas purification. The purified biogas will be stored in a gas tank. The volume of gas tank is 2,000 m3. In addition, a open flare system will be installed to convert excess methane from digesters to carbon dioxide for preventing

any over pressure and explosion risk when generator does not work because of the maintenance or any other emergency situation. The gas tank will be located in the area with safe distance from generators, digesters according to requirement of related national fireproof standard.

Biogas-based power generation: The biogas can be utilized in three possible ways: combustion utility only, power generation only, or combined combustion utility and power generation. In this project, the biogas will be used entirely for power generation. Internal combustion generators using purified biogas will be installed for cogeneration. The purified biogas will be fed to the power generator from the gas holder for power generation. Electricity produced will be sold through the power grid. The heat recovered by heat recovery system from cooling water and the exhaust gas of power generation system will be used as a thermal source of heating the anaerobic biogas digester. In this project, three sets of 1063 KW co-generators will be installed, three sets of co-generators are for daily operation. Operation days for each set are 300 days. The annual biogas electricity will be 22.96 million kWh.

***Aerobic treatment of biogas liquid in lagoon*:** A storage lagoon will be used for aerobic treatment of the biogas liquid. The GHG emissions from aerobic storage of liquid will be calculated for the project activity. The treated biogas liquid will be applied to crop land of the same size croplands and with same application frequency as the baseline condition.

A.5. Title, reference and version of the baseline and monitoring methodology applied to the project activity:

This project activity utilizes the Executive Board of Clean Development Mechanism (CDM) approved consolidated baseline methodology ACM0010-Version 02 titled "Consolidated baseline methodology for GHG emission reductions from manure management systems". This baseline methodology can be downloaded from the Executive Board (EB) website:
http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

A.6. Registration date of the project activity:

The registration date of the project activity is 27 April 2009.

A.7. Crediting period of the project activity and related information (start date and choice of crediting period):

The start date of the crediting period is 27 April 2009, and it has a fixed 10 year crediting period.

A.8. Name of responsible person(s)/entity(ies):

Table A2：Name of persons/entity carrying out the monitoring report:

Name/origination	**Project participant** **Yes/No**
Dong Hongmin Institute of Environment and Sustainable Development in Agriculture Chinese Academy of Agricultural Sciences 12, Zhongguancun South Street, Beijing, 100081, China Tel: 0086-010-82109979 Fax: 0086-010-82109979 E-mail: donghm@cjac.org.cn; donghm@mail.caas.net.cn	**No**
Li Yue Institute of Environment and Sustainable Development in Agriculture, Chinese Academy of Agricultural Sciences. 12, Zhongguancun South Street, Beijing, 100081, China. Tel: 0086-010-82105615 Fax: 0086-010-82105615 E-mail: Yueli@ami.ac.cn; jinghonglv@gmail.com	No

SECTION B. Implementation of the project activity

B.1. Implementation status of the project activity

The construction of all biogas digesters was completed in Oct, 2008. The test run period of biogas power plant was from Nov, 2008 to Feb., 2009. On 15 Feb, 2009, the power generated was sent to the grid. Thus the starting date of operation and monitoring of the project activity was 15 Feb, 2009.

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

B.2. Revision of the monitoring plan

No revision of monitoring plan happened during this monitoring period.

B.3. Request for deviation applied to this monitoring period

There is no deviation applied to this monitoring period

B.4. Notification or request of approval of changes

During project implementation, three sets of 1,063 KW co-generators were installed at the project site, with total installed capacity being changed to 3,189 KW compared to 3,000 KW estimated in the PDD. The annual electricity generated by the project activity is estimated as 22.96 million KWh, against an estimated amount of 16.88 million KWh in the registered PDD. A reassessment was then performed as per paragraph 10(b) of EB 48 Annex 66.

It has been validated by the DOE that the change of co-generators installed has no impact on the additionality and operation/ability of the project activity. The request for notification of changes was submitted to the secretariat on September 28, 2010.

The scale of the CDM project activity remains the same.

SECTION C. Description of the monitoring system

1. Data collection procedure

In accordance with the Monitoring Methodology ACM0010 version 2, the location of the monitoring equipment for the key parameters that must be monitored ex-post are described in Figure C1

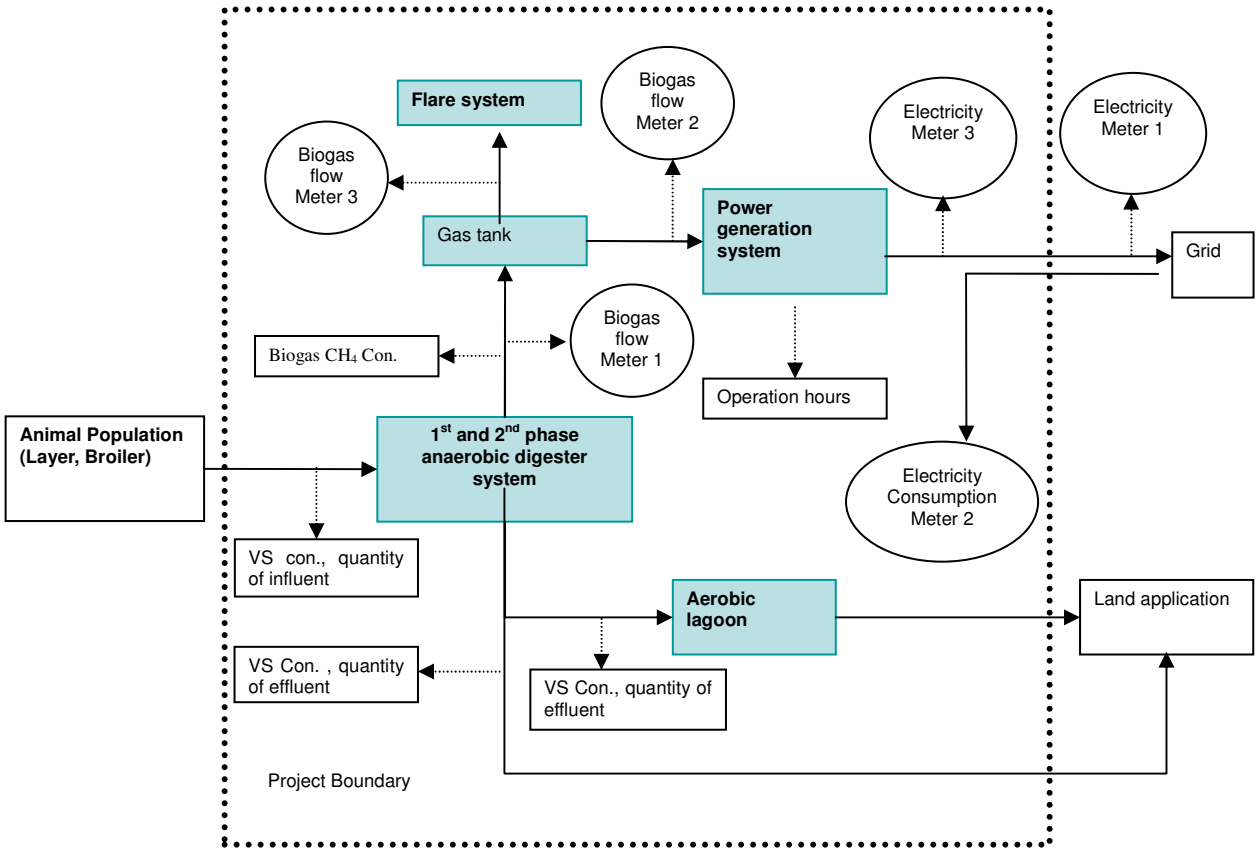


Figure C1 Location of Monitoring Equipment

1) The electricity supply to the grid from the Project Activity EG_y

The local grid company reads the electricity meter (electricity meter 1) installed by the grid company at electrical substation in Penglai Township once every month and issues the sales invoices based on the readings of the meters. For quality assurance, invoices are cross-checked against the readings from the electricity meter (electricity meter 3) installed at the outlet of biogas power generator of project site. The annual electricity supply to the grid is the sum of the monthly supply. The electricity meter used was calibrated periodically by an officially accredited entity, the level of accuracy was deducted from annual electricity supply while calculating the emission reduction.

2) The electricity consumption $EL_{Pr,y,}$

The local grid company reads the electricity meter, (electricity meter 2) installed in project site, once every month and issues the sales invoices based on the readings of the meter. The annual electricity consumption is the sum of the monthly consumption. The electricity meter used was calibrated periodically by an officially accredited entity, the level of accuracy was deducted from the annual electricity supply while calculating the emission reduction.

3) Biogas flow V_f

The Minhe responsible staff reads the biogas flow meters (biogas flow meter 1 installed at the outlet of the anaerobic digesters, biogas flow meter 3 installed at the inlet of the flare, biogas flow meter 2 installed at the inlet of the power generator) everyday and copy picture of the screen of monitoring computer. The daily biogas production or biogas flow to the flare was determined by taking the reading minus the outputs of the previous reading. The weekly biogas production or biogas flow to the flare is the sum of the daily outputs, same principle was applied to calculate the monthly/annual biogas production or biogas flow to the flare. The biogas flow meter used was calibrated periodically by an officially accredited entity. In addition, the biogas gas flow is automatically displayed in normalized cubic meters, it is not need to measure the biogas temperature and pressure.

4) CH_4 concentration

CH4 concentration was measured continuously through onsite gas analyzer installed at the outlet of the anaerobic digesters. The Minhe staffs download hourly recordings of gas analyzer once per day. Monthly CH4 concentration was calculated based on the daily average CH4 concentration. Gas analysis meter was calibrated periodically by an officially accredited entity.

5) Influent quantity

The Minhe staff reads cumulative operational hours of influent pumps installed at the inlet of biogas digesters everyday The daily operational time of influent pumps is calculated by the hour reading as of the day minus the hours on the previous reading. The daily influent amount was calculated based on the operation hours of pump and flow rate of pumps. The weekly influent is the sum of the daily influent, same principle was applied to calculate the monthly/annual influent.

6) Effluent quantity

The Minhe staff reads cumulative of effluent flow rate installed at the outlet of biogas digesters (same to inlet of aerobic lagoon) everyday. The daily effluent quantity was the reading to date minus reading of previous day. The weekly influent is the sum of the daily effluent, same principle was applied to calculate the monthly/annual effluent.

7) VS concentration measurement

Samples were taken from sample points located before the inlet of biogas digesters and inlet of aerobic lagoon for 5 consecutive days quarterly. VS concentration of collected samples was analyzed in Penglai inspection testing centers, the average of VS concentration for 5 consecutive days was applied to calculate the fraction of Volatile solids directed to the stages of anaerobic digesters and aerobic treatment respectively.

8) Animal population

The populations of the broiler hens are recorded daily by the technicians in broiler farm. The data on the start date and handin chicken numbers, end date and handout chicken number of each flocks were also recorded. The relevant monthly/flock data of hens is checked by the operators in the broiler farm and delivered to the CDM monitor division, a report for every flock of broiler is generated by the CDM monitor staff in the form of Excel tables, and the original collected data is archived in both electronic and printed copies.

9) Broiler body weight

0.2% of broiler and layers (about 10,000) for each flock was sampled and weighted weekly by the technicians in each farm, Site weight of each flock was estimated based on average weight of sampled chicken in each flock. After every month or when every flock of broiler is finished, the weighing result is checked by the CDM broiler farm operators and delivered to the CDM monitor division. A report on chicken weight for every month or every flock of broiler is generated by the CDM monitor staff in the form of Excel tables, and the original collected data is archived in both electronic and printed copies.

2. Organizational structure

Figure C2 outlines the Project's operational and management structure. General Manager of Biogas power generation plant is responsible for implementation and supervision of the CDM monitoring activity and is the liaison of the CDM project. Since March 2009, Ms. DONG Tai-li has been serving as General Manager. Digester division is responsible for daily operation of the digesters, CHP division is responsible for the daily operation of the power generators; maintenance division is responsible for daily check and maintenance of the CDM project activity, above three division ensure the sustainable operating of project system.

Monitoring division is responsible for monitoring the CDM data: the data collection personnel are responsible for collecting, processing and submitting data. Internal verification personnel are responsible for meter calibration and data review and archiving in order to ensure data accuracy and completeness. Monitored data will be reviewed and approved by General Manager of Biogas power generation plant before it is accepted and stored.

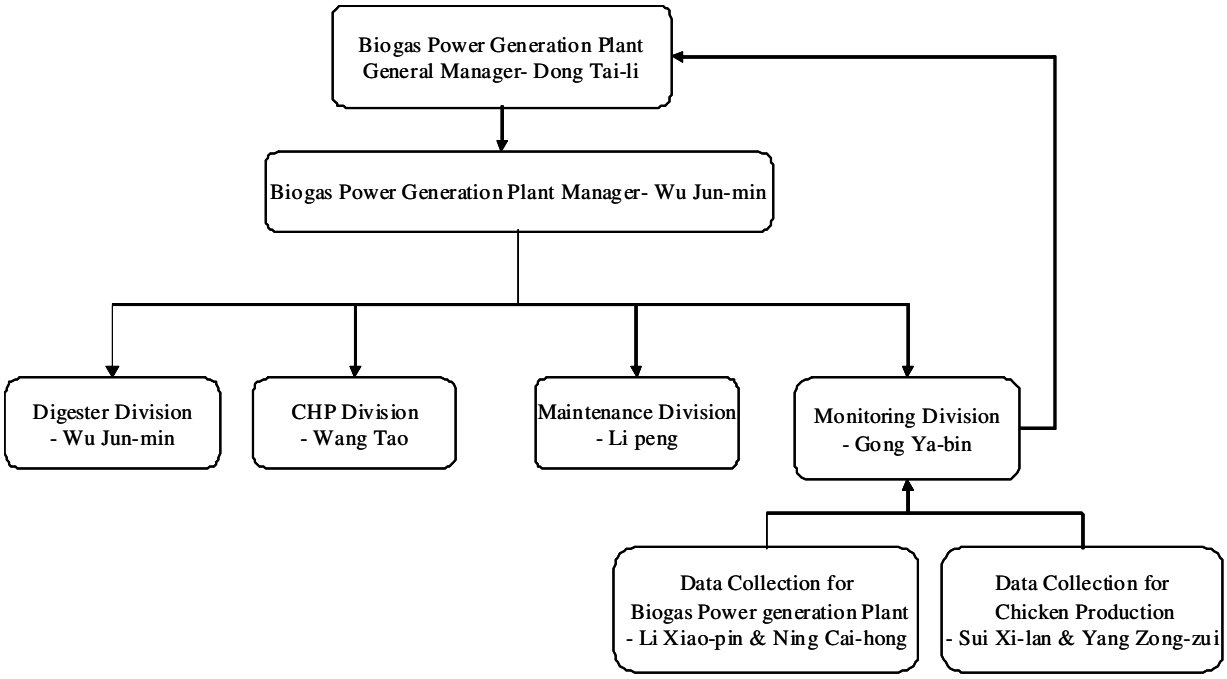


Figure C2: Project's operational and management structure

3. Emergency procedure

If abnormal operation occurs, the responsible staff should immediately report to Project General Manager. When erroneous measurement is detected by operators involved in implementation of the monitoring plan, the erroneous measurement should be reported to the Project General Manager instantly. The Project Manager takes the responsibility to handle the erroneous measurement as follows: If the reason for erroneous measurement is the malfunction of the meter(s), recalibrate or replace the meter as appropriate. At the same time, training courses will be re-arranged for relevant employees to ensure the correct implementation of the monitoring plan, so as to prevent error.

SECTION D. Data and parameters

D.1. Data and parameters determined at registration and not monitored during the monitoring period, including default values and factors

ID Number:	1
Data / Parameter:	$RV_{S,n}$
Data unit:	Fraction
Description:	VS degradation factor
Source of data used:	ACM0010-version 2
Value(s) :	Uncovered anaerobic lagoon: 70%
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Data on uncovered anaerobic lagoon of 70% are used for baseline emission calculations.
Additional comment:	

ID Number:	2
Data / Parameter:	$EF_{N2O, D,j}$, $EF_{N2O,ID,j}$
Data unit:	kg N_2O-N/ kg N and kg N_2O-N/ kg NH_3-N and NO_X-N

Description:	N_2O emission factors (direct and indirect emissions)
Source of data used:	IPCC 2006 Guidelines
Value(s) :	$EF_{N2O, D}$=0 for anaerobic lagoon and digester; $EF_{N2O, D}$=0.01 for aerobic lagoon; $EF_{N2O,ID,j}$=0.01 for indirect N2O emission
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Data on $EF_{N2O, D}$=0 for anaerobic lagoon and $EF_{N2O,ID,j}$=0.01 are used for baseline emission Data on $F_{N2O, D}$=0 for a digester, $EF_{N2O, D}$=0.01 for aerobic lagoon, *as well as* $EF_{N2O,ID,j}$=0.01 are used for project emission
Additional comment:	Default values in IPCC 2006 Guidelines were used because country specific or region specific data are not available.

ID Number:	3
Data / Parameter:	F_{gasm}
Data unit:	Fraction
Description:	Fraction of N lost due to volatilization
Source of data used:	IPCC 2006 Guidelines
Value(s) :	40% for lagoon, 20% for land application
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Data on 40% for lagoon and 20% for land application are used for Baseline, Project and Leakage emission calculations.
Additional comment:	Default values in IPCC 2006 Guidelines were used because country specific or region specific data are not available.

ID Number:	4
Data / Parameter:	EF_1, EF_4, EF_5
Data unit:	kg N_2O-N/ kg N for EF_1, EF_5 and kg N_2O-N/ kg NH_3-N and NO_X-N for EF_4
Description:	EF_1 is emission factor for direct N2O from soils; EF_4 is emission factor for direct N2O emissions from atmospheric deposition of N on soils and water surfaces; EF_5 is emission factor for indirect N2O emission of
Source of data used:	IPCC 2006 Guidelines
Value(s) :	EF_1=0.01, EF_4=0.01, EF_5=0.0075
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Data on EF_1=0.01, EF_4=0.01, EF_5=0.0075 were used for baseline, project and leakage emission calculations.
Additional comment:	Default values in IPCC 2006 Guidelines may be used because country specific or region specific data are not available.

ID Number:	5
Data / Parameter:	F_{leach}
Data unit:	Fraction
Description:	Fraction of N leached
Source of data used:	IPCC 2006 Guidelines
Value(s) :	0
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Data were used for leakage emission calculations.
Additional comment:	Default values in IPCC 2006 Guidelines were used because country specific or region specific data are not available.

ID Number:	6
Data / Parameter:	$EG_{Bl,y}$
Data unit:	MWh

Description:	Electricity consumption within the project boundary under baseline condition
Source of data used:	Project proponents
Value(s) :	1820
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	data are used for baseline emission calculations
Additional comment:	

ID Number:	7
Data / Parameter:	N_{dy}
Data unit:	Number
Description:	Number of days treatment plant was operational.
Source of data used:	Project proponents
Value(s) :	365
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Data are used for baseline, project and leakage emission calculations.
Additional comment:	

ID Number:	8
Data / Parameter:	$MS\%_{Bl,j}$
Data unit:	Fraction
Description:	Fraction of manure handled in open lagoon system in the baseline
Source of data used:	Project proponents
Value(s) :	100%
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Data are used for baseline emission calculations
Additional comment:	

ID Number:	9
Data / Parameter:	GWP_{CH4}
Data unit:	tCO_2 e/tCH_4
Description:	Global warming potential for CH_4
Source of data used:	IPCC
Value(s) :	21
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Data are used for baseline, project and leakage emission calculations.
Additional comment:	

ID Number:	10
Data / Parameter:	GWP_{N2O}
Data unit:	tCO_2e/tN_2O
Description:	Global warming potential for N_2O
Source of data used:	IPCC
Value(s) :	310
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Data are used for baseline, project and leakage emission calculations.

Additional comment:	

ID Number:	11
Data / Parameter:	D_{CH4}
Data unit:	t/m^3
Description:	Density of methane
Source of data used:	ACM0010
Value(s) :	0.00067
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Data are used for baseline, project and leakage emission calculations.
Additional comment:	

ID Number:	12
Data / Parameter:	MCF_d
Data unit:	t/m^3
Description:	Methane conversion factor for leakage calculation.
Source of data used:	ACM0010
Value(s) :	1
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Data are used for leakage emission calculations.
Additional comment:	

ID Number:	13
Data / Parameter:	$CF_{N2O-N,N}$
Data unit:	
Description:	Conversion factor N to N2O
Source of data used:	ACM0010
Value(s) :	44/28
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Data are used for baseline, project and leakage emission calculations.
Additional comment:	

ID Number:	14
Data / Parameter:	$EF_{OM,\ y}$
Data unit:	$tCO_2/MW•h$
Description:	Operating Margin Emission Factor
Source of data used:	The Affiche about determining the emission factors of China regional power grid, released by Office of National Coordination Committee on Climate Change, National Development and Reform Committee, December 15, 2006 (http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/2006/2006121591135575.pdf).
Value(s) :	1.0585
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Data are used for baseline and project emission calculations.
Additional comment:	

ID Number:	15

Data / Parameter:	$EF_{BM,\ y}$
Data unit:	$tCO_2/MW•h$
Description:	Build Margin Emission Factor
Source of data used:	The affiche about determining the emission factor of China Regional Power Grid, released by Office of National Coordination Committee on Climate Change, National Development and Reform Committee, December 15, 2006 (http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/2006/2006121591135575.pdf)**.**
Value(s) :	0.9066
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Data are used for baseline and project emission calculations.
Additional comment:	

ID Number:	16
Data / Parameter:	$\eta_{flare,h}$
Data unit:	percent
Description:	Flare efficiency in hour h
Source of data used:	Tool to determine project emissions from flaring gases containing methane
Value(s) :	0 %
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Data are used for project emission calculations.
Additional comment:	

ID Number:	17
Data / Parameter:	NCV_{CH4}
Data unit:	GJ/tonne
Description:	Net calorific value of methane
Source of data used:	Rose and Cooper, 7th edition 1977 "Technical Data on Fuel" WEC British National Committee, Edinburgh
Value(s) :	50.04
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Data are used for project emission calculations.
Additional comment:	

D.2. Data and parameters monitored	
ID Number:	01
Data / Parameter:	MCF
Data unit:	Fraction
Description:	Methane conversion factor
Measured /Calculated /Default:	Calculated as per IPCC Guidelines
Source of data:	IPCC 2006 Guidelines
Value(s) of monitored parameter:	0.7

Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data was used for baseline emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	NA
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	Annual average temperature during the monitoring period was 12.2 C according to the record Penglai Meteorological Station. According to IPCC 2006 Guideline, when annul average temperature=12 C， the MCF for lagoon is 0.7
QA/QC procedures applied:	IPCC default factor was applied resulting in no error due to measurement.

ID Number:	02
Data / Parameter:	$B_{O,LT}$
Data unit:	$m^3CH_4/kg\text{-}VS$
Description:	Maximum methane production
Measured /Calculated /Default:	Default
Source of data:	IPCC 2006 Guidelines
Value(s) of monitored parameter:	0.36 for broiler; 0.39 for layer
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data was used for baseline, project, and leakage emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	NA
Measuring/ Reading/ Recording frequency:	Annually, according to published information such as IPCC
Calculation method (if applicable):	NA
QA/QC procedures applied:	Values were applied because genetic source of the production operations livestock originate from an Annex I Party; formulated feed rations (FFR) have been used at the project site.

ID Number:	03
Data / Parameter:	$VS_{LT,y}$
Data unit:	kg dry matter/animal/day
Description:	Volatile solid excretion per animal per day
Measured /Calculated /Default:	Calculated based on default
Source of data:	IPCC 2006 Guidelines

Value(s) of monitored parameter:	0.011 for broiler; 0.033 for layer
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data was used for baseline, project, and leakage emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	NA
Measuring/ Reading/ Recording frequency:	Annually, estimated or based on published information such as IPCC
Calculation method (if applicable):	According to equation (4) in ACM0010, site-specific average VS was calculated based on default VS value provided by IPCC 2006, default weight, and measured site average weight of chicken
QA/QC procedures applied:	Values were applied because genetic source of the production operations livestock originate from an Annex I Party; formulated feed rations (FFR) have been used at the project site.

ID Number:	04
Data / Parameter:	$CEF_{Bl,elec,y}$
Data unit:	tCO_2/MWh
Description:	Emission factor of baseline electricity use
Measured /Calculated /Default:	Calculated
Source of data:	The affiche about determining the emission factor of China Regional Power Grid, released by Office of National Coordination Committee on Climate Change, National Development and Reform Committee.
Value(s) of monitored parameter:	0.9826
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data was used for baseline emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	NA
Measuring/ Reading/ Recording frequency:	At start of project
Calculation method (if applicable):	Calculated as per procedure described in registered PDD.
QA/QC procedures applied:	

ID Number:	05
Data / Parameter:	CEFgrid
Data unit:	tCO2/MWh
Description:	Carbon emission factor for the grid under the project activity
Measured /Calculated /Default:	Calculated
Source of data:	The affiche about determining the emission factor of China Regional Power Grid, released by Office of National Coordination Committee on Climate Change, National Development and Reform Committee.

Value(s) of monitored parameter:	0.89355
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data was used for both baseline and project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	NA
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	According to NDRC publication of Emission factors for grids
QA/QC procedures applied:	

ID Number:	06
Data / Parameter:	CEF_d
Data unit:	tCO_2/MWh
Description:	Carbon emissions factor for electricity consumed at the project site during the project activity
Measured /Calculated /Default:	Calculated
Source of data:	The affiche about determining the emission factor of China Regional Power Grid, released by Office of National Coordination Committee on Climate Change, National Development and Reform Committee.
Value(s) of monitored parameter:	0.89355
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data was used for both baseline and project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	NA
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	According to NDRC publication of Emission factors for grids
QA/QC procedures applied:	

ID Number:	07
Data / Parameter:	LF_{AD}
Data unit:	Fraction
Description:	Fraction of methane leakage from anaerobic digester
Measured /Calculated /Default:	Default
Source of data:	ACM0010
Value(s) of monitored parameter:	0.15

Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data was used for project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	NA
Measuring/ Reading/ Recording frequency:	NA
Calculation method (if applicable):	NA
QA/QC procedures applied:	

ID Number:	08
Data / Parameter:	$R_{N,n}$
Data unit:	fraction
Description:	Fraction of NEX in manure waste that is reduced in the baseline AWMS.
Measured /Calculated /Default:	Default
Source of data:	Refer to Annex 1 of ACM0010
Value(s) of monitored parameter:	0.0 for heated digesters, 0.4 for aerobic treatment
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data was used for leakage emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	NA
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	According to ACM0010
QA/QC procedures applied:	

ID Number:	09
Data / Parameter:	Type
Data unit:	Type of barn and AMMS
Description:	Project proponents
Measured /Calculated /Default:	NA
Source of data:	
Value(s) of monitored parameter:	keep same with the baseline
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	NA

Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	NA
Measuring/ Reading/ Recording frequency:	NA
Calculation method (if applicable):	NA
QA/QC procedures applied:	

ID Number:	10
Data / Parameter:	T
Data unit:	
Description:	Annual Average ambient temperature at weather station nearby project
Measured /Calculated /Default:	Measured
Source of data:	Penglai Meteorological Station
Value(s) of monitored parameter:	12.2
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data was used for, baseline emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	The data source is from meteorological station directly, no equipment is required on the project site.
Measuring/ Reading/ Recording frequency:	Monthly
Calculation method (if applicable):	Average of monthly temperature
QA/QC procedures applied:	NA

ID Number:	11
Data / Parameter:	Rainfall
Data unit:	mm
Description:	Annual Average rainfall at weather station nearby project site
Measured /Calculated /Default:	Measured
Source of data:	Penglai Meteorological Station
Value(s) of monitored parameter:	1024.8
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data was used for both baseline and leakage emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	The data source is from meteorological station directly, no equipment is required on the project site.
Measuring/ Reading/ Recording frequency:	Monthly

Calculation method (if applicable):	Average of monthly rainfall
QA/QC procedures applied:	NA

ID Number:	12
Data / Parameter:	Evaporation
Data unit:	mm
Description:	Annual Average evaporation at weather station nearby project site
Measured /Calculated /Default:	Measured
Source of data:	Penglai Meteorological Station
Value(s) of monitored parameter:	2232.5
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data was used for baseline and leakage emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	The data source is from meteorological station directly, no equipment is required on the project site.
Measuring/ Reading/ Recording frequency:	Monthly
Calculation method (if applicable):	Average of monthly evaporation
QA/QC procedures applied:	NA

ID Number:	13
Data / Parameter:	$EG_{d,y}$
Data unit:	MWh
Description:	Electricity exported to grid
Measured /Calculated /Default:	Measured
Source of data:	Project proponents
Value(s) of monitored parameter:	14757.1
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data was used for baseline emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Type: DSSD876 Accuracy class: 0.5S Series number: 200808251072 Calibration frequency: 5 years Date of last calibration: July 23, 2009
Measuring/ Reading/ Recording frequency:	Monthly
Calculation method (if applicable):	Accumulative electricity exported to the grid
QA/QC procedures applied:	Electricity meters undergo maintenance/calibration subject to

ID Number:	14
Data / Parameter:	N_{LT}
Data unit:	Number

Description:	Average chicken population used in both baseline and project case emissions estimations.
Measured /Calculated /Default:	Calculated
Source of data:	Project proponents
Value(s) of monitored parameter:	Broiler: 2,181,378 Layers: 582,664
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data was used for baseline, project and leakage emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	NA
Measuring/ Reading/ Recording frequency:	Each flock
Calculation method (if applicable):	The method for monitoring the number of livestock population was described in B7.2 of this PDD.
QA/QC procedures applied:	Feed purchase will be recorded to verify the chicken population

ID Number:	15
Data / Parameter:	W_{site}
Data unit:	kg
Description:	Weight of chicken
Measured /Calculated /Default:	Measured
Source of data:	Project proponents
Value(s) of monitored parameter:	Broiler: 0.95 Layers: 2.98
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data was used for baseline, project, and leakage emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Type: ACS-30 Accuracy class: III Series number: 08021852, Calibration frequency: annually Date of last calibration: Feb.11, 2010
Measuring/ Reading/ Recording frequency:	Weekly
Calculation method (if applicable):	0.2% of broiler and layers will be weighed weekly to obtain average site weight.
QA/QC procedures applied:	

ID Number:	16
Data / Parameter:	F_{AD}
Data unit:	Fraction
Description:	Fraction of volatile solids directly to anaerobic digesters

Measured /Calculated /Default:	Measured
Source of data:	Project proponents
Value(s) of monitored parameter:	100%
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data was used for project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Type: NM090SY01L06V Accuracy class: NA Series number: 19456 and 19457 Calibration frequency: Annually Date of last calibration: April 29, 2010 Validity: April 28, 2011
Measuring/ Reading/ Recording frequency:	Four times a year in different seasons.
Calculation method (if applicable):	Fraction of volatile solids directed to anaerobic digesters was calculated based on the VS concentration and quantity of influent of biogas digesters. VS concentration was measured by taking sample of influent. Quantity of influent was measured by the operation hours of pumps.
QA/QC procedures applied:	Pumps will be in compliance with relevant standards in China, there is no requirement on calibration of pumps at national level. The pumps was calibrated according to manufacturers recommendation VS concentration of collected samples was sent for analysis at qualified labs or testing centers at the city level.

ID Number:	17
Data / Parameter:	F_{Aer}
Data unit:	Fraction
Description:	Fraction of volatile solids directly to aerobic treatment
Measured /Calculated /Default:	Calculated
Source of data:	Project proponents
Value(s) of monitored parameter:	26.7%
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data was used for project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Type: LMZ-100 Accuracy class: NA Series number: 800930105 Calibration frequency: annually Date of last calibration: March 16, 2010 Validity: March 16, 2011
Measuring/ Reading/ Recording frequency:	Four times a year in each season.

Calculation method (if applicable):	Fraction of volatile solids directed to aerobic lagoons was calculated based on the VS concentration and quantity of influent of biogas digesters. VS concentration was measured by taking sample of influent. Quantity of influent was measured by flow meter.
QA/QC procedures applied:	Flow meter will be in compliance with relevant standards in China, calibration of flow meter occured according to technical specification by an officially accredited entity. VS concentration of collected samples was sent for analysis at qualified labs or testing centers at the city level.

	18
Data / Parameter:	$EL_{Pr,y}$
Data unit:	MWh
Description:	Electricity used under project activity
Measured /Calculated /Default:	Measured
Source of data:	Project proponents
Value(s) of monitored parameter:	1,440
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data was used for project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Type: DTSD71 Accuracy class: 0.5 S Series number: 623154 Calibration frequency: 5 years Date of last calibration: September 18, 2008 Validity: September 17, 2013
Measuring/ Reading/ Recording frequency:	Monthly
Calculation method (if applicable):	Accumulative electricity consumption
QA/QC procedures applied:	Electricity meters undergo maintenance/calibration subject to appropriate industry standards. The accuracy of the meter readings will be verified by receipts issued by the purchasing power company. Uncertainty of the meters to be obtained from the manufacturers. This uncertainty was included in a conservative manner while calculating CERs.

ID Number:	19
Data / Parameter:	V_f
Data unit:	m^3
Description:	Biogas flow
Measured /Calculated /Default:	Measured
Source of data:	Project proponents
Value(s) of monitored parameter:	7,287,024

Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data was used for project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Type: KVS08IIKF23FSN Accuracy class: 0.5S Series number: 8060604 Calibration frequency:2 years Date of last calibration: June 30, 2008 Validity: June 29, 2010
Measuring/ Reading/ Recording frequency:	Continuously measured by flow meter and report the accumulative data on weekly basis
Calculation method (if applicable):	Accumulative total biogas production
QA/QC procedures applied:	Biogas flow meters will undergo maintenance/calibration subject to appropriate national standards or manufacture's recommendations.

ID Number:	20
Data / Parameter:	T_{Biogas}
Data unit:	℃
Description:	Biogas temperature
Measured /Calculated /Default:	Measured
Source of data:	Project proponents
Value(s) of monitored parameter:	NA (No separate biogas temperature is required because flow meter expressing biogas volumes in normalized cubic meters)
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data was used for project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Type: STT3000 Accuracy class: B Series number: b120870437 Calibration frequency: Annually Date of last calibration: April 26, 2010 Validity: April 25, 2011
Measuring/ Reading/ Recording frequency:	Continuous measurement
Calculation method (if applicable):	Daily average
QA/QC procedures applied:	Measuring instruments should be subject to a regular maintenance and testing regime in accordance to appropriate national/international standards.

ID Number:	21
Data / Parameter:	P_{Biogas}
Data unit:	Pa
Description:	Biogas pressure
Measured /Calculated /Default:	Measured
Source of data:	Project proponents
Value(s) of monitored parameter:	NA (No separate biogas pressure is required because flow meter expressing biogas volumes in normalized cubic meters)

Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data was used for project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Type: 3051 Accuracy class: 0.5S Series number: 4640566 Calibration frequency: Annually Date of last calibration: April 26, 2010 Validity: April2 5, 2011
Measuring/ Reading/ Recording frequency:	Continuous measurement
Calculation method (if applicable):	Daily average
QA/QC procedures applied:	Measuring instruments should be subject to a regular maintenance and testing regime in accordance to appropriate national/international standards.

ID Number:	22
Data / Parameter:	C_{CH4}
Data unit:	Fraction
Description:	Methane fraction of biogas
Measured /Calculated /Default:	Measured
Source of data:	Project proponents
Value(s) of monitored parameter:	66.6%
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data was used for project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Type: 97460 Accuracy class: 0.5S Series number: 27112 Calibration frequency: Annually Date of last calibration: April 1, 2010 Validity: March 31, 2010
Measuring/ Reading/ Recording frequency:	Continuous measurement
Calculation method (if applicable):	Daily average
QA/QC procedures applied:	The project proponents shall define the viability of the concentration. They shall also define the error in estimating for different level of measurement frequency. The level of accuracy will be deducted from average concentration measurement.

ID Number:	23
Data / Parameter:	$PE_{flare,y}$
Data unit:	tCO_2e
Description:	Project emission from flaring of the residual gas stream in year y

Measured /Calculated /Default:	Calculated based on measurements for gas flared
Source of data:	Project participant
Value(s) of monitored parameter:	469.5
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data was used for project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Type: KVS08IIKF23FSN Accuracy class: 0.5S Series number: 8060601 Calibration frequency:2 years Date of last calibration: March 22, 2010 Validity: March 21, 2011
Measuring/ Reading/ Recording frequency:	Continuously by flow meter and reported cumulatively on weekly basis
Calculation method (if applicable):	Accumulative total biogas production
QA/QC procedures applied:	Biogas flow meters will undergo maintenance/calibration subject to appropriate national standards or manufacture's recommendations.

ID Number:	24
Data / Parameter:	$MS\%_j$
Data unit:	Fraction
Description:	Fraction of manure handled in anaerobic digesters under project activity
Measured /Calculated /Default:	Measured
Source of data:	Project proponents
Value(s) of monitored parameter:	100%
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data was used for project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Type: NM090SY01L06V Accuracy class: Series number: 19456 and 19457 Calibration frequency: Annually Date of last calibration: April 29, 2010 Validity: April 28, 2011
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	The manure flow into system and manure influent into the digesters was measured.
QA/QC procedures applied:	

ID Number:	25
Data / Parameter:	$NEX_{LT,y}$
Data unit:	kg N/1000 kg animal mass/year

Description:	Annual average nitrogen excretion per 1000 kg animal mass, estimated as described in Annex 2 of ACM0010.
Measured /Calculated /Default:	Calculated
Source of data:	2006IPCC Guideline, Project proponents
Value(s) of monitored parameter:	1.1 for broiler, 0.83 for layer
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data was used for baseline, project, and leakage emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	NA
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	According to Annex 2 of ACM0010, default NEX from IPCC 2006 Guidelines, default weight, and measured site average weight to scale site-specific average $NEX_{LT,y}$
QA/QC procedures applied:	NA

ID Number:	26
Data / Parameter:	Genetic source
Data unit:	
Description:	Genetic source of broilers and layers
Measured /Calculated /Default:	Default
Source of data:	Project proponent, recorded certificate of genetic source
Value(s) of monitored parameter:	Arbor Acres (AA)
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data was used for baseline, project, and leakage emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	NA
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	NA
QA/QC procedures applied:	Genetic source of the livestock production operations was confirmed to originate from an Annex I Party.

ID Number:	27
Data / Parameter:	FFR
Data unit:	

Description:	Formulated feed ratio
Measured /Calculated /Default:	Measured
Source of data:	Project proponent, recorded amounts of FFR for farm and the ingredient of FFR
Value(s) of monitored parameter:	100%
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data was used for baseline, project, and leakage emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	NA
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	NA
QA/QC procedures applied:	NA

ID Number:	28
Data / Parameter:	MCF_{sl}
Data unit:	Fraction
Description:	Methane conversion factor
Measured /Calculated /Default:	Default
Source of data:	IPCC 2006 Guidelines
Value(s) of monitored parameter:	0.01
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data was used for project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	NA
Measuring/ Reading/ Recording frequency:	NA
Calculation method (if applicable):	NA
QA/QC procedures applied:	

SECTION E. Emission reductions calculation

E.1. Baseline emissions calculation

The calculation spreadsheet on baseline emission are included in excel file named as Minhe ER calculation table.

Baseline emissions are estimated as follows:

$$BE_y = BE_{CH4,y} + BE_{N2O,y} + BE_{elec/heat,y} \quad (1)$$

where:

BE_y	Baseline emissions in year y, in tCO_2e/year.
$BE_{CH4,y}$	Baseline methane emissions in year y, in tCO_2e/year.
$BE_{N2O,y}$	Baseline N_2O emissions in year y, in tCO_2e/year.
$BE_{elec/heat,y}$	Baseline CO_2emissions from electricity and/or heat used in the baseline in year y, in tCO_2e/year.

(i) Methane emissions

$$BE_{CH4,y} = GWP_{CH4} * D_{CH4} * \sum_{j,LT} (MCF_j * B_{O,LT} * N_{LT} * VS_{LT,y} * MS\%_{Bl,j}) \quad (2)$$

where:

$BE_{CH4,y}$	The annual baseline methane emissions in t CO_2 e/y
GWP_{CH4}	Global Warming Potential (GWP) of CH_4.
D_{CH4}	CH_4 density (0.00067 t/m^3 at room temperature (20ºC) and 1 atm pressure).
MCF_j	Annual methane conversion factor (MCF) for the baseline $AMMS_j$ (anaerobic lagoon) from IPCC 2006 Guidelines Table 10.17, chapter 10, volume 4.
$B_{O,LT}$	Maximum methane producing potential of the volatile solid generated, in m^3CH_4/kg_dm, by broiler and layer chicken.
N_{LT}	Number of broiler and layer for the year y, expressed in numbers.
$VS_{LT,y}$	Annual volatile solid for broiler and layer chickens on a dry matter weight basis (kg dm/year).
$MS\%_{Bl,j}$	Fraction of manure handled in system j, here, In this proposed project, the baseline manure management system is an anaerobic lagoon only. The amount of manure handled by the anaerobic lagoon is 100%. $MS\%_{Bl,j}$ =100%

<u>Estimation of various variables and parameters for above equations:</u>

(A) Determination of volatile solids ($VS_{LT,y}$)

ACM0010-Version 2 provides four options for the determination of volatile solids (VS) excretion rate: (1) Using published country specific data; (2) Estimation of VS based on dietary intake of livestock; (3)Scaling default IPCC values to adjust for a site-specific average animal weight; (4) Utilizing published IPCC defaults.

According to scientific publication database (www.cnki.org.cn), there are no published country-specific data on VS data available, there are no energy intake of chicken available. Scaling default IPCC values VSdefault to adjust for a site-specific average animal weight as shown in equation (3):

$$VS_{LT,y} = \left[\frac{W_{site,LT}}{W_{default}}\right] \times VS_{default} \times nd_y \quad (3)$$

Where

$W_{site,LT}$	Average animal weight of a defined livestock population at the project site for LT type of chicken
$W_{default}$	IPCC Default weight, 2006 IPCC Guidelines (kg) for developed countries， for broilers (0.9 Kg /head) and for layers (1.8 Kg /head)
$VS_{default}$	The IPCC default $VS_{LT,y}$ values, The IPCC default $VS_{LT,y}$ values for broilers (0.01 kg dm/day) and for layers (0.02 kg dm/day) are selected for the project activity sites. Because the genetic source of chicken is

from the developed country, the FFR was used as chicken feed, and animal weight are similar to developed country IPCC default value.

ndy Number of days in year "y" where the treatment plant was operational.

(B) ***Maximum Methane Production Potential ($B_{O,LT}$)***

According to the scientific publication database (www.cnki.org.cn), there are no published country specific data on Bo. Developed countries $B_{O,LT}$ values will be used. Because the genetic source of chicken is from the developed country, the FFR was used as chicken feed, and animal weight are similar to developed country IPCC default value.

(C) Methane conversion factor (MCF_j)

IPCC 2006 Guidelines MCF values given in table 10.17 (chapter 10, volume 4) will be used. MCF 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 12.2℃ and the value of 70% is applied. A conservative factor should be applied by multiplying MCF values with a value of 0.94, to account for the 20% uncertainty in the MCF values as recommended by ACM0010.

(ii) ***N_2O emissions from manure management***

Equation 4 will be applied to calculate N2O emissions from the baseline according to ACM0010.

$$BE_{N2O,y} = GWP_{N2O} * CF_{N2O-N,N} * \frac{1}{1000} * (E_{N2O,D,y} + E_{N2O,ID,Y}) \quad (4)$$

where:

GWP_{N2O} Global Warming Potential for N_2O.

$CF_{N2O-N,N}$ Conversion factor N_2O-N to N_2O (44/28).

$E_{N2O,D,y}$ Direct N_2O emission in kg N_2O-N/year.

$E_{N2O,ID,Y}$ Indirect N_2O emission in kg N_2O-N/year.

Direct N_2O emission will be estimated according to equation 5.

$$E_{N2O,D,y} = \sum_{j,LT} (EF_{N2O,D,j} * NEX_{LT,y} * N_{LT} * MS\%_{BL,j}) \quad (5)$$

where:

$EF_{N2O,D,j}$ The direct N_2O emission factor for the treatment system j of the manure management system in kg N_2O-N/kg N. According to scientific the publication database (www.cnki.org.cn), there are no published country specific data on EF_{N2O}. Default EF_3 from table 10.21, chapter 10, volume 4, in the IPCC 2006 Guidelines was applied.

$NEX_{LT,y}$ The annual average nitrogen excretion per head of a defined livestock population in kg N/animal/day. Even there are data on crude percent of protein, there are no gross energy intake data available, because lack of daily weight gain data which is important to calculate the gross energy intake. So, there is no data on protein intake. According to scientific publication database (www.cnki.org.cn), there are also no published country-specific data on NEX data available. According to the Annex 2 of ACM 0010 version 2, scaling default IPCC values NEX to adjust for a site-specific average animal weight as shown in equation (6).

$MS\%_{BL,j}$ Fraction of manure handled in system j, in %. In this proposed project, j = anaerobic lagoon. $MS\%_{BL,j}$=100%.

N_{LT} Number of broilers and layers for the year y, expressed in numbers.

$$NEX_{LT,y} = \left[\frac{W_{site,LT}}{W_{default}}\right] \times NEX_{IPCC,default} \quad (6)$$

Where

$NEX_{IPCC,default}$ 2006 IPCC Guidelines default NEX. the default value (1.1 kg /1000 kg animal mass/day for broilers ,0.83 kg /1000 kg animal mass/day for layers) n volume 4, chapter 10, table 10.19 in IPCC 2006 Guidelines for developed countries will be applied. Because the genetic source of chicken is from the developed country, the FFR was used as chicken feed, and animal weight are similar to developed country IPCC default value

The indirect N_2O emissions will be estimated according to equation 7.

$$E_{N2O,ID,y} = \sum_{j,LT}(EF_{N2O,ID,j} * F_{gasm} * NEX_{LT,y} * N_{LT} * MS\%_{Bl,j}) \quad (7)$$

Where:

$EF_{N2O,ID,j}$ The 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 NOx-N emitted. According to scientific publication database (www.cnki.org.cn), there are no published country specific data on $EF_{N2O,ID,j}$. Default values for EF_4 from table 11.3, chapter 11, volume 4 of IPCC 2006 Guidelines was applied.

F_{gasm} Percent of managed manure nitrogen for livestock category that volatilizes as NH_3 and NOx in the manure management system. According to scientific publication database (www.cnki.org.cn), there are no published country specific data on F_{gasm}. Default value, 0.4, was applied (Table 10.22, Volume 4 of IPCC 2006 Guidelines).

(iii) CO_2 emission from electricity and heat within the project boundary

$$BE_{elec/heat,y} = EG_{Bl,y} * CEF_{Bl,elec,,y} + EG_{d,y} * CEF_{grid} + HG_{BL,y} * CEF_{Bl,\ therm,y} \quad (8)$$

where:

$EG_{Bl,y}$ The amount of electricity in the year y that would be consumed at the project site in the absence of the project activity (MWh) for operating AMMS. 182 MWh was consumed according to the Minhe electricity payment.

$CEF_{Bl,\ elec,y}$ The carbon emissions factor for electricity consumed at the project site in the absence of the project activity (tCO_2/MWh).

$EG_{d,y}$ The amount of electricity generated utilizing the biogas collected during project activity and exported to the grid during the year y (MWh)

CEF_{grid} The carbon emissions factor for the grid in the project scenario (tCO_2/MWh)

$HG_{BL,y}$ The quantity of thermal energy that would be consumed in year y at the project site in the absence of the project activity (MJ) using fossil fuel for operating AMMS, there is no thermal energy consumption in the baseline.

$CEF_{Bl,\ therm}$ The CO_2 emissions intensity for thermal energy generation (tCO_2 e/MJ)

The Electricity consumed is from the same regional grid where the generated electricity is exported to, the carbon emission factor for the grid EF_y is calculated as the weighted average of the Operating Margin emission factor ($EF_{OM,y}$) and the Build Margin emission factor ($EF_{BM,y}$):

$$EF_y = \omega_{OM} \times EF_{OM,y} + \omega_{BM} \times EF_{BM,y} \quad (9)$$

where the weights ω_{OM} and ω_{BM} are 50% and 50% respectively by default.

Where the default weights are adopted for the proposed project, the baseline emission factor is:

$$EF_y = 0.50 \times EF_{OM,y} + 0.50 \times EF_{BM,y} \quad (10)$$

Therefore for this monitoring period the following is the summary of the Baseline Emissions:

Summary of Baseline Emissions for this monitored Period	
$BE_{CH4,y}$	53,527 tCO2e
$BE_{N2O,y}$	2,658 tCO2e
$BE_{elec,y}$	14,974 tCO2e
BE_y	71,159 tCO_2e

For further details please see spreadsheet.

E.2. Project emissions calculation

The calculation spreadsheet are included in excel file named as Minhe ER calculation table.

Project emissions are calculated as follows:

$$PE_y = PE_{AD,y} + PE_{Aer,y} + PE_{N2O,y} + PE_{PL,y} + PE_{flared,y} + PE_{elec/heat} \quad (11)$$

$PE_{AD,y}$ Leakage from AMMS systems that capture methane in tCO_2e/yr

$PE_{Aer,y}$ Methane emissions from AMMS that aerobically treats the manure in tCO_2e/y

$PE_{N2O,y}$ Nitrous oxide emission from project manure waste management system in tCO_2e/yr

$PE_{PL,y}$ Physical leakage of emissions from biogas network to flare the captured methane or supply to the facility where it is used for heat and/or electricity generation in tCO_2e/yr

$PE_{flared,y}$ Project emissions from flaring of the residual gas stream in tCO_2e/yr

$PE_{elec/heat,y}$ Project emissions from use of heat and/or electricity in the project case in tCO_2e/yr

(i) Methane emissions from anaerobic digester where gas is captured ($PE_{AD,y}$):

ACM0010 specify physical leakage from anaerobic digesters as being 15% of total biogas production. Because two stage manure management is involved in the manure treatment for the project activity, the equation 12 will be applied to the estimate methane emissions from the project activity.

$$PE_{AD,y} = GWP_{CH4} * D_{CH4} * LF_{AD} * F_{AD} * \left[\prod_{n=1}^{N}\left(1 - R_{VS,n}\right)\right] * \sum_{j,LT}(B_{O,LT} * N_{LT} * VS_{LT,y} * MS\%_j) \quad (12)$$

D_{CH4} CH4 density (0.00067 t/m3 at room temperature (20 ºC) and 1 atm pressure).

LF_{AD} Methane leakage from Anaerobic digesters, default of 0.15 multiplied by methane content of biogas.

F_{AD} Fraction of volatile solid treated in anaerobic digester, 100% was applied, because all the manure was feed into anaerobic digester.

$R_{VS,n}$ Fraction of volatile solid degraded in AMMS stage n.

LT Index for livestock type

$B_{O,LT}$ CH4 production capacity from manure for chickens, in m^3 CH4/kg-VS.

$VS_{LT,y}$ Annual volatile solid excretion of chickens on a dry matter basis in kg/animal/day.

N_{LT} Population of livestock type LT for the year y, expressed in numbers.

MS%j Fraction of manure handled in system j.

(ii) Methane emissions from aerobic AMMS treatment ($PE_{Aer,y}$):

IPCC 2006 Guidelines specify emissions from aerobic lagoons as 0.1% of total methane generating potential of the waste processed, which can be used as a default for all types of aerobic AMMS treatment.

$$PE_{Aer,y} = GWP_{CH4} \cdot D_{CH4} * 0.001 * F_{Aer} * \left[\prod_{n=1}^{N} (1 - R_{VS,n}) \right] * \sum_{j.LT} (B_{O,LT} * N_{LT} * VS_{LT,y} * MS\%_j) + PE_{Sl,y} \quad (13)$$

F_{Aer} The fraction of volatile solid directed to aerobic system.

$PE_{Sl,y}$ CH4 emissions from sludge disposed of in storage pit prior to disposal during the year in tCO2e/yr.

The equation used to estimate methane emissions from sludge is in equation 14.

$$PE_{SL,y} = GWP_{CH4} * D_{CH4} * MCF_{sl} * F_{Aer} * \left[\prod_{n=1}^{N} (1 - R_{VS,n}) \right] * \sum_{j,LT} (B_{O,LT} * N_{LT} * VS_{LT,y} * MS\%_j) \quad (14)$$

MCF_{sl} Methane conversion factor (MCF) for the sludge stored in sludge pits estimated as in the baseline emissions section.

The slurry storage ponds are not within the project boundary. The CH4, direct N2O and indirect N2O emissions from methane emissions from sludge are considered as leakage of the project activity.

(iii) N_2O emissions from manure management

$$PE_{N2O,y} = GWP_{N2O} \cdot CF_{N2O-N,N} \cdot \frac{1}{1000} * (E_{N2O,D,Y} + E_{N2O,ID,y}) \quad (15)$$

where:

$PE_{N2O,y}$ Annual project N_2O emissions in t CO_2e / yr

GWP_{N2O} Global Warming Potential (GWP) for N_2O.

$CF_{N2O-N,N}$ Conversion factor N_2O-N to N_2O (44/28).

$E_{N2O,D,,y}$ Direct N_2O emission in kg N_2O-N/year.

$E_{N2O,ID,,y}$ Indirect N_2O emission in kg N_2O-N/year.

The same method used to estimate the emissions in the baseline is used to estimate the project emissions of nitrous oxide.

$$E_{N2O,D,y} = \sum_{j,LT} (EF_{N2O,D,j} * NEX_{LT,y} * N_{LT} * MS\%_j) \quad (16)$$

where:

$EF_{N2O,D,j}$ The direct N_2O emission factor for the treatment system j of the manure management system in kg N_2O-N/kg N. According to scientific publication database (www.cnki.org.cn), there are no published country specific data on $EF_{N2O,D,j}$. Default EF3 in volume 4, chapter 10, table 10.21 in IPCC 2006 Guidelines was applied.

$NEX_{LT,y}$ The annual average nitrogen excretion per head of a defined livestock population in kg N/animal/year. IPCC default value (0.83 kgN/1000kg weight/day) was applied.

$$E_{N2O,ID,y} = \sum_{j,LT} EF_{N2O,ID,j} * F_{gasm} * NEX_{LT,y} * N_{LT} * MS\%_j \quad (17)$$

where:

$EF_{N2O,ID,j}$ The 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 NOx-N emitted, 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 can be used.

F_{gasm} Percent of managed manure nitrogen for livestock category that volatilizes as NH_3 and NOx in the manure management system.

(iv) Physical leakage from distribution network of the captured methane in ($PE_{PL,Y}$)

This refers to leaks in the biogas system from the biogas pipeline delivery system. In this proposed project, $PE_{PL,Y}$ is assumed to be zero because biogas is a very dangerous gas and gas delivery is on site delivery only). During the construction of the pipelines, the project sponsor will be very careful to avoid gas leakage from pipelines.

(v) Project emissions from flaring of the residual gas stream (*PE*$_{flare,y}$):

In case, there is residual gas stream which will be flared by open flaring. Project emissions from open flaring of the residual gas stream can be determined according to the "Tool to determine project emissions from flaring gases containing Methane". According to "Tool to determine project emissions from flaring gases containing Methane", in case open flare system will be installed and the flare efficiency cannot be measured in a reliable manner, default value of 50% can be used when the flare is operational. If the flare is not operational the default value to be adopted for flare efficiency is 0%. In this project, Fixed value of 0% for the flare efficiency will be applied, and this is for conservative.

(vi) Project emissions from heat and electricity use ($PE_{elec/heat}$):

$$PE_{elec/heat} = EL_{Pr,y} * CEF_{d} + HG_{Pr,y} * CEF_{Pr,therm,y} \quad (18)$$

where:

$EL_{Pr,y}$	The amount of electricity in the year y that is consumed at the project site for the project activity (MWh).
CEF_{d}	The carbon emissions factor for electricity consumed at the project site during the project activity (tCO_2/MWh).
$HG_{Pr,y}$	The quantity of thermal energy consumed in year y at the project site due to the project activity (MJ).
$CEF_{Pr,therm,y}$	The CO_2 emissions intensity for thermal energy generation (tCO_2e/MJ). The factor is zero if biogas is used for generating thermal energy.

In this project, there is no thermal energy consumed, Determination of CEF_d: the determination of CEF_d is the same as the method of $CEF_{grid.}$

Therefore for this monitoring period the following is the summary of the Project Emissions:

Summary of Project Emissions for this monitored Period	
$PE_{AD,y}$	5,956 tCO2e
$PE_{Aer,y}$	15.2 tCO2e
$PE_{N2O,y}$	6,628 tCO2e
$PE_{PL,y}$	0 tCO2e
$PE_{flare,y}$	469.5 tCO2e
$PE_{elec/heat}$	1,287 tCO2e
PE_{y}	14,356 tCO_2e

For further details please see spreadsheet.

E.3. Leakage calculation

This section shall include all formulae used and description to calculate the leakage applying actual values. A table may be used or include a reference to the spreadsheet to report multiple values.

The calculation spreadsheet on leakage are included in excel file named as Minhe ER calculation table.

Leakage **emissions are calculated as follows:**

$$LE_y = (LE_{P,N2O} - LE_{B,N2O}) + (LE_{P,CH4} - LE_{B,CH4}) \quad (19)$$

Where,

$LE_{P,N2O}$	The N_2O emissions released during the project activity from land application of the treated manure, in tCO_2e/year.
$LE_{B,N2O}$	The N_2O emissions released during the baseline scenario from land application of the treated manure, in tCO_2e/year.
$LE_{P,CH4}$	The CH_4 emissions released during the project activity from land application of the treated manure, in tCO_2e/year.
$LE_{B,CH4}$	The CH_4 emissions released during the baseline scenario from land application of the treated manure, in tCO_2e/year.

(i) Estimation of N_2O emissions outside the project boundary in baseline:

$$LE_{B,N2O} = GWP_{N2O} * CF_{N2O-N,N} * \frac{1}{1000} * (LE_{N2O,land} + LE_{N2O,runoff} + LE_{N2O,vol}) \quad (20)$$

$$LE_{N2O,land} = EF_1 * \prod_{n=1}^{N} (1 - R_{N,n}) * \sum_{LT} NEX_{LT,y} * N_{LT} \quad (21)$$

$$LE_{N2O,runoff} = EF_5 * F_{Leach} * \prod_{n=1}^{N} (1 - R_{N,n}) * \sum_{LT} NEX_{LT,y} * N_{LT} \quad (22)$$

$$LE_{N2O,vol} = EF_4 * F_{gasm} * \prod_{n=1}^{N} (1 - R_{N,n}) * \sum_{LT} NEX_{LT,y} * N_{LT} \quad (23)$$

where:

$LE_{N2O,land}$	Direct nitrous oxide emission from application of manure waste, in Kg N_2O-N/year.
$LE_{N2O,runoff}$	Nitrous oxide emission due to leaching and run-off, in Kg N_2O-N/year.
F_{gasm}	Fraction of animal manure N that volatizes as NH_3 and NOX in kg NH_3-N and NOx-N per kg of N. There is no site-specific, regional, or national data available. According to ACM0010, default values from table 11.3, chapter 11, volume 4 of IPCC 2006 Guidelines was used.
EF_1	Emission factor for direct emission of N_2O from soils in Kg N_2O-N/kg N. There is no site-specific, regional, or national data available. According to ACM0010, default values from table 11.1, chapter 11, volume 4 of IPCC 2006 Guidelines was used.
EF_4	Emission factor for N_2O emissions from atmospheric deposition of N on soils and water surfaces, in kg N- N_2O / (kg NH_3-N + NOx-N volatilized. There is no site-specific, regional, or national data available. According to ACM0010, default values from table 11.3, chapter 11, volume 4 of IPCC 2006 Guidelines was used.
EF_5	Emission factor for indirect emission of N_2O from runoff in Kg N_2O-N/kg N. There is no site-specific, regional, or national data available. According to ACM0010, default values from table 11.3, chapter 11, volume 4 of IPCC 2006 Guidelines was used.
F_{leach}	Fraction of *all* N added to mineralized in managed soils in regions where leaching/runoff occurs that is lost through leaching and runoff. There is no site-specific, regional, or national data available. According to ACM0010, default values from table 11.3, chapter 11, volume 4 of IPCC 2006 Guidelines was used.
$R_{N,n}$	Fraction of NEX in manure waste that is reduced in the Baseline AMMS. The relative reduction 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 Annex 1 of methodology ACM 0010.

(ii) N_2O emissions out the project boundary in project case

$$LE_{P,N2O} = GWP_{N2O} * CF_{N2O-N,N} * \frac{1}{1000} * (LE_{N2O,land} + LE_{N2O,runoff} + LE_{N2O,vol}) \quad (24)$$

$$LE_{N2O,land} = EF_1 * \prod_{n=1}^{N} (1 - R_{N,n}) * \sum_{LT} NEX_{LT,y} * N_{LT} \quad (25)$$

$$LE_{N2O,runoff} = EF_5 * F_{Leach} * \prod_{n=1}^{N} (1 - R_{N,n}) * \sum_{LT} NEX_{LT,y} * N_{LT} \quad (26)$$

$$LE_{N2O,vol} = EF_4 * F_{gasm} * \prod_{n=1}^{N} (1 - R_{N,n}) * \sum_{LT} NEX_{LT,y} * N_{LT} \quad (27)$$

(iii) Methane emissions from disposal of treated manure in baseline condition

$$LE_{B,CH4} = GWP_{CH4} \cdot D_{CH4} * MCF_d * \left[\prod_{n=1}^{N} (1 - R_{VS,n})\right] * \sum_{j,LT} (B_{O,LT} * N_{LT} * VS_{LT,y} * MS\%_j) \quad (28)$$

Where:

$LE_{B,CH4}$ Methane leakage emissions in the baseline (tCO_2e / yr)
MCF_d Methane conversion factor (MCF) assumed to be equal to 1.

(iv) Methane emissions from disposal of treated manure in project case

$$LE_{P,CH4} = GWP_{CH4} * D_{CH4} * MCF_d * \left[\prod_{n=1}^{N} (1 - R_{VS,n})\right] * \sum_{j,LT} B_{O,LT} * N_{LT} * VS_{LT,y} * MS\%_j) \quad (29)$$

Where:

$LE_{P,CH4}$ Methane leakage emissions in the project case (tCO_2e / yr)

Therefore leakage emissions for the current monitored period are summarized as follows:

Summary of Leakage Emissions for this monitored Period	
LE*B,CH4*	24,405 tCO2e
LE*pro,CH4*	12,309 tCO2e
LE*B,N2O*	6,628 tCO2e
LE*pro,N2O*	6,562 tCO2e
LE	0 tCO2e

For further details please see spreadsheet.

E.4. Emission reductions calculation / table

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The emission reduction ERy by the project activity during a given year y is the difference between the baseline emissions (BEy) and the sum of project emissions (PEy) and leakage, as follows:

$$ER_y = BE_y - PE_y - LE_y \quad (30)$$

Further, in estimating emissions reductions for claiming certified emissions reductions (CERs), if the actual methane captured from anaerobic digesters in project activity is lower than ($BE_{CH4,y}$ - $PE_{AD,y}$), then ($BE_{CH4,y}$ - $PE_{AD,y}$) (which is a component of BEy -PEy) in equation 30 is replaced by actual methane captured.

Total baseline emissions: BE_y=71,153 tCO_2e.

Total project emissions: PE_y $_y$= 14,356 tCO_2e.

Total leakage: LE_y =0 tCO_2e.

Total emission reductions: ER_y =56,803 tCO_2e.

During the monitoring period, biogas captured during monitoring period was 7,287,024 m^3, which equals to 102,528.4 tCO_2e. Baseline methane emission ($BE_{CH4,y}$) was 53,527 tCO_2e. Methane emissions from anaerobic digester where gas is captured ($PE_{AD,y}$) was 5,956 tCO_2e. Actual methane captured from anaerobic digesters is higher than the difference of $BE_{CH4,y}$ and $PE_{AD,y}$. Therefore, the equation 30 can be used to calculate emission reduction.

Emission reduction generated in the monitoring period (27/04/2009-30/04/2010): 56,803 tCO_2e.

E.5. Comparison of actual emission reductions with estimates in the CDM-PDD

According to the registered PDD, the expected emission reduction of the project was estimated to be 72,371 tCO2e per year. During the monitoring period (27/04/2009-30/04/2010), the measured emission reduction was 56,803 tCO2e which is lower than the ex-ante calculated result.

Item	Values applied in ex-ante calculation of the registered CDM-PDD	Actual values reached during the monitoring period
Emission reductions (tCO_2e)	72,371	56,803

E.6. Remarks on difference from estimated value in the PDD

There was no increase from actual values compared with estimated values.

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History of the document

Version	Date	Nature of revision
01	EB 54, Annex 34 28 May 2010	Initial adoption.
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