



**UNFCCC**  
**Clean Development Mechanism**  
**Monitoring Report**

**AWMS GHG Mitigation Project**  
**BR05-B-04, Parana, Santa Catarina and Rio**  
**Grande do Sul, Brazil**

**Monitoring Period:** 1 December 2009 – 31 May 2010

**CDM Registration number:** UNFCCC0411

**Document ID:** MR06-BR05-B-04, V.1

**Date:** 12 July 2010

**MONITORING REPORT FORM (CDM-MR)**  
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**MONITORING REPORT**

Version 1 28 May 2010

**AWMS GHG MITIGATION PROJECT****I. BR05-B-04, PARANA, SANTA CATARINA AND RIO GRANDE DO SUL, BRAZIL  
UNFCCC0411**

Monitoring Period #6 1/12/2009 – 31/05/2010

**SECTION A. General description of the project activity****A.1. Brief description of the project activity: >>>**

The purpose of the AWMS GHG Mitigation Project, BR05-B-04, Parana, Santa Catarina and Rio Grande do Sul, Brazil is to mitigate animal effluent related GHG emissions by improving the animal waste management system (AWMS) at several swine farms (See A.1 below).

| Site                |        |  | Monitoring Start<br>Date | Renewable<br>Energy Equipment |
|---------------------|--------|--|--------------------------|-------------------------------|
| Legal Entity        | ID     | Name                                   |                          |                               |
| Mario Lanznaster    | 10617  | Master - Site 1 - F-F                  | 06-Sep-06                | X                             |
|                     | 10618  | Master - Site 2 - N-F                  | 19-Sep-05                | X                             |
| COPERCAMPOS         | 10619  | Granja Ibicuí-Central Produtora        | 01-Jun-05                | X                             |
|                     | 10620  | Granja Floresta                        | 26-Aug-05                | X                             |
|                     | 10621  | Fazenda Otaciano                       | 02-Aug-05                |                               |
|                     | 10657  | Granja Natalino Calegari               | 20-Jul-06                | X                             |
|                     | 10658  | Fazenda Santa Clara                    | 05-Aug-05                |                               |
|                     | 10659  | Fazenda Santa Cruz                     | 25-Jan-06                |                               |
|                     | 10660  | Fazenda Lacerdópolis - Vitalino Zenaro | N/A                      |                               |
|                     | 10661  | Fazenda Papua - Vitalino Zenaro        | 20-Jul-06                |                               |
|                     | 10700  | Granja Amazonas Belló                  | 25-Jan-06                |                               |
|                     | 10701  | Triunfo II                             | 25-Jan-06                |                               |
|                     | 10702  | Granja Sergio Scalçavara               | 16-Aug-06                |                               |
|                     | 10703  | Granja José Ricardo Durigon            | 25-Jan-06                |                               |
|                     | 26282  | Granja Ibicuí - Sítio 2                | 01-Jun-05                | X                             |
| COPERIO             | 10680  | Granja Luzerna                         | 24-Jan-06                | X                             |
|                     | 10681  | Granja Agua Doce                       | 24-Jan-06                |                               |
|                     | 10682  | Granja Jaborá                          | 24-Jan-06                |                               |
| Neudi Pelizza       | 10630  | Granja Frei Plácido                    | 22-Aug-05                |                               |
| Pedro Carpenedo     | 10633  | Granja Ganedo                          | 22-Aug-05                | X                             |
| Anélio Thomazzoni   | 10683  | Fazenda Thomazzoni - Swine             | 25-Jul-05                | X                             |
| Darci Siviero       | 10684  | Sítio Siviero                          | 18-Aug-06                | X                             |
| Edson Ricardo Gross | 10741  | Granja Ipê                             | 17-Dec-05                | X                             |
| Antonio Cecatto     | 29352  | Granja Cecatto                         | 04-Apr-06                |                               |
| Wybe de Jager       | 850061 | Fazenda Cercadinho                     | 13-Feb-06                | X                             |

Table A.1 Project Source Ids and Legal Entity



The project is comprised of reduction of methane (CH<sub>4</sub>) emissions by means of installing ambient temperature anaerobic digesters for treatment of manure and by capturing and flaring the resulting biogas or utilizing biogas for energy generation at selected sites.

The technology employed by the project activity includes installation of new covered lagoons creating an anaerobic digester. The covered and lined lagoon system creates a digester with sufficient capacity and hydraulic retention time (HRT) to nearly eliminate the volatile solids loading in the effluent. Processed effluent from the lagoon cells is routed to the clarification lagoon(s) and captured gas will be removed and combusted.

This project was registered on 9/07/2006 with a 10 year renewal, and projects were constructed and entered into monitoring per the Table A.2.

Total emission reductions achieved in this monitoring period are 18,679.

**A.2. Project Participants**

&gt;&gt;

| <b>Name of Party involved (*)<br/>((host) indicates a host Party)</b> | <b>Private and/or public entity(ies)<br/>project participants (*)<br/>(as applicable)</b> | <b>Kindly indicate if the<br/>Party involved wishes to<br/>be considered as project<br/>participant<br/>(Yes/No)</b> |
|---|---|--|
| Brazil (host)   | AgCert Do Brasil Solucoes Ambientais Ltda.  | No   |
| United Kingdom of Great Britain and Northern Ireland                  | AgCert International Ltd.   | No   |
| Switzerland   | AgCert International Ltd.   | No   |

**A.3. Location of the project activity:**

>> The locations of the sites within the project activity are below in Table A.2.

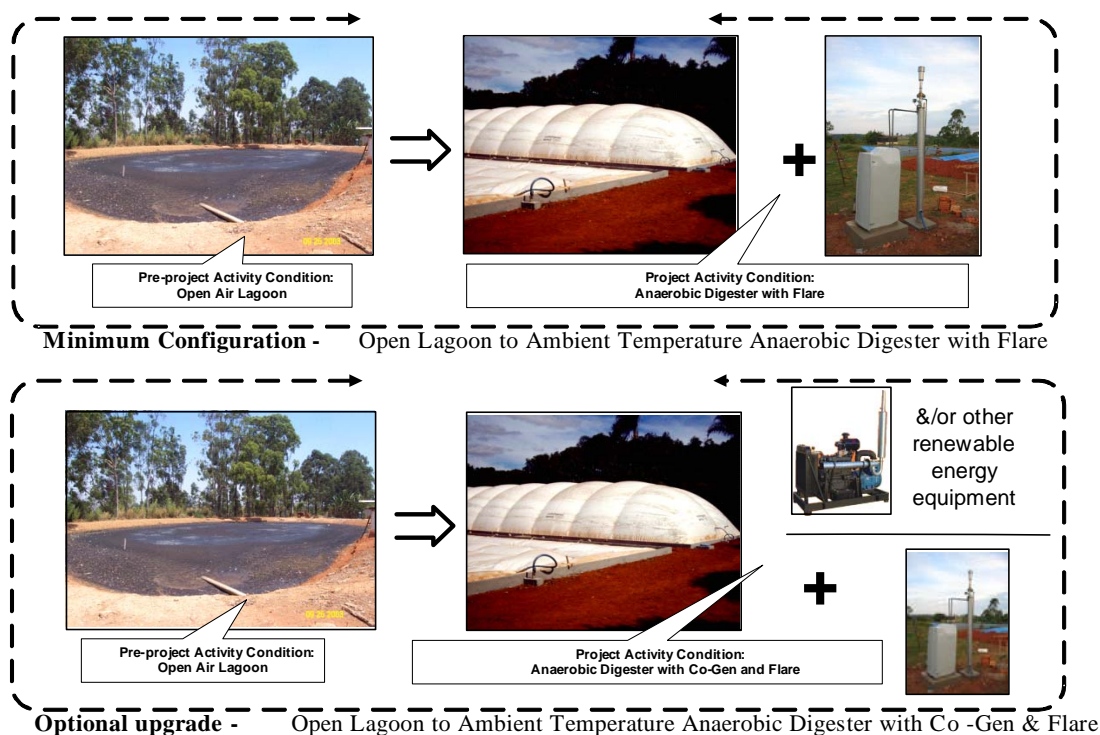
| Source Id | Source Name                                | Latitude | Longitude | City         | Region            |
|-----------|--|----------|-----------|--------------|-------------------|
| 10617     | Master - Site 1 - F-F                      | -27.07   | -52.72    | Chapecó      | Santa Catarina    |
| 10618     | Master - Site 2 - N-F                      | -27.07   | -52.71    | Chapecó      | Santa Catarina    |
| 10619     | Granja Ibicuí-Central Produtora de Leitões | -27.47   | -51.22    | Campos Novos | Santa Catarina    |
| 10620     | Granja Floresta                            | -27.34   | -50.99    | Campos Novos | Santa Catarina    |
| 10621     | Fazenda Otaciano                           | -27.49   | -51.33    | Campos Novos | Santa Catarina    |
| 10630     | Granja Frei Plácido                        | -26.90   | -52.48    | Xaxim        | Santa Catarina    |
| 10633     | Granja Ganedo                              | -27.82   | -54.41    | Santa Rosa   | Rio Grande do Sul |
| 10657     | Granja Natalino Calegari                   | -27.58   | -51.39    | Campos Novos | Santa Catarina    |
| 10658     | Fazenda Santa Clara                        | -27.36   | -51.21    | Campos Novos | Santa Catarina    |
| 10659     | Fazenda Santa Cruz                         | -27.50   | -51.39    | Campos Novos | Santa Catarina    |
| 10660     | Fazenda Lacerdópolis - Vitalino Zenaro     | -27.27   | -51.58    | Lacerdópolis | Santa Catarina    |
| 10661     | Fazenda Papua - Vitalino Zenaro            | -27.48   | -51.06    | Campos Novos | Santa Catarina    |
| 10680     | Granja Luzerna                             | -27.10   | -51.53    | Luzerna      | Santa Catarina    |
| 10681     | Granja Agua Doce                           | -26.85   | -51.55    | Agua Doce    | Santa Catarina    |
| 10682     | Granja Jaborá                              | -27.13   | -51.71    | Joaçaba      | Santa Catarina    |
| 10683     | Fazenda Thomazzoni - Swine                 | -26.83   | -52.13    | Vargeão      | Santa Catarina    |
| 10684     | Sítio Siviero                              | -26.42   | -52.39    | Civelândia   | Parana            |
| 10700     | Granja Amazonas Belló                      | -27.26   | -51.24    | Campos Novos | Santa Catarina    |
| 10701     | Triunfo II                                 | -27.48   | -51.20    | Campos Novos | Santa Catarina    |
| 10702     | Granja Sergio Scalçavara                   | -27.29   | -51.15    | Campos Novos | Santa Catarina    |
| 10703     | Granja José Ricardo Durigon                | -27.39   | -51.42    | Campos Novos | Santa Catarina    |
| 10741     | Granja Ipê                                 | -27.92   | -54.49    | Santa Rosa   | Rio Grande do Sul |
| 26282     | Granja Ibicuí - Sítio 2                    | -27.47   | -51.22    | Campos Novos | Santa Catarina    |
| 29352     | Granja Cecatto                             | -28.83   | -51.55    | Vila Flores  | Rio Grande do Sul |
| 850061    | Fazenda Cercadinho                         | -24.72   | -49.90    | Castro       | Parana            |

Table A.2 Project location

**A.4. Technical description of the project**

>>

The technology employed by the project activity includes the total replacement of the open primary lagoon at the project activity sites with positive pressure covered lagoon “cells”, creating ambient temperature anaerobic digesters. The system is comprised of identical cells with sufficient combined capacity to create an adequate Hydraulic Retention Time (HRT). Each cell uses a liner affixed to a reinforced outer concrete frame. The outer cover consists of a synthetic UV-treated multi-layer membrane, which is also fastened to the frame. The liner and cover are sealed together. The cells have been designed to enable solids residue removal without breaking seal and the biogas from each cell can be independently sectioned off. Maintenance and repairs can be made to one cell without affecting operation of the other cells. All cell components are sourced from in-country manufacturers. Processed effluent from the lagoon cells is routed to the clarification lagoon(s) and captured gas is routed to flare and/or generator and combusted.



**Figure A2. Project Activity Configurations**

Figure A2 depicts two approaches to mitigate AWMS GHG emissions. The minimum configuration constructs cells and a flaring system, as described above. The optional upgrade incorporates the use of a cogeneration system to produce on-farm electricity, using methane produced by the covered cells as fuel. The minimum configuration flare is retained to burn methane not required by the engine/generator set.

Care was given to use compatible components in the design of the AWMS. For example, the geomembrane cover has tensile and tear strengths which far exceed the flare over-pressure release threshold. Furthermore, the flare combustion capacity exceeds the estimated GHG production forecasts.

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

>>

This project activity utilized the CDM approved baseline methodology AM0016, Version 02: *Greenhouse gas mitigation from improved Animal Waste Management Systems in confined animal feeding operations*.

**A.6. Registration date of the project activity:**

>>

This project was registered 9 July 2006.

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

>>

The Crediting Period of the project activity is 1 May 2005 – 30 April 2015 (Fixed)

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



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&gt;&gt;&gt;

The person responsible for completing the monitoring report form is Pamela McRoy, Monitoring and Verification Manager; AgCert International. Phone (321) 549-3972.

**SECTION B. Implementation of the project activity****B.1. Implementation status of the project activity**

&gt;&gt;&gt;

The Operations Monitoring System (OMS) Start Date is indicated in the below table, with the construction completion date for each site. No equipment was replaced during this monitoring period. Events that were significant impact to operations are listed in Table B.1 per site.

| Source ID | Source Name                               | OMS start date | Construction completion date | Equipment replaced | Date of replacement | Significant events  |
|-----------|---|----------------|------------------------------|--------------------|---------------------|---|
| 10617     | Master - Site 1 - F-F                     | 9/6/2006       | 12/5/2006                    |                    |                     |   |
| 10618     | Master - Site 2 - N-F                     | 9/19/2005      | 8/11/2005                    |                    |                     | Compressor did not work from Oct 19th to Oct 22th   |
| 10619     | Granja Ibicui-Central Produtora de Leites | 6/1/2005       | 6/1/2005                     |                    |                     |   |
| 10620     | Granja Floresta                           | 8/26/2005      | 8/26/2005                    |                    |                     |   |
| 10621     | Fazenda Otaciano                          | 8/2/2005       | 7/31/2005                    |                    |                     |   |
| 10630     | Granja Frei Plácido                       | 8/22/2005      | 8/11/2005                    |                    |                     |   |
| 10633     | Granja Ganedo                             | 8/22/2005      | 8/11/2005                    |                    |                     |   |
| 10657     | Granja Natalino Calegari                  | 7/20/2006      | 12/5/2006                    |                    |                     | sanitary empty space from Dec 17th to Jan 10th  |
| 10658     | Fazenda Santa Clara                       | 8/5/2005       | 7/31/2005                    |                    |                     | blower broken from Feb 09th to Feb 23th. Blower broken from Apr 27th to May 03rd                                    |
| 10659     | Fazenda Santa Cruz                        | 1/25/2006      | 11/27/2005                   |                    |                     | sanitary empty space from Dec 22th to Jan 10th  |
| 10660     | Fazenda Lacerdópolis - Vitalino Zenaro    | N/A            | N/A                          |                    |                     |   |
| 10661     | Fazenda Papua - Vitalino Zenaro           | 7/20/2006      | 4/10/2007                    |                    |                     |   |
| 10680     | Granja Luzema                             | 1/24/2006      | 11/27/2005                   |                    |                     |   |
| 10681     | Granja Água Doce                          | 1/24/2006      | 12/4/2005                    |                    |                     |   |
| 10682     | Granja Jaborá                             | 1/24/2006      | 12/4/2005                    |                    |                     |   |
| 10683     | Fazenda Thomazzoni - Swine                | 7/25/2005      | 7/25/2005                    |                    |                     |   |
| 10684     | Sítio Siviero                             | 8/18/2006      | 8/18/2006                    |                    |                     | removal and recirculation of sludge in Mar 29th. In March/10 finishers are being reduced                            |
| 10700     | Granja Amazonas Belló                     | 1/25/2006      | 11/27/2005                   |                    |                     | flow meter stopped from Jan 16th to Jan 26th. Without animals from Feb 02nd to Feb 14th                             |
| 10701     | Triunfo II                                | 1/25/2006      | 2/8/2006                     |                    |                     | sanitary empty space from Jan 15th to Jan 31th  |
| 10702     | Granja Sergio Scalçavara                  | 8/16/2006      | 12/5/2006                    |                    |                     | site is not working. Sanitary empty space from Dec 12th to Dec 20th. Sanitary empty space from Apr 08th to Apr 16th |
| 10703     | Granja José Ricardo Durigon               | 1/25/2006      | 11/27/2005                   |                    |                     |   |
| 10741     | Granja Ipê                                | 12/17/2005     | 12/4/2005                    |                    |                     | site did not work from Dec 24th to Dec 30 due to electrical problems  |
| 26282     | Granja Ibicui - Sítio 2                   | 6/1/2005       | 6/1/2005                     |                    |                     |   |
| 29352     | Granja Cecatto                            | 4/4/2006       | 3/24/2006                    |                    |                     |   |
| 850061    | Fazenda Cercadinho                        | 2/13/2006      | 12/18/2005                   |                    |                     | tubing was broken, bio was opened from Nov 16th to Dec 14th   |

Table B.1 Project Implementation Status

Table B.2 lists all monitoring reports for this project.

| Report Number                   | Dates      |             | Resulting emission reductions | Verifying DOE |
|---------------------------------|------------|-------------|-------------------------------|---------------|
|                                 | From       | To          |                               |               |
| MR06-BR05-B-04 (current report) | 1 Dec 2009 | 31 May 2010 | See A.1                       | DNV           |
| MR05-BR05-B-04                  | 1 Jun 2009 | 30 Nov 2009 | 19,966                        | DNV           |
| MR04-BR05-B-04                  | 1 Aug 2008 | 31 May 2009 | 29,634                        | DNV           |
| MR03-BR05-B-04                  | 1 Oct 2007 | 31 Jul 2008 | 24,467                        | DNV           |
| MR02-BR05-B-04                  | 1 Nov 2006 | 30 Sep 2007 | 20,829                        | DNV           |
| MR01-BR05-B-04                  | 1 May 2005 | 31 Oct 2006 | 17,175                        | DNV           |

Table B.2. Monitoring Reports

**B.2. Revision of the monitoring plan**

&gt;&gt;&gt;



Monitoring is carried out in accordance with the revision to the monitoring plan which was approved on 20 August 2007.

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

&gt;&gt;

No deviations were requested.

**B.4. Notification or request of approval of changes**

&gt;&gt;

Not applicable.

**SECTION C. Description of the monitoring system**

&gt;&gt;

The biogas transfer system and biogas flow meter system consists of biogas trapped under a positive pressure geomembrane cover installed over the digester cell. The biogas is routed from the digester to the flare via PVC tubing. A Roots flow meter, which measures gas flow, is fitted in the biogas transfer system piping. Readings and operation of the flow meter is recorded weekly and monthly. A LandTec biogas check gas analyzer is used to check the CO<sub>2</sub> concentration of the gas at a port, located near the meter, at least quarterly. The flare system is designed to combust the biogas. Weekly checks of the enclosed flare ensure the correct operation of the system. In the case the flare system becomes unusable, the farm manager immediately notifies the PP, and the system is shut down until repairs are made. An optional combustion system may be installed to take advantage of the biogas and convert it into renewable energy. Those sites which have generators installed are indicated in Table A.1



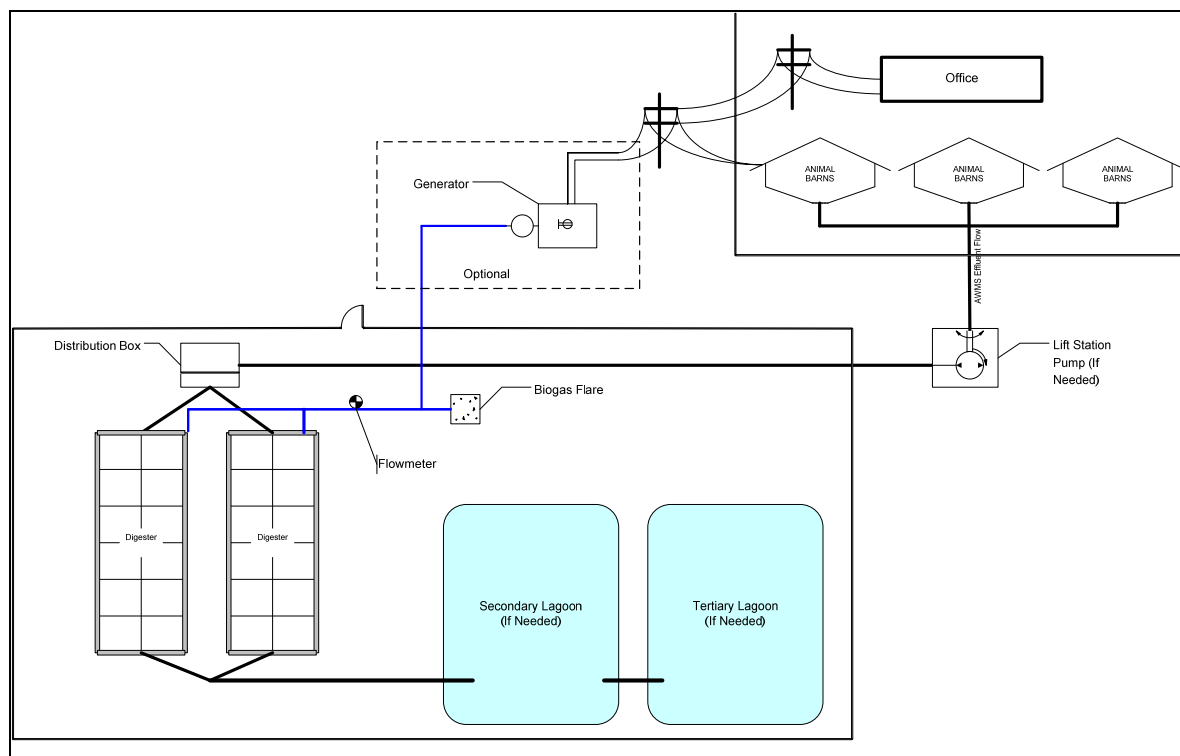


Figure C-1. Project Activity Configuration

#### QA/QC roles and responsibilities

Complete work instructions and QA/QC roles and responsibilities are listed in the O&M plan. Below is a summary of QA/QC responsibilities and documentation applied for the monitored parameters:

| Parameter                | Documentation                               | Performed by | QA/QC check performed by: |
|--------------------------|---|--------------|---------------------------|
| Biogas Produced          | Monthly Report                              | RMT          | QA, OP                    |
| CO2 produced             | Reported on Monthly Report; taken quarterly | RMT          | QA, OP                    |
| Population               | Monthly inventory reports                   | FH, RMT      | QA, OP                    |
| AWMS Type                | Form B                                      | OP           | QA, OP                    |
| Temperature and Rainfall | NOAA.gov; imported to EnviroCert monthly    | IT           | QA, OP                    |
| Operational Status       | Weekly Report                               | FH, RMT      | QA, OP                    |
| Power Consumption        | 24h/7d                                      | IT           | QA, OP                    |

FH-Farm Hand, RMT - Regional maintenance technician; QA - quality assurance; OP – operations; IT – Integrated Technology Technician



The organization chart below in Figure 2.1 shows how the organization is structured for Operations and Maintenance of the sites.

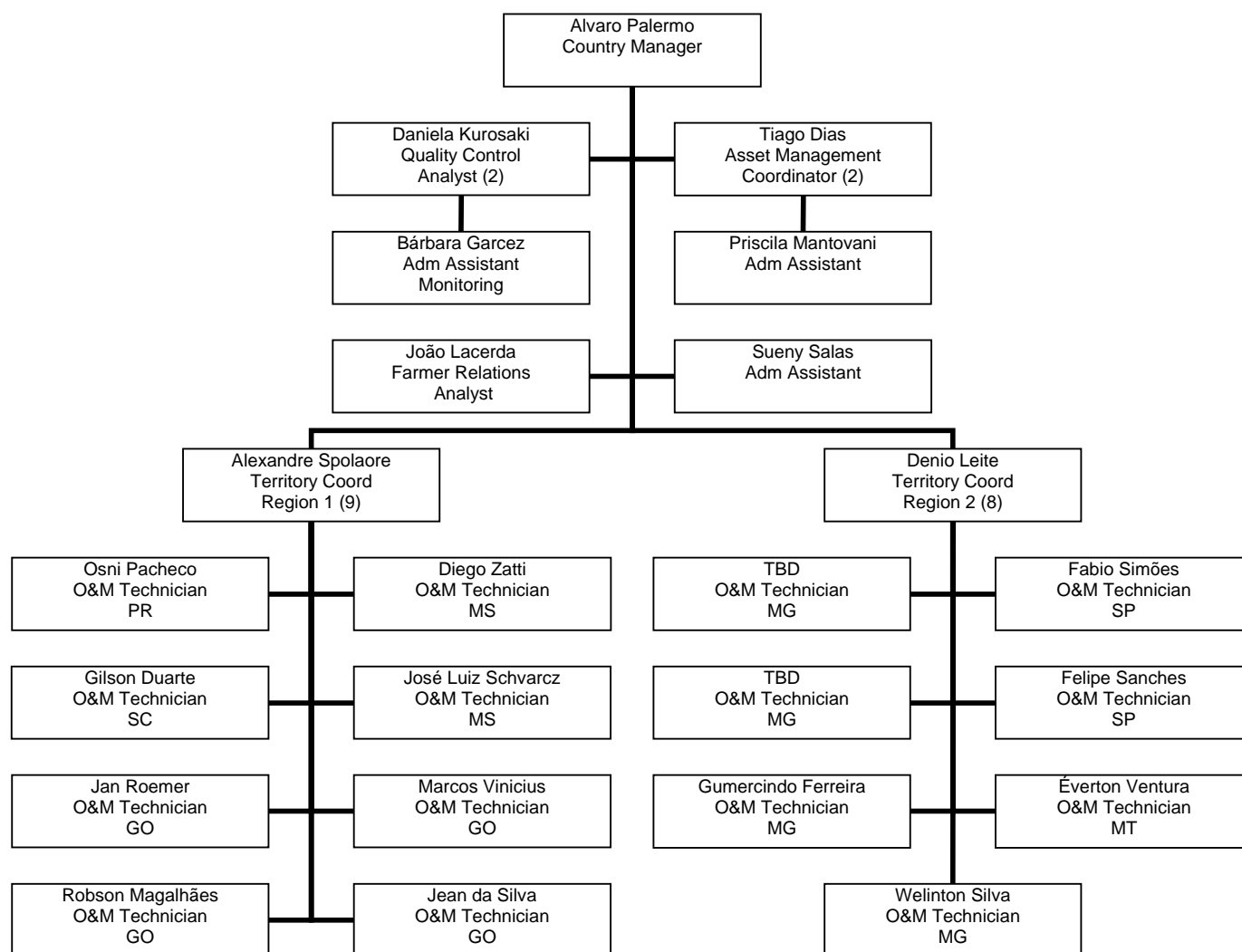


Figure C.2. Organization Chart

**SECTION D. Data and parameters**

The parameters used to calculate baseline, project, and leakage emissions as well as other relevant parameters required by the approved methodology and the monitoring plan; and specific information on how data and parameters have been monitored during the monitoring period are listed below.

| <b>D.1. Data and parameters determined at registration and not monitored during the monitoring period, including default values and factors</b> |  |
|---|--|
| <b>Data / Parameter:</b>  | <b>CH<sub>4</sub> GWP</b>  |
| Data unit:  | <b>integer</b>   |
| Description:  | Global Warming Potential of Methane  |
| Source of data used:  | Intergovernmental Panel on Climate Change, <i>Climate Change 1995: The Science of Climate Change</i> (Cambridge, UK: Cambridge University Press, 1996) |
| Value(s) :  | 21   |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)  | Baseline/Project Activity  |
| Additional comment:   |  |

|  |                                    |
|--|------------------------------------|
| <b>Data / Parameter:</b>   | <b>MS%<sub>j</sub></b>             |
| Data unit:   | <b>%</b>                           |
| Description:   | Percent of effluent used in system |
| Source of data used:   | Form B                             |
| Value(s) :   | 100%                               |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | Baseline/Project Activity/         |
| Additional comment:  |                                    |

|  |   |
|--|---|
| <b>Data / Parameter:</b>   | <b>V<sub>s</sub></b>                                    |
| Data unit:   | <b>Kg-dm/day</b>  |
| Description:   | Volatile solids excretion rate                          |
| Source of data used:   | Obtained from 1996 IPCC, Appendix B, Table B-6, p. 4.46 |
| Value(s) :   | 0.5   |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | Baseline/Project Activity                               |
| Additional comment:  |   |

|  |
|--|
|  |
|--|



|  |   |
|--|---|
| <b>Data / Parameter:</b>   | <b>B<sub>0</sub></b>  |
| Data unit:   | <b>integer</b>  |
| Description:   | Maximum methane producing capacity (B <sub>0</sub> ) for the animal waste |
| Source of data used:   | Obtained from 1996 IPCC, Appendix B, Table B-6, p.4.46                    |
| Value(s) :   | 0.45  |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | Baseline/Project Activity   |
| Additional comment:  |   |

|  |   |
|--|---|
| <b>Data / Parameter:</b>   | <b>MCF<sub>month</sub></b>                              |
| Data unit:   | <b>integer</b>  |
| Description:   | Methane conversion factor per month                     |
| Source of data used:   | Obtained from 1996 IPCC, Appendix B, Table B-6, p. 4.46 |
| Value(s) :   | 0.90 Baseline/ 0.10 Project Activity                    |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | Baseline/Project Activity                               |
| Additional comment:  |   |

|  |  |
|--|--|
| <b>Data / Parameter:</b>   | <b>N<sub>2</sub>O GWP</b>  |
| Data unit:   | <b>integer</b>   |
| Description:   | Global Warming Potential of N <sub>2</sub> O   |
| Source of data used:   | Intergovernmental Panel on Climate Change, <i>Climate Change 1995: The Science of Climate Change</i> (Cambridge, UK: Cambridge University Press, 1996) |
| Value(s) :   | 310  |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | Baseline/Project Activity  |
| Additional comment:  |  |

|  |   |
|--|---|
| <b>Data / Parameter:</b>   | <b>C<sub>m</sub></b>  |
| Data unit:   | <b>integer</b>  |
| Description:   | Conversion factor from [N <sub>2</sub> O-N] to N <sub>2</sub> O (C <sub>m</sub> =44/23) |
| Source of data used:   |   |
| Value(s) :   | 1.5714  |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | Baseline/Project Activity/Leakage   |



|                                |  |
|--------------------------------|--|
| Leakage emission calculations) |  |
| Additional comment:            |  |

|  |   |
|--|---|
|  |   |
|  |   |
| <b>Data / Parameter:</b>   | <b>F<sub>gasm</sub></b>   |
| Data unit:   | <b>integer</b>  |
| Description:   | Fraction of animal manure N that volatilizes as NH <sub>3</sub> and NO <sub>x</sub> in kg NH <sub>3</sub> -N and NO <sub>x</sub> -N per kg of N |
| Source of data used:   | Obtained from IPCC, Table 4-19, p. 4.94   |
| Value(s) :   | 0.2   |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | Baseline/Project Activity /Leakage  |
| Additional comment:  |   |

|  |  |
|--|--|
|  |  |
|  |  |
| <b>Data / Parameter:</b>   | <b>EF<sub>3</sub></b>  |
| Data unit:   | <b>integer</b>   |
| Description:   | Emission factor  |
| Source of data used:   | Obtained from IPCC 2000 Table 4.12, Section 4.4.1.2, p. 4.43 |
| Value(s) :   | 0.001  |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | Baseline/Project Activity                                    |
| Additional comment:  |  |

|  |  |
|--|--|
|  |  |
|  |  |
| <b>Data / Parameter:</b>   | <b>EF<sub>4</sub></b>  |
| Data unit:   | <b>integer</b>   |
| Description:   | Emission factor for indirect N <sub>2</sub> O emissions from atmospheric deposition of N on soils and water surfaces in kg N <sub>2</sub> O-N per kg NH <sub>3</sub> -N and NO <sub>x</sub> -N emitted |
| Source of data used:   | Obtained from IPCC 2000 Table 4.18, Section 4.8.1.2, p. 4.73   |
| Value(s) :   | 0.01   |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | Baseline/Project Activity/Leakage  |
| Additional comment:  |  |

|                          |                       |
|--------------------------|-----------------------|
|                          |                       |
|                          |                       |
| <b>Data / Parameter:</b> | <b>N<sub>ex</sub></b> |



|  |  |
|--|--|
| Data unit:   | <b>Kg/animal/year</b>                        |
| Description:   | Nitrogen Excretion Rate                      |
| Source of data used:   | Obtained from 1996 IPCC, Table 4-20, p. 4.99 |
| Value(s) :   | 20   |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | Baseline/Project Activity/Leakage            |
| Additional comment:  |  |

|  |   |
|--|---|
| <b>Data / Parameter:</b>   | <b>EF<sub>1</sub></b>   |
| Data unit:   | <b>integer</b>  |
| Description:   | Emission factor for direct emission of N <sub>2</sub> O from soils in Kg N <sub>2</sub> O-N/kg N. |
| Source of data used:   | Obtained from IPCC 1996, Table 4-18, p.4.39   |
| Value(s) :   | 0.0125  |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | Leakage   |
| Additional comment:  |   |

|  |  |
|--|--|
| <b>Data / Parameter:</b>   | <b>F<sub>leach</sub></b>                     |
| Data unit:   | <b>integer</b>                               |
| Description:   | Non-volatized runoff                         |
| Source of data used:   | Obtained from IPCC 1996, Table 4-24, p.4.106 |
| Value(s) :   | 0.3  |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | Leakage                                      |
| Additional comment:  |  |

|  |  |
|--|--|
| <b>Data / Parameter:</b>   | <b>EF<sub>5</sub></b>  |
| Data unit:   | <b>integer</b>   |
| Description:   | Emission factor for indirect emission of N <sub>2</sub> O from runoff in Kg N <sub>2</sub> O-N/kg N. |
| Source of data used:   | Obtained from IPCC 1996, Table 4-23, p.4.105   |
| Value(s) :   | 0.025  |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | Leakage  |



|                     |  |
|---------------------|--|
| Additional comment: |  |
|---------------------|--|

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|  |  |
| <b>Data / Parameter:</b>   | <b>ID19</b>  |
| Data unit:   | <b>integer</b>   |
| Description:   | Electricity generated by project activity equipment using captured methane |
| Source of data used:   |  |
| Value(s) :   | 90,000kwh/year   |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | Leakage  |
| Additional comment:  |  |

|  |   |
|--|---|
|  |   |
| <b>Data / Parameter:</b>   | <b>EC<sub>v</sub></b>   |
| Data unit:   | <b>integer</b>  |
| Description:   | Energy Consumed by project Activity equipment   |
| Source of data used:   | OECD: Road Testing Baseline for GHG projects in the Energy Power Sector. Emission coefficient for electricity (consumed by Project Activity Equipment |
| Value(s) :   | 0.719kG CO <sub>2</sub> /kwh  |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | Leakage   |
| Additional comment:  |   |

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|--|--|
|  |  |
| <b>Data / Parameter:</b>   | <b>ID1</b>   |
| Data unit:   | <b>integer</b>   |
| Description:   | Animal population used to estimate baseline and project emission estimates was based on a 12 month period of actual operation production data. See Annex 3 of PDD. |
| Source of data used:   | Annex 3  |
| Value(s) :   |  |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | Baseline/Project Activity  |
| Additional comment:  |  |

|                          |            |
|--------------------------|------------|
|                          |            |
| <b>Data / Parameter:</b> | <b>ID1</b> |



|  |                           |
|--|---------------------------|
| Data unit:   | <b>integer</b>            |
| Description:   | Mortality Rate            |
| Source of data used:   | Annex 3                   |
| Value(s) :   |                           |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | Baseline/Project Activity |

|  |                           |
|--|---------------------------|
| <b>Data / Parameter:</b>   | <b>ID1(n<sub>m</sub>)</b> |
| Data unit:   | <b>integer</b>            |
| Description:   | Days resident in system   |
| Source of data used:   | Annex 3                   |
| Value(s) :   |                           |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | Baseline/Project Activity |

|  |                                |
|--|--------------------------------|
| <b>Data / Parameter:</b>   | <b>ID14</b>                    |
| Data unit:   | <b>Operating/not operating</b> |
| Description:   | AWMS Operation Status          |
| Source of data used:   | Weekly Records                 |
| Value(s) :   |                                |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | Baseline/Project Activity      |

| <b>D.2. Data and parameters monitored</b>  |  |
|--|--|
| <b>Data / Parameter:</b>   | <b>ID 1.Population<sub>month</sub></b> |
| Data unit:   | <b>#, type</b>                         |
| Description:   | Herd/breed counts per type             |
| Measured /Calculated /Default:   | measured                               |
| Source of data:  | Farm records                           |
| Value(s) of monitored parameter:   | variable                               |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | Baseline/Project Activity              |





|   |  |
|---|--|
| Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity) | No equipment necessary   |
| Measuring/ Reading/ Recording frequency:  | monthly  |
| Calculation method (if applicable):   | N/A  |
| QA/QC procedures applied:   | AgCert employs an internal QA process that ensures monitoring activities are conducted in accordance with the monitoring plan and verifies the accuracy of data reported |

|   |  |
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|   |  |
| <b>Data / Parameter:</b>  | <b>ID 6. BA</b>  |
| Data unit:  | <b>Type</b>  |
| Description:  | Type of barn and AWMS  |
| Measured /Calculated /Default:  | Measured   |
| Source of data:   | Farm records   |
| Value(s) of monitored parameter:  | variable   |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)                                | Baseline/Project Activity  |
| Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity) | No equipment necessary   |
| Measuring/ Reading/ Recording frequency:  | Entrance-Exit record of animals to the barn  |
| Calculation method (if applicable):   | Not applicable   |
| QA/QC procedures applied:   | AgCert employs an internal QA process that ensures monitoring activities are conducted in accordance with the monitoring plan and verifies the accuracy of data reported |

|                                |                          |
|--------------------------------|--------------------------|
|                                |                          |
|                                |                          |
| <b>Data / Parameter:</b>       | <b>ID 9. TR</b>          |
| Data unit:                     | <b>°C, cm</b>            |
| Description:                   | Temperature and rainfall |
| Measured /Calculated /Default: | measured                 |



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|   |  |
|---|--|
| Source of data:   | NOAA   |
| Value(s) of monitored parameter:  | variable   |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)                                | Baseline/Project Activity  |
| Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity) | Not applicable. Obtained from NOAA and imported every two weeks into envirocert database. Data is provided in Table D.4.   |
| Measuring/ Reading/ Recording frequency:  | Monthly  |
| Calculation method (if applicable):   | Not applicable   |
| QA/QC procedures applied:   | AgCert employs an internal QA process that ensures monitoring activities are conducted in accordance with the monitoring plan and verifies the accuracy of data reported |

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|   |   |
|   |   |
| <b>Data / Parameter:</b>  | <b>ID 12. CF</b>  |
| Data unit:  | M <sup>3</sup>  |
| Description:  | Biogas produced   |
| Measured /Calculated /Default:  | Measured  |
| Source of data:   | metered   |
| Value(s) of monitored parameter:  | Variable  |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)                                | Project Activity  |
| Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity) | Roots Meter, Serial #s are listed in table D.1 below. According to manufacturer; no calibration after correct installation is required. Biogas produced is listed in table D.5 below. |
| Measuring/ Reading/ Recording frequency:  | Monthly   |
| Calculation method (if applicable):   | Not applicable  |
| QA/QC procedures applied:   | AgCert employs an internal QA process that ensures monitoring activities are conducted in accordance with the monitoring plan and verifies the accuracy of data reported.             |

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|---|--|------------------|------------------|
| <b>Data / Parameter:</b>  | <b>ID 13. CD</b>   |                  |                  |
| Data unit:  | %  |                  |                  |
| Description:  | Percent CO <sub>2</sub> concentration in biogas  |                  |                  |
| Measured /Calculated /Default:  | measured   |                  |                  |
| Source of data:   | Biogas pipe portal   |                  |                  |
| Value(s) of monitored parameter:  | Variable   |                  |                  |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)                                | Project Activity   |                  |                  |
| Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity) | LandTec Biogas Check analyzer; calibrated against bottled gas samples at every farm visited. Every 6 months sent back to manufacturer for recalibration. CO2 data is available in Table D.5 below. |                  |                  |
|   | Landtec Serial Number  | Calibration Date | Calibration Date |
|   | GM11594  | 11/5/2009        |                  |
|   | GM11379  | 8/17/2009        | 3/5/2010         |
| Measuring/ Reading/ Recording frequency:  | Quarterly  |                  |                  |
| Calculation method (if applicable):   | Not applicable   |                  |                  |
| QA/QC procedures applied:   | AgCert employs an internal QA process that ensures monitoring activities are conducted in accordance with the monitoring plan and verifies the accuracy of data reported.                          |                  |                  |

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|  |  |
| <b>Data / Parameter:</b>   | <b>ID 14. INT</b>  |
| Data unit:   | <b>Operational/not operational</b>   |
| Description:   | Operational Status   |
| Measured /Calculated /Default:   | Measured   |
| Source of data:  | Weekly Reports   |
| Value(s) of monitored parameter:   | Operational/not operational. Table D.2 contains weekly operational status. |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)         | Project Activity   |
| Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last | Not applicable   |



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|  |  |
|--|--|
| calibration, validity)                   |  |
| Measuring/ Reading/ Recording frequency: | Weekly   |
| Calculation method (if applicable):      | Not applicable   |
| QA/QC procedures applied:                | AgCert employs an internal QA process that ensures monitoring activities are conducted in accordance with the monitoring plan and verifies the accuracy of data reported |

|   |  |
|---|--|
|   |  |
| <b>Data / Parameter:</b>  | <b>ID 16. EP<sub>v</sub></b>   |
| Data unit:  | kWh  |
| Description:  | Electricity used for project equipment   |
| Measured /Calculated /Default:  | Per Monitoring Plan Revision, it is calculated.  |
| Source of data:   | Farm Records   |
| Value(s) of monitored parameter:  | Variable.  |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)                                | Leakage  |
| Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity) | Type, quantity, and rated electrical usage are provided in Table D.3   |
| Measuring/ Reading/ Recording frequency:  | Monthly  |
| Calculation method (if applicable):   | Electricity used is calculated based on 24 hours per day, 7 days per week for a total annual hours of operation of 8,760, plus 10% overage for leakage.                  |
| QA/QC procedures applied:   | AgCert employs an internal QA process that ensures monitoring activities are conducted in accordance with the monitoring plan and verifies the accuracy of data reported |

|   |  |
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|   |  |
| <b>Data / Parameter:</b>                                | <b>ID 19. EP<sub>p</sub></b>                                       |
| Data unit:  | kWh  |
| Description:  | Electricity produced through co-generation of the captured methane |
| Measured /Calculated /Default:                          | Measured   |
| Source of data:   | Meter  |
| Value(s) of monitored parameter:                        | Variable   |
| Indicate what the data are used for (Baseline/ Project/ | Data not used in this monitoring period.                           |



|   |                |
|---|----------------|
| Leakage emission calculations)  |                |
| Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity) | Not applicable |
| Measuring/ Reading/ Recording frequency:  | Not applicable |
| Calculation method (if applicable):   | Not applicable |
| QA/QC procedures applied:   | Not applicable |

### D.3 Detailed data for Parameters

Table D.1 provides the serial number of Roots meter equipment installed per site, the date the meter was calibrated at the manufacturer's facility, and the date of installation. Per the manufacturer, Roots meters do not require calibration after correct installation. This flow meter type applied has a tendency to measure lower volumes if there are any operating problems, resulting in rather an underestimation of actual biogas flows.

| Site ID | Serial Number<br>Roots Meter | Manufacturer<br>Calibration<br>Date | Installation<br>Date | Serial Number<br>Roots Meter | Manufacturer<br>Calibration<br>Date | Installation<br>Date |
|---------|------------------------------|-------------------------------------|----------------------|------------------------------|-------------------------------------|----------------------|
| 10617   | 531633                       | 6/11/2005                           | 12/5/2006            |                              |                                     |                      |
| 10618   | 538057                       | 8/17/2005                           | 3/21/2006            |                              |                                     |                      |
| 10619   | 534941                       | 7/14/2005                           | 11/24/2005           |                              |                                     |                      |
| 10620   | Meter 1-741062               | 8/24/2007                           | 12/11/2007           | Meter 2-534924               | 7/14/2005                           | 10/5/2005            |
| 10621   | 534952                       | 7/15/2005                           | 10/3/2006            |                              |                                     |                      |
| 10631   | 531635                       | 6/11/2005                           | 8/11/2005            |                              |                                     |                      |
| 10633   | 544093                       | 10/24/2005                          | 12/19/2006           |                              |                                     |                      |
| 10657   | 531624                       | 6/11/2005                           | 12/5/2006            |                              |                                     |                      |
| 10658   | 531609                       | 6/11/2005                           | 7/31/2005            |                              |                                     |                      |
| 10659   | 534916                       | 7/15/2005                           | 11/27/2005           |                              |                                     |                      |
| 10683   | 531616                       | 6/11/2005                           | 7/25/2005            |                              |                                     |                      |
| 10684   | 538074                       | 8/17/2005                           | 8/18/2006            |                              |                                     |                      |
| 10700   | 531591                       | 6/10/2005                           | 4/18/2007            |                              |                                     |                      |
| 10701   | 534918                       | 7/15/2005                           | 2/8/2006             |                              |                                     |                      |
| 10702   | 531617                       | 6/11/2005                           | 12/5/2006            |                              |                                     |                      |
| 10703   | 534945                       | 7/14/2005                           | 11/27/2005           |                              |                                     |                      |
| 10741   | 534885                       | 7/15/2005                           | 12/4/2005            |                              |                                     |                      |
| 26282   | 441945                       | 8/28/2004                           | 6/1/2005             |                              |                                     |                      |
| 29352   | 538113                       | 8/16/2005                           | 3/24/2006            |                              |                                     |                      |
| 850061  | 538024                       | 8/16/2005                           | 12/18/2005           |                              |                                     |                      |

**Table D.1. Roots meter serial number/calibration date/installation date**



ID14 and ID16 are provided in detail below per the requirements of the PDD.

| ID 14 Status          |         |       |       |       |       |       |       |       |       |       |       |       |
|-----------------------|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Start date<br>of week | Site ID |       |       |       |       |       |       |       |       |       |       |       |
|                       | 10617   | 10618 | 10619 | 10620 | 10621 | 10630 | 10633 | 10657 | 10658 | 10659 | 10660 | 10661 |
| 12/1/2009             | Oper    | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | N/A   | N/A   |
| 12/6/2009             | Oper    | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | N/A   | N/A   |
| 12/13/2009            | Oper    | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | N/A   | N/A   |
| 12/20/2009            | Oper    | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | N/A   | N/A   |
| 12/27/2009            | Oper    | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | N/A   | N/A   |
| 1/3/2010              | Oper    | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | N/A   | N/A   |
| 1/10/2010             | Oper    | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | N/A   | N/A   |
| 1/17/2010             | Oper    | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | N/A   | N/A   |
| 1/24/2010             | Oper    | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | N/A   | N/A   |
| 1/31/2010             | Oper    | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | N/A   | N/A   |
| 2/7/2010              | Oper    | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | N/A   | N/A   |
| 2/14/2010             | Oper    | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | N/A   | N/A   |
| 2/21/2010             | Oper    | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | N/A   | N/A   |
| 2/28/2010             | Oper    | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | N/A   | N/A   |
| 3/7/2010              | Oper    | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | N/A   | N/A   |
| 3/14/2010             | Oper    | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | N/A   | N/A   |
| 3/21/2010             | Oper    | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | N/A   | N/A   |
| 3/28/2010             | Oper    | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | N/A   | N/A   |
| 4/4/2010              | Oper    | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | N/A   | N/A   |
| 4/11/2010             | Oper    | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | N/A   | N/A   |
| 4/18/2010             | Oper    | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | N/A   | N/A   |
| 4/25/2010             | Oper    | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | N/A   | N/A   |
| 5/2/2010              | Oper    | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | N/A   | N/A   |
| 5/9/2010              | Oper    | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | N/A   | N/A   |
| 5/16/2010             | Oper    | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | N/A   | N/A   |
| 5/23/2010             | Oper    | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | N/A   | N/A   |
| 5/30/2010             | Oper    | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | N/A   | N/A   |

Table D.2 ID 14 Weekly Operational Status



| ID 14 Status          |         |       |       |       |       |       |       |       |       |       |       |       |        |
|-----------------------|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|
| Start date<br>of week | Site ID |       |       |       |       |       |       |       |       |       |       |       |        |
|                       | 10680   | 10681 | 10682 | 10683 | 10684 | 10700 | 10701 | 10702 | 10703 | 10741 | 26282 | 29352 | 850061 |
| 12/1/2009             | N/A     | N/A   | N/A   | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper   |
| 12/6/2009             | N/A     | N/A   | N/A   | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper   |
| 12/13/2009            | N/A     | N/A   | N/A   | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper   |
| 12/20/2009            | N/A     | N/A   | N/A   | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper   |
| 12/27/2009            | N/A     | N/A   | N/A   | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper   |
| 1/3/2010              | N/A     | N/A   | N/A   | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper   |
| 1/10/2010             | N/A     | N/A   | N/A   | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper   |
| 1/17/2010             | N/A     | N/A   | N/A   | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper   |
| 1/24/2010             | N/A     | N/A   | N/A   | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper   |
| 1/31/2010             | N/A     | N/A   | N/A   | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper   |
| 2/7/2010              | N/A     | N/A   | N/A   | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper   |
| 2/14/2010             | N/A     | N/A   | N/A   | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper   |
| 2/21/2010             | N/A     | N/A   | N/A   | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper   |
| 2/28/2010             | N/A     | N/A   | N/A   | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper   |
| 3/7/2010              | N/A     | N/A   | N/A   | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper   |
| 3/14/2010             | N/A     | N/A   | N/A   | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper   |
| 3/21/2010             | N/A     | N/A   | N/A   | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper   |
| 3/28/2010             | N/A     | N/A   | N/A   | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper   |
| 4/4/2010              | N/A     | N/A   | N/A   | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper   |
| 4/11/2010             | N/A     | N/A   | N/A   | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper   |
| 4/18/2010             | N/A     | N/A   | N/A   | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper   |
| 4/25/2010             | N/A     | N/A   | N/A   | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper   |
| 5/2/2010              | N/A     | N/A   | N/A   | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper   |
| 5/9/2010              | N/A     | N/A   | N/A   | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper   |
| 5/16/2010             | N/A     | N/A   | N/A   | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper   |
| 5/23/2010             | N/A     | N/A   | N/A   | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper   |
| 5/30/2010             | N/A     | N/A   | N/A   | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper  | Oper   |

Table D.2 ID 14 Weekly Operational Status (Continued)



| ID 16 Leakage Data |         |        |        |        |        |        |        |        |        |        |       |       |       |                |
|--------------------|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|-------|-------|----------------|
| Month/Year         | Site ID |        |        |        |        |        |        |        |        |        |       |       |       | Total          |
|                    | 10617   | 10618  | 10619  | 10620  | 10621  | 10630  | 10633  | 10657  | 10658  | 10659  | 10660 | 10661 | 10680 |                |
| Dec-10             | 1220    | 1220   | 1220   | 1220   | 1220   | 1220   | 1220   | 1220   | 1220   | 1220   | N/A   | N/A   | N/A   | 12204          |
| Jan-10             | 1220    | 1220   | 1220   | 1220   | 1220   | 1220   | 1220   | 1220   | 1220   | 1220   | N/A   | N/A   | N/A   | 12204          |
| Feb-10             | 1102    | 1102   | 1102   | 1102   | 1102   | 1102   | 1102   | 1102   | 1102   | 1102   | N/A   | N/A   | N/A   | 11023          |
| Mar-10             | 1220    | 1220   | 1220   | 1220   | 1220   | 1220   | 1220   | 1220   | 1220   | 1220   | N/A   | N/A   | N/A   | 12204          |
| Apr-10             | 1181    | 1181   | 1181   | 1181   | 1181   | 1181   | 1181   | 1181   | 1181   | 1181   | N/A   | N/A   | N/A   | 11811          |
| May-10             | 1220    | 1220   | 1220   | 1220   | 1220   | 1220   | 1220   | 1220   | 1220   | 1220   | N/A   | N/A   | N/A   | 12204          |
| <b>Equipment</b>   |         |        |        |        |        |        |        |        |        |        |       |       |       | <b>71651.6</b> |
| Blower             | 2 HP    | 2 HP   | 2 HP   | 2 HP   | 2 HP   | 2 HP   | 2 HP   | 2 HP   | 2 HP   | 2 HP   | N/A   | N/A   | N/A   |                |
| - Quantity         | 1       | 1      | 1      | 1      | 1      | 1      | 1      | 1      | 1      | 1      | N/A   | N/A   | N/A   |                |
| Pump               |         |        |        |        |        |        |        |        |        |        | N/A   | N/A   | N/A   |                |
| - Quantity         |         |        |        |        |        |        |        |        |        |        | N/A   | N/A   | N/A   |                |
| kwh/day            | 35.79   | 35.79  | 35.79  | 35.79  | 35.79  | 35.79  | 35.79  | 35.79  | 35.79  | 35.79  | N/A   | N/A   | N/A   |                |
| -times 10%/day     | 39.369  | 39.369 | 39.369 | 39.369 | 39.369 | 39.369 | 39.369 | 39.369 | 39.369 | 39.369 | N/A   | N/A   | N/A   |                |

Table D.3. Leakage Data per ID 16

| ID 16 Leakage Data |         |       |        |        |        |        |        |        |        |        |        |        |         |
|--------------------|---------|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|
| Month/Year         | Site ID |       |        |        |        |        |        |        |        |        |        |        | Total   |
|                    | 10681   | 10682 | 10683  | 10684  | 10700  | 10701  | 10702  | 10703  | 10741  | 26282  | 29352  | 850061 |         |
| Dec-10             | N/A     | N/A   | 1220   | 1220   | 1220   | 1220   | 1220   | 1220   | 1220   | 1220   | 1220   | 1220   | 12204   |
| Jan-10             | N/A     | N/A   | 1220   | 1220   | 1220   | 1220   | 1220   | 1220   | 1220   | 1220   | 1220   | 1220   | 12204   |
| Feb-10             | N/A     | N/A   | 1102   | 1102   | 1102   | 1102   | 1102   | 1102   | 1102   | 1102   | 1102   | 1102   | 11023   |
| Mar-10             | N/A     | N/A   | 1220   | 1220   | 1220   | 1220   | 1220   | 1220   | 1220   | 1220   | 1220   | 1220   | 12204   |
| Apr-10             | N/A     | N/A   | 1181   | 1181   | 1181   | 1181   | 1181   | 1181   | 1181   | 1181   | 1181   | 1181   | 11811   |
| May-10             | N/A     | N/A   | 1220   | 1220   | 1220   | 1220   | 1220   | 1220   | 1220   | 1220   | 1220   | 1220   | 12204   |
| Equipment          |         |       |        |        |        |        |        |        |        |        |        |        | 71651.6 |
| Blower             | N/A     | N/A   | 2 HP   | 2 HP   | 2 HP   | 2 HP   | 2 HP   | 2 HP   | 2 HP   | 2 HP   | 2 HP   | 2 HP   |         |
| - Quantity         | N/A     | N/A   | 1      | 1      | 1      | 1      | 1      | 1      | 1      | 1      | 1      | 1      |         |
| Pump               | N/A     | N/A   |        |        |        |        |        |        |        |        |        |        |         |
| - Quantity         | N/A     | N/A   |        |        |        |        |        |        |        |        |        |        |         |
| kwh/day            | N/A     | N/A   | 35.79  | 35.79  | 35.79  | 35.79  | 35.79  | 35.79  | 35.79  | 35.79  | 35.79  | 35.79  |         |
| -times 10%/day     | N/A     | N/A   | 39.369 | 39.369 | 39.369 | 39.369 | 39.369 | 39.369 | 39.369 | 39.369 | 39.369 | 39.369 |         |

Table D.3 Leakage Data per ID 16 (continued)





The baseline data collected in accordance with the registered PDD and approved monitoring methodology, AM0016, is provided in the following table:

| Baseline Data |       |      |          |       |        |        |           |         |         |
|---------------|-------|------|----------|-------|--------|--------|-----------|---------|---------|
| Year          | Month | ID1  |          |       |        |        | ID 6      | ID 9    |         |
|               |       | Boar | Finisher | Gilt  | Nurser | Sow    | AWMS Type | Temp °C | Rain cm |
| 2009          | 12    | 191  | 46,265   | 897   | 41,443 | 16,656 | AL        | 24.00   | 13.67   |
| 2010          | 1     | 193  | 46,768   | 913   | 40,744 | 16,702 | AL        | 24.77   | 24.87   |
| 2010          | 2     | 211  | 46,876   | 1,026 | 41,790 | 16,780 | AL        | 25.09   | 15.30   |
| 2010          | 3     | 201  | 46,548   | 1,100 | 42,181 | 16,783 | AL        | 23.18   | 15.62   |
| 2010          | 4     | 196  | 42,480   | 1,045 | 41,195 | 16,821 | AL        | 20.57   | 12.24   |
| 2010          | 5     | 196  | 38,638   | 816   | 41,258 | 16,891 | AL        | 18.04   | 6.30    |

Table D.4 Baseline Data

The project activity data collected in accordance with the registered PDD and approved monitoring methodology, AM0016. Based on a mutual contractual agreement between the farm site owner and the Project Participant, the latter will no longer monitor 10680, 10681, 10682 and 10661 and will take zero credits for these sites. The data shown in table B.5 is a summation or average of all sites included in the project. Individual site specific inventory data has been presented to the DOE for verification.

| Project Activity Data |       |      |          |      |        |       |           |         |         |                       |                   |
|-----------------------|-------|------|----------|------|--------|-------|-----------|---------|---------|-----------------------|-------------------|
| Year                  | Month | ID1  |          |      |        |       | ID 6      | ID 9    |         | ID 12                 | ID 13             |
|                       |       | Boar | Finisher | Gilt | Nurser | Sow   | AWMS Type | Temp °C | Rain cm | Biogas m <sup>3</sup> | CO <sub>2</sub> % |
| 2009                  | 12    | 191  | 46265    | 897  | 41443  | 16656 | AD        | 24.00   | 13.67   | 340,184               | 33.48             |
| 2010                  | 1     | 193  | 46768    | 913  | 40744  | 16702 | AD        | 24.77   | 24.87   | 339,431               |                   |
| 2010                  | 2     | 211  | 46876    | 1026 | 41790  | 16780 | AD        | 25.09   | 15.30   | 314,463               |                   |
| 2010                  | 3     | 201  | 46548    | 1100 | 42181  | 16783 | AD        | 23.18   | 15.62   | 356,133               | 33.34             |
| 2010                  | 4     | 196  | 42480    | 1045 | 41195  | 16821 | AD        | 20.57   | 12.24   | 327,742               |                   |
| 2010                  | 5     | 196  | 38638    | 816  | 41258  | 16891 | AD        | 18.04   | 6.30    | 305,078               |                   |

Table D.5 Project Activity Data

## SECTION E. Emission reductions calculation

### E.1. Baseline emissions calculation

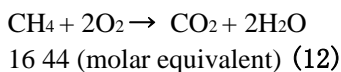
>>>

This section includes all formulae used and description to calculate the baseline emissions. A spreadsheet accompanies this report, titled 0411-MR06-BR05-B-03 Envirocert Calculations which includes all calculations for baseline emissions.

$$CO_{2eq\ methane} = CH_4\ annual * GWP_{CH_4}/1000 \quad (9)$$

$$CH_4\ annual = \sum_{mj} EF_{month} * Population_{month} * MS\% \quad (10)$$

$$EF_{month} = V_s * n_m * B_0 * 0.67kg/m^3 * MCF_{month} \quad (11)$$



$$\text{CO}_{2\text{equiv N}_2\text{O}} = \text{GWP}_{\text{N}_2\text{O}} * \text{N}_2\text{O}_{\text{total annual}}/1000 \quad (13)$$

$$\text{N}_2\text{O}_{\text{total annual}} = \sum_{mj} (\text{N}_2\text{O}_d + \text{N}_2\text{O}_i) * \text{Population}_{\text{month}} * \text{MS}\%_j \quad (14)$$

$$\text{N}_2\text{O}_d = \text{N}_{\text{ex month}} * \text{EF}_3 * (1 - F_{\text{gasm}}) * C_m \quad (15)$$

$$\text{N}_2\text{O}_i = \text{N}_{\text{ex month}} * \text{EF}_4 * F_{\text{gasm}} * C_m \quad (16)$$

Equations 9, 10, 11, 12, 13, 14, 15, and 16 from the UNFCCC-approved methodology AM0016 were used to determine baseline emissions. The baseline was calculated using Equations 9, 10, 11, and 12 for methane emissions and Equations 13, 14, 15, and 16 for nitrous oxide emissions.

Since country-specific factors were not available, values for  $V_s$  were calculated based on standard North American animal group weights.

To determine the methane conversion factors (MCF) used with equation 11, IPCC default values were selected for use at the project activity sites.

To determine the nitrogen excretion ( $\text{N}_{\text{ex}}$ ) rate used with equations 15 and 16, IPCC default values were selected for use at the project activity sites since country specific factors were not available.

## E.2. Project emissions calculation

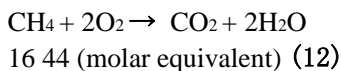
>>

This section includes all formulae used and description to calculate the project emissions. A spreadsheet accompanies this report, titled 0411-MR06-BR05-B-03 Envirocert Calculations which includes all calculations for project emissions.

$$\text{CO}_{2\text{eq methane}} = \text{CH}_4 \text{ annual} * \text{GWP}_{\text{CH}_4}/1000 \quad (9)$$

$$\text{CH}_4 \text{ annual} = \sum_{mj} \text{EF}_{\text{month}} * \text{Population}_{\text{month}} * \text{MS}\%_j \quad (10)$$

$$\text{EF}_{\text{month}} = V_s * n_m * B_0 * 0.67\text{kg/m}^3 * \text{MCF}_{\text{month}} \quad (11)$$



$$\text{CO}_{2\text{equiv N}_2\text{O}} = \text{GWP}_{\text{N}_2\text{O}} * \text{N}_2\text{O}_{\text{total annual}}/1000 \quad (13)$$

$$\text{N}_2\text{O}_{\text{total annual}} = \sum_{mj} (\text{N}_2\text{O}_d + \text{N}_2\text{O}_i) * \text{Population}_{\text{month}} * \text{MS}\%_j \quad (14)$$

$$\text{N}_2\text{O}_d = \text{N}_{\text{ex month}} * \text{EF}_3 * (1 - F_{\text{gasm}}) * C_m \quad (15)$$

$$\text{N}_2\text{O}_i = \text{N}_{\text{ex month}} * \text{EF}_4 * F_{\text{gasm}} * C_m \quad (16)$$



Equations 9, 10, 11, 12, 13, 14, 15, and 16 from UNFCCC-approved methodology AM0016 were used to determine project activity emissions. The methane (CH<sub>4</sub>) emissions for the project activity were calculated using AM0016 equations 9, 10, 11, and 12. The nitrous oxide (N<sub>2</sub>O) emissions for the project activity were calculated using Equations 13, 14, 15, and 16. Within these equations, several key parameters and emission factors were utilized.

Since country-specific factors were not available, values for V<sub>s</sub> were calculated based on standard North American animal group weights.

To determine the methane conversion factors (MCF) used with equation 11, IPCC default values were selected for use at the project activity sites.

To determine the nitrogen excretion (N<sub>ex</sub>) rate used with equations 15 and 16, IPCC default values were selected for use at the project activity sites since country specific factors were not available.

### **E.3. Leakage calculation**

>>

This section includes all formulae used and description to calculate the leakage applying actual values. A spreadsheet accompanies this report, titled 0411-MR06-BR05-B-03 Envirocert Calculations which includes all calculations for leakage.

$$EE_y = (EP_{y-project} - EP_{p-project} - EP_{baseline}) * EC_y / 1000 \quad (17)$$

$$Land \text{ Leakage} = Project \text{ activity land emissions} - Baseline \text{ land emissions} \quad (18)$$

$$N_2O_{land} = N_{ex} * N * (1 - F_{gasm}) * EF_1 * C_m \quad (19)$$

and

$$N_2O_{runoff} = N_{ex} * N * (1 - F_{gasm}) * F_{leach} * EF_5 * C_m \quad (20)$$

and

$$N_2O_i = N_{ex} * EF_4 * F_{gasm} * C_m \quad (21)$$

$$N_2O_{total} = (N_2O_{land} + N_2O_i + N_2O_{runoff}) * N / 1000 \quad (22)$$

$$N_2OCO_2\text{-equiv} = GWP_{N_2O} * N_2O_{total} \quad (23)$$

Equations 17 to 23 from UNFCCC-approved Methodology AM0016 were used to determine project activity leakage.

Equation 17 was used to determine electrical leakage on a continual basis.

Electrical demand as a consequence of the project activity is mainly from motors and other electrical components. Electrical leakage data is in section B.7 of this monitoring report.

The project developer used equations 18 through 23 in a one-time analysis to confirm that the change in AWMS (project activity) did not adversely affect GHG emissions due to land application, runoff and ammonia volatilization. The results of the analysis show that there is no change in GHG emissions in these areas by incorporating an anaerobic digester.

#### E.4. Emission reductions calculation / table

&gt;&gt;

$$Total\ Emission_{Smt} = CO_{2eq\ methane} + CO_{2equiv\ N_2O} \quad (24)$$

$$ER_{net} = BE - PE - L_o \quad (26)$$

Equations 24 and 26 from UNFCCC-approved Methodology AM0016 were used to determine project activity emission reductions. A spreadsheet accompanies this report, titled 0411-MR06-BR05-B-03 EnviroCert Calculations, which contains specific calculations for each month for each site within the project. Below are tables which provide a summation of this spreadsheet.

Table E.1 shows the sum of project emissions and leakage as the total project activity emissions for the current monitoring period

| E.1 - Total Project Activity Emissions During the Monitoring Period |   |                 |              |
|---|---|-----------------|--------------|
| Source  | GHG Emissions (CO <sub>2</sub> e) metric tonnes |                 |              |
|   | CH <sub>4</sub>                                 | CO <sub>2</sub> |              |
| Project Emissions   | 5,988   |                 |              |
| Leakage   |   | 103             |              |
| <b>Total:</b>   | 5,988   | 103             | <b>6,091</b> |

Table E.2 displays baseline emissions for the current monitoring period:

| E.2 - Baseline Emissions During the Monitoring Period |   |               |
|---|---|---------------|
| Source  | GHG Emissions (CO <sub>2</sub> e) metric tonnes |               |
|   | CH <sub>4</sub>                                 |               |
| AWMS GHG Mitigation Project BR05-B-04                 | 53,894  | <b>53,894</b> |

The project activity emission reductions for the current monitoring period were determined by subtracting the total project activity emissions (Table E.1) from the baseline emissions (Table E.2), as shown in Table E.3.

| E.3 - Total Project Activity Emission Reductions |   |
|--|---|
| Source   | GHG Emissions (CO <sub>2</sub> e) metric tonnes |
| Baseline Emissions                               | 53,894  |
| Project Activity Emissions                       | 6,091   |
| <b>Total:</b>                                    | <b>47,803</b>                                   |

Table E.4 presents emission reductions derived through monitored parameters.



| E.4 Metered Project Activity Emissions Reductions (CO <sub>2</sub> e) during the Monitoring Period |         |  |   |
|--|---------|--|---|
| No.  | Site ID | Source                                   | GHG Emissions (CO <sub>2</sub> e)<br><i>metric tonnes</i> |
| 1  | 10617   | Master - Site 1 - F-F                    | 1,711   |
| 2  | 10618   | Master - Site 2 - N-F                    | 843   |
| 3  | 10619   | Granja Ibicuí-Central Produtora de Leite | 961   |
| 4  | 10620   | Granja Floresta                          | 3,274   |
| 5  | 10621   | Fazenda Otaciano                         | 2,067   |
| 6  | 10630   | Granja Frei Plácido                      | 857   |
| 7  | 10633   | Granja Ganedo                            | 1,052   |
| 8  | 10657   | Granja Natalino Calegari                 | 252   |
| 9  | 10658   | Fazenda Santa Clara                      | 205   |
| 10   | 10659   | Fazenda Santa Cruz                       | 123   |
| 11   | 10660   | Fazenda Lacerdópolis - Vitalino Zenaro   | 0   |
| 12   | 10661   | Fazenda Papua - Vitalino Zenaro          | 0   |
| 13   | 10680   | Granja Luzerna                           | 0   |
| 14   | 10681   | Granja Agua Doce                         | 0   |
| 15   | 10682   | Granja Jaborá                            | 0   |
| 16   | 10683   | Fazenda Thomazzoni - Swine               | 1,246   |
| 17   | 10684   | Sítio Siviero                            | 2,083   |
| 18   | 10700   | Granja Amazonas Belló                    | 80  |
| 19   | 10701   | Triunfo II                               | 362   |
| 20   | 10702   | Granja Sergio Scalçavara                 | 0   |
| 21   | 10703   | Granja José Ricardo Durigon              | 313   |
| 22   | 10741   | Granja Ipê                               | 961   |
| 23   | 26282   | Granja Ibicuí - Sítio 2                  | 1,128   |
| 24   | 29352   | Granja Cecatto                           | 900   |
| 25   | 850061  | Fazenda Cercadinho                       | 364   |
| Total:   |         |  | <b>18,782</b>   |

Table E.5 presents the lesser of calculated emission reductions or metered emission reductions derived through monitored parameters.



| E.5 Lower of Calculated Project Activity ERs and Metered Project Activity ERs by Site |         |   |  |                      |                       |  |
|---|---------|---|--|----------------------|-----------------------|--|
| No.   | Site ID | Source                                      | GHG Emissions (CO <sub>2</sub> e) <i>metric tonnes</i> |                      |                       | Lower of<br>Calculated or<br>Metered ERs |
|   |         |   | Calculated<br>Emissions                                | Metered<br>Emissions | Electrical<br>Leakage |  |
| 1   | 10617   | Master - Site 1 - F-F                       | 2,693  | 1,711                | 5.15                  | 1,706                                    |
| 2   | 10618   | Master - Site 2 - N-F                       | 2,042  | 843                  | 5.15                  | 838                                      |
| 3   | 10619   | Granja Ibicuí-Central Produtora de Leitoões | 1,694  | 961                  | 5.15                  | 956                                      |
| 4   | 10620   | Granja Floresta                             | 10,338   | 3,274                | 5.15                  | 3,269                                    |
| 5   | 10621   | Fazenda Otaciano                            | 3,500  | 2,067                | 5.15                  | 2,062                                    |
| 6   | 10630   | Granja Frei Plácido                         | 1,755  | 857                  | 5.15                  | 852                                      |
| 7   | 10633   | Granja Ganedo                               | 3,479  | 1,052                | 5.15                  | 1,047                                    |
| 8   | 10657   | Granja Natalino Calegari                    | 764  | 252                  | 5.15                  | 247                                      |
| 9   | 10658   | Fazenda Santa Clara                         | 1,299  | 205                  | 5.15                  | 200                                      |
| 10  | 10659   | Fazenda Santa Cruz                          | 747  | 123                  | 5.15                  | 118                                      |
| 11  | 10660   | Fazenda Lacerdópolis - Vitalino Ze          | 0  | 0                    | 0.00                  | 0  |
| 12  | 10661   | Fazenda Papua - Vitalino Zenaro             | 0  | 0                    | 0.00                  | 0  |
| 13  | 10680   | Granja Luzerna                              | 0  | 0                    | 0.00                  | 0  |
| 14  | 10681   | Granja Agua Doce                            | 0  | 0                    | 0.00                  | 0  |
| 15  | 10682   | Granja Jaborá                               | 0  | 0                    | 0.00                  | 0  |
| 16  | 10683   | Fazenda Thomazzoni - Swine                  | 2,325  | 1,246                | 5.15                  | 1,241                                    |
| 17  | 10684   | Sítio Siviero                               | 3,503  | 2,083                | 5.15                  | 2,078                                    |
| 18  | 10700   | Granja Amazonas Belló                       | 767  | 80                   | 5.15                  | 75                                       |
| 19  | 10701   | Triunfo II                                  | 717  | 362                  | 5.15                  | 357                                      |
| 20  | 10702   | Granja Sergio Scalçavara                    | 772  | 0                    | 5.15                  | -5                                       |
| 21  | 10703   | Granja José Ricardo Durigon                 | 843  | 313                  | 5.15                  | 308                                      |
| 22  | 10741   | Granja Ipê                                  | 2,587  | 961                  | 5.15                  | 956                                      |
| 23  | 26282   | Granja Ibicuí - Sítio 2                     | 4,213  | 1,128                | 5.15                  | 1,123                                    |
| 24  | 29352   | Granja Cecatto                              | 1,993  | 900                  | 5.15                  | 895                                      |
| 25  | 850061  | Fazenda Cercadinho                          | 1,876  | 364                  | 5.15                  | 359                                      |
| Total:  |         |   |  |                      |                       | 18,679                                   |

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

&gt;&gt;&gt;

This section shall include a comparison of actual values of the emission reductions achieved during the monitoring period with the estimations in the registered CDM-PDD.

| Item                                     | Values applied in ex-ante calculation of the registered CDM-PDD | Actual values reached during the monitoring period |
|--|---|--|
| Emission reductions (tCO <sub>2</sub> e) | 45,288  | 18,679   |

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

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

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## History of the document

| Version  | Date                           | Nature of revision |
|--|--------------------------------|--------------------|
| 01   | EB 54, Annex 34<br>28 May 2010 | Initial adoption.  |
| <b>Decision Class:</b> Regulatory<br><b>Document Type:</b> Guideline, Form<br><b>Business Function:</b> Issuance |                                |                    |