UNFCCC
Clean Development Mechanism Monitoring Report

AWMS GHG Mitigation Project BR05-B-12, Mato Grosso, Mato Grosso do Sul, Minas Gerais, and Sao Paulo, Brazil

Monitoring Period: 1 October 2006 – 30 September 2007

CDM Registration number: UNFCCC000000472CDMP

Document ID: MR01-BR05-B-12, V.3
Date: 09 January 2008

CLEAN DEVELOPMENT MECHANISM
PROJECT ACTIVITY MONITORING REPORT

CONTENTS

Section A General Project Activity Information

A.1 Title of the project activity:

AWMS GHG Mitigation Project, BR05-B-12, Mato Grosso, Mato Grosso do Sul, Minas Gerais, and Sao Paulo, Brazil

A.2 Project participants:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Brazil (host)	• AgCert International plc • AgCert Do Brasil Solucoes Ambientais Ltda.	No

A.3 Crediting period:

A.3.1 Crediting period:

The crediting period for this project activity is from 1 October 2006 through 30 September 2016.

A.3.2 Total estimated emission reductions over the crediting period:

The total estimated emissions reduction over the 10 year project period as documented in the PDD is 760,526 Tonnes of CO_2 equivalent.

A.4 Project activity description and background:

The AWMS Methane Recovery Project, BR05-B-12, Mato Grosso, Mato Grosso do Sul, Minas Gerais, and Sao Paulo, Brazil began in January 2005, when AgCert and farm owners executed activities to undertake a Clean Development Mechanism project. The details of the project are described in the Project Design Document, Version 3.1, dated 24 May 2006, which can be downloaded from the UNFCCC website -- Link to PDD. The project activity will capture and combust methane gas produced from the decomposing manure of swine farms located in Mato Grosso, Mato Grosso do Sul, Minas Gerais, and Sao Paulo, Brazil. The project activities mitigate and recover AWMS GHG emissions in an economically sustainable manner, and will result in other environmental benefits, such as improved water quality and reduced odour. In simple terms, the project proposes to move from a high-GHG AWMS practice, an open air lagoon, to a lower-GHG AWMS practice, an anaerobic digester with capture and combustion of resulting biogas.

This project activity was validated by TUV-SÜD in May 2006 - Link to Report and approved by the Brazilian Government in June 2006 - Link to Report. Registration of this project activity occurred on 11 September 2006. Operations, maintenance, and monitoring training was conducted by AgCert and

manufacturer representatives. Monitoring activities, in accordance with the approved monitoring methodology, began in December 2005.

Construction of all sites was completed and monitoring commenced as indicated in Table A1.

Site			Monitoring Start Date	Renewable Energy Equipment
Legal Entity	**ID**	**Name**		
Arilson Nascimento Targino	10817	Chácara Ouro Verde	24-Feb-06	
Milton Bigatão	10818	Chácara Tio Bita	22-Dec-05	
Gilberto Cherri	10819	Parte do Lote 16 Quadra 44 - Swine	01-Jul-06	
José Jair Caires	10820	Parte do Lote 17 Quadra 59	05-Sep-06	
Orivaldo Aparecido Golfeto	10821	Parte do Lote 23 - Quadra 39 - Swine	02-Jun-06	
Daniel Inacio de Almeida Neto	10822	Sítio Peroba	10-Apr-06	
José Roberto Cardoso Ferreira	10831	Fazenda Santa Felicidade	10-Jan-06	X
David Vincensi	10832	Granja Fazenda Mata Azul	05-Apr-06	X
Otavio Vieira de Melo	10833	Sitio Cabeceira Grande	30-Nov-06	
Jango Tomás de Resende	10841	Fazenda Nossa Senhora da Abadia	01-Mar-06	
Agropecuária Sachetti Ltda	10847	Fazenda Sucuri	17-May-06	
Clóvis Lucion	10911	Fazenda Lucion	01-Mar-06	
Solon Araújo Silva	10933	Fazenda Carumbé	17-May-06	
Eugênio Bacoccina	10962	Sítio Boa Esperança	14-Feb-07	
Moacir Iria Custódio	10966	Fazenda Sítio Prata	03-Apr-06	
João Carlos Pereira	20012	Parte do Lote 24 Quadra 54 - Swine	05-Sep-06	
Adauto Nunes de Oliveira	20022	Sítio Nossa Aparecida	10-Jun-06	
Raul Torezan	20042	Sítio Bom Retiro III	29-Nov-06	
Afrânio Brettas Leite	20102	Fazenda Bom Jardim	17-May-06	
João Carlos Bretas Leite	20162	Fazenda Água Limpa	02-Feb-06	
Fernando César Soares	20182	Granja Soares	01-Feb-06	
Eduardo Luiz Ferreira Junior e outros	27262	FAZENDA VEREDAS	16-Feb-06	
Osmar Rodrigues Caíres	27862	Sítio São Jorge	11-May-06	
José Telmo Viero	27992	Fazenda Araguaia - Swine	27-Jul-06	
Raulino Teixeira Machado	28092	Fazenda Caverá - Site 1	26-May-06	X
Clóvis Lucion	28322	Fazenda Lucion - sítio 2	13-Feb-06	
	28332	Fazenda Lucion - sítio 3	03-Jun-06	

Table A.1. Monitoring Start Dates for Individual Sites

Section B Monitoring of a CDM project activity

B.1 Monitoring report:

B.1.1 Monitoring reports associated with this project activity:

Table B.1 lists all monitoring reports associated with this project activity.

Report Number	Dates		Resulting emission reductions	Verifying DOE
	From	To		
MR01-BR05-B-12 (current report)	1 Oct 2006	30 Sep 2007	See B.1.2	DNV

Table B.1. Monitoring reports submitted for project activity

B.1.2 Emission reductions achieved over the monitored period:

THE EMISSIONS REDUCTION ACHIEVED OVER THE DESIGNATED MONITORING PERIOD IS 56,838 TONNES OF CO_2 EQUIVALENT

B.2 Methodologies applied:

This project activity utilized the CDM approved baseline methodology AM0016, Version 03: *Greenhouse gas mitigation from improved Animal Waste Management Systems in confined animal feeding operations*.

The subset of parameters which were identified, validated, and applied to this project activity is shown in Tables B.2 and B.3.

B.3 Monitoring plan:

The monitoring plan "AWMS GHG Mitigation Project, Operations & Maintenance Plan" was developed based on the approved monitoring methodology identified in paragraph B.2. The monitoring plan was validated by TÜV-SÜD at the time of project activity validation.

B.4 Parameters, emission factors and references for calculations:

Values for all parameters, emission factors, and their associated references are available in the PDD associated with this project. All of the parameters noted in Table B.2 and Table B.3 were previously validated by TÜV-SÜD during the validation period of the project activity.

Parameter/Factor	Value	Source/Comment
CH_4 GWP	21	Intergovernmental Panel on Climate Change, *Climate Change 1995: The Science of Climate Change* (Cambridge, UK: Cambridge University Press, 1996)
MS%j	100%	Percent of effluent used in system.
V_S	Variable	Based on standard animal class weights and obtained from 1996 IPCC, Appendix B, Table B-6, p. 4.46, adjusted via equation 1 of AM0016 capped at 0.5
B_o	0.45	Obtained from 1996 IPCC, Appendix B, Table B-6, p. 4.46
MCF_{month}	0.90 (baseline) 0.10 (project)	Obtained from 1996 IPCC, Appendix B, Table B-6, p. 4.46
N_2O GWP	310	Intergovernmental Panel on Climate Change, *Climate Change 1995: The Science of Climate Change* (Cambridge, UK: Cambridge University Press, 1996)
C_m	1.5714	Conversion factor from [N_2O – N] to N_2O (Cm=44/28)
F_{gasm}	0.2	Obtained from 1996 IPCC, Table 4-19, p. 4.94
EF_3	0.001	Obtained from IPCC 2000 Table 4.12, Section 4.4.1.2, p. 4.43
EF_4	0.01	Obtained from IPCC 2000 Table 4.18 Section 4.8.1.2, p. 4.73
N_{ex}	20	Obtained from 1996 IPCC, Table 4-20, p. 4.99
ID14	100%	AWMS operation status

Table B.2. Data / Parameter Values for Baseline and Project Activity

Parameter/Factor	Value	Source/Comment
N_{ex}	20	Obtained from 1996 IPCC, Table 4-20, p. 4.99
F_{gasm}	0.2	Obtained from IPCC 1996, Table 4-19, p. 4.94
EF_1	0.0125	Obtained from IPCC 1996, Table 4-18, p. 4.39
C_m	1.5714	Conversion factor from [N_2O – N] to N_2O (Cm=44/28)
F_{leach}	0.3	Obtained from IPCC 1996, Table 4-24, p. 4.106
EF_5	0.025	Obtained from IPCC 1996, Table 4-23, p. 4.105
EF_4	0.01	Obtained from IPCC 2000 Table 4.18 Section 4.8.1.2, p. 4.73
EC_y	0.719kg CO_2 / kWh	OECD: Road-Tesing Baseline for GHG Projects in the Energy Power Sector.

Table B.3. Parameter/Emission Factor Values and References for leakage calculations

B.5 Monitored baseline data:

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

Baseline Data										
		ID1					ID 6	ID 9		ID 14
							AWMS	Temp	Rain	
Year	Month	Boar	Finisher	Gilt	Nurser	Sow	Type	°C	cm	Status
2006	10	132	104,984	1,201	43,256	12,098	AL	23.32	6.54	Oper.
2006	11	134	108,493	1,140	43,220	12,185	AL	22.96	10.90	Oper.
2006	12	130	103,534	1,175	43,702	12,192	AL	24.40	12.75	Oper.
2007	1	134	107,131	1,180	43,668	12,087	AL	24.60	12.19	Oper.
2007	2	145	104,580	1,202	45,675	12,592	AL	24.39	10.83	Oper.
2007	3	144	109,311	1,143	45,970	12,605	AL	24.58	10.26	Oper.
2007	4	144	114,641	1,180	47,811	12,674	AL	23.35	11.91	Oper.
2007	5	144	114,229	1,261	48,117	12,581	AL	20.56	2.72	Oper.
2007	6	147	113,481	1,399	48,447	12,510	AL	19.47	0.20	Oper.
2007	7	160	111,430	1,391	49,922	12,503	AL	19.15	0.00	Oper.
2007	8	147	110,301	1,338	52,322	12,734	AL	20.25	0.00	Oper.
2007	9	148	115,149	1,159	53,432	12,669	AL	21.53	0.00	Oper.

Table B.4. Baseline data (ID6[1], ID9[2])

[1] AL: Anaerobic Lagoon
[2] http://www7.ncdc.noaa.gov/IPS/MCDWPubs?action=getpublication

B.6 Monitored project activity data:

The project activity data collected in accordance with the registered PDD and approved monitoring methodology, AM0016. 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												
		ID 1					ID 6	ID9		ID 12	ID 13	ID 14
							AWMS	Temp	Rain	Biogas	CO2	
Year	Month	Boar	Finisher	Gilt	Nurser	Sow	Type	°C	cm	m3	%	Status
2006	10	132	104,984	1,201	43,256	12,098	AD	23.32	6.54	500,928		Oper.
2006	11	134	108,493	1,140	43,220	12,185	AD	22.96	10.90	491,675	40	Oper.
2006	12	130	103,534	1,175	43,702	12,192	AD	24.40	12.75	539,224		Oper.
2007	1	134	107,131	1,180	43,668	12,087	AD	24.60	12.19	539,870		Oper.
2007	2	145	104,580	1,202	45,675	12,592	AD	24.39	10.83	509,942	40	Oper.
2007	3	144	109,311	1,143	45,970	12,605	AD	24.58	10.26	577,849		Oper.
2007	4	144	114,641	1,180	47,811	12,674	AD	23.35	11.91	603,917		Oper.
2007	5	144	114,229	1,261	48,117	12,581	AD	20.56	2.72	657,323	41	Oper.
2007	6	147	113,481	1,399	48,447	12,510	AD	19.47	0.20	631,087		Oper.
2007	7	160	111,430	1,391	49,922	12,503	AD	19.15	0.00	646,939		Oper.
2007	8	147	110,301	1,338	52,322	12,734	AD	20.25	0.00	682,852	41	Oper.
2007	9	148	115,149	1,159	53,432	12,669	AD	21.53	0.00	723,749		Oper.

Table B.5. Project activity data (ID6[3], ID9[4])

B.7 Monitored leakage data:

The leakage data collected in accordance with the registered PDD and approved monitoring methodology, AM0016, is provided in Table B.6.

Based on guidance issued as a result of Requests for Deviation (approved at EB27) on five projects with the same scenario, leakage contributions from electrical components were determined based on operation at full rated capacity, 24 hours per day,7 days a week, plus an additional 10% to account for distribution losses. Specific site component information has been verified by the DOE.

Leakage Data		
Period	**ID 16 Energy Consumed kWh**	**ID 19 Energy produced kWh**
Oct 06 – Sep 07	717,261	0

Table B.6. Leakage data collected during the monitoring period

[3] AD: Anaerobic Digester

[4] http://www7.ncdc.noaa.gov/IPS/MCDWPubs?action=getpublication

Section C Equations and calculation methods

C.1 Baseline equations and calculation methods:

Equations 1, 9, 10, 11, 13, 14, 15, and 16 from the UNFCCC-approved methodology AM0016 were used to determine baseline emissions. The baseline was calculated using Equations 15, 16 and 17 for methane emissions and Equations 18, 19, and 20 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 (N_{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.

C.2 Project Activity equations and calculation methods:

Equations 1, 9, 10, 11, 13, 14, 15, and 16 from UNFCCC-approved methodology AM0016 were used to determine project activity emissions. The **methane (CH_4)** emissions for the project activity were calculated using AM0016 equations 9, 10, and 11. The **nitrous oxide (N_2O)** 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. The **carbon dioxide (CO_2)** emissions for the project activity were calculated using Equation 17. Within this equation, coefficient factors were utilized.

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 (N_{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.

C.3 Leakage equations and calculation methods:

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.

C.4 Total emission reductions equations and calculation methods:

Equations 24 and 26 from UNFCCC-approved Methodology AM0016 were used to determine project activity emission reductions.

Section D Emission reductions

D.1 Project activity emissions:

Table D.1 shows project activity emissions for the current monitoring period.

D.1 - Project Activity Emissions during the Monitoring Period			
Source	**GHG Emissions (CO_2e)** *metric tonnes*		
	CH_4	**N_2O**	
AWMS GHG Mitigation Project BR05-B-12, Mato Grosso, Mato Grosso do Sul, Minas Gerais, and Sao Paulo, Brazil	11,056	3,063	**14,119**

D.2 Leakage

Table D.2 presents project leakage:

D.2 - Total Leakage Emissions									
Source	**GHG Emissions (CO_2e)** *metric tonnes*								
	Baseline			**Project**			**Change**		
	CH_4	**N_2O**	**CO_2**	**CH_4**	**N_2O**	**CO_2**	**CH_4**	**N_2O**	**CO_2**
Land Application									
AWMS GHG Mitigation Project BR05-B-12, Mato Grosso, Mato Grosso do Sul, Minas Gerais, and Sao Paulo, Brazil		17,502			17,502			0	
AWMS Electrical Power									
AWMS GHG Mitigation Project BR05-B-12, Mato Grosso, Mato Grosso do Sul, Minas Gerais, and Sao Paulo, Brazil			0.00			515.71			515.71

As noted in UNFCCC-approved methodology AM0016, project activity leakage may be offset by the "green" energy produced using the captured methane. Table D.2.A summarizes the data used above for the *AWMS Electrical Power – Project - CO_2* parameter.

D.2.A. Leakage Calculations			
Source	**Kilowatt Hours (kWh) of Energy Consumed / Produced**	**CO2e (kg) emitted per kWh produced**	**CO2e (metric tonnes)**
Leakage	717,261	0.7190	515.7107
Green energy produced		0.2750	0.0000
			515.7107

D.3 Total Project Activity emissions:

Table D.3 shows the sum of project emissions and leakage as the total project activity emissions.

D.3 - Total Project Activity Emissions During the Monitoring Period				
Source	**GHG Emissions (CO_2e)** *metric tonnes*			
	CH_4	**N_2O**	**CO_2**	
D.1 - Project Emissions	11,056	3,063		
D.2 - Leakage			516	
Total:	11,056	3,063	516	**14,635**

D.4 Baseline emissions:

Table D.4 displays baseline emissions for the current monitoring period.

D.4 - Baseline Emissions During the Monitoring Period			
Source	**GHG Emissions (CO_2e)** *metric tonnes*		
	CH_4	**N_2O**	
AWMS GHG Mitigation Project BR05-B-12, Mato Grosso, Mato Grosso do Sul, Minas Gerais, and Sao Paulo, Brazil	99,511	3,063	**102,574**

D.5 Calculated Emission Reductions:

The project activity emission reductions for the current monitoring period were determined by subtracting the total project activity emissions (Table D.3) from the baseline emissions (Table D.4), as shown in Table D.5.

D.5 - Total Project Activity Emission Reductions	
Source	**GHG Emissions (CO_2e)** *metric tonnes*
D.4 - Baseline Emissions	102,574
D.3 - Project Activity Emissions	14,635
Total:	**87,939**

D.6 Metered Emission Reductions:

Table D.6 presents emission reductions derived through monitored parameters. Equipment outages which required an adjustment to emission reductions have been factored into the totals below. Site specific information has been provided to and verified by the DOE.

D.6 Metered Project Activity Emissions Reductions(CO2e) during the Monitoring Period					
No.	**Site ID**	**Source**	**GHG Emissions (CO2e)** *metric tonnes*	**FlareEfficiency**	**TotalMeterEr**
1	10817	Chácara Ouro Verde	1,158	0.99	1,146
2	10818	Chácara Tio Bita	788	0.99	780
3	10819	Parte do Lote 16 Quadra 44 - Swine	1,039	0.99	1,028
4	10820	Parte do Lote 17 Quadra 59	317	0.99	313
5	10821	Parte do Lote 23 - Quadra 39 - Swine	802	0.99	793
6	10822	Sítio Peroba	952	0.99	942
7	10831	Fazenda Santa Felicidade	1,220	0.99	1,207
8	10832	Granja Fazenda Mata Azul	2,833	0.99	2,804
9	10833	Sitio Cabeceira Grande	721	0.99	713
10	10841	Fazenda Nossa Senhora da Abadia	1,688	0.99	1,671
11	10847	Fazenda Sucuri	7,764	0.99	7,686
12	10911	Fazenda Lucion	2,086	0.99	2,065
13	10933	Fazenda Carumbé	848	0.99	839
14	10962	Sítio Boa Esperança	619	0.99	612
15	10966	Fazenda Sítio Prata	2,341	0.99	2,317
16	20012	Parte do Lote 24 Quadra 54 - Swine	389	0.99	385
17	20022	Sítio Nossa Aparecida	1,196	0.99	1,184
18	20042	Sítio Bom Retiro III	819	0.99	810
19	20102	Fazenda Bom Jardim	3,092	0.99	3,061
20	20162	Fazenda Água Limpa	3,321	0.99	3,287
21	20182	Granja Soares	2,686	0.99	2,659
22	27262	FAZENDA VEREDAS	828	0.99	819
23	27862	Sítio São Jorge	1,841	0.99	1,822
24	27992	Fazenda Araguaia - Swine	2,947	0.99	2,917
25	28092	Fazenda Caverá - Site 1	7,377	0.99	7,303
26	28322	Fazenda Lucion - sítio 2	4,819	0.99	4,771
27	28332	Fazenda Lucion - sítio 3	3,541	0.99	3,505
				Total:	**57,439**

D.7 Lesser of Calculated ERs (D.5) and Metered ERs (D.6):

Table D.7 presents the lesser of calculated emission reductions or metered emission reductions derived through monitored parameters.

In accordance with the methodology, AgCert has used the CERs calculated from inventory data for any sites in which the CERs calculated from inventory data are less than CERs achieved from biogas.

D.7 Lower of Calculated Project Activity ERs and Metered Project Activity ERs by Site						
No.	**Site ID**	**Source**	**GHG Emissions (CO2e)** *metric tonnes*			**Lower of Calculated or Metered ERs**
			Calculated Emissions	**Metered Emissions**	*Electrical Leakage*	
1	10817	Chácara Ouro Verde	2,248	1,146	*10.30*	1,136
2	10818	Chácara Tio Bita	1,326	780	*10.30*	770
3	10819	Parte do Lote 16 Quadra 44 - Swine	1,672	1,028	*10.30*	1,018
4	10820	Parte do Lote 17 Quadra 59	1,682	313	*10.30*	303
5	10821	Parte do Lote 23 - Quadra 39 - Swine	1,616	793	*10.30*	783
6	10822	Sítio Peroba	1,726	942	*10.30*	932
7	10831	Fazenda Santa Felicidade	1,692	1,207	*10.30*	1,197
8	10832	Granja Fazenda Mata Azul	3,476	2,804	*41.22*	2,763
9	10833	Sitio Cabeceira Grande	1,156	713	*8.61*	704
10	10841	Fazenda Nossa Senhora da Abadia	3,548	1,671	*10.30*	1,661
11	10847	Fazenda Sucuri	8,282	7,686	*10.30*	7,676
12	10911	Fazenda Lucion	3,131	2,065	*10.30*	2,055
13	10933	Fazenda Carumbé	1,060	839	*10.30*	829
14	10962	Sítio Boa Esperança	1,324	612	*6.45*	606
15	10966	Fazenda Sítio Prata	3,107	2,317	*10.30*	2,307
16	20012	Parte do Lote 24 Quadra 54 - Swine	1,811	385	*10.30*	375
17	20022	Sítio Nossa Aparecida	1,515	1,184	*10.30*	1,174
18	20042	Sítio Bom Retiro III	2,620	810	*8.63*	801
19	20102	Fazenda Bom Jardim	4,713	3,061	*87.59*	2,973
20	20162	Fazenda Água Limpa	4,373	3,287	*126.23*	3,161
21	20182	Granja Soares	3,208	2,659	*10.30*	2,649
22	27262	FAZENDA VEREDAS	1,428	819	*10.30*	809
23	27862	Sítio São Jorge	3,847	1,822	*10.30*	1,812
24	27992	Fazenda Araguaia - Swine	2,832	2,917	*30.91*	2,801
25	28092	Fazenda Caverá - Site 1	9,988	7,303	*10.30*	7,293
26	28322	Fazenda Lucion - sítio 2	8,564	4,771	*10.30*	4,761
27	28332	Fazenda Lucion - sítio 3	6,510	3,505	*10.30*	3,495
					Total:	**56,838**