COMPOSTING PROJECT IN SANTA CATARINA

Document Prepared by Sustainable Carbon – Projetos Ambientais Ltda.

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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The Composting Project in Santa Catarina was developed by Sustainable Carbon – Projetos Ambientais Ltda along with 13 swine confinement farms in Brazil, aiming to improve animal manure management systems, reduce greenhouse gases (GHG) emissions and improve the living conditions of the population on the project sites.

The project replaces the baseline Animal Waste Management Systems (AWMS) by a lower GHG emitting AWMS. All farms are located in the State of Santa Catarina, in the south region of Brazil.

The farms involved in the present project are divided into two groups:

- Brownfield farms: in these farms, swine waste was previously treated in anaerobic lagoons, which result in high GHG emissions. As part of the project activity, farmers shifted heir AWMS to mechanized composting units, thus avoiding methane (CH4) emissions.
- Greenfield farms: as part of the project activity, these farmers installed the composting unit since the beginning of their swine confinement operations. This means the composting unit was chosen instead of building anaerobic lagoons, which would be the most likely scenario in the absence of the present Project Activity.

Each farm started the full operation of the automated composting unit in a specific date, i.e., when the composting unit was installed, and farm owners received training for its operation; or when the first batch of animals was received following installation. However, the project start date was defined as the date when the first farm included in this project began reducing GHG emissions by applying the composting unit, which was Fazenda Altenor on 21-May-2010.

By replacing the baseline system, the present project activity reduces methane emissions from anaerobic decay through composting, which is a controlled aerobic treatment. Therefore, the Composting Project in Santa Catarina resulted in a GHG emission reduction of **29,826 tonnes of CO2e** during the current monitoring period from **01-July-2015 to 30-April-2019**. In addition, this new AWMS technology treats the manure under a more controlled and economically sustainable manner.

As part of this project, animal waste is treated in a mechanized composting unit, where the liquid wastes are incorporated with dry solid substrate to be submitted to the mechanical stirring process. This process mixes the liquid and solid parts, maintaining appropriate levels of oxygen, moisture content, and temperature to ensure that organic matter degradation occurs under aerobic conditions. The final compost obtained is used to fertilize cultivated soil within each farm or sold to local consumers.

Besides reducing GHG emissions, the project activity promotes other benefits, such as: improvement of health and working conditions; enhancement of the organic matter stabilization for later soil application; reduction of surface runoff risks from animal manure, which also reduces soil leaching and river pollution; odor reduction, thus combating vector proliferation; income distribution; access to innovative technology; capacity building of the people involved in the project; encouragement of regional integration and development of similar projects with a view to sustainable development.

The project has been fully operational on all farms since the start date described above, except for Fazenda Sítio Pickler, Fazenda Helena, Fazenda Gilmar, Fazenda Suruvy, Fazenda Colônia Zuffo, Fazenda Pissaia and Fazenda Andretta. These farms were not included in the current monitoring report following a personal decision from farm owners. The current operational status of the project in these farms is unknown.

1.2 Sectoral Scope and Project Type

The project is associated to the following scope, as per UNFCCC definitions:

13 - Waste handling and disposal

This is not an AFOLU project. This is not a grouped project. This is a bundled project involving 13 swine farms located in the State of Santa Catarina, in the south region of Brazil.

1.3 Project Proponent

Organization name	Sustainable Carbon - Projetos Ambientais LTDA.
Contact person	Marcelo Hector Sabbagh Haddad Guilherme Lucas Medeiros Prado Carolina Pendl Abinajm Lyara Carolina Montone do Amaral Yara Fernandes da Silva
Title	Marcelo Hector Sabbagh Haddad – Technical Coordinator Guilherme Lucas Medeiros Prado – Technical Analyst Carolina Pendl Abinajm - Technical Analyst Lyara Carolina Montone do Amaral - Technical Analyst Yara Fernandes da Silva - Technical Analyst
Address	R. Doutor Bacelar, 368 – Conj. 23 – Vila Clementino
Telephone	+55 11 2649 0036
Email	tecnica@sustainablecarbon.com

Organization name	Fazenda Sítio Pickler [1]
Contact person	Mr. Adelmo Pickler
Title	Farm owner
Address	Linha São Roque, S/N Zona Rural Arroio Trinta/SC - Brazil
Telephone	+55 49 3535-1138
Email	Not available

Organization name	Fazenda Altenor
Contact person	Mr. Altenor José Basso
Title	Farm owner
Address	Linha Pinheirinho, S/N Zona Rural Nova Erechim/SC - Brazil
Telephone	+55 49 3333-0122
Email	Not available

Organization name	Fazenda Ramela
Contact person	Mr. Antônio Carlos Ramela
Title	Farm owner
Address	Linha Barreiros, S/N Zona Rural Herval d'Oeste/SC - Brazil
Telephone	+55 49 3554-0692

[1] Fazenda Sítio Pickler was not included in the current monitoring report, following a personal decision from Mr. Pickler, the farm owner.

Email	Not available

Organization name	Sítio Santa Lúcia
Contact person	Mr. Belmirro Secco
Title	Farm owner
Address	Linha Banhado Grande, S/N Zona Rural Jaborá/SC - Brazil
Telephone	+55 49 3525-1196
Email	secco_@brturbo.com.br

Organization name	Fazenda Helena[2]
Contact person	Mr. Diacir Coradi
Title	Manager
Address	Linha Santo Antônio, S/N Zona Rural Vargeão/SC - Brazil
Telephone	+55 49 3434-0447
Email	Not available

Organization name	Fazenda Gilmar[3]
Contact person	Mr. Gilmar José Sinigaglia
Title	Farm owner

[2] Fazenda Helena was not included in the current monitoring report, following a personal decision from Mr. Diacir Coradi, the farm owner.

[3] Fazenda Gilmar was not included in the current monitoring report, following a personal decision from Mr. Gilmar Sinigaglia, the farm owner.

Address	Linha Pedreira, S/N Zona Rural Rio das Antas, SC - Brazil
Telephone	+55 49 99134-1119
Email	gilmar@contavi.com.br

Organization name	Fazenda Suruvy[4]
Contact person	Mr. Airton Piovezan
Title	Farm owner
Address	Linha Rui Barbosa, S/N Zona Rural Concórdia /SC - Brazil
Telephone	+55 49 3425-8001
Email	Not available

Organization name	Fazenda Granja Silva
Contact person	Mr. Jair da Silva
Title	Farm owner
Address	Linha Gomercindo, S/N Zona Rural Concórdia/SC - Brazil
Telephone	+55 49 3442-8484
Email	Not available

Organization name	Fazenda Colônia Suspiro
Contact person	Mr. Nóbile Tomazi
Title	Farm owner

[4] Fazenda Suruvy was not included in the current monitoring report, following a personal decision from Mr. Airton Piovezan, the farm owner.

Address	Linha Pinheirinho, S/N Zona Rural Nova Erechim/SC - Brazil
Telephone	+55 49 98860-0650
Email	Not available

Organization name	Fazenda Colônia Zuffo[5]
Contact person	Mr. Dario Marcos Zuffo
Title	Farm owner
Address	Linha Vista Alegre, S/N Zona Rural Rio das Antas/SC - Brazil
Telephone	+55 49 3564-2044
Email	Not available

Organization name	Fazenda Pissaia[6]
Contact person	Mr. Neimar Pissaia
Title	Farm owner
Address	Linha Chapada, S/N Zona Rural Arvoredo/SC - Brazil
Telephone	+55 49 3356-3560
Email	Not available

Organization name	Fazenda Baccin
Contact person	Mr. Renato Baccin

[5] Fazenda Colônia Zuffo was not included in the current monitoring report, following a personal decision from Mr. Dario Zuffo, the farm owner.

[6] Fazenda Pissaia was not included in the current monitoring report. The farm was sold to a relative of Mr. Pissaia, and the current status of the project is unknown.

Title	Farm owner
Address	Linha 24 de Fevereiro, S/N Zona Rural Concórdia/SC - Brazil
Telephone	+55 49 99109-0087
Email	baccin.baccin@yahoo.com.br

Organization name	Fazenda Andretta[7]
Contact person	Mr. Selvino Andretta
Title	Farm owner
Address	Linha Amizade, S/N Zona Rural Nova Itaberaba/SC - Brazil
Telephone	+55 49 3327-0076
Email	fabianeandretta@hotmail.com

1.4 Other Entities Involved in the Project

Organization name	LPC Tecnologia Ambiental
Role in the Project	Developer and provider of the Mechanized and Automated Composting Unit (UMAC[8]), which is used in the farms included in this project activity. Moreover, LPC provides assistance to the operation and maintenance of the composting unit on each farm, and support to the monitoring of the carbon project.
Contact person	Mr. Renato Baccin
Title	Director
Address	Rua Padres Franciscanos, s/n, Bairro Nra Salete, Concórdia / SC - Brazil

[7] Fazenda Andretta was not included in the current monitoring report, following a personal decision from Mr. Selvino Andretta, the farm owner.

[8] UMAC – Unidade Mecanizada e Automatizada de Compostagem. For more information please check the website <www.umac.com.br>.

	Postal Code: 89.700-000
Telephone	+55 49 3442-2208
Email	baccin@umac.com.br

1.5 Project Start Date

The full operation[9] of the automated composting unit was defined to be the starting date at each farm, i.e., when the farm began reducing GHG emissions. Furthermore, one of the two criteria below was considered to determine the starting date at each farm:

(a) When the composting unit was installed and farm owners received training for its operation; or

(b) When the first batch of animals following event (a) was received.

Table below provides the starting date and the criteria used for each farm.

Farm Name	Starting Date	Criteria used to define the project start date (as described above)
Brownfield farms[10]		
Fazenda Altenor	21/05/2010	(b)
Fazenda Pissaia[11]	20/12/2010	(b)
Fazenda Sitio Pickler[12]	27/01/2011	(b)
Fazenda Granja Silva	14/04/2011	**(a)**
Fazenda Helena[13]	18/10/2011	(b)
Fazenda Andretta[14]	26/10/2011	**(a)**
Fazenda Suruvy[15]	28/11/2011	**(a)**

[9] Prior to this date, only tests and field settings were performed, but the composting unit was not available to properly treat animal manure.

[10] A definition of brownfield and greenfield farms is available on Section 1.1.

[11] Fazenda Pissaia was not included in the current monitoring period.

[12] Fazenda Sítio Pickler was not included in the current monitoring report, following a personal decision from Mr. Pickler.

[13] Fazenda Helena was not included in the current monitoring report, following a personal decision from Mr. Diacir Coradi, the farm owner.

[14] Fazenda Andretta was not included in the current monitoring report, following a personal decision from Mr. Selvino Andretta, the farm owner.

[15] Fazenda Suruvy was not included in the current monitoring report, following a personal decision from Mr. Airton Piovezan, the farm owner.

Fazenda Gilmar[16]	11/01/2012	(b)
Greenfield farms		
Fazenda Ramela	21/10/2010	(b)
Sítio Santa Lucia	29/11/2010	(b)
Fazenda Colônia Zuffo[17]	29/11/2010	**(a)**
Fazenda Colônia Suspiro	27/07/2011	(b)
Fazenda Baccin	20/09/2012	(b)

Table 1. Starting date for each farm included in this project activity

However, the project start date was defined as the date when the first farm included in this project began reducing GHG emissions by applying the composting unit under full operation, which was Fazenda Altenor on 21-May-2010.

1.6 Project Crediting Period

The project has a crediting period of 10 years, from 01-January-2011 until 31-December-2020. According to VCS rules, the project crediting period may be renewable at most twice.

The crediting period start date was chosen to simplify the emission reductions calculation and to allow for retroactive credits generated since 2011, in accordance with VCS procedures.

1.7 Project Location

The project activity was implemented in the municipalities of Arroio Trinta, Nova Erechim, Herval d'Oeste, Jaborá, Vargeão, Rio das Antas, Concórdia, Arvoredo and Nova Itaberaba, as presented in Figure 1 and Table 2 below.

During the current monitoring period, farmers have operated the animal manure management system in accordance to the monitoring plan specified in the VCS PD. However, as described above, the farms Fazenda Sítio Pickler, Fazenda Helena, Fazenda Gilmar, Fazenda Suruvy, Fazenda Colônia Zuffo, Fazenda Pissaia and Fazenda Andretta, located in Arroio Trinta, Vargeão, Rio das Antas, Concórdia, Rio das Antas, Arvoredo and Nova Itaberaba, respectively, were not included in the current monitoring report.

[16] Fazenda Gilmar was not included in the current monitoring report, following a personal decision from Mr. Gilmar Sinigaglia, the farm owner.

[17] Fazenda Colônia Zuffo was not included in the current monitoring report, following a personal decision from Mr. Dario Zuffo, the farm owner.

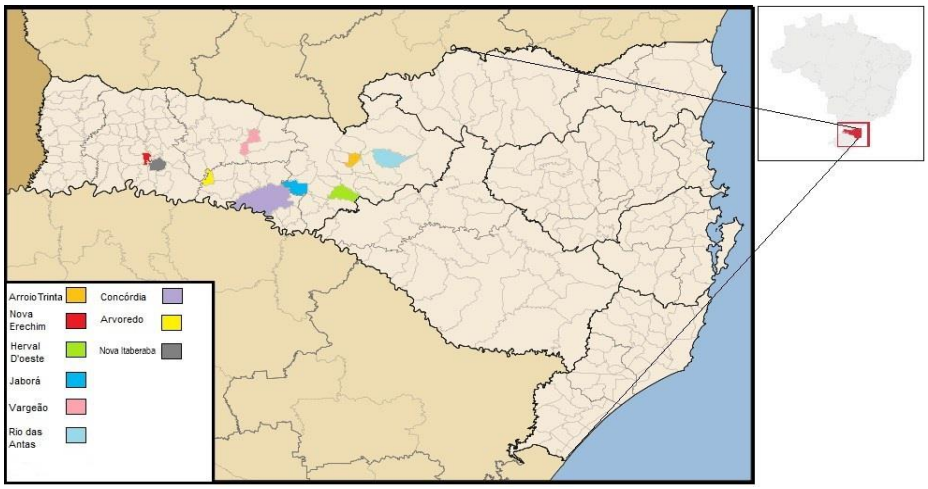

Figure 1. Location of the farms participating in the project activity

State	City	Participating Farm
Santa Catarina	Arroio Trinta	Fazenda Sitio Pickler[18]
	Arvoredo	Fazenda Pissaia[19]
	Concórdia	Fazenda Granja Silva
		Fazenda Baccin
		Fazenda Suruvy
	Herval d'Oeste	Fazenda Ramela
	Jaborá	Sítio Santa Lucia
	Nova Erechim	Fazenda Altenor
		Fazenda Colônia Suspiro
	Nova Itaberaba	Fazenda Andretta
	Rio das Antas	Fazenda Colônia Zuffo
		Fazenda Gilmar
	Vargeão	Fazenda Helena

Table 2. Location of the farms participating in the project activity

The precise location of farms is identified by means of global positioning system (GPS) as displayed on Table 3 below:

[18] Fazenda Sítio Pickler was not included in the current monitoring report, following a personal decision from Mr. Pickler.

[19] Fazenda Pissaia was not included in the current monitoring period.

ID	Farm Name	Farm owner	Address	Town	Contact	Global Positioning System[20]	
						S	W
1	Fazenda Sitio Pickler[21]	Adelmo Pickler	Linha São Roque, S/N	Arroio Trinta	Adelmo Pickler	-26.905787°	-51.302095°
2	Fazenda Altenor	Altenor José Basso	Linha Pinheirinho, S/N	Nova Erechim	Altenor José Basso	-26.913729°	-52.932355°
3	Fazenda Ramela	Antônio Carlos Ramela	Linha Barreiros, S/N	Herval d'Oeste	Antônio Carlos Ramela	-27.187098°	-51.395069°
4	Sítio Santa Lucia	Belmiro Secco	Linha Banhado Grande, S/N	Jaborá	Clodoaldo Secco	-27.128526°	-51.688554°
5	Fazenda Helena[22]	Diacir Coradi	Linha Santo Antônio, S/N	Vargeão	Diacir Coradi	-26.905891°	-52.145477°
6	Fazenda Gilmar[23]	Gilmar José Sinigaglia	Linha Pedreira, S/N	Rio das Antas	Gilmar José Sinigaglia	-26.916379°	-51.083891°
7	Fazenda Suruvy[24]	Airton Piovezan	Linha Rui Barbosa, S/N	Concórdia	Gilmar Piovezan	-27.308228°	-52.068764°
8	Fazenda Granja Silva	Jair da Silva	Linha Gomercindo, S/N	Concórdia	Jair da Silva	-27.293422°	-51.900758°
9	Fazenda Colônia Suspiro	Nóbile Tomazi	Linha Pinheirinho, S/N	Nova Erechim	Lenize Tomazi	-26.903279°	-52.931321°
10	Fazenda Colônia Zuffo[25]	Dario Marcos Zuffo	Linha Vista Alegre, S/N	Rio das Antas	Dario Marcos Zuffo	-26.974623°	-51.068915°
11	Fazenda Pissaia[26]	Neimar Pissaia	Linha Chapada, S/N	Arvoredo	Neimar Pissaia	-27.108491°	-52.411704°
12	Fazenda Baccin	Renato Baccin	Linha 24 de Fevereiro, S/N	Concórdia	Renato Baccin	-27.169646°	-52.103517°

[20] All GPS coordinates were taken near the location where the composting machines are installed.

[21] Fazenda Sítio Pickler was not included in the current monitoring report, following a personal decision from Mr. Pickler.

[22] Fazenda Sítio Helena was not included in the current monitoring report, following a personal decision from Mr. Diacir Coradi.

[23] Fazenda Gilmar was not included in the current monitoring report, following a personal decision from Mr. Gilmar Sinigaglia.

[24] Fazenda Suruvy was not included in the current monitoring report, following a personal decision from Mr. Airton Piovezan.

[25] Fazenda Colônia Zuffo was not included in the current monitoring report, following a personal decision from Mr. Dario Zuffo.

[26] Fazenda Pissaia was not included in the current monitoring report.

ID	Farm Name	Farm owner	Address	Town	Contact	Global Positioning System[20]	
						S	W
13	Fazenda Andretta[27]	Silvino Andretta	Linha Amizade, S/N	Nova Itaberaba	Fabiana Andretta	-26.934749°	-52.833069°

Table 3. Farms location and contact information

[27] Fazenda Andretta was not included in the current monitoring report, following a personal decision from Mr. Silvino Andretta.

1.8 Title and Reference of Methodology

The present project activity applies small scale methodologies approved under the Clean Development Mechanism, as follows:

- Category AMS-III.F. - "Avoidance of methane emissions through composting", version 10, valid from 04-March-2011 to 24-May-2012[28].

Calculations of baseline emissions were determined using relevant sections of:

- Category AMS-III.D. – "Methane recovery in animal manure management systems", version 18, valid from 13-October-2011 to 06-December-2012[29].

Furthermore, procedures for the calculation of project emission from electricity consumption were determined according to:

- "Tool to calculate baseline, project and/or leakage emissions from electricity consumption", version 01, valid from 16-May-2008 onwards[30].

In addition, the SOCIALCARBON Methodology[31] is being applied as a sustainability tool in association with the present VCS project.

1.9 Participation under other GHG Programs

- Emission Trading Programs and Other Binding Limits: The project activity is not included in an emission trading program or any other mechanism that includes GHG allowance trading.
- Other Forms of Environmental Credit: The project activity is not creating any other form of environmental credit under any specific program.
- Participation under Other GHG Programs: The project activity is not registered under any other GHG program.

[28] This version of the methodology is available at: <https://cdm.unfccc.int/filestorage/D/Y/A/DYABR6QZTOW9SH2FM1J3GP5XVKL48N/EB59_repan05_AMS_III.F_ver10.pdf?t=dmF8bnRmbTcwfDCiAXYhcj-F23lSBZzpnh3j>. Last visited on August 06th, 2015.

[29] This version of the methodology is available at: <https://cdm.unfccc.int/filestorage/9/K/Y/9KYSPHV51TNF6MO8LRICJAB0GX3Z27/EB63_repan22_Draft%20revision_AMS_III.D_ver18.pdf?t=STR8bnRmbThtfDCyEKi0h1iLTPcuxYGiID1l>. Last visited on August 06th, 2015.

[30] Tool available at: <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v1.pdf>. Last visited on August 06th, 2015.

[31] SOCIALCARBON Methodology was developed by Ecológica Institute (www.ecologica.org.br). It was founded on the principle that transparent assessment and monitoring of the social and environmental performance of projects improves their long-term effectiveness. The methodology uses a set of analytical tools that assess the social, environmental and economic conditions of communities affected by the project, and demonstrates through continuous monitoring the project's contribution to sustainable development.

1.10 Other Forms of Credit

The project is not creating any other form of environmental credit under any specific program. SOCIALCARBON® Methodology is being applied only as a Sustainability tool in association with VCS.

SOCIALCARBON Methodology was developed by *Instituto Ecológica* (www.ecologica.org.br). It was founded on the principle that transparent assessment and monitoring of the social and environmental performance of projects improves their long-term effectiveness. The methodology uses a set of analytical tools that assess the social, environmental and economic conditions of communities affected by the project and demonstrates through continuous monitoring the project's contribution to sustainable development.

1.11 Sustainable Development

Besides reducing greenhouse gas emissions, the project activity will provide better treatment and stabilization of the organic matter for later soil application, reduction of the surface runoff risks of the waste and leaching in to the soil, odor reduction, combating vector proliferation, improved working conditions and net generation of jobs (temporary and permanent), income distribution, access to technology, capacity building of the people involved and encouraging regional integration and the development of similar projects with a view to sustainable development.

2 SAFEGUARDS

2.1 No Net Harm

The SOCIALCARBON indicators evaluated if there were positive social and environmental impacts from the Project Activity. The SOCIALCARBON methodology uses a set of analytical tools that assess the social, environmental and economic conditions of communities affected by the project and demonstrates the project's contribution to sustainable development through continuous monitoring.

2.2 Local Stakeholder Consultation

Before implementing any farm or composting unit, a consultation with the environmental agency was carried out and only with the release of the licenses was the project undertaken. Stakeholders were informally informed and were not send comments and suggestions during this current monitoring period.

2.3 AFOLU-Specific Safeguards

Not Applicable, this is not an AFOLU project.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The VCS PD was validated by the Designated Operational Entity TÜV Rheinland (China) Ltd and this present monitoring report is being verified by Earthood Services Private Limited.

The project activity reduces methane emissions and treats manure produced by small and medium swine farms in a correct manner. Mechanized composting units (UMAC system) were installed instead of using anaerobic lagoons on swine farms. Composting is an aerobic process producing little or no GHG. Emission reductions occurs because of the low methane emissions resulting from composting compared to the large amount of this GHG that would be released to the atmosphere if anaerobic lagoons were used to treat animal manure.

As described in the VCS PD, the project faces difficulties concerning both the current lack of more rigorous legislation and the common practices in the region. Therefore, without the incentive of the carbon credits, the farms involved in the project would install or maintain anaerobic lagoons to treat manure, instead of installing a mechanized composting system. This scenario would ensure compliance with local regulations but would result in higher GHG emissions.

Besides being more economically attractive than the AWMS proposed by the project activity, anaerobic lagoons were already built in brownfield farms in accordance with Santa Catarina State environmental legislation. Even where there is the need for further investments, anaerobic lagoons would be more economically attractive because the costs would be lower than implementing a new AWMS.

Before implementing the project activity, manure was disposed in anaerobic lagoons over 1 meter deep, causing methane emissions to the atmosphere due to the anaerobic decaying of the organic matter. This occurred in all Brownfield farms and was considered the baseline scenario for all Greenfield farms, as explained in the VCS PD, version 06.1. Besides, wastes generated by anaerobic lagoons were used in liquid form for soil application onsite.

Eight swine farms involved in the current project activity operated anaerobic lagoons prior to the project initiation, since they are less expensive systems and easier to maintain and operate than composting units. The other five farms are considered Greenfield Projects, which means that they started the project activity already using the mechanized composting unit.

As part of this project activity, animal waste is treated in a mechanized composting unit, where liquid wastes are incorporated with dry solid substrate to be submitted to the mechanical stirring process. This process mixes the liquid and solid parts, maintaining appropriate levels of oxygen, moisture content, and temperature to ensure that organic matter degradation occurs under aerobic conditions. The final compost obtained is used to fertilize cultivated soil within each farm or sold to local consumers nearby.

The project has been fully operational on all farms since the start date described above, except for Fazenda Sítio Pickler, Fazenda Helena, Fazenda Gilmar, Fazenda Suruvy, Fazenda Colônia Zuffo, Fazenda Pissaia and Fazenda Andretta. These farms were not included in the current monitoring report following a personal decision of the farm owners. The current operational status of the project in these farms is unknown.

Moreover, the project also adopts the SOCIALCARBON® Methodology, an innovative concept developed by the Ecológica Institute to measure the contribution of carbon projects to sustainability. The Methodology is based in six main pointers: Technology; Natural; Financial; Human; Social and Carbon Resources[32].

[32] More information on SOCIALCARBON is available at: <http://www.socialcarbon.org>. Last visit on 10/08/2015.

3.2 Deviations

3.2.1 Methodology Deviations

As described in the VCS PD version 06.1, Project Proponents have applied a minor deviation to the equation used for determining the annual average number of animals of type LT in year y (parameter NLT,y)[33]. This adaptation increases the accuracy of emission reduction quantification, since it allows PPs to use reliable third-party information to monitor key parameters related to animal production. Third party information shall be sourced from entities that are the direct responsible for measuring monitored data, such as integrators (food companies that manage the complete meat production cycle) and State Agencies.

As farms usually operate in batches lasting from 3 to 4 months, all data on animal production is documented by integrators after each batch is delivered. Batches and related documents do not follow a yearly calendar.

This deviation will not negatively impact the conservativeness of the quantification of GHG emission reductions or removals; instead, it increases the accuracy of monitoring and emission reduction calculations, as described above. Moreover, this deviation only relates to the criteria and procedures for monitoring or measurement and does not relate to any other part of the applied methodology.

Project Proponents have also used a deviation in the monitoring of the quantity of electricity consumed by the project, which is related to emissions from electricity consumption. AMS-III.F version 10 determines it shall be assumed that all relevant electrical equipment operate at a full rate capacity, plus 10% to account for distribution losses, for 8,760 hours per year in case electricity consumption is not directly monitored.

However, given the farms management processes and their low energy consumption, a conservative value was applied. Such value is based on monitored data collected in part of this monitoring period and on LPC judgment about the expected time of operation of the manure pump and the UMAC equipment[34], which are the two only equipment demanding electricity consumption in the AWMS. Values applied on the emission reduction calculation were conservatively defined as the highest value from either:

- LPC judgement corrected with the use of a conservative factor of 125%, meaning an operation time 25% higher than expected by LPC; or
- The average operation time of each AWMS equipment, which was monitored by each farmer during part of the monitored period.

This estimate is also considered conservative given that electricity is a significant cost for the operation of the composting unit and farmers would have no interest in using the equipments longer than necessary.

[33] Please check equation 4 on Section 3.1 of the VCS PD.

[34] Estimates from LPC took into consideration the design of each individual farm. Estimates were based on the size of each composting site and the typical operating conditions of the UMAC system.

This deviation will not negatively impact the conservativeness of the quantification of GHG emission reductions or removals, since conservative estimated values were applied in case monitoring data was incomplete[35]. Moreover, this deviation only relates to the criteria and procedures for monitoring or measurement and does not relate to any other part of the applied methodology.

Project Proponents have also used a deviation regarding the monitoring of the quantity of manure treated in the year y (parameter Qy) and the quantity of compost produced in year y (parameter Qy,treatment). The applied version of the methodology establishes these parameters should be monitored by on-site data measurement using weigh bridges. However, the project does not involve the transportation of waste by vehicles[36] and the compost is mostly used as fertilizer within the farm or on nearby farms, where weigh bridges are not available.

Project Proponents have proposed to determine the amount of waste composted by monitoring the number of operating hours of the pump that sends manure to the composting unit and/or applying default values. However, as data were incomplete, a conservative value was applied based on monitored data collected in part of this monitoring period and on a scientific study about the quantity of swine manure produced per animal type per day. Values applied on the emission reduction calculation were conservatively defined as the highest value of:

- Embrapa study[37]; or
- The average quantity of manure treated per day monitored by each farmer during part of the monitored period.

Since this parameter is only used to calculate project emissions, using default values is conservative as long as values are higher than monitored data. Also, the CDM Methodological Tool "Project and leakage emissions from composting" (EB 65 Annex 09) allows for a different procedure in case there are no weighing device. The tool recommends estimating the amount of waste based on the number of trucks and their capacity. Under this option, no direct measurement or calibrated equipments are used for the monitoring of the amount waste composted.

Also, since no project emissions from the produced compost are expected (as explained on Section 4.2 below), this deviation will not negatively impact the conservativeness of the quantification of GHG emission reductions or removals, as a conservative approach was chosen to monitor Qy and Qy,treatment. The approach is considered conservative since it is based either on on-site data or on reliable EMBRAPA default values that are applicable to local conditions. Moreover, this deviation is only related to criteria and procedures for monitoring or measurement and is not relate to any other part of the methodology.

[35] Evidence on the expected time of operation of electric equipments of each farm was provided to the Validation and Verification Body responsible for project verification.

[36] Waste is carried to composting units by gravity and electrical pumps. Compost is usually removed with wheelbarrow or small vehicles (tractors). This is applicable to all farms included in the project.

[37] OLIVEIRA, Paulo Armando V. de. **Produção e manejo de dejetos de suínos**. Concórdia: Embrapa, 2003. 83 p. Information taken from Table 1. Value adopted to the current monitoring for the amount of solid waste (in kilogram): average daily production of swine manure, including manure and urine, according to animals weight.

3.2.2 Project Description Deviations

Not applicable. There was no project description deviations.

3.3 Grouped Projects

Not applicable. This is not a grouped project.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	***Annual average temperature***
Data unit	ºC
Description	Annual average temperature at project site
Source of data	National Institute of Meteorology (Instituto Nacional de Meteorologia – INMET).
Value applied	18ºC
Justification of choice of data or description of measurement methods and procedures applied	The annual average temperature at the western region of Santa Catarina State was determined according to the data available at INMET.
Purpose of Data	According to AMS.III.D version 18, this parameter is necessary to comply with the requirement described in the first paragraph of item (c): “The annual average temperature of baseline site where anaerobic manure treatment facility is located must be higher than 5°C”. The annual average temperature at western region of Santa Catarina State is 18ºC according to data available from. This parameter follows the conditions of applicability of AMS.III.D. It is not used in the quantification of GHG emission reductions.
Comments	

Data / Parameter	GWP_{CH4}
Data unit	tCO2e/tCH4
Description	Global Warming Potential of CH4

Source of data	Table 2.14 of the errata to the contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) based on the effects of greenhouse gases over a 100-year time horizon.
Value applied	25
Justification of choice of data or description of measurement methods and procedures applied	Although the value of 21 was indicated in version 18 of the methodology AMS-III.D, this parameter shall be updated according to decisions of COP/MOP. The Annex 3 from EB 69 established that "All emission reductions and removals achieved by CDM project activities and PoAs in the second commitment period of the Kyoto Protocol shall be calculated using the global warming potentials (GWPs) adopted by the Conference of the Parties serving as the meeting of the Parties at its seventh session, in accordance with decision 4/CMP.7. This requirement shall apply from 1 January 2013, notwithstanding any GWPs stated to be applicable in the relevant procedures, standards, guidance, approved baseline and monitoring methodologies, methodological tools and other rules being used in relation to that project activity or PoA."[38] In addition, the Decision 4/CMP.7., paragraph 5, states that the GWP "(...) shall be those listed in the column entitled “Global Warming Potential for Given Time Horizon” in table 2.14 of the errata to the contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, based on the effects of greenhouse gases over a 100-year time horizon (...)".[39] Therefore, according to Intergovernmental Panel on Climate Change - IPCC (2014), the new GWP of methane based on a 100-year time horizon is 25.
Purpose of Data	This parameter is used to convert methane emissions to tCO2e for calculation of baseline and project emissions.
Comments	

Data / Parameter	DCH_4
Data unit	t/m3

[38] More information at: <https://cdm.unfccc.int/faq/Reference/Standards/meth/reg_stan02.pdf>. Last visited on: October 16th, 2015.

[39] More information at: <http://unfccc.int/resource/docs/2011/cmp7/eng/10a01.pdf#page=23>. Last visited on: October 16th, 2015.
Moreover, Table 2.14 of the errata to the contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) can be found here: <https://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html#table-2-14>. Last visited on: October 16th, 2015.

Description	Density of CH4
Source of data	Methodology AMS-III.D., version 18 Information available on Page 3.
Value applied	0.00067 at room temperature (20ºC) and 1 atm pressure.
Justification of choice of data or description of measurement methods and procedures applied	Value proposed by the methodology.
Purpose of Data	This parameter is used to convert methane emissions from cubic meters to tonnes regarding the calculation of baseline emissions
Comments	

Data / Parameter	UF_b
Data unit	Fraction
Description	Correction factor to account for model uncertainties.
Source of data	Methodology AMS-III.D., version 18 Information available on Page 3.
Value applied	0.94
Justification of choice of data or description of measurement methods and procedures applied	Value proposed by the methodology.
Purpose of Data	This parameter is a correction factor to account for model uncertainties on the calculation of baseline emissions.
Comments	

Data / Parameter	MCF_j
Data unit	Fraction
Description	Annual methane conversion factor for the baseline animal manure management system j.
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories, volume 4, chapter 10, table 10.17.
Value applied	Uncovered anaerobic lagoons: 77%
Justification of choice of data or description of measurement methods and procedures applied	The methane conversion factor of 77% for anaerobic lagoons was determined according to IPCC (2006), considering 18°C as the annual average temperature at the region where project is located.

Purpose of Data	This parameter is used to calculate baseline emissions, providing the methane conversion factor from the use of anaerobic lagoons to treat animal manure.
Comments	

Data / Parameter	$B_{0,LT}$
Data unit	m^3 CH_4/kg dm
Description	Maximum methane producing potential of the volatile solid generated for animal type *LT.*
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories, volume 4, chapter 10, table 10.A-7 and 10A-8.
Value applied	The following values are applied:

Animal Type	Value	Reference
Market swine	0.29	Latin America
Breeding swine	0.45	Western Europe

Justification of choice of data or description of measurement methods and procedures applied	Brazil does not have published data of the maximum methane producing potential from manure. Hence, default values sourced from IPCC (2006) were applied.
Purpose of Data	This parameter is used to calculate baseline emissions. Provides the maximum methane producing potential of volatile solids present in manure, depending on the animal type.
Comments	Farrowing farms included in the present project activity are in compliance with all conditions described in paragraph 10 (d) of AMS-III.D version 18. Hence, default values from developed countries can be utilized to define $B_{0,LT}$.

Data / Parameter	$MS\%_{BL,j}$
Data unit	%
Description	Fraction of manure handled in baseline animal manure management system *j*
Source of data	Project proponent
Value applied	

Farm	$MS\%_{BL,j}$ From 01/Jul/2015 to 30/April/2019				
	2015	2016	2017	2018	2019
Fazenda Altenor	100%	100%	100%	100%	100%
Fazenda Baccin	100%	100%	100%	100%	100%

	Fazenda Colônia Suspiro	100%	100%	100%	100%	100%
	Fazenda Granja Silva	100%	100%	100%	100%	100%
	Fazenda Ramella	100%	100%	100%	100%	100%
	Sitio Santa Lúcia	100%	100%	100%	100%	100%

Justification of choice of data or description of measurement methods and procedures applied	All waste was sent to the baseline treatment system (anaerobic lagoons) prior to the project initiation in Brownfield farms. This is also considered the baseline scenario for Greenfield farms, since it is the common practice in the region.
Purpose of Data	This parameter is used to calculate baseline emissions, providing the fraction of manure that would otherwise be handled on the considered baseline treatment system (anaerobic lagoon).
Comments	As described in Section 2.1 above - Implementation Status of the Project Activity, three farms operated anaerobic lagoons during this monitoring period. The operation of anaerobic lagoons in these farms was measured by the parameter Fraction of manure handled in baseline animal manure management system j (MS%BL,j), based on the period within the monitoring period that each farm operated anaerobic lagoons. This approach has been carried out in order to claim emission reductions only for the manure treated by the composting process during the monitoring period, as this parameter directly impacts the GHG emission reductions.

Data / Parameter	$W_{default}$
Data unit	Kg
Description	Default average animal weight of a defined population
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories, volume 4, chapter 10, tables 10A-7 and 10A-8.
Value applied	The following values are applied:

Animal Type	Value	Reference
Market swine	28	Latin America
Breeding swine	198	Western Europe

Justification of choice of data or description of measurement methods and procedures applied	Default average animal weight value was obtained from IPCC (2006).

Purpose of Data	This parameter is used to calculate baseline emissions by providing the estimated amount of volatile solid excretion rate for each animal type according to the average animal weight.
Comments	Farrowing farms included in the present project activity are in compliance with all conditions described in paragraph 10 (d) of AMS-III.D version 18. Hence, default values from developed countries can be utilized to define $W_{default}$.

Data / Parameter	$VS_{default}$
Data unit	Kg dm/animal/day
Description	Default value for the volatile solid excretion rate per day on a dry-matter basis for a defined livestock population
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories, volume 4, chapter 10, tables 10A-7 and 10A-8.
Value applied	The following values are applied:

Animal Type	Value	Reference
Market swine	0.3	Latin America
Breeding swine	0.46	Western Europe

Justification of choice of data or description of measurement methods and procedures applied	Brazil does not have published data of the volatile solid excretion rate by animal type. Hence, default values sourced from 2006 IPCC were applied. Values for Latin America are used for market swine and for Western Europe are used for breeding swine, since farrowing farms comply with all conditions of paragraph 10 (d) of AMS-III.D, version 18. Hence, default values from developed countries can be utilized.
Purpose of Data	This parameter is used to calculate baseline emissions by providing the estimated amount of volatile solid excretion rate for each animal type according to average animal weight.
Comments	

Data / Parameter	$EF_{composting}$
Data unit	gCH_4 / kg of waste treated on a wet basis
Description	Emission factor for composting of manure
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories, table 4.1, chapter 4, Volume 5
Value applied	4
Justification of choice of data or description of	This emission factor is described in the applied methodology to calculate methane emissions from composting

measurement methods and procedures applied	
Purpose of Data	This parameter is used to calculate project emissions from composting. It is a default value that provides composting emissions from the amount of waste composted per year
Comments	

Data / Parameter	$TDL_{j,y}$
Data unit	Percentage
Description	Average technical transmission and distribution losses for providing electricity to source *j* in year *y*
Source of data	Approved methodology AMS-III.F, version 10.
Value applied	10%
Justification of choice of data or description of measurement methods and procedures applied	This value is recommended by the applied methodology AMS-III.F, version 10, as described on Table III.F.1.
Purpose of Data	This parameter is used calculate project emissions from electricity consumption taking into consideration the expected transmission and distribution losses.
Comments	

Data / Parameter	***MD***
Data unit	Kg/m³
Description	Manure density
Source of data	OLIVEIRA, Paulo Armando V. de. **Produção e manejo de dejetos de suínos**. Concórdia: Embrapa, 2003. 83 p.
Value applied	1,016
Justification of choice of data or description of measurement methods and procedures applied	The density of 1,016 kg per m³ was obtained from a publication of an EMBRAPA researcher (Mr. Paulo Armando V. de Oliveira). Such density is applicable for swine manure with 3% of solid matter, which is the expected value for the farms included in the project[40].
Purpose of Data	This density is used to convert monitored values of Q_y (Quantity of manure treated in the year *y*) from volume to weight, regarding calculations of project emissions.

[40] This value is used by LPC Tecnologia Ambiental on the Technical Project of the composting unit. Hence, it is considered applicable to the farms conditions.

Comments	More information on the calculation of Q_y is available on Sections 3.2 and 4.2 below.

4.2 Data and Parameters Monitored

Data / Parameter	$VS_{LT,y}$
Data unit	kg dm/animal/year
Description	Volatile solids for livestock LT entering the animal manure management system in year y
Source of data	- IPCC default value from: 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, chapter 10, tables 10 A-7 and 10 A-8; - Wsite: Farmers, based on documents provided by integrators, State Agencies or other internal documents.
Description of measurement methods and procedures to be applied	Values from IPCC were applied (Wdefault and VSdefault); however, they were adjusted considering the weight of animals in the project sites (Wsite). The parameter Wsite was monitored as described in this section below.
Frequency of monitoring/recording	Annually
Value monitored	Detailed information on Appendix 1.
Monitoring equipment	No monitoring equipment is used. Since this is a default value from IPCC, it is not possible to quantify the accuracy. However, the correction of this parameter with Wsite ensures values are consistent to the project situation.
QA/QC procedures to be applied	This parameter was calculated with monitored data on ndy and Wsite. More information about QA/QC procedures can be found at the respective description of each parameter.
Purpose of the data	This parameter is used to calculate baseline methane emissions from animal manure treatment system.
Calculation method	Calculated through Equation 3 of VCS PD v06.1, considering the average animal weight at the project site (Wsite), the default average animal weight (Wdefault) according to IPCC (2006), the default value of volatile solid excretion rate (VSdefault) also according to IPCC (2006), and the number of days the system is operational during year y (ndy).
Comments	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Data / Parameter	nd_y
Data unit	Days
Description	Number of days in year y in which the animal manure management system is operational.
Source of data	Project proponents
Description of measurement methods and procedures to be applied	The number of days the manure management system is operational were obtained either from monitoring spreadsheets where farmers record operating time of the composting unit or from third party information (such as documents from integrators or State Agricultural agencies). The treatment plant is considered to be operational whenever manure is applied and/or the composting windrows are mixed with substrate to produce compost. In case third party information was used, ndy was considered as the number of days animals are alive in the farm per year, since farmers need to operate the composting unit on a daily basis when animals are confined in the farms.
Frequency of monitoring/recording	Annually based on daily records (monitoring spreadsheets) or monthly records (third party information).
Value monitored	Detailed information on Appendix 1.
Monitoring equipment	No equipment is used to monitor this parameter. Farmers filled in paper spreadsheets or stored third party information regarding animal confinement to monitor this parameter.
QA/QC procedures to be applied	Farmers were trained for the monitoring of this parameter. Monitoring spreadsheets were cross-checked with third party information to avoid possible errors.
Purpose of the data	This parameter is used to calculate baseline methane emissions from animal manure treatment system. It is also used to calculate project emissions resulting from electricity consumption and from composting process.
Calculation method	ndy was obtained by counting the days in the years in which monitoring data indicates that the animal manure management system was operational on each farm.
Comments	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Data / Parameter	W_{site}
Data unit	Kg

Description	Average animal weight of a defined livestock population at the project site
Source of data	Project proponents
Description of measurement methods and procedures to be applied	The average animal weight by animal type was obtained from the following sources: 1. Third party information (such as documents from integrators or State Agricultural agencies) 2. Onsite measurements 3. Other farms included in the Project that have similar production conditions 4. Conservative default values given the project conditions
Frequency of monitoring/recording	Periodic records provided by integrators for each batch. Integrators provide documents for each batch. Thus, animal weight controls do not follow an annual schedule; instead they are based on each batch period.
Value monitored	Detailed information on Appendix 1. Wsite for Finishing Unit farms were mostly obtained from Third party information, as integrators are responsible to measure animal weight. Wsite for breeding swine found in Farrowing Unit farms were based on IPCC (2006) default values, as these are considered conservative given the project conditions. This approach is considered conservative, since breeding swine in the project region usually weight from 220kg to 250kg[41].
Monitoring equipment	No monitoring equipment is used. Animal weight is usually measured by integrators for commercial purposes, in order to determine due financial compensations for farmers.
QA/QC procedures to be applied	Control forms and registration documents provided by third parties (integrators, State Agencies, etc) are considered reliable sources, once data are used for financial purposes. Sustainable Carbon - Projetos Ambientais Ltda. kept a database with the information provided for each farm.
Purpose of the data	This parameter is used to calculate baseline methane emissions from animal manure treatment system, specifically for calculating the volatile solids for livestock entering the animal manure management system (VSLT,y).

[41] According to TALAMINI, T J D; MARTINS, F M; ARBOIT, C; WOLOZSYN, N. Custos agregados da produção integrada de suínos nas fases de leitões e de terminação. **Custos e @gronegocio online**. v. 02, October/2006. Information available at Page 75. This study was performed with farms located within the project region and the report states sows usually weight 220Kg and boars weight 250kg. Document available at: <http://www.custoseagronegocioonline.com.br/especialv2/custos%20agregados%20de%20producao.pdf>. Last visited on 19/08/2015.

Calculation method	Calculated based on a weighted average of the initial medium weight and the final medium weight of animal batches at each farm per year.
Comments	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Data / Parameter	$N_{da,y}$
Data unit	Days
Description	Number of days animal is alive in the farm in the year y
Source of data	Project proponents
Description of measurement methods and procedures to be applied	Market swine: this parameter was monitored using registries from third parties (integrators, State Agencies, etc) regarding input and output data of animals in each farm. Breeding swine: this parameter was also monitored using registries from third parties (integrators, State Agencies, etc) regarding input and output data of animals in each farm. However, some breeding swine (i.e. boars and sows) usually stay in the farm during the whole year, therefore the value considered to this parameter was 365 days per year.
Frequency of monitoring/recording	Periodic records provided by integrators for each batch. Integrators provide document control and financial arrangements for each batch, which do not follow an annual schedule; instead the frequency of monitoring is based on each batch period.
Value monitored	Detailed information on Appendix 1.
Monitoring equipment	No monitoring equipment is used. This parameter is usually based on third party information, such as documents from integrators and State Agencies. Therefore, although it is not feasible to quantify accuracy, a high level of accuracy is expected.
QA/QC procedures to be applied	Control forms and registration documents provided by third parties (integrators, State Agencies, etc) are considered reliable sources, once data are used for financial purposes. Sustainable Carbon - Projetos Ambientais Ltda. kept a database with the information provided for each farm.
Purpose of the data	This parameter is used to calculate baseline methane emissions from animal manure treatment system, specifically for calculating the annual average number of animals (NLT,y).

Calculation method	Calculated based on a weighted average of the period that animal batches stay in each farm per year.
Comments	The current monitoring period starts in 01/January/2013, thus the number of days animals are alive in the farm (Nda,y) starts only after this date, regardless if the batch entry date was before January 2013. This approach has been carried out in order to claim emission reductions only during the current monitoring period. In addition, the Number of days animal is alive in the farm was also limited to the final date of the current monitoring period. Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Data / Parameter	$N_{p,y}$
Data unit	Number of animals
Description	Number of animals produced annually of type LT for the year y
Source of data	Project proponents
Description of measurement methods and procedures to be applied	Market swine: this parameter was monitored using registries from third parties (integrators, State Agencies, etc) regarding input and output data of animals in each farm. Breeding swine: this parameter was also monitored using registries from third parties (integrators, State Agencies, etc) regarding input and output data of animals in each farm. However, some breeding swine (i.e. boars and sows) usually stay in the farm during the whole year, and thus are not included in registries from third parties. Therefore, this parameter was monitored using internal registries from farmers. The number of animals produced was considered the annual average.
Frequency of monitoring/recording	Periodic records provided by integrators for each batch. Integrators provide document control and financial arrangements for each batch, which do not follow an annual schedule; instead the frequency of monitoring is based on each batch period.
Value monitored	Detailed information on Appendix 1.
Monitoring equipment	No monitoring equipment is used. This parameter is usually based on third party information, such as documents from integrators and State Agencies. Therefore, although it is not feasible to quantify accuracy, a high level of accuracy is expected.

QA/QC procedures to be applied	Control forms and registration documents provided by third parties (integrators, State Agencies, etc) are considered reliable sources, once data are used to financial purposes. Sustainable Carbon - Projetos Ambientais Ltda. kept a database with the information provided for each farm.
Purpose of the data	This parameter is used to calculate baseline methane emissions from animal manure treatment system, specifically for calculating the annual average number of animals (NLT,y).
Calculation method	Total of animals LT produced at each farm per year (or in a specific period of time according to the current monitoring period).
Comments	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Data / Parameter	$N_{LT,y}$
Data unit	Number of animals
Description	Annual average number of animals of type LT in year y
Source of data	Project proponents
Description of measurement methods and procedures to be applied	This parameter was monitored based on parameters Nda,y and Np,y previously described. Project Proponents have applied a minor deviation to the equation used for determining the annual average number of animals of type LT in year y (NLT,y), as defined on the VCS PD version 06.1. This adaptation increases the accuracy of emission reduction calculations, since it allows PPs to use reliable third-party information to monitor key parameters related to animal production. Third party information were sourced from entities that are the direct responsible for measuring monitored data, such as integrators (food companies that manage the complete meat production cycle) and State Agencies. As farms operate in batches lasting from 3 to 4 months, all data on animal production is documented by integrators after each batch is delivered. Batches and related documents do not follow a yearly calendar.
Frequency of monitoring/recording	Annually, based on periodic records.
Value monitored	Detailed information on Appendix 1.

Monitoring equipment	No monitoring equipment is used. This parameter is calculated based on third party information, such as documents from integrators and State Agencies. Therefore, although it is not feasible to quantify accuracy, a high level of accuracy is expected.
QA/QC procedures to be applied	Farmers are responsible for storing data regarding animal production, such as control forms and registration documents provided by integrators. Sustainable Carbon - Projetos Ambientais Ltda. kept a database with the information provided for each farm.
Purpose of the data	This parameter is used to calculate baseline methane emissions from animal manure treatment system.
Calculation method	The annual average number of animals of type LT was calculated using the Equation 4 described in VCS PD version 06.1, considering the number of days animals are alive in the farm (Nda,y) and the total number of animals produced (Np,y) in year y. The annual average number of animals (NLT,y) was calculated by Sustainable Carbon technical team. However, as described above, a minor deviation is used to calculate this parameter in this project. Given that documents regarding the production of animals are not generated annually, but based on batches, a period of time different than 365 is usually considered. Hence, NLT,y is obtained by dividing the number of animals produced by the number of days in the period of time considered[42].
Comments	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Data / Parameter	$Q_{y,treatment}$
Data unit	Tonnes
Description	Quantity of compost produced in year y
Source of data	Project proponents
Description of measurement methods	Farmers monitored the amount of compost produced per year using spreadsheets. Compost was measured using standard storage units with known volume or weight. In addition, farmers

[42] The period of time considered in a specific year is the period between the entry date of the first batch managed in the year and the end date of the last batch managed in the year.

End dates are limited to the monitoring period end date. This ensures emission reductions are not claimed for a period beyond the monitoring period.

<table>
<tr><td>and procedures to be applied</td><td>measured the amount of storage units every time compost is used or sold.</td></tr>
<tr><td>Frequency of monitoring/recording</td><td>Annually, based on monthly records.</td></tr>
<tr><td>Value monitored</td><td><table><tr><th>Year</th><th>$Q_{y,treatment}$</th></tr><tr><td>2015 – July - December</td><td>1,344</td></tr><tr><td>2016</td><td>1,749</td></tr><tr><td>2017</td><td>1,713</td></tr><tr><td>2018</td><td>72</td></tr><tr><td>2019 – January - April</td><td>350</td></tr><tr><td>Total</td><td>5,228</td></tr></table>Values monitored and spreadsheet template were available to Auditor team during the site visit.</td></tr>
<tr><td>Monitoring equipment</td><td>Storage bags with predefined weight or volume. The indirect measurement procedure chosen to monitor this parameter is expected to result in low levels of accuracy. However, procedures with higher precision are not feasible given the farmers reality. Also, no project emissions from the produced compost are expected. Hence, the low accuracy of this parameter is not expected to affect the calculation of GHG emission reductions during the current monitoring period.</td></tr>
<tr><td>QA/QC procedures to be applied</td><td>Farmers were trained on the project monitoring in order to achieve a higher accuracy in the determination of this parameter.</td></tr>
<tr><td>Purpose of the data</td><td>This parameter is monitored as requested by the applied methodology. However, since compost is not subject to anaerobic treatment or disposal, no emissions are associated to the amount of compost produced. Therefore, it is not used in the quantification of GHG emission reductions.</td></tr>
<tr><td>Calculation method</td><td>The total quantity of compost produced per year was monitored through farmers' records, which also detailed the final destination of compost (i.e. usage, sale, etc).</td></tr>
<tr><td>Comments</td><td>As previously described in section 2.2.1 (Methodology Deviations), project proponents applied a deviation regarding the monitoring of the quantity of compost produced in year y (parameter Qy,treatment). The applied version of the methodology establishes this parameter should be monitored by on-site data measurement using weigh bridges. However, compost is mostly used as fertilizer within the farm or on nearby farms, where weigh bridges are not available.</td></tr>
</table>

	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Data / Parameter	$EC_{PJ,j,y}$
Data unit	MWh
Description	Quantity of electricity consumed by the project electricity consumption source j in year y
Source of data	Project proponents
Description of measurement methods and procedures to be applied	As predicted in the VCS PD v.06.1, farmers would record the frequency of operation of the manure pumps and of the mixing equipment (Mechanized and Automated Composting Unit - UMAC) in spreadsheets on a daily basis. These are the only two equipment demanding electricity consumption in the AWMS. Since monitoring data is incomplete for the current monitoring period, this parameter was conservatively defined as the highest value of: • LPC judgment corrected with the use of a conservative factor of 125%, meaning an operation time 25% higher than expected by LPC was considered. • The average operation time of each equipment as monitored by each farmer during part of the monitored period. The approach used and the value applied for each farm is available in Section 3.3 – Monitoring Plan, below.
Frequency of monitoring/recording	Daily
Value monitored	Detailed information on Appendix 1.
Monitoring equipment	No equipment is used to monitor this parameter. Monitoring is based on default value applied to all farms. The indirect measurement procedure chosen to monitor this parameter is expected to result in low levels of accuracy. However, procedures with higher precision are not feasible to apply given the farmers reality. Project emissions from electricity are expected to be quite low compared to emission reductions (around 1%). Hence, the low accuracy is not expected to significantly affect the calculation of emission reductions during the crediting period.
QA/QC procedures to be applied	Farmers were trained on the project monitoring in order to achieve a higher accuracy in the determination of this parameter. In

	addition, Sustainable Carbon shall manage the project database and check possible errors. Estimated values were only applied when it was possible to ensure that their use resulted in a conservative calculation of emission reduction. In addition, estimated values were compared either to existing data of the same farm (for different periods of time) or to data from other farms with similar operating conditions. Such comparison confirmed that estimated values were in most cases conservative.
Purpose of the data	This parameter is used to calculate project emissions from electricity consumption.
Calculation method	Farmers recorded the exact time period per day they operated the mixing equipment (UMAC) and the manure pump only during part of the monitored period. Thus, estimated value was also applied. Estimated values were defined by LPC and are described on Annex 2 of the VCS PD v06.1. However, when those default values could not be considered conservative, project proponents utilized the existing data (average operation time of each equipment), which was then extrapolated for the whole monitoring period.
Comments	Currently, electricity consumption is measured for the whole farm, which includes several components that are not within the project boundary. Project Proponents have used a deviation in the monitoring of the quantity of electricity consumed by the project. This monitoring approach has been chosen since it is not feasible to measure the electricity consumption separately for the operation of each AWMS. This would require installing equipments and making changes to electricity systems within the farm, which are costly. Given the farms management processes and their low energy consumption, a conservative value was applied. Such value is based on monitored data collected in part of this monitoring period and on LPC judgment about the expected time of operation of the manure pump and the UMAC equipment. More information is available on Section 2.2.1 – Methodology Deviation. Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Data / Parameter	$EF_{EL,j,y}$
Data unit	tCO2/MWh

<table>
<tr><td>Description</td><td>Emission factor for electricity generation for source j in year y (tCO2/MWh)</td></tr>
<tr><td>Source of data</td><td>Brazilian Designated National Authority (DNA)[43]</td></tr>
<tr><td>Description of measurement methods and procedures to be applied</td><td>Sustainable Carbon – Projetos Ambientais Ltda. was responsible to organize the emission factor of the grid available in the Brazilian DNA website.</td></tr>
<tr><td>Frequency of monitoring/recording</td><td>Annually</td></tr>
<tr><td>Value monitored</td><td>The annual emission factor for electricity consumption is described below:
<table>
<tr><th>Year</th><th>EFEL,j,y (tCO2/MWh)</th></tr>
<tr><td>2015</td><td>0.4075</td></tr>
<tr><td>2016</td><td>0.3904</td></tr>
<tr><td>2017</td><td>0.2955</td></tr>
<tr><td>2018</td><td>0.3380</td></tr>
<tr><td>2019</td><td>0.3380</td></tr>
</table></td></tr>
<tr><td>Monitoring equipment</td><td>No monitoring equipment is used. As this parameter is calculated by the Brazilian Designated National Authority following CDM methodologies, a high accuracy level is expected.</td></tr>
<tr><td>QA/QC procedures to be applied</td><td>The grid emission factor will be obtained directly from the Brazilian DNA website. No QA/QC procedures are applied to this parameter.</td></tr>
<tr><td>Purpose of the data</td><td>This parameter is used to calculate project emissions from electricity consumption.</td></tr>
<tr><td>Calculation method</td><td>Emission factor is calculated by the Brazilian DNA according to current CDM tools and guidelines.
The calculation of the combined margin (CM) emission factor (EFgrid,CM,y) is based on a weighted average of the Build Margin and the Operating Margin, using a 0.5 weight for each parameter, as detailed below:
<table>
<tr><th>Emission factors – annual average (tCO2/MWh)</th><th>Year 2015</th><th>Year 2016</th><th>Year 2017</th><th>Year 2018</th><th>Year 2019</th></tr>
</table></td></tr>
</table>

[43] Available at: < https://www.mctic.gov.br/mctic/opencms/ciencia/SEPED/clima/textogeral/emissao_despacho.html>. Last visited on: 16/09/2019.

	Build Margin	0.2553	0.1581	0.0028	0.1370	-
	Operating Margin	0.5597	0.6228	0.5882	0.5390	-
	Combined margin emission factor (EFgrid,CM,y)	0.4075	0.3904	0.2955	0.3380	0.3380

The emission factor of the grid - Year 2019 is not available yet. Therefore, the same value of the year before (2018) was used.

More information on the calculation method of the grid emission factor is available at:

<http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v3.0.0.pdf>. Last visited on 20/08/2015.

Comments	All farms included in the project exclusively use electricity from the Brazilian Interconnected System. Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Data / Parameter	Q_y
Data unit	Tonnes (wet basis)
Description	Quantity of manure treated in the year y
Source of data	Project Proponents
Description of measurement methods and procedures to be applied	The amount of waste produced per year was monitored by registering the operating hours of the pump that destine the manure from the storage tank to the composting unit. Spreadsheets were used to record the operation time per day of manure pumps. Nevertheless, during the current monitoring period, default values of animal waste production had to be used to obtain the quantity of manure treated (Qy), since monitoring data was incomplete. Given the farms management processes, a conservative value was applied. Such value is based on monitored data collected in part of this monitoring period and on a scientific study about the quantity of manure produced per animal type per day. Values applied on the emission reduction calculation were conservatively defined as the highest value of: • Embrapa scientific study[44].

[44] OLIVEIRA, Paulo Armando V. de. **Produção e manejo de dejetos de suínos**. Concórdia: Embrapa, 2003. 83 p. Information taken from Table 1. Value adopted to the current monitoring for the amount of solid waste (in kilogram): average daily production of swine manure, including manure and urine, according to animals weight.

	• The average quantity of manure treated per day monitored by each farmer during part of the monitored period. The most conservative value was then multiplied by the number of days where animal manure management system is operational (ndy), achieving the quantity of manure treated per year (Qy). The approach used and the value applied for each farm is available in Section 3.3 – Monitoring Plan, below.
Frequency of monitoring/recording	Annually, based on monthly records
Value monitored	Detailed information on Appendix 1.
Monitoring equipment	The indirect measurement procedure chosen to monitor this parameter is expected to result in low levels of accuracy. However, procedures with higher precision are not feasible to apply given the farmers reality. The installation of hour meters or data loggers to record information automatically will increase accuracy, but this will only be possible in a near future. Please see calculation method below for more information.
QA/QC procedures to be applied	Values were cross-checked with estimated data from Embrapa. These values are based in Santa Catarina State Environmental Agency (FATMA) normative and specific literature and were also used by LPC in the design of the composting units.
Purpose of the data	This parameter is used to calculate project emissions resulting from the composting process.
Calculation method	The amount of waste (in wet basis) was calculated by multiplying the most conservative value found of average daily production of swine manure by the number of days in a year in which the treatment plant is operational (ndy). If data monitored by each farmer during part of the monitored period is more conservative, the amount of waste (in wet basis) is calculated by the nominal flow rate of the pump multiplied by the time of operation, as monitored by the farmers with manual spreadsheets. Thus, the value is estimated in liters and then, converted to weight, using a default value for the density of the waste. This parameter was also corrected to discount water that is flushed to the composting site. However, if Embrapa default values are more conservative, a scientific study[45] developed by this Institution was utilized to obtain default values on the average production of swine manure, which are established according to the swine weight, as described in table below.

[45] OLIVEIRA, Paulo Armando V. de. **Produção e manejo de dejetos de suínos**. Concórdia: Embrapa, 2003. 83 p. Information taken from Table 1. Value adopted to the current monitoring for the amount of solid waste (in kilogram): average daily production of swine manure, including manure and urine, according to animals weight.

Animal	Average daily production of swine manure (manure and urine, in kg)
Swine weight from 25 to 100 kg	4.90
Sows in gestation	11.00
Sows	18.00
Boars	6.00
Nursery	0.95
Average	5.80

In case these values were used, they were multiplied by the annual average number of animals of each type and by the number of days in year y where the animal manure management system was operational, thus obtaining the quantity of manure treated in the year y.

Embrapa publication indicates that wastes from swine confinements are composed of dung, urine and flushed water. Swine manure (both dung and urine) consist of nearly 70% of total wastes (i.e., 4.9kg out of 7 liters, or 7.112 kg considering a density of 1.016 kg per liter). Such density is expected for swine manure with 3% of solid matter, which is the expected value for the farms included in the project[46].

The predicted value of manure and urine to be processed by the LPC equipment is 7 liters of liquid waste, following Embrapa's reference values.

More information about the Qy calculation method applied at each farm is described on Section 3.3 – Monitoring Plan, below.

Comments

As previously described in Section 2.2.1 – Methodology Deviations, Project Proponents applied a deviation regarding the monitoring of the quantity of manure treated in the year y. The applied version of the methodology establishes this parameter should be monitored by on-site data measurement using weigh bridges. However, the project does not involve the transportation of waste by vehicles[47].

Project Proponents have proposed to calculate the amount of waste composted by monitoring the number of hours that the pump that sends manure to the composting unit operates and/or applying default values.

The amount of wash water was not considered as it does not present organic matter and does not result in methane emissions. This approach is considered appropriate, given that the UNFCCC

[46] This value is used by LPC Tecnologia Ambiental on the Technical Project of the composting unit. Hence, it is considered applicable to farms conditions.

[47] Waste is carried to the composting units by gravity and electrical pumps. Compost is usually removed with wheelbarrow or small vehicles (tractors). This is applicable to all farms included in the project.

	Methodological Tool "Project and leakage emissions from composting" v.01.0.0[48] provides the following information: (i) Composting converts biodegradable organic carbon to mostly carbon dioxide (CO2) and a residue (compost) that can be used as a fertilizer. Other outputs from composting can include, inter alia, methane (CH4), nitrous oxide (N2O), and run-off wastewater (in case of co-composting). Therefore, emissions from composting are only expected for the degradation of biodegradable organic carbon. (ii) Even in cases of co-composting (a type of composting where solid wastes and wastewater are composted together), wastewater should not be accounted for the estimation of Qy. The current project does not involve co-composting. Instead, the project involves the composting of animal manure diluted with wash water from the barns. Such water does not contain organic carbon and, therefore, should not result in project emissions from composting. Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Data / Parameter	***Conditions of the composting process***
Data unit	ºC for temperature; moisture level (qualitative analysis), ranging from very humid to very dry; Frequency of time for operation of the mixing equipment.
Description	Conditions of the composting process include monitoring the following parameters: temperature and moisture of the composting mass and frequency of operation of the mixing equipment (UMAC).
Source of data	Project proponents
Description of measurement methods and procedures to be applied	Farmers followed technical recommendations from LPC to ensure that the composting unit was operating according to a quality control program. Farmers periodically monitored the temperature and moisture of the composting mass in composting windrows. In addition, they also recorded the operation frequency of the UMAC equipment, which mixes the composting mass. Farmers took notes of the measurements on manual spreadsheets (paper copies).

[48] Available at: <http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-13-v1.pdf>. Last visited on 20/08/2015.

Frequency of monitoring/recording	The average monitoring/recording frequency of the temperature and moisture in the composting mass was of around 15 days. Frequency of operation of the composting equipment was monitored on a daily basis.
Value monitored	Not applied for calculations. Spreadsheet template were available to Auditor team during the site visit.
Monitoring equipment	Thermometers and moisture meters. Measurement accuracy is expected to be high (above 90%), given the technical specification of the equipment and the fact that farmers were trained for the measurement of these parameters.
QA/QC procedures to be applied	Farmers performed the measurement of the temperature and moisture of the composting mass using thermometers and moisture meters. Sustainable Carbon controlled the database of the project (spreadsheet, measurements, etc.) LPC gave support on how to control the moisture of the composting process. The moisture of the composting mass was monitored by each farmer using visual inspections to check whether the composting mass is too dry (crumbling in the hand), or too wet (dripping liquid). In addition, a moisture meter was used to indicate the level of moisture in the composting mass. Farmers were trained to ensure that these parameters were correctly measured. Farmers were instructed to contact LPC for assistance in case the temperature or moisture of the composting mass is outside desired ranges.
Purpose of the data	This parameter is monitored as requested by the applied methodology. However, it is not used for the calculation of GHG emission reductions.
Calculation method	Thermometers and moisture meters provide direct measurement of these parameters.
Comments	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Data / Parameter	***Soil application of the compost for agricultural purposes***
Data unit	Numerical frequency
Description	Number of times that the compost is removed from the treatment system, providing a description of the soil application.
Source of data	Project proponents

Description of measurement methods and procedures to be applied	Swine farmers controlled the final destination of the compost (control of sales, consumer records, distance, etc) using a spreadsheet developed by Sustainable Carbon.
Frequency of monitoring/recording	Annually, based on monthly records
Value monitored	Not applied for calculations. The compost was applied in a manner to avoid methane emissions. Part of the compost was sold to rural properties located nearby the farms.
Monitoring equipment	No monitoring equipment is used. The indirect monitoring procedure chosen for this parameter is expected to result in medium to low levels of accuracy. However, procedures with a higher precision are not feasible to apply given the farmers reality. Also, no project emissions from the produced compost are expected. Hence, the low accuracy is not expected to affect the calculation of emission reductions during the current monitoring period.
QA/QC procedures to be applied	An annual verification was carried out by a technician in a sample of users, who analyzed the compost application in the farms.
Purpose of the data	This parameter is monitored as requested by the applied methodology. It is used to confirm that the compost is not subject to anaerobic treatment or disposal and thus, verifying if project emissions could be expected from this source.
Calculation method	The soil application of the compost was monitored through a sheet fed by the farmers, who are responsible for controlling the final destination of the compost in each farm.
Comments	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

4.3 Monitoring Plan

Sustainable Carbon – Projetos Ambientais Ltda. was responsible for managing the monitoring plan during the current monitoring period and also executed on-site inspections on each individual farm to confirm that the monitoring plan is being executed properly. Sustainable Carbon also provided training on data collection and storage, as well as emergency reporting procedures.

In case of emergencies, farmers contacted LPC Tecnologia Ambiental immediately, usually requiring maintenance or repairs on the composting unit. Farmers also contacted Sustainable Carbon to inform on the type of emergency, its cause, its consequences and any information needed to allow Sustainable

Carbon determining the impact of such emergency on the project emission reductions for the corresponding monitoring period.

In general terms, farmers applied the monitoring plan on a regular basis and were responsible to store data regarding animal production and to record and store monitoring data on the operation of the composting unit. This includes filling monitoring spreadsheets prepared by Sustainable Carbon, taking notes on animal production and storing documents provided by the integrators.

Part of the monitoring data on ECPJ,j,y and Qy was incomplete. In general, alternative procedures described on the VCS PD version 06.1 allowed for conservative estimates of emission reductions generation. These procedures involved applying estimated values based on LPC judgment and/or scientific studies to determine the quantity of electricity consumed and the quantity of manure treated by the Project. Tables below provide more information on which procedure method was chosen for each farm.

Farm	(A) Average Manure pump daily operating time (hours)[49]	(B) LPC estimated data	Conservative estimate: manure pump operating time (hours)	Approach used
Fazenda Altenor	0.47	0.67	0.67	(A)
Fazenda Baccin	0.91	0.96	0.96	(A)
Fazenda Colônia Suspiro	0.39	1.46	1.46	(B)
Fazenda Granja Silva	0.00	0.73	0.73	(B)
Fazenda Ramella	0.10	0.73	0.73	(B)
Sitio Santa Lúcia	1.96	0.96	1.96	(A)

Table 4. Assessment of monitoring data on the manure pump daily operating time (hours)

Farm	(A) Average UMAC equipment daily operating time (hours)[50]	(B) LPC estimated data	Conservative estimate: UMAC equipment daily operating time (hours)	Approach used
Fazenda Altenor	0.95	4.38	4.38	(B)
Fazenda Baccin	3.04	6.35	6.35	(B)
Fazenda Colônia Suspiro	0.39	6.58	6.58	(B)
Fazenda Granja Silva	0.00	3.29	3.29	(B)
Fazenda Ramella	0.10	3.33	3.33	(B)
Sitio Santa Lúcia	3.95	3.96	3.96	(B)

Table 5. Assessment of monitoring data on the daily operating time of the UMAC equipment (hours)

[49] Based on monitored data collected in part of the current monitoring period.
[50] Based on monitored data collected in part of the current monitoring period.

Farm	(A) Average Q_y (tonnes/day)[51]	(B) Embrapa estimated data	Conservative estimate: Q_y (tonnes/day)	Approach used
Fazenda Altenor	6.69	8.36	8.36	(A)
Fazenda Baccin	10.15	17.93	17.93	(B)
Fazenda Colônia Suspiro	12.36	14.83	14.83	(A)
Fazenda Granja Silva	0.00	4.83	4.83	(B)
Fazenda Ramella	0.81	8.62	8.62	(B)
Sitio Santa Lúcia	18.12	11.10	18.12	(A)

Table 6. Assessment of monitoring data on the quantity of manure treated (tonnes per day).

[51] Based on monitored data collected in part of the current monitoring period.

According to Section 4.2 of the VCS PD v.06.1, third parties (i.e. integrators and State agencies) were the direct responsible for measurement and recording of some monitoring parameters (such as *ndy*, W_{site}, $N_{da,y}$ and $N_{p,y}$). Such information is used to determine farms' productivity and to calculate financial compensations. For these reasons, third parties information is considered the most reliable data source.

In general terms, farmers do not control animal production on a consistent and regular basis, as this is the responsibility of integrators, according to predefined agreements and procedures. Fazenda Andretta is an exception to this statement as the animal production is monitored through software. In such case, data from this software was utilized instead of third parties information.

Integrators are agribusiness companies responsible for the productive cycle of animals and food products. They establish partnerships with farmers to outsource stages of the production cycle (such as animal fattening). Furthermore, these enterprises are responsible for providing feed, medicines and technical assistance to producers in order to ensure swine quality and production. They have control of the number and weight of animals, which generates documents with information related to each batch of animals. In finishing unit farms, the animals usually remain for a period of approximately 04 months, whereas in farrow to nursery farms, this period varies from 30 to 60 days for piglets/ nursery and 02 years for other animals (gilts, sows in gestation, sows and boars).

Monitored variables are described in Section 3.2 above. In addition, each farm has an authority for organizing the monitoring data, as described in table below:

Farm Name	Town	Monitoring authority
Fazenda Altenor	Nova Erechim	Mr. Altenor José Basso
Fazenda Ramela	Herval d'Oeste	Mr. Antônio Carlos Ramela
Sítio Santa Lucia	Jaborá	Mr. Belmiro Secco
Fazenda Granja Silva	Concórdia	Mr. Jair da Silva
Fazenda Colônia Suspiro	Nova Erechim	Ms. Lenize Tomazi
Fazenda Baccin	Concórdia	Mr. Renato Baccin

Table 7. Monitoring authority on each farm.

The organizational structure of the project regarding the monitoring plan is illustrated in figure below.

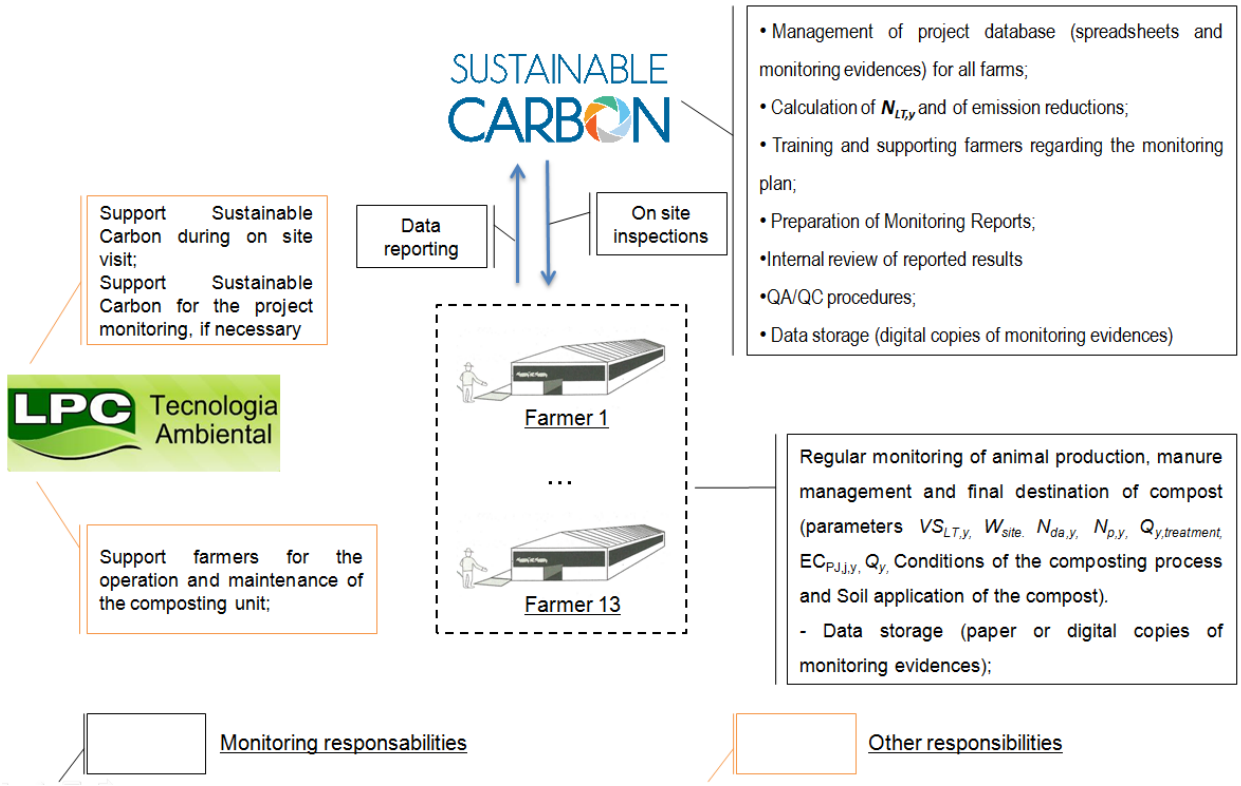

Figure 2. Organizational structure for the project monitoring

During the preparation of the current monitoring report, Sustainable Carbon carried out internal reviews of collected data. The calculation of emission reductions was made based on existing documentation, taking into account the most conservative assumption in case of incompleteness of the monitoring data.

Sustainable Carbon also assisted farmers to double check monitored parameters. Sustainable Carbon performed double check of several monitoring parameters, especially those related to animal production and compost management (such as $N_{p,y}$, $N_{da,y}$, $Q_{y,treatment}$, among others). Double check was performed by comparing different sources of information (when available). Sustainable Carbon also double checked the monitoring information of each farm against monitoring checklists to ensure monitoring data was complete.

Non-conformities identified during double check procedures were clarified between Sustainable Carbon technical team, LPC, and the monitoring responsible on the farms.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

Baseline emissions are calculated according to AMS-III.F. Version 10, paragraph 14. According to such paragraph of the methodology, baseline emissions are calculated as:

$$BE_y = BE_{CH4,SWDS,y} + BE_{ww,y} + BE_{CH4,manure,y} - MD_{y,reg} * GWP\_CH_4$$

Equation 1

Where,

$BE_{CH4,SWDS,y}$ Yearly methane generation potential of the solid waste composted by the project activity during the years *x* from the beginning of the project activity (*x*=1) up to the year *y* estimated as per the latest version of the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site" (tCO_2e). The tool may be used with the factor "f=0.0" assuming that no biogas is captured and flared. With the definition of year *x* as 'the year since the project activity started diverting wastes from landfill disposal, *x* runs from the first year of crediting period (*x*=1) to the year for which emissions are calculated (*x*=*y*)'

$MD_{y,reg}$ Amount of methane that would have to be captured and combusted in the year *y* to comply with the prevailing regulations (tonne)

$BE_{CH4,manure,y}$ Baseline emissions from manure composted by the project activities, as per the procedures of AMS-III.D

$BE_{ww,y}$ Where applicable, baseline emissions from the wastewater co-composted, calculated as per the procedures in AMS-III.H

GWP_CH_4 GWP for CH4 (value of 25 is used)

Only baseline emissions from animal manure composted by the project activities are considered. Hence, baseline emissions are calculated in accordance to procedures from approved methodology AMS-III.D, version 18. Procedures from paragraph 9(a) are used, since data needed to apply option 9(b) is not available.

The baseline emissions are calculated by Equation 2 below:

$$BE_y = GWP_{CH4} * D_{CH4} * UF_b * \sum_{j,LT} MCF_j * B_{0,LT} * N_{LT,y} * VS_{LT,y} * MS\%_{Bl,j}$$

Equation 2

Where:

BE_y	Baseline emissions in year y (tCO_2e)
GWP_{CH4}	Global Warming Potential (GWP) of CH_4 (25)
D_{CH4}	CH_4 density (0.00067 t/m³ at room temperature (20 ºC) and 1 atm pressure)
LT	Index for all types of livestock
j	Index for animal manure management system
MCF_j	Annual methane conversion factor (MCF) for the baseline animal manure management system *j*
$B_{0,LT}$	Maximum methane producing potential of the volatile solid generated for animal type *LT* (m^3CH4 / kg dm)
$N_{LT,y}$	Annual average number of animals of type *LT* in year *y* (numbers)
$VS_{LT,y}$	Volatile solids for livestock *LT* entering the animal manure management system in year *y* (on a dry matter weight basis, kg dm/animal/year)
$MS\%_{Bl,j}$	Fraction of manure handled in baseline animal manure management system *j*
UF_b	Model correction factor to account for model uncertainties (0.94)

The value of $VS_{LT,y}$ is adjusted according to the average animal weight of project activity, by means of Equation 3 below, considering the default value of IPCC ($VS_{default}$):

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

Equation 3

Where:

W_{site}	Average animal weight of a defined livestock population at the project site (kg)
$W_{default}$	Default average animal weight of a defined population, this data is sourced from 2006 IPCC (kg)
$VS_{default}$	Default value for the volatile solid excretion rate per day on a dry-matter basis for a defined livestock population (kg dm/animal/day)
nd_y	Number of days in year *y* where the animal manure management system is operational.

The average number of animals ($N_{LT,y}$) is calculated by Equation 4:

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

Equation 4

N_{day} Number of days animal is alive in the farm in the year *y* (numbers)

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

A minor adaptation to equation 4 is used in this project. Since documents regarding the production of animals is not generated monthly, but based on batches, a period of time different than 365 is usually considered. Hence, $N_{LT,y}$ is obtained by dividing the number of animals produced by the number of days in the period of time considered.

This causes no significant alteration to $N_{LT,y}$, but allows for a correct calculation given the type of documentation available on animal production. Farmers are granted documents and financial compensation from integrators for each batch. Thus, animal production controls do not follow an annual schedule; instead it is based on each batch period. Project Proponents consider documents provided by integrators to be the most reliable and conservative source of monitoring data. Hence, monitoring will be done based on documents for each batch.

The parameters GWP_{CH4}, D_{CH4}, UF_b, MCF_j, $B_{0,LT}$, $MS\%_{BI,j}$, $W_{default}$, and $VS_{default}$ are used to calculate baseline emissions, which values are described above in Section 3.1 – Data and Parameters Available at Validation. The number of days animals is alive in the farm ($N_{da,y}$), the number of days in year *y* in which the animal manure management system is operational (nd_y), the number of animals produced in year *y* ($N_{p,y}$), and the annual average number of animals per type ($N_{LT,y}$) are also used to calculate baseline emissions, and their values are shown in Appendix 1.

Baseline emissions during the monitored period are summarized in the following table. More detailed information can be seen in tables on Appendix 1.

Year	Baseline emissions or removals (tCO_2e)
2015 (01/Jul/2015 to 31/Dec/2015)	4,099
2016 (01/Jan/2016 to 31/Dec/2016)	9,095
2017 (01/Jan/2017 to 31/Dec/2017)	16,726
2018 (01/Jan/2018 to 31/Dec/2018)	4,990
2019 (01/Jan/2019 to 30/April/2019)	1,199
Total	**36,109**

Table 8. ***Total baseline emissions for the*** **Composting Project in Santa Catarina** ***during the current monitoring period****.*

5.2 Project Emissions

According to the methodology AMS-III.F., version 10, project activity emissions consist of:

(i). CO_2 emissions due to the incremental transportation distances;

(ii). CO_2 emissions from electricity and/or fossil fuel consumption by the project activity facilities;

(iii). Methane emissions during composting process;

(iv). Methane emissions from runoff water; and

(v). Methane emissions due to compost storage.

The equation for project emission calculation is:

$$PE_y = PE_{y,transp} + PE_{y,power} + PE_{y,comp} + PE_{y,runoff} + PE_{y,res\ waste}$$

Equation 5

Where:

PE_y	Project activity emissions in the year *y* (tCO_2e)
$PE_{y,\ transp}$	Emissions from incremental transportation in the year *y* (tCO_2e)
$PE_{y,power}$	Emissions from electricity or fossil fuel consumption in the year *y* (tCO_2e)
$PE_{y,comp}$	Methane emissions during composting process in the year *y* (tCO_2e)
$PE_{y,runoff}$	Methane emissions from runoff water in the year *y* (tCO2e)
$PE_{y,res}$ waste	In case produced compost is subjected to anaerobic storage or disposed in a landfill: methane emissions from the anaerobic decay of the residual organic content (tCO_2e)

Among the project emissions listed by the methodology AMS-III.F., version 10, the proposed project activity will not produce emissions referring to the consumption of fossil fuels, emissions due to incremental transportation distances, emissions due to runoff water, and emissions related to compost storage. This is justified by the following:

- ✓ There is no fossil fuel consumption by the equipments installed as part of the project; the project will not result in additional transportation of waste or compost;
- ✓ The project results in a significant reduction in the volume of treated manure, since the composting process evaporates most of the water content on the treated manure. This reduction in volume also reduces associated consumption of fossil fuels for its transportation until final destination.
- ✓ The mechanized composting units are automated and designed to not apply excessive wastes on the substrate. In addition, sheds are covered, avoiding rainwater percolation onto the substrate. Any runoff water is recirculated into the composting mass;
- ✓ Finally, the compost is not stored in anaerobic conditions nor sent to landfills. Thus, the equation to be applied to determine project activity emissions takes the following structure:

$$PE_y = PE_{y,power} + PE_{y,comp}$$

Equation 6

a) Emissions from electricity or fossil fuel consumption in the year *y* ($PE_{y,power}$)

Emissions from grid electricity consumed by the project are determined according to the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption", version 01[52]. Emissions from electricity are calculated as the product of the energy consumed by the CO_2 emission factor of the grid, according to the equation below:

$$PE_{y,power} = \sum_{j} EC_{PJ,j,y} \times EF_{EL,j,y} \times (1 + TDL_{j,y})$$

Equation 7

Where:

$EC_{PJ,j,y}$	Quantity of electricity consumed by the project electricity consumption source *j* in year *y* (MWh/yr)
$EF_{EL,j,y}$	Emission factor for electricity generation for source *j* in year *y* (tCO_2/MWh)
$TDL_{j,y}$	Average technical transmission and distribution losses for providing electricity to source *j* in year *y*

Therefore, $PE_{y,power}$ (as defined on Equation 6, above) is equal to $PE_{EC,y}$ as provided by the referred tool. Please note that in Equation 7 the term $PE_{EC,y}$ was replaced by $PE_{y,power}$ to ensure consistency with the applied methodology. The quantity of electricity consumed by the project activity on each farm ($EC_{PJ,j,y}$) is determined considering the combined power capacity of the all equipments in the mechanized composting unit and a conservative estimate on the time of operation of each equipment.

All farms included in the present project consume electricity exclusively from the grid. Grid emission factors shall be calculated through the Brazilian combined margin (CM) emission factor ($EF_{grid,CM,y}$), which is based on a weighted average of the Build Margin and the Operating Margin, using a 0.5 weight for each parameter, in accordance with procedures described in version 18 of AMS-III.D. Both parameters are calculated by the Brazilian DNA (Interministerial Commission on Global Climate Change - Comissão Interministerial de Mudança Global do Clima - CIMGC). Thus, the Brazilian combined margin emission factor ($EF_{grid,CM,y}$) is calculated through the equation below[53]:

$$EF_{grid,CM,y} = EF_{grid,OM,y} * W_{OM} + EF_{grid,BM,y} * W_{BM}$$

Equation 8

Where,

[52] Tool available at: <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v1.pdf>. Last visited on August 06th, 2015

[53] UNFCCC. Methodological tool: Tool to calculate the emission factor for an electricity system. Version 03.0.0. Equation 14. Document available at: <http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v3.0.0.pdf>. Last visit: 20/08/2015.

$EF_{grid,CM,y}$ Combined margin CO_2 emission factor in year *y* (tCO_2/MWh)

$EF_{grid,OM,y}$ Operating margin CO_2 emission factor in year *y* (tCO_2/MWh)

W_{OM} Weighting of operating margin emissions factor (%)

$EF_{grid,BM,y}$ Build margin CO_2 emission factor in year *y* (tCO_2/MWh)

W_{BM} Weighting of build margin emissions factor (%)

Furthermore, according to Table III.F.1, paragraph 27 of methodology AMS-III.F., version 10, $TDL_{j,y}$ is defined as 10%.

b) Methane emissions during composting process in the year *y* ($PE_{y,comp}$)

Methane emissions generated during the composting process ($PE_{y,comp}$) are determined according to Equation 9 below:

$$PE_{y,comp} = Q_y * EF_{composting} * GWP\_CH_4$$

Equation 9

Where:

Q_y Quantity of raw waste/manure treated in the year *y* (tonnes)

$EF_{composting}$ Emission factor for composting of manure (tCH_4/ton waste treated). Emission factors can be based on site measurements, country specific values or IPCC default values (table 4.1, chapter 4, Volume 5, 2006 IPCC Guidelines for National Greenhouse Gas Inventories). IPCC default values are 10 gCH_4/kg waste treated on a dry basis and 4 gCH_4/kg waste treated on a wet basis. $EF_{composting}$ can be set zero in case the monitored oxygen content during of the composting process within the windrow is above 8%.

During the current monitoring period, $EF_{composting}$ was considered as 4 gCH_4/kg of waste treated on a wet basis, sourced from 2006 IPCC as referred in the methodology. This approach was taken since the level of oxygen in the composting windrows had not been monitored.

The quantity of raw manure treated per year (Q_y) was monitored by registering the operating hours of the pump that destine the manure from the storage tank to the composting unit. Nevertheless, during the current monitoring period, default values of animal waste production had also to be used to obtain the quantity of manure treated, since monitoring data was incomplete. The most conservative value was applied for calculating GHG emission reductions, as described above in Section 3.2 – Data and Parameters Monitored.

$$Q_y = P_{NF} * P_{TO,y} * MD * 0.7$$

Equation 10

Where:

P_{NF} Pump nominal flow (m^3/hour)

$P_{TO,y}$ Pump time of operation in year y (hours)

MD Manure density (tonnes/m³)

0.7 Fraction of waste from confinement that is manure

Project emissions during the monitored period are summarized in the following table. More detailed information is also available on Appendix 1.

Year	PE_y (tCO_2e)
2015 (01/Jul/2015 to 31/Dec/2015)	901
2016 (01/Jan/2016 to 31/Dec/2016)	1,789
2017 (01/Jan/2017 to 30/June/2017)	1,682
2018 (01/Jan/2018 to 31/Dec/2018	1,541
2019 (01/Jan/2019 to 30/Apr/2019	370
Total in the Monitoring Period	6,283

Table 9. Total project emissions for the *Composting Project in Santa Catarina* during the current monitoring period

5.3 Leakage

As the project does not involve equipment transference from another activity, there is no leakage to be considered, according to methodology AMS-III.F., version 10.

5.4 Net GHG Emission Reductions and Removals

Q According methodology AMS-III.F., version 10, GHG emission reductions achieved by the project activity are calculated as the difference between the baseline emissions and the project emissions, as described below:

$$ER_y = BE_y - PE_y$$

Equation 11

Where,

ER_y Emission reduction in year *y* (tCO_2e)

The specific annual summary of GHG reductions and removals at each farm composing the *Composting Project in Santa Catarina* are included in Tables 10, 11, 12, 13 and 14 below. Latter tables include

baseline emissions (BE_y), project emissions (PE_y), leakage emissions, and the resulting GHG emissions reduction (ER_y) per farm.

Emission reductions 2015					
Farm	Farm Owner	BE_y (tCO_2e)	PE_y (tCO_2e)	Leakage (tCO_2e)	ER_y (tCO_2e)
Fazenda Altenor	Altenor José Basso	0	0	0	0
Fazenda Baccin	Renato Baccin	1,950	208	0	1,742
Fazenda Colônia Suspiro	Nóbile Tomazi	1,186	244	0	942
Fazenda Granja Silva	Jair da Silva	176	84	0	92
Fazenda Ramella	Antônio Carlos Ramela	172	93	0	79
Sitio Santa Lúcia	Belmiro Secco	615	272	0	343
TOTAL		**4,099**	**901**	**0**	**3,198**

Table 10. Emission Reductions for *Composting Project in Santa Catarina* – Year 2015[54]

Emission reductions 2016					
Farm	Farm Owner	BE_y (tCO_2e)	PE_y (tCO_2e)	Leakage (tCO_2e)	ER_y (tCO_2e)
Fazenda Altenor	Altenor José Basso	500	118	0	382
Fazenda Baccin	Renato Baccin	1,665	397	0	1,268
Fazenda Colônia Suspiro	Nóbile Tomazi	2,340	215	0	2,125
Fazenda Granja Silva	Jair da Silva	351	166	0	185
Fazenda Ramella	Antônio Carlos Ramela	1,974	277	0	1,697
Sitio Santa Lúcia	Belmiro Secco	2,265	616	0	1,649
TOTAL		**9,095**	**1,789**	**0**	**7,306**

Table 11. Emission Reductions for *Composting Project in Santa Catarina* – Year 2016[55]

Emission reductions 2017					
Farm	Farm Owner	BE_y (tCO_2e)	PE_y (tCO_2e)	Leakage (tCO_2e)	ER_y (tCO_2e)
Fazenda Altenor	Altenor José Basso	4,395	337	0	4,058
Fazenda Baccin	Renato Baccin	2,089	218	0	1,871
Fazenda Colônia Suspiro	Nóbile Tomazi	7,038	365	0	6,673
Fazenda Granja Silva	Jair da Silva	351	164	0	187
Fazenda Ramella	Antônio Carlos Ramela	1,301	184	0	1,117
Sitio Santa Lúcia	Belmiro Secco	1,552	414	0	1,138

[54] Fazenda Sítio Pickler and Pissaia were not included in the current monitoring report, following a personal decision from farm owners.

[55] Fazenda Sítio Pickler and Pissaia were not included in the current monitoring report, following a personal decision from farm owners.

TOTAL	16,726	1,682	0	15,044

Table 12. Emission Reductions for *Composting Project in Santa Catarina* – Year 2017[56]

Emission reductions 2018					
Farm	Farm Owner	BE_y (tCO_2e)	PE_y (tCO_2e)	Leakage (tCO_2e)	ER_y (tCO_2e)
Fazenda Altenor	Altenor José Basso	3,560	316	0	3,244
Fazenda Baccin	Renato Baccin	115	143	0	-28
Fazenda Colônia Suspiro	Nóbile Tomazi	0	0	0	0
Fazenda Granja Silva	Jair da Silva	350	165	0	185
Fazenda Ramella	Antônio Carlos Ramela	278	276	0	2
Sitio Santa Lúcia	Belmiro Secco	687	641	0	46
TOTAL		**4,990**	**1,541**	**0**	**3,449**

Table 13 Emission Reductions for Composting Project in Santa Catarina - Year 2018

Emission reductions 2019					
Farm	Farm Owner	BE_y (tCO_2e)	PE_y (tCO_2e)	Leakage (tCO_2e)	ER_y (tCO_2e)
Fazenda Altenor	Altenor José Basso	908	102	0	806
Fazenda Baccin	Renato Baccin	0	0	0	0
Fazenda Colônia Suspiro	Nóbile Tomazi	0	0	0	0
Fazenda Granja Silva	Jair da Silva	116	55	0	61
Fazenda Ramella	Antônio Carlos Ramela	0	0	0	0
Sitio Santa Lúcia	Belmiro Secco	175	213	0	-38
TOTAL		**1,199**	**370**	**0**	**829**

Table 14 Emission Reductions for Composting Project in Santa Catarina - Year 2019

[56] Fazenda Sítio Pickler and Pissaia were not included in the current monitoring report, following a personal decision from farm owners.

The net GHG Emission Reductions in the Composting Project in Santa Catarina during the monitored period are summarized in the following table. More detailed information can be seen in tables on Appendix 1.

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
2015 (01-Jul to 31-Dec)	4,099	901	0	3,198
2016	9,095	1,789	0	7,306
2017	16,726	1,682	0	15,044
2018	4,990	1,541	0	3,449
2019 (01-Jan to 30-Apr)	1,199	370	0	829
Total	**36,109**	**6,283**	**0**	**29,826**

APPENDIX 1: DETAILS OF DATA AND PARAMETERS MONITORED

Data and parameters monitored of the *Composting Project in Santa Catarina* can be verified in following tables. These parameters are described on Section 3.2 of the current monitoring report.

Data and parameters monitored - Year 2015												
Farm Name	**Farm owner**	**Animal Type**	**$N_{da,y}$** (number)	**$N_{p,y}$** (number)	**$N_{LT,y}$** (number)	**W_{site}** (Kg)	**$VS_{LT,y}$** (Kg dm/animal/ year)	**nd_y** (number)	**$Q_{y,treatment}$** (tonnes)	**$EC_{P,j,y}$** (MWh)	**Q_y** (tonnes)
Fazenda Altenor	Altenor José Basso	Finishers	0	0	0	0	0	0	55	0	0
Fazenda Baccin	Renato Baccin	Nursery	0	0	0	0	0	0	900	8	2,037
		Finishers	76	8,493	2,395	142	232	152			
Fazenda Colônia Suspiro	Nóbile Tomazi	Finishers	83	8,561	2,325	85	145	159	132.6	12	2,385
Fazenda Granja Silva	Jair da Silva	Gilts	183	45	45	198	85	184		7	802
		Sows in gestation	183	250	249	198	85				
		Sows	183	50	50	198	85				
		Boars	183	5	5	198	85				
		Piglets	24	3,655	482	5	9				
Fazenda Ramela	Antônio Carlos Ramela	Finishers	57	3,061	635	63	77	114	250	6	899
Sítio Santa Lucia	Belmiro Secco	Finishers	76	3,791	1,116	96	157	152	6	8	2,684

Table 15 Parameters monitored for the Composting Project in Santa Catarina – Year 2015

Data and parameters monitored - Year 2016												
Farm Name	**Farm owner**	**Animal Type**	**$N_{da,y}$** (number)	**$N_{p,y}$** (number)	**$N_{LT,y}$** (number)	**W_{site}** (Kg)	**$VS_{LT,y}$** (Kg dm/animal/ year)	**nd_y** (number)	**$Q_{y,treatment}$** (tonnes)	**$EC_{P,j,y}$** (MWh)	**Q_y** (tonnes)

Fazenda Altenor	Altenor José Basso	Finishers	127	2,055	1,052	99	135	127	100	6	1,150
Fazenda Baccin	Renato Baccin	Nursery	49	46,762	7,747	19	61	298	935	0	3,966
		Finishers	0	0	0	0	0	0			
Fazenda Colônia Suspiro	Nóbile Tomazi	Finishers	140	4,487	4,487	99	148	140	249	11	2,100
Fazenda Granja Silva	Jair da Silva	Gilts	365	45	45	198	168	365	200	14	1,591
		Sows in gestation	365	250	250	198	168				
		Sows	365	50	50	198	168				
		Boars	365	5	5	198	168				
		Piglets	26	6,608	471	5	19				
Fazenda Ramela	Antônio Carlos Ramela	Finishers	114	4,543	2,223	69	253	342	250	17	2,697
Sítio Santa Lucia	Belmiro Secco	Finishers	76	5,717	1,831	95	352	344	16	18	6,075

Table 16 Parameters monitored for the Composting Project in Santa Catarina – Year 2016

Data and parameters monitored - Year 2017											
Farm Name	**Farm owner**	**Animal Type**	**$N_{da,y}$** (number)	**$N_{p,y}$** (number)	**$N_{LT,y}$** (number)	**W_{site}** (Kg)	**$VS_{LT,y}$** (Kg dm/animal/ year)	**nd_y** (number)	**$Q_{y,treatment}$** (tonnes)	**$EC_{P,j,y}$** (MWh)	**Q_y** (tonnes)
Fazenda Altenor	Altenor José Basso	Finishers	122	6,365	3,064	104	408	365	150	18	3,305
Fazenda Baccin	Renato Baccin	Nursery	40	7,886	7,886	19	8	40	1,000	6	2,157
		Finishers	121	4,182	4,182	98	127	121			
Fazenda Colônia Suspiro	Nóbile Tomazi	Finishers	120	8,871	8,495	92	236	239	45	18	3,585
Fazenda Granj	Jair da Silva	Gilts	364	45	45	198	168	365	213	14	1,591
		Sows in gestation	364	250	249	198	168				

a Silva		Sows	364	50	50	198	168				
		Boars	364	5	5	198	168				
		Piglets	26	6,890	491	5	19				
Fazenda Ramela	Antônio Carlos Ramela	Finishers	114	3,039	3,039	50	122	228	250	11	1,798
Sítio Santa Lucia	Belmiro Secco	Finishers	116	3,812	1,790	99	247	232	56	12	4,097

Table 17 Parameters monitored for the Composting Project in Santa Catarina – Year 2017

Data and parameters monitored - Year 2018											
Farm Name	**Farm owner**	**Animal Type**	**$N_{da,y}$ (number)**	**$N_{p,y}$ (number)**	**$N_{LT,y}$ (number)**	**W_{site} (Kg)**	**$VS_{LT,y}$ (Kg dm/animal/ year)**	**nd_y (number)**	**$Q_{y,treatment}$ (tonnes)**	**$EC_{P,j,y}$ (MWh)**	**Q_y (tonnes)**
Fazenda Altenor	Altenor José Basso	Finishers	114	6,620	2,905	95	349	341	120	17	3,088
Fazenda Baccin	Renato Baccin	Nursery	0	0	0	0	0	0	900	5	1,407
		Finishers	105	4,064	4,064	33	8	105			
Fazenda Colônia Suspiro	Nóbile Tomazi	Finishers	0	0	0	0	0	0		0	0
Fazenda Granja Silva	Jair da Silva	Gilts	364	45	45	198	168	365	230	14	1,591
		Sows in gestation	364	250	249	198	168				
		Sows	364	50	50	198	168				
		Boars	364	5	5	198	168				
		Piglets	26	6,653	474	5	168				
Fazenda Ramela	Antônio Carlos Ramela	Finishers	114	4,393	2,149	46	37	342	2,500	17	2,697
Sítio Santa Lucia	Belmiro Secco	Finishers	119	5,638	2,532	93	77	359	53	19	6,339

Table 18 Parameters monitored for the Composting Project in Santa Catarina – Year 2018

Data and parameters monitored - Year 2019

Farm Name	Farm owner	Animal Type	$N_{da,y}$ (number)	$N_{p,y}$ (number)	$N_{LT,y}$ (number)	W_{site} (Kg)	$VS_{LT,y}$ (Kg dm/animal/ year)	nd_y (number)	$Q_{y,treatment}$ (tonnes)	$EC_{P,j,y}$ (MWh)	Q_y (tonnes)
Fazenda Altenor	Altenor José Basso	Finishers	110	2,219	2,219	99	116	110		5	996
Fazenda Baccin	Renato Baccin	Nursery	0	0	0	0	0	0	350	0	0
		Finishers	0	0	0	0	0	0			
Fazenda Colônia Suspiro	Nóbile Tomazi	Finishers	0	0	0	0	0	0		0	0
Fazenda Granja Silva	Jair da Silva	Gilts	119	45	45	198	55	120		5	523
		Sows in gestation	119	250	248	198	55				
		Sows	119	50	50	198	55				
		Boars	119	5	5	198	55				
		Piglets	26	2,664	577	5	6				
Fazenda Ramela	Antônio Carlos Ramela	Finishers	0	0	0	0	0	0		0	0
Sítio Santa Lucia	Belmiro Secco	Finishers	119	1,904	1,904	95	26	119		6	2,101

Table 19 Parameters monitored for the Composting Project in Santa Catarina – Year 2019