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# VERIFICATION/ CERTIFICATION REPORT

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## AWMS GHG MITIGATION PROJECT BR05-B-07, MATO GROSSO, MINAS GERAIS AND GOIÁS, BRAZIL

(UNFCCC Registration Ref. No. 0337)

Verification Period:  
1 September 2009 to 28 February 2010

REPORT No. 2010-0953

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DET NORSKE VERITAS



## VERIFICATION/ CERTIFICATION REPORT

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Lai Chee Keong	Michael Lehmann	
Client: AgCert International Ltd		Client ref.: Michael Mosley

DET NORSKE VERITAS  
CERTIFICATION AS

*Climate Change Services*

Veritasveien 1,  
1322 HØVIK, Norway  
Tel: +47 67 57 99 00  
Fax: +47 67 57 99 11  
http://www.dnv.com  
Org. No: NO 945 748 931 MVA

### Summary:

Det Norske Veritas Certification AS (DNV) has performed the verification of the emission reductions reported for the “AWMS GHG Mitigation Project BR05-B-07, Mato Grosso, Minas Gerais and Goiás, Brazil” (UNFCCC Registration Ref. No. 0337) for the period 1 September 2009 to 28 February 2010.

In our opinion, the GHG emission reductions reported for the project in the monitoring report (MR08-BR05-B-07, V.4) of 22 December 2010 are fairly stated.

The GHG emission reductions were calculated correctly on the basis of the approved monitoring methodology AM0016 (version 02), the revised monitoring plan approved on 20 Aug 2007 and the Project Design Document of 26 October 2005.

Det Norske Veritas Certification AS is able to certify that the emission reductions from the “AWMS GHG Mitigation Project BR05-B-07, Mato Grosso, Minas Gerais and Goiás, Brazil” during the period 1 September 2009 to 28 February 2010 amount to 39 089 tonnes of CO<sub>2</sub> equivalent.

Report No.: 2010-0953	Subject Group: Environment	
Report title: AWMS GHG Mitigation Project BR05-B-07, Mato Grosso, Minas Gerais and Goiás, Brazil		
Work carried out by: Andrea Leiroz, Luis Filipe Tavares, Fabiana Philipi, Anali Araújo, Gabriel Baines and David Costa		
Work verified by: Lai Chee Keong		
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	Process Industry
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<b><i>Table of Content</i></b>	<b><i>Page</i></b>
1 INTRODUCTION .....	1
1.1 Objective	1
1.2 Scope	1
1.3 Description of the Project Activity	1
1.4 Methodology for Determining Emission Reductions	2
2 VERIFICATION METHODOLOGY .....	3
2.1 Review of Documentation	4
2.2 On-Site Audits at Farm Offices and Inspection of Project Implementation	4
2.3 Assessment of Emission Reductions Calculations	4
2.4 Reporting of Findings	4
3 VERIFICATION FINDINGS .....	5
3.1 Open Issues from Validation and/or Previous Verifications	5
3.2 Project Implementation	5
3.3 Compliance of Monitoring Plan with Monitoring Methodology	6
3.4 Compliance of Monitoring with Monitoring Plan	6
3.5 Accuracy of Emission Reduction Calculations	10
3.6 Data Management System and Quality Assurance	11
4 CERTIFICATION STATEMENT .....	12
REFERENCES .....	13
Appendix A List of audited AWMS	
Appendix B Corrective action requests and forward action requests	
Appendix C Checklists	
1) Management system/controls for data collection and recording	
2) Project implementation and installation of monitoring equipment	
3) Evidence and correctness of reported data	
4) Emission reduction calculations	



## Abbreviations

AWMS	Animal Waste Management System
B <sub>0</sub>	Maximum methane potential
CAFO	Confined Animal Feeding Operations
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEF	Carbon Emission Factor
CER	Certified Emission Reduction(s)
CH <sub>4</sub>	Methane
C <sub>m</sub>	Conversion factor from [N <sub>2</sub> O – N] to N <sub>2</sub> O
CO <sub>2</sub>	Carbon dioxide
CO <sub>2</sub> e	Carbon dioxide equivalent
DNV	Det Norske Veritas
DNA	Designated National Authority
EF <sub>3</sub>	Emission factor for direct N <sub>2</sub> O emissions from manure management systems
EF <sub>4</sub>	Emission factor for indirect N <sub>2</sub> O emissions from atmospheric deposition of N on soils and water surfaces
FAR	Forward Action Request
F <sub>gasm</sub>	Fraction of animal manure N that volatilizes as NH <sub>3</sub> and NO <sub>x</sub>
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
HRT	Hydraulic Retention Time
IPCC	Intergovernmental Panel on Climate Change
MCF	Methane conversion factor
MP	Monitoring Plan
N <sub>2</sub> O	Nitrous oxide
N <sub>ex</sub>	Average annual N excretion per head per animal category
PDD	Project Design Document
QA/QC	Quality Assurance/Quality Control
UNFCCC	United Nations Framework Convention for Climate Change
V <sub>s</sub>	Volatile solids excreted in kg/day



## 1 INTRODUCTION

AgCert International plc (AgCert) has commissioned Det Norske Veritas Certification AS (DNV) to carry out the verification and certification of emission reductions reported for the “AWMS GHG Mitigation Project BR05-B-07, Mato Grosso, Minas Gerais and Goiás, Brazil” (the project) in the period 1 September 2009 to 28 February 2010. This report contains the findings from the verification and a certification statement for the certified emission reductions.

### 1.1 Objective

Verification is the periodic independent review and *ex post* determination by a Designated Operational Entity (DOE) of the monitored reductions in GHG emissions that have occurred as a result of the registered CDM project activity during a defined verification period.

Certification is the written assurance by a DOE that, during a specific period in time, a project activity achieved the emission reductions as verified.

The objective of this verification was to verify and certify emission reductions reported for the “AWMS GHG Mitigation Project BR05-B-07, Mato Grosso, Minas Gerais and Goiás, Brazil” for the period 1 September 2009 to 28 February 2010.

### 1.2 Scope

The scope of the verification is:

- To verify that actual monitoring systems and procedures are in compliance with the monitoring systems and procedures described in the monitoring plan.
- To evaluate the GHG emission reduction data and express a conclusion with a reasonable level of assurance about whether the reported GHG emission reduction data is free from material misstatement.
- To verify that reported GHG emission data is sufficiently supported by evidence.

The verification shall ensure that reported emission reductions are complete and accurate in order to be certified.

### 1.3 Description of the Project Activity

Participating Party(ies):	Brazil, Switzerland, United Kingdom
Title of project activity:	AWMS GHG Mitigation Project BR05-B-07, Mato Grosso, Minas Gerais and Goiás, Brazil
UNFCCC Registration Ref. No.:	0337
Project's crediting period:	1 August 2005 to 31 July 2015
Period verified in this verification:	1 September 2009 to 28 February 2010



The project comprises 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 and/or utilizing the 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.

Prior to project implementation, the project farms used anaerobic lagoon systems to treat manure. Treatment of manure in anaerobic lagoons is thus the selected baseline scenario.

#### 1.4 Methodology for Determining Emission Reductions

Project and baseline CH<sub>4</sub> emissions are determined on a monthly basis by monitoring the livestock (swine) population and by calculating emissions using the validated calculation formulas and validated IPCC default factors emission factors for e.g.

- the volatile solid excretion rate (Vs expressed in kg solid/swine/day) for swine manure
- the maximum methane production capacity (B<sub>0</sub> expressed in m<sup>3</sup>/kg of Vs) and
- methane conversion factor (MCF expressed in %) applicable for the relevant AWMS, i.e. anaerobic lagoon in the baseline scenario and anaerobic digester in the project scenario.

The project activity does not affect N<sub>2</sub>O emissions from manure treatment. N<sub>2</sub>O emissions from manure treatment in the project and the baseline scenario are identical when calculated in accordance with AM0016. Validated IPCC default values are used for nitrogen excreted (N<sub>ex</sub> expressed in kg/swine/day) and emission factors (EF<sub>3</sub> and EF<sub>4</sub> expressed in kg N<sub>2</sub>O-N/kg) applicable for determining direct and indirect N<sub>2</sub>O emissions.

According to the validated project design, potential leakage effects are associated with the electricity consumed by the project and possible changes to the land application of treated manure effluent. Electricity used by the project activity equipment, such as fans, blowers, motors, pumps, igniters, etc. have been calculated and CO<sub>2</sub> emissions associated with the generation of this electricity has been determined using the validated emission factor of 0.7190 kg CO<sub>2</sub> per kWh.

Emission reductions are determined as the difference between baseline emissions and project emissions and leakage ( $ER_{net} = BE - PE - L_o$ ).

Moreover, the amount of CH<sub>4</sub> generated by the digester based on the monitored volume of biogas produced and the biogas composition has been calculated and compared with the CH<sub>4</sub> emission reductions calculated based on livestock population data and IPCC default emission factors (i.e.  $BE - PE$ ).

As required by AM0016, the lowest of i) the amount of CH<sub>4</sub> generated by the digester and ii) the amount of CH<sub>4</sub> emission reductions that has been calculated based on livestock population data and IPCC default emission factors was selected to determine the emission reductions of the project. The selection of the lower of these two values was done for each farm individually.



## 2 VERIFICATION METHODOLOGY

The verification of the emission reductions has assessed all factors and issues that constitute the basis for emission reductions from the project. These include:

- i) The livestock populations managed by the farms which is recorded monthly;
- ii) The selection of appropriate IPCC default emission factors for determining project and baseline CH<sub>4</sub> and N<sub>2</sub>O emissions;
- iii) The biogas flow to the flares and the CO<sub>2</sub> contents of the biogas in order to determine the amount of CH<sub>4</sub> that has been captured and flared;
- iv) The assumptions made to calculate the electricity consumption that occurs as a result of the project and associated emissions.

### *Verification team*

### *Type of involvement*

<i><b>Role/Qualification</b></i>	<i><b>Last Name</b></i>	<i><b>First Name</b></i>	<i><b>Country</b></i>	Desk review	Site visits / Visit to AgCert office	Reporting	Supervision of work	Technical review	Expert input
CDM verifier / technical team leader	Leiroz	Andrea	Brazil	✓	✓	✓	✓		
Sector expert	Tavares	Luis Filipe	Brazil	✓					✓
GHG auditor	Costa	David	Brazil		✓				
GHG auditor	Philipi	Fabiana	Brazil		✓				
GHG auditor	Baines	Gabriel	Brazil		✓				
Auditor	Araujo	Anali	Brazil		✓				
Technical reviewer	Lai	Chee Keong	China					✓	

### *Duration of verification*

Preparations: 29 March 2010 to 30 March 2010

On-site verification: 20 April 2010 to 29 April 2010

Reporting, calculation checks & QA: 28 April 2010 to 30 August 2010

Corrections following 1<sup>st</sup> completeness

check by CDM Secretariat: 23 December 2010

Corrections following 2<sup>nd</sup> completeness

check by CDM Secretariat: 14 February 2011



## 2.1 Review of Documentation

The monitoring report (version 1 dated 26 Mar 2010, version 3 dated 18 August 2010 and version 4 dated 22 December 2010) /1/ for the period 1 September 2009 to 28 February 2010, the procedure for calculating emission reductions in AgCert's database EnviroCert /2/, supporting spreadsheets, consisting of specific monthly livestock population data and biogas volume measurement data for each farm /3/ and the instruction manuals for the applied flow meter type /4/ were assessed. In addition, the project's Project Design Document (PDD) /5/, the revised monitoring plan approved on 20 August 2007, and the project's validation report /6/ were reviewed.

The monitoring report of 26 March 2010 has been made publicly available on the CDM website (date of requesting publication was 30 March 2010).

## 2.2 On-Site Audits at Farm Offices and Inspection of Project Implementation

DNV visited all farms for which emission reductions have been reported (refer to Appendix A). For all farms DNV verified that the actual implementation of the project was as described in the PDD. The site visit comprised a check of the digester system, the flare and the biogas meter and included:

- Verifying the implementation and the effectiveness of operation and maintenance of the anaerobic digester and biogas handling system;
- Verifying that the volumes of biogas produced by the digester and sent to the flare are measured with a gas flow meter and verifying that the CO<sub>2</sub> content of biogas is analysed at least quarterly; and
- Verifying that monitoring equipment is correctly operated and maintained.

DNV audited also selected farm owner offices (refer to Appendix A) in order to verify the reported livestock inventory data by comparing livestock population inventory records kept at the farm owner office of selected months with the livestock population data reported in the monitoring report.

AgCert's office in São Paulo was visited on 19 April 2010. DNV audited the processes for recording data collected by AgCert's employees in Brazil. DNV audited in particular the procedures for data recording, processing and reporting and associated QA/QC procedures.

The above assessments were guided by the checklists contained in Appendix C.

## 2.3 Assessment of Emission Reductions Calculations

The Excel spreadsheet with output of data and the calculations from the AgCert's EnviroCert database /3/ was assessed. In addition, DNV performed control calculations to verify the correct calculation of the database. The assessment was guided by the checklist contained in Appendix C.

## 2.4 Reporting of Findings

Findings established during the verification may be as follows:

A corrective action request (CAR) is issued, where:





- i. Non-conformities with the monitoring plan or methodology are found in monitoring and reporting, or if the evidence provided to prove conformity is insufficient;
- ii. Mistakes have been made in applying assumptions, data or calculations of emission reductions which will impair the estimate of emission reductions;
- iii. Issues identified in a FAR during validation to be verified during verification have not been resolved by the project participants.

A clarification request (CL) shall be raised if information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met.

A forward action request (FAR) is issued for actions if the monitoring and reporting require attention and/or adjustment for the next verification period.

One clarification request (CL) was raised in this verification and was addressed by the project participants by submitting a revised monitoring report. No corrective action requests (CAR) or forward action requests (FAR) were identified (refer to Appendix B). In addition, the monitoring report was revised to include further details as requested by the UNFCCC Secretariat's completeness check checklist.

### 3 VERIFICATION FINDINGS

This section summarises the findings from the verification of the emission reductions reported for the "AWMS GHG Mitigation Project BR05-B-07, Mato Grosso, Minas Gerais and Goiás, Brazil" for the period 1 September 2009 to 28 February 2010.

#### 3.1 Open Issues from Validation and/or Previous Verifications

There are no remaining issues from the previous verification audit.

#### 3.2 Project Implementation

DNV inspected all farms for which emission reductions have been reported and was able to verify that anaerobic digesters and systems for capturing and flaring and/or utilizing biogas have been implemented at all farms for which emission reductions have been reported. DNV was thus able to confirm that project implementation is in accordance with the project description contained in registered PDD of 26 October 2005.

The digesters performance is as planned and the captured biogas is flared and/or combusted in a generator or boilers at selected sites identified in the monitoring report. Visual checks of the digesters' membrane integrity and the gas handling system are performed by AgCert and/or the farm owner, recorded and presented to the audit team.

The flares at all farms have a temperature measure device that assures the effective combustion of CH<sub>4</sub> during the time the biogas is directed to the flare. If the temperature decreases, the electronic system closes the main valve and restarts after a few minutes with an electric spark. The flare design ensures that no gas is sent through the flare without the flare being ignited. The flares were inspected and maintained as required by the operation manual and these checks are reported in the "Record Book" of each farm according to inspections and maintenances procedure.



### 3.3 Compliance of Monitoring Plan with Monitoring Methodology

DNV is able to confirm that the revised monitoring plan approved on 20 Aug 2007 is in accordance with the approved methodology applied by the project activity, i.e. AM0016 (version 02), with the exception of the electricity consumed by the project activity equipment being not metered but calculated. However, that electricity consumption is calculated and not metered was addressed as part of the request for revision of the monitoring plan and this deviation from the monitoring methodology was accepted by the CDM Executive Board.

### 3.4 Compliance of Monitoring with Monitoring Plan

The monitoring has been carried out in accordance with the revised monitoring plan approved on 20 Aug 2007. All indicators stated in the monitoring plan have been monitored and the data have been reported as specified. Only the electricity generated in case biogas is utilised for electricity generation is not measured as stated in the monitoring plan and electricity generation is assumed to be zero.

	<i>Assessment/ Observation</i>
<i>Data / Parameter: (as in monitoring plan):</i>	Population and classification of livestock
<i>Measuring frequency:</i>	The monitoring and reporting of livestock population data is in accordance with well established operational procedures. There is a daily count of the livestock population and birth and mortality are recorded on a daily basis.
<i>Reporting frequency:</i>	Livestock inventories are aggregated in weekly or monthly reports by the farm owner. The records of the farm owners are collected by AgCert's local employees, and monthly livestock inventories are reported to AgCert's data processing unit in Melbourne, Florida, USA.
<i>Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)</i>	Yes
<i>Type of monitoring equipment:</i>	Not applicable
<i>If applicable, has the reported data been cross-checked with other available data?</i>	Not applicable
<i>How were the values in the monitoring report verified?</i>	DNV compared the livestock population data reported in the monitoring report for selected months with livestock population inventory records kept at the farm owner offices that were audited. Reported data matched the inventory records kept at the farm owner offices.
<i>Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?</i>	AgCert's data processing unit in Melbourne, Florida, USA performs QA/QC of the reported data before the monthly livestock inventory data are recorded in AgCert's database EnviroCert.



	<i>Assessment/ Observation</i>
<i>Data / Parameter: (as in monitoring plan):</i>	Temperature and rainfall
<i>Measuring frequency:</i>	Information is taken from data published by the US National Oceanic and Atmospheric Administration <a href="http://www7.ncdc.noaa.gov">http://www7.ncdc.noaa.gov</a>
<i>Reporting frequency:</i>	Monthly
<i>Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)</i>	Yes
<i>If applicable, has the reported data been cross-checked with other available data?</i>	Not applicable
<i>How were the values in the monitoring report verified?</i>	Cross check of a sample of reported data with the data published on <a href="http://www.inmet.gov.br">www.inmet.gov.br</a> . It must be noted that rainfall is not considered in the determination of emission reductions.
<i>Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?</i>	Yes

	<i>Assessment/ Observation</i>
<i>Data / Parameter: (as in monitoring plan):</i>	Biogas produced
<i>Measuring frequency:</i>	Continuous measurement of the flow
<i>Reporting frequency:</i>	Biogas meters are read at least once a month by a local AgCert employee and the meter readings are reported and recorded in EnviroCert by AgCert's data processing unit in Melbourne.
<i>Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)</i>	Yes
<i>Type of monitoring equipment:</i>	ROOTS® Rotary Meters
<i>Is accuracy of the monitoring equipment as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise?</i>	The PDD does not specify the accuracy. The type of flow meter applied represent good monitoring practise.
<i>Calibration frequency /interval:</i>	According to the installation, operation and maintenance manual /4/, no initial calibration after correct installation is required. Moreover, DNV's investigations showed that the 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. DNV verified during the verification of emission reductions reported for the first monitoring period of this project that the flow meters were calibrated at



## VERIFICATION/ CERTIFICATION REPORT

	the manufacturer's facility.
<i>Is the calibration interval in line with the monitoring plan? If the monitoring plan does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?</i>	See above The flow meter is maintained and operated according to a well defined Operations and Maintenance (O&M) Plan.
<i>If applicable, has the reported data been cross-checked with other available data?</i>	In line with AM0016, the measured biogas flow is cross-checked with the theoretical amount of biogas generated, calculated based on livestock population data and IPCC default emission factors
<i>How were the values in the monitoring report verified?</i>	The biogas volumes reported in the monitoring report were assessed against the records on biogas flow meter readings recorded in EnviroCert (output spreadsheets). Moreover, the biogas volume meter reading at the farms at the time of the on-site audit was compared with the last biogas meter reading recorded by AgCert to cross-check the reported biogas meter readings.
<i>Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?</i>	AgCert's data processing unit in Melbourne, Florida, USA performs QA/QC of the reported data before the biogas flow data are recorded in AgCert's database EnviroCert.

	<b>Assessment/ Observation</b>
<i>Data / Parameter: (as in monitoring plan):</i>	CO <sub>2</sub> concentration of biogas
<i>Measuring frequency:</i>	Monthly
<i>Reporting frequency:</i>	Quarterly
<i>Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)</i>	Yes
<i>Type of monitoring equipment:</i>	Landtec Biogas Check portable gas analyser
<i>Is accuracy of the monitoring equipment as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise?</i>	The PDD does not specify the accuracy. The manual CO <sub>2</sub> analyser represent good monitoring practise.
<i>Calibration frequency /interval:</i>	The Landtec Biogas Check portable gas analyser performs a self-calibration (against bottled gas samples) prior to use at each site. Every 6 months the portable gas analysers are taken out of service and sent to the manufacturer for recalibration. All methane content measurements were measured with a Landtec Biogas Check portable gas analyser which was last calibrated less than six months prior to the measurement. DNV verified the calibration certificates for the below calibration of Landtec Biogas Check portable

	gas analysers applied for methane content measurements during the monitoring period:  <table><tr><td><i>Landtec Serial Number</i></td><td><i>Calibration 1</i></td><td><i>Calibration 2</i></td></tr><tr><td>BM10042</td><td>09 Apr 2009</td><td></td></tr><tr><td>GM10236</td><td>02 Apr 2009</td><td>15 Oct 2009</td></tr><tr><td>GM11381</td><td>17 Aug 2009</td><td>26 Feb 2010</td></tr><tr><td>GM11382</td><td>03 Sep 2009</td><td></td></tr><tr><td>GM11383</td><td>06 Aug 2009</td><td></td></tr><tr><td>GM11592</td><td>03 Dec 2009</td><td></td></tr><tr><td>GM11593</td><td>24 Apr 2009</td><td>05 Nov 2009</td></tr><tr><td>GM11595</td><td>24 Apr 2009</td><td>05 Nov 2009</td></tr><tr><td>GM11380</td><td>26 Aug 2009</td><td></td></tr><tr><td>M10245</td><td>19 Aug 2009</td><td></td></tr></table>	<i>Landtec Serial Number</i>	<i>Calibration 1</i>	<i>Calibration 2</i>	BM10042	09 Apr 2009		GM10236	02 Apr 2009	15 Oct 2009	GM11381	17 Aug 2009	26 Feb 2010	GM11382	03 Sep 2009		GM11383	06 Aug 2009		GM11592	03 Dec 2009		GM11593	24 Apr 2009	05 Nov 2009	GM11595	24 Apr 2009	05 Nov 2009	GM11380	26 Aug 2009		M10245	19 Aug 2009	
<i>Landtec Serial Number</i>	<i>Calibration 1</i>	<i>Calibration 2</i>																																
BM10042	09 Apr 2009																																	
GM10236	02 Apr 2009	15 Oct 2009																																
GM11381	17 Aug 2009	26 Feb 2010																																
GM11382	03 Sep 2009																																	
GM11383	06 Aug 2009																																	
GM11592	03 Dec 2009																																	
GM11593	24 Apr 2009	05 Nov 2009																																
GM11595	24 Apr 2009	05 Nov 2009																																
GM11380	26 Aug 2009																																	
M10245	19 Aug 2009																																	
<i>Is the calibration interval in line with the monitoring plan? If the monitoring plan does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?</i>	The PDD does not specify the calibration frequency, but the calibration frequency represents good monitoring practise.																																	
<i>Did calibration confirm proper functioning of monitoring equipment? (Yes / No):</i>	Yes																																	
<i>Is(are) calibration(s) valid for the whole reporting period?</i>	Yes																																	
<i>If applicable, has the reported data been cross-checked with other available data?</i>	Reported CO <sub>2</sub> concentrations are cross-checked with CO <sub>2</sub> concentration reported for other similar sites.																																	
<i>How were the values in the monitoring report verified?</i>	The CO <sub>2</sub> concentrations reported in the monitoring report were assessed against the records on CO <sub>2</sub> concentration recorded in EnviroCert (output spreadsheets). Moreover, at selected sites DNV observed the measurements of the CO <sub>2</sub> concentration.																																	
<i>Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?</i>	AgCert’s data processing unit in Melbourne, Florida, USA performs QA/QC of the reported data before the biogas flow data are recorded in AgCert’s database EnviroCert.																																	

	<i>Assessment/ Observation</i>
<i>Data / Parameter: (as in monitoring plan):</i>	Operational status and type of AWMS
<i>Observation frequency:</i>	Weekly
<i>Reporting frequency:</i>	Weekly
<i>Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)</i>	Yes
<i>How were the values in the monitoring report verified?</i>	<p>Sample of records from weekly assessments on operational status were reviewed.</p> <p>Two sites had periods of no operation. This was recorded. The reported emission reductions were</p>



	adjusted by not including the biogas produced from the day the equipment was last observed to function properly to the day normal operation status was again observed following the malfunctioning of equipment.
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	<i>Assessment/ Observation</i>
<i>Data / Parameter: (as in monitoring plan):</i>	Electricity consumed
<i>Measuring frequency:</i>	The electricity used by the project activity equipment is not metered but calculated. Based on a farm specific list of project activity equipment, the electricity use has been calculated assuming that all relevant electrical equipment operates at full rated capacity, plus 10% to account for distribution losses, for 8760 hours per annum. This is in accordance with the revised monitoring plan for the project approved on 20 August 2007.
<i>Reporting frequency:</i>	Monthly
<i>Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)</i>	Yes
<i>How were the values in the monitoring report verified?</i>	The project participant provided DNV with information on the equipment installed on all sites, and DNV used this list to verify that the electricity consumption is accurately calculated for each site within the project activity. Moreover, during the site visits DNV confirms that the list of equipment provided is correct.

### 3.5 Accuracy of Emission Reduction Calculations

CH<sub>4</sub> and N<sub>2</sub>O emissions in the project and the baseline scenario during the reporting period were correctly calculated based on reported livestock population data and using the validated calculation formulas and the validated IPCC default factors emission factors contained in the PDD. DNV performed control calculations to verify the application of the automated calculation procedure embedded in EnviroCert.

AM0016 requires that “the lower of the actual gas captured and flared or those estimated by equation 26 limits emissions reductions from the project activity”. However, AM0016 (version 02) does not provide any guidance on how to calculate emission reductions based on captured biogas. In the absence of any guidance, emission reductions for each month were calculated by multiplying the biogas volumes measured for each month with the CH<sub>4</sub> content of biogas. The CH<sub>4</sub> content of biogas was determined based on the measured CO<sub>2</sub> content, assuming that biogas consists of mainly CH<sub>4</sub> and CO<sub>2</sub> only, so that the CH<sub>4</sub> content is 100% minus the measured CO<sub>2</sub> content in volume %. In addition, the volume of CH<sub>4</sub> was converted to mass of CH<sub>4</sub> using the density of CH<sub>4</sub> at the average ambient temperature reported for each months (assuming the





biogas has standard atmospheric pressure). This approach is in DNV's opinion deemed appropriate.

The biogas meter readings are recorded once a month by a local AgCert employee. For practical reasons (long distances from one farm to another), it is not always feasible to read the biogas meters at all farms included in the project on exactly the starting date and the end date of the reporting period. Hence, meter reading dates do not necessarily fall on the exact date of the reporting period start and end dates. As a consequence, average daily biogas volumes for each site and for a specific month are determined in accordance with a well defined procedure /2/ using the last biogas meter reading in the month prior to that month, the reading(s) in the month itself and the first reading in the month after that month.

### 3.6 Data Management System and Quality Assurance

The monitoring and reporting of livestock population data is in accordance with well established operational procedures. The person in charge of the farm is responsible for livestock population data collection and recording. There is a daily count and the data is internally verified on a weekly basis. There are no written procedures for recording inventory data for the livestock population. Nonetheless, the audits of selected farm owner offices confirmed that monitoring and reporting are carried out consistently and in line with well established practises.

Data is collected and processed by AgCert according to well defined data collection and processing procedures:

- i) Data on livestock population is collected by the farm manager;
- ii) A local AgCert employee visits the farm owner office at least once a month to obtain a monthly livestock inventory and visits the farms to read the biogas flow meters and perform measurements of the CO<sub>2</sub> content of biogas;
- iii) Data is checked by employees of AgCert's São Paulo office before being reported to AgCert's data processing unit at Melbourne, Florida, USA;
- iv) Reported data is thoroughly checked prior to being entered into AgCert's EnviroCert database;
- v) Data is processed using well-established procedures and automated processes.

QA/QC for reported data and calculations is generally adequate.



#### 4 CERTIFICATION STATEMENT

Det Norske Veritas Certification AS (DNV) has performed the verification of the emission reductions that have been reported for the “AWMS GHG Mitigation Project BR05-B-07, Mato Grosso, Minas Gerais and Goiás, Brazil” (UNFCCC Registration Reference No. 0337) for the period 1 September 2009 to 28 February 2010.

AgCert International plc is responsible for the collection of data in accordance with the monitoring plan and the reporting of GHG emissions reductions from the project.

It is DNV’s responsibility to express an independent verification statement on the reported GHG emission reductions from the project. DNV does not express any opinion on the selected baseline scenario or on the validated and registered PDD.

DNV conducted the verification on the basis of the monitoring methodology AM0016 (version 02), the Project Design Document of 26 October 2005, the revised monitoring plan approved on 20 Aug 2007 and the monitoring report (MR08-BR05-B-07, V.4) dated 22 December 2010. The verification included i) checking whether the provisions of the monitoring methodology AM0016 and the monitoring plan were consistently and appropriately applied and ii) the collection of evidence supporting the reported data.

DNV’s verification approach draws on an understanding of the risks associated with reporting of GHG emission data and the controls in place to mitigate these. DNV planned and performed the verification by obtaining evidence and other information and explanations that DNV considers necessary to give reasonable assurance that reported GHG emission reductions are fairly stated.

In our opinion the GHG emissions reductions of the “AWMS GHG Mitigation Project BR05-B-07, Mato Grosso, Minas Gerais and Goiás, Brazil” (UNFCCC Registration Ref. No. 0337) for the period 1 September 2009 to 28 February 2010 are fairly stated in the monitoring report (MR08-BR05-B-07, V.4) dated 22 December 2010.

The GHG emission reductions were calculated correctly on the basis of the approved baseline and monitoring methodology AM00016 (version 02), the revised monitoring plan approved on 20 Aug 2007 and the Project Design Document of 26 October 2005.

Det Norske Veritas Certification AS is able to certify that the emission reductions from the “AWMS GHG Mitigation Project BR05-B-07, Mato Grosso, Minas Gerais and Goiás, Brazil” during the period 1 September 2009 to 28 February 2010 amount to 39 089 tonnes of CO<sub>2</sub> equivalent.

Rio de Janeiro and Oslo, 14 February 2011

Andrea Teixeira Leiroz  
CDM Verifier  
DNV Rio de Janeiro, Brazil

Michael Lehmann  
Technical Director, Climate Change Services  
Det Norske Veritas Certification AS





## REFERENCES

*Documents provided by the Project Participants that relate directly to the reporting of emission reductions.*

- /1/ AgCert: *Monitoring Report for “AWMS GHG Mitigation Project BR05-B-07, Mato Grosso, Minas Gerais and Goiás, Brazil” for period 1 September 2009 to 28 February 2010.* Version 01 dated 26 March 2010, version 3 dated 22 December 2010 and version 4 dated 22 December 2010.
- /2/ AgCert: *How to Calculate Metered ERs (This document describes how the EnviroCert System calculates a month’s Metered ER from Biogas (based on meter readings), CO<sub>2</sub> (based on CO<sub>2</sub> readings), and Methane Density (based on monthly temperature).* Version of 20 October 2007
- /3/ AgCert: *Excel sheets documenting the emission reduction calculations:*
  - MR08-BR05-B-07 envirocert output 032610.xls
  - MR08-BR05-B-07 swine am0016 calculation tables.xls
  - 0337 - MR08-BR05-B-07 EnviroCert Calculations.xls
  - MR08-BR05-B-07 ID14 and ID16.xls
- /4/ Dresser ROOTS Meter and Instruments: *Installation, Operation & Maintenance - Series B3 ROOTS Meters Models and Differential Testing of ROOTS® Rotary Meters*
- /5/ AgCert: *Project Design Document of “AWMS GHG Mitigation Project BR05-B-07, Mato Grosso, Minas Gerais and Goiás, Brazil”.* Version 2.0 of 26 October 2005.

*Background documents:*

- /6/ TÜV Industries Service GmbH TÜV SÜD Group: *Validation Report for “AWMS GHG Mitigation Project BR05-B-07, Mato Grosso, Minas Gerais and Goiás, Brazil”.* Report No 692233, Revision 0 of 29 October 2005
- /7/ CDM Executive Board: *Approved baseline and monitoring methodology AM0016 – Greenhouse gas mitigation from improved Animal Waste Management Systems in confined animal feeding operations.* Version 02, 3 December 2004.
- /8/ CDM Executive Board: *Validation and Verification Manual.* Version 01.

*Persons interviewed during the verification, or persons who contributed with other information that are not included in the documents listed above.*

- /9/ Daniela Kurosaki Figueiredo , Monitoring Manager, AgCert Brazil
- /10/ David Lawrence, Project Coordinator, AgCert Brazil
- /11/ Michael Mosley, Director of Quality, AgCert Melbourne, USA

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## **APPENDIX A**

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### **LIST OF AUDITED AWMS**

**List of audited AWMS**

<b>Name of farm owner</b>	<b>Name of farm</b>	<b>Site identify- cation</b>	<b>Date of audit / Auditor</b> AA: Anali Araujo DC: David Costa FP: Fabiana Philipi GB: Gabriel Baines	<b>Conformity of audited AWMS with AMWS characteristics indicated in PDD</b>	<b>Destruction method</b>	<b>Farm office audited this verification</b>
José Ricardo Bretãs Leite	Faz Estiva	10653	27 Apr 2010 / DC	✓	Flare	✓
Sebastião Moreira Machado	Sítio Conquista	10656	29 Apr 2010 / DC	✓	Flare	✓
Expedito Martins	Faz Vargem Alegre Site1 <sup>(2)</sup>	10663	28 Apr 2010 / DC	✓	Flare	✓
Renato Tavares Lanna	Granja Bom Futuro	10685	28 Apr 2010 / DC	✓	Flare	✓
Paulo Roberto G. Almeida	Faz Pantaneira	10719	21 Apr 2010 / GB	✓	Flare	✓
Agropecuária Sete Léguas	Agropecuária 7 Léguas	10757	No ERs reported	NA	NA	NA
André Silva Pinto	Faz 7 Léguas #1	10758	No ERs reported	NA	NA	NA
Walter Ferreira Pinto	Faz 7 Léguas #4	10759	No ERs reported	NA	NA	NA
Marcelo Silva Pinto	Faz 7 Léguas #3	10760	No ERs reported	NA	NA	NA
Emilio Leão Baylão	Faz Barra do Lajeado – Granja Baylão	10762	21 Apr 2010 / FP	✓	Flare	✓
Antonio Juarez Berta	Faz Morada do Sonho	10763	21 Apr 2010 / GB	✓	Flare	✓
Darvil Berta	Faz Morada do Sonho	10764	21 Apr 2010 / GB	✓	Flare	✓
Marcos Pedro Berta	Faz Rio Doce – Morada Sonho	10765	21 Apr 2010 / GB	✓	Flare	✓
Maria Graças Amaral Franco	Faz Cachoeira do Liberal	10772	28 Apr 2010 / AA	✓	Flare/Generator	✓
Rosália Franco Mariotto	Granja Nova Canaã	10773	28 Apr 2010 / AA	✓	Flare/Generator	✓
José Miguel Oliv. Fernandes	Faz Cruz da Pedra	10774	29 Apr 2010 / DC	✓	Flare	✓
Luciano Salgado Arantes	Sítio Panorama	10775	27 Apr 2010 / DC	✓	Flare	✓
José Cupertino Campos	Granja Limeira	10782	26 Apr 2010 / DC	✓	Flare	✓
Fransual Ananias da Silva	Faz Córrego Fundo	10792	28 Apr 2010 / GB	✓	Flare	✓
Clair Caetano Carnevali	Faz Lagoa Dourada	10793	28 Apr 2010 / GB	✓	Flare	✓
Jonas Celestino Silva	Faz Pouso Alegre	10794	27 Apr 2010 / GB	✓	Flare	✓

Name of farm owner	Name of farm	Site identification	Date of audit / Auditor AA: Anali Araujo DC: David Costa FP: Fabiana Philipi GB: Gabriel Baines	Conformity of audited AWMS with AMWS characteristics indicated in PDD	Destruction method	Farm office audited this verification
Ari João Perazzoli	Faz Talhado Lugar Irara	10805	20 Apr 2010 / GB	✓	Flare	✓
Juvino Campagnolo	Faz Talhado Lugar Irara	10806	20 Apr 2010 / GB	✓	Flare	✓
Volmir Orlando	Faz Pindaíba Orlando - Granja Orlando	10807	21 Apr 2010 / FP	✓	Flare/Generator	✓
Silvio Wegener	Faz S Tomaz Aterrado	10888	28 Apr 2010 / FP	✓	Flare/Generator	✓
Paulo Roberto Carvalho Luz	Faz Alegre e Cervo	10889	28 Apr 2010 / FP	✓	Flare	✓
Eduardo Ribeiro Ralson	Faz 7 Léguas #2	26942	No ERs reported	NA	NA	NA
Mário Ferreira Guimarães	Granja João Dias	27452	28 Apr 2010 / AA	✓	Flare/Generator	✓
Luiz Eugênio Fonseca	Faz São José – St 1 Fin	27772	27 Apr 2010 / GB	✓	Flare	✓
	Faz São José – St 2 Fin	27782	27 Apr 2010 / GB	✓	Flare	✓
	Faz São José – St 3 Fin	27792	27 Apr 2010 / GB	✓	Flare	✓
José Cupertino Campos	Sítio São Joaquim II	27832	26 Apr 2010 / DC	✓	Flare	✓
SADIA <sup>(1)</sup>	SADIA Creche e ST	28172	21 Apr 2010 / AA	✓	Flare	✓
	SADIA – UPL 4	28182	19 Apr 2010 / AA	✓	Flare	✓
COOPERMUTUM	Faz Ranchão	28262	20 Apr 2010 / AA	✓	Flare	✓
	Faz Rancho Alegre	28272	20 Apr 2010 / AA	✓	Flare/Generator	✓
Expedito Martins	Faz Vargem Alegre Site2 <sup>(2)</sup>	850221	28 Apr 2010 / DC	✓	Flare	✓

(1) This farm used to belong to COOAGRIL – Cooperativa Agropecuária Industrial Luverdense

(2) It is demonstrated that these are the two digester systems for the farm "Fazende Vargem Alegre" mentioned in the PDD, which is as mentioned in the monitoring report and Table A.2 in the PDD owned by Expedito Martins and is located at Jequeri in the state of Minas Gerais.

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## **APPENDIX B**

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### **CORRECTIVE ACTION REQUESTS, CLARIFICATION REQUESTS AND FORWARD ACTION REQUESTS**

**Corrective action requests**

<b>CAR ID</b>	<b>Corrective action request</b>	<b>Response by Project Participants</b>	<b>DNV's assessment of response by Project Participants</b>
	<i>No CAR was identified.</i>		

**Clarification requests**

<b>CAR ID</b>	<b>Corrective action request</b>	<b>Response by Project Participants</b>	<b>DNV's assessment of response by Project Participants</b>
CL 1	During the site visit, DNV verified that the actual implementation of the project activity in Fazenda Pindaíba Orlando – Granja Orlando (10807), Granja Nova Canaã (10773), Granja João Dias (27452) and Fazenda São Tomaz Aterrado (10888) was not according to the monitoring report MR08-BR05-B-07 (version 1 dated 26 Mar 2010). While the monitoring report does not identify the installation of a generator, it was checked that a generator was installed in these sites.	The monitoring report was revised to include the generator in the required sites.	Ok. DNV verified the revised monitoring report and confirm that information regarding the implementation of the project activity in Fazenda Pindaíba Orlando – Granja Orlando (10807), Granja Nova Canaã (10773), Granja João Dias (27452) and Fazenda São Tomaz Aterrado (10888) is correct. This CL is closed.

**Forward action requests from previous verification**

<b>FAR ID</b>	<b>Forward action request</b>	<b>Summary of how FAR has been addressed in this reporting period</b>	<b>Assessment of how FAR has been addressed</b>
	<i>No FAR was identified in the previous verification.</i>		

**Forward action requests from this verification**

<b>FAR ID</b>	<b>Forward action request</b>	<b>Response by Project Participants</b>	<b>DNV's assessment of response by Project Participants</b>
	<i>No FAR was identified.</i>		

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## **APPENDIX C**

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### **CHECKLISTS**



## Checklist 1: Management system/controls for data collection and recording

The data management system/controls are assessed to identify reporting risks and to assess the data management system's/control's ability to mitigate reporting risks. The GHG data management system/controls are assessed against expectations for best practice. A score is assigned as follows:

F: Full - all best practice expectations are implemented.

P: Partial - a proportion of the best practice expectations is implemented

L: Limited - this should be given if little or none of the system component is in place.

A Forward Action Request (FAR) is issued where the management system/controls need to be improved in order to assure that data is adequately collected and recorded during the subsequent monitoring and reporting period.

### ***1) Livestock population data***

Is there a clear allocation of responsibility and authority for data collection and recording and have persons assigned to specific tasks received sufficient training?

Is data collected and recorded in a consistent manner in terms of data collection frequency, data collection and recording practice, etc.?

Is there any QA/QC performed by farm owner with regard to data collection and recording?

Is there any QA/QC performed by local employees of AgCert with regard to data collection and recording?

Is the collection of data and QA/QC of reported data carried out in a consistent and systematic manner?

### ***2) Data on average weight of livestock population data (if applicable)***

Is there a clear allocation of responsibility and authority for data collection and recording and have persons assigned to specific tasks received sufficient training?

Is data collected and recorded in a consistent manner in terms of data collection frequency, data collection and recording practice, etc.?

Is there any QA/QC performed by farm owner with regard to data collection and recording?

Is there any QA/QC performed by local employees of AgCert with regard to data collection and recording?

### ***3) Data on biogas volume and CO<sub>2</sub> content of biogas***

Is there a clear allocation of responsibility and authority for data collection and recording and have persons assigned to specific tasks received sufficient training?

Is data collected and recorded in a consistent manner in terms of data collection frequency, data collection and recording practice, etc.?

Is there any QA/QC performed with regard to data collection and recording?

Is there any QA/QC performed by local employees of AgCert with regard to data collection and recording?

### ***4) Data on electricity generation (if applicable)***

Is there a clear allocation of responsibility and authority for data collection and recording and have persons assigned to specific tasks received sufficient training?

Is data collected and recorded in a consistent manner in terms of data collection frequency, data collection and recording practice, etc.?

Is there any QA/QC performed with regard to data collection and recording?

### ***5) Data on electricity consumption***

Is there a clear allocation of responsibility and authority for data collection and recording and have persons assigned to specific tasks received sufficient training?

Is data collected and recorded in a consistent manner in terms of data collection frequency, data collection and recording practice, etc.?

Is there any QA/QC performed by local employees of AgCert with regard to data collection and recording?

### ***6) Data processing by AgCert***

Is there a clear allocation of responsibility and authority for data processing and have persons assigned to specific tasks received sufficient training?

Is data processing carried out in a consistent manner?

Is there any QA/QC performed with regard to data processing?

Are there any written procedures for data processing and QA/QC of data processing?

## Checklist 2: Project implementation and installation of monitoring equipment

It is assessed whether

- the project has been implemented as described in the Project Design Document
- the AWMS characteristics are as described in the Project Design Document and the monitoring report
- appropriate monitoring equipment has been installed and calibrated as required in the monitoring plan described in the Project Design Document

A forward action request (FAR) is issued where special attention has to be given in the subsequent monitoring and reporting period with regard to project implementation in order to ensure appropriate project performance maintenance and calibration of monitoring equipment to assure that relevant indicators are accurately measured

### ***1) Project implementation and AWMS characteristics***

Have anaerobic digesters been installed and is all manure produced at the farm treated in the anaerobic digesters before being treated in secondary lagoons?

Is biogas utilised for electricity generation and/or flared as described in the PDD?

Has the farm used the same or similar animal feed throughout the whole monitoring and reporting period?

Is the flush system as described in the PDD?

Have there been any significant changes to the flush volume during the selected monitoring and reporting period?

Is the land application of treated manure as described in PDD?

### ***2) Digester performance***

Is digester performance as anticipated?

Are the digesters' membranes regularly checked for possible leaks through visual checks? Are visual checks of the digesters' membrane integrity recorded?

### ***3) Biogas handling system***

Has the biogas handling system been tested and are the test results recorded?

Is the biogas handling system regularly checked for possible leaks through visual checks? Are visual checks of gas handling system recorded?

### ***4) Electricity generation (if applicable)***

Is the electricity generated from biogas measured with an electricity meter and recorded on a monthly basis?

Is the electricity meter used of adequate accuracy?

Has the electricity meter been calibrated in accordance with the meter producer's specifications for calibration?

### ***5) Electricity consumption of project equipment***

Has the electricity consumption of all equipment that needed to be installed as a consequence of the project been accounted?

### ***6) Flare***

Has the flare been tested as required by the flare's producer?

Has the flare been regularly inspected and has maintenance been carried out as required by the flare's producer and has flare inspections and maintenance been recorded?

### ***7) Biogas flow meter***

Has the biogas flow meter continuously monitored the biogas flow from the digesters to the generator and/or flare during the selected monitoring and reporting period?

Is the biogas flow meter used of adequate accuracy?

Has the biogas flow meter been tested as required by the flow meter's producer and have flow meter calibrations been recorded?

### ***8) Measurements of CO<sub>2</sub> content of biogas***

Has the CO<sub>2</sub> content of biogas been measured on a quarterly basis during the whole monitoring and reporting period?

Has the CO<sub>2</sub> content of biogas been accurately measured and have measurement results been recorded?

### Checklist 3: Evidence and correctness of reported data

Data reported in the monitoring report (and if applicable, in more detailed data reports provided by AgCert) is assessed against data records kept at the farm owner office. Reported data may be verified by checking an adequate sample of data records kept at the farm owner office. The sample size may be selected based on the findings of the assessment of the management system/controls for data collection and recording. More data record samples should be verified if the assessment of the management system/controls indicated that there is a risk for misreporting due to inadequate management system/controls and lack of QA/QC procedures.

If deviations from reported data are observed, these deviations have to be documented below and all data records have to be verified in order to ensure that there are no other reporting errors.

A corrective action request (CAR) is issued where data reported in the monitoring report has to be corrected.

A forward action request (FAR) is issued where data evidence and archiving of records need to be improved in order to assure that adequate evidence for reported data is available for the subsequent monitoring and reporting period.

#### ***1) Livestock population data***

Is there evidence for the reported data for the selected verification period?

Is the data collected in accordance with required data collection and recording frequency?

Is the data in the monitoring report sustained by data records kept at the farm owner office and has data been correctly transferred from the farm owner data management system to AgCert's data management system?

#### ***2) Data on average weight of livestock population data (if applicable)***

Is there evidence for the reported data for the selected verification period?

Is the data collected in accordance with required data collection and recording frequency?

Is the data in the monitoring report sustained by data records kept at the farm owner office and has data been correctly transferred from the farm owner data management system to AgCert's data management system?

#### ***3) Data on biogas volume and CO<sub>2</sub> content of biogas***

Is there evidence for the reported data for the selected verification period?

Is the data collected in accordance with required data collection and recording frequency?

#### ***4) Data on electricity generation (if applicable)***

Is there evidence for the reported data for the selected verification period?

Is the data collected in accordance with required data collection and recording frequency?

Is the data in the monitoring report sustained by data records kept at the farm owner office and has data been correctly transferred from the farm owner data management system to AgCert's data management system?

#### ***5) Data on electricity consumption***

Is the electricity consumption estimated using appropriate and conservative assumptions?

## Checklist 4: Emission reduction calculations

### ***Emission reduction calculations***

It is assessed whether baseline and project emissions have been calculated correctly using correct emission factors

A Corrective Action Request (CAR) is issued where mistakes in the emission reduction calculations have to be corrected.

A Forward Action Request (FAR) is issued where special attention has to be given in the subsequent monitoring and reporting period with regard to

- the transparency of the emission reduction calculations
- reducing risks of calculation errors

### ***1) Calculation of project and baseline emissions based on livestock population data (Note that the calculation of project and baseline emissions only differs with regard to the MCF selected for the project and the baseline scenario)***

Has correct input data been used in the calculations?

Have correct emission factors been applied?

Are the calculations correct and transparently presented and the results correctly reported in the monitoring report?

### ***2) Calculation of leakage***

Has correct input data been used in the calculations?

Have correct emission factors been applied?

Are the calculations correct and transparently presented and the results correctly reported in the monitoring report?

### ***3) Calculation of emission reductions based on measured biogas volumes***

Has correct input data been used in the calculations?

Have correct emission factors been applied?

Are the calculations correct and transparently presented and the results correctly reported in the monitoring report?

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