CLEAN DEVELOPMENT MECHANISM
SMALL-SCALE PROGRAM ACTIVITY DESIGN DOCUMENT FORM (CDM-SSC-CPA-DD)
Version 01

CONTENTS

Annexes

NOTE:

(i) This form is for submission of CPAs that apply a small scale approved methodology using the provision of the proposed small scale CDM PoA.

(ii) The coordinating/managing entity shall prepare a CDM Small Scale Programme Activity Design Document (CDM-SSC-CPA-DD)[1,2] that is specified to the proposed PoA by using the provisions stated in the SSC PoA DD. At the time of requesting registration the SSC PoA DD must be accompanied by a CDM-SSC CPA-DD form that has been specified for the proposed SSC PoA, as well as by one completed CDM-SSC CPA-DD (using a real case). After the first CPA, every CPA that is added over time to the SSC PoA must submit a completed CDM-SSC CPA-DD.

[1] The latest version of the template form CDM-CPA-DD is available on the UNFCCC CDM web site in the reference/document section.

[2] At the time of requesting validation/registration, the coordinating managing entity is required to submit a completed CDM-POA-DD, the PoA specific CDM-CPA-DD, as well as one of such CDM-CPA-DD completed (using a real case).

SECTION A. General description of small scale CDM programme activity (CPA)

A.1. Title of the small-scale CPA:

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Hebei Animal Manure Management System (AMMS) GHG Mitigation Programme---CPA No.###
Version Number:##
Date: ##/##/20##

A.2. Description of the small-scale CPA:

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The project is developed under the Small-Scale Programme of Activities (PoA) titled "Hebei Animal Manure Management System (AMMS) GHG Mitigation Programme". The Hebei Green Agriculture Co. Ltd will act as the coordinating/managing entity under the PoA, (Names of CPA Implementers) will act as the SSC-CPA Implementer (CPA Implementer).

Prior to the implementation of CPA No.###, open lagoon was applied to treat [swine][dairy cattle][chicken] manure, coal was used to heating the livestock house and electricity was imported from the grid. The project activity is to construct two biogas digester tanks and collect the produced biogas to generate electricity and thermal energy for the farm. Therefore, the baseline scenario of manure management and energy consumed of CPA No.### is open lagoon, electricity imported from the grid and coal based thermal energy.

The CPA No.### aims to mitigate greenhouse gas (GHG) emissions in (Names of CPA Implementers) by changing the manure management practice from open lagoon to biogas digesters and utilizing biogas to generate electricity and thermal energy. Biogas utilization are envisaged as scenario [A]/[B]/[C]. [Biogas will be routed to produce heat for internal use in the farms and/or nearby household.][Biogas will be used to produce electricity, which will displace grid electricity, for use of the farm itself or nearby household.][Biogas will be used to provide both thermal and electricity, or use of the farm itself or nearby household, by using boiler/heater and power generator separately.] The implementation of the CPA No.### will contribute to reduction of the country's heavy dependence on coal.

The baseline manure management system prior to the implementation of the CPA was anaerobic open lagoons. The CPA No.### will include installation of ( ) anaerobic digesters with total volume of ( ) m^3 in (Names of CPA Implementers). The CPA No.### is designed to treat manure of ( ) swine, ( ) dairy cattle, ( ) chicken. Among the three scenarios for biogas utilization as described in section A4.2.1 of PoA-DD, the CPA will apply scenario [A]/[B]/[C]. Specifically, [( ) boiler(s) with a total installed thermal energy generation capacity of ( )MW thermal] [( ) power generator with a total capacity of ( )kW] [( ) boiler(s) with a total installed thermal energy generation capacity of ( )MW thermal and ( ) power generator with a total capacity of ( )kW] are to be installed. [Biogas-based heating system]/[Power generation system]/[Biogas-based heating and power generation system] will supply [thermal energy]/[electricity energy]/[thermal and electricity energy] to (Names of CPA Implementers), replacing coal-based heating and fossil fuel-based electricity. [The annual biogas production would be around ( ) million m^3]. [Annual heating provision will be ( ) TJ based on the Feasibility Study Report (FSR)]. [Annual power generation will be ( ) MWh] (Table A1). The estimated annual emission reduction will be ( ) tCO_2e.

Table A1: The detailed information for Livestock farm(s) involved in CPA No###

Farm name	Animal population			Number of biogas digester to be	Volume of Biogas digesters (m^3)	Annual Biogas production (millionm^3)	Scenario of biogas utilization	Annual electricity production (MWh)	Annual heat provision (TJ)
	Swine	Cattle	Chicken						

				constructed					
(Name of CPA Implementer 1)									
(Name of CPA Implementer 2)									
……									

In addition to reduction of GHG emissions compared to the emissions that would occur in the absence of this project activity, implementation of CPA No.### will protect human health and the environment, demonstrate a sustainable model to solve pollution problems from livestock operations, facilitate sectoral restructuring, and increase farmers' income. It supports China's sustainable development strategy in the following ways:

(i) Improving the local environment and human health. CPA No.###. of Hebei AMMS GHG Mitigation Programme, through installing biogas digesters and biogas utilizing systems, aims to reduce negative environmental impacts of livestock production. Treatment of large quantities of animal waste instead of open lagoon will reduce organic material in wastewater, the nuisance of odors and wastewater, thus decreasing diseases, disease vectors, bacteria, and leading to better environmental conditions and local quality of life.

(ii) Creating job opportunities and increasing farms' income. CPA No.###of Hebei AMMS GHG Mitigation Programme brings several contributions to improving social and economic conditions for (Names of CPA Implementers).CPA No.### will increase the local employment for skilled labor during production, installation, operation, and maintenance of the equipment and systems. CPA No.### will reduce the farms' electricity and heating costs under the operation of the (Names of CPA Implementers).

(iii) Diversifying energy supply. CPA No.### will diversify the source of the energy supply through biogas production and biogas-based heating and power generation systems, which will make local energy a substitute for coal and other sources to generate electricity. It will also help to ease power shortages.

(iv) Application of advanced technology. CPA No.### under Hebei AMMS GHG Mitigation Programme will apply new, advanced, and environmentally friendly technologies in treating animal wastes and associated utilization, which can be replicated on other CAFO livestock farms, dramatically reducing livestock-related GHG emissions and providing the potential for new sources of revenue and green power, raising the economic benefits from livestock industry, and promoting utilization of agricultural waste, hence helping to build a circular economy. CPA No.###also provides technological support for the project activities, thus ensuring the security of working conditions for farmers to adopt and operate biogas digesters and other related equipment.

A.3. Entity/individual responsible for the small-scale CPA:

The entities responsible for the small-scale CPA are(Names of CPA Implementers)in CPA No.###, which are referred to as CPA implementers.

The details of the CPA Implementer and entity responsible for CPA No. ### are provided in Annex 1.

The CPA implementer is not a project participant of the PoA. The project participant is Hebei Green Agriculture Co. Ltd, which is recorded at the PoA level.

A.4. Technical description of the small-scale CPA:

A.4.1. Identification of the small-scale CPA:

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A.4.1.1. Host Party:

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The host party for the project is People's Republic of China.

A.4.1.2. Geographic reference or other means of identification allowing the unique identification of the small-scale CPA (maximum one page):

CPA No.### is identified by detailing all the relevant information as tabulated in table A2 below. This has enabled to give the unique identification of the participating farm in the CPA No.###. Figure A1 shows the location of (Names of CPA Implementers)

Table A2: Detailed information for the farm or a bundle of farms under CPA No.###

CPA number	Farm(s) name	Prefecture (city)	County (city)	Address	Geographic reference		Type of animal
					Latitude	Longitude	
###	(Names of CPA Implementers)						

Figure A1: Location of the (Names of CPA Implementers)

A.4.2. Duration of the small-scale CPA:

A.4.2.1. Starting date of the small-scale CPA:

>>

The start date of CPA No.### is DD/MM/YYYY. It is the date of construction contract signed by (Names of CPA Implementers))

The start date of the CPA is no earlier than the date of commencement of PoA validation.

A.4.2.2. Expected operational lifetime of the small-scale CPA:

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The expected operational lifetime of this CPA No.### is estimated to be 20 years.

A.4.3. Choice of the crediting period and related information:

Fixed Crediting period: 10 years

A.4.3.1. Starting date of the crediting period:

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The starting date of the crediting period is DD/MM/YYYY or the date of its inclusion in the registered PoA, whichever is later.

A.4.3.2. Length of the crediting period, first crediting period if the choice is renewable CP:

>> 10 years.

The duration of the crediting period should not exceed the end date of the PoA.

A.4.4. Estimated amount of emission reductions over the chosen crediting period:

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The estimated amount of emission reductions calculated for the CPA No.### over 10 years will be XXX equivalents.

Table A3: Estimated amount of emission reductions of CPA No. ###

Year	Annual estimation of emission reduction in tonnes of CO_2e
DD/MM/YYY- DD/MM/YYY	
DD/MM/YYY- DD/MM/YYY	
DD/MM/YYY- DD/MM/YYY	
DD/MM/YYY- DD/MM/YYY	
DD/MM/YYY- DD/MM/YYY	
DD/MM/YYY- DD/MM/YYY	
DD/MM/YYY- DD/MM/YYY	

DD/MM/YYY- DD/MM/YYY	
DD/MM/YYY- DD/MM/YYY	
DD/MM/YYY- DD/MM/YYY	
Total estimated reductions (tonnes of CO_2e)	
Total number of crediting years	**10**
Annual average of the estimated reduction over crediting period (tonnes of CO_2e)	

A.4.5. Public funding of the CPA:

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No public funding is used to implement CPA No.###.

A.4.6. Information to confirm that the proposed small-scale CPA is not a de-bundled component

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The CPA No.### included in the PoA is not a de-bundled component of another CDM Programme Activity or CDM project activity through the following conditions:

1) Both the coordinating entity of the Hebei AMMS PoA and project owner of CPA No.### do not manage any other CDM projects similar to CPA No.###
2) There is no other similar project activity, the boundary of which is within 1km of the boundary of (Names of CPA Implementers), at the closest point;

Therefore, CPA No.### is not a de-bundled component of another CDM Programme Activity or CDM project activity, and it is eligible to use the simplified modalities and procedures for small-scale project activities.

A.4.7. Confirmation that small-scale CPA is neither registered as an individual CDM project activity or is part of another Registered PoA:

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This CPA No.###is, neither registered as an individual CDM project activity nor is part of another Registered PoA.

SECTION B. Eligibility of small-scale CPA and Estimation of emissions reductions

B.1. Title and reference of the Registered PoA to which small-scale CPA is added:

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Hebei Animal Manure Management System (AMMS) GHG Mitigation Programme

Version3.1

Date: 10/01/2013

B.2. Justification of the why the small-scale CPA is eligible to be included in the Registered PoA :

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The CPA No.### is eligible to be included in the PoA (Hebei Animal Manure Management System (AMMS) GHG Mitigation Programme) because it meets the following criteria as required in the PoA:

Table B1: Eligibility demonstration of CPA No. ###

Eligibility Criteria	Analysis/ Evidence
1. The project geographical boundary has to be within the geographical territory of Hebei Province. The location will be specified in each CPA-DD.	The boundary of CPA No.### is in ( ) County, ( ) City/Prefecture, within the geographical territory of Hebei Province. Thus, the CPA No.### meets this criterion. Geographical coordinates of the farm are listed in Table A2
2. To meet the condition that avoid double counting of emission reductions, the proposed CPA under this PoA has not been and will not be either registered as a single CDM project activity or included as a CPA under another PoA: a **unique identification number** will be included in the specific CPA-DD for each farm included in the CPA-DD. **Geographical coordinates** of each farm will be the basis for the unique identification number. In addition, the CME will check the UNFCCC website with the date of access, and a statement from CME will be included in CPA-DD that the specific CPA will not be part of another single CDM project activity or CPA under another POA.	CME has checked UNFCCC website. The CPA No.### is either not registered as a single CDM project activity nor included as a CPA under another PoA. CME issued a statement that CPA No.### will not be part of another single CDM project activity or CPA under another POA. Geographical coordinates of CPA No.### are listed in Table A2.
3. The proposed CPAs shall use the same principle technologies, which include the construction of anaerobic biogas digesters to replace open lagoon to treat the manure from confined livestock farms to achieve methane recovery and destruction by flaring/combustion or gainful use of the recovered methane. Open flare system shall be installed to prevent any over pressure and explosion risk. The captured biogas can be used to provide thermal or electrical energy, or both thermal and electrical energy, that displaces fossil fuel; Specific biogas digester technologies, utilization or flaring of captured biogas, as well as the manure storage time limit and aerobic residues handle measures with the requirement of AMS III. D will be described in specific CPA-DD.	CPA No.###will construct anaerobic biogas digesters to replace open lagoon to treat the manure from confined livestock farms. The captured biogas will be used to provide [thermal energy]/[electricity energy]/[both thermal and electricity energy]. The CPA No.### will install open flare system to prevent any over pressure and explosion risk. The estimated manure storage timein open anaerobic lagoon is ( ) days, longer than one month. The biogas residue will be applied to dry land, such as wheat, maize, vegetables and orchard.

4. The starting date of the CPA is defined as "the earliest date at which either the implementation or construction or real action of a CDM project activity or PoA begins", and it cannot be prior to 11/05/2011, the commencement of validation (date of beginning of the Global Stakeholder Process posted on the UNFCCC website).	The start date of CPA No.### is DD/MM/YYYY, later than date of commencement of DOE validation (11/05/2011). Thus, the CPA No.### meets this criterion. The contract for civil works demonstrated the start date of the CPA No. ### to be DD/MM/YYYY.
5. The proposed CPA meets the applicability condition of applied methodology AMS III.D version 18, The CPA should present the following characteristics: a) The livestock population in the farm is managed under confined conditions; b) Manure or the streams obtained after treatment are not discharged into natural water resources; c) In the baseline scenario the retention time of manure waste in the anaerobic treatment system (open lagoon) is greater than one month, and their depths are at least 1 m; d) No methane recovery and destruction by flaring, combustion or gainful use takes place in the baseline scenario; e) The residual waste from manure management should be handled aerobically. In case of soil application of the final sludge the proper conditions and procedures (not resulting in methane emissions) must be ensured; f) The captured biogas of the CPA should be used for thermal or electricity supply, or both thermal and electricity supply, and flaring system will be installed to ensure that excess biogas produced by the digester is flared; g) The storage time of the manure after removal from the animal barns, including transportation, should not exceed 45 days before being fed into the anaerobic digester when the dry matter	The CPA No.### meets the related applicability conditions of AMS III.D version 18 below which are confirmed by the DOE's desk review of the feasibility study prepared by accredited third party and the DOE's site visit: (a) The livestock is managed under confined conditions; (b) Manure and biogas residue after treatment are applied to croplands, not discharged into natural water resources; (c) There are ( ) anaerobic lagoons under the baseline with the capacity of ( )m^3 and ( )m^3. The total volume of lagoons under CPA No.### is ( ) m^3. The depth of anaerobic lagoons is ( ) meters. The estimated daily manure waste is ( ) tons/day. The estimated retention time of manure and sewage water in open anaerobic lagoon is ( ) days, longer than one month; (d) No methane recovery and destruction by flaring, combustion or gainful use takes place in the baseline scenario; (e) The biogas residue will be applied to dryland, such as maize, wheat, orchard, which are under aerobic condition; The type of crop land for each residue application will be recorded in the application log; (f) The captured biogas of CPA No.### will be used for [thermal energy provision]/[power generation]/[thermal energy provision and power generation]. Flare system will be installed to combust the excess biogas during maintenance; (g) The distance of the livestock barns to the biogas digesters are ( ) meters. Manure will be directly fed to the biogas digesters through pipe within one day after the

content of manure is less than 20%; h) Each livestock farm will use its own livestock manure produced on site to feed the biogas digester. No manure will be collected/processed/transported from off-site.	excretion. The storage time is less than 24 hours. (h) CPA No.### will use its own livestock manure produced on site to feed the biogas digester. No manure will be collected/processed/transported from off-site.
6 The biogas generated under CPA will be utilized to supply thermal energy and/or electricity to displace fossil fuel, and should meet applicability conditions of one of the two applied methodologies AMS I.C Version 19 and/or AMS I.F version 2, or both; Specifically, Scenario A as described in Stage 3 Biogas Utilization in the section A4.2.1 should meet the application conditions of AMS I.C Version 19. Scenario B should meet the application conditions of AMS I.F Version 2, and Scenario C should meet the applicability conditions of both AMS I.C Version 19 and AMS I.F Version 2. The PoA will not apply biomass co-generation unit. The specific CPA should present following characteristics wherever they are applicable:	The CPA No.### is to construct ( ) biogas digesters with total daily biogas production of ( ) m^3, and use biogas to provide [thermal energy]/[electricity energy]/[thermal and electricity energy] to [displace fossil coal for heating the barns]/[supply electricity to feeding machine]/[displace fossil coal for heating the barns and supply electricity to feeding machine]. Specifically, the CPA No. ### presents the scenario [A]/[B]/[C] and should meet the applicability conditions of [AMS I.C Version 19]/[AMS I.F Version 2]/[both AMS I.C Version 19 and AMS I.F Version 2]. It should present the following characteristics as applicable to scenario [A]/[B]/[C].
a) The specific CPA included in the proposed PoA is installation of a new biogas based boiler(s) or/and power generator(s) at a livestock farm where there was no renewable thermal energy supply and no renewable power plant operating prior to the implementation of the project activity.. This criterion applies to Scenarios A), B) and C)	(a) The Specific CPA is to install new [biogas based boilers]/[power generators]/[biogas based boiler and power generators] at a livestock farm where there was no renewable thermal energy supply and no renewable power plant operating prior to the implementation of the project activity.
b) The specific CPA supply biogas based electricity to user(s) that would have otherwise been supplied by the North China Power Grid. This criterion applies to Scenario B) and Scenario C)	(b) [for Scenario A)] The eligibility criteria 6 b] is not applicable to this CPA which has Scenario A].] [for Scenario B) and Scenario C)] The specific CPA supply biogas based electricity to user(s) that would have otherwise been supplied by the North China Power Grid. The feasibility study and the electricity bill that the CPA No.### entity presented to the DOE's site visit proved that the electricity was supplied by
c) If electricity and/or heat produced by the project activity is delivered to a third party	

i.e. another facility or facilities within the project boundary, a contract between the supplier and consumer(s) of the energy will have to be entered into that ensures there is no double-counting of emission reductions.This criterion applies to Scenarios A), B) and C). d) Each livestock farm to be included in CPA will construct biogas digester and install new energy generating equipment to utilize the biogas. No energy generating equipment is transferred from another activity or outside the project boundary. This criterion applies to Scenarios A), B) and C). e) The replaced coal-based boiler, if existing in the baseline, is kept onsite as backup for thermal energy supply. This criterion applies to Scenario A and Scenario C. f) CPAs are only eligible when coal is used as a baseline fuel in the existing farms and nearby households where coal is being displaced. This criterion applies to Scenario A) and Scenario C)	the North China Power Grid. (c) The CPA No.### will supply [electricity]/[heat]/[electricity and heat] for on-site consumption or nearby households, no third parties will receive electricity and heat supply from the CPA No. ###. This criterion is not applicable. (d) The CPA No. ### will install new energy generation equipment to utilize the biogas as demonstrated by the procurement document and FSR presented to the DOE. (e) [for Scenario B)] The eligibility criteria 6 e) is not applicable to this CPA. [for Scenario A) and Scenario C)]The replaced coal-based boiler will be kept onsite as backup for thermal energy supply. (f) [for Scenario B)] The eligibility criteria 6 f) is not applicable to this CPA. [for Scenario A) and Scenario C)]The baseline fuel in the [existing farms] [and] [nearby households] is coal.
7. The CPA is not new livestock farming facilities (Greenfield projects) nor project activities involving livestock farming capacity additions compared to the baseline scenario.	The CPA No.### was to install biogas digester in an existing livestock farming facility (not greenfield project) and it didn't involve livestock farming capacity additions.. This will be verified by the DOE's site visit.
8. The proposed CPA meets small scale CDM project applicability conditions. Aggregated emission reductions of the CPA is less than or equal to 60 kt CO_2 equivalent annually; The maximum output capacity equivalent of each CPA should not exceed 15 megawatts or equivalent to 45 MW thermal output of the equipment or the plant.	The Aggregated annual emission reductions of the CPA is ( ) t CO_2, less than or equal to 60 kt CO_2 equivalent. The total installed/rated thermal energy & electricity generation capacity of CPA No.### is equal to ( )MW thermal , less than 45 MW thermal. The rated [thermal] [electricity generation] [thermal and electricity generation] capacity has been demonstrated by the feasibility study and procurement documents.
9. The proposed project activity has to be voluntary action by the livestock farms involved in one of the CPAs under the PoA and the implementation of the	The participating livestock farm(s) of the CPA No.### signed participation agreements with CME, in which the livestock farm(s) indicated

proposed project activity is not to fulfill any mandatory policy or regulation; The statement on voluntary action and no requirement or enforcement under existing regulation will be included in the CPA-DD.	its (their) interest and voluntary action in the PoA. There is no mandatory regulation on application of the proposed technology in China. Thus, the CPA No.### meets this criterion.
10. Additionality criteria: as per "Guidelines on the demonstration of additionality of small-scale project activities" (version 09), the PoA choose d) other barrier(s) to demonstrate additionality. Due to the other barrier, the investment on biogas technology become financially unviable and the project would not have occurred without carbon finance support. The additionality criteria that demonstrate the existence of the other barrier in an objective manner is defined as that the equity Internal Rate of Return (IRR) after tax, is lower than the defined livestock industry benchmark of 9%.	As demonstrated by the Feasibility Study, The equity IRR after tax without CDM revenue of CPA No.### is ( )%, lower than 9% of benchmark IRR for livestock industry. Therefore, the CPA No.### is not financially viable without CDM revenue. Thus, the CPA No.### is additional. The detailed IRR calculation and evidences to support the estimate of key parameter value can be found in section B3 of the CPA-DD.
11. As the requirement related to undertaking local stakeholder consultations and environmental impact analysis, if the power generation is envisaged as a component of the project, an approved Environmental Impact Assessment is available at the time of inclusion of CPA; The related official EIA document number and major conclusions will be included in CPA-DD.	Approval of Environmental Impact Assessment of CPA No.### by ( ) was obtained on (DD/MM/YYYY). The EIA conclusion was included in section C2.
12. In case of funding from Annex I country, the proposed CPA will provide an affirmation that funding does not result in a diversion of official development assistance.	N.A. As this PoA aims to register as unilateral project, no Annex I parties are involved. Letter of Approval from China confirmed the intention to seek unilateral status.
13. The proposed CPA project activity is not a debundled one whose project boundary is not within 1 km of the project boundary of the proposed small-scale activity at the closest point.	This CPANo.### is the first CDM project activity implemented by (Names of CPA Implementers). There is no other CDM project activity which the boundary is within 1 km of the boundary of the CPANo.###, at the closest point.

As demonstrated, the CPA No.### is in compliance with all requirements.

B.3. Assessment and demonstration of additionality of the small-scale CPA , as per eligibility criteria listed in the Registered PoA:

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CPA No.### is implemented by (Names of CPA Implementers) Hebei Green Agriculture Co. Ltd. will act as the coordinating/managing entity under the PoA. The CPA No.### meets all the eligibility criteria set

in the registered PoA. The investment analysis below demonstrates that CPA No.### is not financially feasible without CDM revenue thus it is additional.

The additionality of the proposed project is demonstrated through investment analysis.

According to "Economic Evaluation for Construction Project: Methods and Parameters version 3", issued by NDRC and Ministry of Construction, the benchmark after-tax equity IRR for husbandry industry is 9%. Based on the important parameters of the proposed project, the after-tax Equity IRRs of the proposed project with CDM and without CDM are calculated. The main parameters are as Table B2.

Table B2： Main parameters for the calculation of financial indicators

Farm name	Parameters	Value	Data sources
All farms	Project life time	20 Year	Feasibility study report
	Expected CER Price	8 €/tCO_2e	Seller Participation Agreement of Carbon Partnership Facility
	Exchange rate	1€= 9.0 RMB	Website of Bank of China
	CER crediting time	10 Year	UNFCCC CDM rules
(Name of CPA Implementer 1)	Total investment	( ) million Yuan	Feasibility study report estimated by comparing costs of main components with similar type of projects
	Equity/long-term debt ratio	( )%	The balance sheet ( ) provided under (name of accounting firm), signed by Certified Public Accountant.
	Cost of long-term debt	( ) million Yuan	Letter of intent for long-term debt funding signed between the farm and its bank, or the cost of debt can be assumed as the commercial lending rate in China or the yield of a 10 year bond issued by the government of China. or Not applicable, as the company hasn't incur any long-term debt in the past three years
	Operation and maintenance cost	( ) million Yuan/yr	Feasibility study report. The breakdown of operation and maintenance cost is listed in Table B3.
	Residue value	( ) million Yuan	Feasibility study report

	Coal saving	( ) t/year	Calculated. The detailed parameters are listed in table B4. This is applicable for scenario A and Scenario C.
	Coal price	( ) Yuan/t	Invoice of coal purchase. This is applicable for scenario A and Scenario C.
	Electricity generation	( ) kwh/yr	Feasibility study report. This is applicable for scenario B and Scenario C.
	Electricity price(including VAT)	( ) Yuan/kwh	FSR and monthly electricity bill for the past year. This is applicable for scenario B and Scenario C.
	Expected CERs	( ) t CO_2/yr	Estimated by CDM project developer
	Tax	( ) %	No tax for livestock farms According to China Tax regulation
(Name of CPA Implementer 2)	Total investment	( ) million Yuan	Feasibility study report estimated by comparing costs of main components with similar type of projects
	Equity/long-term debt ratio	( )%	The balance sheet ( ) provided under (name of accounting firm), signed by Certified Public Accountant.
	Cost of long-term debt	( ) million Yuan	Letter of intent for long-term debt funding signed between the farm and its bank, or the cost of debt can be assumed as the commercial lending rate in China or the yield of a 10 year bond issued by the government of China. Or Not applicable, as the company hasn't incur any long-term debt in the past three years
	Operation and	( ) million Yuan/yr	Feasibility study report. The

	maintenance cost		breakdown of operation and maintenance cost is listed in Table B3.
	Residue value	( ) million Yuan	Feasibility study report
	Coal saving	( ) t/year	Calculated. The detailed parameters are listed in table B4. This is for scenario A and Scenario C.
	Coal price	( ) Yuan/t	invoice of coal purchase
	Electricity generation	( ) kwh/yr	Feasibility study report. This is for scenario A and Scenario C.
	Electricity price(including VAT)	( ) Yuan/kwh	FSR. This is for scenario B and Scenario C.
	Expected CERs	( ) t CO_2/yr	Estimated by CDM project developer
	Tax	( ) %	No tax for livestock farms According to China Tax regulation
……	Total investment	( ) million Yuan	Feasibility study report estimated by comparing costs of main components with similar type of projects
	Equity/long-term debt ratio	( )%	The balance sheet ( ) provided under (name of accounting firm), signed by Certified Public Accountant.
	Cost of long-term debt	( ) million Yuan	Letter of intent for long-term debt funding signed between the farm and its bank, or the cost of debt can be assumed as the commercial lending rate in China or the yield of a 10 year bond issued by the government of China
	Operation and maintenance cost	( ) million Yuan/yr	Feasibility study report. The breakdown of operation and maintenance cost is listed in Table B3.
	Residue value	( ) million Yuan	Feasibility study report

	Coal saving	( ) t/year	Calculated. The detailed parameters are listed in table B4. This is applicable for scenario A and Scenario C.
	Coal price	( ) Yuan/t	Invoice of coal purchase. This is applicable for scenario A and Scenario C.
	Electricity generation	( ) kwh/yr	Feasibility study report. This is applicable for scenario B and Scenario C.
	Electricity price(including VAT)	( ) Yuan/kwh	FSR and monthly electricity bill for the past year. This is applicable for scenario B and for Scenario C.
	Expected CERs	( ) t CO_2/yr	Estimated by CDM project developer
	Tax	( ) %	No tax for livestock farms According to China Tax regulation

Table B3: Breakdown of annual operation and maintenance cost

Item	Cost (Yuan RMB)	Source
Electricity consumption		FSR
Wages and welfare		FSR
Office supply		FSR
Maintenance cost		FSR
Equipment validation and verification		FSR
Total		

Table B4: Parameters used for calculating coal saving

Item	Value	Source
Biogas for heating (m^3)		FSR
Heat provided to boiler (TJ)		Calculated

Biogas boiler heat efficiency (%)	0.92	Tool to determine the baseline efficiency of thermal or electric energy generation systems, Version 01
The net quantity of steam/heat supplied by the project activity during the year y (TJ)		Calculated
Thermal value of coal (kCal/kg)		FSR
Thermal value of biogas (kCal/m^3)		FSR
Coal boiler heat efficiency (%)		Tool to determine the baseline efficiency of thermal or electric energy generation systems, Version 01
Coal saving (t)		Calculated

The after-tax Equity IRRs with and without income from CERs sale are listed in table B5 below. The IRR of (Names of CPA Implementers) without CDM income is ( )% which is lower than the benchmark IRR of 9% for the animal industry[3] provided in "Economic Assessment Methodology and Parameters for Construction Project", making the proposed project financially not viable. With the income from CERs, the IRR is increased to ( )%.

Table B5: Comparison of after-tax Equity IRR with and without income from CERs

Livestock Farm	After-tax Equity IRR	
	Without income from CERs	With income from CERs
Farm 1	( ) %	( ) %
Farm 2	( ) %	( ) %
……	( ) %	( ) %
Farm n	( ) %	( ) %

In order to further illustrate that CPA No.### without CDM is unlikely to be financial attractive, sensitivity analysis was conducted with reasonable variations of critical variables that constitute more than 10% of either total project costs or total project revenues. ( ) factors are considered in the sensitivity analysis: 1) XXX, 2) XXX; 3) XXX; and ……..

Assuming the above factors vary in the range of -10% ~ +10%, the IRR of the proposed project (without income from selling CERs) varies to some extent, as shown in table B6 and Figure B1. Through the sensitivity analysis, it is further demonstrated that the CPA No.### without CDM is not financially viable.

[3]China National Development and Reform Committee, China Ministry of Housing and Urban-Rural Development.Economic Assessment Methodology and Parameters for Construction Project, Published by China plan publishing house, 2006.

Table B6: Sensitivity analysis

Farm name	Parameters	-10%	0%	10%
Farm 1	XXX	( )%	( )%	( )%
	XXX	( )%	( )%	( )%
	XXX	( )%	( )%	( )%
	……	( )%	( )%	( )%
Farm 2	XXX	( )%	( )%	( )%
	XXX	( )%	( )%	( )%
	XXX	( )%	( )%	( )%
	……	( )%	( )%	( )%
……	XXX	( )%	( )%	( )%
	XXX	( )%	( )%	( )%
	XXX	( )%	( )%	( )%
	……	( )%	( )%	( )%
Farm n	XXX	( )%	( )%	( )%
	XXX	( )%	( )%	( )%
	XXX	( )%	( )%	( )%
	……	( )%	( )%	( )%

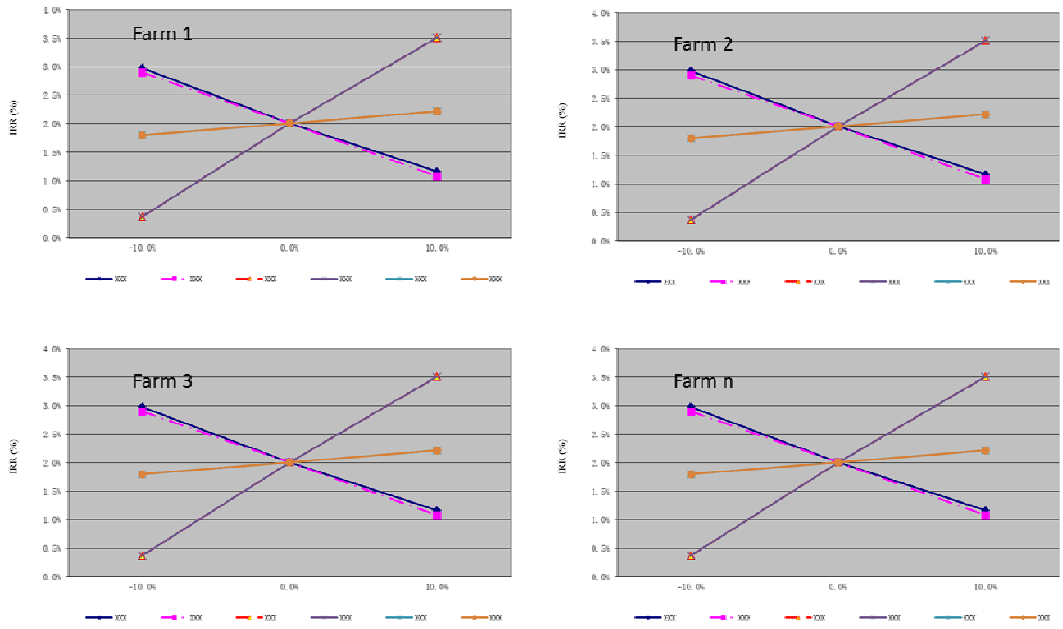

Figure B1： Sensitivity analysis

Based on the above investment analysis, without CDM, the proposed project is not financially attractive since the Equity Internal Rate of Return is below the benchmark of commercial operation. Since the

investment decision is made by individual farm owners based on the financial return of the CPA No.###, a high investment risk is foreseen without CDM support thus it is unlikely the farm owners will invest in the CPA without CDM consideration.

Alternatively, when the after-tax Equity IRR reach the benchmark, the required changes of critical parameters are shown in the Table 7 below.

Table B7: Parameter changes when after-tax Equity IRR reach benchmark

Changes of parameters	XXX	XXX	……	……	……	……
after-tax Equity IRR= 9%						

It shows that when the after-tax Equity IRR is equal to the benchmark, the XXX needs to be decreased by ( )%, the XXX needs to be decreased by ( )%, ……. These situations are unlikely to occur as analysed in details as follows:

a. XXX

……

b. XXX

……

c. XXX

……

d. ……

In conclusion, the CPA No.### ***is not financially viable without CDM revenue. Thus it is additional.***

B.4. Description of the sources and gases included in the project boundary and proof that the small-scale CPA is located within the geographical boundary of the registered PoA.

>>

The proposed project boundary of CPA No.### is under project scenario [A][B][C] as defined in Figure E1.3 of the PoA-DD.The CPA considers CH_4 emission from animal manure management system practices (open anaerobic lagoon(s)), CH_4 emission resulting from the capture of biogas (leakage from biogas digester(s)), CO_2 emissions from electricity consumption by biogas system (electricity consumption under project activity),CH_4 emission from flare, and avoided CO_2 emissions from [replacing coal] [generating electricity] [replacing coal and generating electricity] by using biogas, CH_4 emission from manure storage. The project boundary (Figure B2) doesn't consider the effects of enteric emissions and barn-related emissions, as these emissions are not triggered by the proposed CPA No.###. Technical process and equipment are to be reflected in the project boundary chart. Project locations will be within the defined PoA boundary chart as below. The CPA is located within the geographical boundary of the PoA.

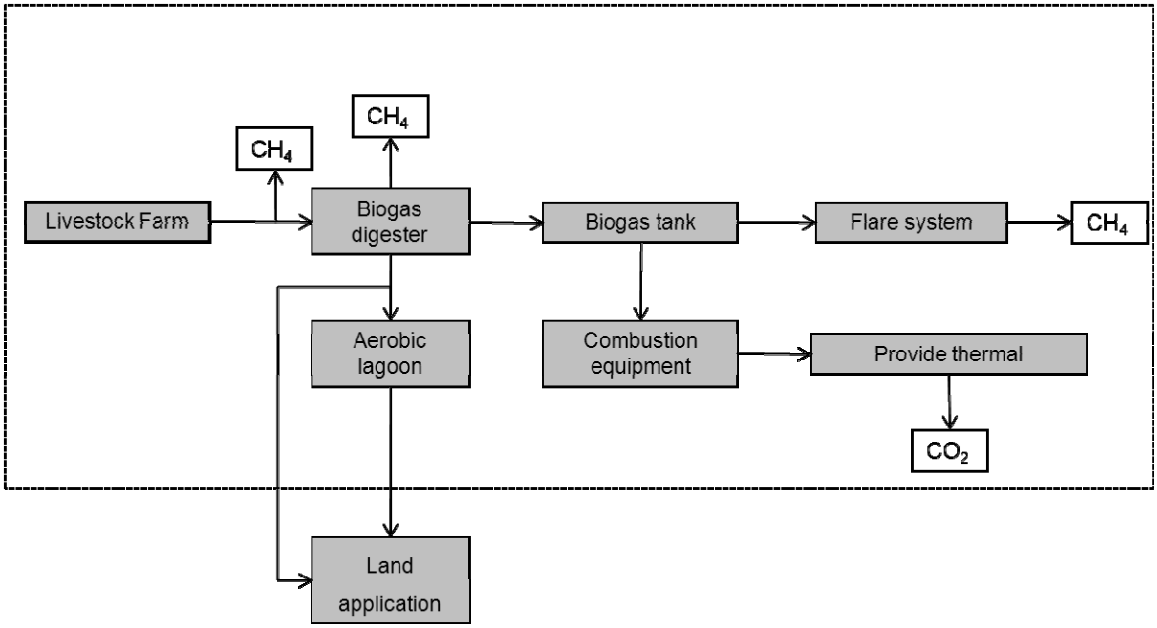

Figure B2-1: CPA boundary for scenario A

or

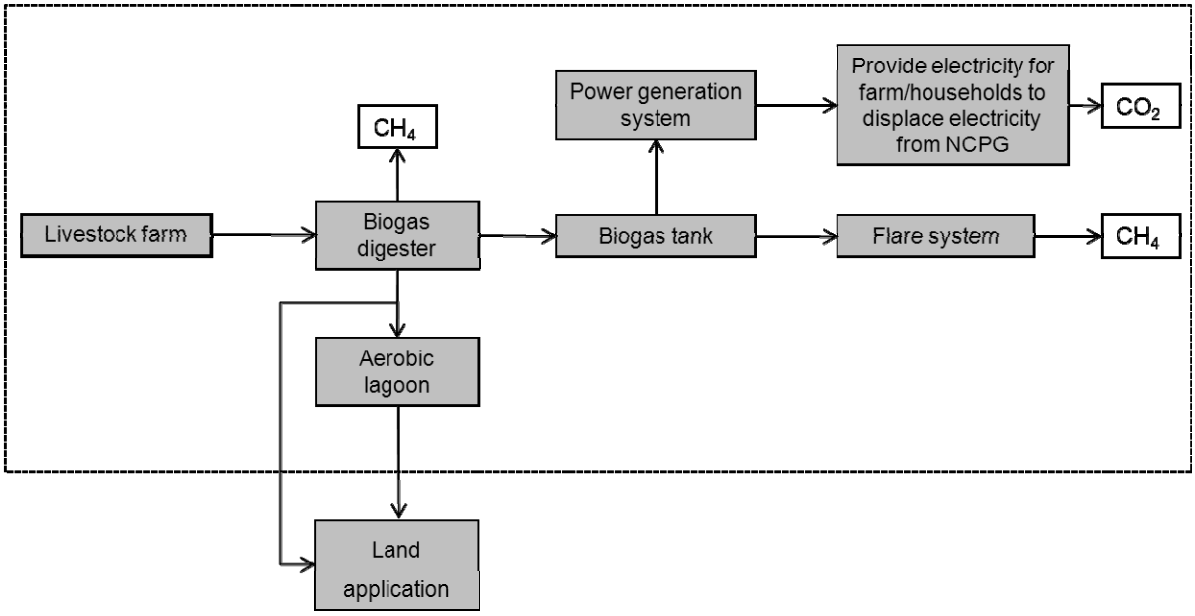

Figure B2-2: CPA boundary for scenario B

or

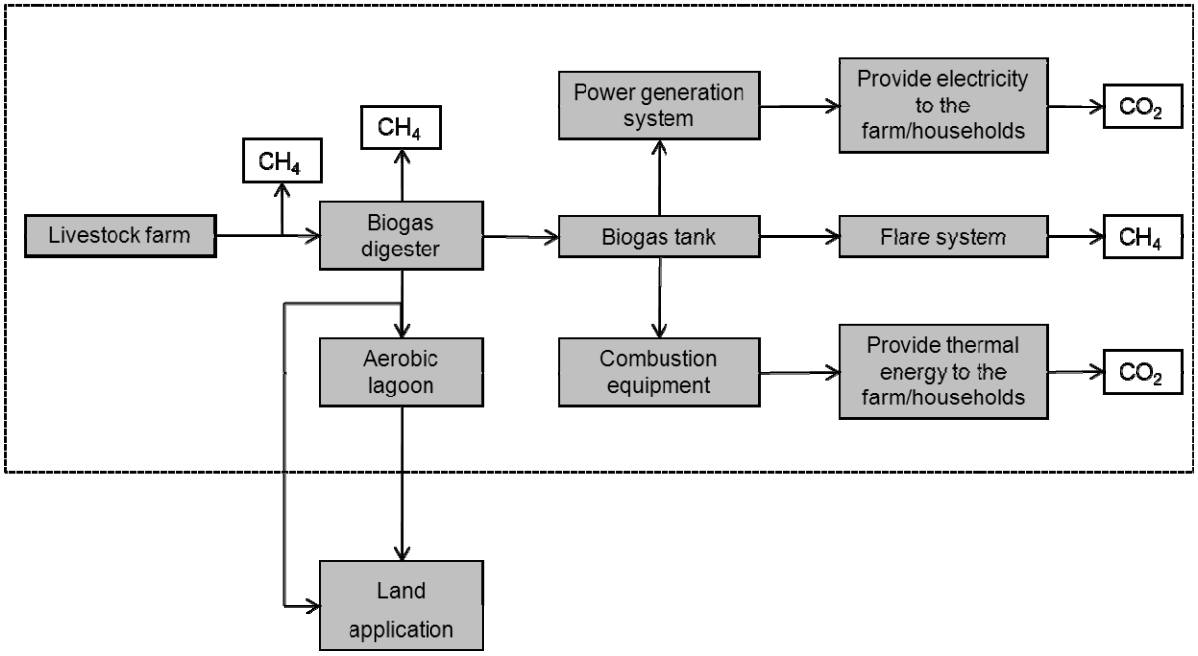

Figure B2-3: CPA boundary for scenario C

The boundary of CPA No.### included in the PoA is

- The livestock farm;
- Animal manure management systems;
- Facilities which generate, recover and flare/combust biogas to generate [power] [heat] [both power and heat] located at the project site.
- The spatial extent of the project boundary includes facilities consuming energy generated by the system.
- For Scenario B and Scenario C, the boundary also extends to the North China Power Grid that the CDM project power plant is connected to.

As illustrated in Table B8, the Project boundary includes in the baseline direct CH_4 emission from the open anaerobic lagoon, CO_2 emission from [displaced burning of coal] [electricity consumption/generation] [burning of coal and emission from electricity consumption/generation] under the baseline, but exclude N_2O emission because no N_2O emission from the open anaerobic lagoon according to IPCC 2006 Guidelines. The Project boundary includes in the project activity the CO_2 emission from on-site electricity use, CH_4 direct emission from physical leakage, flare and manure storage.

Table B8: Emission sources and gases to be included in project boundary

	Source	**Gas**		**Justification /Explanation**
Baseline	Direct	CH_4	Included	Main emission source

	emissions from the open anaerobic lagoon (This is for all scenarios)	N_2O	Excluded	Not required by AMS III.D version 18.
		CO_2	Excluded	Not required by AMS III.D version 18.
	Emissions from displaced burning of coal. (This is relevant to scenario A and scenario C.)	CO_2	Included	Main emission source.
		N_2O	Excluded	Minor emission source, excluded for simplification. This is conservative.
		CH_4	Excluded	Minor emission source, excluded for simplification. This is conservative.
	Emissions from electricity consumption/ generation. (This is relevant to scenario B and scenario C.)	CO_2	Included	Main emission source
		CH_4	Excluded	Minor emission source, excluded for simplification. This is conservative.
		N_2O	Excluded	Minor emission source, excluded for simplification. This is conservative.
Project activity	Emissions fromon site electricity use. (This is for all scenarios)	CO_2	Included	Main emission source
		CH_4	Excluded	Minor emission source
		N_2O	Excluded	Minor emission source
	Direct emission from physical leakage.(This is for all scenarios)	CH_4	Included	Main emission source
		CO_2	Excluded	Not required by AMS III.D version 18.
		N_2O	Excluded	No TN reduction based on Annex 1 of AMS III.D.
	Emissions from flare. (This is for all scenarios)	CH_4	Included	Main emission source
		CO_2	Excluded	Not required by AMS I.C version 19.
		N_2O	Excluded	No N_2O produced during flare of biogas.
	Emissions from manure storage. (This is for all scenarios)	CH_4	Included	Main emission source
		CO_2	Excluded	Not required by AMS III.D version 18.
		N_2O	Excluded	Not required by AMS III.D version 18.

B.5. Emission reductions:

B.5.1. Data and parameters that are available at validation:

>>

Table B9: Data and parameters are not monitored

Data / Parameter:	GWP_{CH4}
Data unit:	tCO_2 e/tCH_4
Description:	Global warming potential for CH_4
Source of data used:	Fourth Assessment Report of IPCC
Value applied:	25
Justification of the choice of data or description of measurement methods and procedures actually applied:	The default value is taken from Table 2.14 of the contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.
Any comment:	It will be applied to all scenarios.

Data / Parameter:	D_{CH4}
Data unit:	t/m^3
Description:	Density of methane at room temperature (20℃ and 1 atm pressure)
Source of data used:	AMS-III. D Version 18
Value applied:	0.00067
Justification of the choice of data or description of measurement methods and procedures actually applied:	The default value is approved by the applicable methodology
Any comment:	It will be applied to all scenarios.

Data / Parameter:	UF_b
Data unit:	-
Description:	Model correction factor to account for model uncertainties
Source of data used:	AMS III.D version 18
Value applied:	0.94
Justification of the choice of data or description of measurement methods and procedures actually applied:	The default value is approved by the applicable methodology -
Any comments:	It will be applied to all scenarios.

Data / Parameter:	MCF
Data unit:	Fraction
Description:	Methane conversion factor for baseline manure management system (anaerobic treatment of manure (anaerobic lagoon))
Source of data used:	Obtained from 2006 IPCC Guidelines according to the site annual average temperature
Value applied:	0.71
Justification of the choice	The factor MCF is taken from 2006 IPCC Guidelines. If annual average

of data or description of measurement methods and procedures actually applied:	temperature is lower than 10℃, and higher than 5℃, annual MCF should be estimated using linear interpolation assuming that MCF=0 at the annual average temperature of 5℃. MCF was selected based on the annual average temperature which is from county meteorological station of the (Names of CPA Implementers) located.
Any comments:	It will be applied to all scenarios.

Data / Parameter:	$B_{O,LT}$
Data unit:	m^3/kg of dm VS
Description:	Maximum methane producing potential of VS generated for animal type LT
Source of data used:	Obtained from 2006 IPCC Guidelines, Table 10A-4, 10A-5, 10A-7,10A-8,10A-9
Value applied:	Swine 0.29; Dairy cow:0.24; Other cattle: 0.1; Broiler:0.01; Layers: 0.02
Justification of the choice of data or description of measurement methods and procedures actually applied:	No specific country data available.
Any comments:	It will be applied to all scenarios.

Data / Parameter:	$VS_{default}$
Data unit:	kg dm/animal/day
Description:	Volatile solids excreted for animal type per head per day
Source of data to be used:	Obtained from 2006 IPCC Guidelines, Table 10A-4, 10A-5, 10A-7,10A-8,10A-9
Value applied:	Swine 0.30; Dairy cow:5.1; Other cattle: 2.3; Broilers: 0.36; Layers: 0.39
Justification of the choice of data or description of measurement methods and procedures actually applied:	No specific country data available.
Any comment:	$VS_{default}$ values for dairy cow, broilers, and layers applicable to developed countries can be used provided four conditions are satisfied mentioned in section E6.1 above. It will be applied to all scenarios.

Data / Parameter:	$MS\%_{BL}$
Data unit:	Fraction
Description:	Fraction of manure handled in open anaerobic lagoon system in the baseline
Source of data used:	Project proponents
Value applied:	100 percent

Justification of the choice of data or description of measurement methods and procedures actually applied:	All manure produced by livestock farms was treated in open anaerobic lagoon
Any comment:	It will be applied to all scenarios.

Data / Parameter:	$N_{LT,y}$
Data unit:	Number of heads
Description:	Annual average number of animals of type LT in year y,
Source of data used:	(Names of CPA Implementers)
Value applied:	Swine :Sow:( ), Boar:( ), Piglets:( ), Nursery:( ), Growing and finishing: ( ) Dairy cow:( ); Other cattle ( ); Broilers:( ); Layers: ( )
Justification of the choice of data or description of measurement methods and procedures actually applied:	Calculated based on number of days animal is alive and number of animals produced annually in year y (equation (4) of this PoA-DD.
Any comments:	It will be applied to all scenarios.

Data / Parameter:	$W_{default}$
Data unit:	Kg
Description:	Body weight of livestock
Source of data used:	Obtained from 2006 IPCC Guidelines, Table 10A-4, 10A-5, 10A-7,10A-8,10A-9
Value applied:	Swine 28; Dairy cow:600; Other cattle: 319; Broilers: 0.9; Layers: 1.8
Justification of the choice of data or description of measurement methods and procedures actually applied:	The default value is taken from IPCC guideline.
Any comments:	It will be applied to all scenarios.

Data / Parameter:	$\eta_{b,thermal,boiler}$
Data unit:	Percent
Description:	The efficiency of the boiler using fossil fuel that would have been used by (Names of CPA Implementers) in absence of the project activity
Source of data used:	Tool to determine the baseline efficiency of thermal or electric energy generation systems, Version 01
Value applied:	-

Justification of the choice of data or description of measurement methods and procedures actually applied:	According to Tool to determine the baseline efficiency of thermal or electric energy generation systems, Version 01.Project proponents can choose Option E in the Tool to determine the baseline boiler efficiency to be the default efficiency of old coal fired boiler of 80% if the boiler has been in use for over 10 year, or to be the default efficiency of new coal fired boiler of 85% if the baseline boiler has been in use for less than 10 year,
Any comment:	It will be applied to scenario A) and scenario C).

Data / Parameter:	$\eta_{householdstove,b}$
Data unit:	Percent
Description:	Efficiency of the baseline equipment (household stove) being replaced
Source of data used:	Manufacturer and Project proponents
Value applied:	-
Justification of the choice of data or description of measurement methods and procedures actually applied:	Because the output capacity is less than 45KW thermal and metering the thermal efficiency is not plausible, project proponents can choose either the highest of the efficiency values provided by two or more manufacturers for household stove with similar specifications using the baseline fuel or the highest efficiency from referenced literature values. If both options are not available, the project proponentscan use default efficiency of 100%.
Any comment:	It will be applied to scenario A) and scenario C).

Data / Parameter:	$\eta_{biogasstove,p}$
Data unit:	Percent
Description:	Efficiency of the project equipment (biogas stove)
Source of data used:	Project proponents
Value applied:	-
Justification of the choice of data or description of measurement methods and procedures actually applied:	Measured using representative sampling methods or based on referenced literature values. The efficiency tests shall be conducted following the guidance provided in the relevant national/international standards
Any comment:	It will be applied to scenario A) and scenario C).

Data / Parameter:	NCV_{biogas}
Data unit:	TJ/m^3
Description:	The net calorific value of the biomass
Source of data used:	Project proponents
Value applied:	-

Justification of the choice of data or description of measurement methods and procedures actually applied:	Measurement in laboratories according to relevant national/international standards. Measure quarterly, taking at least three samples for each measurement. The average value can be used for the rest of the crediting period.
Any comment:	

Data / Parameter:	$EF_{CO2,y}$
Data unit:	tCO_2/MWh
Description:	Emission factor of a grid
Source of data used:	The affiche about determining the emission factors of North China Power Grid, released by Climate Change Department, National Development and Reform Commission (NDRC), announced on DD/MM/YYY (Website). Detailed information can be found in Annex 3.
Value applied:	
Justification of the choice of data or description of measurement methods and procedures actually applied:	Released by Chinese government.
Any comment:	It will be applied to all scenarios.

Data / Parameter:	$EF_{OM,y}$
Data unit:	tCO_2/MWh
Description:	Operating Margin Emission Factor
Source of data used:	The affiche about determining the emission factors of North China Power Grid, released by Climate Change Department, National Development and Reform Commission (NDRC), announced on DD/MM/YYY (Website). Detailed information can be found in Annex 3.
Value applied:	
Justification of the choice of data or description of measurement methods and procedures actually applied :	Released by Chinese government.
Any comment:	It will be applied to all scenarios.

Data / Parameter:	$EF_{BM,y}$,
Data unit:	tCO_2/MWh
Description:	Build Margin Emission Factor
Source of data used:	The affiche about determining the emission factors of North China Power Grid, released by Climate Change Department, National

	Development and Reform Commission (NDRC), announced on DD/MM/YYY (Website). Detailed information can be found in Annex 3.
Value applied:	
Justification of the choice of data or description of measurement methods and procedures actually applied :	Released by government.
Any comment:	It will be applied to all scenarios.

Data / Parameter:	TDL_y,
Data unit:	Fraction
Description:	Average technical transmission and distribution losses
Source of data used:	Tool to calculate baseline, project and/or leakage emissions from electricity consumption
Value applied:	
Justification of the choice of data or description of measurement methods and procedures actually applied :	It is used for calculating project electricity consumption sources;
Any comment:	It will be applied to all scenarios.

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 applied:	0 %
Justification of the choice of data or description of measurement methods and procedures actually applied:	This is conservative.
Any comment:	It will be applied to all scenarios.

Data / Parameter:	$\mathbf{W_{CH4,y}}$
Data unit:	mass fraction
Description:	Methane content in biogas in year “y”
Source of data used:	Based on options provided in AMS III D version18
Value applied:	60%

Justification of the choice of data or description of measurement methods and procedures actually applied:	As per the methodology
Any comment:	--

Data / Parameter:	RL_{boiler}
Data unit:	Year
Description:	Remaining lifetime of boiler
Source of data used:	Manufacturer and Project proponents
Value applied:	-
Justification of the choice of data or description of measurement methods and procedures actually applied:	According to the "General Guidelines to SSC CDM methodologies" and "Tool to determine the remaining lifetime of equipment", RL_{boiler} equals the designed lifetime indicated in the manufacturer specification of boiler or default values of boiler life time minus the number of years that it has been used since commissioning.
Any comment:	--

Data / Parameter:	RL_{stove}
Data unit:	Year
Description:	Remaining lifetime of household stove
Source of data used:	Manufacturer and Project proponents
Value applied:	-
Justification of the choice of data or description of measurement methods and procedures actually applied:	According to the "General Guidelines to SSC CDM methodologies" and "Tool to determine the remaining lifetime of equipment", RL_{stove} equals the designedlifetime indicated in the manufacturer specification, minus the number of years that it was has been used since commissioning.
Any comment:	--

B.5.2. Ex-ante calculation of emission reductions:

>>

1. Baseline Emission Calculation:

For scenario A, the baseline emission is as equation (1-1).

$$BE_y = BE_{CH_4,y} + BE_{thermal,y} \quad (1\text{-}1)$$

Where:

$BE_{CH_4,y}$ Baseline CH_4 emissions from open anaerobic lagoon in year y (tCO_2e)

$BE_{thermaly}$ The baseline emissions from displaced steam/heat consumption by the project activity in the year y (tCO_2)

For scenario B, the baseline emission is as equation (1-2).

$$BE_y = BE_{CH_4,y} + BE_{Electricity,y} \quad (1\text{-}2)$$

Where:

$BE_{CH_4,y}$ Baseline CH_4 emissions from open anaerobic lagoon in year y (tCO_2e)

$BE_{Electricity,y}$ Baseline CO_2emission from displaced electricity use by the project activity in year y ($t\ CO_2$)

For scenario C, the baseline emission is as equation (1-3).

$$BE_y = BE_{CH_4,y} + BE_{Electricity,y} + BE_{thermal,y} \quad (1\text{-}3)$$

Where:

$BE_{CH_4,y}$ Baseline CH_4 emissions from open anaerobic lagoon in year y (tCO_2e)

$BE_{Electricity,y}$ Baseline CO_2emission from displaced electricity use by the project activity in year y ($t\ CO_2$)

$BE_{thermal,y}$ The baseline emissions from displaced steam/heat consumption by the project activity in the year y (tCO_2)

1.1 Baseline CH_4 emission from the open anaerobic lagoon ($BE_{CH_4,y}$)

For all scenarios, baseline CH_4 emission from the open anaerobic lagoon shall be calculated as per paragraph 10 of AMSIII.D version 18

$$BE_{CH_4,y} = GWP_{CH4} * D_{CH4} * UF_b * \sum_{LT} MCF * B_{0,LT} * N_{LT,y} * VS_{LT,y} * MS\%_{Bl} \quad (2)$$

Where:

$BE_{CH_4,y}$ Baseline CH_4 emissions in year y (tCO_2e)

GWP_{CH4} Global Warming Potential (GWP) of CH_4 (25)

D_{CH4} CH_4 density (0.00067 t/m^3 at room temperature (20 ºC) and 1 atm pressure)

LT Index for all types of livestock

MCF Annual methane conversion factor (MCF) for the baseline animal manure management system (open lagoon)

$B_{0,LT}$ Maximum methane producing potential of the volatile solid generated for animal type LT ($m^3\ CH_4$/kg dm)

$N_{LT,y}$ Annual average number of animals of type LT in year y (numbers)

$VS_{LT,y}$ Volatile solids for livestock LT entering the animal manure management system in year y (on a dry matter weight basis, kg dm/animal/year)

$MS\%_{Bl}$ Fraction of manure handled in baseline animal manure management system j. In (Names of CPA Implementers) all the manures are transported to open anaerobic

lagoon by closed pipe. MS= 100%.

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

Annual baseline CH_4 emission from the open anaerobic lagoon and values of related parameters were listed in table B10.

Table B10: Estimated annual baseline methane emissions in year y

Parameters	Unit	Livestock 1	Livestock 2	……	Livestock n
GWP_{CH4}	-	25	25	25	25
D_{CH4}	t/m$_3$	0.00067	0.00067	0.00067	0.00067
UF_b	fraction	0.94	0.94	0.94	0.94
MCF	fraction				
$B_{O,LT}$	m^3CH_4/kg_dm				
N_{LT}	head				
$VS_{LT,y}$ *	kg dm/head/year				
$MS\%_{Bl}$	%				
$BE_{CH_4,y}$	t CO_2e				

*: Calculated using equation (3).

Because $VS_{LT,y}$ data from nationally published sources are not available, default values from 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 chapter 10, Table 10 A-7 will be used and adjusted for a site-specific average animal weight. The following equation will be used:

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

Where:

W_{site} Average animal weight of a defined livestock population at the project site (kg)

$W_{default}$ Default average animal weight of a defined population, this data is sourced from IPCC 2006 (kg)

$VS_{default}$ Default value for the volatile solid excretion rate per day on a dry-matter basis for a defined livestock population (kg dm/animal/day)

nd_y Number of days in year *y* where the animal manure management system is operational

In case of sequential treatment stages, the reduction of the volatile solids during a treatment stage is estimated based on referenced data for different treatment types. Emissions from the next treatment stage are then calculated following the approach outlined above, but with volatile solids adjusted for the reduction from the previous treatment stages by multiplying by (1 - *RVS*), where *RVS* is the relative reduction of volatile solids from the previous stage. The relative reduction (*RVS*) of volatile solids depends on the treatment technology and should be estimated in a conservative manner. Default values for different treatment technologies can be found in the table in annex 1 of AMS III.D version 18.

The annual average number of animals ($N_{LT,y}$) are determined as follows:

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

Where:

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

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

Estimation of annual volatile solid for swine was listed in table B11.

Table B11: Annual volatile solid for swine

Parameters	$VS_{default}$ (kg dm/day/head)	$W_{default}$ (kg)	$W_{site,LT}$ (kg)	nd_y (day)	$VS_{LT,y}$ (kg dm/year/head)
Livestock 1					
Livestock 2					
……					
Livestock n					

1.2 Baseline CO_2 emission from displaced electricity consumption ($BE_{Electricity,y}$)

For the CPA with scenario A, this section will left blank intentionally because no electricity will be displaced.

For the CPA with scenario B or scenario C, baseline CO_2 emission from electricity use, that would have been otherwise generated by the grid, equals the quantity of renewable electrical energy produced by the project activity multiplied by the grid emission factor, as per paragraph 14 of AMS I.F- version 02 described as following:

$$BE_{Electricity,y} = EG_{BL,y} * EF_{CO_2,y} \quad (5)$$

Where:

$BE_{Electricity,y}$	Baseline Emissions from displaced electricity consumption in year y (t CO_2)
$EG_{BL,y}$	Quantity of electricity displaced as a result of the implementation of the CDM project activity in year y(MWh)
$EF_{CO2,y}$	Emission factor for electricity consumed at the project site in the absence of the project activity. (tCO_2/MWh)
$EF_{OM,y}$, $EF_{BM,y}$	Operating and Build-in margin emission factor(tCO_2/MWh) of the North China Grid, which can be obtained from National Development and Reform Commission (NDRC) website (cdm.ccchina.gov.cn). Because the electricity consumed is supplied from North China Power Grid, emission factor of North China Power Grid will be applied and it can be obtained from National Development and Reform Commission (NDRC), announced on DD/MM/YYY (Website).

Estimation of annual baseline emissions from displaced electricity consumption in year y was listed in table B12.

Table B12: Annual baseline emissions from displaced electricity consumption in year y

Parameters	Unit	Value
$EG_{BL,y}$	MWh	
$EF_{OM,y}$	tCO_2/MWh	
$EF_{BM,y}$	tCO_2/MWh	
$EF_{CO2,y}$	tCO_2/MWh	
$BE_{Electricity,y}$	t CO_2 e	

*: $EF_{CO2,y}=0.5\times EF_{OM,y}+0.5\times EF_{BM,y}$

1.3 CO_2 emission from displaced coal ($BE_{thermal,y}$)

CO_2 emission from burning of displaced fossil fuel shall be calculated as per paragraph 18 of AMS I.C. Equation (6) is used calculate CO_2 emission from burning of displaced fossil fuel by boiler and/or household stove.

$$BE_{thermal,CO_2,y} = BE_{thermal,boiler,CO_2,y} + BE_{thermal,stove,CO_2,y} \quad (6)$$

$BE_{thermal,CO_2,y}$	The total baseline emissions from steam/heat displaced by the project activity during the year y (tCO_2)
$BE_{thermal,boiler,CO_2,y}$	The boiler baseline CO_2 emissions from steam/heat displaced by the project activity during the year y (tCO_2)
$BE_{thermal,stove,CO_2,y}$	The household stove baseline CO_2 emissions from steam/heat displaced by the project activity during the year y (tCO_2)

CO_2 emission from burning of displaced fossil fuel by boiler shall be calculated according to paragraph 22 and equation (2) of AMS I.C. version 19.

$$BE_{thermal,boiler,CO_2,y} = (EG_{thermal,boiler,y} / \eta_{b,thermal,boiler}) * EF_{FF,CO_2} \quad (6\text{-}1)$$

Where:

$BE_{thermal,boiler,CO_2,y}$	The boiler baseline CO_2 emissions from steam/heat displaced by the project activity during the year y (tCO_2)
$EG_{thermal,boiler,y}$	The net quantity of steam/heat supplied by the project activity to displace steam/heat provided by boiler under baseline scenario during the year y (TJ)
EF_{FF,CO_2}	The CO_2 emission factor of the fossil fuel that would have been used in the baseline plant; tCO_2/TJ, obtained from reliable local or national data if available, otherwise, IPCC default emission factors are used
$\eta_{b,thermal,boiler}$	The efficiency of the boiler using fossil fuel that would have been used in the absence of the project activity

CO_2 emission from burning of displaced fossil fuel by household stove shall be calculated according to paragraph 43 and equation (9) of AMS I.C. version 19.

$$BE_{thermal,stove,CO_2,y} = [HG_{p,y} / \eta_{householdstove,b}] * EF_{FF,CO2}$$
$$= \{[B_{biogas,p,y} * NCV_{biogas} * \eta_{biogasstove,p}] / \eta_{householdstove,b}\} * EF_{FF,CO2} \quad (6\text{-}2)$$

Where:

$BE_{thermal,stove,CO_2,y}$	The household stove baseline CO_2 emissions from thermal energy displaced by the project activity using biogas during the year *y* (tCO_2)
$HG_{p,y}$	The net quantity of thermal energy supplied by the project activity using biogas during the year *y* (TJ)
$\eta_{householdstove,b}$	Efficiency of the baseline equipment (household stove) being replaced
$\eta_{biogasstove,p}$	Efficiency of the project equipment (biogas stove) measured using representative sampling methods or based on referenced literature values. The efficiency tests shall be conducted following the guidance provided in the relevant national/international standards
EF_{FF,CO_2}	The CO_2 emission factor of the fossil fuel that would have been used in the baseline (tCO_2/TJ)
$B_{biogas,p,y}$	The net quantity of the biogas consumed by nearby households in year *y* (m^3)
1. NCV_{biogas}	The net calorific value of the biomass (m^3)

Estimation of annualCO_2 emission from displaced fossil fuel in year y was listed in table B13.

Table B13: Annual baseline CO_2 emission from displaced fossil fuel in year y

Parameters	Unit	Value

$EG_{thermal,boiler,y}$	TJ	
$B_{biogas,p,y}$	m^3	
NCV_{biogas}	m^3	
$\eta_{biogasstove,p}$	%	
$HG_{p,y}$	TJ	
EF_{FF,CO_2}	tCO_2/TJ	
$\eta_{b,thermal,boiler}$	%	
$\eta_{householdstove,b}$	%	
$BE_{thermal,boiler,CO_2,y}$	tCO_2e	
$BE_{thermal,stove,CO_2,y}$	tCO_2e	
$BE_{thermal,CO_2,y}$	tCO_2e	

2. Project Emission Calculation:

For all scenarios, project emissions include direct CH_4 emissions from physical leakage, CH_4 emission from flaring/combustion of biogas, CO_2emissions fromon site electricity use, and manure storage.

$$PE_y = PE_{PL,y} + PE_{flare,y} + PE_{power,y} + PE_{transp} + PE_{storage,y} \quad (7)$$

Where:

PE_y Project emissions in year *y* (tCO_2e)

$PE_{PL,y}$ Emissions due to physical leakage of biogas in year *y* (tCO_2e)

$PE_{flare,y}$ Emissions from flaring or combustion of the biogas stream in the year *y* (tCO_2e)

$PE_{power,y}$ Emissions from the use of fossil fuel or electricity for the operation of the installed facilities in the year *y* (tCO_2e)

PE_{transp} Emissions from incremental transportation in the year *y* (tCO_2e). Each livestock farm will use its own livestock manure produced on site to feed the biogas digester. No manure will be collected/processed/transported from off-site. No emission from transportation will be occurred in this CPA.

$PE_{storage,y}$ Emissions from the storage of manure (tCO_2e)

Under this PoA, there will not be any project emissions from transport, as there will be no incremental transportation due to the project activity.

2.1 Project CH_4 emissions from physical leakage ($PE_{PL,y}$)

The direct CH_4 emissions from physical leakage shall be calculated as per Paragraph 13 (a)(i) of AMS III.D, version 18. Project emissions due to physical leakage of biogas from the animal manure management systems used to produce, collect and transport the biogas to the point of flaring or gainful use is estimated as10% of the maximum methane producing potential of the manure fed into the management systems implemented by the project activity:

$$PE_{PL,y} = 0.10 * GWP_{CH4} * D_{CH4} * \sum_{LT} B_{0,LT} * N_{LT,y} * VS_{LT,y} * MS\%_y \quad (8)$$

Where:

0.10	10% of the maximum methane producing potential (Bo) for the physical leakages from anaerobic digesters
$MS\%_y$	Fraction of manure handled in biogas digester in year y

Estimation of annual project CH_4 emissions from physical leakagein year y was listed in table B14.

Table B14: Annual project CH_4 emissions from physical leakagein year y

Parameters	Unit	Livestock 1	Livestock 2	……	Livestock n
GWP_{CH4}	-	25	25	25	25
D_{CH4}	t/m_3	0.00067	0.00067	0.00067	0.00067
$B_{O,LT}$	m^3CH_4/kg_dm				
N_{LT}	head				
$VS_{LT,y}$	kg dm/year				
$MS\%_y$	%				
$PE_{PL,y}$	t CO_2e				

2.2 CH_4 emission from flaring/combustion of biogas ($PE_{flare,y}$)

For flaring/combustion of biogas, project emissions are estimated using the procedures described in the latest version "Tool to determine project emissions from flaring gases containing methane" (Annex 13, EB 28).

In case, there is residual biogas stream which will be flared by open flaring. According AMS III.D (Version 18), 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". Because open flare system will be installed and the flare efficiency cannot be measured in a reliable manner, default value of 50%is to be used when the flare is operational. If the flare is not operational the default value to be adopted for flare efficiency is 0%.

Project emissions from flaring are calculated as the sum of emissions from each hour *h*, based on the methane flow rate in the residual gas ($TM_{RG,h}$) and the default flare efficiency during each hour *h* ($\eta_{flare,h}$), as follows:

$$PE_{flare,y} = \sum_{h=1}^{8760} TM_{RG,h} \times (1 - \eta_{flare,h}) \times \frac{GWP_{CH4}}{1000} \quad (9)$$

Where:

$PE_{flare,y}$	Project emissions from flaring of the residual gas stream in year y, tCO_2e
$TM_{RG,h}$	Mass flow rate of methane in the residual gas in the hour h
$\eta_{flare,h}$	Flare efficiency in hour h. In this project, fixed value of 0% for the flare efficiency will be applied, and this is for conservative.

Estimation of annual project CH_4 emissions from flaring/combustion of biogasin year y was listed in table B15.

Table B15: Annual baseline emissions from flaring/combustion of biogasin year y

Parameters	Unit	Value
$TM_{RG,h}$	m^3	
GWP_{CH4}	-	25
$\eta_{flare,h}$	fraction	
h	hour	
$PE_{flare,y}$	t CO_2 e	

2.3 CO_2emissions from the use of electricity for the operation of the installed facilities($PE_{power,y}$)

Project emission from on site electricity use equals the quantity of electricity consumed under project activity times emission factor.

$$PE_{power,y} = EG_{P,y} * EF_{CO_2,y} \quad (10)$$

Where:

$PE_{power,y}$	Project emissions from the use of electricity for the operation of the installed facilitiesin year y (t CO_2)
$EG_{P,y}$	Quantity of electricity consumed under project activity in year y(MWh). $EG_{P,y}$ equals to quantity of electricity consumed by the project activity adjusted by average technical transmission and distribution losses. $EG_{P,y} = EC_{PJ,y} \times (1 + TDL_y)$. Default $TDL_y = 20\%$ according to "Tool to calculate baseline, project and/or leakage emissions from electricity consumption".
$EF_{CO2,y}$	Emission factor for electricity consumed at the project site in the absence of the project activity, (tCO_2/MWh).
$EF_{OM,y}$, $EF_{BM,y}$	Operating and Build margin emission factor (tCO_2/MWh) of the North China Grid, which can be obtained from National Development and Reform Commission (NDRC) website (cdm.ccchina.gov.cn).Because the electricity consumed is supplied from North China Power Grid, emission factor of North China Power Grid can be obtained from National Development and Reform Commission (NDRC), announced on DD/MM/YYYY (China DNA's website: http://cdm.ccchina.gov.cn/).

Estimation of annual project CO_2 emissions from electricity purchased from the grid in year y was listed in table B16.

Table B16: Annual project CO_2 emissions from electricity purchased from the gridin year y

Parameters	Unit	Value
$EC_{PJ,y}$	kWh	
TDL_y	%	
$EG_{P,y}$	kWh	
$EF_{OM,y}$	tCO_2/MWh	
$EF_{BM,y}$	tCO_2/MWh	
$EF_{CO2,y}$	tCO_2/MWh	
$PE_{power,y}$	tCO_2 e	

2.4 CH_4 emissions from manure storage

Project emissions on account of storage of manure before being fed into the anaerobic digester shall be accounted for if both condition (a) and condition (b) below are satisfied according to AMS III.D-version 18:

(a) The storage time of the manure after removal from the animal barns, including transportation, exceeds 24 hours before being fed into the anaerobic digester; and

(b) The dry matter content of the manure when removed from the animal barns is less than 20%.

The following method shall be used to calculate project emissions from manure storage:

$$PE_{storage,y} = GWP_{CH_4} * D_{CH_4} * \sum_{LT,l}\left[\frac{365}{AI_l}\sum_{d=1}^{AI}(N_{LT,y} * VS_{LT,d} * MS\%_l * (1-e^{-k\ (AI_l-d)}) * MCF_l * B_{0_{LT}})\right] \quad (11)$$

Where:

$PE_{storage,y}$	Project emissions on account of manure storage in year y (tCO_2e)
AI_l	Annual average interval between manure collection and delivery for treatment at a given storage device l (days)
$VS_{LT,d}$	Amount of volatile solid production by type of animal LT in a day (kg VS/head/d)
$MS\%_l$	Fraction of volatile solids (%) handled by storage device *l*
k	Degradation rate constant (0.069)
d	Days for which cumulative methane emissions are calculated; d can vary from 1 to 45 and to be run from 1 up to AI_l
MCF_l	Annual methane conversion factor for the project manure storage device *l* from Table 10.17, Chapter 10, Volume 4

Estimation of annual project CO_2 emissions from manure storage in year y was listed in table B17.

Table B17: Annual project CO_2 emissions from manure storagein year y

Parameters	Unit	Swine	Dairy cattle	Chicken
GWP_{CH4}	-	25	25	25
D_{CH4}	t/m^3	0.00067	0.00067	0.00067
AI_l	days			
$N_{LT,y}$	head			

$VS_{LT,d}$	kgVS/head/d			
$MS\%_l$	%			
MCF_l	%			
$B_{O,LT}$	m^3CH_4/kg_dm			
$PE_{storage,y}$	tCO_2e			
Total emission from manure storage	tCO_2e			

3. Leakage

The requirement for calculating leakage described in methodologies AMS III.D (version 18), AMS I.C (version 19), and AMS I.F(version 02) is described in table B18 below. Therefore, for this PoA, leakage calculations are not required.

Table B18: The requirement for calculating leakage described in methodologies

Methodology	Requirement for leakage calculation	Condition of the PoA
AMS III.D (version 18)	17. No leakage calculation is required.	-
AMS I.C (version 19)	47. If the energy generating equipment currently being utilised is transferred from outside the boundary to the project activity, leakage is to be considered. 48. In cases where the collection/processing/transportation of biomass residues is outside the project boundary CO_2 emissions from the collection/processing/transportation[4] of biomass residues to the project site shall be taken into account as leakage.	(Names of CPA Implementers) included in CPA will construct biogas digester and install energy generating equipment to utilize the biogas. No energy generating equipment is transferred from another activity or from outside the project boundary. (Names of CPA Implementers) will use its own livestock manure to feed the biogas digester. No manure will be collection/processing/transportation from off-site.

[4] If biomass residues are transported over a distance of more than 200 kilometres due to the implementation of the project activity then this leakage source attributed to transportation shall be considered, otherwise it can be neglected.

AMS I.F(version 02)	21. If the energy generating equipment is transferred from another activity, leakage is to be considered.	(Names of CPA Implementers) included in CPA will construct biogas digester and install energy generating equipment to utilize the biogas. No energy generating equipment is transferred from another activity.

4. Emission reduction

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

$$ER_y = BE_y - PE_y \quad (12)$$

The emission reductions achieved by the project activity will be determined ex post through direct measurement of the amount of methane fuelled, flared or gainfully used. It is likely that the project activity involves manure treatment steps with higher methane conversion factors (MCF) than the MCF for the manure treatment systems used in the baseline scenario, therefore the emission reductions achieved by the project activity is limited to the ex post calculated baseline emissions minus project emissions using the actual monitored data for the project activity. The emission reductions achieved in any year are the lower value of the following:

$$ER_{y,ex\ post} = \min[(BE_{y,ex\ post} - PE_{y,ex\ post}),(MD_y - PE_{power,y,ex\ post})] \quad (13)$$

Where:

$ER_{y,ex\ post}$	Emission reductions achieved by the project activity based on monitored values for year y (tCO_2e)
$BE_{y,ex\ post}$	Baseline emissions calculated using equation 2 (for projects using option in paragraph 9 (a)) using ex post monitored values of $N_{LT,y}$ and if applicable $VS_{LT,y}$.
$PE_{y,ex\ post}$	Project emissions calculated using equation 7 using ex post monitored values of $N_{LT,y}$, $MS\%_y$, AI_l, and if applicable $VS_{LT,y}$
MD_y	Methane captured and used gainfully by the project activity in year y (tCO_2e)
$PE_{power,y,ex\ post}$	Emissions from the use of fossil fuel or electricity for the operation of the installed facilities based on monitored values in the year y (tCO_2e)

B.5.3. Summary of the ex-ante estimation of emission reductions:

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Table B19: Estimation of emission reductions of CPA No. ###

Year	Estimation of project activity emissions (tonnes of CO_2 e)	Estimation of baseline emissions (tonnes of CO_2 e)	Estimation of leakage(tonnes of CO_2 e)	Estimation of overall emission reductions (tonnes of CO_2 e)
DD/MM/YYYY-DD/MM/YYYY				
DD/MM/YYYY-DD/MM/YYYY				
DD/MM/YYYY-DD/MM/YYYY				
DD/MM/YYYY-DD/MM/YYYY				
DD/MM/YYYY-DD/MM/YYYY				
DD/MM/YYYY-DD/MM/YYYY				
DD/MM/YYYY-DD/MM/YYYY				
DD/MM/YYYY-DD/MM/YYYY				
DD/MM/YYYY-DD/MM/YYYY				
DD/MM/YYYY-DD/MM/YYYY				
Total (tonnes of CO_2e)				

B.6. Application of the monitoring methodology and description of the monitoring plan:

B.6.1. Description of the monitoring plan:

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Table B20: Data and parameters are to be monitored

Data / Parameter:	$VS_{LT,y}$
Data unit:	kg dm/animal/year
Description:	Volatile solids excreted for animal type per head per year
Source of data to be used:	Calculated according to equation $VS_{LT,y} = \left(\frac{W_{site}}{W_{default}}\right) * VS_{default} * nd_y$ $VS_{default}$ will be obtained from 2006 IPCC Guidelines, Table 10A-4, 10A-5, 10A-7,10A-8,10A-9 $W_{default}$ obtained from 2006 IPCC Guidelines, Table 10A-4, 10A-5, 10A-7,10A-8,10A-9
Value of data applied for the purpose of calculating expected	$VS_{default}$: Swine 0.30; Dairy cow:5.1; Other cattle: 2.3; Broilers: 0.36; Layers: 0.39

emission reductions in section B.5	$W_{default}$: Swine 28; Dairy cow:600; Other cattle: 319; Broilers: 0.9; Layers: 1.8
Description of measurement methods and procedures to be applied:	Data type: Calculated according to equation $VS_{LT,y} = \left(\frac{W_{site}}{W_{default}} \right) * VS_{default} * nd_y$ Review the new data from IPCC future guidelines Monitoring frequency: annually
QA/QC procedures:	The genetic source, formulated feed rations (*FFR)*, use of *FFR*, specific animal weights will be checked to ensure applicability of default volatile solids for the specific animal type in the CPA
Any comment:	Archive electronically during the crediting period plus 2 years. It will be applied to all scenarios.

Data / Parameter:	$MS\%_y$
Data unit:	Percentage
Description:	Percentage of manure handled in anaerobic digester
Source of data to be used:	(Names of CPA Implementers)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	100%
Description of measurement methods and procedures to be applied:	Data type: Daily measurement of manure that is not handled in digesters and monthly record This value should be 100%, but any diversion of manure by other manure management will be measured using a scale suitable for carts or other carriers used for removal of manure from the livestock farms. Monitor whenever there is other manure management.
QA/QC procedures:	Periodic calibration of the scale
Any comment:	Monthly recorded and archived electronically during the crediting period plus 2 years.

Data / Parameter:	T_{air}
Data unit:	℃
Description:	Annual Average ambient temperature at weather station nearby project site.
Source of data to be used:	County meteorological station
Value of data applied for the purpose of calculating expected emission reductions in section B.5	
Description of measurement methods	Monthly average ambient temperature at weather station nearby project site.

and procedures to be applied:	
QA/QC procedures:	The (Names of CPA Implementers) will take the record from the weather station nearby project site every month. The CME technical staff will have monthly visit to double check the recorded temperatures with the temperature published at the weather station nearby the project site.
Any comment:	Used to select the annual MCF from 2006 IPCC Guidelines Archive electronically during the crediting period plus 2 years. It will be applied to all scenarios.

Data / Parameter:	W_{site}
Data unit:	kg
Description:	Average weigh of livestock by type and category
Source of data to be used:	Regular record by (Names of CPA Implementers)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Monthly (for cattle and swine), or weekly (for broiler and layers) sample of each livestock type will be weighed on a typical scale and the results averaged for each species and type. Types: Swine: sow, boar, piglet, nursery, growing and/or finishing Dairy cattle: Breeding cow, Young cow (young than one year old), other cow Other cattle: Breeding cattle, Young cattle (young than one year old), other cattle Broilers Layers Monitoring frequency: Swine: Monthly Dairy cow: Monthly Other cattle: Monthly Broilers: Weekly Layers: monthly
QA/QC procedures:	Periodic calibration of the scale, and sample will meet required level of reliability of 90/10 as per EB65 Annex 2.
Any comment:	Archive electronically during the crediting period plus 2 years. It will be applied to all scenarios.

Data / Parameter:	nd_y
Data unit:	Day
Description:	Annual operational days of anaerobic digesters
Source of data to be used:	Regular farm record of project owner

Value of data applied for the purpose of calculating expected emission reductions in section B.5	365
Description of measurement methods and procedures to be applied:	This value will be calculated based on the length of period biogas digesters are not operating because of maintenance and repair. Annual amount based on daily record taken throughout the year.
QA/QC procedures:	Cross check with gas production
Any comment:	This value is kept electronically during the crediting period plus 2 years. It will be applied to all scenarios

Data / Parameter:	$N_{p,y}$
Data unit:	Number
Description:	Number of animals produced annually of type LT in year y
Source of data to be used:	Regular record by (Names of CPA Implementers)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	-
Description of measurement methods and procedures to be applied:	Data type: measured Monitoring frequency: monthly.
QA/QC procedures:	Annual average livestock population will be check based on monthly count and record number of livestock in stock by type. Checking consistency between the population value and indirect information (records of sales, records of food purchases)
Any comment:	Archive electronically during the crediting period plus 2 years. It will be applied to all scenarios.

Data / Parameter:	$N_{da,y}$
Data unit:	Days
Description:	Number of days pig alive in the farm
Source of data to be used:	Regular record by (Names of CPA Implementers)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	-
Description of measurement methods and procedures to be	Data type: measured Record the number of days livestock raised based on counts by type Livestock types Swine= sow, boar, piglet, nursery, growing and finishing

applied:	Dairy cow=breeding cow, young cow, other cow Dairy cattle=breeding cattle, young cattle, other cattle Broilers Layers Monitoring frequency for swine and cattle: monthly; Monitoring frequency for broilers and layers: weekly.
QA/QC procedures:	Annual average livestock population will be check based on monthly count and record number of livestock in stock by type. Checking consistency between the population value and indirect information (records of sales, records of food purchases)
Any comment:	Archive electronically during the crediting period plus 2 years. It will be applied to all scenarios.

Data / Parameter:	$BG_{burnt,y}$
Data unit:	m^3
Description:	Biogas volume in year y
Source of data to be used:	Reading records of flow meters by the staff of (Names of CPA Implementers)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	-
Description of measurement methods and procedures to be applied:	The amount of biogas recovered and fuelled, flared or used gainfully biogas output of the project will be measured through four biogas flow meters continuously with weekly accumulated reading. First, biogas output of the project will be measured through a biogas flow meter with temperature and pressure measurement installed after the purification of biogas and before the biogas tank (biogas flow meter 1 for all scenarios). In the meantime, three biogas flow meters (BF-2, BF-3, and BF-4) will be installed at the inlet of power generator (for scenario B and scenario C), boiler(for scenario A and scenario C), and flare system (for all scenarios), respectively.
QA/QC procedures:	Biogas flow meters will undergo maintenance/calibration subject to appropriate national standards or manufacture's recommendations.
Any comment:	Archive electronically during the crediting period plus 2 years. It will be applied to all scenarios.

Data / Parameter:	T_{biogas}
Data unit:	℃
Description:	Biogas temperature
Source of data to be used:	Reading records of flow meters with temperature testing by the staff of (Names of CPA Implementers)
Value of data applied for the purpose of calculating expected	20 ℃

emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	The meter will be installed in the same point with the biogas flow meter in the outlet of digesters. It will be measured to determine the density of methane D_{CH4} No separate monitoring of temperature is necessary when using flow meters that automatically measure the temperature and pressure of biogas, and expressing biogas volumes in normalized cubic meters. Continuous at daily interval.
QA/QC procedures:	Measuring instruments should be subject to a regular maintenance and testing regime in accordance to appropriate national or international standards, or manufactures' recommendation.
Any comment:	Archive electronically during the crediting period plus 2 years. It will be applied to all scenarios.

Data / Parameter:	P_{biogas}
Data unit:	Pa
Description:	Biogas pressure
Source of data to be used:	Reading records of flow meters with pressure testing
Value of data applied for the purpose of calculating expected emission reductions in section B.5	-
Description of measurement methods and procedures to be applied:	The meter will be installed in the same point with the biogas flow meter in the outlet of digesters. It will be measured to determine the density of methane $D_{CH4.}$ No separate monitoring of pressure is necessary when using flow meters that automatically measure the temperature and pressure of biogas, and expressing biogas volumes in normalized cubic meters. Continuous at daily interval.
QA/QC procedures:	Measuring instruments should be subject to a regular maintenance and testing regime in accordance to appropriate national or international standards or manufactures' recommendation.
Any comment:	Archive electronically during the crediting period plus 2 years. It will be applied to all scenarios.

Data / Parameter:	$EG_{BL,y}$
Data unit:	MWh
Description:	Quantity of net electricity displaced as a result of the implementation of the CDM project activity in year y
Source of data to be used:	Reading records of electricity meters by the staff of (Names of CPA Implementers)
Value of data applied	-

for the purpose of calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Measurements are undertaken usingElectricity meters. Monitoring/recording Frequency: Continuous monitoring, and reported monthly.
QA/QC procedures:	Calibration should be undertaken as prescribed in the relevant paragraph of General Guidelines to SSC Methodologies: In the case of electricity sold to a third party, measurement results shall be cross-checked with records of sold/purchased electricity, e.g., invoices/receipts.
Any comment:	Archive electronically during the crediting period plus 2 years. It will be applied to scenario B and scenario C.

Data / Parameter:	$EG_{thermal,boiler,y}$
Data unit:	TJ
Description:	The net quantity of steam/heat supplied by the project activity to displace steam/heat provided by boiler under baseline scenario during the year y
Source of data to be used:	Estimated ex ante in the Feasibility Study Report of (Names of CPA Implementers) Biogas Project
Value of data applied for the purpose of calculating expected emission reductions in section B.5	-
Description of measurement methods and procedures to be applied:	$EG_{thermal,boiler,y}$ will be monitored as per AMSI.C version 19, which defines: the flow and temperature of hot water generated from the boilers will be monitored at the outlet and returning point in order to measure the difference in the enthalpy.
QA/QC procedures:	The flow meter and temperature meter should be subject to a regular maintenance andcalibration in accordance with appropriate national or international standards, or manufactures' recommendation.
Any comment:	It will be applied to scenario A and scenario C.

Data / Parameter:	$B_{biogas,p,y}$
Data unit:	m^3
Description:	The net quantity of the biogas consumed by nearby households in year *y*
Source of data to be used:	Project proponents
Value of data applied for the purpose of calculating expected	-

emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	The quantity of biogas shall be measured continuously. Adjust for the moisture content in order to determine the quantity of dry biomass.
QA/QC procedures:	Check the consistency of measurements *ex post* with annual data on energy generation, fossil fuels and biogas used and the efficiency of energy generation as determined *ex ante*
Any comment:	Archive electronically during the crediting period plus 2 years. It will be applied to scenario A and scenario C.

Data / Parameter:	$EC_{PJ,y}$
Data unit:	MWh
Description:	Quantity of electricity consumed under project activity in year y
Source of data to be used:	(Names of CPA Implementers)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	-
Description of measurement methods and procedures to be applied:	The electricity consumed will be monitored by electricity meter (EM-2) continuously, and reported monthly.
QA/QC procedures:	Electricity meters will 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.
Any comment:	Archive electronically during the crediting period plus 2 years. It will be applied to all scenarios.

Data / Parameter:	Soil application of the residual waste
Data unit:	-
Description:	To record destination of digested sludge for land application
Source of data to be used:	Residue application log input by the staff of (Names of CPA Implementers)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	dryland
Description of measurement methods and procedures to be applied:	To record destination of digested sludge generated from anaerobic digester for each application.
QA/QC procedures:	-

Any comment:	Archive electronically during the crediting period plus 2 years. It will be applied to all scenarios.

Data / Parameter:	*AI*
Data unit:	Day
Description:	Annual average interval between manure collection and delivery for treatment in biogas digester
Source of data to be used:	Regular record by (Names of CPA Implementers)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	-
Description of measurement methods and procedures to be applied:	When the storage time of the manure after removal from the animal barns, including transportation, exceeds 24 hours before being fed into the anaerobic digester; and the dry matter content of the manure when removed from the animal barns is less than 20%, then record *AI.* Annual amount based on record of *AI.*
QA/QC procedures:	-
Any comment:	This value is kept electronically during the crediting period plus 2 years. It will be applied to all scenarios.

Data / Parameter:	Genetic source
Data unit:	-
Description:	Genetic source of swine, dairy cow, other cattle, broilers and layers
Source of data to be used:	Project proponent, recorded certificate of genetic source
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Genetic source from developed
Description of measurement methods and procedures to be applied:	NA
QA/QC procedures:	Genetic source of the livestock production operations was confirmed to originate from an Annex I Party.
Any comment:	It will be applied to all scenarios.

Data / Parameter:	FFR
Data unit:	-
Description:	Formulated feed ratio
Source of data to be used:	Project proponent, recorded amounts of FFR for farm and the ingredient of FFR

Value of data applied for the purpose of calculating expected emission reductions in section B.5	100%
Description of measurement methods and procedures to be applied:	Annually
QA/QC procedures:	NA
Any comment:	It will be applied to all scenarios.

1. Implementation of monitoring plan

The implementation of the monitoring plan is to ensure real, measurable, long-term greenhouse gas emissions reduction. It is a crucial procedure to identify the final CERs of the proposed project. This monitoring plan for CPA No.### will be implemented by (Names of CPA Implementers) included under CPA of the PoA under the technical support from Hebei Green Agriculture Co. Ltd.The original records and electronic copy will be kept by (Names of CPA Implementers). Hebei Green Agriculture Co. Ltd will keep the copy of original records and electronic data.

(Names of CPA Implementers) included under CPA of the PoA and Hebei Green Agriculture Co. Ltd must maintain credible, transparent, and adequate data estimation, as well as measurement, collection, and tracking systems to maintain the information required for audit of an emissions reduction project. These records and monitoring systems are needed to allow the selected DOE to verify project performance as part of the verification and certification process.

2. Monitoring management

(Names of CPA Implementers) will appoint 3 staffs who will be responsible for the monitoring work. One is responsible for the monitoring related to biogas digester operation, one is responsible for biogas utilization system(s), and the third is responsible for the livestock production and land application. The management system in individual livestock farm is illustrated in figure B3. Technicians in Hebei Green Agriculture Co. Ltd will visit the (Names of CPA Implementers) once a month to provide guidance and support if needed for the monitoring.

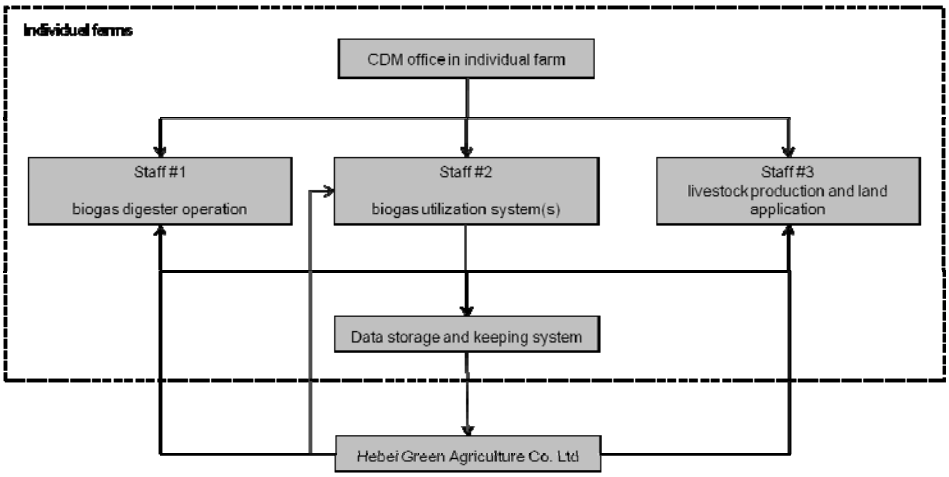

Figure B3：Management structure

3. Monitoring components

According to methodologies AMS III.D Version 18, AMS I.C Version 19, and AMS I.F Version 02, the data to be monitored are shown in Section B6.1 of the CPA-DD. The monitoring plan for different scenarios are as figure B4-1 to B4-3

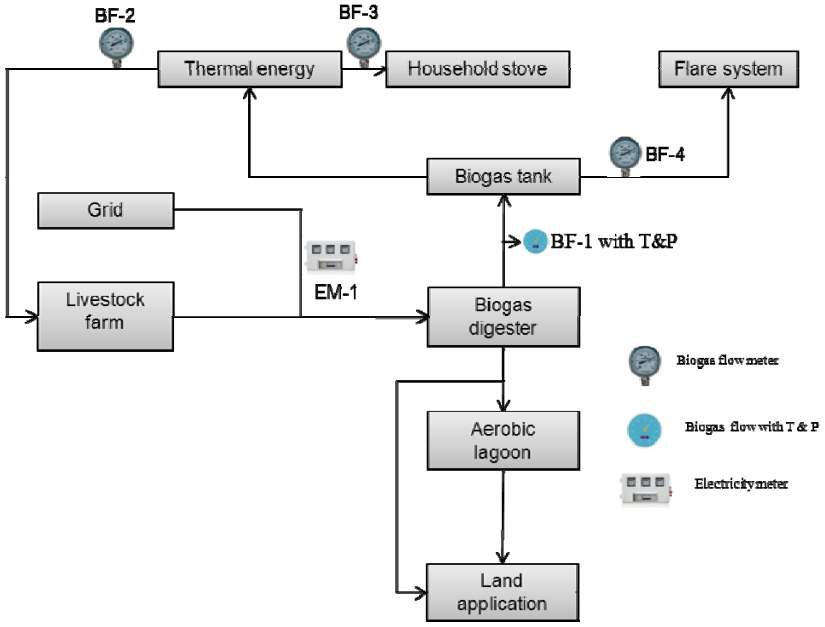

Figure B4-1：Monitoring plan for scenario A

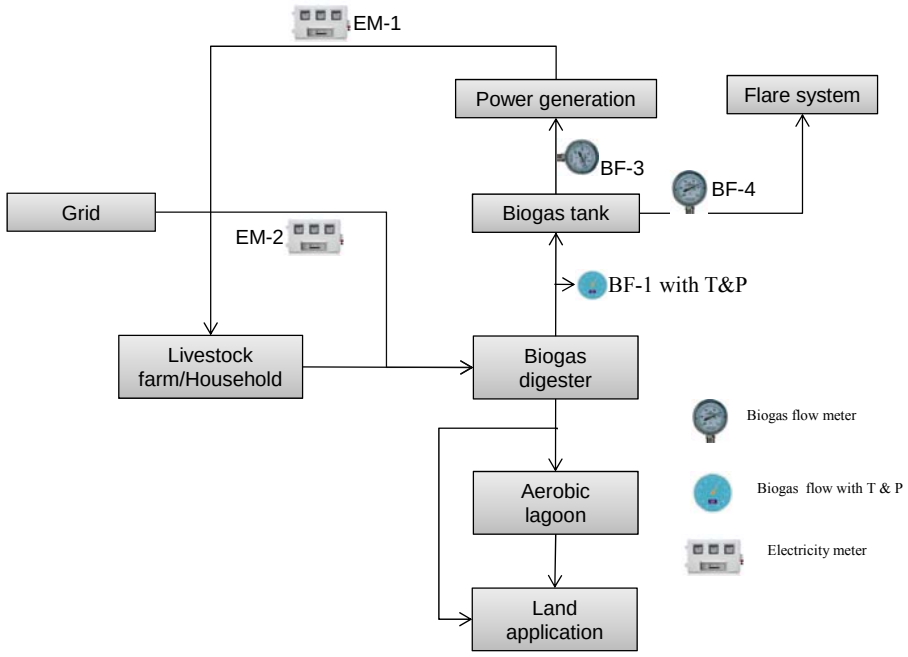

Figure B4-2：Monitoring plan for scenario B

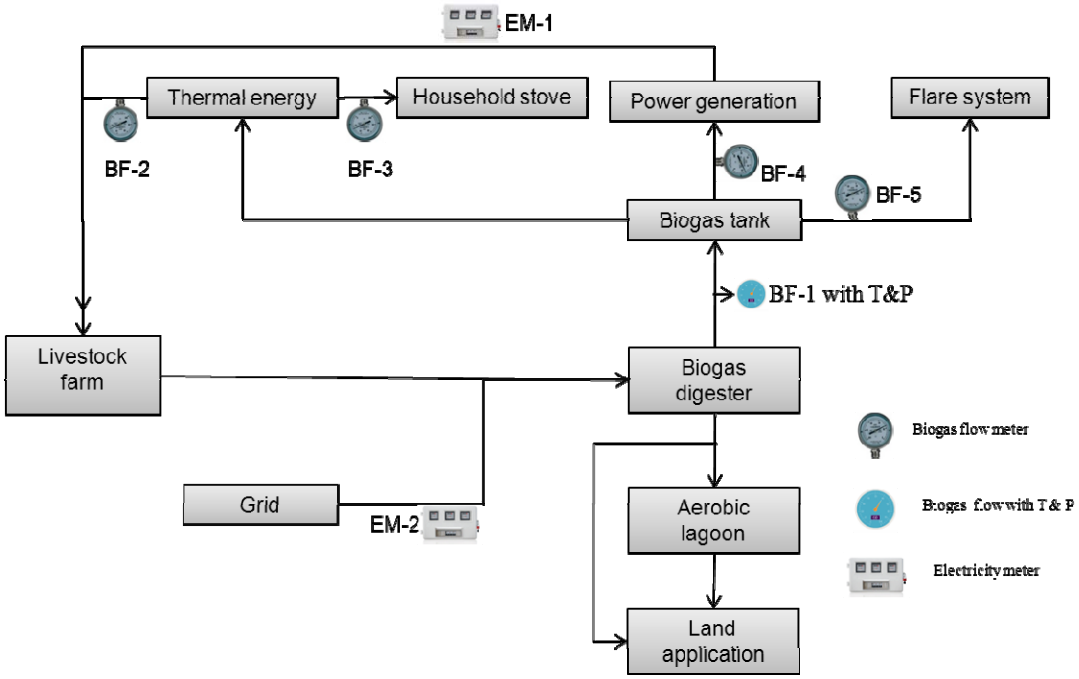

Figure B4-3：Monitoring plan for scenario C

As shown in figure B4, the PoA is composed by four main monitoring components:

- Biogas digester operation;
- Biogas utilization system(s);

- Livestock production
- Land application;

1) Biogas digester system;

The parameters to be monitored related to biogas digester system include the operation of biogas digester, biogas production, biogas temperature and pressure. Training on the monitoring biogas digester system is performed by Hebei Green Agriculture Co. Ltd and outsourced experts. The training includes normal operation of the system and maintenance. Daily inspections are performed by technicians in (Names of CPA Implementers) and monthly inspection by techniciansworking in Hebei Green Agriculture Co. Ltd. All data is saved on the computer and print out once a week.

2) Biogas utilization system(s)

The parameters to be monitored related to biogas utilization system(s) include the biogas used for thermal energy supply, power generation, and flare of residual biogas. Training on the monitoring biogas utilization system(s) is performed by Hebei Green Agriculture Co. Ltd and outsourced experts. The training includes location of biogas flow meters and electrical meters to be installed, the monitor frequency and calibration of the meters. All data is archived in the computer upon being measured or collected and printed out once a week.

3) Livestock production

Training on livestock production is provided by the Hebei Green Agriculture Co. Ltd and outsourced experts. The training includes the method and frequency to monitor the livestock population, feed, percentage of manure management by biogas digesters.

4) Land application

Training on the biogas residual system is provided by the Hebei Green Agriculture Co. Ltd and outsourced experts. The training includes the how to ensure the aerobic condition of the biogas residual to avoid methane production and emission.

4. Data collection and storage

The CDM monitoring staff with proper training will monitor the parameters according to the monitoring plan, and all the records will be double checked. At the end of each month, the monitoring data and records will be filed in spreadsheet and kept in the electrical database and in paper document format by (Names of CPA Implementers) and upload the electronic data to Hebei Green Agriculture Co. Ltd. Physical documentation such as paper-based maps, diagrams, and environmental impact assessments will be collected by Hebei Green Agriculture Co. Ltd..

All paper-based information and electronic database will be stored by the proposed project owner during the crediting period plus 2 years.

All meters used in the proposed project should be accorded with national standard or manufacture’s recommendation, including precision requirement and calibration. All the equipment used should be serviced and maintained in accordance with the original manufacturers’ instructions and complete records preservation.

5. Calibration of Meters

Biogas flow meters, electricity meters, scale will be subject to regular maintenance and testing according to technical specifications from the manufactures to ensure accuracy and good performance. Equipment calibration will be conducted periodically according to technical specifications. Biogas temperature and pressure meter will also need to be calibrated if they are applied in the monitoring of project activity.

6. QA/QC

The reliability of monitoring system is determined by precision, quality of measuring meters as well as the data collection procedure. All the meters shall be purchase from professional manufactures with certificate. Meters shall be calibrated according to national standard by qualified institutions or manufacture's recommendations. The monitoring staff shall follow the monitoring plan and second monitoring staff should double check the reading and records. QA/QC will make assurance the precision and steadiness of the metering results and correct reading and records.

Every month thetechnician of theHebei Green Agriculture Co. Ltd will visit the livestock farm which is included in the PoA to make sure the sustainable operation of the farm including the livestock production, biogas digesters system, biogas utilization facilities. He/she will also check the data recording, data collection and archiving, as well as calibration of meters undertaken by the monitoring staff.

SECTION C. Environmental Analysis

C.1. Please indicate the level at which environmental analysis as per requirements of the CDM modalities and procedures is undertaken. Justify the choice of level at which the environmental analysis is undertaken:

☐ Please tick if this information is provided at the PoA level. In this case, sections C.2. and C.3. need not be completed in this form.

C.2. Documentation on the analysis of the environmental impacts, including transboundary impacts:

>>

The Environmental Impact Assessment (EIA) of CPA No.###was undertaken. The information related to the EIA preparation and approval is listed in table C1.

Table C1: The information related to the EIA

Farm name	Institution for preparing of EIA	Agency for the approval of EIA	Date DD/MM/YYYY	Documentation No.
Farm 1				
Farm 2				
……				
Farm n				

Main conclusions of the Environmental Impact Assessment are summarized as follows:

The CPA No.###does not have any negative environmental impact.

(1) In addition to reducing GHG emissions, the CPA No.### has no impact on the air quality.

(2) The wastewater will be applied to the agricultural land instead of being discharged to the outside environment, which guarantees that CPA No.### has no impact on the water quality.

(3)All the solid waste will be treated in biogas digesters, ensuring that CPA No.### has no impact on local ecology.

In summary, the design of the project follows up the clean production principle, thus the implementation of CPA No.### will improve the local environment.

C.3. Please state whether an environmental impact assessment is required for a typical CPA, included in the programme of activities (PoA), in accordance with the host Party laws/regulations:

>>

Chinese environmental legislation<Categorization of construction project and the requirement for environmental impact assessment>does not require an Environmental Impact Assessment for biogas digester project, in general but EIA is required for biogas project with power generation component.

SECTION D. Stakeholders' comments

>>

D.1. Please indicate the level at which local stakeholder comments are invited. Justify the choice:

☒ Please tick if this information is provided at the PoA level. In this case, sections D.2. to D.4. need not be completed in this form.

D.2. Brief description how comments by local stakeholders have been invited and compiled:

>>

D.3. Summary of the comments received:

>>

D.4. Report on how due account was taken of any comments received:

>>

Annex 1

CONTACT INFORMATION ON ENTITY/INDIVIDUAL RESPONSIBLE FOR THE SMALL-SCALE CPA

Organization:	(Names of CPA Implementers)
Street/P.O.Box:	
Building:	
City:	
State/Region:	
Postfix/ZIP:	
Country:	
Telephone:	
FAX:	
E-Mail:	
URL:	
Represented by:	
Title:	
Salutation:	
Last Name:	
Middle Name:	-
First Name:	
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding from Annex I Parties for the Project.

Annex 3

BASELINE INFORMATION

Table 1: Swine population in livestock farms involved in CPA No.###

Farm Name	Sows	Boar	Piglets	Nursery	Growing and Finishing
Farm 1					
Farm 2					
……					
Farm n					
Total population					

Table 2: Dairy cattle population in livestock farms involved in CPA No.###

Farm Name	**Dairy cattle**
Farm 1	
Farm 2	
……	
Farm n	
Total population	

Table 3: Chicken population in livestock farms involved in CPA No.###

Farm Name	Broilers	Layers
Farm 1		
Farm 2		
……		
Farm n		
Total population		

The baseline information for calculation of OM, BM and CM emission factor of the North China Power Grid is shown in the Report on Determination of Baseline Grid Emission Factor by NDRC at http://cdm.ccchina.gov.cn on DD/MM/YYYY. The concrete process is shown in the following tables.

TableA2: Fuel consumption and emission of the North China Power Grid in YYYY

Fuels	Units	Bei jing	Tian jin	He Bei	Shanxi	Inner Mongolia	Shan dong	Total	Carbon Content (tC/TJ)	OXID (%)	Emission factor ($kgCO_2/TJ$)	NCV ($MJ/t,m^3$)	CO_2 emissions（tCO_2e）
		A	**B**	**C**	**D**	**E**	**F**	**G=A+B +C+D+E +F**	**H**	**I**	**J**	**K**	**L=G×J×K/100000 (**mass unit**) L=G×J×K/10000 (**volume unit**)**
Raw coal	10^4 ton												
Washed coal	10^4 ton												
Other washed coal	10^4 ton												
Moulded Coal													
Coke	10^4 ton												
Coke oven gas	10^8 M^3												
Other gas	10^8 M^3												
Crude oil	10^4 ton												
Gasoline	10^4 ton												
Diesel	10^4 ton												
Fuel oil	10^4 ton												
LPG	10^4 ton												
Refinery gas	10^4 ton												
Natural gas	10^8 M^3												
Other petroleum products	10^4 ton												

Other coking products	10^4 ton												
Other energy	10^4 ton												
Total													
Data source: *China Energy Statistical Yearbook YYYY*													

TableA3: The fuel fired electricity generation and calculation of emission factor of the North China Power Grid in YYYY

Province	**The fuel fired electricity generation (MWh)**	**The rate of electricity self-consumption (%)**	**The fuel fired electricity connected to the grid(MWh)**	Electricity import from Northeast China Power Grid (MWh)	
Beijing				Emission factor of the Northeast China Power Grid (tCO_2e/MWh)	
Tianjin				Electricity import from Central China Power Grid (MWh)	
Hebei				Emission factor of the Central China Power Grid (tCO_2e/MWh)	
Shanxi				Total CO_2 emission (tCO_2e)	
Inner Mongolia				The total fuel fired electricity connected to the grid (MWh)	
Shandong				$EF_{simple,OM,YYYY}$ (tCO_2e/MWh)	
Total					

Data Source: *China Electric Power Yearbook YYYY*

TableA4: Calculation of simple OM emission factor of the North China Power Grid in YYYY

Fuels	*Units*	*Beijing*	*Tianjin*	*Hebei*	*Shanxi*	*Inner Mongolia*	*Shandong*	*Total*	*Carbon Content (tC/TJ)*	*OXID (%)*	*Emission factor ($kgCO_2/TJ$)*	*NCV ($MJ/t,m^3$)*	*CO_2 emissions (tCO_2e)*
		A	***B***	***C***	***D***	***E***	***F***	***G=A+B+C+D+E+F***	***H***	***I***	***J***	***K***	***L=G×J×K/100000*** *(mass unit)* ***L=G×J×K/10000*** *(volumeunit)*
Raw coal	10^4ton												
Washed coal	10^4ton												
Other washed coal	10^4ton												
Moulded Coal													
Coke	10^4ton												
Coke oven gas	10^8M^3												
Other gas	10^8M^3												
Crude oil	10^4ton												
Gasoline	10^4ton												
Diesel	10^4ton												
Fuel oil	10^4ton												
LPG	10^4ton												
Refinery gas	10^4ton												
Natural gas	10^8M^3												
Other petroleum products	10^4ton												
Other coking products	10^4ton												
Other energy	10^4ton												
Total													
Data source: China Energy Statistical Yearbook YYYY													

Table A5: The fuel fired electricity generation and calculation of emission factor of the North China Power Grid in YYYY

Province	**The fuel fired electricity generation (MWh)**	**The rate of electricity self-consumption (%)**	**The fuel fired electricity connected to the grid (MWh)**	Electricity import from Northeast China Power Grid (MWh)	
Beijing				Emission factor of the Northeast China Power Grid (tCO_2e/MWh)	
Tianjin				Electricity import from Central China Power Grid (MWh)	
Hebei				Emission factor of the Central China Power Grid (tCO_2e/MWh)	
Shanxi				Total CO_2 emission (tCO_2e)	
Inner Mongolia				The total fuel fired electricity connected to the grid (MWh)	
Shandong				$EF_{simple,OM,YYYY}$ (tCO_2e/MWh)	
Total					

Data source: *China Electric Power Yearbook* YYYY

Table A6: Fuel consumption and emission of the North China Power Grid in YYYY

Fuels	*Units*	*Bei jing*	*Tian jin*	*He bei*	*Shanxi*	*Inner Mongolia*	*Shan dong*	*Total*	*Carbon Content (tC/TJ)*	*OXID (%)*	*Emission factor ($kgCO_2/TJ$)*	*NCV ($MJ/t,m^3$)*	*CO_2 emissions (tCO_2e)*
		A	***B***	***C***	***D***	***E***	***F***	***G=A+B+C+D+E+F***	***H***	***I***	***J***	***K***	***L=G×J×K/100000 (mass unit) L=G×J×K/10000 (volume unit)***
Raw coal	*10^4 ton*												
Washed coal	*10^4 ton*												
Other washed coal	*10^4 ton*												
Moulded Coal													
Coke	*10^4 ton*												
Cokeoven gas	*10^8 M^3*												
Other gas	*10^8 M^3*												
Crude oil	*10^4 ton*												
Gasoline	*10^4 ton*												
Diesel	*10^4 ton*												
Fuel oil	*10^4 ton*												
LPG	*10^4 ton*												
Refinery gas	*10^4 ton*												
Natural gas	*10^8 M^3*												
Other petroleum products	*10^4 ton*												
Other coking products	*10^4 ton*												
Other energy	*10^4 ton*												
Total													

Data source: China Energy Statistical Yearbook YYYY

Table A7: The fuel fired electricity generation and calculation of emission factor of the North China Power Grid in YYYY

Province	**The fuel fired electricity generation (MWh)**	**The rate of electricity self-consumption (%)**	**The fuel fired electricity connected to the grid (MWh)**		
Beijing				Electricity import from Northeast China Power Grid (MWh)	
Tianjin				Emission factor of the Northeast China Power Grid (tCO_2e/MWh)	
Hebei					
Shanxi				The total fuel fired electricity connected to the grid (MWh)	
Inner Mongolia				Total CO_2 emission(tCO_2e)	
Shandong				$EF_{simple,OM,YYYY}$ (tCO_2e/MWh)	
The Total					

Data Source: *China Electric Power Yearbook* YYYY

Table A8: The three years generation weighted average emission factor of the North China Power Grid

Years	YYY Y	YYY Y	YYY Y
Total CO2 emission（tCO2e）			
The total fuel fired electricity connected to the grid			
OM=( )tCO2e/MWh			

Table A9: Calculation the weight of CO_2 emissions from solid fuels, liquid fuels and gas fuels among the total emissions in North China Power Grid

Fuels	Units	Beijing	Tianjin	Hebei	Shanxi	Shandong	Inner Mongolia	Total	NCV (kJ/kg or m^3)	Emission factor	OXID (%)	CO_2 emissions (tCO_2e) **K=G×H×I×J/10 0,000**
		A	**B**	**C**	**D**	**E**	**F**	**G=A+B+C +D+E+F**	**H**	**I**	**J**	**K**
Raw coal	10^4t											
Washed coal	10^4t											
Other washed coal	10^4t											
Mould coal	10^4t											
Coke	10^4t											
Other coking products	10^4t											
Total of solid fuels												
Crude oil	10^4t											
Gasoline	10^4t											
Diesel	10^4t											
Fuel oil	10^4t											
Other petroleum products	10^4t											
Total of liquid fuels												
Natural gas	10^8m^3											
Coke oven gas	10^8m^3											
Other gas	10^8m^3											
LPG	10^4t											
Refinery gas	10^4t											
Total of gas fuels												

Total of all fuels	

Data source: *China Energy Statistical Yearbook* YYYY

Table A10: The emission factor of the most efficient commercial coal-fueled, oil-fueled and gas-fueled power plant

	Variable	Efficiency of electricity supply	Emission factor of the fuels ($kgCO_2/TJ$)	OXID	Emission factor (tCO_2e/MWh)
		A	B	C	D=3.6/A/10,000*B*C
Coal-fueled power plant	$EF_{Coal,Adv,y}$				
Oil-fueled power plant	$EF_{Oil,Adv,y}$				
Gas-fueled power plant	$EF_{Gas,Adv,y}$				

Table A11: The weight of CO_2 emission from solid, liquid and gas fuels among the total emissions and the thermal emission factor of NCPG

$\lambda_{Coal,y}$	$\lambda_{Oil,y}$	$\lambda_{Gas,y}$	$EF_{EL,fossil,Adv,y}$（tCO_2e/MWh） ($\lambda_{Coal,y}$* $EF_{Coal,Adv,y}$+$\lambda_{Oil,y}$* $EF_{Oil,Adv,y}$+$\lambda_{Gas,y}$* $EF_{Gas,Adv,y}$)

Table A12: Calculation of BM emission factor of North China Power Grid

	YYYY installed capacity	YYYY **installed capacity**	**YYYY installed capacity**	**Newly added capacity between YYYY and YYYY**	**Newly added capacity between YYYY and YYYY**	**Weight in newly added capacity**
	A	B	C	D	E	F
Fossil fueled(MW)						
Hydro power(MW)						
Nuclear power(MW)						
Wind power(MW)						
Total(MW)						
Share in YYYY installed						
BM=( )*( )%=( ) tCO_2e/MWh						

Data source: *China Electric Power Yearbook YYYY*-YYYY

According to "Tool to calculate the emission factor for an electricity system (Version 02.2.1)". The combined emission factor $EF_{CO2,y}$=0.5* $EF_{OM,y}$ +0.5* $EF_{BM,y}$ =0.5×( )+0.5×( )=( ) tCO_2e/MWh.

Annex 4

MONITORING INFORMATION

Monitoring information is described in section B6.
