CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

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SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

Amazon Carbon Swine Waste Management System Project 02.
Version: 8.1 (Minor corrections were made on version 8, following a request for review by the CDM Executive Board)
Date: 03/03/2009

A.2. Description of the small-scale project activity:

Amazon Carbon is starting a sustainability program along with 09 swine confinement farms in Brazil, aiming at improving animal manure management systems, reducing greenhouse gases (GHG) emissions and improving the living conditions of the population on the project sites.

Purpose: The purpose of this project is to reduce GHG emissions associated to swine waste management and to contribute to sustainable development.

Explanation of GHG emission reductions: The project proposes to replace the existing Animal Waste Management Systems (AWMS) by a lower-GHG emitting AWMS. Currently, swine waste is flushed from the barns and treated in anaerobic lagoon management systems that results in high GHG emissions (additional information on the current AWMS of each farm is available in section A.4.1.4).

The project will replace the current system by anaerobic digesters that capture and combusts methane in a controlled and economically sustainable manner. According to the ex-ante estimations (described in sections B.4 and B.6.1, below), this shift of animal waste management systems will result in a GHG emission reduction of 219 245 tons of CO_2e during the crediting period. Certified Emission Reductions are claimed exclusively for the emission reductions associated to methane capture and combustion.

In the project case, all animal waste will be flushed from the barns to the anaerobic digesters. The anaerobic digesters captures a considerable amount of volatile solids (as carbon dioxide and methane) produced by anaerobic bacteria. The anaerobic digestion reduces and stabilizes the organic material, retrieve the substrate for fertilizer and produces biogas (that contains methane). The biogas is captured and burned in an enclosed flare, in a controlled manner to ensure methane destruction. The equipments installed by the project activity are described in section A.4.2.

The resulting effluent will then flow into the existing storage lagoons where it is collected to irrigate either the farmer's crops or neighbouring areas, if necessary. The GHG emissions should, after this process, show considerable reduction as a result of the implementation of the system. Sludge application and irrigation shall be carried out on neighbouring fields, offsite, where methane emissions may be regarded as insignificant, since anaerobic conditions shall be avoided.

Contribution to sustainable development: Swine waste is considered a serious environmental concern in the project regions. The project proposes major improvements in swine waste handling. This will result not only in GHG emission reduction, but also in other environmental and social benefits, such as:

- **Contribution to local environmental sustainability:**

  - Reduction in the risk of underground water contamination due to correct management of swine manure. The proposed AWMS is built in a manner to avoid effluent leakages or uncontrolled disposal. Effluents are managed in completely sealed pipeline and lagoons. Guidance on sludge disposal will be provided to avoid uncontrolled disposal of sludge.

  - Reduction in the odours arising from open anaerobic lagoons.

  - Reduction in the pathogenic vectors associated to animal manure. The proposed AWMS is equipped with sealed PVC cover layers to capture the resulting biogas. The cover layer also avoids odour emissions and eliminates the presence of pathogenic vectors in the AWMS surroundings.

  - Improvement of swine manure quality as fertilizer. The proposed AWMS results in a more efficient treatment in animal manure. The organic fraction of manure will be significantly reduced due to improved anaerobic digestion, when compared to baseline AWMS. The improvement in manure treatment reduces it's pollutant potential and improves it's quality as soil fertilizer.

- **Contribution to working conditions and employment creation**

  - Increase of job opportunities during and post project activity due to the continuous need for equipment monitoring and workforce improvement. The proposed AWMS includes several equipments/technologies that do not exist in the baseline AWMS. These equipments demand regular monitoring, operation and maintenance, creating the potential for job opportunities.

  - Improvement on working conditions to farms personnel, due to odour and pathogenic vectors reduction. The presence of odours and pathogenic vectors is unpleasant and might constitute health hazards to farms personnel and to the local community. The proposed AWMS will significantly reduced or eliminate these issues.

  - Employees' professional skill development (training) to operate the installed AWMS; Training on farms personnel will be necessary to operate the proposed AWMS, since it is equipped with advanced technology that does not exist in baseline AWMS.

- **Contribution to income distribution**

  - Improvement on the quality of manure to be used as fertilizer by neighbouring farmers. Neighbouring farmers consider animal manure to be an important income. The use of animal manure as fertilizer reduces or eliminates the need to acquire industrial fertilizers for these farmers. With the proposed AWMS, the quality of such manure will be significantly improved. The amount of manure distributed to local farmers might also increase, due to better handling of animal waste.

- **Contribution to capacitating and technological development**

- Technological development of the region through the implementation of innovative equipment. The proposed AWMS is far more advanced than the baseline AWMS. The new AWMS is equipped with devices to capture and combust methane in a controlled manner, thus reducing local greenhouse gas emissions. Besides, the new AWMS reduces environmental hazards and pollutant potential due to manure handling. The new AWMS complies with local and national environmental law.

The proposed AWMS can also be applied to similar activities in the region, since it is produced or distributed by Brazilian companies. No international technical assistance is necessary for the operation and maintenance of the proposed AWMS.

- **Contribution for regional integration and articulation with other sectors**

- Regional development might be attained by the replication of this project by other swine farms in the region, later on. All benefits above are in line with the farmer's goals to improve the quality of they operation and to act in a positive manner in the community. According to the project participant, the project is an opportunity to adopt sustainable practices and provide guidelines for future swine confinement farms.

A.3. Project participants:

Name of Party involved* (indicate the host Country)	Private and/or public entity (ies) participating in project	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Brazil (Host)	Amazon Carbon S/S Ltda	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

Further information regarding the parties involved, please refer to Annex I.

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

A.4.1.1. Host Party(ies):

Brazil.

A.4.1.2. Region/State/Province etc.:

States of Rio Grande do Sul, Santa Catarina, Goiás and Mato Grosso.

A.4.1.3. City/Town/Community etc:

The project activity will take place at the following cities:

State	City	Participating Farm
Rio Grande do Sul	Santa Rosa	Granja Cambrasil
	Santa Rosa	Granja Capim
	Santa Rosa	Granja Rincão dos Rochas
	Santa Rosa	Granja COOPERMIL
	Santo Ângelo	Granja Santo Ângelo
Santa Catarina	Bom Jesus	Fazenda Chapecózinho
	Xanxerê	Granja Pompermaier
Mato Grosso	Tapurah	Fazenda Martelli III
Goiás	Rio Verde	Fazenda Coqueiros do Rio Doce

Table A1. Cities involved in the project activity.

A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity :

The precise location of farms is identified by means of global positioning system as seen on Table A2, below.

ID	Farm Name	Property	Address	Town	Contact	Phone	Global Positioning System*	
							S	W
1	Granja Cambrasil	Alibem comercial de Alimentos Ltda	Esquina Guia Lopes, s/nº	Santa Rosa/RS	Mr. Fabrício Ruschel	(55) 3513-0005	27º50'11.5"	54º32'09.2"
2	Granja Capim	Alibem comercial de Alimentos Ltda	Lageado Capim, s/nº	Santa Rosa/RS	Mr. Fabrício Ruschel	(55) 3513-0005	27º50'17.7"	54º24'47.9"
3	Granja Rincão dos Rochas	Alibem comercial de Alimentos Ltda	Linha São Salvador, s/nº	Santa Rosa/RS	Mr. Fabrício Ruschel	(55) 3513-0005	27º56'23.5"	54º30'02.1"
4	Granja Santo Ângelo	Alibem comercial de Alimentos Ltda	Estrada Colônia das Almas, s/nº	Santo Ângelo/RS	Mr. Fabrício Ruschel	(55) 3513-0005	28º 15'16.4"	54º13'39.2"
5	Granja COOPERMIL	Cooperativa Mista São Luiz LTDA	Linha Lajeado Bonito, s/nº	Santa Rosa/RS	Mr. Gabriel Weber	(55) 3512-5022	27º49'38.1"	54º30'53.9"
6	Fazenda Chapecózinho	Mr. Alcydes Bortoluzzi	Linha Tavares, s/nº	Bom Jesus/SC	Mr. Sérgio Bortoluzzi	(49) 9989-7371	26º44'28.5"	52º23'08.2"
7	Granja Pompermaier	Mr. César Pompermaier	Linha Invernada Grande,/Brinckimann, Bairro Interior	Xanxerê/SC	Mr. Fábio Pompermaier	(49) 9989-7131	26º51'12.5"	52º20'53.1"
8	Fazenda Martelli III	Mr. Vitório Manoel Martelli	Rodovia MT 338, Km 120 + 13, Caixa postal 04	Tapurah/MT	Mr. Wilson Martelli	(65) 9973-1182	12º29'31.5"	56º43'01.6"
9	Fazenda Coqueiros do Rio Doce	Mr. Avelino Pessenti	BR 060 Km 413.7 a esquerda	Rio Verde/GO	Mr. Odivar Pessenti	(64) 9225-9099	17º51'07.5"	51º10'00.6"

Table A2: Farms location and contact information.

*All GPS coordinates were taken in the position where the anaerobic digester will be installed.

A brief description of the farms follows:

1. **Granja Cambrasil**: This is a Piglet Producing Unit farm owned by ALIBEM. It is located in Santa Rosa/RS. From January to December 2007, there were approximately 6 878 animals on site. No population increase is expected during the crediting period. Animal waste is sent from 15 containment areas to a sequential system of 04 anaerobic lagoons by flushing and scrapping. The first lagoon measures 70 x 58.9 x 1.62, the second lagoon measures 32 x 20 x 1.62, the third lagoon measures 40 x 35 x 1.62 and the fourth lagoon measures 75 x 75 x 1.62 meters (length, width and depth). Effluent is disposed of through irrigation on neighbouring fields. Irrigation is currently done by trucks, tractors and electric pumps. No additional pumping will be necessary due to the project activity. Installation of the equipments is expected to be completed by March, 2009.

2. **Granja Capim**: This is a Nursery Unit farm owned by ALIBEM. It is located in Santa Rosa/RS. From January to December 2007, there were approximately 9 908 animals on site. ALIBEM is currently increasing the installed capacity of the farm, adding 8 000 nursery. This increase in livestock is going to be implemented before the start of the crediting period. No population increase is expected during the crediting period. Animal waste is sent from 09 containment areas to a sequential system of 03 anaerobic lagoons by flushing and scrapping. The first lagoon has an area of 1 849 m^2 and a depth of 2 m, the second lagoon has an area of 2 025m^2 and a depth of 2m and the third lagoon has an area of 2 184 m2 and a depth of 2m. Effluent is disposed of through irrigation on neighbouring fields. Irrigation is currently done by trucks, tractors and electric pumps. No additional pumping will be necessary due to the project activity. Installation of the equipments is expected to be completed by March, 2009.

3. **Granja Rincão dos Rochas:** This is a Finishing Unit farm owned by ALIBEM. It is located in Santa Rosa/RS. From January to December 2007, there were approximately 6 195 animals on site. No population increase is expected during the crediting period. Animal waste is sent from 06 containment areas to a sequential system of 04 anaerobic lagoons by flushing and scrapping. The first, second and third lagoon measure 34 x 19 x 3.2 and the fourth lagoon measures 53 x 27 x 3.2 meters (length, width and depth). Effluent is disposed of through irrigation on neighbouring fields. Irrigation is currently done by trucks, tractors and electric pumps. No additional pumping will be necessary due to the project activity. Installation of the equipments is expected to be completed by March, 2009.

4. **Granja Santo Ângelo**: This is a Piglet Producing, Nursery and Finishing Unit farm owned by ALIBEM. It is located in Santo Ângelo/RS. From January to December 2007, there were approximately 12 709 animals on site. ALIBEM is currently increasing the installed capacity of the farm, adding 3 850 nursery and 1 000 finishers. This increase in livestock is going to be implemented before the start of the crediting period. No population increase is expected during the crediting period..Animal waste is sent from 21 active containment areas to a sequential system of 10 anaerobic lagoons by flushing and scrapping (there is an eleventh lagoon that is not operational). There are also three other containment areas under construction, to support the population increase. The first lagoon measures 30 x 27 x 2.5, the second lagoon measures 40 x 28 x 2.5, the third lagoon measures 41 x 23 x 2.5, the fourth lagoon measures 25 x 22 x 2.5, the fifth lagoon measures 27 x 22 x 2.5, the sixth lagoon measures 46 x 22 x 2.5, the seventh lagoon measures 40 x 30 x 2.5, the eighth lagoon measures 44 x 22 x 2.5, the ninth lagoon measures 28 x 27 x 2.5 and the tenth lagoon measures 28 x 30 x 2.5 meters (length, width, and depth). Effluent is disposed of through irrigation on neighbouring fields. Irrigation is currently done by trucks, tractors and electric pumps. No additional pumping will be necessary due to the project activity. Installation of the equipments is expected to be completed by March, 2009.

5. **Granja COOPERMIL:** This is a Piglet Producing and Nursery Unit farm owned by COOPERMIL. It is located in Santa Rosa/RS. From January to December 2007, there were approximately 5 751 animals on site. No population increase is expected during the crediting period. There are 07 containment areas that use flushing system and scrapping to remove animal waste periodically. From the containment areas, animal waste is destined to a system of three anaerobic lagoons. The first lagoon measures 22.0 x 22.0 x 2.0 meters (length, width and depth), the second lagoon measures 25 x 18.x 2.0 and the third lagoon measures 33 x 33 x 2,0. A fraction of animal waste is destined to lagoon one and flows to lagoon two. The other fraction of waste is destined directly to the third lagoon. Effluent is disposed of through irrigation on neighbouring fields. Waste is removed from lagoons two and three. Irrigation is currently done by trucks, tractors and diesel fuelled pumps. No additional pumping will be necessary due to the project activity. Installation of the equipments is expected to be completed by March, 2009.

6. **Fazenda Chapecózinho:** This is a Finishing Unit farm owned by Mr. Alcydes Bortoluzzi. It is located in Bom Jesus/SC. From January to December 2007, there were approximately 2 227 animals on site. No population increase is expected during the crediting period. There are 04 containment areas that use flushing system and scrapping to remove animal waste periodically. From the containment areas, animal waste is destined to a system of three anaerobic lagoons. The first lagoon measures 8.0 x 7.0 x 3.0 meters

(length, width and depth), the second lagoon measures 12.0 x 10.0 x 3.0 and the third lagoon measures 23 x 17.0 x 4,0. A fraction of animal waste is destined to lagoon one, and flows to lagoons two and three. The other fraction of waste is destined directly to the third lagoon. Effluent is disposed of through irrigation on neighbouring fields. Waste is removed from lagoons two and three. Irrigation is currently done by trucks and diesel fuelled pumps. No additional pumping will be necessary due to the project activity. Installation of the equipments is expected to be completed by March, 2009.

7. Granja Pompermaier:: This is a Finishing Unit farm owned by Mr. César Antônio Pompermaier. It is located in Xanxerê/SC. Granja Pompermaier finishes lots of 1 100 swine. In April, 2008 the farm will start to finish two lots, instead of one. Hence, animal population equals 2 148 animals, when accounting mortality. No population increase is expected during the crediting period. There are 02 containment areas that use flushing system and scrapping to remove animal waste periodically. From the containment areas, animal waste is destined to an anaerobic lagoon. This lagoon measures 38.0 x 14.0 x 4.5 meters (length, width and depth),. Effluent is disposed of through irrigation on neighbouring fields. Waste is removed from the lagoon after a retention time of 150 days. Irrigation is currently done by tractors equipped with lobular pumps. No additional pumping will be necessary due to the project activity. Installation of the equipments is expected to be completed by March, 2009.

8. **Fazenda Martelli III:** This is a Piglet Producing , Nursery and Finishing Unit farm owned by Mr. Vitório Manoel Martelli. It is located in Tapurah/MT. From January to December 2007 there were approximately 6 155 animals on site. This farm has increased it's livestock during 2007. From January to March 2008, there were approximately 7 009 animals on site. No further population increase is expected during the crediting period. There are 12 containment areas that use flushing system and scrapping to remove animal waste periodically. From the containment areas, animal waste is destined to a sequential system of two anaerobic lagoons. The first lagoon measures 61.0 x 35.0 x 2.5 m. The second lagoon is cylindrical and has a diameter of 24 m and a depth of 2 m. Effluent is disposed of through irrigation on neighbouring fields. Waste is removed from all lagoons, after a retention time of at least 40 days. Irrigation is currently done by tractors and diesel fuelled pumps. No additional pumping will be necessary due to the project activity. Installation of the equipments is expected to be completed by March, 2009.

9. **Fazenda Coqueiros do Rio Doce:** This is a Finishing Unit farm owned by Mr. Avelino Pessenti. It is located in Rio Verde/GO. In this farm, there are two finishing units that receives lots of 3 800 swine each. From January to December 2007, there were approximately 6 884 animals on site. No population increase

is expected during the crediting period. There are 08 containment areas that use flushing system and scrapping to remove animal waste periodically. In each finishing unit, animal waste is destined to a system of three anaerobic lagoons. All lagoons measure 45.5 x 35 x 3.0 meters (length, width and depth). Effluent is disposed of through irrigation on neighbouring fields. Waste is removed from all lagoons after a retention time of at least 45 to 60 days. Irrigation is currently done by diesel fuelled pumps. No additional pumping will be necessary due to the project activity. Installation of the equipments is expected to be completed by March, 2009.

Fig. A1: Map showing the location of Project farms.

A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:

The proposed project activity fits in type III: Other project activities, category III.D/Ver. 13 Methane recovery in agricultural and agro industrial activities. This category is applicable to project activities that result in GHG emission reductions under or equal to 60 000 metric tons of CO_2 equivalent (tCO_2e). The proposed project activity will capture and combust methane gas resulting from the anaerobic decomposition of swine manure from farms located in Brazil.

The equipment used by the project activity will be provided by the Brazilian Company AVESUY. The technology shall be easily transferred to and assimilated by the project participant and the farms involved, since there are no problems regarding language or proximity. Farms' personnel training and good practice guidance by the technology provider will ensure that technology transfer will be done successfully. All technology to operate the AWMS is produced in Brazil. Technology transfer from Annex I will only be necessary for the monitoring equipment, such as the gas analyzer and the flow meters. However, this equipment is provided by Brazilian companies, that also provide training and maintenance, if necessary.

AVESUY was established in 1980 and has been working with anaerobic digesters since 2001. AVESUY provides technology, equipments and a wide range of products for swine farms, soil irrigation and wastewater treatment, among others. AVESUY was the technology provider for several CDM projects registered in Brazil.

The technology installed by the project includes the adaptation of existing anaerobic lagoons and the creation of new covered lagoons (in some of the farms) in order to create anaerobic digesters. The system will be built as one or more anaerobic digesters, ensuring a minimum Hydraulic Retention Time (HRT) of 30 days, to guarantee a significant reduction in organic matter and volatile solids through anaerobic digestion. The AWMS proposed includes technical components to ensure methane production, capture and combustion. A brief description of such components follows:

Manure loading system:

Animal waste is sent from the barns to the anaerobic digester through two sealed pipes made of Polymer Polyvinyl Chloride (PVC). These pipes have a diameter of 150mm each. Manure is loaded from the barns to the manure tanks.

Manure tanks:

Two manure tanks are built in each AWMS to collect manure prior to entering the anaerobic digester. The tanks have the following dimensions: 1,0 x 2,0 x 1,0 meters. Collecting pipelines are located in the bottom of the manure tanks, in order to avoid solid accumulation in the manure tanks.

Sludge removal and manure reflux system

PVC pipelines along the digester will remove manure from the bottom of the anaerobic digester and pump it to the frontal part of the anaerobic digester and will prevent gas leakages under the bottom geomembrane of the digester. Each AWMS will be equipped with one electric pump to operate this system. The electric pump is equipped with a 5 horsepower (Hp) engine, providing a flow of 50 m^3/hour. The electric pump has an estimated consumption of 1.5 KWh.

Gas draining system:.

The anaerobic digester is equipped with a gas draining system. It consists of a High Density Polyethylene (HDPE) pipeline called Kanadren. The draining system will be placed transversally along the digester.

Bottom geomembrane

The bottom geomembrane is made of PVC. This geomembrane is 0,8mm thick. PVC was chosen due to its high resistance against UV radiation, chemical compounds and physical wearing.

Internal walls:

Each anaerobic digester will be equipped with two 0,8mm thick PVC geomembranes, acting as internal walls. These walls are made to retain solids, improving the system's efficiency on organic matter degradation. Internal walls will be held by steel wires and bolted in the concrete gutter surrounding the anaerobic digester.

Agitation system

The agitation system will reflux the available biogas into the effluent through a gas compressor and a 20mm PVC pipeline. Biogas will be periodically refluxed into the effluent to avoid solid agglomeration in the bottom of the anaerobic digester, improving the system's efficiency to decompose organic matter. This reflux will occur inside the digester cell, before biogas is collected and measured. Thus, refluxing biogas will not result in changes in the amount of biogas measured by the flow meters, nor in risks of double counting biogas. Each AWMS will be equipped with on gas compressor to operate this system. The gas compressor is equipped with a 5 HP engine and an estimated consumption of 1.5 KWh.

Cover layer:

The anaerobic digester will have a 1mm thick PVC layer to ensure biogas capture and storage. This layer will be sealed and fixed in the concrete gutter. It will be 1.5 to 2.5 meters high once biogas is regularly produced.

Upon leaving the anaerobic digester, the treated effluent will flow into the existing storage lagoons, through PVC pipelines. In the storage lagoons, the treated effluent will be collected and used to irrigate cropping areas. The captured biogas will be conducted to a flow meter and an enclosed flare system through a sealed PVC pipeline.

Enclosed combustion System (flares)

A total of 13 stainless steel enclosed flaring equipments will be installed by the project activity. The flaring system is automated to ensure that all produced biogas is flared (after passing through the flow meter). Pressure control devices within the gas handling system maintain ideal biogas flow to the combustion system.

The enclosed fares are built in thermo resistant material, such as stainless steel. Two temperature meters are included to determine the combustion temperature. Ventilation devices regulate air flow to allow the complete combustion of methane.

The system is designed to reach a minimum temperature of 500ºC in the flaring process (a second ignition system is automatically activated if the exhaust gas temperature is below the programmed temperature).

Programmable Logic Controller:

A Programmable Logic Controller will coordinate the combustion system and the monitoring equipments. Through the PLC, data on biogas flow, biogas temperature, biogas pressure, flaring temperature, etc will be recorded and stored. The PLC will record data hourly on a 16 Mb Data Flash, allowing the project participant to determine emission reductions on an hourly basis in every farm. The PLC will be interfaced to a PC terminal via Universal Serial Bus (USB) connection and appropriate software. The components parts are verified functional on a quarterly basis, in accordance with manufacturer and other technical specifications.

The PLC coordinates all systems through pressure controlling devices. Once the ideal biogas pressure is present, the ignition system is activated and monitoring information recorded (regarding biogas flow, temperature and temperature of the flaring process).

Flow meter

Biogas flow will be measured by ROOTS® G65 SSM – ICPWS flow meters. ROOTS® special service meters (SSM) are continuous duty meters for measurement of gases where entrained liquids may be present and where the gas being measured may have a corrosive effect on some of the materials employed in meters of standard construction. Typical applications would be in a production pipeline with sour, wet gases or in a sewage treatment plant to measure gases produced by a sludge digester.

SSM Construction

All carbon steel parts have been eliminated from the gas stream in a Special Service Meter. The bearings are made of stainless steel as are the timing gears, spring clips, and internal cap screws. The bearing retainers, clamps and magnet wheel housings are made of anodized aluminium to provide greater resistance to corrosion.

The impellers are made from aluminium extrusions and hard-coated to impart wear and corrosion resistance. The cylinder and head plates on the Series B meters (sizes 8C175 through the 56M175) are manufactured from aluminium and hard-coat anodized. The anodizing also makes the meter highly resistant to abrasion from particles which may be in the gas stream.

The flow meter is equipped with ROOTS® micro corrector, which measures temperature and pressure of residual gas to provided corrected flow. Data on biogas flow, temperature and pressure is automatically registered and stored by the flow meter., More details can be found in Annex IV.

Gas analyzer

All biogas produced in the digester cells will be analyzed by a Dual wavelength Infra-red Refrigerant Gas sensor. One gas analyzer will be available in every farm. This sensor has a measurement range of 0-100% and an accuracy range of 2.5%. This gas sensor will be periodically connected to the gas pipeline in a specific valve and perform gas analysis. More details can be found in Annex IV.

Biogas Pressure analyzer

Biogas pressure will be determined on an hourly basis by LD301 Smart Pressure Transmitter Series in the combustion system. The LD301 series uses, as its measuring principle, the well-known and field proven technique of capacitance sensing, enhanced by a microprocessor based electronics. Designed for process control applications, these 2-wire transmitters generate a 4-20 mA signal proportional or characterized to the applied differential pressure.

This signal can be transmitted over a pair of twisted wires through long distances (limited only by the wire resistance and load). Digital communication for remote calibration and monitoring is also provided, superimposing a digital signal on the same pair of wires that carries the 4-20 mA signal. Remarkable features of the LD301 series are its 0.075% high accuracy, 120:1 rangeability, compactness and light weightiness, PID control capability (optional), etc. .More details can be found in Annex IV.

Exhaust gas temperature analyzer

Type K sensors will be used to determine the temperature of the flaring process, by measuring the temperature of the exhaust gas. This sensor is built in thermo resistant material and is tested to operate in temperature as high as 1 100ºC. More details can be found in Annex IV.

The AWMS installed by the project activity is far more advanced then the existing AWMS. AVESUY will perform training and guidance for all participating farms personnel prior to the crediting period. Training will involve normal operation, emergency operation, maintenance, and request for warranty service. Amazon Carbon will perform training for all participating farms personnel regarding monitoring and emergency operations as well.

Physical description of the proposed AWMS:

In **Granja Cambrasil**, the AWMS will consist of two digester cells, measuring 40.0 x 13.0 x 4 meters (length, width and depth) each. The digester cells will be built before the existing anaerobic lagoons. Each digester cell will have a volume of 1 510 m^3. The combined system has a total volume capacity of 3 020 m^3. One enclosed flare will be used to combust the produced biogas in a controlled manner. The resulting effluent will flow to the exiting storage lagoons.

In **Granja Capim** the AWMS will consist of two digester cells, measuring 35.0 x 11.0 x 4 meters (length, width and depth) each The digester cells will be built before the existing anaerobic lagoons. Each digester cell will have a volume of 1 060 m^3. The combined system has a total volume capacity of 2 120 m^3. One enclosed flare will be used to combust the produced biogas in a controlled manner. The resulting effluent will flow to the remaining storage lagoons.

In **Granja Rincão dos Rochas,** the AWMS will consist of three digester cells, measuring 31.0 x 15.0 x 3 meters (length, width and depth) each. The digester cells will be adapting the existing anaerobic lagoons. Each digester cell will have a volume of 1 035 m^3. The combined system has a total volume capacity of 3 105 m^3. Two enclosed flares will be used to combust the produced biogas in a controlled manner. The resulting effluent will flow to the remaining storage lagoons.

In **Granja Santo Ângelo,** the AWMS will consist of three digester cells, measuring 45.0 x 15.0 x 4 meters (length, width and depth) each. The digester cells will be built adapting existing anaerobic lagoons. Each digester cell will have a volume of 2 052 m^3. The combined system has a total volume capacity of 6 156 m^3. Two enclosed flares will be used to combust the produced biogas in a controlled manner. The resulting effluent will flow to the remaining storage lagoons.

In **Granja COOPERMIL**, the AWMS will consist of one digester cell, measuring 39 x 13 x 4.0 meters (length, width and depth). The digester cell will be built before the existing anaerobic lagoons. The digester cell will have a volume of 1 476 m^3. One enclosed flare will be used to combust the produced biogas in a controlled manner. The resulting effluent will flow to the remaining storage lagoons.

In **Fazenda Chapecózinho**, the AWMS will consist of one digester cell, measuring 33 x 10 x 4.0 meters (length, width and depth). The digester cell will be built before the existing anaerobic lagoons. The digester cell will have a volume of 876 m^3. One enclosed flare will be used to combust the produced biogas in a controlled manner. The resulting effluent will flow to the existing storage lagoons.

In **Granja Pompermaier**, the AWMS will consist of one digester cell, measuring 30 x 10 x 4.0 meters (length, width and depth). The digester cells will be built before the existing anaerobic lagoons. The digester cell will have a volume of 792 m^3. One enclosed flare will be used to combust the produced biogas in a controlled manner. The resulting effluent will flow to the existing storage lagoons.

In **Fazenda Martelli III**, the AWMS will consist of one digester cell, measuring 37 x 13 x 4.0 meters (length, width and depth). The digester cell will be built before the two existing anaerobic lagoons. The system will have a volume of 1 396 m^3. Two enclosed flares will be used to combust the produced biogas in a controlled manner. The resulting effluent will flow to the existing storage lagoons.

In **Fazenda Coqueiros do Rio Doce,** the AWMS will consist of two digester cells, measuring 36 x 12 x 4.0 meters (length, width and depth) each. The digester cells will be built before the two existing anaerobic lagoons. Each digester cell will have a volume of 1 150m^3. The combined system has a total volume capacity of 2 300 m^3. Two enclosed flares will be used to combust the produced biogas in a controlled manner. The resulting effluent will flow to the existing storage lagoons.

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

Years	Annual estimated emission reductions in tCO_2e
2009	18 393*

2010	21 939
2011	21 939
2012	21 939
2013	21 939
2014	21 939
2015	21 939
2016	21 939
2017	21 939
2018	21 939
2019	3 546**
Total estimated reductions (tCo$_2$e)	**219 390**
Crediting period (years)	**10**
Annual average of estimated reductions over the crediting period (CO$_2$e)	**21 939**

Tab. A.3: Project activity estimated GHG emission reduction values.

* For the first crediting year, the project will be operational for 306 days (from 01/03/2009 to 31/12/2009)

** For the last crediting year, the project will be operational for 59 days (from 01/01/2019 to 28/02/2019)

A.4.4. Public funding of the small-scale project activity:

No public funds will be invested in the project.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

The project activity includes only the above mentioned farms and the associated estimated emission reductions. Based on paragraph 2 of Appendix C of the Simplified Modalities and Procedures for Small Scale CDM project activities, this project is not deblundled. There are no other registered (or on application to register) small-scale CDM project activities with the same project participants, in the same project category and technology/measure whose project boundaries is within 1 km of another proposed small-scale project activity sites.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the small-scale project activity:

The title of the approved baseline methodology is AMS-III.D "Methane Recovery in agricultural and agro industrial activities" version 13, and the reference is the United Nations Framework Convention on Climate Change (UNFCCC) website:

(http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html).

B.2 Justification of the choice of the project category:

The small-scale project activity category is methane recovery from manure and wastes from agricultural or agro-industrial activities that would be decaying anaerobically in the absence of the project activity by

(a) Installing methane recovery and combustion system to an existing source of methane emissions, or

(b) Changing the management practice of a biogenic waste or raw material in order to achieve the controlled anaerobic digestion equipped with methane recovery and combustion system.

The project satisfies item 1(a) of the methodology III.D and items 2(a) and (b) that follows:

(a) The sludge must 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.

(b) Technical measures shall be used (e.g. flared, combusted) to ensure that all biogas produced by the digester is used or flared.

The project consists in implementing a methane recovery and combustion system on an existing source of methane that would continue to decay anaerobically without the project. The project activity also satisfies the applicability conditions of item 2 of the adopted methodology, since all sludge will be used to irrigate cropping areas, avoiding the occurrence of anaerobic conditions.

Enclosed flares will be installed to ensure that all methane produced by the anaerobic digester is efficiently combusted. Technical measures will be adopted to ensure proper flare operation and maintenance. Based on historical data from animal population and baseline studies, the estimated emission reduction of the project activity shall not exceed 60 Kt CO_2e in any year of the crediting period, as shown in Section A.4.3.

B.3. Description of the project boundary:

The project boundary is the physical and geographic sites where methane recovery occurs. Therefore, the application of treated waste to neighbouring fields occurs outside the project boundaries. The project boundary includes only the emissions (and related reductions) from the AWMS that captures and combusts methane installed by the project activity. This means that the anaerobic digester is the physical boundary of the methane recovery facility. Project boundary is shown in Figure B1 that follows:

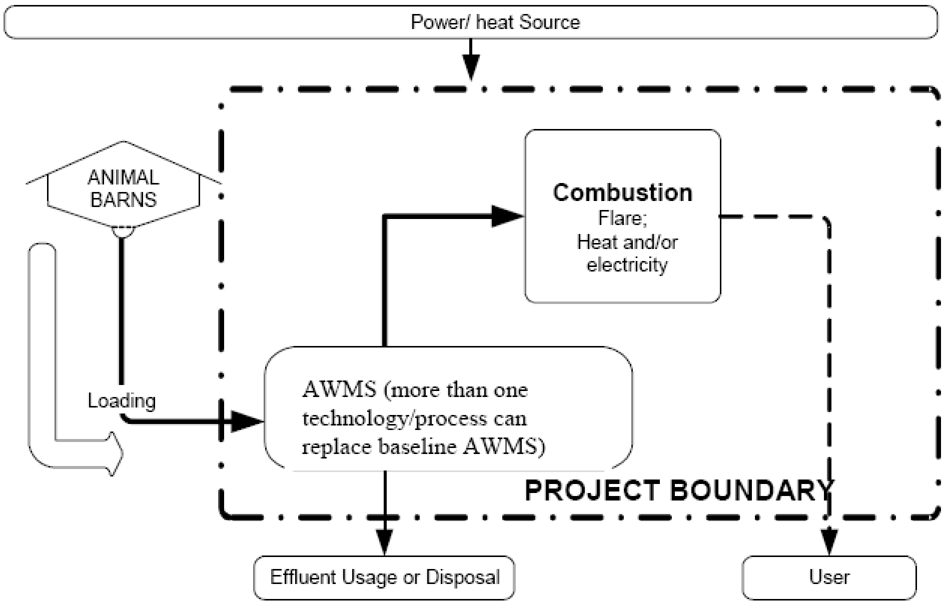

Figure B1. Project boundary

B.4. Description of baseline and its development:

The baseline emission is the amount of methane that would be released into the atmosphere during the crediting period in the absence of the project activity (ten years). The baseline emissions will be calculated as specified in paragraph 7 of AMS.III.D "The baseline scenario is the situation where, in the absence of the project activity, biomass and other organic matter are left to decay anaerobically within the project boundary and methane is emitted to the atmosphere. Baseline emissions (BEy) are calculated ex ante using the amount of the waste or raw material that would decay anaerobically in the absence of the project activity, with the most recent IPCC tier 2 approach".

Therefore, baseline emissions were determined according to the chapter 10 'Emissions from Livestock and Manure Management' under the volume 4 'Agriculture, Forestry and other Land use' of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

Step 1 – Livestock population

Animal population was determined using historical records of participating farms. Animal population was defined by two different approaches:

- Based on the average of animals confined in 2007.
- Based on the total of animals produced in 2007,

The choice of approach was based on the type of historic data available at the farms. Where farms performed monitoring of monthly livestock, the first approach was chosen. In this approach, the values used to determine livestock population are directly monitored by the farms manager. This was the case for Granja Cambrasil (except for piglets), Granja Capim, Granja Rincão dos Rocha, Granja Santo Ângelo (except for piglets), Granja Coopermil and Granja Pompermaier.

The second approach was used where farms performed monitoring of animals produced in a given year. In this approach, the number of animals produced was corrected for the average days animals are confined. This was the case for Fazenda Chapecózinho, Fazenda Coqueiros do Rio Doce, Fazenda Martelli III and to determine piglets population for Granja Cambrasil and Granja Santo Ângelo. More detail on historic livestock data can be found in Annex III.

In Granja Capim and Granja Santo Ângelo, livestock was determined as the historical livestock plus the population increase to occur before the start of the crediting period. As a conservative action, population increase was considered as the increase on installed capacity multiplied by an occupation factor based on 2007 data.

Occupation factors are determined as the ratio between the average population for a given year and the installed capacity of the farm. For Granja Capim, the increase on installed capacity is equal to 8 000 nursery and the occupation factor is equal to 86% ($^{9\ 908}/_{11\ 500}$*100). Hence, population increase for Granja Capim is equal to 6 880 nursery.

For Granja Santo Ângelo, the increase on installed capacity is equal to 3 850 nursery and 1 000 finishers. Occupation factors are equal to 85% for the Nursery Unit and 80% for the Finishing Unit. Hence, the population increase for Granja Santo Ângelo is equal to 3 272 nursery and 800 finishers.

Productive Units are similar in the participating farms, although some differences exist. A brief description of the productive units follows:

- **PPU (Piglet Producing Unit)**: This practice consists on gilts (weighting an average of 140 Kg), gestating sows (weighting an average of 160 kg), sows (weighting an average of 220 to 240 kg) that give birth 2.4 times a year on average, bearing an average 10.6 piglets per delivery and boars (weighting an average of 240kg). Piglet's are then breastfed for a 21-day period and after weaning are taken to the nursery. Piglets are transferred to the nursery weighting 6 Kg on average. Considering the 21-day periods, piglets weight around 4 Kg.
- **Nursery:** This unit consists only in swine coming from the PPU. Animals are fed for a 40-days period and sold at the age of 60 days. Animals are then transferred to the Finishing Units weighting 23 Kg on average. Considering the 40 days-period, animals in the nursery weight 14 - 15 Kg.
- **FU (Finishing Unit)**: This unit contains only weanlings from the nursery. Animals proceed through fattening up and growth until slaughter or transfer to the PPU. Slaughter is done when

animals weight around 110 kg. Animals usually remain in the FU for a period of 120 days. Considering this period, animals in the FU unit weight 68 Kg.

The livestock population for each farm is demonstrated in Table B1, bellow:

Animal category	Data	Granja Cambrasil	Granja Capim	Granja Rincão dos Rochas	Granja Santo Ângelo
Piglet Producing Unit					
Gilts	Population	-	-	-	-
	Average Weight (Kg)	-	-	-	-
Sows in gestation	Population	-	-	-	-
	Average Weight (Kg)	-	-	-	-
Sows	Population	2 809		-	2 488
	Average Weight (Kg)	215.9		-	226
Boars	Population	20		-	27
	Average Weight (Kg)	198*		-	198*
Piglets		4 049		-	3 479
	Average Weight (Kg)	4		-	4
Nursery Unit					
Nursery	Population	-	16 788	-	7 987
	Average Weight (Kg)	-	14.5	-	13.49
Finishing Unit					
Finishers	Population	-	-	6 195	2 799
	Average Weight (Kg)	-	-	65	56.85
Total Livestock	**---**	**6 878**	**16 788**	**6 195**	**16 780**

Table B1. Information on farm's livestock. Historic livestock data can be found in Annex III.
*Data on this animal category is not available. As a conservative action, IPCC default value for this parameter was chosen. See more details in Section B.6.1.

Animal category	Data	Granja COOPERMIL	Fazenda Chapecózinho	Granja Pompermaier
Piglet Producing Unit				
Gilts	Population	85	-	-
	Average Weight (Kg)	198*	-	-
Sows in gestation	Population	-	-	-
	Average Weight (Kg)	-	-	-
Sows	Population	1062	-	-
	Average Weight (Kg)	198*	-	-
Boars	Population	14	-	-
	Average Weight (Kg)	198*	-	-
Piglets		1 863	-	-
	Average Weight (Kg)	4	-	-
Nursery Unit				
Nursery	Population	2 727	-	-
	Average Weight (Kg)	15.51	-	-
Finishing Unit				
Finishers	Population	-	2 227	2 148
	Average Weight (Kg)	-	65	61.06
Total Livestock	**---**	**5 751**	**2 227**	**2 148**

Table B1 (cont). Information on farm's livestock. Historic livestock data can be found in Annex III.
* Data on this animal category is not available. As a conservative action, IPCC default value for this parameter was chosen. See more details in Section B.6.1.

Animal category	Data	Fazenda Martelli III	Fazenda Coqueiros do Rio Doce
Piglet Producing Unit			
Gilts	Population		-
	Average Weight (Kg)		-
Sows in gestation	Population		-
	Average Weight (Kg)		-
Sows	Population	607	-
	Average Weight (Kg)	198*	-
Boars	Population		-
	Average Weight (Kg)		-
Piglets	Population	897	-
	Average Weight (Kg)	3	-
Nursery Unit			
Nursery	Population	2 220	-
	Average Weight (Kg)	14	-
Finishing Unit			
Finishers	Population	3 285	6 884
	Average Weight (Kg)	65	72.89
Total Livestock	**---**	**7 009**	**6 884**

Table B1 (cont.). Information on farm's livestock. Historic livestock data can be found in Annex III.
* Data on this animal category is not available. As a conservative action, IPCC default value for this parameter was chosen. See more details in Section B.6.1.

Step 2 – Methane Emission Factors

Emission factors were determined individually for every animal category shown on Table B1. The baseline AWMS is an open anaerobic lagoon, as described on item A.4.1.4

The emission factor for each animal group is determined by the following equation:

$$EF_{CH4,i} = (Vs_{site} * Nd * Bo * DCH_4 * MCF * MS\% * GWP\_CH_4)/1000$$

Where,

$EF_{CH4,i}$: Methane emission factor for the animal category i, expressed in tCO_2e/animal/year.

Vs_{site}: Adjusted volatile solids excretion per day, expressed in kg-dm/animal/day.

Nd Number of days animals are present in containment areas

Bo: Maximum methane production capacity, in m^3 of CH_4/kg-dm

DCH_4: Density of CH_4, in kg/m^3

MCF: Methane conversion factor for the anaerobic lagoon.

MS% Fraction of waste that is treated in the baseline AWMS.

Default values are used to determine manure characteristics (regarding VS and B_0), since local data is not available. Local data collection on manure characteristics is not a viable option, since the baseline AWMS does not include monitoring of such parameters. Default values for VS and for B_0 are taken from 2006 IPCC Guidelines for National Greenhouse Gas Inventories, since national values are not available. IPCC 2006 default values for VS are adjusted for a site-specific average animal weight. More details on this procedure are provided in Section B.6.1. VS are adjusted by applying the following formula:

Adjusted volatile solids excretion (Vs_{site}):

$$VS_{site,i} = (W_{site,i} / W_{default}) * VS_{default}$$ [1]

Where,

$VS_{site,i}$: Adjusted daily volatile solid matter excretion for the animal category i, on a dry matter basis, for a specific animal category on project site, in kg-dm/animal/day.

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[1] Adapted from AMS.III.D, version 14, equation 2. The number of days in the year “y” where the treatment plant was operational (nd_y) of the referenced equation is not taken into account at this moment because it integrates the calculation of $EF_{CH4,i}$ (as nd). Therefore, VSsite represents the daily volatile solid matter excretion rate..

W_{site}: Average weight of local animal for category i, in kg.

$W_{default}$: Default value (2006 IPCC) of average weight per animal for a specific category, in kg.

$VS_{default}$: Default value (2006 IPCC) for daily volatile solid matter excretion, on a dry matter basis, for a specific animal category, in kg-dm/animal/day.

The amount of methane emitted in the baseline scenario is calculated by the equation:

$$CH_{4a} = EF_{CH4,i} * N_a$$

Where,

CH_{4a} Methane produced by the animal population of category I, expressed in tCO2e/year.

N_a Number of animals of the type i.

Step 3 – Total Baseline emissions

$$BE = \sum CH_{4a,i}$$

Where,

BE: Total baseline emissions, in tCO_2e/year.

$CH_{4a,i}$ Methane produced by the population of animal categories i.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

The additionality of the proposed project activity was defined as per guidance of the Attachment A to Appendix B of the Simplified modalities and procedures for small-scale clean development mechanism project activities.

The most probable baseline hypotheses have been selected for the proposed Project activity. In this case, the baseline scenario is determined as the scenario that represents "emissions from a technology which is economically attractive as far as the investment barriers are concerned". Therefore, this hypothesis determines the baseline scenario under a cost-benefit assessment point of view and assumes that high cost scenarios shall not be implemented. The various possible baseline scenarios, including different effluent management technologies, are described in detail in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual (Chapter 10, Table 10.18) and also in the GHG emissions inventory of the Ministry of Technology and Science

(http://www.mct.gov.br/index.php/content/ view /3881.html).

The baseline scenario for the participating farms has been defined per the following steps:

Step 1: Identifying the project activity alternatives

In the first step of the procedure to prove the additionality of the proposed project activity, the complete set of possible baseline scenarios and project activity, which are listed in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories should be taken into account.

This includes the following swine manure treatment options:

- Disposal of untreated manure to environment
- Daily spread
- Liquid/slurry
- Solid storage
- Dry lot
- Anaerobic lagoon
- Pit storage below animal confinements
- Anaerobic digester
- Deep bedding
- Composting
- Aerobic treatment
- Burned for fuel

Step 2: Identification of plausible scenarios

2.a: Consistency with mandatory laws and regulations.

Laws and regulations concerning swine confinement farms are defined by the Environmental authority in each State. In Rio Grande do Sul, FEPAM (Fundação Estadual de Proteção Ambiental Luiz Henrique Roessler) is responsible for such regulation. According to the Technical Criteria for Environmental Licensing for New Swine Raising Farms (Critérios Técnicos para o Licenciamento de Novos Emrpreendimentos Destinados à Suinocultura) of FEPAM, the only excluded scenario is the disposal of untreated manure to water streams or in Environmental Protected areas. The referenced document is available at FEPAM website, below:

http://www.fepam.rs.gov.br/central/diretrizes/diret_suinos_novos.pdf

Similar demands are made by FATMA (Fundação do Meio Ambiente), the environmental authority in Santa Catarina, by Agência Ambiental de Goiás, the environmental authority in Goiás and by SEMA-MT (Secretaria de Estado do Meio Ambiente), the environmental authority in Mato Grosso. The referenced documents are available at:

http://www.fatma.sc.gov.br/download/IN_0312/htm/In_11(Suinocultura).htm

http://www.sema.mt.gov.br/suimis/caap/SUIMIS.0028-3%20-%20Licenca%20Previa%20para%20Suinocultura.pdf

http://www3.agenciaambiental.go.gov.br/site/legislacao/01_legis_port_agenc_007_06.php

Bearing current practice in Brazil, a number of plausible scenarios have been identified from the list of possible options. The aspects that have been considered in order to identify the plausible baseline scenarios are: historic or pre-existing practices within the organization, technology available, possible and correct application of the technology in the context and assessment of national technological development.

These plausible scenarios are based on data described in the First Brazilian anthropogenic GHG emissions inventory of the Ministry of Science and Technology and EMBRAPA, available at:

(http://www.mct.gov.br/index.php/content/view/17341.html):

- Daily spread
- Composting
- Pit storage below animal confinements
- Anaerobic lagoon
- Anaerobic digester
- Aerobic digester
- Deep bedding

A justification for the inclusion/exclusion of the manure management systems that cannot be considered a plausible baseline scenario (including the proposed project activity) was determined according to the Technological Inventory of EMBRAPA for Swine Manure Management Systems, unless otherwise stated. The Technological Inventory is available at:

(http://www.cnpsa.embrapa.br/invtec/15.html)

Excluded scenarios:

The criteria used to determine the scenarios excluded are practical and economical regarding the type of technology. From these analyses, the excluded scenarios follow:

- Solid storage: Usually, the type of swine manure storage offers no protection against pathogenic vectors and, because it's a non-sealed area, releases odours that jeopardize the residents' quality of life.
- Daily spread: This system has been excluded due to the size of the livestock. Manure production is too great to allow daily spread on cropping areas. Besides, manure is handled in liquid form, as it is removed from the barns through a flushing system.
- Dry lot: This system has been excluded because it does not apply to confined animals.

- Liquid/slurry: This system was excluded because manure is removed by a flushing system that adds a considerable amount of water to the manure.
- Pit storage below animal confinements: This treatment system has been excluded due to the fact that biological manure digestion releases methane, which can intoxicate the herd when it's not properly eliminated through exhaustion systems.
- Deep bedding: According to the EMBRAPA researcher Mr. Paulo Armando de Oliveira, in his Article published in 2000 "Swine Production in Deep bedding systems: the Brazilian experience"[2], this type of treatment is inconsistent with the current productive systems adopted in Brazil, which require flushing to remove manure from the barns. Hence, this type of treatment has been excluded as a plausible scenario.
- Composting: Composting systems are not suitable for great volumes of confined swine manure. This occurs because there is too much water in the waste, which makes the drying process very hard. This treatment is more effective when dealing with the sludge resulting from bacterial decomposition processes.
- Aerobic treatment: This type of treatment is more commonly used when dealing with sludge or diluted waste. The solids in the manure are difficult to homogenize and oxygenate, which demands too much activity from the agitators. Another important consideration is the ammonium release potential from the system when it is not properly aerated. This equipment consumes high amounts of energy, which increases costs for the swine raiser.
- Burned for fuel: Animal waste is handled in a liquid form, since flushing systems are used to remove manure from the barns.

Through this analysis, the plausible scenarios have been reduced to two potential manure treatment systems:

Plausible baseline scenario: Anaerobic lagoon.

Proposed project activity: Anaerobic Digester.

Included scenarios:

[2] Available at: http://www.cnpsa.embrapa.br/down.php?tipo=publicacoes&cod_publicacao=301

- Anaerobic Lagoon: This treatment system is easy to operate, which requires little workforce and maintenance investment. It is a viable alternative and has been considered a plausible baseline scenario.
- Anaerobic digester: This system retrieves methane, which is responsible for global warming, is capable of producing biogas and biofertilizer, and also reduces odours. It requires high implementation costs and medium maintenance cost and efforts. This alternative is not very popular among Brazilian swine raisers and has been considered the project activity.

After the identification of the plausible scenarios, following the process of measurement and additionality demonstration, an analysis shall be made to demonstrate the barriers that the proposed project activity selected above will face without the CDM project register.

Step 3: ***Barrier Analysis***

This Project activity is not adopted nationally due to the following barriers:

Investment Barriers: this manure management system is regarded as one of the most advanced practices worldwide. A few countries use this technology due to high costs involved when compared to other systems. The technology applied by the project demands an investment of R$ 68 to R$165[3] (U$41 to U$98, approximately)[4] per cubic meter of installed digester capacity. Less expensive AWMS are available (as anaerobic lagoons), but result in higher GHG emissions, as demonstrated in the Technological Inventory of EMBRAPA for Swine Manure Management Systems.

Technological Barriers: In order to justify the implementation of an anaerobic digester, a great deal of manure is needed, as well as proximity and concentration of barns, since the smaller the herd, the more expensive the implementation of the system regarding cost/benefit.

Anaerobic digesters are systems that need detailed planning to be installed. Operating also involves controlled manure handling practices, constant performance checking and maintenance. This is not usually the case for baseline scenarios, where farmers have little to no control of the existing AWMS.

According to EMBRAPA researchers Mr. Airton Kunz, Mr. Carlos Cláudio Perdomo and Mr. Paulo Armando de Oliveira, in the Article published in 2004 '*Biodigesters: Advances and Drawbacks*

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[3] These values were determined based on the actual cost for the installation of the AWMS in each farm, as provided by AVESUY. To determine the investment per m^3 of installed capacity, the total cost of each AWMS was divided by the volume capacity described in Section A.4.2.

[4] Currency exchange rate of 28/04/2007 (U$1.00=R$1.676). Source: Banco Central do Brasil. Available at http://www5.bcb.gov.br/pec/conversao/Resultado.asp?idpai=convmoeda.

(Biodigestores: Avanços e Retrocessos)", the following barriers, amongst others, prevented anaerobic digesters to become common use for the treatment of swine manure:

- ✓ Lack of technical knowledge for the construction and operation of anaerobic digesters;
- ✓ High implementation and maintenance costs;
- ✓ High costs involved in using the resulting biofertilzer;
- ✓ Low efficiency in animal waste treatment, due to inadequate operation and maintenance procedures.

The referenced Article is available at:

(http://www.cnpsa.embrapa.br/index.php?ids=Sq4r54z6x&pg=1&ano=2004)

According to this article, most of these barriers are still prevailing. Despite the technological improvement in anaerobic digestion in the last 30 years, pig farmers still lack the knowledge and the assistance to successfully install and operate anaerobic digesters for the treatment of animal manure. In most cases, anaerobic digesters are built ignoring the basic principles of anaerobic digestion. This results in low efficient AWMS that are both technically and economically not viable.

EMBRAPA researchers conclude the article informing that unless proper technological transfer and technical assistance procedures are provided, anaerobic digesters might become more discredited in Brazil.

The above mentioned barriers have prevented anaerobic digesters to become the Business as Usual for manure treatment in Brazil. As demonstrated in the First Brazilian anthropogenic GHG emissions inventory of the Ministry of Science and Technology and EMBRAPA, the use of anaerobic digester is still limited for swine manure treatment.

Legal Restrictions: The Brazilian legislation related to swine confinement farms is focused on the protection of water sources and protected areas. A few water quality guidelines are determined. It is also forbidden to dispose untreated effluent into the environment, as demonstrated by FEPAM's Technical Criteria for Environmental Licensing for New Swine Raising Farms, amongst others. No specific effluent treatment or GHG emission control in swine farm operations are required.

Step 4: Common practice analysis:

The common practice analysis does not include farms that integrate registered CDM project activities. As from 19/06/2008, there are 34 registered CDM projects involving methane capture and combustion in swine confinement farms in Brazil[5].

[5] Source: UNFCCC website (http://cdm.unfccc.int/Projects/index.html)

According to the First Brazilian anthropogenic GHG emissions inventory of the Ministry of Science and Technology and EMBRAPA, the Brazilian swine manure systems can be divided into two distinct groups. The first group (occurring mainly in the states of São Paulo, Goiás and Mato Grosso) with large farms, over one thousand swine and usually treatment systems that consist of a series of stabilization lagoons and, in some cases, partly digested waste spray. And the second group (occurring mainly in the west of the state of Santa Catarina, state of Paraná and northwest of the state of Rio Grande do Sul), with small farms, distributed as follows: small (up to 100 swine), medium (100 to 300 swine) and large (over 300 swine). The treatment system commonly used is the open tank (single anaerobic lagoon), which a retention time that varies from 20 to 90 days. After that period it's applied to the soil on site or in neighbouring areas.

As described above, we are able to conclude that the usual technology applied to Brazilian swine confinement farms is based on anaerobic lagoons. Therefore the project activity, which consists on anaerobic digesters, is not similar to what can be commonly found in Brazil.

Step 5: Impact caused by the registration of the project as CDM:

As shown in the steps above, the only way to implement the proposed project activity is by overcoming the barriers mentioned and reducing the risks commonly associated to this type of project.

The potential of the CDM project, mainly the environmental and financial one, was extremely important in the decision-making process of the participating swine raisers. The implementation of such an innovative technology into the production system, which can bring great environmental improvements due to GHG emission reduction, would be impossible in the absence of the financial aid raised by the project activity.

Within the process of gathering the producers to implement the project activity it was possible to notice how resilient some of them were regarding the technology applied, which was caused mainly by the lack of information regarding economic and environmental cost/benefit. This type of situation was only clarified by the possibility of implementation of this system on the farms mentioned in the project activity.

We must also consider the development and encouragement of new technologies or the application of well-known, widespread technologies to other productive activities, as they are adjusted for highly atmospheric polluting activities (such as swine confinement farms).

As demonstrated in this fifth step of the additionality analysis, it becomes evident that the impact caused by the registration of the CDM project was decisive to overcome the barriers to the implementation of the proposed project activity.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Baseline emissions are calculated as described in Section B.4. Project emissions were determined according to the approved small-scale methodology AMS.III.D. The project emissions for the proposed project activity are defined as the amount of methane that would be emitted to the atmosphere during the crediting period due to the project activity, besides emissions associated to fossil fuel and energy consumption within project boundary. An anaerobic digester is considered the project activity and projects emissions consist of:

Ex ante estimation of Emissions from project activity ($PE_{ex\text{-}ante}$):

Four factors are considered emissions from the project activity: methane emissions from digester, methane emissions from inefficient flaring, CO_2 emissions from fossil fuel combustion and CO_2 emissions from electricity consumption. The following formulae are used to calculate these factors:

$$PE = PE_{digester} + PE_{flare} + PE_{FC,j} + PE_{EC}$$

Where,

PE	Project emissions, in tCO_2e.
$PE_{digester}$	Methane emissions from anaerobic digester, in tCO_2e.
PE_{flare}	Methane emissions from inefficiency in methane flaring in tCO_2e.
$PE_{FC,j}$	CO_2 emissions from fossil fuel combustion in process *j* of the operation of the AWMS
PE_{EC}	CO_2 emissions from electricity consumption to operate the AWMS

Methane emissions from anaerobic digester ($PE_{digester}$)

Anaerobic digester emissions were also estimated according to the Tier 2 approach of the 2006 IPCC Guidelines for Greenhouse Gas Inventories, chapter 10 'Emissions from Livestock and Manure Management' under the volume 4 'Agriculture, Forestry and other Land use'. Emissions from this source were determined through the following steps:

<u>Step 1 – Livestock population</u>

Livestock population was defined as described in section B.4. Livestock population will remain constant during the project activity, unless where otherwise stated in Section A.4.1.4.

<u>Step 2 – Methane Emission Factors</u>

Emission factors were determined individually for every animal category shown on Table B1. The emission factor for each animal group is determined by the following equation:

$$EF_{CH4,i} = (Vs_{site} * Nd * Bo * DCH_4 * MCF * MS\% * GWP\_CH_4)/1000$$

Where,

$EF_{CH4,i}$:	Methane emission factor for the animal category i, expressed in tCO_2e/animal/year.
Vs_{site}:	Adjusted volatile solids excretion per day, expressed in kg-dm/animal/day.
Nd	Number of days animals are present in containment areas
Bo:	Maximum methane production capacity, in m^3 of CH_4/kg-dm
DCH_4:	Density of CH_4, in kg/m^3
MCF:	Methane conversion factor for the anaerobic digester.
MS%	Fraction of waste that is treated in the project AWMS.

Adjusted volatile solids excretion (Vs_{site}):

$$VS_{site,i} = (W_{site,i} / W_{default}) * VS_{default}$$

Where,

$VS_{site,i}$:	Adjusted daily volatile solid matter excretion for the animal category i, on a dry matter basis, for a specific animal category on project site, in kg-dm/animal/day.
W_{site}:	Average weight of local animal for category i, in kg.
$W_{default}$:	Default value of average weight per animal for a specific category, in kg.
$VS_{default}$:	Default value (2006 IPCC) for daily volatile solid matter excretion, on a dry matter basis, for a specific animal category, in kg-dm/animal/day.

The amount of methane emitted by an animal population is calculated by the equation:

$$CH_{4a} = EF_{CH4,i} * N_a$$

Where,

CH_{4a}	Methane emissions by the animal population of category i, expressed in tCO2e/year.
N_a	Average number of animals of the type i.

Step 3 – Total methane emissions from anaerobic digester

$$PE_{digester} = \sum CH_{4a,i}$$

Where,

$PE_{digester}$:	Methane emissions from anaerobic digester.
$CH_{4a,i}$	Methane emissions by the population of animal categories , expressed in tCO2e/year.

Emissions from inefficiency in methane flaring (PE_{flare}):

Methane emissions from flaring occur due to the incomplete flaring of the methane contained in the residual gas that will be sent to the flares during the crediting period. Emissions from this source are estimated as the amount of methane emitted in the baseline scenario, corrected for the efficiency of the proposed AWMS on methane destruction, as follows:

$$PE_{Flare} = \text{Baseline } CH_{4a,i} * (1\text{-}FE)$$

Where,

PE_{flare}	Project emissions from inefficiency in methane flaring, in tCO_2e.
Baseline $CH_{4a,i}$	Amount of methane emitted in the baseline, calculated as described in Section B.4, in tCO_2e.
FE	Flare efficiency on methane destruction

CO_2 emissions from fossil fuel combustion in process *j* of the operation of the AWMS

For the ex-ante estimations, project emissions from this source are considered negligible, because the AWMS installed as the project activity will not result in increase in fossil fuel consumption. During the crediting period, however, the amount of fossil fuels used for onsite applications shall be monitored as described in Section B.7. Emission from this source shall be calculated during the crediting period as per guidance of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion". Hence, emissions from this source are calculated as:

$$PE_{FC,j} = \sum_i FC_{i,j,y} \times COEF_{i,y}$$ [6]

Where,

$FC_{i,j,y}$	Quantity of fuel type i combusted in process j during the year y (mass or volume unit/yr).
$COEF_{i,y}$	CO_2 emission coefficient of fuel type i in year y (tCO_2/mass or volume unit).

The CO_2 emission coefficient ($COEF_{,i,y}$) shall be calculated according to Option B of the referenced tool, due to the lack of data availability to use Option A. In Option B, the CO_2 emission

[6] Adapted from the Tool to calculate project or leakage CO2 emissions from fossil fuel combustion (version 02), equation (1).

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

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y}$$

Where,

$NCV_{i,y}$	Weighted average net calorific value of the fuel type i in year y (GJ/mass or volume unit).
$EFCO_{2,I,y}$	Weighted average CO_2 emission factor of fuel type i in year y (tCO2/GJ).
i	Fuel types combusted in process j during the year y

CO_2 emissions from electricity consumption to operate the AWMS

For the ex-ante estimations, project emissions from this source are considered negligible, because the AWMS installed as the project activity is not expected to result in significant increase in energy consumption. The combined electricity consumption of the electric pumps and the gas compressors for each farm is estimated as 0.8 MWh per year. During the crediting period, however, the amount of electicity used by the project activity shall be monitored as described in Section B.7. Emission from this source shall be calculated during the crediting period as per guidance of the approved methodology AMS.I-D (Grid connected renewable electricity generation), version 13.

Considering the procedures described in paragraph 11 of the referenced methodology for baseline emissions calculation, the project emissions from this source are considered as the product of the grid emissions factor times the electricity consumed by the project activity

The emission factor is calculated as a combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the 'Tool to calculate the emission factor for an electricity system', version 01.1, which is in accordance with paragraph 9(a) of AMS.I.D, version 13. Hence,

$$PE_{EC} = ECy * EF_{grid,CM,y}$$

Where,

ECy	Electricity consumed by the project activity in the year y, in MWh.
$EF_{grid,CM,y}$	Combined margin CO_2 emission factor for grid connected power generation in year y that supplies energy to the project activity.

According to the referenced tool, $EF_{grid,CM,y}$ is calculated in six steps, as described below:

STEP 1. Identify the relevant electric power system.

STEP 2. Select an operating margin (OM) method.

STEP 3. Calculate the operating margin emission factor according to the selected method.

STEP 4. Identify the cohort of power units to be included in the build margin (BM).

STEP 5. Calculate the build margin emission factor.

STEP 6. Calculate the combined margin (CM) emissions factor.

A description of how each of these steps was applied to the project activity follows:

STEP 1. Identify the relevant electric power system.

According to the tool, if the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, these delineations should be used. If such delineations are not available, project participants should define the project electricity system and any connected electricity system and justify and document their assumptions in the CDM-PDD.

For this project activity, the Brazilian DNA has published delineations regarding the electric system, by means of Resolution Number 8, from 26/05/2008[7]. This resolution defines that for CDM project activities there is a single system as delineation of the electric system for projects connected to the National Interconnected System. Since all participating farms are connected to this electric system, this delineation shall be used for the definition of $EF_{grid,CM,y}$.

STEP 2. Select an operating margin (OM) method.

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods:

(a) Simple OM, or

(b) Simple adjusted OM, or

(c) Dispatch data analysis OM, or

(d) Average OM.

The Brazilian DNA has considered the Dispatch data analysis (option C) as the most appropriate for calculating the OM emission factor of the SIN. The DNA keeps data on this emission factor on its website[8].

STEP 3. Calculate the operating margin emission factor according to the selected method.

The dispatch data analysis OM emission factor is determined based on the power units that are actually dispatched at the margin during each hour *h* where the project is displacing electricity. This approach is not applicable to historical data and, thus, requires annual monitoring of $EF_{grid,OM-DD,y}$.

[7] Available at http://www.mct.gov.br/index.php/content/view/72763.html

[8] The procedures and values adopted by the DNA are available at: http://www.mct.gov.br/index.php/content/view/74689.html

The emission factor is calculated by the following equation:

$$EF_{grid,OM-DD,y} = \frac{\sum_{h} EG_{PJ,h} \cdot EF_{EL,DD,h}}{EG_{PJ,y}}$$

Where,

$EG_{pj,h}$	Electricity displaced by the project activity in hour h of year y (MWh)
$EF_{EL,DD,h}$	CO2 emission factor for power units in the top of the dispatch order in hour h in year y (tCO_2e/MWh)
$EG_{PJ,y}$	Total electricity displaced by the project activity in year y (MWh)
h	Hours in year y in which the project activity is displacing grid electricity
y	Year in which the project activity is displacing grid electricity;

STEP 4. Identify the cohort of power units to be included in the build margin (BM).

The procedures for the determination of the BM were defined by the Brazilian DNA and are published on its website.

STEP 5. Calculate the build margin emission factor.

The build margin emission factor is equally provided by the Brazilian DNA and published on its website. The build margin emission factor is determined by the following equation:

$$EF_{grid,BM,y} = \frac{\sum_{m} EG_{m,y} \times EF_{EL,m,y}}{\sum_{m} EG_{m,y}}$$

Where,

$EF_{grid,BM,y}$	Build margin CO2 emission factor in year y (tCO_2e/MWh)
EGm,y	Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh).
$EF_{EL,m,y}$	CO2 emission factor of power unit m in year y (tCO_2e/MWh)
m	Power units included in the build margin
y	Most recent historical year for which power generation data is available

STEP 6. Calculate the combined margin (CM) emissions factor.

Finally, the combined margin emission factor is calculated by the following equation:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$$

Where,

W_{OM} Weighting of operating margin emissions factor

W_{BM} Weighting of build margin emissions factor

The default value of 0.5 shall be used for W_{OM} and W_{BM}, for the first crediting period. This value is indicated in the methodological tool for projects not involving wind and solar power generation.

The Project Participant shall obtain the emission factor as published by the Brazilian DNA for every year of the crediting period where energy is consumed by the project activity.

Leakage emissions (LE):

Leakage emissions are not considered as defined in paragraph 9 of approved small-scale methodology AMS.III.D, version 13.

Emission Reductions (ER)

In order to obtain the project activity emission reductions, project activity emissions and leakage emissions must be subtracted from the baseline emissions, as described below:

Estimated project activity emission reductions ($ER_{PA\_estimated}$):

$$ER_{PA\_estimated} = BE – PE - LE$$

Where,

$ER_{PA\_estimated}$ is expressed in tCO_2e.

BE: Total baseline emissions in tCO_2e.

PE: Total emissions from project activity.

LE Total leakage emissions.

Calculated project activity emission reductions ($ER_{PA\_calculated}$):

The actual emission reduction achieved by the project during the crediting period will be calculated using the amount of methane recovered and destroyed by the project activity, calculated as:

$$ER_{PA\_calculated} = MD_y – PE_y – Leakage$$

Where:

PEy	actual project emissions in the year y
MDy	methane captured and destroyed by the project activity in the year "y" (tCO2 e), that will be measured using the conditions of the flaring process:

$$MD_y = BG_{burnt,y} * w_{CH4,y} * D_{CH4,y} * FE * GWP_{CH4}$$

Where:

$BG_{burnt,y}$	biogas flared or used as fuel in the year "y" (m^3).
$w_{CH4,y}$	methane content in biogas in the year "y" (mass fraction).
$D_{CH4,y}$	density of methane at the temperature and pressure of the biogas in the year "y" (tonnes/m3).
FE	flare efficiency in the year "y" (fraction)
GWPCH4	Methane global warming potential (21)

Explanation of methodological choices

Default values are used to represent volatile solid excretion (Vs), methane production from treated manure (Bo) and Methane Conversion Factors (MCF). Default values have been chosen to quantify the emissions, since the existing AWMS did not include direct monitoring of such values. Determining these parameters on site is not an economically viable option. Default values for Vs are used to determine Adjusted VS values, as described above. Default values are taken from 2006 IPCC Guidelines for Greenhouse Gas Inventories, chapter 10 'Emissions from Livestock and Manure Management' under the volume 4 'Agriculture, Forestry and other Land use', unless otherwise stated. Default values for North American and Western Europe genetics were chosen, since these are the genetics used in the participating farms.

Default values for VS were adjusted for site-specific average animal weight to provide more realistic values for this parameter. This is in accordance with the following information provided in IPCC 2006:

"Even when the level of detail presented in the Tier 2 method is not possible in some countries, country-specific data elements such as animal mass, VS excretion, and others can be used to improve emission estimates."[9]

In Annex 10A.2 of Chapter 10 of IPCC 2006, default values for VS from swine are only provided for two animal categories: market swine and breeding swine. The project participant consider this approach

[9] Extracted from page 10.42 of Chapter 10 of IPCC 2006.

to be incomplete, considering that swine are classified in up to seven categories in the participating farms (gilts, sows in gestation, sows, boars, piglets, nursery and finishers).

The project participant considers that there are significant differences in animal average weight among the chosen animal categories and those described in Tables 10A-7 and 10A-8 of Chapter 10 of IPCC 2006. This is especially applicable for piglets (weighting around 3 to 4 Kg), nursery (weighting around 13 to 15 kg) and finishers (that weight from 56 to 72 Kg.

The project participant considers as a more conservative approach to correct VS for each animal category adopted in the participating farms, instead of using only two animal categories. Choosing only two categories would imply in considering piglets, nursery and finishers as market swine, with the same value for VS, which is unrealistic due to their average weight.

Carbon dioxide emissions from methane combustion (burned in the flare) are biogenic. This assumption is based on the fact that the organic matter consumed by the animals has a renewable origin (and therefore is not considered fossil). CO_2 emissions from anaerobic digestion do not represent any difference in the emission volumes between each scenario since there is no possible additional transformation once that compound is burned. Methane emissions from biogas flaring were determined as described above

The characteristics of the livestock regarding number and weight of individuals were collected on site. Therefore, the degree of uncertainty of these variables is minimal. Data on animal population and weight is monitored differently on each participating farm. Details on monitoring procedures for each farm follows:

- **Granja Cambrasil, Capim, Rincão dos Rochas and Santo Ângelo:** In all ALIBEM farms, data on animal population is collected through individual swine counting, as swine are transferred from one productive unit to another. Piglets, nursery and finishers are weighted as lots, as they are transferred from one productive unit to another. Breeders are counted twice a month. Sows are weighted as they are transferred to slaughter. Monitored data is registered in electronic spreadsheets by specific software. To determine the applied value of these parameters, historic record was used.
- **Granja COOPERMIL**: In this farm, data on animal population is collected through individual swine counting, as swine are transferred from one productive unit to another. Sample weighting is used to determine piglets and nursery weight. Animals are weighted in birth, before being transferred to the nursery and before selling. Breeders are counted on a monthly basis. Monitored data is registered in electronic spreadsheets by specific software. To determine the applied value of these parameters, historic record was used.

- **Fazenda Chapecózinho**: In this farm, finishers are counted and weighted individually by the piglets' provider, as they enter the productive unit. Animals are weighted and counted again as they exit the productive unit, before being transferred to the slaughter house. Data is recorded in spreadsheets by the piglets provider. To determine the applied value of these parameters, historic record was used..
- **Granja Pompermaier:** In this farm, finishers are counted and weighted by the piglets' provider, as they enter the productive unit. Animals are weighted and counted again as they exit the productive unit, before being transferred to the slaughter house. Data is recorded in spreadsheets by the piglets provider.. To determine the applied value of these parameters, historic record was used.
- **Fazenda Martelli III:** In this farm, data on animal population is collected through swine counting, as swine are transferred from one productive unit to another. Breeders are counted on a monthly basis. Monitored data is registered in electronic spreadsheets by specific software. To determine the applied value of these parameters, historic record was used.
- **Fazenda Coqueiros do Rio Doce:** In this farm, finishers are counted and weighted by the piglets' provider, as they enter the productive unit. Animals are weighted and counted again as they exit the productive unit, before being transferred to the slaughter house. Data is recorded in electronic spreadsheets by the piglets provider. To determine the applied value of these parameters, historic record was used.

Data on the weight of sows is only available for Alibem's farms. Data on the weight of boars was not available for any farm. Default IPCC values were adopted to determine breeder's weight where local data was not available. A value of 198 Kg/animal was extracted from Table 10A-8 of the Chapter 10 of volume 4 of the 2006 IPCC Guidelines for National GHG Inventories. This value was chosen considering the genetics, management and practices used in participating farms. Where data on market swine weight was not available, conservative values based on monitored values of other participating farms and on the farms manager opinion were adopted.

The following sources have been used to calculate the baseline and project emissions:

- Approved small-scale methodology AMS.III.D, version 13.
- Approved small-scale methodology AMS.I.D, version 13.
- 2006 IPCC Guidelines for National GHG Inventories;
- Tool to calculate project or leakage CO2 emissions from fossil fuel combustion, version 02.

- Tool to calculate the emission factor for an electricity system, version 01.1.
- First Brazilian Inventory on GHG Anthropogenic Emissions – Support Report – Agriculture and Animal Husbandry.
- Technological Inventory of EMBRAPA for Swine Manure Management Systems
- INSTITUTO NACIONAL DE METEOROLOGIA, CLIMATE DATABASE

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	**Na**
Data unit:	N/A
Description:	Average number of animals of type i
Source of data used:	Farms monitoring spreadsheets
Value applied:	Values applied are described in Table B.1.
Justification of the choice of data or description of measurement methods and procedures actually applied:	The procedures for determining this parameter are described in Section B.6.1.
Any comment:	

Data / Parameter:	$VS_{default}$
Data unit:	Kg-dm/animal/day
Description:	Daily volatile solids excretion rate
Source of data used:	2006 IPCC, Annex 10A.2, Table 10A-7 (market swine) and 10A-8 (breeding swine)
Value applied:	0.27 and 0.3 (market swine) 0.46 and 0.5 (breeding swine)
Justification of the choice of data or description of measurement methods and procedures actually applied:	Default values are applied because local data is not available. Local data collection is not a viable option for excretion rate.
Any comment:	

Data / Parameter:	VS_{site}
Data unit:	Kg-dm/animal/day
Description:	Daily volatile solids excretion rate, corrected for local animal weight
Source of data used:	2006 IPCC, Annex 10A.2, Table 10A-7 (market swine) and 10A-8 (breeding swine)
Value applied:	Values applied are described in Tables B2 to B10.
Justification of the choice of data or description of measurement methods and procedures actually	A correction of VS default value was made considering local animal weight. Default values were used for Gilts, Sows and Boars where local data was not available.

applied:	
Any comment:	

Data / Parameter:	$\mathbf{W_{default}}$
Data unit:	Kg/animal
Description:	Default animal weight per animal category
Source of data used:	2006 IPCC, Annex 10A.2, Table 10A-7and 10A-8
Value applied:	198 for breeding swine and 46 and 50 for market swine
Justification of the choice of data or description of measurement methods and procedures actually applied:	
Any comment:	These values are only used to determine VSsite, as shown in Sections B.4 and B.6.1

Data / Parameter:	Wsite
Data unit:	Kg/animal
Description:	Average animal weight per animal category
Source of data used:	Farms manager and monitoring spreadsheets
Value applied:	Values applied are described in Table B1.
Justification of the choice of data or description of measurement methods and procedures actually applied:	The procedures for determining this parameter are described in Section B.6.1.

Data / Parameter:	$\mathbf{nd_y}$
Data unit:	Days/year
Description:	Number of days animals are present in containment areas in the year y
Source of data used:	Farms managers and monitoring spreadsheets
Value applied:	306 for 2009, 59 for 2019 and 365 for the remaining years
Justification of the choice of data or description of measurement methods and procedures actually applied:	
Any comment:	

Data / Parameter:	**Bo**
Data unit:	m^3/Kg of VS
Description:	Maximum methane producing capacity for manure produced by animal type
Source of data used:	2006 IPCC, Annex 10A.2, Table 10A-7 (market swine) and 10A-8 (breeding swine)
Value applied:	0.48(North America) and 0.45 (Western Europe)
Justification of the choice of data or description of measurement methods	Default values are applied because local data is not available. Local data collection is not a viable option for methane producing capacity.

and procedures actually applied:	
Any comment:	

Data / Parameter:	**MCF**
Data unit:	Fraction or percentage
Description:	Methane Conversion Factor for baseline and project AWMS
Source of data used:	2006 IPCC Table 10.17
Value applied:	77, 78 and 79 for baseline AWMS and 10 for project AWMS
Justification of the choice of data or description of measurement methods and procedures actually applied:	Default values are applied because local data is not available. Local data collection is not a viable option for methane conversion factor. The project AWMS (anaerobic digester) is a sealed system that does not result in methane emissions. A 10% conservative factor was adopted to account for uncertainties.
Any comment:	Baseline Methane Conversion Factors were determined according to the average annual temperature for the different project sites. Temperatures were obtained from INMET (Instituto Nacional de Meteorologia) database, available at http://www.inmet.gov.br/html/clima.php#. Temperatures applied were 18ºC for the Southern region, 22ºC for the Central Region and 24ºC for the Midwest region of Brazil.

Data / Parameter:	**MS% baseline**
Data unit:	Fraction or percentage
Description:	Fraction of waste destined to the baseline AWMS
Source of data used:	Farms manager
Value applied:	100%
Justification of the choice of data or description of measurement methods and procedures actually applied:	All manure is destined to the baseline AWMS (anaerobic lagoons) in the farms.
Any comment:	

Data / Parameter:	**MS% project activity**
Data unit:	Fraction or percentage
Description:	Fraction of waste destined to the project AWMS
Source of data used:	AVESUY
Value applied:	100%
Justification of the choice of data or description of measurement methods and procedures actually applied:	All manure will be destined to the project AWMS (anaerobic digesters) in the farms.
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

Baseline emissions were determined as described in section B.4. Project emissions and emissions reductions were determine through equations shown in section B.6.1. A summary of emission reductions for each farm are shown in Tables B.2 to B.10:

Granja Cambrasil											
Baseline emissions											
Animal category	Na	Wdefault	Wsite	Vssite	Bo	DCH4	MS%	MCF	GWPCH4	EFi	Annual CH4 emissions (in tCO2e)
Gilts											
Sows in gestation											
Sows	2 809	198	216	0.5016	0.48	0.00067	100	0.77	21	0.893	2 507
Boars	20	198	198	0.4600	0.48	0.00067	100	0.77	21	0.819	16
Piglets	4 049	50	4.00	0.0240	0.48	0.00067	100	0.77	21	0.043	173
Nursery											
Finishers											
									Baseline emissions		**2 696**
Project emissions											
Animal category	Na	Wdefault	Wsite	Vssite	Bo	DCH4	MS%	MCF	GWPCH4	EFi	Annual CH4 emissions (in tCO2e)
Gilts											
Sows in gestation											
Sows	2 809	198	216	0.5016	0.48	0.00067	100	0.10	21	0.116	326
Boars	20	198	198	0.4600	0.48	0.00067	100	0.10	21	0.106	2
Piglets	4 049	50	4.00	0.0240	0.48	0.00067	100	0.10	21	0.006	22
Nursery											
Finishers											
									PEdigester		**350**
									PEflare		**270**
									Project emissions		**620**

Table B2. Baseline and project emissions for Granja Cambrasil.

Granja Capim											
Baseline emissions											
Animal category	Na	Wdefault	Wsite	Vssite	Bo	DCH4	MS%	MCF	GWPCH4	EFi	Annual CH4 emissions (in tCO2e)
Gilts											
Sows in gestation											
Sows											
Boars											
Piglets											
Nursery	16 788	50	14.50	0.0870	0.48	0.00067	100	0.77	21	0.155	2 599
Finishers											
									Baseline emissions		**2 599**
Project emissions											
Animal category	Na	Wdefault	Wsite	Vssite	Bo	DCH4	MS%	MCF	GWPCH4	EFi	Annual CH4 emissions (in tCO2e)
Gilts											
Sows in gestation											
Sows											
Boars											
Piglets											
Nursery	16 788	50	14.50	0.0870	0.48	0.00067	100	0.10	21	0.020	338
Finishers											
									PEdigester		**338**
									PEflare		**260**
									Project emissions		**597**

Table B3. Baseline and project emissions for Granja Capim.

Granja Rincão dos Rocha											
Baseline emissions											
Animal category	Na	Wdefault	Wsite	Vssite	Bo	DCH4	MS%	MCF	GWPCH4	EFi	Annual CH4 emissions (in tCO2e)
Gilts											
Sows in gestation											
Sows											
Boars											
Piglets											
Nursery											
Finishers	6 195	50	65.00	0.3900	0.48	0.00067	100	0.77	21	0.694	4 299
									Baseline emissions		**4 299**
Project emissions											
Animal category	Na	Wdefault	Wsite	Vssite	Bo	DCH4	MS%	MCF	GWPCH4	EFi	Annual CH4 emissions (in tCO2e)
Gilts											
Sows in gestation											
Sows											
Boars											
Piglets											
Nursery											
Finishers	6 195	50	65.00	0.3900	0.48	0.00067	100	0.10	21	0.090	558
									PEdigester		**558**
									PEflare		**430**
									Project emissions		**988**

Table B4. Baseline and project emissions for Granja Rincão dos Rochas

Granja Santo Ângelo											
Baseline emissions											
Animal category	Na	Wdefault	Wsite	Vssite	Bo	DCH4	MS%	MCF	GWPCH4	EFi	Annual CH4 emissions (in tCO2e)
Gilts											
Sows in gestation											
Sows	2 488	198	226	0.5251	0.48	0.00067	100	0.77	21	0.934	2 325
Boars	27	198	198	0.4600	0.48	0.00067	100	0.77	21	0.819	22
Piglets	3 479	50	4	0.0240	0.48	0.00067	100	0.77	21	0.043	149
Nursery	7 987	50	13	0.0809	0.48	0.00067	100	0.77	21	0.144	1 150
Finishers	2 799	50	57	0.3411	0.48	0.00067	100	0.77	21	0.607	1 699
									Baseline emissions		**5 345**
Project emissions											
Animal category	Na	Wdefault	Wsite	Vssite	Bo	DCH4	MS%	MCF	GWPCH4	EFi	Annual CH4 emissions (in tCO2e)
Gilts											
Sows in gestation											
Sows	2 488	198	226	0.5251	0.48	0.00067	100	0.10	21	0.121	302
Boars	27	198	198	0.4600	0.48	0.00067	100	0.10	21	0.106	3
Piglets	3 479	50	4	0.0240	0.48	0.00067	100	0.10	21	0.006	19
Nursery	7 987	50	13	0.0809	0.48	0.00067	100	0.10	21	0.019	149
Finishers	2 799	50	57	0.3411	0.48	0.00067	100	0.10	21	0.079	221
									PEdigester		**694**
									PEflare		**534**
									Project emissions		**1 229**

Table B5. Baseline and project emissions for Granja Santo Ângelo for 2009 and following years.

Granja COOPERMIL											
Baseline emissions											
Animal category	Na	Wdefault	Wsite	Vssite	Bo	DCH4	MS%	MCF	GWPCH4	EFi	Annual CH4 emissions (in tCO2e)
Gilts	85	198	198	0.4600	0.45	0.00067	100	0.77	21	0.819	70
Sows in gestation											
Sows	1 062	198	198	0.4600	0.45	0.00067	100	0.77	21	0.819	869
Boars	14	198	198	0.4600	0.45	0.00067	100	0.77	21	0.819	11
Piglets	1 863	50	3.75	0.0225	0.45	0.00067	100	0.77	21	0.040	75
Nursery	2 727	50	14.96	0.0898	0.45	0.00067	100	0.77	21	0.160	436
Finishers											
									Baseline emissions		**1 460**
Project emissions											
Animal category	Na	Wdefault	Wsite	Vssite	Bo	DCH4	MS%	MCF	GWPCH4	EFi	Annual CH4 emissions (in tCO2e)
Gilts	85	198	198	0.4600	0.45	0.00067	100	0.10	21	0.106	9
Sows in gestation											
Sows	1 062	198	198	0.4600	0.45	0.00067	100	0.10	21	0.106	113
Boars	14	198	198	0.4600	0.45	0.00067	100	0.10	21	0.106	1
Piglets	1 863	50	3.75	0.0225	0.45	0.00067	100	0.10	21	0.005	10
Nursery	2 727	50	14.96	0.0898	0.45	0.00067	100	0.10	21	0.021	57
Finishers											
									PEdigester		**190**
									PEflare		**146**
									Project emissions		**336**

Table B6. Baseline and project emissions for Granja COOPERMIL.

FAZENDA CHAPECÓZINHO											
Baseline emissions											
Animal category	Na	Wdefault	Wsite	Vssite	Bo	DCH4	MS%	MCF	GWPCH4	EFi	Annual CH4 emissions (in tCO2e)
Gilts											0
Sows in gestation											0
Sows											0
Boars											0
Piglets											0
Nursery											0
Finishers	2 227	50	65.00	0.3900	0.48	0.00067	100	0.77	21	0.694	1 580
									Baseline emissions		**1 580**
Project emissions											
Animal category	Na	Wdefault	Wsite	Vssite	Bo	DCH4	MS%	MCF	GWPCH4	EFi	Annual CH4 emissions (in tCO2e)
Gilts											0
Sows in gestation											0
Sows											0
Boars											0
Piglets											0
Nursery											0
Finishers	2 227	50	65.00	0.3900	0.48	0.00067	100	0.10	21	0.090	205
									PEdigester		**205**
									PEflare		**158**
									Project emissions		**363**

Table B7. Baseline and project emissions for Fazenda Chapecózinho.

Granja Pompermaier											
Baseline emissions											
Animal category	Na	Wdefault	Wsite	Vssite	Bo	DCH4	MS%	MCF	GWPCH4	EFi	Annual CH4 emissions (in tCO2e)
Gilts											
Sows in gestation											
Sows											
Boars											
Piglets											
Nursery											
Finishers	2 148	50	61.06	0.3664	0.48	0.00067	100	0.77	21	0.652	1 400
									Baseline emissions		**1 400**
Project emissions											
Animal category	Na	Wdefault	Wsite	Vssite	Bo	DCH4	MS%	MCF	GWPCH4	EFi	Annual CH4 emissions (in tCO2e)
Gilts											
Sows in gestation											
Sows											
Boars											
Piglets											
Nursery											
Finishers	2 148	50	61.06	0.3664	0.48	0.00067	100	0.77	21	0.085	182
									PEdigester		**182**
									PEflare		**140**
									Project emissions		**322**

Table B8. Baseline and project emissions for Granja Pompermaier.

FAZENDA MARTELLI III											
Baseline emissions											
Animal category	Na	Wdefault	Wsite	Vssite	Bo	DCH4	MS%	MCF	GWPCH4	EFi	Annual CH4 emissions (in tCO2e)
Gilts											
Sows in gestation											
Sows	607	198	198	0.5000	0.48	0.00067	100	0.79	21	0.974	591
Boars											
Piglets	897	46	3.0	0.0176	0.48	0.00067	100	0.79	21	0.034	31
Nursery	2 220	46	14.0	0.0822	0.48	0.00067	100	0.79	21	0.160	355
Finishers	3 285	46	65.00	0.3815	0.48	0.00067	100	0.79	21	0.743	2 441
									Baseline emissions		**3 418**
Project emissions											
Animal category	Na	Wdefault	Wsite	Vssite	Bo	DCH4	MS%	MCF	GWPCH4	EFi	Annual CH4 emissions (in tCO2e)
Gilts											
Sows in gestation											
Sows	607	198	198	0.5000	0.48	0.00067	100	0.79	21	0.123	75
Boars											
Piglets	897	46	3.0	0.0176	0.48	0.00067	100	0.79	21	0.004	4
Nursery	2 220	46	14.0	0.0822	0.48	0.00067	100	0.79	21	0.020	45
Finishers	3 285	46	65.00	0.3815	0.48	0.00067	100	0.79	21	0.094	309
									PEdigester		**433**
									PEflare		**342**
									Project emissions		**774**

Table B9. Baseline and project emissions for Fazenda Martelli III.

Fazenda Coqueiros do Rio Doce											
Baseline emissions											
Animal category	Na	Wdefault	Wsite	Vssite	Bo	DCH4	MS%	MCF	GWPCH4	EFi	Annual CH4 emissions (in tCO2e)
Gilts											
Sows in gestation											
Sows											
Boars											
Piglets											
Nursery											
Finishers	6 884	46	72.89	0.4278	0.48	0.00067	100	0.78	21	0.823	5 663
									Baseline emissions		**5 663**
Project emissions											
Animal category	Na	Wdefault	Wsite	Vssite	Bo	DCH4	MS%	MCF	GWPCH4	EFi	Annual CH4 emissions (in tCO2e)
Gilts											
Sows in gestation											
Sows											
Boars											
Piglets											
Nursery											
Finishers	6 884	46	72.89	0.4278	0.48	0.00067	100	0.78	21	0.105	726
									PEdigester		**726**
									PEflare		**566**
									Project emissions		**1 292**

Table B10. Baseline and project emissions for Fazenda Coqueiros do Rio Doce.

B.6.4 Summary of the ex-ante estimation of emission reductions:

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)
2009	5 467	23 860	Neglected	**18 393**
2010	6 522	28 461	Neglected	**21 939**
2011	6 522	28 461	Neglected	**21 939**
2012	6 522	28 461	Neglected	**21 939**
2013	6 522	28 461	Neglected	**21 939**
2014	6 522	28 461	Neglected	**21 939**
2015	6 522	28 461	Neglected	**21 939**
2016	6 522	28 461	Neglected	**21 939**
2017	6 522	28 461	Neglected	**21 939**
2018	6 522	28 461	Neglected	**21 939**
2019	1 054	4 600	Neglected	**3 546**
Total (tCO_2e)	**65 216**	**284 611**	**Neglected**	**219 390**

B.7 Application of a monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

Data / Parameter:	**Sludge removal**
Data unit:	Numeric frequency
Description:	Sludge removal count
Source of data to be used:	Amazon Carbon Data collection and Monitoring spreadsheets
Value of data applied for the purpose of calculating expected emission reductions in section B.5	N/A
Description of measurement methods and procedures to be applied:	Measured each time sludge removal is performed. Proper disposition of sludge shall be accomplished to avoid anaerobic conditions that can lead to methane emissions.
QA/QC procedures to be applied:	Amazon Carbon will provide good practice guidance and training for farms personnel. This parameter will be electronically recorded in spreadsheets. Back up copies shall be made weekly.
Any comment:	Data will be available for the duration of the crediting period plus 2 years.

Data / Parameter:	**BGburnt**
Data unit:	m^3
Description:	**Biogas Burnt or used as fuel**
Source of data to be used:	Amazon Carbon Data collection and Monitoring spreadsheets
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Not applicable
Description of measurement methods and procedures to be applied:	Biogas flow will be continuously measured by Roots Special Service Meters, with an accuracy of +/- 0.55% and electronically recorded hourly by a PLC system. Biogas flow will also be measured to determine the flare efficiency default values,
QA/QC procedures to be applied:	Biogas flow meter will be subject to constant checking and maintenance. Data will be recorded automatically by the PLC and will be made available online for Amazon Carbon through PC terminals.
Any comment:	The biogas flow will be monitored to perform continuous check of compliance with the manufacturer´s specifications of the flare device (regarding gas flow). If in any specific hour this parameters is out of the range of specification, 50 % of default value for flare efficiency shall be used for this specific hour.Data will be available for the duration of the crediting period plus 2 years. Monitored data on this parameter will be used to determine Methane flared, as described bellow.

Data / Parameter:	**CCH_4**
Data unit:	Fraction or percentage
Description:	Methane content in biogas
Source of data to be used:	Amazon Carbon Data collection and Monitoring spreadsheets
Value of data applied for the purpose of calculating expected emission reductions in section B.5	70%
Description of measurement methods and procedures to be applied:	Measured and recorded on a daily basis by dual wavelength Infra-red refrigerant gas sensors. This sensor has a accuracy of +-2.5%. Analysis will be stored in PC terminals, organized in spread sheets. A 95% confidence level will be ensured through maintenance and calibration of gas sensors.
QA/QC procedures to be applied:	Biogas analyser will be subject to constant checking and maintenance. Data will be recorded automatically and will be available online for Amazon Carbon
Any comment:	Data will be available for the duration of the crediting period plus 2 years.

Data / Parameter:	**Methane flared**
Data unit:	Kg
Description:	Methane flared or used as fuel
Source of data to be used:	Amazon Carbon Data collection and Monitoring spreadsheets
Value of data applied	Not applicable

for the purpose of calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	The amount of methane flared will be determined as the mass flow rate of methane multiplied by the system efficiency on methane destruction.
QA/QC procedures to be applied:	All sensors and meters will be subject to maintenance and calibration. Data to determine the methane flared will be digitally recorded and stored by the PLC.
Any comment:	Data will be available for the duration of the crediting period plus 2 years.

Data / Parameter:	**RGT**
Data unit:	ºC
Description:	Residual Gas temperature
Source of data to be used:	Amazon Carbon Data collection and Monitoring spreadsheets
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Not applicable. Residual Gas temperature will be monitored to determine the density of methane combusted during the project activity. This data will be automatically recorded by biogas flow meter.
Description of measurement methods and procedures to be applied:	Measured by Roots Special Service Meters, with an accuracy of +/- 0.55% and recorded automatically by the PLC.
QA/QC procedures to be applied:	Roots Special Service Meters are built and calibrated according to national and international standards. Recalibration, testing and maintenance will be performed during the crediting period. More details are available in Annex IV
Any comment:	Data will be available for the duration of the crediting period plus 2 years.

Data / Parameter:	**RGP**
Data unit:	Bar
Description:	Residual Gas Pressure
Source of data to be used:	Amazon Carbon Data collection and Monitoring spreadsheets
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Not applicable. Residual Gas pressure will be monitored to determine the density of methane combusted during the project activity.
Description of measurement methods and procedures to be applied:	Measured by LD301 Smart Pressure Transmitter Series with an accuracy of +/- 0.075% and recorded automatically by the PLC and the pressure controlling devices.
QA/QC procedures to be applied:	LD301Smart Pressure Transmitter Series will be subject to constant checking and maintenance. Data will be recorded automatically will be available online for Amazon Carbon

Any comment:	Data will be available for the duration of the crediting period plus 2 years.

Data / Parameter:	**Methane density**
Data unit:	Kg/m^3
Description:	Density of flared methane
Source of data to be used:	Amazon Carbon Data collection and Monitoring spreadsheets
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.67 (extracted from approved small scale methodology AMS.III.D, version 14 and adjusted for the chosen Data unit).
Description of measurement methods and procedures to be applied:	Methane density will be determined through measurement of temperature and pressure of the residual biogas.
QA/QC procedures to be applied:	Temperature and pressure sensors will be subject to constant maintenance and calibration
Any comment:	Data will be available for the duration of the crediting period plus 2 years.

Data / Parameter:	**ExGT**
Data unit:	ºC
Description:	Temperature of the exhaust gas
Source of data to be used:	Amazon Carbon Data collection and Monitoring spreadsheets
Value of data applied for the purpose of calculating expected emission reductions in section B.5	>500ºC
Description of measurement methods and procedures to be applied:	Measured and recorded automatically by type K temperature sensors within the combustion systems. This parameter is measured to determine the fraction of time the flare is operational and to determine flare efficiency default values.
QA/QC procedures to be applied:	Temperature sensors are made to operate in a temperature range of 0 to 1280ºC. This type of sensor provides +- 2.2ºC accuracy. Data will be recorded automatically by the PLC with 100% precision and will be available online for Amazon Carbon.
Any comment:	The temperature of the exhaust gas will be measured to determine flare efficiency default values. A default value of 90% will be adopted for the fraction of time the temperature is above 500ºC. Continuous check of compliance with the manufacturer´s specifications of the flare device (regarding temperature of the exhaust gas) will be done. If in any specific hour any of the parameters is out of the range of specifications, 50 % of default value shall be used for this specific hour. In the cases where the temperature of the exhaust gas is lower than 500ºC the flaring efficiency will be considered 0%. Data will be available for the duration of the crediting period plus 2 years.

Data / Parameter:	**GWP CH4**
Data unit:	tCO_2/tCH_4
Description:	Methane Global Warming Potential, valid for the relevant commitment period
Source of data to be used:	2006 IPCC
Value of data applied for the purpose of calculating expected emission reductions in section B.5	21
Description of measurement methods and procedures to be applied:	GWPCH4 will be obtained from the most recent IPCC Guidelines for National Greenhouse Gas Inventories
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	**FCi,j,y**
Data unit:	m^3/year
Description:	Quantity of fuel type i combusted in process j during the year y
Source of data to be used:	Amazon Carbon Data collection and Monitoring spreadsheets
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Not applicable. Emissions from this source are considered insignificant for the calculation of expected emission reductions. The AWMS installed as the project activity shall not result in a onsite increase in fossil fuel consumption.
Description of measurement methods and procedures to be applied:	Volume meters shall be used to determine this parameter for each farm individually. In cases where fuel is supplied from small daily tanks, rulers shall be used to determine volume of the fuel consumed. The ruler gauge shall be part of the daily tank and calibrated at least once a year and have a book of control for recording the measurements (on a daily basis or per shift).
QA/QC procedures to be applied:	Meters shall will be subject to constant maintenance and be calibrated on an annual basis. Metes shall be in accordance with national standards. The consistency of metered fuel consumption quantities should be cross-checked by an annual energy balance that is based on purchased quantities and stock changes.
Any comment:	Data will be available for the duration of the crediting period plus 2 years.

Data / Parameter:	**ρi,y**
Data unit:	Mass unit/volume unit
Description:	Weighted average density of fuel type i in year y
Source of data to be used:	National default values shall be used, as published by the Agência Nacional do Petróleo (Brazillian Agency of Petroleum)
Value of data applied for the purpose of	Not applicable. Emissions from this source are considered insignificant for the calculation of expected emission reductions. The AWMS installed as the project

calculating expected emission reductions in section B.5	activity shall not result in a onsite increase in fossil fuel consumption.
Description of measurement methods and procedures to be applied:	This parameter will be obtained from the most recent publication of the referenced source.
QA/QC procedures to be applied:	
Any comment:	This parameter is adopted even though Option B of the Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion is used to calculate COEF,$_{i,y..}$ It is used to convert the monitored values of FCi,j,y for each individual farm from volume to mass. Data from the Brazilian Agency is available at: http://www.anp.gov.br/doc/audiencia_publica/Resolucao_Diesel_Padrao_090304.pdf. Data will be available for the duration of the crediting period plus 2 years.Data will be available for the duration of the crediting period plus 2 years.

Data / Parameter:	**$NCV_{i,y}$**
Data unit:	GJ/ton
Description:	Weighted average net calorific value of fuel type i in year y
Source of data to be used:	Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories (upper limit of uncertainty at a 95% confidence interval).
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Not applicable. Emissions from this source are considered insignificant for the calculation of expected emission reductions.
Description of measurement methods and procedures to be applied:	This parameter will be obtained from the most recent IPCC Guidelines for National Greenhouse Gas Inventories.
QA/QC procedures to be applied:	
Any comment:	Data will be available for the duration of the crediting period plus 2 years.

Data / Parameter:	**$EFCO_2$**
Data unit:	tCO_2/JG
Description:	Weighted average CO_2 emission factor of fuel type i in year y
Source of data to be used:	Table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories (upper limit of uncertainty at a 95% confidence interval).
Value of data applied for the purpose of calculating expected emission reductions in	Not applicable. Emissions from this source are considered insignificant for the calculation of expected emission reductions.

section B.5	
Description of measurement methods and procedures to be applied:	This parameter will be obtained from the most recent IPCC Guidelines for National Greenhouse Gas Inventories.
QA/QC procedures to be applied:	
Any comment:	Data will be available for the duration of the crediting period plus 2 years.

Data / Parameter:	**EC_y**
Data unit:	MWh
Description:	Electricity consumed by the project activity in the year y
Source of data to be used:	Amazon Carbon Data collection and Monitoring spreadsheets
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Not applicable. For the ex-ante estimations, project emissions from this source are considered negligible, because the AWMS installed as the project activity is not expected to result in significant increase in energy consumption.
Description of measurement methods and procedures to be applied:	Dedicated electricity meters shall be installed to measure the electricity consumed for the operation of the AWMS for each farm individually.
QA/QC procedures to be applied:	Meters shall will be subject to constant maintenance and be calibrated on an annual basis.
Any comment:	Data will be available for the duration of the crediting period plus 2 years.

Data / Parameter:	**$EF_{grid,CM,y}$**
Data unit:	tCO_2e/MWh
Description:	Combined margin CO_2 emission factor for grid connected power generation in year y that supply energy to the project activity.
Source of data to be used:	Brazilian DNA (Comissão Interministerial de Mudança Global do Clima)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Not applicable. For the ex-ante estimations, project emissions from this source are considered negligible, because the AWMS installed as the project activity is not expected to result in significant increase in energy consumption.
Description of measurement methods and procedures to be applied:	The methods applied for the determination of this parameter are described in Section b.6.1. The project participants will use the emission factors published on the DNA website and will monitor and update the applied values annually.
QA/QC procedures to be applied:	Values published by the Brazilian DNA will be digitally stored by the Project Participants. Values applied on calculations shall be carefully compared to published data.
Any comment:	The methods applied by the Brazilian DNA for determining the operating margin (Dispatch data analysis OM) is not applicable for historic data and, therefore,

	requires the annual monitoring of $EF_{grid,OM-DD,y}$. Data will be available for the duration of the crediting period plus two years

B.7.2 Description of the monitoring plan:

Amazon Carbon and all participating farms will perform monitoring of methane capture and combustion during the crediting period. Farms personnel will operate the installed AWMS in all farms. Amazon Carbon will provide training on data collection and storage, as well as emergency reporting procedures.

Amazon Carbon will also execute on-site inspections on each individual farm for each verification period, to confirm that the monitoring plan is being executed properly.

The variables monitored are described in Section B.7.1 above. Emission reductions and project emissions will be determined according to the monitored amount of methane captured and destroyed. Data used for the ex ante estimation of baseline and project emissions (described in Section B.6.2) do not need to be monitored.

The actual project emissions will be calculated according to the monitored amount of methane captured and destroyed by the project activity and the monitored amount of fossil fuel and electricity used for onsite applications. The amount of methane sent to the flare will be determined by monitoring the amount of biogas flared and the methane content in the biogas, monitored as described bellow. Hence,

$$PE_{digester,y} = BG_{burnt} * C_{CH4} * MCF * GWPCH4$$

Methane emissions from inefficiency in methane flaring are incorporated in the calculation of Methane captured and destroyed by the project activity in the year “y” (MDy), as described in Section B.6.1. Through this equation, inefficiencies in the flaring process are accounted since the total amount of biogas flared is multiplied by a flaring efficiency factor of 90%.

Sludge removal will be performed by farms personnel. Guidance for sludge removal and application was developed by AVESUY and will be made available in the projects sites during the crediting period (see Annex IV). Data on sludge removal will be recorded every time sludge removal is performed in electronic spreadsheets. The final destination of sludge will also be monitored to ensure that anaerobic conditions are avoided.

In every farm, all monitoring equipment (flow meter, gas analyser, biogas pressure and temperature analyser, exhaust gas temperature analyser) will be controlled by a PLC and connected to a PC terminal, allowing the electronic collection and recording of monitoring data.

The Programmable Logic Controller (PLC) is a digital computer used for automation of industrial processes. Unlike general-purpose computers, the PLC is designed for multiple inputs and output arrangements, extended temperature ranges, immunity to electrical noise, and resistance to vibration and impact. The PLC will register monitoring information on an hourly basis. 100% precision is ensured due to the automation of the process.

Through the PC terminals all participating farms and Amazon Carbon will have online access to monitoring variables via internet connection. Data will also be stored in data discs by all participating farms and by Amazon Carbon, providing redundancy in data storage. All data will be stored and made available for the crediting period plus two years.

The PC terminals in every farm will store all data necessary to determine the amount of methane fuelled and flared in a given crediting year. These terminals will also store any additional data that is necessary to calculate emission reductions.

The amount of biogas produced and sent to the flare will be continuously measured by ROOTS Special Service Flow meters. Details on the flow meter are provided in Annex IV. The amount of methane actually destroyed will be obtained by monitoring the methane content in the biogas, the pressure and temperature of the biogas previous to the flaring process.

The methane content in the biogas will be analysed by a Dual wavelength Infra-red Refrigerant Gas sensor. This sensor has a measurement range of 0-100% and an accuracy range of 2.5%. This gas sensor will be periodically connected to the gas pipeline in a specific valve and perform gas analysis. Additional information on the gas analyzer is available in Annex IV. Biogas pressure and temperature will be measured by monitoring components within the combustion system. Biogas pressure and temperature will be monitored to determine methane density during the project activity.

The efficiency of the flaring process will not be directly measured. Default values will be adopted, and the temperature of the exhaust gas will be monitored. Flare efficiency will be considered 90% in the fraction of time the exhaust gas temperature is higher than 500ºC. In the cases where the temperature of the exhaust gas is lower than 500ºC the flaring efficiency will be considered 0%.

Continuous check of compliance with the manufacturer´s specifications of the flare device (regarding biogas flow and temperature of the exhaust gas) will be done. If in any specific hour any of these parameters are out of the range of specifications, 50 % of default value shall be used for this specific hour. In the cases where the temperature of the exhaust gas is lower than 500ºC the flaring efficiency will be considered 0%.

The manufacturer's specifications of the flare devices are described in Annex 4. Compliance with the specifications will be monitored as described in Section B.7.1 (see items ExGT and BGburnt).

The amount of fossil fuel used for onsite application shall be monitored per guidance of the Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion. In case fossil fuels are actually combusted for onsite application (which is not expected by the Project Participant), the quantity of fuel type i combusted in process j during the year y ($FC_{i,j,y}$) shall be continuously measured for each farm individually in volume (m^3/year) by ruler gauges that integrate daily tanks used for fossil fuel supply.

The CO_2 emission coefficient ($COEF_{,i,y}$) shall be calculated according to Option B of the referenced tool, due to the lack of data availability to use Option A. Default values shall be used for the determination of $NCV_{i,y}$ and $EFCO_{2,I,y}$, as described in Section B.7.1.

The electricity consumed by the project activity shall be continuously measured by dedicated electricity meters for each farm individually. Electricity shall be continuously measured and aggregated on an annual basis. The grid emission factor shall be defined as per guidance of the Tool to calculate the emission factor for an electricity system and data published by the Brazilian DNA shall be adopted.

B.8 Date of completion of the application of the baseline and monitoring methodology and the name of the responsible person(s)/entity(ies)

Date of completion of the application of the methodology to this project activity: 19/06/2008.

Name of the person/entity responsible for the application of the baseline and monitoring methodology to this project activity:

Amazon Carbon S/S Ltda (project participant)**.**

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SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

The starting date of the project activity is 01/11/2007.

C.1.2. Expected operational lifetime of the project activity:

25 years, 0 months.

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

Not applicable.

C.2.1.2. Length of the first crediting period:

Not applicable.

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

The start of the crediting period is 01/03/2009 or on the date of the registration of the project activity, whichever is later.

C.2.2.2. Length:

The duration of the project activity is 10 years, 0 months.

SECTION D. Environmental impacts

D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

The Brazilian environmental legislation forces swine breeders to go through a process of environmental licensing where environmental impacts are assessed. All participating farms are in accordance with the environmental authority. Licenses have already been issued or are in process. Local environmental authorities shall be informed of the installation of anaerobic digesters, but no Environmental Impact Study is necessary.

The AWMS proposed by the project will result in various environmental benefits, as described in Section A.4.3 of this document. The project, besides promoting GHG emission reduction, will also contribute to sustainable development. The anaerobic digester reduces the organic matter in the effluent when compared to anaerobic lagoons. Besides, the odour arising from the volatile molecules, which result from the anaerobic digestion, is considerably diminished since the gases produced are contained by a sealed cover and then flared. No transboundaries impacts are expected to result from the project activity.

The pro-active stand of Amazon Carbon and all participating farms to implement anaerobic digesters on swine farms is a great challenge that must be regarded as an initiative that will encourage other swine breeders to improve the existing AWMS, aiming to reduce the overall environmental impacts caused by this activity.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

No action required. Environmental impacts of the project activity are considered positive since they contribute to local, regional and global sustainable development.

SECTION E. Stakeholders' comments

E.1. Brief description how comments by local stakeholders have been invited and compiled:

The invitation to the project stakeholders was made as per the "September 11th, 2003 Resolution No. 1 (Approved by Administrative Law Nr 863, of November 27th, 2003 and published in the "Diário Oficial da República Federativa do Brasil" on December 2nd, 2003.)". Invitations were sent by postal service, on 07/02/2008.The following stakeholders were invited:

ENTITY	CITY
PREFEITURA MUNICIPAL DE SANTA ROSA	SANTA ROSA
SECRETARIA DE MEIO AMBIENTE E AGROPECUÁRIA	SANTA ROSA
CAMARA MUNICPAL DE SANTA ROSA	SANTA ROSA
PROMOTORIA DE JUSTIÇA CÍVEL DE SANTA ROSA	SANTA ROSA
ASSOCIAÇÃO LAJADO MANCHINHA	SANTA ROSA
ASSOCIAÇÃO BAIRRO SULINA	SANTA ROSA
ASSOCIAÇÃO VILA BOM RETIRO	SANTA ROSA
ASSOCIAÇÃO VILA JARDIM	SANTA ROSA
SECRETARIA ESTADUAL DE MEIO AMBIENTE	PORTO ALEGRE
FÓRUM BRASILEIRO DE ONGS E MOVIMENTOS SOCIAIS PARA O MEIO AMBIENTE E DESENVOLVIMENTO	BRASÍLIA
PREFEITURA MUNICIPAL DE SANTO ANGELO	SANTO ANGELO
DEPARTAMENTO MUNICPAL DE MEIO AMBIENTE	SANTO ANGELO
CÂMARA MUNICIPAL DE SANTO ÂNGELO	SANTO ANGELO
PROMOTORIA DE JUSTIÇA CÍVEL DE SANTO ÂNGELO	SANTO ANGELO

ALIANÇA	SANTO ANGELO
ALVORADA	SANTO ANGELO
ASSISTENCIAL BRAGA	SANTO ANGELO
CENTRO SUL	SANTO ANGELO
COHAB	SANTO ANGELO
COLMEIA	SANTO ANGELO
DIDO I	SANTO ANGELO
DITZ	SANTO ANGELO
FAVA	SANTO ANGELO
PREFEITURA MUNICIPAL DE MARIPÁ-PR	MARIPÁ
SECRETARIA DE AGRICULTURA, OBRAS E SERVIÇOS PÚBLICOS	MARIPÁ
CAMARA MUNICIPAL DE MARIPÁ	MARIPÁ
SECRETARIA DE ESTADO DO MEIO AMBIENTE E RECURSOS HÍDRICOS	CURITIBA
MINISTÉRIO PÚBLICO DO ESTADO DO PARANÁ	PALOTINA
ASSOCIAÇÃO DE MORADORES E AGRICULTORES DA ESTRADA GAÚCHA	MARIPÁ
ASSOCIAÇÃO DE MORADORES E AGRICULTORES BLUMECO	MARIPÁ
ASSOCIAÇÃO DE MORADORES E AGRICULTORES SANGA DA SEDE	MARIPÁ
ASSOCIAÇÃO DE MORADORES E AGRICULTORES DO BAIRRO DAS CHÁCARAS	MARIPÁ
ASSOCIAÇÃO DE MORADORES E AGRICULTORES DA LINHA ALTO AURORA	MARIPÁ
ASSOCIAÇÃO DE MORADORES E AGRICULTORES DA LINHA 5 DE OUTUBRO	MARIPÁ
ASSOCIAÇÃO DE MORADORES E AGRICULTORES DA LINHA PIRATININGA	MARIPÁ
ASSOCIAÇÃO DE MORADORES E AGRICULTORES DA LINHA ARAPAÇU	MARIPÁ
ASSOCIAÇÃO DE MORADORES E AGRICULTORES DA LINHA	MARIPÁ

SETE RUMOS	
ASSOCIAÇÃO DE MORADORES E AGRICULTORES LINHA MARAVILHA	MARIPÁ
ASSOCIAÇÃO DE MORADORES E AGRICULTORES DA LINHA 18 DE ABRIL – CANDEIA	MARIPÁ
ASSOCIAÇÃO DE AQUICULTORES DE MARIPÁ – AQUIMAP	MARIPÁ
ASSOCIAÇÃO SERVIDORES PÚBLICOS DE MARIPÁ – ASSEMAP	MARIPÁ
PREFEITURA MUNICIPAL DE BOM JESUS	BOM JESUS
CÂMARA MUNICIPAL DE BOM JESUS	BOM JESUS
SECRETARIA DE AGRICULTRA	BOM JESUS
ASSOCIAÇÃO BENEFICIENTE VIDA SOLIDÁRIA	BOM JESUS
ASSOCIAÇÃO DO BAIRRO ALTO DA COLINA	BOM JESUS
PREFEITURA MUNICIPAL DE XANXERÊ	XANXERÊ
CÂMARA MUNICIPAL DE XANXERÊ	XANXERÊ
PROMOTORIA DE JUSTIÇA	XANXERÊ
SECRETARIA ESTADUAL DE DESENVOLVIMENTO SUSTENTÁVEL	FLORIANÓPOLIS
FUNDAÇÃO DO MEIO AMBIENTE	FLORIANÓPOLIS
SECRETARIA MUNICIPAL DO MEIO AMBIENTE	XANXERÊ
CONSELHO COMUNITÁRIO DO BAIRRO CASTELO BRANCO	XANXERÊ
ASSOCIAÇÃO DOS MORADORES DO BAIRRO JOÃO BATISTA TONIAL	XANXERÊ
ASSOCIAÇÃO DOS MORADORES DO BAIRRO BORTOLON	XANXERÊ
PREFEITURA MUNICIPAL DE RIO VERDE	RIO VERDE
SECRETARIA DE AGRICULTURA E MEIO AMBIENTE	RIO VERDE
câmara municipal de rio verde	RIO VERDE
SECRETARIA DO MEIO AMBIENTE E DOS RECURSOS HÍDRICOS	GOIANIA
MINISTÉRIO PÚBLICO	RIO VERDE
PREFEITURA MUNICIPAL DE TAPURAH	TAPURAH
CÂMARA MUNICIPAL DE TAPURAH	TAPURAH
PROMOTORIA DE JUSTIÇA	TAPURAH
SECRETARIA ESTADUAL DO MEIO AMBIENTE DO ESTADO DO	CUIABÁ

MATO GROSSO	
SECRETARIA MUNICIPAL DE OBRAS, SERVIÇOS E TRANSPORTES	TAPURAH
APAE	TAPURAH
ASSOC.MOR.MORADA DO SOL,CORREDOR PUBLICO	RIO VERDE
Assoc.Mor.São Tomas I e II	RIO VERDE
Assoc.Mor.Jardim das Margaridas	RIO VERDE
Assoc.Mor.Parque Gameleira	RIO VERDE
Assoc.Mor.Bairro Serpro	RIO VERDE
Assoc.Mor.Bairro Promissão	RIO VERDE
Assoc.Mor.Vila Moraes/Marconal	RIO VERDE

A lecture was held in 14/02/2008, at Bom Jesus/SC to expose the project to stake holders. The lecture was presented by the Projects Director of Amazon Carbon. The PDD was made publicly available on Amazon Carbon website for commenting from 07/02/2008 to 15/03/2008. An e-mail account was also made available on Amazon Carbon website, to receive comments..

E.2. Summary of the comments received:

Comments by stakeholders and local community were received orally during and after the presentation. No written commentaries were received through e-mail made available in Amazon Carbon website. No negative comments were received during the presentation or via e-mail.

E.3. Report on how due account was taken of any comments received:

No action required.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Amazon Carbon S/S Ltda
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funds will be invested in the project.

Annex III

Baseline information

GRANJA CAMBRASIL LIVESTOCK

Piglet Producing Unit farm

GRANJA CAMBRASIL	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
SOWS	2790	2828	2814	2765	2794	2307	2860	2876	2902	2922	2921	2927	2808.8
BOARS	22	22	25	25	23	21	20	19	18	17	17	19	20.7
PIGLETS PRODUCED	5612	4559	5647	5095	6053	5117	4530	6480	5203	5756	6298	5490	5486.7
DAYS IN CONFINEMENT	21.6	20.2	20.8	21.9	22.9	23.8	23	23.9	22.9	22.3	22.3	22.8	22.4
PIGLETS CONFINED	3910	3289	3789	3719	4471	4059	3361	5162	3972	4141	4682	4038	4049.45
TOTAL	6722	6139	6628	6509	7288	6387	6241	8057	6892	7080	7620	6984	6878.95

GRANJA CAPIM LIVESTOCK

Nursery farm

GRANJA CAPIM - 4.1 SANTO ÂNGELO	2007 Average
NURSERY	2947

GRANJA CAPIM - 4.2 CAMBRASIL	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
NURSERY	7373	6422	7353	6959	7792	7414	5811	7567	7489	6480	6802	6073	6961.25

GRANJA CAPIM - LIVESTOCK	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
NURSERY	10320	9369	10300	9906	10739	10361	8758	10514	10436	9427	9749	9020	9908.25

GRANJA RINCÃO DOS ROCHAS LIVESTOCK

Finishing Unit farm

GRANJA RINCÃO DOS ROCHAS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
FINISHERS	6709	5872	6340	5814	5866	7030	7041	5826	6696	5882	5359	5913	6195.67

GRANJA SANTO ÂNGELO LIVESTOCK

Piglet Producing, Nursery and Finishing Unit Farm

GRANJA SANTO ANGELO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
SOWS	2483	2436	2439	2435	2446	2460	2500	2521	2506	2545	2534	2560	2488.75
BOARS	26	26	28	28	30	29	29	28	28	26	26	28	27.67
PIGLETS PRODUCED	4683	4578	5677	4524	5137	4641	4466	5740	4172	5311	6168	4986	5006.92
DAYS IN CONFINEMENT	20.4	20.8	21.3	21.2	21	20	20.5	20.5	21.3	22.3	21.7	21.6	21.05
PIGLETS CONFINED	3082	3401	3901	3197	3480	3094	2953	3922	2962	3820	4462	3474	3478.99

	2007 AVERAGE
NURSERY	4715
FINISHERS	1999

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
TOTAL LIVESTOCK	12305	12577	13082	12374	12670	12297	12196	13185	12210	13105	13736	12776	12709.411

GRANJA COOPERMIL LIVESTOCK

GRANJA COOPERMIL	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
SOWS	1098	1100	1068	1052	1056	1054	1035	1081	1076	1057	1037	1027	1061.75
GILTS	46	54	84	72	205	161	124	57	62	49	55	54	85.25
BOARS	15	16	14	14	13	13	14	15	15	15	14	14	14.33
PIGLETS	2215	1997	1988	1598	1444	1300	1923	1980	1871	2174	1619	2241	1862.50
NURSERY	2331	2621	3071	2815	3291	2963	2212	2555	2685	2709	2870	2605	2727.33
TOTAL	5705	5788	6225	5551	6009	5491	5308	5688	5709	6004	5595	5941	5751.17

GRANJA COOPERMIL LOCAL WEIGHT

GRANJA COOPERMIL	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
PIGLETS WEIGHT ON BIRTH	1.08	1.37	1.38	1.39	1.45	1.44	1.46	1.44	1.46	1.56	1.53	1.55	1.43
PIGLETS WEIGHT ON TRANSFER	5.46	5.69	5.62	5.56	5.74	6.57	6.35	6.72	6.61	6.5	5.87	6.12	6.07
PIGLETS AVERAGE WEIGHT	3.27	3.53	3.50	3.47	3.60	4.00	3.90	4.08	4.04	4.03	3.70	3.83	3.75
NURSERY FINAL WEIGHT	22.92	22.4	23.38	22.13	23.83	22.7	24.16	26.18	25.51	24.46	23.95	24.66	23.86
NURSERY AVERAGE WEIGHT	14.19	14.045	14.5	13.845	14.785	14.635	15.255	16.45	16.06	15.48	14.91	15.39	14.96

GRANJA POMPERMAIER LIVESTOCK

COD. DO PARCEIRO 30136623921 ORIGEM : 0104 - CRECHES

NOME DO PARCEIRO CESAR ANTONIO POMPERMAIER
(Farm manager)

ENDERECO INVERNADA GRANDE

NOME DO TECNICO JULCIMAR BORDIGNON

DATA DE REFERENCIA 18/09/2007 LOTE 20/09/2007 SEXO FEMEA

TABELA 001 - NORMAL SEARA

DESEMPENHO TECNICO	CABECA	PESO (KG)
CAPACIDADE ALOJ (Farm capacity).	1.100	
LEITOES LOTADOS (animals confined)	1.100	32.970
PESO MEDIO DOS LEITOES (average entry weight)		29,972
SUINOS RECEBIDOS (animals delivered)	1.074	100.146
SUINOS MORTOS LOC.CRIACAO (mortality)	26	944
RACAO CONSUMIDA............		291.960
PESO MEDIO (average weight on delivery)		93,246
IDADE MEDIA.................		116
DIAS EM TERMINACAO..........		123
CONVERSAO ALIMENTAR REAL....		3,714
CONVERSAO ALIMENTAR CORRIGIDA		3,730
% MORTALIDADE LOC.CRIACAO...		2,363
GPD.........................		0,635

FAZENDA COQUEIROS DO RIO DOCE LIVESTOCK

MR. AVELINO PESSENTI							
Entry Date	Slaughter Date	Animals confined	Animals slaughtered	Nursery weight	Finishers final weight	Finishers weight	Days in confinement
27/09/06	16/01/07	1895	1813	24.36	122.51	73.44	111
27/09/06	19/01/07	1895	1857	24.18	120.29	72.24	114
25/01/07	21/05/07	939	898	22.95	125.04	74.00	116
25/01/07	21/05/07	940	899	24.69	130.63	77.66	116
25/01/07	25/05/07	1880	1830	23.78	125.01	74.40	120
05/06/07	25/09/07	3899	3786	22.88	121.43	72.16	112
Average				23.81	124.15	73.98	114.83

MR. AVELINO PESSENTI	
Total Animal production	11083
Period considered (days)	363.00
Average days in confinement	114.83
Average population	3506.1

Mr. EDIMAR GIOVANI PESSENTI							
Entry Date	Slaughter Date	Animals confined	Animals slaughtered	Nursery weight	Finishers final weight	Finishers weight	Days in confinement
21/08/06	04/12/06	1880	1783	23.21	120.78	72.00	105
21/08/06	12/12/06	1880	1817	23.16	121.06	72.11	113
22/12/06	11/04/07	940	907	23.46	122.88	73.17	110
21/12/06	11/04/07	940	912	23.42	126.22	74.82	111
22/12/06	24/04/07	1883	1838	22.84	122.19	72.52	123
02/05/07	22/08/07	3869	3749	23.23	122.17	72.70	112
Average				23.22	122.55	72.89	112.33

MR. EDIMAR G. PESSENTI	
Total Animal production	11006
Period considered (days)	366.00
Average days in confinement	112.33
Average population	3378.0

Combined average population	6884.0

FAZENDA CHAPECÓZINHO LIVESTOCK

FAZENDA CHAPECÓZINHO - FINISHING UNIT FARM			
Entry Date	Amount	Total weight	Average entry weight
31/12/2006	1874		
5/1/2007	35	800.4	22.87
5/1/2007	35	750.9	21.45
5/1/2007	89	1984.7	22.30
12/1/2007	25	556.5	22.26
12/1/2007	48	1087	22.65
12/1/2007	35	776.8	22.19
12/1/2007	50	1138.7	22.77
12/1/2007	55	1167	21.22
12/1/2007	40	871.1	21.78
18/1/2007	50	1027.1	20.54
18/1/2007	50	1076.4	21.53
18/1/2007	50	1216.7	24.33
2/2/2007	100	2157.3	21.57
2/2/2007	61	1345.2	22.05
2/2/2007	50	1109.7	22.19
10/2/2007	75	1647.5	21.97
10/2/2007	75	1695.5	22.61
10/2/2007	20	437	21.85
10/2/2007	28	670	23.93
14/2/2007	80	1824.7	22.81
14/2/2007	40	914.7	22.87
15/2/2007	60	1252.2	20.87
15/2/2007	30	642.2	21.41
10/3/2007	55	1165.7	21.19
10/3/2007	55	1240.2	22.55
14/3/2007	127	2688.3	21.17
21/3/2007	33	679.9	20.60
21/3/2007	40	808.6	20.22
21/3/2007	57	1190.4	20.88
21/3/2007	43	843.6	19.62
30/3/2007	54	1146.5	21.23
30/3/2007	65	1346.3	20.71
4/4/2007	53	1042.5	19.67
4/4/2007	90	1793.5	19.93
25/4/2007	20	437.5	21.88
25/4/2007	68	1406	20.68
25/4/2007	62	1297.3	20.92
1/5/2007	70	1425.6	20.37
1/5/2007	64	1275.2	19.93
11/5/2007	67	1446.4	21.59
11/5/2007	35	715.1	20.43
11/5/2007	61	1291.1	21.17
24/5/2007	135	2877.8	21.32
9/6/2007	37	817.1	22.08
9/6/2007	116	2542.6	21.92
14/6/2007	47	1015.6	21.61
14/6/2007	80	1656.4	20.71
14/6/2007	55	1123.2	20.42
14/6/2007	37	775.5	20.96
14/6/2007	40	823.5	20.59
23/6/2007	96	2042.8	21.28
23/6/2007	40	792	19.80
23/6/2007	92	1991	21.64
29/6/2007	33	680.1	20.61
29/6/2007	98	2152.7	21.97
29/6/2007	26	524.5	20.17
2/7/2007	3	58.1	19.37
6/7/2007	20	400.4	20.02
6/7/2007	25	527	21.08
6/7/2007	29	577.8	19.92
6/7/2007	35	703.7	20.11
6/7/2007	35	766.4	21.90
6/7/2007	40	895	22.38
6/7/2007	26	526.1	20.23
6/7/2007	56	1227.9	21.93
13/7/2007	125	2655.1	21.24
24/7/2007	42	846.9	20.16
24/7/2007	25	479.2	19.17
24/7/2007	40	791.3	19.78
24/7/2007	20	404.7	20.24
24/7/2007	55	1154.8	21.00
7/8/2007	69	1558.3	22.58
7/8/2007	20	449.3	22.47
7/8/2007	50	993.6	19.87
7/8/2007	20	419.6	20.98
21/8/2007	59	1253.7	21.25
21/8/2007	25	498.7	19.95
21/8/2007	55	1167.9	21.23
21/8/2007	20	433.8	21.69
20/8/2007	58	1223.1	21.09
28/8/2007	80	1591.4	19.89
28/8/2007	70	1492.5	21.32
11/9/2007	27	554.4	20.53
11/9/2007	70	1503.9	21.48
11/9/2007	50	1020.3	20.41
11/9/2007	20	435.2	21.76
18/9/2007	72	1526.5	21.20
18/9/2007	38	754.5	19.86
18/9/2007	40	806.5	20.16
28/9/2007	50	1023	20.46
28/9/2007	50	1060.1	21.20
28/9/2007	40	884.2	22.11
5/1/2007	35	767.3	21.92
5/10/2007	95	1932.7	20.34
5/10/2007	30	660.8	22.03
30/10/2007	80	1704.9	21.31
30/10/2007	117	2378.6	20.33
8/11/2007	130	2801.4	21.55
8/11/2007	60	1249.1	20.82
8/11/2007	94	1942.3	20.66
16/11/2007	150	3306.6	22.04
21/11/2007	40	811.9	20.30
21/11/2007	30	603.7	20.12
21/11/2007	44	927	21.07
21/11/2007	56	1152.6	20.58
30/11/2007	150	3303.8	22.03
30/11/2007	30	641.1	21.37
6/12/2007	45	906.9	20.15
6/12/2007	140	2977.4	21.27
6/12/2007	40	809.8	20.25
6/12/2007	40	797.9	19.95
21/12/2007	40	772.6	19.32
21/12/2007	118	2495.1	21.14
26/12/2007	38	805.5	21.20
26/12/2007	20	437.7	21.89
26/12/2007	25	577.6	23.10
26/12/2007	40	814.5	20.36
28/12/2007	84	1811.6	21.57
28/12/2007	37	738	19.95
TOTAL 2007	8473	Average weight	21.15

Days in confinement	110
Average population	2553.51
MORTALITY ON 2007	276
LIVESTOCK	2277.51

FAZENDA MARTELLI III LIVESTOCK

FAZENDA MARTELLI III - 01/01/2007 a 31/12/2007	ANIMAL PRODUCTION	DEATH RATE	PERIOD OF CONFINEMENT (DAYS)	PERIOD CONSIDERED (DAYS)	AVERAGE POPULATION
SOWS	485.82	0.0%	365	365	486
PIGLETS	11752	5.9%	22	365	708
NURSERY	11576	1.5%	53	365	1681
FINISHERS	11403	1.5%	105	365	3280
FAZENDA MARTELLI III - 01/01/2008 -26/03/2008	ANIMAL PRODUCTION	PERIOD OF CONFINEMENT (DAYS)	PERIOD CONSIDERED (DAYS)	AVERAGE POPULATION	
SOWS	607	117	117	607	
PIGLETS PRODUCED	4772	22	117	897	
NURSERY PRODUCED	4902	53	117	2221	
FINISHERS PRODUCED	3660	105	117	3285	

GRANJA CAMBRASIL LOCAL WEIGHT

Animals transferred to Granja Capim				
Provider	Date	Piglets transferred	Piglets weight	Total weight
Cambrasil	3/1/07	1 383	6.57	9 090
Cambrasil	8/1/07	1 391	6.69	9 300
Cambrasil	15/1/07	1 371	6.45	8 840
Cambrasil	22/1/07	1 328	6.70	8 900
Cambrasil	29/1/07	1 401	6.30	8 820
Cambrasil	5/2/07	1 365	5.97	8 150
Cambrasil	12/2/07	1 337	5.96	7 970
Cambrasil	19/2/07	1 328	6.23	8 280
Cambrasil	26/2/07	1 282	6.01	7 710
Cambrasil	5/3/07	1 304	6.03	7 860
Cambrasil	12/3/07	1 278	5.99	7 650
Cambrasil	19/3/07	1 228	6.13	7 530
Cambrasil	26/3/07	1 136	5.98	6 790
Cambrasil	5/4/07	1 112	5.93	6 590
Cambrasil	9/4/07	1 139	6.06	6 900
Cambrasil	16/4/07	1 148	5.74	6 590
Cambrasil	23/4/07	1 142	5.79	6 610
Cambrasil	30/4/07	1 236	5.83	7 210
Cambrasil	7/5/07	1 242	6.01	7 460
Cambrasil	14/5/07	1 245	5.97	7 430
Cambrasil	21/5/07	1 294	5.83	7 550
Cambrasil	28/5/07	1 268	5.99	7 600
Cambrasil	6/6/07	1 251	6.20	7 750
Cambrasil	12/6/07	1 284	6.40	8 220
Cambrasil	18/6/07	1 154	6.39	7 370
Cambrasil	25/6/07	1 160	6.61	7 670
Cambrasil	2/7/07	1 219	6.58	8 020
Cambrasil	9/7/07	1 205	6.94	8 360
Cambrasil	16/7/07	1 328	7.04	9 350
Cambrasil	23/7/07	1 333	7.05	9 400
Cambrasil	30/7/07	1 367	7.45	10 180
Cambrasil	6/8/07	1 362	7.11	9 690
Cambrasil	13/8/07	1 046	6.83	7 140
Cambrasil	20/8/07	1 065	6.74	7 180
Cambrasil	27/8/07	1 098	6.99	7 680
Cambrasil	3/9/07	1 186	7.18	8 510
Cambrasil	10/9/07	1 177	7.46	8 780
Cambrasil	17/9/07	1 302	7.15	9 310
Cambrasil	24/9/07	1 261	7.26	9 160
Cambrasil	1/10/07	1 327	7.44	9 870
Cambrasil	1/10/07	1 313	7.17	9 410
Cambrasil	15/10/07	1 277	6.94	8 860
Cambrasil	15/10/07	1 326	6.91	9 160
Cambrasil	22/10/07	1 308	6.84	8 950
Cambrasil	29/10/07	1 286	6.77	8 700
Cambrasil	5/11/07	1 291	6.42	8 290
Cambrasil	16/11/07	1 321	6.56	8 670
Cambrasil	22/11/07	1 338	6.51	8 710
Cambrasil	3/12/07	1 325	6.60	8 740
Cambrasil	10/12/07	1 620	5.96	9 650
Cambrasil	10/12/07	1 302	6.70	8 720
Cambrasil	13/12/07	1 263	6.47	8 170
Cambrasil	20/12/07	1 293	6.35	8 210
Cambrasil	31/12/07	1 427	6.62	9 450
Average		1 274	6.51	8 299

Date	ROM	SOWS TRANSFERRED	TOTAL WEIGHT	AVERAGE WEIGHT
02.01.07	31956	21	4722	224.86
09.01.07	32033	32	6446	201.44
16.01.07	32115	27	5342	197.85
23.01.07	32210	29	5546	191.24
29.01.07	32284	21	4082	194.38
TOTAL JANUARY		**130**	**26138**	**201.06**
06.02.07	32385	27	5340	197.78
13.02.07	32480	10	2036	203.60
21.02.07	32599	13	2875	221.15
27.02.07	32653	14	2890	206.43
TOTAL FEBRUARY		**64**	**13141**	**205.33**
06.03.07	32743	31	5808	187.35
13.03.07	32833	23	4443	193.17
20.03.07	32918	28	5665	202.32
27.03.07	32999	26	5831	224.27
TOTAL MARCH		**108**	**21747**	**201.36**
03.04.07	33094	32	6612	206.63
10.04.07	33160	31	6792	219.10
17.04.07	33251	30	6492	216.40
24.04.07	33361	30	6714	223.80
30.04.07	33453	35	7339	209.69
TOTAL APRIL		**158**	**33949**	**214.87**
08.05.07	33569	32	7346	229.56
15.05.07	33702	26	5206	200.23
22.05.07	33832	29	6202	213.86
29.05.07	33947	28	5966	213.07
TOTAL MAY		**115**	**24720**	**214.96**
05.06.07	34055	28	5902	210.79
12.06.07	34167	31	6632	213.94
19.06.07	34298	24	5573	232.21
26.06.07	34433	28	5915	211.25
TOTAL JUNE		**111**	**24022**	**216.41**
03.07.07	34562	22	4571	207.77
10.07.07	34673	18	3790	210.56
17.07.07	34808	24	5001	208.38
24.07.07	34941	14	2552	182.29
31.07.07	35073	20	4536	226.80
TOTAL JULY		**98**	**20450**	**208.67**
09.08.07	35217	18	4018	223.22
14.08.07	35303	25	5746	229.84
21.08.07	35728	25	4880	195.20
28.08.07	35880	26	5536	212.92
TOTAL AUGUST		**94**	**20180**	**214.68**
04.09.07	36026	22	5126	233.00
11.09.07	36135	23	4603	200.13
18.09.07	36255	16	3778	236.13
25.09.07	35513	13	2933	225.62
TOTAL SEPTEMBER		**74**	**16440**	**222.16**
02.10.07	35646	24	5069	211.21
09.10.07	36330	19	4383	230.68
16.10.07	36472	24	4967	206.96
23.10.07	36603	23	5016	218.09
30.10.07	36756	23	5274	229.30
TOTAL OCTOBER		**113**	**24709**	**218.66**
06.11.07	36868	20	4634	231.70
13.11.07	37010	29	6830	235.52
20.11.07	37145	27	6767	250.63
27.11.07	37279	30	6705	223.50
TOTAL NOVEMBER		**106**	**24936**	**235.25**
03.12.07	37389	24	5988	249.50
10.12.07	37521	30	6918	230.60
19.12.07	37696	30	7135	237.83
26.12.07	37799	29	6830	235.52
TOTAL DECEMBER		**113**	**26871**	**237.80**
AVERAGE 2007		**107**	**23108.58**	**215.93**

GRANJA CAPIM LOCAL WEIGHT

Date	Piglet weight	Nursery weight	Weight gained	Average weight
39085.00	6.57	20.74	14.17	13.66
39090.00	6.69	21.83	15.14	14.26
39097.00	6.45	22.43	15.99	14.44
39097.00	6.45	21.18	14.74	13.82
39104.00	6.70	22.98	16.27	14.84
39111.00	6.30	22.03	15.73	14.16
39118.00	5.97	21.34	15.37	13.66
39122.00	6.02	23.55	17.53	14.79
39125.00	5.96	21.41	15.45	13.69
39132.00	6.23	21.85	15.62	14.04
39139.00	6.01	20.31	14.29	13.16
39146.00	5.81	21.78	15.97	13.79
39146.00	6.03	21.26	15.23	13.64
39153.00	5.99	20.65	14.66	13.32
39160.00	6.13	22.26	16.13	14.20
39167.00	5.98	21.20	15.23	13.59
39167.00	6.01	22.32	16.31	14.17
39177.00	5.93	21.59	15.67	13.76
39181.00	6.06	22.28	16.22	14.17
39188.00	5.74	22.05	16.31	13.89
39188.00	6.05	22.23	16.18	14.14
39195.00	5.79	22.41	16.62	14.10
39202.00	5.83	22.63	16.79	14.23
39209.00	6.01	22.29	16.28	14.15
39216.00	5.97	21.43	15.47	13.70
39216.00	5.92	22.11	16.19	14.02
39223.00	5.83	22.16	16.33	14.00
39230.00	5.99	23.26	17.27	14.63
39237.00	5.96	23.46	17.50	14.71
39239.00	6.20	22.00	15.81	14.10
39245.00	6.40	25.01	18.61	15.70
39251.00	6.39	24.79	18.40	15.59
39258.00	6.61	24.71	18.10	15.66
39258.00	6.34	24.30	17.97	15.32
39265.00	6.58	24.33	17.75	15.46
39272.00	6.94	23.96	17.02	15.45
39279.00	7.04	24.44	17.40	15.74
39286.00	7.05	23.25	16.20	15.15
39286.00	6.34	23.30	16.97	14.82
39293.00	7.45	23.90	16.45	15.67
39300.00	7.11	24.08	16.97	15.60
39307.00	6.83	23.53	16.70	15.18
39307.00	6.34	23.13	16.79	14.73
39314.00	6.74	22.48	15.74	14.61
39321.00	6.99	23.02	16.03	15.01
39328.00	7.18	23.66	16.48	15.42
39329.00	6.11	23.90	17.78	15.00
39335.00	7.46	23.64	16.18	15.55
39342.00	7.15	23.28	16.13	15.22
39349.00	7.26	23.84	16.57	15.55
39349.00	6.44	23.97	17.53	15.21
39356.00	7.44	23.81	16.37	15.62
39356.00	7.17	23.86	16.69	15.51
39370.00	6.94	21.06	14.12	14.00
39370.00	6.91	20.97	14.06	13.94
39377.00	6.84	19.76	12.92	13.30
39377.00	6.03	22.13	16.10	14.08
39384.00	6.77	19.64	12.88	13.20
39391.00	6.42	18.53	12.11	12.48
39402.00	6.56	18.86	12.30	12.71
39405.00	6.15	19.93	13.78	13.04
39408.00	6.51	17.97	11.46	12.24
39419.00	6.60	17.85	11.25	12.22
39419.00	6.20	18.89	12.69	12.55
39426.00	5.96	18.34	12.39	12.15
39426.00	6.70	18.06	11.36	12.38
39429.00	6.47	17.46	10.99	11.96
39436.00	6.35	18.13	11.78	12.24
39442.00	6.41	19.14	12.73	12.77
39447.00	6.62	17.94	11.32	12.28
Average	**6.43**	**21.88**	**15.45**	**14.16**

GRANJA RINCÃO DOS ROCHAS LOCAL WEIGHT

GRANJA RINCÃO DOS ROCHAS	Date	Nursery weight	Finisher weight	Weight gained	Average weight
Jan	7/1/07	22.66	105.02	82.36	63.84
	23/1/07	22.18	109.08	86.90	65.63
Feb	4/2/07	22.01	115.23	93.22	68.62
	20/2/07	22.73	104.60	81.86	63.66
Mar	5/3/07	23.16	111.71	88.55	67.43
Apr	1/4/07	21.16	114.51	93.35	67.83
	29/4/07	23.10	108.18	85.08	65.64
May	11/5/07	21.62	110.56	88.95	66.09
	25/5/07	22.15	110.54	88.39	66.35
Jun	17/6/07	22.37	106.27	83.90	64.32
Jul	4/7/07	21.91	108.71	86.80	65.31
	17/7/07	22.41	110.46	88.05	66.43
Aug	12/8/07	21.68	102.23	80.55	61.95
	27/8/07	22.59	103.90	81.32	63.24
Sep	9/9/07	24.04	109.07	85.03	66.56
Oct	1/10/07	24.62	109.96	85.35	67.29
	7/10/07	24.80	106.83	82.03	65.82
	25/10/07	24.04	105.61	81.57	64.83
Nov	18/11/07	23.67	103.34	79.68	63.51
Dec	2/12/07	23.83	101.30	77.48	62.56
	27/12/07	23.76	106.23	82.47	64.99
Average		**22.88**	**107.78**	**84.90**	**65.33**

GRANJA SANTO ÂNGELO LOCAL WEIGHT

NURSERY

GRANJA SANTO ANGELO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
Nursey weighted	2120	1220	2150	1750	1950	2480	1570	1900	1850	2470	2410	2149	2002
Total weight	42130	25220	43020	37820	44570	57780	35590	44320	40350	46900	43190	40220	41759
Average weight	**19.87**	**20.67**	**20.01**	**21.61**	**22.86**	**23.30**	**22.67**	**23.33**	**21.81**	**18.99**	**17.92**	**18.72**	**20.98**

FINISHERS

MONTH	FINISHERS SENT TO SLAUGHTER			FINISHERS TRANSFERRED TO PPU			FINISHERS TRANSFERRED TO CAMBRASIL			FINISHERS SOLD			TOTAL		
	QTD	Weight	Average	QTD	Weight	Average	QTD	Weight	Average	QTD	Weight	Average	QTD	Weight	Average
JAN	430	36 395	84.64	102	9 687	94.97	150	14 363	95.75	239	22 771	95.28	921	83 216	90.35
FEB	290	24 995	86.19	66	6 209	94.08	120	11 387	94.89	229	21 753	94.99	705	64 344	91.27
MAR	310	24 858	80.19	67	6 468	96.54	120	11 362	94.68	290	27 689	95.48	787	70 377	89.42
APR	424	35 697	84.19	89	8 486	95.35	119	11 963	100.53	256	25 113	98.10	888	81 259	91.51
MAY	279	23 840	85.45	61	5 614	92.03	150	14 794	98.63	219	20 857	95.24	709	65 105	91.83
JUN	430	35 983	83.68	61	5 993	98.25	135	12 883	95.43	179	17 095	95.50	805	71 954	89.38
JUL	380	32 913	86.61	90	8 566	95.18	161	15 526	96.43	314	29 709	94.61	945	86 714	91.76
AUG	309	27 103	87.71	66	6 362	96.39	120	11 713	97.61	262	25 260	96.41	757	70 438	93.05
SEP	340	32 468	95.49	45	4 560	101.33	120	12 133	101.11	269	26 824	99.72	774	75 985	98.17
OCT	444	41 684	93.88	84	8 048	95.81	149	15 179	101.87	315	31 423	99.76	992	96 334	97.11
NOV	400	36 448	91.12	39	3 753	96.23	120	12 336	102.80	221	21 692	98.15	780	74 229	95.17
DEC	530	47 517	89.65	69	6 841	99.14	150	14 498	96.65	296	28 461	96.15	1 045	97 317	93.13
TOTAL	**4 566**	**399 901**	**87.58**	**839**	**80 587**	**96.05**	**1 614**	**158 137**	**97.98**	**3 089**	**298 647**	**96.68**	**10 108**	**937 272**	**92.73**
AVERAGE	**381**	**33 325**	**87.58**	**70**	**6 716**	**96.05**	**135**	**13 178**	**97.98**	**257**	**24 887**	**96.68**	**842**	**78 106**	**92.73**

SOWS

DATE	SOWS WEIGHTED	TOTAL WEIGHT	AVERAGE WEIGHT
02.01.07	10	2 426	242.60
09.01.07	19	4 468	235.16
19.01.07	20	4 851	242.55
23.01.07	17	4 158	244.59
30.01.07	21	4 746	226.00
TOTAL JANUARY	**87**	**20 649**	**237.34**
06.02.07	27	6 042	223.78
06.02.07			
13.02.07	22	4 943	224.68
20.02.07	23	4 866	211.57
27.02.07	24	5 393	224.71
TOTAL FEBRUARY	**69**	**21 244**	**307.88**
06.03.07	25	5 125	205.00
13.03.07	20	4 189	209.45
20.03.07	21	4 500	214.29
27.03.07	23	4 800	208.70
TOTAL MARCH	**89**	**18 614**	**209.15**
03.04.07	25	5 510	220.40
10.04.07	20	4 036	201.80
17.04.07	25	4 897	195.88
24.04.07	14	2 790	199.29
30.04.07	19	3 655	192.37
TOTAL APRIL	**103**	**20888**	**202.80**
08.05.07	24	5 384	224.33
15.05.07	15	3 167	211.13
21.05.07	11	2 410	219.09
29.05.07	14	2 788	199.14
TOTAL MAY	**64**	**13 749**	**214.83**
04.06.07	10	2 207	220.70
12.06.07	20	4 018	200.90
19.06.07	16	3 414	213.38
26.06.07	17	3 515	206.76
TOTAL JUNE	**63**	**13 154**	**208.79**
03.07.07	15	3 592	239.47
10.07.07	13	2 530	194.62
17.07.07	12	2 925	243.75
24.07.07	10	1 991	199.10
31.07.07	12	2 782	231.83
TOTAL JULY	**62**	**13 820**	**222.90**
09.08.07	12	2 989	249.08
14.08.07	14	3 270	233.57
21.08.07	15	3 043	202.87
29.08.07	22	5 340	242.73
TOTAL AUGUST	**63**	**14 642**	**232.41**
05.09.07	18	4 127	229.28
11.09.07	19	4 232	222.74
18.09.07	12	2 584	215.33
25.09.07	14	3 245	231.79
TOTAL SEPTEMBER	**63**	**14 188**	**225.21**
01.10.07	27	6 242	231.19
09.10.07	26	5 487	211.04
16.10.07	7	1 553	221.86
23.10.07	20	4 405	220.25
30.10.07	28	5 905	210.89
TOTAL OCTOBER	**108**	**23 592**	**218.44**
05.11.07	20	4 410	220.50
13.11.07	25	5 699	227.96
20.11.07	20	4 572	228.60
27.11.07	17	4 106	241.53
TOTAL NOVEMBER	**82**	**18 787**	**229.11**
04.12.07	12	2 295	191.25
10.12.07	10	1 775	177.50
17.12.07	25	5 705	228.20
26.12.07	24	4 735	197.29
TOTAL DECEMBER	**71**	**14 510**	**204.37**
AVERAGE 2007	**77**	**17320**	**226.10**

Annex 4

MONITORING INFORMATION

This section provides further details on monitoring equipment, training, monitoring procedures, data recording and maintenance.

System Overview:

The Animal Waste Management System installed by the project is illustrated in figure 1. The system consists in four major components:

- Manure loading system
- Anaerobic digester cells
- Biogas transfer and flow meters
- Flaring system

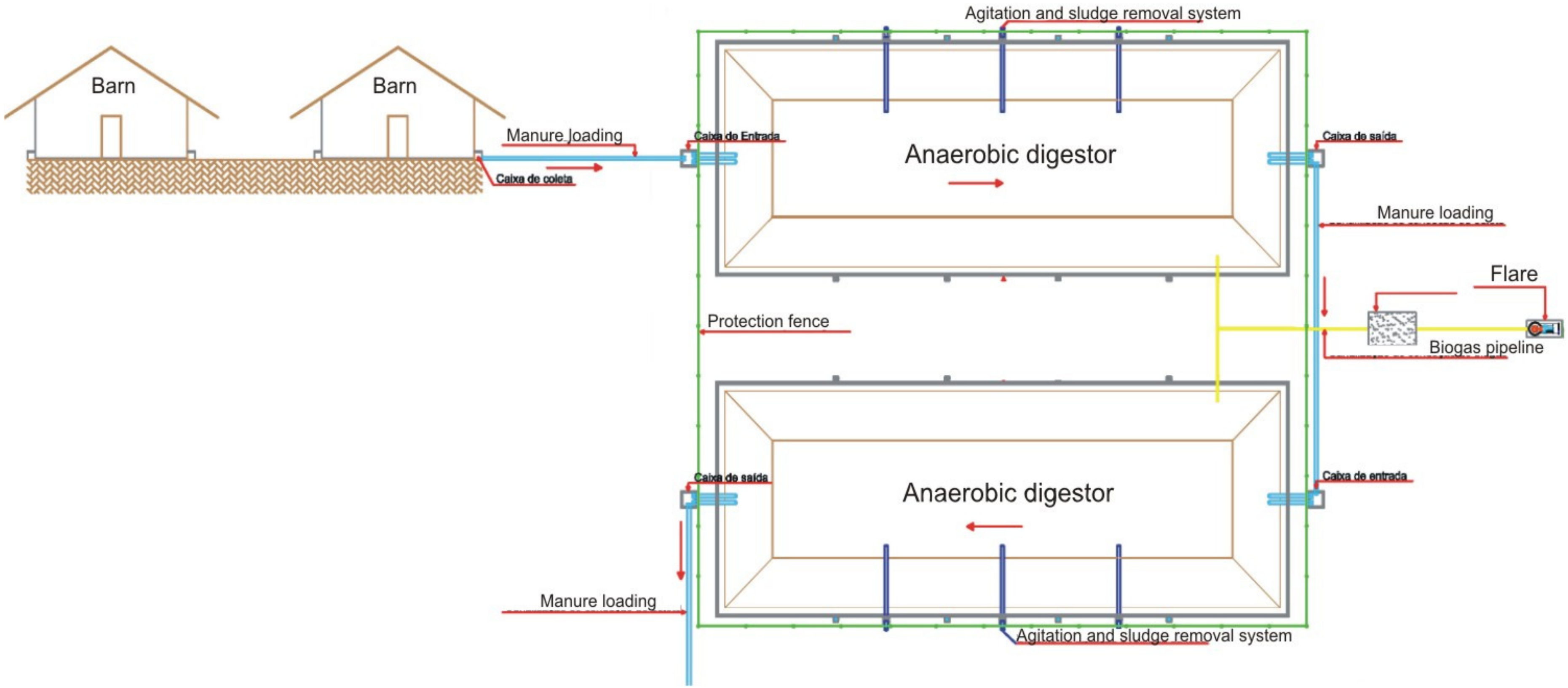

Figure 1. AWMS installed as the project activity.

System components Operation and maintenance:

1. Manure loading system

Training: Training on manure loading system will be provided by the technology manufacturer. Training shall include: system components, normal operation, emergency operations, maintenance and request for warranty service. Reporting procedures shall be made directly to Amazon Carbon.

Normal Operation: The manure loading system installed by the project activity is not much different than the existing system. Farms' managers are familiar with the system operation and maintenance. Under normal operations, manure is removed from the barns using water hoses and squeegees. This effluent is collected and flushed from the barns periodically. The effluent is sent to the manure tanks and then to the digester cells. To optimize manure treatment and biogas production, the excessive use of water shall be avoided.

Safety issues: All personnel working on the barns make use of appropriated gear and clothing. Sanitary and health issues are a serious concern. Care should be taken on handling animal manure and around the manure tanks, to avoid falling into them.

Regular inspections: Regular inspections shall be executed at least on a weekly basis, and will include the following procedures:

- ✓ Check for pipeline obstruction and leakages;
- ✓ Check for corrosion at exposed joints
- ✓ Check for clogging in the manure tanks
- ✓ Check the operational status of the pumping station, where applicable.

Alternative Operating procedures: In the event of malfunction of the manure loading system, all participating farms personnel shall immediately notify Amazon Carbon. The AWMS manufacturer will be notified to provide warranty or maintenance services, if required. Upon restoration of the system, Amazon Carbon shall be notified.

The proximity between the project sites and the manufacturer Head Office will allow fast emergency maintenance. Upon report by all participating farms, AVESUY maintenance team shall arrive on site in less than 48 hours. In the mean time, all participating farms and Amazon Carbon shall work together to identify an alternative method to route the effluent in order not to affect the farm nor result in additional GHG emissions.

2. Anaerobic digester:

The anaerobic digesters will be surrounded by a protection fence. Only authorized and trained personnel shall be in contact with the digesters.

Training: Training on the anaerobic digesters shall be provided to all participating farms personnel by the system manufacturer. Training shall include: construction and installation, system components, start-up procedures, normal operation, biogas and sludge handling, emergency operation, safety issues, maintenance and request for service. Reporting procedures shall be directly to Amazon Carbon.

Normal Operation:

Training on normal operation will include the basic operations of the system, biogas production, sludge production and disposal, start-up procedures, safety procedures, daily inspections, technical components and effluent quality.

Safety issues: Safety advice shall include the following instructions:

- ✓ No open flame permitted within 10 meters of the digester
- ✓ Do not allow the access of untrained personnel in the digester surroundings
- ✓ Do not use sharp objects or tools around the digester cover

Regular inspections: Regular inspections shall be executed at least on a weekly basis, and will include the following procedures:

- ✓ Cover material – check for cracks, tears, points of distress and other irregularities around the perimeter of the digester cell.
- ✓ Check for excessive ballooning of cover or presence of odour
- ✓ Check seams for signs of gas leakages
- ✓ Check for manure leakages

Alternative operation procedures: In the event of malfunction of the anaerobic digesters, all participating farms personnel shall immediately notify Amazon Carbon. The AWMS manufacturer will be notified to provide warranty or maintenance services, if required. Upon restoration of the system, Amazon Carbon shall be notified. The proximity between the project sites and the manufacturer Head Office will allow fast emergency maintenance. Upon report by all participating farms, AVESUY maintenance team shall arrive on site in less than 48 hours. In the mean time, all participating farms and Amazon Carbon shall work together to identify an alternative method to route the effluent in order not to affect the farm nor result in additional GHG emissions.

3. Biogas transfer and flow meter devices:

Training on the biogas transfer and flow meter devices shall be provided to all participating farms personnel by the system manufacturer (AVESUY). Training shall include: system components, normal operation, emergency operation, safety issues, maintenance and request for service. Reporting procedures shall be directly to Amazon Carbon.

Normal operation: The biogas produced by the anaerobic digesters will be contained by a sealed geomembrane and sent to the combustion system through PVC pipeline. The combustion system, through the PLC will be regulated by pressure controlling devices to ensure ideal biogas pressure. ROOTS B3 G65 – SSM ICPWS Flow meters will be connected to the PVC pipeline and continuously measure biogas flow to the combustion system. Biogas flow meters also monitor biogas temperature. The flow meters are incorporated to the PLC, which will record biogas flow on an hourly basis. The PLC will be connected to a PC terminal that will store monitoring data and transmit it via internet to Amazon Carbon personnel.

Safety issues: Measures will be taken to avoid biogas leakage and pipeline damages. Care shall be taken when performing maintenance on the flow meters and when digging near the pipelines.

Preventive maintenance: Maintenance procedures shall be conducted according the manufacturer's recommendations. Preventive maintenance shall be executed on a quarterly basis.

Regular inspections: Regular inspections shall be executed at least on a weekly basis, and will include the following procedures:

- ✓ Check for leaks in exposed pipelines
- ✓ Check for operational status of flow meters
- ✓ Check for PLC operational status.
- ✓ Check for PC terminal operational status (on a daily basis)

- ✓ Make security copies of monitoring information on data discs (DVD).

Alternative operating procedures: In the event of malfunction of the biogas transfer system and flow meter devices, farms' personnel shall immediately notify Amazon Carbon. The AWMS manufacturer will be notified to provide warranty or maintenance services, if required. Upon restoration of the system, Amazon Carbon shall be notified. The proximity between the project sites and the manufacturer Head Office will allow fast emergency maintenance. Upon report by all participating farms, AVESUY maintenance team shall arrive on site in less than 48 hours. In the mean time, all participating farms and Amazon Carbon shall work together to identify an alternative method to route the effluent in order not to affect the farm nor result in additional GHG emissions.

4. Combustion System (flares):

Training: Training on the combustion system shall be provided to farms' personnel by the system manufacturer. Training shall include: system components, normal operation, emergency operation, safety issues, maintenance and request for service. Reporting procedures shall be directly to Amazon Carbon.

Normal operation: The flare installed by the project activity has an automatic system designed to combust methane whenever biogas is present at the combustion chamber. The system is also equipped with pressure control devices to maintain ideal flow to the flares. More details on the flaring system are provided in Section A.4.2.

Safety issues: This system will be surrounded by a protection fence. Only authorized and trained personnel shall near the combustion system. Prior to maintenance, the gas flow must be turned off. Double checking of operational status shall be performed prior to maintenance procedures.

Regular inspections: Regular inspections shall be executed at least on a weekly basis, and will include the following procedures:

- ✓ Check for flaring operational status by checking the presence of a flame, the temperature of the combustion system and data from PC terminal.
- ✓ Check for PLC operational status.
- ✓ Check for PC terminal operational status (on a daily basis)
- ✓ Store monitoring information on data discs (DVD).

Preventive maintenance: Preventive maintenance shall be conducted on a quarterly basis.

System components Operation and maintenance:

Amazon Carbon and all participating farms will have online access to monitoring information via internet connection. All monitoring equipment will be regulated by a PLC, which collects and stores information. PLCs will be connected to PC terminals for storage and distribution of data. Emergency and malfunction on any of the equipment installed by the project shall be reported immediately to Amazon Carbon. All participating farms will have trained personnel working on the farms on a daily basis. The equipment provider will assist in preventive and emergency maintenance during the crediting period.

Maintenance and Trouble reporting:

In the event of failure in the components of the AWMS installed by the project, including the digesters and the combustion system, all participating farms shall immediately report to Amazon Carbon and to AVESUY. Contact information for emergency situations follows:

Person/ Entity	Phone	e-mail
Amazon Carbon Projects Department	+ 55 48 3024.7152	amazoncarbon@amazoncarbon.com.br
Amazon Carbon Projects Director	+ 55 48 9164.2973	thiago@amazoncarbon.com.br
Amazon Carbon Technology Analyst	+ 55 48 9164.2970	alexandre@amazoncarbon.com.br
Avesuy Head Office	+ 55 49 3433. 4594	avesuy@avesuy.com.br

Data storage:

All monitoring data will be stored by all participating farms and Amazon Carbon. The above contact information applies to the responsible for data storage.

Monitoring Procedures:

Monitoring of emission reduction shall include the following items/procedures:

ID	Item	Performed by	Recording procedures
1	Sludge removal	Farms personnel	Recorded by trained personnel every time sludge removal occurs. Digitally stored in PC terminal and data discs on a weekly basis.
2	Biogas produced	Farms personnel and Amazon Carbon	Electronically recorded by ROOTS B3 G65 – SSM ICPWS Flow meters continuously. Digitally stored by PLCs and PC terminals.
3	Methane combusted	Farms personnel and Amazon Carbon	Total methane combusted will be obtained by determining the amount of methane in the combusted biogas multiplied by the flare efficiency. Methane content in biogas will be determined by a gas analyzer on a daily basis. Results will be electronically recorded through a PLC and a PC terminal.
4	Flare efficiency	Farms personnel and Amazon Carbon	Flare efficiency will be determined on an hourly basis and will be determined by the temperature in the exhaust gas stream. If the temperature is below 500ºC, the flare efficiency will be considered 0%. Flare efficiency will be considered 90% when the measured temperature is above 500ºC. Data to determine methane combustion efficiency will be electronically detected by Type K temperature sensors and digitally stored by a PLC system and a PC terminal.
5	Residual gas pressure	Farms personnel and Amazon Carbon	The combustion system is equipped with LD301Smart Pressure Transmitter Series, used to assure proper residual gas (biogas) flow to the combustion system. Residual gas pressure is used to determine methane density. Data will be electronically recorded by electronic sensors in the combustion system and digitally stored by a PLC system and a PC terminal.
6	Residual gas temperature	Farms personnel and Amazon Carbon	Measured by ROOTS B3 G65 – SSM ICPWS Flow meters. Residual gas temperature is used to determined methane density. Data will be electronically recorded by electronic sensors in the combustion system and digitally stored by a PLC system and a PC terminal.

ID	Item	Performed by	Recording procedures
7	Fossil fuel combusted for onsite applications	Farms personnel	Continuously measured by volume meters that shall integrate daily tanks for fossil fuel supply, if fossil fuels are needed for the operation of the AWMS. Recorded by trained personnel in spreadsheets every time fossil fuels are used. Digitally stored in PC terminal and data discs on a weekly basis.
8	Electricity consumption for onsite applications	Farms personnel	Continuously measured by dedicated electricity meters in each individual farm. Recorded by trained personnel in spreadsheets and aggregated on an annual basis. Digitally stored in PC terminal and data discs on a weekly basis.

Monitoring Instructions

This Section provides an overview for monitoring the items described above.

1. Sludge Removal: sludge removal shall be executed as follows:

Step	Activity	Recording/storage	Documentation	Comment
1	Determine the need to remove sludge			Sludge will be disposed through soil application on nearby cropping areas
2	Perform sludge removal in accordance to guidance provided		AVESUY guidance on sludge removal (paper)	
3	Document disposal method on monitoring form	Manual recording by all participating farms personnel	Spread sheet (paper/electronic)	
4	Store data in data discs (DVD)		Electronic	

2. Biogas produced: Biogas produced shall be monitored as follows:

Step	Activity	Recording/storage	Documentation	Comment
1	Record biogas flow meter reading	Automatically recorded by a PLC system connected to the flow meter	Electronic	Biogas flow is measured continuously and recorded electronically by a PLC system. all participating farms and Amazon Carbon will have online access to this monitoring parameter
2	Check for last 24 hours recording		Electronic	
3	Check PLC and flow meter operational status			If PLC or PC terminal are not operating properly, contact Amazon Carbon for maintenance procedures
4	Store data in data discs (DVD)		Electronic	

3. Methane Combusted: shall be monitored as follows

Step	Activity	Recording/storage	Documentation	Comment
1	Prepare the gas analyzer as indicated in operator manual		Gas analyzer operations manual	
2	Connect the gas analyzer to the biogas pipeline system			
3	Open valve on test port			
4	Take gas reading in accordance with Operations manual			
5	Record reading on PC terminal	Recording on gas analysis will be downloaded to PC terminals.	Electronic	If the analysis demonstrate significant differences from previous readings (more than 10% points) contact Amazon Carbon for maintenance procedures
6	Close valve on test port			

7	Disconnect gas analyzer from biogas pipeline			
8	Check PLC and PC terminal operational status			If PLC or PC terminal are not operating properly, contact Amazon Carbon for maintenance procedures
9	Store data in data discs (DVD)		Electronic	

4. Flare efficiency

Step	Activity	Recording/storage	Documentation	Comment
1	Record temperature of exhaust gas stream	Automatically recorded by electronic sensors in the combustion system and a PLC and PC terminal.	Electronic	
2	Check PLC and PC terminal operational status			If PLC or PC terminal are not operating properly, contact Amazon Carbon for maintenance procedures
3	Store data in data discs (DVD)		Electronic	
4	Check for last 24 hour records to confirm that readings are within expected limits			If the combustion system is not operating properly, immediately contact Amazon Carbon for maintenance procedures.

5. Residual gas pressure

Step	Activity	Recording/storage	Documentation	Comment
1	Record residual gas (biogas) pressure	Automatically recorded by LD301 Smart Pressure Transmitter Series and a PLC and PC terminal.	Electronic	
2	Check PLC and PC terminal operational status			If PLC or PC terminal are not operating properly, contact Amazon Carbon for maintenance procedures
3	Store data in data discs (DVD)		Electronic	
4	Check for last 24 hour records to confirm that readings are within expected limits			If the combustion system is not operating properly, immediately contact Amazon Carbon for maintenance procedures.

6. Residual gas temperature

Step	Activity	Recording/storage	Documentation	Comment
1	Record residual gas (biogas) temperature	Automatically recorded by the flow meters and the PLC and PC terminal.	Electronic	Data on biogas temperature is collected to provide corrected biogas flow. The flow meter automatically records data on biogas temperature.
2	Check PLC and PC terminal operational status			If PLC or PC terminal are not operating properly, contact Amazon Carbon for maintenance procedures
3	Store data in data discs (DVD)		Electronic	
4	Check for last 24 hour records to confirm that readings are within expected limits			If the combustion system is not operating properly, immediately contact Amazon Carbon for maintenance procedures.

7. Fossil fuel combusted for onsite applications

Step	Activity	Recording/storage	Documentation	Comment
1	Determine the need for the use of fossil fuels for the process *j*.			Fossil fuel consumption is not expected. The AWMS is designed to operate without the need for fossil fuel usage.
2	Connect the daily tank to the equipment fuelled by fossil fuel			
3	Record reading of ruler gauge on specific monitoring spreadsheet	Manual recording by all participating farms personnel	Spread sheet (paper/electronic)	
4	Store data in data discs (DVD)		Electronic	

8. Electricity consumption for onsite applications

Step	Activity	Recording/storage	Documentation	Comment
1	Record electricity consumption for onsite applications	Automatically recorded by dedicated electricity meters		Meters shall measure only the electricity used on the project site.
2	Record reading on specific monitoring spreadsheet	Manual recording by all participating farms personnel	Spread sheet (paper/electronic)	
3	Check electricity meters operational status			If electricity meters terminal are not operating properly, contact Amazon Carbon for maintenance procedures
4	Store data in data discs (DVD)		Electronic	

Sludge removal Guidance:

Sludge removal from the digesters cells will be made using a pumping system. The followings procedures should be adopted when performing sludge removal:

- ✓ Connect the pump flexible pipeline to the appropriate sludge removal pipe, located laterally in the digester cells. Do not connect more than one pipeline at the same time.
- ✓ Place the other pipeline (pump outlet) in the distribution tanks.
- ✓ Activate the pumping system.
- ✓ Dispose sludge on cropping areas.
- ✓ Record data on sludge removal in monitoring spreadsheet.

Sludge disposal is critical to avoid methane emissions. Care should be taken in order:

- ✓ Not to cause sludge spills.
- ✓ Not to use the pumping system longer than necessary. Deactivate the pumping system immediately after removing the necessary amount of sludge.
- ✓ To perform sludge disposal immediately after loading the distribution tanks.
- ✓ Not to dispose sludge in places other than cropping areas.
- ✓ To correctly record data on the monitoring spreadsheet.

Dual wavelength Infra-red refrigerant gas sensor

Specifications

Specifications

Sensing Technology	Infra Red			
Measurement Range	CO_2 (1000ppm, 5000ppm)	CO (3,10,30,100%)	CH_4 (1%)	N2O (1000ppm)
Accuracy	± 80ppm, 2.5% of range	± 2.5% of range	± 2.5% of range	± 160ppm
Stability (per year)	± 180ppm, 2.0% of range	± 2.0% of range	± 2.0% of range	± 360ppm
Repeatability at zero	± 0.9%, 0.3%	± 0.3%	± 0.3%	± 20ppm
Repeatability at span	± 4.5%, 1.5%	± 1.5%	± 1.5%	± 90ppm
Response Time	T_{90} < 30s	T_{90} < 30s	T_{90} < 30s	T_{90} < 30s
Operating Temperature	0 - 40°C	0 - 40°C	0 - 40°C	0 - 40°C
Temperature Drift	± 0.1% of range per °C	± 0.1% of range per °C	± 0.1% of range per °C	± 0.2% of range per °C
Warm Up Time - operational	3 mins	3 mins	3 mins	3 mins
Warm Up Time - full specification	40 mins	40 mins	40 mins	40 mins
Humidity	unaffected by 5-90% RH (non condensing)	unaffected by 5-90% RH (non condensing)	unaffected by 5-90% RH (non condensing)	unaffected by 5-90% RH (non condensing)
Linear Output Resolution	0.006mA	0.006mA	0.006mA	0.006mA
Power Consumption	13W typical	13W typical	13W typical	13W typical
Input Voltage Requirements	88-138VAC or 172-276VAC (switch selectable)	88-138VAC or 172-276VAC (switch selectable)	88-138VAC or 172-276VAC (switch selectable)	88-138VAC or 172-276VAC (switch selectable)
Dimensions	267 x 258 x 148mm	267 x 258 x 148mm	267 x 258 x 148mm	267 x 258 x 148mm

Certificate No. Q 07882

EDINBURGH SENSORS: The gas sensor division of EDINBURGH INSTRUMENTS Ltd.

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Gas analyzers will measure methane content in produced biogas in parts per million (ppm). Gas analyzers will be calibrated according to manufacturer specifications. Calibration certificates will be provided when the equipment is installed in project sites. Calibration certificates shall be made available during the crediting period.

Calibration frequency will be determined by frequent recalibration of gas analyzers in the first months of operation. Calibration frequency, however, shall not exceed two years. Calibration is done using Industrial Pure gas cylinders, such as Synthetic Air or Nitrogen. Recalibration shall be done according to equipment manual by trained personnel.

ROOTS B3 G65 – SSM ICPWS Flow meter

Specifications

SERIES B3: G65 ROOTS® Meter

	UNITS	Metric
Temperature Range	deg. C	-40 to +60
Base Rating (Q Max.)	m^3/h	100
Max. Operating Pressure (MAOP)	bar	12
Leak Test (125% MAOP)	bar	15
Static Test (2 x MAOP)	bar	24
Rangeability +/- 1%	ratio	89:1
Rangeability +/- 2%	ratio	163:1
Start Rate	m^3/h	0,0595
Stop Rate	m^3/h	0,0510
Flow Rate @ 1,25 mbar, Gas	m^3/h	73,1
Avg. Differential, 100% Flow	mbar	3,2
Max. Pressurization Rate	kPa/sec	35
Max. Operating Speed	rpm	2350
Gear Ratio	ratio	141,1764:1
Displaced Volume/Revolution	m^3	0,000708
Drive Rate, CD	m^3/rev	0,1
Min. Odometer Reading	m^3	0,002
Odometer Turnover	yrs.	1,14
Nominal Pipe Size	mm	50
Flange-to-Flange	mm	172
Flange Connection	ANSI	150#FF
Bolts per Flange	qty.	4
Bolt Size[1]	in.	5/8 - 11
Flange Bolt Hole Depth	mm	23,8
Bolt Torque: Lubricated/Non-Lub.	N-m	74/81
Restricting Orifice (120%)	mm	9,525
Oil Capacity – Side Inlet	ml	37
Oil Capacity – Top Inlet	ml	226
Counter Version (CTR)[2]		
Net Weight	kg	13
Shipping Weight	kg	14
Carton Size	cm	69 x 28 x 23
Counter with Instrument Drive (CD)[2]		
Net Weight	kg	15
Shipping Weight	kg	17
Carton Size	cm	79 x 38 x 33

NOTES:
[1] Bolt Length varies by application.
[2] Weights and dimensions available for CPS upon request.

ROOTS B3 G65 – SSM ICPWS Flow meters are built and calibrated according to INMETRO (National Institute of Metrology, Standardization and Industrial Quality) Standard 114/1997 and OIML (International Organization of Legal Metrology) Recommendation 32. Standards and recommendations are annexed to this document.

Calibration frequency will be determined by sample checking of flow meters in the first months of operation. Calibration frequency, however, shall not exceed five years, as stated in INMETRO Standard 114/1997. Calibration is done using ROOTS® Proving System. This equipment is certified according to NMI (Netherlands Measurement Institute) standards. System specification follows:

ROOTS® Proving System Model 5 2M/10M

Specifications
(excludes computer)

Accuracy:		+/- 0.55%
Repeatability:		+/- 0.15%
Ambient Operating Temperature:	Master Meter:	+32° to +140°F 0° to +60°C
	Controller, etc.:	-4° to +140°F -20° to +60°C
Ambient Storage Temperature:	Master Meter:	-40° to +140°F -40° to +60°C
	Controller, etc.:	-40° to +185°F -40° to +85°C
Humidity:		Up to 95% non-condensing
AC Power:	Blower: Electronics:	120 or 240 volts ± 15%, 48 to 62 hertz 120 or 240 volts ± 15%, 48 to 62 hertz
Blower Capacity:	Single:	0 to 7,200 ACFH at 10 inch differential 0 to 200 m³/h at 25 millibar differential
Blower Capacity:	Dual:	0 to 14,400 ACFH at 10 inch differential 0 to 400 m³/h at 25 millibar differential
Compliance:		Meets FCC Part-15 requirements NMi and NIST Traceable
Test Medium:		Air
Test Flow Rate:	10M Master Meter:	100 to 10,000 ACFH 2.83 to 283 m³/h
	2M Master Meter:	35 to 2,300 ACFH 1 to 65.1 m³/h
Safety Rating:		Complies with Underwriters Laboratory Requirements
Inverter Capacity Required:		2000 watts continuous
Net Weight:		10M only 143 lbs. 2M/10M 173 lbs. Hose Carton* 50 lbs
Shipping Weight:		10M only 198 lbs. 2M/10M 228 lbs. Hose Carton 60 lbs.
Overall Prover Dimensions (l x w x h):		51" x 19.5" x 29.5"
Prover Shipping Dimensions (l x w x h):		54" x 24" x 32"
Hose Carton Shipping Dimensions (l x w x h):		41" x 22" x 35"

*Hose Carton contains prover Hose and Tool Kit

Minimum Computer System Requirements:

- Microsoft Windows® 95 or Windows® 98 Me, Windows NT® 4.0
- Pentium 200Mhz processor with 32 Megabytes of RAM
- 256 color video with 800 x 600 capability
- 100 MB of free Hard Disk space

DRESSER Roots Meters & Instruments

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Outside US Ph: 832.590.2303 Fax: 832.590.2494
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TS:MODEL 5
9.02

LD301 Smart Pressure Transmitter Series

Specifications

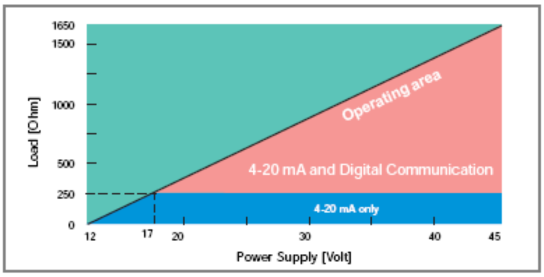
Functional Specifications

Process Fluid
Liquid, gas or vapor.

NEW Output Signal
Two-wire, 4-20 mA controlled according to NAMUR NE43 Specification, with superimposed digital communication (HART® Protocol).

Power Supply
12 to 45 Vdc.

Load Limitation

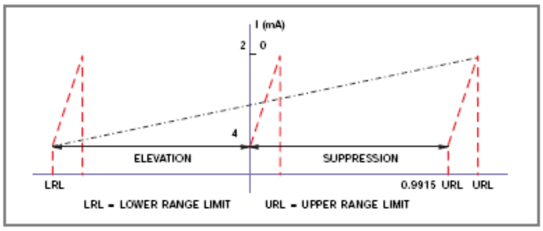


Indicator
Optional 4½-digit numerical and 5-character alphanumerical LCD indicator.

Hazardous Area Certifications
Explosion proof, weather proof and intrinsically safe (NEMKO, DMT, CEPEL, CSA and FM standards).

Zero and Span Adjustments
Noninteractive, via digital communication.

Zero Adjustment Limits



Calibrated span shall not be less than 0.0085 URL and shall not exceed 2 URL.
Low range value shall not be below LRL.
Upper range value shall not be greater than URL.
(LRL = -URL for all models, except absolute, where LRL = vacuum).

Temperature Limits

Ambient:	-40 to 85 °C (-40 to 185 °F).
Process:	-40 to 100 °C (-40 to 212 °F) (Silicone Oil).
	0 to 85 °C (-32 to 185 °F) (Fluorolube Oil).
	-40 to 150 °C (-40 to 302 °F) for LD301L.
	-25 to 85 °C (-13 to 185 °F) (Viton O-Rings).
Storage:	-40 to 100 °C (-40 to 212 °F).
Digital Display:	-10 to 60 °C (14 to 140 °F).
	-40 to 85 °C (-40 to 185 °F) without damage.

NEW Failure Alarm
In case of sensor or circuit failure, the self diagnostics drives the output to 3.6 or 21.0 mA, according to the user's choice.

Turn-on Time
Performs within specifications in less than 5.0 seconds after power is applied to the transmitter.

Volumetric Displacement
Less than 0.15 cm^3 (0.01 in^3).

Overpressure and Static Pressure Limits
From 3.45 kPa abs. (0.5 psia)* to:
8 MPa (1150 psi) for range 1.
16 MPa (2300 psi) for ranges 2, 3 & 4.
32 MPa (4600 psi) for models H & A5.
40 MPa (5800 psi) for model M5.
52 MPa (7500 psi) for model M6.

* except the LD301A model.
Flange Test Pressure: 60 MPa (8570 psi).

For ANSI/DIN Level flanges (LD301L models):
150lb: 6 psia to 275 psi at 38 °C (-0.6 to 19 bar).
300lb: 6 psia to 720 psi at 38 °C (-0.6 to 50 bar).
PN10/16: -60 kPa to 1.4 MPa at 120 °C.
PN25/40: -60 kPa to 4 MPa at 120 °C.

These pressures will not damage the transmitter, but a new calibration may be necessary.

Humidity Limits
0 to 100% RH.

Damping Adjustment
User configurable from any value higher than zero seconds in addition to intrinsic sensor response time (0.2s) (via digital communication).

Configuration
By digital communication (HART® protocol) using the Configuration Interface CONF301 or the Hart Pocket Configurator HPC301. Can be done partially, through local adjustment.

Performance Specifications
Reference conditions: range starting at zero, temperature 25 °C (77 °F), atmospheric pressure, power supply of 24 Vdc, silicone oil fill fluid, isolating diaphragms in 316L SS and digital trim equal to lower and upper range values.

Accuracy
0.1 URL ≤ span ≤ URL:
±0.075% of span;
0.025 URL ≤ span ≤ 0.1 URL:
±0.0375 [1+0.1 URL/span]% of span;
0.0085 URL ≤ span ≤ 0.025 URL:
±[0.0015+0.00465 URL/span]% of span (*).

(*) - Recommended minimum span for Range 1 is 0.025 URL.

For ranges 5 and 6, Absolute models, diaphragms in Tantalum, Monel or fill fluid in Fluorolube:
0.1 URL ≤ span ≤ URL:
± 0.1% of span;
0.025 URL ≤ span ≤ 0.1 URL:
±0.05 [1+0.1 URL/span]% of span;
0.0085 URL ≤ span ≤ 0.025 URL:
±[0.01+0.006 URL/span]% of span.

For Absolute - range 1:
± 0.2% of span
Linearity, hysteresis and repeatability effects are included.

Stability

± 0.1% of URL for 24 months for ranges 2, 3, 4, 5 & 6.
± 0.2% of URL for 12 months for range 1 & L models.
± 0.25% of URL for 5 years, at 20 °C temperature change and up to 7 MPa (1000 psi) of static pressure.

Temperature Effect

± (0.02% URL+0.1% span) per 20 °C (36 °F) for ranges 2, 3, 4, 5 & 6.
± (0.05% URL+0.15% span) per 20 °C (36 °F) for range 1.

For LD301L:
6 mmH_2O per 20 °C for 4" and DN100.
17 mmH_2O per 20 °C for 3" and DN80.
Consult for other flange dimensions and fill fluid.

Static Pressure Effect

Zero error:
± 0.1% URL per 7 MPa (1000 psi) for ranges 2, 3, 4 & 5, or 3.5 MPa (500 psi) for L models or 1.7 MPa (250 psi) for range 1. This is a systematic error that can be eliminated by calibrating at the operating static pressure.
Span error:
Correctable to ± 0.2% of reading per 7 MPa (1000 psi) for ranges 2, 3, 4 & 5 or 3.5 MPa (500 psi) for range 1 and L models.

Power Supply Effect

± 0.005% of calibrated span per volt.

Mounting Position Effect

Zero shift of up to 250 Pa (1 inH_2O) which can be calibrated out. No span effect.

Electro-Magnetic Interference Effect

Designed to comply with IEC 61000-6-2:1999, IEC 61000-6-4: 1997, IEC 61326: 2000.

Vibration Effects

Designed according to SAMA PMC 31.1 standard

Physical Specifications

Electrical Connection

½ - 14 NPT, Pg 13,5 or M20 x 1,5 metric.

Process Connection
¼ - 18 NPT or ½ -14 NPT (with adapter). For L models see ordering code.

Wetted Parts

- **Isolating Diaphragms**
  316L SST, Hastelloy C276, Monel 400 or Tantalum.
- **Drain/Vent Valves and Plug**
  316 SST, Hastelloy C276 or Monel 400.
- **Flanges**
  Plated carbon steel, 316 SST, Hastelloy C276 or Monel 400.
- **Wetted O-Rings (For Flanges and Adapters)**
  Buna N, Viton™ or PTFE. Ethylene-Propylene on request.

The LD301 is available in NACE MR-01-75 compliant materials.

Nonwetted Parts

- **Electronic Housing**
  Injected aluminum with polyester painting or 316 SST (NEMA 4X, IP67).
- **Blank Flange**
  Plated carbon steel, when the wetted flange is made of this same material, and 316 SST in the other cases.
- **Level Flange (LD301L)**
  316 SST.
- **Fill Fluid**
  Silicone or Fluorolube Oil.
- **Cover O-Rings**
  Buna N.
- **Mounting Bracket**
  Plated carbon steel with polyester painting or 316 SST. Accessories (bold, nuts, washers and U-clamps) in carbon steel or 316 SST.
- **Flange Bolts and Nuts**
  Plated carbon steel:
  Grade 7, 316 SST or Carbon Steel B7M (for nace applications).
- **Identification Plate**
  316 SST.

Mounting

a) Flange mounted for models LD301L.
b) Optional universal mounting bracket for surface or vertical/horizontal (DN 50) 2"-pipe (optional).
c) Via bracket on manifold valve (optional).
d) Directly on piping for closely coupled transmitter/orifice flange combinations.

Approximate Weights

3.15 kg (7 lb): all models, except L models.
5.85 to 9.0 kg (13 lb to 20 lb): L models depending on the flanges, extension and materials.

Control Characteristics (optional)

PID
Proportional Gain: 0 to 100.
Integral Time: 0.01 to 999 min/rep.
Derivative Time: 0 to 999 s.
Direct / Reverse Action.
Lower and Upper output limits.
Output rate-of-change limit: 0 to 100%/s.
Power-on safety output.
Antireset windup.
Bumpless Auto/Manual transfer.
16 point table for PID input and output, freely user configurable.

Hastelloy is a trademark of the Cabot Corp.
Monel is a trademark of International Nickel Co.
Viton and Teflon are trademarks of E. I. DuPont de Nemours & Co.
Fluorolube is a trademark of Hooker Chemical Corp.
Hart is a trademark of HART Communication Foundation.

Smar Pressure Transmitters are protected by USA patent number 6,433,791

Calibration

LD301 Smart Pressure Transmitter Series are built and calibrated in accordance with INMETRO. Conformity tests were made by the Centre of Electrical Energy Research, organization that is accredited by INMETRO for such testing. Certificates of Conformity are annexed to this document. Testing and certification will be executed during the crediting period to ensure proper operation of LD301 Transmitters.

EXHAUST GAS TEMPERATURE SENSOR

Exhaust gas temperature will be measured by Type K sensors are built and calibrated according to ASTM standard ASTM-E 230/77. These sensors have a temperature range of 0 to 1 100ºC. Sensors will be regulated to operate with maximal temperature of 600 to 700ºC.

The sensor provides +- 2.2 ºC accuracy in temperature reading. The sensors are connected to the PLC, which records readings on an hourly basis, on Celsius degrees. These sensors do not need to be recalibrated. Sensors will be replaced as needed.

FLARE DEVICES

Specifications:

Combu tec

Queimadores e Geradores de ar quente

COMBUSTEC AUTOMATIC COMBUSTION SYSTEM

Model: 470

TECHNICAL SPECIFICATION

CONSTRUCTION:

- Stainless steel AISI 304 construction;
- Plated stainless steel AISI 304 mounting;
- Ceramic coating (thermal capacity of 1450°C);

DIMENSIONS:

- Flare external diameter: 470 mm
- Flare height: 4200 mm
- Combustion chamber height: 3600 mm

Note: Quality Certificates of components (including stainless steel) are provided;

OPERATIONAL RANGE:

- **Flare temperature:**
  Minimal: 500°C
  Maximum: 900°C
- **Gas flow:**
  Minimal: 5 m^3/hour
  Maximum: 90 m^3/hour
  Nominal: 75 m^3/hour

Note: Flare temperature is determined as the temperature of the exhaust gas, measured by Termopar sensors within the combustion system.

EXPECTED COMBUSTION EFFICIENCY:

- Methane (CH_4) destruction efficiency: 99%

Note: The combustion systems shall operate with the expected efficiency given that the flare temperature and gas flow are within the operational range.

ROBERTO VILELA
COMBUSTEC QUEIMADORES
www.combustecqueimadores.com.br

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COMBUSTEC AUTOMATIC COMBUSTION SYSTEM

Model: 630

TECHNICAL SPECIFICATION

CONSTRUCTION:

- Stainless steel AISI 304 construction;
- Plated stainless steel AISI 304 mounting;
- Ceramic coating (thermal capacity of 1450ºC);

DIMENSIONS:

- Flare external diameter: 630 mm
- Flare height: 5100 mm
- Combustion chamber height: 3600 mm

Note: Quality Certificates of components (including stainless steel) are provided;

OPERATIONAL RANGE:

- **Flare temperature**:
  Minimal: 500ºC
  Maximum: 900ºC
- **Gas flow:**
  Minimal: **60 m^3/hour**
  Maximum: **120 m^3/hour**
  Nominal: **100 m^3/hour**

Note: Flare temperature is determined as the temperature of the exhaust gas, measured by Termopar sensors within the combustion system.

EXPECTED COMBUSTION EFFICIENCY:

- Methane (CH_4) destruction efficiency: 99%

Note: The combustion systems shall operate with the expected efficiency given that the flare temperature and gas flow are within the operational range.

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COMBUSTEC AUTOMATIC COMBUSTION SYSTEM

Model: 950

TECHNICAL SPECIFICATION

CONSTRUCTION:

- Stainless steel AISI 304 construction;
- Plated stainless steel AISI 304 mounting;
- Ceramic coating (thermal capacity of 1450ºC);

DIMENSIONS:

- Flare external diameter: 9500 mm
- Flare height: 5100 mm
- Combustion chamber height: 3600 mm

Note: Quality Certificates of components (including stainless steel) are provided;

OPERATIONAL RANGE:

- **Flare temperature**:
  Minimal: 500ºC
  Maximum: 900ºC
- **Gas flow:**
  Minimal: 15 m^3/hour
  Maximum: 200 m^3/hour
  Nominal: 180 m^3/hour

Note: Flare temperature is determined as the temperature of the exhaust gas, measured by Termopar sensors within the combustion system.

EXPECTED COMBUSTION EFFICIENCY:

- Methane (CH_4) destruction efficiency: 99%

Note: The combustion systems shall operate with the expected efficiency given that the flare temperature and gas flow are within the operational range.

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COMBUSTEC AUTOMATIC COMBUSTION SYSTEM

Model: 1260

TECHNICAL SPECIFICATION

CONSTRUCTION:

- Stainless steel AISI 304 construction;
- Plated stainless steel AISI 304 mounting;
- Ceramic coating (thermal capacity of 1450°C);

DIMENSIONS:

- Flare external diameter: 1260 mm
- Flare height: 5200 mm
- Combustion chamber height: 3600 mm

Note: Quality Certificates of components (including stainless steel) are provided;

OPERATIONAL RANGE:

- **Flare temperature**:
  Minimal: 500°C
  Maximum: 900°C
- **Gas flow:**
  Minimal: **150 m^3/hour**
  Maximum: **260 m^3/hour**
  Nominal: **250 m^3/hour**

Note: Flare temperature is determined as the temperature of the exhaust gas, measured by Termopar sensors within the combustion system.

EXPECTED COMBUSTION EFFICIENCY:

- Methane (CH_4) destruction efficiency: 99%

Note: The combustion systems shall operate with the expected efficiency given that the flare temperature and gas flow are within the operational range.

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- Biodigestors: Advances and Drawbacks – Article, EMBRAPA, 2004.