BRASCARBON METHANE RECOVERY PROJECT BCA-BRA-19

Project title	Brascarbon Methane Recovery Project BCA-BRA-19
Project ID	4289
Monitoring period	01-01-2023 to 31-12-2023
Original date of issue	20-05-2024
Most recent date of issue	29-04-2025
Version	04
***VCS Standard* Version**	4.7
Prepared by	Brascarbon Consultoria, Projetos e Representação Ltda David Garcia, +5511989594171

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PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The project is fully implemented and in operation since is 05/01/2022, date in which the first farm begun the monitoring phase.

The purpose of this project is to mitigate and recover animal effluent related Greenhouse Gas (GHG) by improving the Animal Waste Management System practices in the confined animal feed operations in the different cities located at the Mato Grosso do Sul state, central Brazil, developed by BRASCARBON.

In Brazil the agricultural operations related to the confined animals procedures are very wide and grow progressively and intensive to attend the worldwide food demand. There are three types of Confined Animal Operation for this project: finishing, breeding and nursery.

The project is a non-grouped project activity, which will apply a technology based at an ambient temperature storage covered cells (lagoon) with sufficient capacity to create an adequate Hydraulic Retention Time (HRT). The cell will use a single-piece liner affixed to a reinforced outer concrete frame. The outer cover consists of a synthetic vinyl membrane or High-Density Polyethylene (HDPE)-, which is also fastened to the frame. The liner and cover will be sealed together with bolts and iron plate frame. The system also includes a piping biogas collector, from the digester to the flare system.

The flare is enclosed and controlled by a data logger PLC – Programmable Logic Controller – in which the combustion temperature is stored every one minute in the system. This system will record every each minute the combustion temperature to determinate the flare efficiency according to the specification of the flare. A thermocouple installed in the flare is connected to the PLC to control the combustion temperature. The sparkling system in the flare is automatic. Every one second the system sparks. The biogas flow rate will be also controlled by a PLC in which every each minute the system records the flow rate. The sparkling system, the PLC and the control panel are powered by a 12 volts battery charged by solar cells.

A derivation pipe will be installed before the flare and after the flow meter, for future proposals, to supply biogas to the electricity generators, for in site electricity supply where no claims for emissions reductions by the electricity generation will be requested during the entire project activity but by the emissions reductions of the biogas destroyed in the generators.

The treated effluent is discharged to the open lagoons where it is in contact with the natural air as per the design of the original lagoon system. The treated water can be then recycled and sent back to the farm proposals or used for irrigation. No electricity will be consumed from the grid. The technical parts that will be powered by energy will be supplied by solar cells. The energy will be stored in 12 volts batteries.

The sludge from the digesters will be spread aerobically in the surface of the pasture or plantation as fertilizer in a depth less than 0.30 meters.

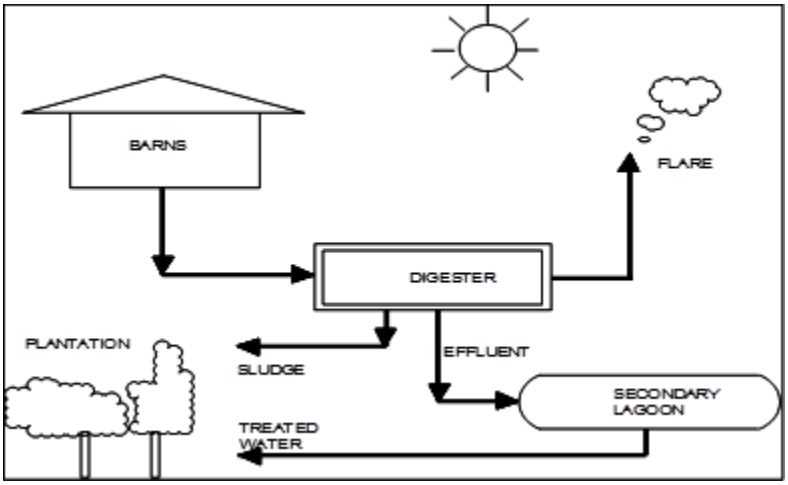

Figure 1 – Flowchart of the treatment system

The scenario existing prior to the implementation of the project activity is the same as the baseline scenario, as follows: the confined animal wastewater, which consists of fresh water mixed with manure and urine that accumulates in pits under or beside the barns, is transported to one open lagoon for evaporation, fed by gravity pipeline systems. The organic material degraded in the primary treatment lagoon is digested, thereby producing significant amounts of methane. These systems emit methane (CH4) resulting from anaerobic decomposition process. The swine livestock operations create profound environmental consequences, such as greenhouse gas emissions, odour and water/land contamination that result of storing animal waste, where this operation is not sustainable due to its sever environmental pollution.

The Project Activity consists in the construction of a new covered in-ground anaerobic reactor (digester) that will utilize the organic material currently treated in the wastewater opened lagoon, of the confined animal operations to produce biogas. All manure will be sent daily directly to digester not exceeding 24 hours in the barns.

The expected result of this project is a significant reduction of GHG emissions compared to those emissions that would have occurred in the absence of the project and also promotion of sustainable swine production farms, bringing environmental and social benefits, moving from a high-GHG animal waste management system practice to anaerobic digester with capture and combustion of resulting biogas. The project is registered, considering 57,930 tCO2e/year and therefore, 405,510 tCO2e over the first 7 years crediting period will be reduced from the baseline scenario as a result of the installation of the project activity.

All sites included in the PD and the relevant dates of the project implementation for each site are described in the following table 1. The project activity is composed by 10 sites (farms)and consists in gathering and destroying the biogas by the use of an enclosed flare, as previously stated. Hence, considering all the phases presented in table 1 bellow, and according with section 3.7 of the VCS Standard project start date definition, the project begun the generation of emissions reductions in the phase of monitoring phase, where all the biodigesters where fully installed, the flaring system put into place and the biogas started to be flared, therefore destroying methane and by consequence avoiding GHG emissions which are fully accounted since the electric system was installed and tested (PLC and monitoring equipment) and hence, where the monitoring process started (and also the crediting period, see section 1.9).

According with section 3.7 of the VCS Standard, the project start date of a non-AFOLU project is the date on which the project began generating GHG emission reductions or removals. Projects shall complete validation within specific timeframes from the project start date.

Table 1 – Relevant dates of project implementation.

Farm/Site Name	Brascarbon ID	Start Construction	Finish Construction	Start-up and Tests	Monitoring Start Date
Lote 23, Quadra 27	BCA-323MS1-19	01/05/21	10/11/21	29/12/2021	05/01/22
Partes do Lotes Rurais N° 24 e N°26 Quadra 37	BCA-324MS1-19	03/05/21	13/11/21	03/01/2021	06/01/22
Lotes 35,37 e 39 Quadra 39	BCA-325MS1-19	07/05/21	17/11/21	03/01/2021	06/01/22
Lote Rural N 56 Quadra 34	BCA-326MS1-19	25/04/21	15/10/21	03/01/2021	06/01/22
Quadra 61, Lote 43	BCA-327MS1-19	21/04/21	10/10/21	03/01/2021	06/01/22
Lote 04 e 06 Quadra 61, Lotes 03,05,07 e 09 Quadra 64	BCA-328MS1-19	25/05/21	05/11/21	03/01/2021	06/01/22
Sitio Nossa Senhora Aparecida - Parte dos Lotes 3 e 5 da	BCA-329MS1-19	19/05/21	09/11/21	29/12/2021	05/01/22
Lote 45, quadra 61	BCA-330MS1-19	23/05/21	19/11/21	29/12/2021	05/01/22
Lote 42 Q 8	BCA-331MS1-19	01/06/21	27/11/21	29/12/2021	05/01/22
Parte dos Lotes 46/48 Quadra 48	BCA-332MS1-19	03/06/21	29/11/21	29/12/2021	05/01/22

During the current Monitoring Period from 01/01/2023 to 31/12/2023 (First and last date included) the project activity has contributed 52,511 tCO2e GHG reductions.

1.2 Audit History

Audit type	Period	Program	Validation/verification body name	Number of years
Validation	05-01-2022 to 04-01-2029	VCS	ICONTEC	seven years
Verification	05-01-2022 to 31-12-2022	VCS	ICONTEC	zero years, eleven months and twenty-six days (three hundred and sixty days overall)
Verification	01-01-2023 to 31-12-2023	VCS	ICONTEC	one year (three hundred and sixty-five days overall)

1.3 Sectoral Scope and Project Type

Sectoral scope[1]	Sectoral Scope 13 – Waste handling and disposal
Project activity type	Small scale

1.4 Project Proponent

Organization name	Brascarbon Consultoria, Projetos e Representação S/A
Contact person	David Garcia
Title	Carbon Manager
Address	Rua Amália de Noronha, 151, CJ 502, 05410-010 São Paulo, SP, Brazil
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Email	david.garcia@brascarbon.com.br

[1] *Projects, activities, or methodologies may be developed under any of the 16 VCS sectoral scopes: https://verra.org/programs/verified-carbon-standard/vcs-program-details/#sectoral-scopes*

1.5 Other Entities Involved in the Project

Organization name	There are no other Entities involved in the project.
Role in the project	There are no other Entities involved in the project.
Contact person	There are no other Entities involved in the project.
Title	There are no other Entities involved in the project.
Address	There are no other Entities involved in the project.
Telephone	There are no other Entities involved in the project.
Email	There are no other Entities involved in the project.

1.6 Project Start Date

Project start date	05-01-2022
Justification	Date in which the first farm begun the monitoring phase

1.7 Project Crediting Period

Crediting period	☒ Seven years, twice renewable ☐ Ten years, fixed ☐ Other (state the selected crediting period and justify how it conforms with the VCS Program requirements)
Start and end date of first or fixed crediting period	05-01-2022 to 04-01-2029

1.8 Project Location

The project activity has several project sites (10) but it is important to highlight that it is not a grouped project. It is located in the Central Region/State of Mato Grosso do Sul, cities of Rio Verde and São Gabriel do Oeste. The geographical location of the project sites is shown in Figure 2 with specifics detailed in Table 2.

Table 2 – Detailed physical location and identification of project site

Farm/Site Name	Brascarbon ID	Address	Town/State	Contact	Phone	GPS Coord
Lote 23, Quadra 27	BCA-323MS1-19	Zona Rural Jatei	Jatei / MS	Andre Henrique da silva Boigues	67 99567 1540	22 32 22,31 54 08 31,99
Partes do Lotes Rurais N° 24 e N°26 Quadra 37	BCA-324MS1-19	3º Linha Nascente Zona Rural	Gloria de Dourados / MS	Geraldo Ferro da Silva	67 98943 1020	22 29 11,69 54 07 30,99
Lotes 35,37 e 39 Quadra 39	BCA-325MS1-19	Zona Rural Linha Iguassu	Gloria de Dourados / MS	luiz Sergio Golfeto	67 89671 1015	22 26 20,19 54 17 48,65
Lote Rural N 56 Quadra 34	BCA-326MS1-19	Linha do Iguassu Poente	Gloria de Dourados / MS	Maria de Lourdes Merlotte torrezan	67 98945 2321	22 27 01,47 54 16 45,52
Quadra 61, Lote 43	BCA-327MS1-19	7º Linha Nascente	Gloria de Dourados / MS	Valdecir Pedro Gomes	67 99945 1323	22 22 22,67 54 09 14,06
Lote 04 e 06 Quadra 61, Lotes 03,05,07 e 09 Quadra 64	BCA-328MS1-19	8º linha KM 8 Nascente	Gloria de Dourados / MS	Graça Rodrigues Nantes	67 98956 1784	22 19 50,21 54 11 06,78
Sitio Nossa Senhora Aparecida - Parte dos Lotes 3 e 5 da Quadra 29	BCA-329MS1-19	Bairro Zona Rural Jatei	Jatei / MS	Paulo Ulisses Bacurau	67 98978 1576	22 27 45,91 54 21 0,76
Lote 45, quadra 61	BCA-330MS1-19	7º Linha Nascente KM 6	Gloria de Dourados / MS	Maria Amelia	67 97845 1652	22 22 26,19 54 09 05,76
Lote 42 Q 8	BCA-331MS1-19	Linha Caraja	Vila Vicentina / MS	Jairo Isauro Medeiros	67 97657 8934	22 32,2 2,88 54 25 25,40

Farm/Site Name	Brascarbon ID	Address	Town/State	Contact	Phone	GPS Coord
Parte dos Lotes 46/48 Quadra 48	BCA-332MS1-19	Linha Caraja	Vila Vicentina / MS	Sebastião Isauro Medeiros	67 98976 1720	22 32 05,30 54 25 2,69

Andre Henrique da silva Boigues has one site in Jatei city:

- Lote 23 Quadra 27 is a farrow-to-finish swine operation. The site uses two primary open lagoons for animal waste storage. Waste from the barns is removed via the pull plug method and then routed to the open lagoon. The methods of effluent disposition used are surface spread and irrigation.

Geraldo Ferro da Silva has one site in Jatei city:

- Partes do Lotes Rurais N° 24 e N°26 Quadra 37 is a finishing swine operation. The site uses two primary open lagoons for animal waste storage. Waste from the barns is removed via the pull plug method and then routed to the open lagoon. The methods of effluent disposition used are surface spread and irrigation.

Luiz Sergio Golfeto has one site in Jatei city:

- Lotes 35,37 e 39 Quadra 39 is a finishing swine operation. The site uses two primary open lagoons for animal waste storage. Waste from the barns is removed via the pull plug method and then routed to the open lagoon. The methods of effluent disposition used are surface spread and irrigation.

Maria de Lourdes Merlotte torrezan has one site in Jatei city:

- Lote Rural N 56 Quadra 34 is a finishing swine operation. The site uses two primary open lagoons for animal waste storage. Waste from the barns is removed via the pull plug method and then routed to the open lagoon. The methods of effluent disposition used are surface spread and irrigation. Water from this lagoon will be used for irrigation.

Valdecir Pedro Gomes has one site in Gória de Dourados city:

- Quadra 61, Lote 43 is a finishing swine operation. The site uses two primary open lagoons for animal waste storage. Waste from the barns is removed via the pull plug method and then routed to the open lagoon. The methods of effluent disposition used are surface spread and irrigation. Water from this lagoon will be used for irrigation.

Graça Rodrigues Nantes has one site in Glória de Dourados city:

- Lote 04 e 06 Quadra 61, Lotes 03,05,07 e 09 Quadra 64 is a finishing swine operation. The site uses two primary open lagoons for animal waste storage. Waste from the barns is removed via the pull plug method and then routed to the open lagoon. The methods of effluent disposition used are surface spread and irrigation.

Paulo Ulisses Bacurau has one site in Caarapó city:

- Lote 04 e 06 Quadra 61, Lotes 03,05,07 e 09 Quadra 64 is a finishing swine operation. The site uses two primary open lagoons for animal waste storage. Waste from the barns is removed via the pull plug method and then routed to the open lagoon. The methods of effluent disposition used are surface spread and irrigation.

Maria Amelia has one site in Caarapó city:

- Lote 45, quadra 61 is a finishing swine operation. The site uses two primary open lagoons for animal waste storage. Waste from the barns is removed via the pull plug method and then routed to the open lagoon. The methods of effluent disposition used are surface spread and irrigation.

Jairo Isauro Medeiros has one site in Caarapó city:

- Lote 42 Q 8 is a finishing swine operation. The site uses two primary open lagoons for animal waste storage. Waste from the barns is removed via the pull plug method and then routed to the open lagoon. The methods of effluent disposition used are surface spread and irrigation.

Sebastião Isauro Medeiros has one site in Caarapó city:

- Parte dos Lotes 46/48 Quadra 48 is a finishing swine operation. The site uses two primary open lagoons for animal waste storage. Waste from the barns is removed via the pull plug method and then routed to the open lagoon. The methods of effluent disposition used are surface spread and irrigation.

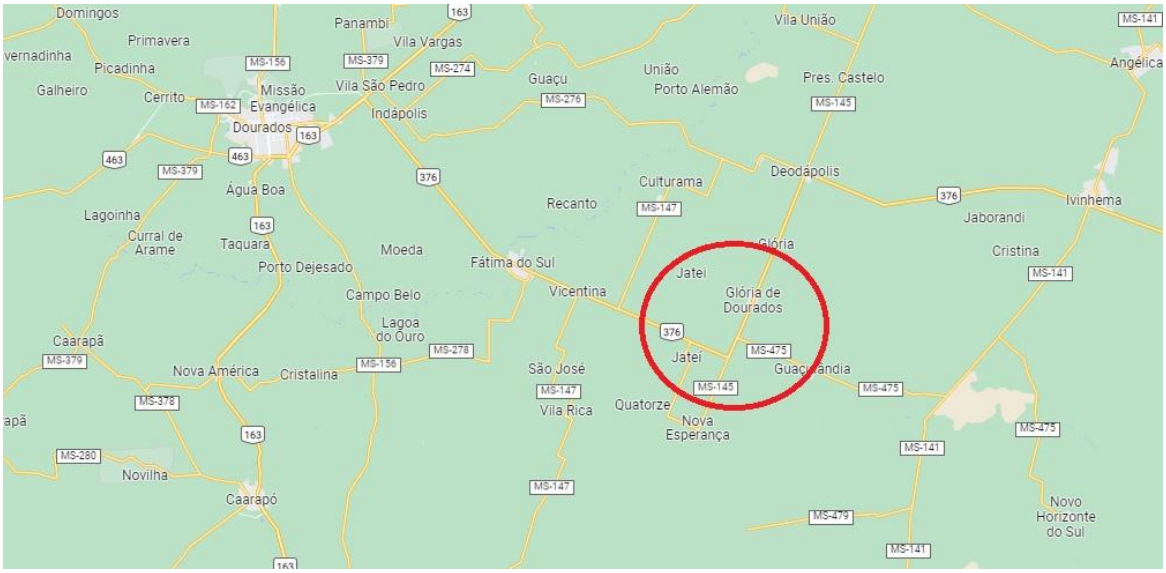


Figure 2 – State of Mato Grosso do Sul, Brazil – city location of the project sites

1.9 Title and Reference of Methodology

Type (methodology, tool or module).	Reference ID, if applicable	Title	Version
Methodology	AMS - III.D	Methane recovery in animal manure management systems	21.0
Tool	TOOL14	Project and leakage emissions from anaerobic digesters	2.0
Tool	TOOL06	Project emissions from flaring	4.0

1.10 Double Counting and Participation under Other GHG Programs

1.10.1 No Double Issuance

Is the project receiving or seeking credit for reductions and removals from a project activity under another GHG program?

☐ Yes ☒ No

1.10.2 Registration in Other GHG Programs

Was the project registered or seeking registration under any other GHG programs?

☐ Yes ☒ No

1.11 Double Claiming, Other Forms of Credit, and Scope 3 Emissions

1.11.1 No Double Claiming with Emissions Trading Programs or Binding Emission Limits

Are project reductions and removals or project activities also included in an emissions trading program or binding emission limit? See the *VCS Program Definitions* for definitions of emissions trading program and binding emission limit.

☐ Yes ☒ No

1.11.2 No Double Claiming with Other Forms of Environmental Credit

Has the project activity sought, received, or is planning to receive credit from another GHG-related environmental credit system? See the *VCS Program Definitions* for definition of GHG-related environmental credit system.

☐ Yes ☒ No

1.11.3 Supply Chain (Scope 3) Emissions

Do the project activities affect the emissions footprint of any product(s) (goods or services) that are part of a supply chain?

☐ Yes ☒ No

If yes:

Is the project proponent(s) or authorized representative a buyer or seller of the product(s) (goods or services) that are part of a supply chain?

☐ Yes ☒ No

If yes:

Has the project proponent(s) or authorized representative posted a public statement on their website saying, "Carbon credits may be issued through the Verified Carbon Standard project [project ID] for the greenhouse gas emission reductions or removals associated with [project proponent or authorized representative organization name(s)] [name of product(s) whose emissions footprint is changed by the project activities]."

☐ Yes ☒ No

1.12 Sustainable Development Contributions

According to Brazil's Inter-Ministerial Commission on Global Climatic Change, manure management is an important issue that needs to be solved. The swine waste storage and treatment systems in Brazil consists of open tanks, open digesting and ponds (anaerobic lagoons) once they are the most economic and viable system approved to manage the manure

in confined animals feed operations. Economic barriers are very common because can invest only in the confined feed operations and with no need to invest in waste management systems. Financial resources are always used to maintain the confined feed operation working. Also, waste treatment involves low technology, as open lagoons need less employees and technicians for operation and maintenance. For these reasons the project is additional, and more details can be found in the section 3.5.

Just few producers invest in bio-digesters to have a modern waste management system. The material cumulated in the open lagoons is normally distributed by pumps or gravity and applied to crops and pastures. EMBRAPA stimulated by the Expansion and Waste Treatment Program of the State of Santa Catarina by giving instructions and providing publications to help the producers and agro-industries to implement projects or systems to control the animal waste management protecting the eco-system.

Failure to do so will spread existing disease continually (i.e. increased (insect) pest populations, problems with allergies and livestock disease). With the purpose of avoiding this problem, Brazil has in recent years, required all confined animals feed operations to change from single to multi-lagoon systems, introducing a Good Practices in confined animal feed operations and even more recently has required them to line the bottom of their primary sedimentation lagoon to prevent effluent infiltration.

In 2005, the swine population in Mato Grosso do Sul state was 855,000. Considering that a typical hog produces 4.9 kilograms of effluent daily (Table 3), annually some 4.2 million metric tons of hog waste are produced in this state alone. Introducing a progressive animal waste management practices throughout this region of Brazil could result in an annual reduction of approximately 655 thousand tons of carbon dioxide equivalent (CO2e/year).

Table 3 – Daily production of effluent by type of swine production

Stage	Manure kg/day	Manure and Urine kg/day	Volume litres/day
25-100 kg	2.3	4.9	7.0
Gestating sows	3.6	11.0	16.0
Nursing sows	6.4	18.0	27.0
Boar pig	3.0	6.0	9.0
Piglet	0.35	0.95	1.4

Source: PNMA-II – Projeto de Controlo da Degradação Ambiental Decorrente da Suinocultura em Santa Catarina, coordenado pelo Sr. Paulo Armando Vitoria de Oliveira, Concordia – SC, EMBRAPA Suínos e Aves, 2004 (Environmental Degradation Control Project ,in Suine Farms Santa Catarina, coordinated by . Paulo Armando Vitoria de Oliveira, Concordia – SC, EMBRAPA Suines and Birds 2004);http://www.cnpsa.embrapa.br/sgc/sgc_publicacoes/publicacao_n3r85f3h.pdf

Socio-Economic Sustainability

- Improvement in air quality (e.g. – reduction of Volatile Organic Compounds [VOCs]) and worker safety;
- Elimination of odors in surrounding areas, improving the living standards of neighbours' communities;
- Proper handling of the animal waste ensuring an adequate level of protection of human health and the environment;
- By improving the waste management system at the farm, the project will support the continued production of pork in order to meet the consumption needs of the growing global population.

Economic Sustainability

- An increase in local employment of skilled labour for the manufacturing, installation, Operation and maintenance of equipment;

- Additional employment opportunities in the agro-industrial sector, specifically from the use of recycled water from the waste management system on the farms for agricultural activities in surrounding land;

- Infrastructure improvement is in direct alignment with the national goals and objectives for agriculture, livestock, rural development, fishing and nutrition.

Environmental Sustainability

- An overall decrease in the amount of Greenhouse Gases (GHGs) emitted into the atmosphere;

- Improvement in the quality of the water used in the waste management system and its potential use as water for irrigation;

Avoiding potential dumping of waste into clean sources of water
.http://www.cnpsa.embrapa.br/sgc/sgc_publicacoes/publicacao_n3r85f3h.pdf

According with the requirements of the new version 4.7 of the VCS standard, the PP should identify, at least three SDGs which the project comply with. Considering the registered PD as well as the current document, the project has fairly demonstrated its different contributions to the sustainable development. However, in order to comply with the stated requisition, the PP states that the project complies with the following SDGs:

SDG 6 Clean Water and Sanitation – The project complies with this objective since it contributes to a cleaner effluent, after treatment, which is discharged into to a water body was well as it contributes to the prevention of groundwater contamination through the treatment of the effluent.

SDG 9 Industry, Innovation and Infrastructure – The project complies with this objective since it provides an innovation on the wastewater treatment in swine farms, through the construction of new and more technological infrastructures.

SDG 13 Climate Action – The project complies with this objective since it is a project that reduces the GHG emissions in the normal operation in swine farms, as demonstrated in the registered PD and current MR.

SDG 15 Life on Land – The project complies with this objective since it contributes to a better surrounding in overall, by reducing the smell, insects and air quality by preventing a wastewater treatment (and therefore organic matter decomposition) in open lagoons.

Table 1: Sustainable Development Contributions

Row number	SDG target	SDG indicator	Net impact on SDG indicator	Current project contributions	Contributions over project lifetime
1)	*6.3*	*Improve water quality by reducing pollution, eliminating dumping, and minimizing the release of hazardous chemicals and materials*	*Implemented activities to increase*	*The project complies with this objective since it contributes to a cleaner effluent, after treatment, which is discharged into to a water body. The Current MR comprises an entire one year (2023) and the project is estimated to treat around 153,2k cubic meter of wastewater, considering that the project had, for that period, a total of 73k animals.* *In the previous monitoring period (which had comprised 11 months) the wastewater treated was 138,4 k cubic meters treated.*	*Improved water quality by treating an estimated 6 liters per animal. Day. That means 153,2k cubic meters of wastewater annually, meaning 1072,4 k cubic meters for the first crediting period (7 years) and around 3217,3k cubic meters over the 21 years of the overall project, reducing hazardous pollutants discharged into water bodies and ensuring safer water sources for public use. These numbers come from the rationality of 6 liters of wasterwater treated per animal, per day which is a figure validated by our internal experience.*

Row number	SDG target	SDG indicator	Net impact on SDG indicator	Current project contributions	Contributions over project lifetime
2)	*6.6*	*Protect and restore water-related ecosystems*	*Implemented activities to increase*	*The project contributes to the prevention of groundwater contamination through the treatment of the effluent. The Current MR comprises an entire one year (2023) and the project is estimated to treat around 153,2k cubic meter of wastewater, considering that the project had, for that period, a total of 73k animals.* *In the previous monitoring period (which had comprised 11 months) the wastewater treated was 138,4 k cubic meters treated.*	*Preservation of aquatic ecosystems by preventing contamination of groundwater sources. Estimated reduction of 153,2k cubic meters of poorly treated wastewater annually, considering a total of around 73k animals per year, meaning 1072,4 k cubic meters for the first crediting period (7 years) and over 3217,4k cubic meters over the 21 years of the overall project, benefiting the biodiversity of surrounding water bodies. These numbers come from the rationality of 6 liters of wasterwater treated per animal, per day which is a figure validated by our internal experience.*

Row number	SDG target	SDG indicator	Net impact on SDG indicator	Current project contributions	Contributions over project lifetime
3)	*9.4*	*Upgrade infrastructure and retrofit industries to make them sustainable*	*Implemented activities to increase*	*The project complies with this objective since it provides an innovation on wastewater treatment in swine farms, through the construction of new and more technological infrastructures. The Current MR comprises an entire one year (2023) and the modernized infrastructure of the project reduces the emissions in 52,511 tCO_2e.* *In the previous monitoring period (which had comprised 11 months) the modernized infrastructure of the project reduces the emissions in 52,007 tCO_2e.*	*Modernized infrastructure reduces GHG emissions by 57,9k tons CO_2e annually (PD values), meaning an overall reduction of 405k CO_2e for the first monitoring period (7 years) and 1,16 M tons CO_2e for the entire lifetime of the project and operational costs, while ensuring compliance with environmental regulations for sustainable swine farming.*

Row number	SDG target	SDG indicator	Net impact on SDG indicator	Current project contributions	Contributions over project lifetime
4)	*13.2*	*Integrate climate change measures into national policies, strategies and planning*	*Implemented activities to increase*	*The Current MR comprises an entire one year (2023) and the modernized infrastructure of the project reduces the emissions in 52,511 tOC_2e, hence contributing for the accomplishment of the Brazilian NDC.* *In the previous monitoring period (which had comprised 11 months) the modernized infrastructure of the project reduces the emissions in 52,007 tCO_2e.*	*The project complies with this objective since the host country (Brazil) has produced its NDC – "National determination to contribute and transform" with the formal contribution with national emissions reduction. The animal sector is considered in this document, in its TNA (Technology Needs Assessment for the Implementation of Climate Action Plans in Brazil) where animal growing is identified as a priority scope.* *The project will reduce GHG emissions by 57,9k tons CO_2e annually (PD values), meaning an overall reduction of 405k CO_2e for the first monitoring period (7 years) and 1,16 M tons CO_2e for the entire lifetime of the project, hence contributing for the accomplishment of the Brazilian NDC.*

5)	*13.3*	*Improve education, awareness-raising, and human and institutional capacity on climate change mitigation*	*Implemented activities to increase*	*The project complies with this objective since it is a project that reduces the GHG emissions in the normal operation in swine farms, as demonstrated in the registered PD and current MR.* *The Current MR comprises an entire one year (2023) and the modernized infrastructure of the project reduces the emissions in 52,511 tOC_2e, hence contributing for the accomplishment of the Brazilian NDC and the local state goals.* *In the previous monitoring period (which had comprised 11 months) the modernized infrastructure of the project reduces the emissions in 52,007 tCO_2e.* *Within the development of the project activity, the PP has conducted clarification sessions, prior to the project implementation, to all the local interested parties (not only the producers comprised in the current project activity) where the importance of this activity was detailed and the climate change mitigation was explained.* *Reduction of CH_4 emissions of 1,875k tons for the current MR*	*The project activity is also in line with the state climate objectives where, in its plan to achieve net zero carbon until 2023 is detailed in Plano Estadual MS Carbono Neutro – PROCLIMA and its implementation tool RTNC (Roadmap Território Carbono Neutro).* *Reduction of CH_4 emissions by an estimated 2,069k tons annually through the implementation of the project activity, meaning 14,4k CH_4 tons for the first crediting period (7 years) and 43,449k tCH_4 for the entire lifetime of the project (21 years). Awareness-raising and training sessions conducted with farm representatives to build capacity for long-term climate change mitigation.*

Row number	SDG target	SDG indicator	Net impact on SDG indicator	Current project contributions	Contributions over project lifetime
				through the implementation of the project activity. *In the previous monitoring period (which had comprised 11 months) the implementation of the project activity.reduces the methane emissions in 1,857k tons.*	

Row number	SDG target	SDG indicator	Net impact on SDG indicator	Current project contributions	Contributions over project lifetime
6)	*15.1*	*Ensure the conservation, restoration, and sustainable use of terrestrial and inland freshwater ecosystems*	*Implemented activities to increase*	*The project complies with this objective since it contributes to a better surrounding in overall, by reducing the smell, insects and air quality by preventing a wastewater treatment (and therefore organic matter decomposition) in open lagoons.* *The Current MR comprises an entire one year (2023) and the project is estimated to treat around 153,2k cubic meter of wastewater, considering that the project had, for that period, a total of 73k animals.* *In the previous monitoring period (which had comprised 11 months) the wastewater treated was 138,4 k cubic meters treated.*	*Improved environmental conditions in a radius of 5km of each farm surrounding the treatment system, benefiting and estimated value of over 100 families. The project helps reduce the proliferation of insects and odors, contributing to healthier ecosystems and better living conditions.* *Preservation of aquatic ecosystems by preventing contamination of groundwater sources. Estimated reduction of 153,2k cubic meters of poorly treated wastewater annually, considering a total of around 73k animals per year, meaning 1072,4 k cubic meters for the first crediting period (7 years) and over 3217,4k of the overall project, benefiting the biodiversity of surrounding water bodies. These numbers come from the rationality of 6 liters of wasterwater treated per animal, per day which is a figure validated by our internal experience.*

1.13 Commercially Sensitive Information

The project does not have any commercially sensitive information.

2 SAFEGUARDS AND STAKEHOLDER ENGAGEMENT

2.1 Stakeholder Engagement and Consultation

2.1.1 Stakeholder Identification

Stakeholder Identification	**The main stakeholders considered in this project are:** • Project Site owners; • Secretaria da Sustentabilidade Glória de Dourados; • Sindicato Rural Jatei; • Secretaria do Meio Ambiente Jatei; • Câmara Municipal Glória de Dourados;
Legal or customary tenure/access rights	All the project sites in the project activity are within private properties with already existing commercial activities (swine production). All the project sites have contracts with the swine farm owners in order for the PP to have full access to the operation, maintenance and monitoring of the project activity.
Stakeholder diversity and changes over time	The PP is a project developer for several years in the region and therefore is quite aware of the stakeholders to be considered and included in all the project activity. In the PP experience there are no changes on the stakeholder's diversity over time but there is a continuous channel of communication for any project clarification that may occur for any giving stakeholder.
Expected changes in well-being	Since the project is quite specific regarding the activity and operation, since there are only positive environmental and social impacts in the project facilities as well as in the surrounding areas to the sites. Also, it presents very small risks both in terms of the construction as in the operation. The project has quite a positive impact environmentally but also, since it is developed in already operating sites, being a complementary activity to the main operation of the site owners, presents zero negative impacts. Also, being an

	addition, in terms of water treatment, to the required in the legislation (open lagoons – baseline scenario), the site owners also have a positive impact in the renewal of their operational license since they are doing a more advanced treatment than the one required by law. Regardless, due to the vast experience of Brascarbon, we have identified possible risks and the needed action to corrected them: Possible clogging of the Biodigester and may cause leakage and contamination of the soil. Action Taken: installation of Bay Pass for diversion of the residue to secondary pond in the case of clogging, continuous evaluation of the effluent, and when necessary is done the internal recirculation of the bio and with this the dilution of the material and improvement of the biodigestion and consequently the best fluidity of the material. Possible hole of the lower canvas caused by drilling material from the farm and may cause lower contamination of the soil by leakage. Possible action to be taken: Training of pig workers regarding the care of the perforating materials used in the work routine of the pig farm and installation of barriers in the exit box of the farm to prevent this type of material from being transported to the Biodigester through the pipe. Possible excess pressure caused by increased gas generation and with this possible rupture in the upper coating released gas into the atmosphere. Possible action to be taken: installation of mechanical safety valve to relieve excess pressure when and if it occurs.
Location of stakeholders	Mato Grosso do Sul State
Location of resources	All the sites included in the project activity are within private properties and therefore with limited access to each project site owner. Each swine producer is owner of its farm, and the remaining stakeholders are public entities.

2.1.2 Stakeholder Consultation and Ongoing Communication

Ongoing consultation	12-05-2020 until today
Date(s) of stakeholder consultation	Brascarbon has sent an invitation to all the stakeholders mentioned in section 2.2 of version 01 of the PD. The invitation letter was sent by email due to the pandemic situation, in May 12th of 2020. With the local producer, Brascarbon has met individually to clarify the project, answer their questions and sign the contract related to the ownership of the carbon project. That visit occurred in the week of May 23rd to 27th of 2020[2]. The public consultation started in the day Brascarbon sent the letter and has the channel open (phone and email) until the present day. Due to the worldwide Corona Virus pandemic that was established in 2020, security and protection measures had to be taken to carry out the consultation with stakeholders. To contain new cases and avoid agglomerations, stakeholder consultation was carried out remotely. Thus, the Stakeholder consultation was divided in two steps: an online request for comments (opened until nowadays without any comments) with all the project site owner's participant in the project and a local consultation with the relevant entities and other potential interested community stakeholders which was addressed through email to all the entities above and requested to leave their comments in our dedicated email. The invitation letter sent by email is presented below.
Communication of monitored results	Brascarbon has not received any comment during the entire period where the project was under public consultation. One of the main reasons for that to happen is that Brascarbon has developed several other carbon projects is the surrounding regions and therefore both the company and the project are well known by all stakeholders.

[2] Due to timing of the starting date of the project, full pandemic stage, these encounters happened individually with each producer, as follow up of the contract signing, to indicate to start of the project.

	The public consultation started in the day Brascarbon sent the letter and has the channel open (phone and email) until the present day. The PP did not receive any comments from the stakeholders. The producers have made comments, especially regarding the biodigestor location in order to better assist the flow and therefore the supply of the biodigestor, which were attended by Brascarbon. Brascarbon procedure, if and/or when any communication should be received is: • Realtime access to email and phone (the two ways to contact us) • Analyze and address the questioning within 5 week days • Wait for feedback and if nothing is received, follow within one month of the response.
Consultation records	The mechanism for on-going communication with local stakeholders Is the same as the one included in the invite letter, meaning a dedicated phone number and email address, which is still available up to this day, according with POP 25 – COMUNICAÇÃO E RECLAMAÇÕES. However, no comments were received during the entire period until the present day. How due account of all and any input received during the consultation has been taken. Include details on any updates to the project design or justify why updates are not appropriate. The PP did not receive any comments from the stakeholders. The producers have made comments, especially regarding the biodigestor location in order to better assist the flow and therefore the supply of the biodigestor, which were attended by Brascarbon. Brascarbon procedure, if and/or when any communication should be received is:

	Realtime access to email and phone (the two ways to contact us) Analyze and address the questioning within 5 week days Way for feedback and if nothing is received, follow within one month of the response. As stated previously in the current section (and in the letter presented below), the communication channels are available up to this day (without any comments so far): Email: info@brascarbon.com.br Phone: +551989017810 If the company receives any grievance from anyone, the PP has fairly demonstrated that he has a dedicated email (info@brascarbon.com.br) which Is regularly checked and is within company policy that any grievance should be answered and, if possible, resolved, under a period of 10 labour days.
Stakeholder input	The PP did not receive any comments from the stakeholders. The producers have made comments, especially regarding the biodigestor location in order to better assist the flow and therefore the supply of the biodigestor, which were attended by Brascarbon.

Projeto Recuperação de Metano

A Brascarbon é uma empresa dedicada e especializada no desenvolvimento de projetos de carbono (MDL), tendo iniciado a sua atividade em 2007 e possuindo 13 projetos registrados no Mecanismo de Desenvolvimento Limpo das Nações Unidas e em operação atualmente. A empresa possui milhões de toneladas de carbono reduzidas ao longo dos vários anos dos seus projetos, tendo contribuído para a redução das emissões do gás metano para a atmosfera, redução esta feita em BioDigestores construídos na área de Suinocultura.

No seguimento da sua atividade, a Brascarbon irá desenvolver novos projetos, designado Projeto de Recuperação de Metano, implementado em dezenas de Sites, o qual utilizará o mesmo padrão, premissas, técnicas e monitoramento dos anteriores projetos registrados e em operação, Projetos estes que se encontram disponível publicamente no site das Nações Unidas (UNFCCC).

Assim, a Brascarbon gostaria de solicitar a sua contribuição, enquanto parte interessada, para quaisquer comentários que considerem importantes, qualquer dúvida ou esclarecimentos no que se refere ao projeto de recuperação de metano, projeto este implementado através de construção de BioDigestores Anaeróbicos. Abaixo segue Breve apresentação do projeto a ser implementado, o qual é idêntico aos já em funcionamento.

Favor enviar comentários ou duvidas para o E-Mail info@brascarbon.com.br e ficaremos agradecidos pela sua participação.

Descrição de Projeto:

Produzindo atualmente em um total de 5 Projetos registrados e em um total de 67 fazendas de suínos nos estados de Mato Grosso do Sul, no Brasil, para captação de metano e geração de biogás. O projeto tem potencial para gerar energia a partir de resíduos utilizando o biogás produzido e capturado. A energia derivada desse processo pode ser usada para alimentar a eletricidade no local dentro de cada um desses projetos.

Antes da atividade do projeto, os agricultores locais consideravam o desperdício como uma externalidade no processo de produção de suínos. Como tal, o financiamento mínimo foi alocado para esta questão e as águas residuais eram frequentemente tratadas em lagoas de águas abertas – frequentemente com profundos impactos ambientais. O projeto demonstra como a construção de um conjunto de novos digestores anaeróbicos, cobertos e no solo, pode utilizar o material orgânico das operações animais para produzir biogás e fertilizantes, reduzindo as emissões de gases de efeito estufa.

A base do projeto é a digestão anaeróbica, pela qual os microrganismos quebram material biodegradável na ausência de oxigênio. Como parte de um sistema integrado de gestão de resíduos, ocorre a captura e a destruição do gas metano em um sistema de flare desenhado para este fim, reduzindo assim a emissão de gases de efeito estufa na atmosfera, temos então um biogás rico em teor de metano e adequado para a produção de energia, que pode ser usado para substituir combustíveis fósseis. Os sólidos ricos em nutrientes deixados após a digestão são usados como fertilizante e o melhor manejo de águas residuais permite mais água para irrigação.

Desenvolvimento Sustentável: Benefícios socio-econômicos

O principal benefício deste projeto é a redução da quantidade de gases de efeito estufa emitidos na atmosfera em cerca de 55.000 toneladas de CO2 equivalente por ano por projeto. Outras vantagens dos projetos incluem:

- A criação de empregos, incluindo trabalhadores de campo, funcionários operacionais e colaboradores agrícolas
- Redução dos Compostos Orgânicos Voláteis (VOCs) transportados pelo ar como resultado do uso de digestores de águas residuais cobertas para armazenar efluentes das fazendas. Essa melhoria na qualidade do ar aumenta o padrão de vida tanto para os agricultores quanto para as comunidades locais
- O melhor manuseio dos resíduos animais garante um melhor nível de proteção à saúde humana e ao meio ambiente;
- Melhoria na qualidade da água no sistema de gestão de resíduos e seu potencial uso como água para irrigação;
- Uma melhoria nas condições de vida dos suínos, pois os produtores devem cumprir as diretrizes de Boas Práticas para participar do projeto.

BrasCarbon Consultoria projetos e Representação S/A

2.1.3 Free, Prior, and Informed Consent

Consent	All the project sites are within private properties with already existing economical and commercial activities so, in order to develop the project activity in all the sites above mentioned, all project sites were dully accommodated in a concession contract with the property owners for full access to develop maintenance and/or monitoring services.
Outcome of FPIC	As previously stated, all the sites included in the project activity are within private properties and therefore with limited access to each project site owner. Each farm included in the project activity was subjected to an individual contract, with the length of the entire crediting period. Additionally, since the project is developed in an already existing operation, it did not encroach on land, relocated people without consent, and forced physical or economic displacement.

2.1.4 Grievance Redress Procedure

Grievances received	Resolution and outcome
No grievance received	Not Applicable

2.1.5 Public Comments

Summary of comments received	Actions taken
No comments received	Not Applicable

2.2 Risks to Stakeholders and the Environment

2.2.1 Management Experience

Brascarbon is a company which is in operation since 2008, always with the focus on developing methane avoidance projects in swine farms. Since then, the company has developed nearly 20 carbon projects registered in different standards (UNFCCC and VERRA).

2.2.2 Risk assessment

	Risk identified	Mitigation or preventative measure(s) taken
Natural and human-induced risks to stakeholders' wellbeing	No risk identified	Brascarbon projects are developed in confined areas, within pig farm properties, without any natural nor human-induced risks to the stakeholders wellbeing. Additionally, the project does not affect the safety of any population, in fact it increases the quality of life in point 1.12.
Risks to stakeholder participation	No risk identified	All the Stakeholders have the same communication channel as the ones during the stakeholder consultation, prior to the registry of the project in VERRA. No communications nor grievance were received as stated in the points above.
Working conditions	No risk identified	Brascarbon has a really small internal structure, with only 3 employees, besides the director (2 Regional Technicians and 1 Carbon Manager), all of which have all the employees' rights, according with Brazil law fully assured. No complain in the labor entities were ever received by the company. The employees have regular training according with the POP11.

Safety of women and girls	No risk identified	Unfortunately, at the time, Brascarbon does not have any female on its collaborators.
Safety of minority and marginalized groups, including children	No risk identified	Brascarbon projects are developed in confined areas, within pig farm properties, without minority and marginalized groups, including children in the surrounding. Additionally, the project does not affect the safety of any population, in fact it increases the quality of life of the surroundings as described in point 1.12.
Pollutants (air, noise, discharges to water, generation of waste, and release of hazardous materials and chemical pesticides and fertilizers)	No risk identified	Brascarbon projects are developed in confined areas, within pig farm properties, increasing the quality of life of the surroundings as described in point 1.12. There are no pollutants discharged or emitted, in fact, they are avoided by the project activity.

2.3 Respect for Human Rights and Equity

2.3.1 Labor and Work

	Risks identified[3]	Mitigation or preventative measure(s) taken
Discrimination	No risk identified	Brascarbon has a really small internal structure, with only 3 employees, besides the director (2 Regional Technicians and 1 Carbon Manager), all of which have all the employees rights, according with Brazil law fully assured. No complain of sexual harassment nor discrimination have ever occurred.
Sexual harassment	No risk identified	Brascarbon has a really small internal structure, with only 3 employees, besides the director (2 Regional Technicians and 1 Carbon Manager), all of which have all the employees rights, according with Brazil law fully assured. No complain of sexual harassment nor discrimination have ever occurred.
Gender equity in labor and work	No risk identified	Brascarbon does not discriminate gender nor is that an issue for the company. Due to its small structured, it happens that only man work at the company. However, in board is constituted by a man and a woman.
Forced labor	No risk identified	Brascarbon fully complies with all Brazilian laws and these practices, Human trafficking, forced labor, and child labor are, of course forbidden hence not in line with the company's values,

[3] The identified risks and commensurate mitigation or preventative measure(s) for forced labor, child labor, and human trafficking, must be inclusive of staff and contracted workers employed by third parties.

		procedures and practices. No complain of these practices was ever received by the company.
Child labor	No risk identified	Brascarbon fully complies with all Brazilian laws and these practices, Human trafficking, forced labor, and child labor are, of course forbidden hence not in line with the company's values, procedures and practices. No complain of these practices was ever received by the company.
Human trafficking	No risk identified	Brascarbon fully complies with all Brazilian laws and these practices, Human trafficking, forced labor, and child labor are, of course forbidden hence not in line with the company's values, procedures and practices. No complain of these practices was ever received by the company.

2.3.2 Human Rights

Risks identified	Mitigation or preventative measure(s) taken
No risk identified	The project activity is developed within private properties with other pre-existing activity (in this case, swine production). The project activity boundary in within these private properties hence fully respecting and promoting the protection of the rights of IPs, LCs, and customary rights holders in line with applicable international human rights law, and the United Nations Declaration on the Rights of Indigenous Peoples and ILO Convention 169 on Indigenous and Tribal Peoples.

2.3.3 Indigenous Peoples and Cultural Heritage

Risks identified	Mitigation(s) or preventative measure taken
No risk identified	The project activity is developed within private properties with other pre-existing activity (in this case, swine production). The project activity boundary in within these private properties hence fully respecting and promoting the protection of the rights of IPs, LCs, and customary rights holders in line with applicable international human rights law, and the United Nations Declaration on the Rights of Indigenous Peoples and ILO Convention 169 on Indigenous and Tribal Peoples.

2.3.4 Property Rights

Risks identified	Mitigation or preventative measure(s) taken
No risk identified	All the project sites are within private properties with already existing economical and commercial activities so, in order to develop the project activity in all the farms above mentioned, all project sites were dully accommodated in a concession contract with the property owners for full access to develop maintenance and/or monitoring services. The project activity does not have issues regarding the protection or preservation of property rights since the contract between the PP and the involved stakeholders (project site owner) considers the activity to be developed, the length of the project activity, the stakeholders compensation and the access to the project sites which, as stated are all within private properties with already ongoing economic activities.

2.3.5 Benefit Sharing

Summary of the benefit sharing plan	The PP has, per contract, a compromise to give 10% of all the gross revenue by the commercialization of the carbon units with each project site owner involved in the project activity.
Benefit sharing during the monitoring period	As previously stated, the PP has, per contract, the mandatory commitment to transfer 10% of all the gross revenue by the commercialization of the carbon units with each project site owner involved in the project activity. Additionally, since the project activity provides a more advanced wastewater treatment system than the mandatory country requirements, the project site owners also have a less tangible benefit of obtaining their operation licence renewals with less constrains, having the project activity implemented.

2.4 Ecosystem Health

	Risk identified	Mitigation or preventative measure(s) taken during the monitoring period
Impacts on biodiversity and ecosystems	No Risk Identified	Brascarbon projects are developed in confined areas, within pig farm properties, increasing the quality of live of the surroundings as described in point 1.12. There are no Impacts on biodiversity and ecosystems, in fact, they are prevented by the project activity.
Soil degradation and soil erosion	No Risk Identified	Brascarbon projects are developed in confined areas, within pig farm properties, increasing the quality of live of the surroundings as described in point 1.12. There are no Soil Degradation or Erosion, in fact, they are prevented by the project activity.
Water consumption and stress	No Risk Identified	The project does not consumes any water

2.4.1 Rare, Threatened, and Endangered species

Species or habitat	N/A
Areas needed for habitat connectivity	N/A

	Risks identified	Mitigation or preventative measure(s) taken
Habitats for rare, threatened, and endangered species	No risk identified	N/A
Areas for habitat connectivity	No risk identified	N/A

2.4.2 Introduction of species

Species introduced	Classification	Justification for use	Adverse effects and mitigation
No species introduced	N/A	N/A	N/A

Existing invasive species	Mitigation measures to prevent the spread or continued existence of invasive species
No existing invasive species	N/A

	Risks identified	Mitigation or preventative measure(s) taken
Invasive species	No risk identified	N/A

2.4.3 Ecosystem conversion

Brascarbon projects are developed in confined areas, within swine farm properties, which have their activity ongoing for a long time, hence without any existing ecosystems.

	Risks identified	Mitigation or preventative measure(s) taken
Ecosystem conversion	No risk identified	N/A

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The project is fully implemented since 05/01/2022, date in which the first farm begun the monitoring phase.

All sites included in the PD and the relevant dates of the project implementation for each site are described in the following table1. The project activity is composed by 10 sites (farms)and consists in gathering and destroying the biogas by the use of an enclosed flare, as previously stated. Hence, considering all the phases presented in table 1 bellow, and according with section 3.8 of the VCS Standard project start date definition, the project begun the generation of emissions reductions in the phase of monitoring phase, where all the biodigesters where fully installed, the flaring system put into place and the biogas started to be flared, therefore destroying methane and by consequence avoiding GHG emissions which are fully accounted since the electric system was installed and tested (PLC and monitoring equipment) and hence, where the monitoring process started (and also the crediting period, see section 1.9).

According with section 3.8 of the VCS Standard, the project start date of a non-AFOLU project is the date on which the project began generating GHG emission reductions or removals. Projects shall complete validation within specific timeframes from the project start date.

Table 4 – Relevant dates of project implementation.

Farm/Site Name	Brascarbon ID	Start Construction	Finish Construction	Start-up and Tests	Monitoring Start Date
Lote 23, Quadra 27	BCA-323MS1-19	01/05/21	10/11/21	29/12/2021	05/01/22
Partes do Lotes Rurais N° 24 e N°26 Quadra 37	BCA-324MS1-19	03/05/21	13/11/21	03/01/2021	06/01/22
Lotes 35,37 e 39 Quadra 39	BCA-325MS1-19	07/05/21	17/11/21	03/01/2021	06/01/22
Lote Rural N 56 Quadra 34	BCA-326MS1-19	25/04/21	15/10/21	03/01/2021	06/01/22
Quadra 61, Lote 43	BCA-327MS1-19	21/04/21	10/10/21	03/01/2021	06/01/22
Lote 04 e 06 Quadra 61, Lotes 03,05,07 e 09 Quadra 64	BCA-328MS1-19	25/05/21	05/11/21	03/01/2021	06/01/22
Sitio Nossa Senhora Aparecida - Parte dos Lotes 3 e 5 da Quadra 29	BCA-329MS1-19	19/05/21	09/11/21	29/12/2021	05/01/22
Lote 45, quadra 61	BCA-330MS1-19	23/05/21	19/11/21	29/12/2021	05/01/22
Lote 42 Q 8	BCA-331MS1-19	01/06/21	27/11/21	29/12/2021	05/01/22
Parte dos Lotes 46/48 Quadra 48	BCA-332MS1-19	03/06/21	29/11/21	29/12/2021	05/01/22

3.2 Deviations

3.2.1 Methodology Deviations

No methodology deviations apply to the current monitoring period.

3.2.2 Project Description Deviations

No project description deviations apply to the current monitoring period.

3.3 Grouped Projects

The project activity is not a grouped project.

3.4 Baseline Reassessment

Did the project undergo baseline reassessment during the monitoring period?

☐ Yes ☒ No

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	MCFj
Data unit	%
Description	Annual methane conversion factor for the baseline animal waste management system "j".
Source of data	Obtained from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, vol 4, chapter 10, Tables 10.17.
Value applied	79%
Justification of choice of data or description of measurement methods and procedures applied	The project activity is using a MCFj value of 79% for an uncovered anaerobic lagoon in a region with estimated temperatures between 23 and 26°C, corresponding to a temperate and warm climate. This information was obtained from the IPCC 2006, Chapter 10, Volume 4 - Table 10.17, p.10.45. The definition and application of this value align with the AMS-III.D.v.21 Small-scale Methodology, specifically in section 4.3 Baseline Emissions and 4.4 Project Activity Emissions. The project activity is located in the state of Mato Grosso do Sul, which has a predominant climatic zone of humid subtropical and tropical, with highly variable temperatures: • January is the warmest month, with average maximum temperatures of 34°C and minimums of 24°C. • July is the coldest month, with average maximum temperatures of 25°C and minimums that can drop to -2°C. • According to the environmental authority of Mato Grosso do Sul, during the 2022 and 2023 period, temperatures ranged from 8°C to 40°C, with an average between 17°C and 28°C. *Source: IMASUL - Environmental Quality Report 2022-2023* Considering that the IPCC references for this parameter depend on the project's site-specific climatic conditions and factors such as temperature, relative humidity, and the 2019 refinement, the IPCC suggests applying more detailed classification when determining the factor for a project. The classification includes: • Temperate (warm humid and warm dry) • Warm (tropical montane, tropical wet, tropical moist,

	tropical dry) Based on this classification, the project activity falls between tropical wet and slightly closer to tropical moist. Therefore, the applicable value cannot be 76% nor 80%, as mentioned in the table.
Purpose of data	Calculation of Baseline Emissions
Comments	No comments

Data / Parameter	MS%Bl,j
Data unit	Fraction
Description	Fraction of manure handled in baseline animal manure management system “j”.
Source of data	Project proponents
Value applied:	1
Justification of choice of data or description of measurement methods and procedures applied	100% of the manure will be handled per category T, system S and climate region k.
Purpose of Data	Calculation of Baseline Emissions
Comments	No comments

Data / Parameter	$VS_{default}$
Data unit	kg dry matter/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	Obtained from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, vol 4, chapter 10.
Value applied:	0.3 for Market Swine (finishers, nursery/weaners, boars) 0.46 for Breeding Swine (guilts, sows)
Justification of choice of data or description of measurement methods and procedures applied	Genetics and nutrition adopted for these farms as so as in western Europe. More details or information of the genetics can be obtained at the producers or at the Associação Brasileira dos Criadores de Suinos (Brazilian Swine Association). http://www.abcs.org.br/ The genetic source of production operation is originated from Annex I; The farm uses formulated feed rations optimized for the various stages of growth and animals category; The formulated feed rations can be validated through on farm record keeping; The project specific animal weights are more similar to developed country IPCC default values. Used of default factors as defined in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, chapter 10, volume 4, since that there is no national data for the default value for the volatile solid excretion rate per day on a dry-matter basis for a defined livestock population. The project activity is using the default value from the 2006 IPCC Guidelines and not the 2019 Refinement since, the default value in this newer publication provides less conservative results.
Purpose of Data	Calculation of Baseline Emissions
Comments	The four conditions to apply VS value of developed countries are fully applicable to developed countries can be used provided the following four conditions are satisfied: - *The genetic source of the livestock originates from an Annex I Party;* Genetics and nutrition adopted for these farms as so as in western Europe. More details or information of the genetics can be obtained at the producers or at the Associação Brasileira dos Criadores de Suinos (Brazilian Swine Association) – http://www.abcs.org.br/ and also at ASSUGLORIA (Associação de Suinoclutores de Glória de Dourados).

The genetic source of the livestock is therefore in compliance with this methodology requirement, which can be confirmed and verified by the genetic documents of the animals of each farm. These evidences were provided and assessed to assure their applicability to this requirement.

- *The farm uses formulated feed rations (FFR) which are optimized for the various animal(s), stage of growth, category, weight gain/productivity and/or genetics;*

The formulated feed rations are created according with the characteristics of the animals, their stage of growth, category, weight gain and genetics. Each farm possesses their FFR composition according with the type of animal(s) accommodated, which was confirmed and verified. These evidences were provided and assessed to assure their applicability this requirement.

- *The use of FFR can be validated (through on-farm record keeping, feed supplier, etc.);*

The formulated feed rations are part of the management system of the farms and therefore, each site possesses on-farm records which attest the FFR used. These evidences are also monitored on a monthly basis, according monitoring plan for the parameter FFR, as described in section 5.3., and the PP internal procedure POP 14.

- *The project specific animal weights are more similar to developed country IPCC default values.*

The W_{site} value considered for each category of swine is the result of an average weight of the animals of all farms included in the project, and this value was applied in the baseline calculation.

Finishers is the animal category that represents majority of all animals from the farms included in this PD, over 80% of the total number of animals (only three farms have other types of animals but not as significant as finishers). Finishers are considered to be “market swine” and presented an average weight of 90kg among all farms included in the PD by the time of the project’s registration (and this was the value adopted for the parameter Wsite). Taking into account the figures presented in Table 10 A-7 from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, chapter 10, the weights that are more similar to the project situation are those from the Western Europe region (50 kg) – the values form Latin America (28 kg), where the project is located, is even lower than Western Europe’s.

This situation is also observed for the remaining four categories of swine (nursery and boars for market swine, guilts and sows for breeding swine): the values are more similar to those adopted in Western Europe than in Latin America, especially regarding the Breeding Swine (guilts and sows) and in the Market Swine (boars) which presented an average weight of 210kg and 230 kg respectively, among all farms included in the PD by the time of the project’s registration (and this was the value adopted for the parameter Wsite). Taking into account the figures presented in Table 10 A-7 from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, chapter 10, the weights that are more similar to the project situation are those from the Western

	Europe region (198kg for Breeding Swine and 50 kg for Market Swine) – the values form Latin America (28kg for both classes of Breeding and Market Swine), where the project is located, is much lower than Western Europe's. Only in the category nursery (also Market Swine), which roughly represents 30% of all animals from the farms included in this PD, have an average weight of 20 kg, closer to the Latin America values than the Western Europe values. Therefore, is fair to consider that "the project specific animal weights are more similar to developed country IPCC default values" condition is fulfilled and that the VS adopted values for developed counties is in full compliance with the methodology requirements.

Data / Parameter	GWP_{CH_4}
Data unit	tCO_2e/tCH_4
Description	Global warming potential of CH_4
Source of data	IPCC Fifth Assessment Report: Climate Change 2013
Value applied:	28
Justification of choice of data or description of measurement methods and procedures applied	Conversion factor for metric tons of CH_4 to metric tons of CO_2 equivalent.
Purpose of Data	Calculation of Baseline Emissions and Project Emissions
Comments	No 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, Table 10-A7.
Value applied:	0.45
Justification of choice of data or description of measurement methods and procedures applied	Default value according to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories in western Europe region. Genetics and nutrition adopted for these farms as so as in western Europe. More details or information of the genetics can be obtained at the producers or at the Associação Brasileira dos Criadores de Suinos (Brazilian Swine Association). http://www.abcs.org.br/ The genetic source of production operation is originated from Annex I; The farm uses formulated feed rations optimized for the various stage of growth and animals category; The formulated feed ratings can be validated through on farm record keeping; The project specific animal weights are more similar to developed country IPCC default values. Used of factors as defined in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, chapter 10, volume 4, since that there is no national data for the Maximum methane producing potential of the volatile solid generated for animal type “LT”
Purpose of Data	Calculation of Baseline Emissions
Comments	The four conditions to apply B0 value of developed countries are fully applicable to developed countries can be used provided the following four conditions are satisfied: - *The genetic source of the livestock originates from an Annex I Party;* Genetics and nutrition adopted for these farms as so as in western Europe. More details or information of the genetics can be obtained at the producers or at the Associação Brasileira dos Criadores de Suinos (Brazilian Swine Association) – http://www.abcs.org.br/ and also at ASSUGLORIA (Associação de Suinoclutores de Glória de Dourados). The genetic source of the livestock is therefore in compliance with this methodology requirement, which can be confirmed and verified by the genetic documents of the animals of each farm. These evidences were provided and

assessed to assure their applicability to this requirement.

- *The farm uses formulated feed rations (FFR) which are optimized for the various animal(s), stage of growth, category, weight gain/productivity and/or genetics;*

The formulated feed rations are created according with the characteristics of the animals, their stage of growth, category, weight gain and genetics. Each farm possesses their FFR composition according with the type of animal(s) accommodated, which was confirmed and verified. These evidences were provided and assessed to assure their applicability this requirement.

- *The use of FFR can be validated (through on-farm record keeping, feed supplier, etc.);*

The formulated feed rations are part of the management system of the farms and therefore, each site possesses on-farm records which attest the FFR used. These evidences are also monitored on a monthly basis, according monitoring plan for the parameter FFR, as described in section 5.3., and the PP internal procedure POP 14.

- *The project specific animal weights are more similar to developed country IPCC default values.*

The W_{site} value considered for each category of swine is the result of an average weight of the animals of all farms included in the project, and this value was applied in the baseline calculation.

Finishers is the animal category that represents majority of all animals from the farms included in this PD, over 80% of the total number of animals (only three farms have other types of animals but not as significant as finishers). Finishers are considered to be “market swine” and presented an average weight of 90kg among all farms included in the PD by the time of the project’s registration (and this was the value adopted for the parameter Wsite). Taking into account the figures presented in Table 10 A-7 from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, chapter 10, the weights that are more similar to the project situation are those from the Western Europe region (50 kg) – the values form Latin America (28 kg), where the project is located, is even lower than Western Europe’s.

This situation is also observed for the remaining four categories of swine (nursery and boars for market swine, guilts and sows for breeding swine): the values are more similar to those adopted in Western Europe than in Latin America, especially regarding the Breeding Swine (guilts and sows) and in the Market Swine (boars) which presented an average weight of 210kg and 230 kg respectively, among all farms included in the PD by the time of the project’s registration (and this was the value adopted for the parameter Wsite). Taking into account the figures presented in Table 10 A-7 from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, chapter 10, the weights that are more similar to the project situation are those from the Western Europe region (198kg for Breeding Swine and 50 kg for Market Swine) – the values form Latin America (28kg for both classes of Breeding and Market Swine), where the project is located, is much lower than Western Europe’s. Only in the category nursery (also Market Swine),

	which roughly represents 30% of all animals from the farms included in this PD, have an average weight of 20 kg, closer to the Latin America values than the Western Europe values. Therefore, is fair to consider that "the project specific animal weights are more similar to developed country IPCC default values" condition is fulfilled and that the B0 adopted values for developed counties is in full compliance with the methodology requirements.

Data / Parameter	$W_{default}$
Data unit	kg
Description	Default average animal weight of a defined population at the project site.
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Table 10-A7.
Value applied:	Sows (breeding swine): 198 kg Finishers (market swine): 50 kg Nursery (market swine): 50 kg Boars (market swine): 50 kg Gilts (breeding swine): 198 kg
Justification of choice of data or description of measurement methods and procedures applied	Default value according to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories in western Europe region. Genetics and nutrition adopted for these farms as so as in western Europe. More details or information of the genetics can be obtained at the producers or at the Associação Brasileira dos Criadores de Suinos (Brazilian Swine Association). http://www.abcs.org.br/ The genetic source of production operation is originated from Annex I; The farm uses formulated feed rations optimized for the various stage of growth and animals category; The formulated feed ratings can be validated through on farm record keeping; The project specific animal weights are more similar to developed country IPCC default values. Used of factors as defined in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, chapter 10, volume 4, since that there is no national data for the Maximum methane producing potential of the volatile solid generated for animal type

	"LT" The project activity is using the default value from the 2006 IPCC Guidelines and not the 2019 Refinement since, the default value in this newer publication provides less conservative results.
Purpose of Data	Calculation of Baseline Emissions
Comments	The four conditions to apply $W_{DEFAULT}$ value of developed countries are fully applicable to developed countries can be used provided the following four conditions are satisfied: - *The genetic source of the livestock originates from an Annex I Party;* Genetics and nutrition adopted for these farms as so as in western Europe. More details or information of the genetics can be obtained at the producers or at the Associação Brasileira dos Criadores de Suinos (Brazilian Swine Association) – http://www.abcs.org.br/ and also at ASSUGLORIA (Associação de Suinoclutores de Glória de Dourados). The genetic source of the livestock is therefore in compliance with this methodology requirement, which can be confirmed and verified by the genetic documents of the animals of each farm. These evidences were provided and assessed to assure their applicability to this requirement. - *The farm uses formulated feed rations (FFR) which are optimized for the various animal(s), stage of growth, category, weight gain/productivity and/or genetics;* The formulated feed rations are created according with the characteristics of the animals, their stage of growth, category, weight gain and genetics. Each farm possesses their FFR composition according with the type of animal(s) accommodated, which was confirmed and verified. These evidences were provided and assessed to assure their applicability this requirement. - *The use of FFR can be validated (through on-farm record keeping, feed supplier, etc.);* The formulated feed rations are part of the management system of the farms and therefore, each site possesses on-farm records which attest the FFR used. These evidences are also monitored on a monthly basis, according monitoring plan for the parameter FFR, as described in section 5.3., and the PP internal procedure POP 14. - *The project specific animal weights are more similar to developed country IPCC default values.* The W_{site} value considered for each category of swine is the result of an average weight of the animals of all farms included in the project, and this value was applied in the baseline calculation. Finishers is the animal category that represents majority of all animals from the farms included in this PD, over 80% of the total number of animals (only three farms have other types of animals but not as significant as finishers). Finishers are considered to be "market swine" and presented an average weight of 90kg among all farms included in the PD by the time of the project's registration (and this was the value adopted for the parameter

	Wsite). Taking into account the figures presented in Table 10 A-7 from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, chapter 10, the weights that are more similar to the project situation are those from the Western Europe region (50 kg) – the values form Latin America (28 kg), where the project is located, is even lower than Western Europe's. This situation is also observed for the remaining four categories of swine (nursery and boars for market swine, guilts and sows for breeding swine): the values are more similar to those adopted in Western Europe than in Latin America, especially regarding the Breeding Swine (guilts and sows) and in the Market Swine (boars) which presented an average weight of 210kg and 230 kg respectively, among all farms included in the PD by the time of the project's registration (and this was the value adopted for the parameter Wsite). Taking into account the figures presented in Table 10 A-7 from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, chapter 10, the weights that are more similar to the project situation are those from the Western Europe region (198kg for Breeding Swine and 50 kg for Market Swine) – the values form Latin America (28kg for both classes of Breeding and Market Swine), where the project is located, is much lower than Western Europe's. Only in the category nursery (also Market Swine), which roughly represents 30% of all animals from the farms included in this PD, have an average weight of 20 kg, closer to the Latin America values than the Western Europe values. Therefore, is fair to consider that "the project specific animal weights are more similar to developed country IPCC default values" condition is fulfilled and that the $W_{default}$ adopted values for developed counties is in full compliance with the methodology requirements.

Data / Parameter	UF_b
Data unit	Fraction
Description	Model correction factor to account for model uncertainties
Source of data	FCCC/SBSTA/2003/10/Add.2, page 25.
Value applied:	0.94
Justification of choice of data or description of measurement methods and procedures applied	Default value according to methodology AMS-III.D
Purpose of Data	Calculation of Baseline Emissions
Comments	No comments.

Data / Parameter	$SPEC_{flare}$
Data unit	Temperature - °C Flow rate or heat flux - kg/h or m3/h Maintenance schedule - number of days
Description	Manufacturer's flare specifications for temperature, flow rate and maintenance schedule
Source of data	Flare manufacturer
Value applied:	The flare optimal conditions are, according the manufacturers specifications: Flow: between + 40% of the estimated flow (in m3/h) for any giving farm; Temperature: between 500ºC and 800ºC Maintenance: Annually, recommended by the manufacturer. The PP preforms monthly maintenance, both preventive and corrective, if needed.
Justification of choice of data or description of measurement methods and procedures applied	N/A
Purpose of Data	N/A
Comments	The maintenance schedule is not required if Option A is selected to determine flare efficiency of an enclosed flare

4.2 Data and Parameters Monitored

Data / Parameter	Tf
Data unit	°.C
Description	Combustion temperature of the flare
Source of data	Brascarbon Monitoring Report System
Description of measurement methods and procedures to be applied	Every 1 minute measurement and registration by a Control Logic Program (CLP)
Frequency of monitoring/recording	Every 1 minute measurement and registration by the PLC. Data is collected monthly from the field by the use of the pen drive. According to the Monitoring Operational Procedure POP-01
Value monitored	The aggregate values of Tf (hours with Tf above 500° C and hours with Tf below 500°C) can be found in the spreadsheet calculation file "ER Calculation MR02 - BCA-BRA-19_v4" in the folder MDy-PEpower,y,ex-post.
Monitoring equipment	Thermocouple [1]

Farm name	Site ID	Thermocouple Serial Number [2]	Calibration Certification Number	Calibration Date	Instalation Date [3]	Expiration Date
Lote 23, Quadra 27	BCA-323MS1-19	320348	CA 6930 21	08/11/21	05/01/22	04/01/23
		89316	CA 1711 22	08/03/22	03/01/23	02/01/24
		320363	CA 8378 23	04/10/23	30/12/23	29/12/24
Partes do Lotes Rurais N° 24 e N°26 Quadra 37	BCA-324MS1-19	320356	CA 6938 21	08/11/21	06/01/22	05/01/23
		166919	CA 1712 22	08/03/22	04/01/23	03/01/24
		320362	CA 8377 23	04/10/23	29/12/23	28/12/24
Lotes 35,37 e 39 Quadra 39	BCA-325MS1-19	320358	CA 6940 21	08/11/21	06/01/22	05/01/23
		166920	CA 1713 22	08/03/22	04/01/23	03/01/24
		320361	CA 8376 23	04/10/23	29/12/23	28/12/24
Lote Rural N 56 Quadra 34	BCA-326MS1-19	320359	CA 6941 21	08/11/21	06/01/22	05/01/23
		166924	CA 1717 22	08/03/22	04/01/23	03/01/24
		320360	CA 8375 23	04/10/23	29/12/23	28/12/24
Quadra 61, Lote 43	BCA-327MS1-19	320360	CA 6942 21	08/11/21	06/01/22	05/01/23
		81334	CA 1675 22	08/03/22	04/01/23	03/01/24
		320359	CA 8374 23	04/10/23	29/12/23	28/12/24
Lote 04 e 06 Quadra 61, Lotes 03,05,07 e 09 Quadra 64	BCA-328MS1-19	320361	CA 6943 21	08/11/21	06/01/22	05/01/23
		81332	CA 1673 22	08/03/22	04/01/23	03/01/24
		320358	CA 8373 23	04/10/23	29/12/23	28/12/24
Sitio Nossa Senhora Aparecida - Parte dos Lotes 3 e 5 da Quadra 29	BCA-329MS1-19	320347	CA 6929 21	08/11/21	05/01/22	04/01/23
		81333	CA 1674 22	08/03/22	03/01/23	02/01/24
		320357	CA 8372 23	04/10/23	30/12/23	29/12/24
Lote 45, quadra 61	BCA-330MS1-19	320339	CA 6921 21	08/11/21	05/01/22	04/01/23
		81337	CA 1677 22	08/03/22	03/01/23	02/01/24
		320356	CA 8371 23	04/10/23	30/12/23	29/12/24
Lote 42 Q 28	BCA-331MS1-19	320354	CA 6936 21	08/11/21	05/01/22	04/01/23
		81338	CA 1678 22	08/03/22	03/01/23	02/01/24
		320355	CA 8370 23	04/10/23	30/12/23	29/12/24
Parte dos Lotes 46/48 Quadra 48	BCA-332MS1-19	320355	CA 6937 21	08/11/21	05/01/22	04/01/23
		81340	CA 1679 22	08/03/22	03/01/23	02/01/24
		320354	CA 8369 23	04/10/23	30/12/23	29/12/24

Monitoring equipment type:	Standard Thermocouple from ALUTAL
Accuracy class:	± 1.5 °C or ± 0.25%
Calibration frequency:	Every year of continuous operation (counted from the date of installation)

QA/QC procedures to be applied	Check the data for more accurate information.
Purpose of the data	Calculation of Baseline Emissions and Project Emissions
Calculation method	Monitoring operational procedure POP-01 can be found at the Brascarbon Operational Procedure Manual
Comments	Check the data for more accurate information.

Data / Parameter	W_{site}
Data unit	kg
Description	Average animal weight of a defined livestock population at the project site in year
Source of data	Brascarbon Monitoring Report System
Description of measurement methods and procedures to be applied	The data collection is realized quarterly by each farm owner, together with ASSUGLORIA (Associação de Suinoclutores de Glória de Dourados) and provided to the PP. ASSUGLORIA is the Pig Producers Association to whom the farms contained in the PD are associated; its main role is to act as a third party responsible for the assurance of all the logistics associated with the swine producers, providing the animal nutrition, genetics and all the overall animal weight.
Frequency of monitoring/recording	Quarterly (based on sampling following ASSUGLORIA's internal procedure) and at full weight of the batch of pigs every time it leaves the farms (each batch stays around 5 to 6 months per farm).
Value monitored	Annual follow-up of the documentation to check the expiration date, changes in the production lay-out and surroundings of the digester. Actions within the property and around the biodigesters should be taken both by the contractor and the client Brascarbon. Photos should be attached to the annual inspection report to prove that the system of wastewater management has not changed namely regarding the following items: pipes, gutters, roofs, fences, trees, control panel, flare, terminal boxes and general cleaning. Use of the annex attached at the operational procedure POP-16

Monitoring equipment	N/A
QA/QC procedures to be applied	Check of the site records and documents. The values of the quarterly weights presented by ASSUGLORIA's (following the association's internal procedures) to the PP are cross-checked against two different credible sources: - reference figures from EMBRAPA (an undisputed Brazilian Agricultural Research Corporation nationally recognized for these scope) for each category; and - the figures provided by ASSUGLORIA when each of the swine batches exits each farm (each batch stays around 5 to 6 months per farm), as explained below. Here ASSUGLORIA provides invoices with 100% of the animals weight (and number), allowing a full cross- check with the weight values provided and assuring that all the information is accurate. - If the PP verifies during the cross-check any discrepancy between the values provided quarterly and the full weighting and counting of the animals in the invoices provided by ASSUGLORIA's each time any batch exits a giving farm, those values will be updated accordingly with these real figures.
Purpose of the data	Calculation of Baseline Emissions and Project Emissions
Calculation method	The current practice of swine farms in Brazil is that each farm receives new batches of animals every 5 to 6 months (which is also the average time that a batch stays in a farm) and the producer, together with ASSUGLORIA, performs regular and periodical visits to each farm in order to assess and evaluate the correct development of each batch in terms of growing/weighting of the animals (according with what is expected at each growing stage of a given batch). It is important to highlight that both the farm owners ASSUGLORIA rely on the quality of the values measured since their sole professional occupation is the pig production and, therefore, it is within their best interests to have a correct and reliable way to assess the weighting of the animals (which is their business) based on their experience and internal procedures. Every 5 to 6 months (depending on each batch and farm), the animal batches leave the farms and they are, in this specific situation, 100% weighted by the producers, together with ASSUGLORIA – this weighting is undertaken to the totality of animal presented in the batch since the profits associated with the animal production are weight based. According with ASSUGLORIA a possible range of +/- 5kg within the animal growing is considered a normal fluctuation and therefore admissible. Each time a batch exits a farm, ASSUGLORIA provides the invoices to attest the feasibility of the figures adopted, allowing a complete and thorough cross-check by PP of all the data used for this parameter.

	Monitoring operational procedure POP-016
Comments	it is important to clarify that the current MR is in complianc with the guidance set forth in methodology AMS-III.D. version 21, which states that monitoring must reflect the actual conditions and operational practices of the project. In this case, the project comprises 10 sites or farms, and of these, only one site – Lote 23 Quadra 27 - SITE ID BCA-323MS1-19 – includes a full production cycle, as defined in the PD and MR. The remaining nine sites operate exclusively as swine finishing units (over 80% of the entire swine population for the current monitoring period). According to the definition of the Wsite parameter in the methodology, this represents the average animal weight of a defined livestock population at the project site (kg). Although the suggested monitoring frequency is annually, due to the predominance of the finishing stage across the farms, this parameter is monitored quarterly (based on sampling following ASSUGLORIA's internal procedure) and at the full weight of each batch of pigs every time it leaves the farms (each batch stays around 5 to 6 months per farm). This approach allows for greater accuracy in the information collected. The data presented were collected during field visits and through the monitoring activities carried out by the Brascarbon technical team, in coordination with the project sites owners. This information was also provided and validated with records from ASSUGLORIA, the company that operates and oversees the participating sites

Data / Parameter	SITE INSPECTION
Data unit	N/A
Description	Inspection on the site considering relevant regulation and the infra-structure of the site
Source of data	Brascarbon Monitoring Report System
Description of measurement methods and procedures to be applied	Annual follow-up of the documentation to check the expiration date, changes in the production lay-out and surroundings of the digester. Actions within the property and around the biodigesters should be taken both by the contractor and the client Brascarbon. Photos should be attached to the annual inspection report to prove that the system of wastewater management has not changed namely regarding the following items: pipes, gutters, roofs, fences, trees, control panel, flare, terminal boxes and general cleaning. Use of the annex attached at the operational procedure POP-02
Frequency of monitoring/recording	Annually
Value monitored	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	A copy of the documents is submitted to the central office to the Quality Coordinator, who will verify the data, controlling it through an electronic system and ensuring its integrity.
Purpose of the data	Calculation of Baseline Emissions and Project Emissions
Calculation method	N/A
Comments	Monitoring operational procedure POP-02 can be found at the Brascarbon Operational Procedure Manual

Data / Parameter	$N_{LT,y}$
Data unit	Number
Description	Annual average number of animals of type “LT” in year “y”
Source of data	Calculated. Data for calculation gathered according with Brascarbon Monitoring Report System
Description of measurement methods and procedures to be applied	Checking of the documentation located at the confined animal production and use of the table annexed at the operational procedure POP-03. Use of the Equation 4 established in the section 4 step 2 item B – determination of the annual average number of animals.
Frequency of monitoring/recording	Monthly
Value monitored	The values of NLT,y can be found in the spreadsheet calculation file “ER Calculation MR02 - BCA-BRA-19_v4” in the folder BEy ex-post – PEy ex-post.
Monitoring equipment	N/A
QA/QC procedures to be applied	A copy of the documents is submitted to the central office to the Quality Coordinator, who will verify the data, controlling it through an electronic system and ensuring its integrity.
Purpose of the data	Calculation of Baseline Emissions and Project Emissions
Calculation method	N/A
Comments	Monitoring operational procedure POP-03 can be found at the Brascarbon Operational Procedure Manual

Data / Parameter	$BG_{burnt,y}$
Data unit	m^3
Description	Biogas flared or used as a fuel in the year y.
Source of data	Brascarbon Monitoring Report System
Description of measurement methods and procedures to be applied	Minute by minute measurement and cumulative registration by a Control Logic Program (CLP). Monthly the registered data will be recovered in the data logger (CLP) of the volume in the local control panel according to the operational procedure POP-04
Frequency of monitoring/recording	Continuously recording. Every 1 minute measurement and registration by the PLC. Data is collected monthly from the field.
Value monitored	The values of BGburnt,y can be found in the spreadsheet calculation file "ER Calculation MR02 - BCA-BRA-19_v4" in the folder MDy-PEpower,y,ex-post.
Monitoring equipment	Flow Meter [1][2] Calibration Control Site ID / Farm Name / Flow Meter Serial Number / Calibration Certification Number / Instalation Calibration Date [3] / Expiration Date BCA-323MS1-19 / Lote 23, Quadra 27 / D700563412A / EN 10204 - 2.1 / 05/01/22 / 04/01/24 BCA-324MS1-19 / Partes do Lotes Rurais N° 24 e N°26 Quadra 37 / B600703412A / EN 10204 - 2.1 / 06/01/22 / 05/01/24 BCA-325MS1-19 / Lotes 35,37 e 39 Quadra 39 / C401643412A / EN 10204 - 2.1 / 06/01/22 / 05/01/24 BCA-326MS1-19 / Lote Rural N 56 Quadra 34 / B601203412A / EN 10204 - 2.1 / 06/01/22 / 05/01/24 BCA-327MS1-19 / Quadra 61, Lote 43 / C401613412A / EN 10204 - 2.1 / 06/01/22 / 05/01/24 BCA-328MS1-19 / Lote 04 e 06 Quadra 61, Lotes 03,05,07 e 09 Quadra 64 / C401693412A / EN 10204 - 2.1 / 06/01/22 / 05/01/24 BCA-329MS1-19 / Sitio Nossa Senhora Aparecida - Parte dos Lotes 3 e 5 da Quadra 2 / D700413412A / EN 10204 - 2.1 / 05/01/22 / 04/01/24 BCA-330MS1-19 / Lote 45, quadra 61 / C401313412A / EN 10204 - 2.1 / 05/01/22 / 04/01/24 BCA-331MS1-19 / Lote 42 Q 28 / C401593412A / EN 10204 - 2.1 / 05/01/22 / 04/01/24 BCA-332MS1-19 / Parte dos Lotes 46/48 Quadra 48 / C401363412A / EN 10204 - 2.1 / 05/01/22 / 04/01/24 Monitoring equipment type: Endress+Hauser thermal mass flow meter t-trend - ATT12 Accuracy class: ± 5% of factory full scale Calibration frequency: Every 2 years of continuous operation (counted from the date of installation)
QA/QC procedures to be applied	Check the monthly registers sent from the field to proceed with the emissions reductions calculation. The registers are read and stored every minute continuously in the CLP. The data is recovered from the CLP every month. The QA/QC also controls and assures the calibration program of the flow meter.
Purpose of the data	Calculation of Baseline Emissions
Calculation method	N/A

Comments	Monitoring operational procedure POP-04 can be found at the Brascarbon Operational Procedure Manual

Data / Parameter	W_{CH_4}
Data unit	%
Description	Methane content in biogas in the year “y”
Source of data	Brascarbon Monitoring Report System
Description of measurement methods and procedures to be applied	Use of methane concentration analysis instrument on dry basis in the sampling point at piping to the flare.
Frequency of monitoring/recording	Periodical. To assure. that the monitoring frequency provides a 90% confidence level and 10% precision. The adequate frequency will be determined through a statistical analysis of the methane fraction variation, based on methane fraction data gathered on a group of farms per region during a certain period time. According with the data/parameter table 6 of the methodology AMS III.D version 21.0, The fraction of methane in the biogas should be measured with a continuous analyser (values are recorded with the same frequency as the flow) or, with periodical measurements at a 90/10 confidence/precision level by following General guidelines for sampling and surveys for SSC project activities, or, alternatively a default value of 60% methane content can be used The option chosen was periodical measurements at a 90/10 confidence/precision level. For details, please see Section regarding the Sampling Plan.
Value monitored	The values of WCH4,y can be found in the spreadsheet calculation file “ER Calculation MR02 - BCA-BRA-19_v4” in the folder MDy-PEpower,y,ex-post.

Monitoring equipment

Biogas Analyser [1][2] Calibration Control

Site ID	Farm Name	Biogas Analyser Serial Number	Calibration Certificate Number	Last Calibration Date [3]	Expiration Date
BCA-323MS1-19	Lote 23, Quadra 27				
BCA-324MS1-19	Partes do Lotes Rurais N° 24 e N°26				
BCA-325MS1-19	Lotes 35,37 e 39 Quadra 39				
BCA-326MS1-19	Lote Rural N 56 Quadra 34	BM 11042	RBC.0902.22.rev.00	20/07/2022	19/01/2023
BCA-327MS1-19	Quadra 61, Lote 43	BM 11042	RBC.0025.23.rev.00	10/01/2023	09/06/2023
BCA-328MS1-19	Lote 04 e 06 Quadra 61, Lotes 03,05,07	BM 11042	RBC.0123.23.rev.00	07/05/2023	06/11/2023
BCA-329MS1-19	Sitio Nossa Senhora Aparecida - Parte	BM 11042	RBC.0450.23.rev.00	03/11/2023	02/05/2024
BCA-330MS1-19	Lote 45, quadra 61				
BCA-331MS1-19	Lote 42 Q 8				
BCA-332MS1-19	Parte dos Lotes 46/48 Quadra 48				

Monitoring equipment type:	Biogas Check Portable Digital Analyzer from Geotech/Landtech
Accuracy class:	• **CH4:** ± 0.5% from 0-5% CH4 content; ± 1.0% from 5-15% CH4 content; ± 3.0% from 15%-full scale CH4 content • **Temperature:** ± 0.2°C (Biogas check analyzer accuracy) ± 0.5°C (temperature probe accuracy) • **Pressure**: ± 4mbar typically and ±15 mbar maximum
Calibration frequency:	Every 6 months

QA/QC procedures to be applied

Check the registers in the generated documents. Control and assure the calibration program of the instrument.

Purpose of the data

Calculation of Baseline Emissions

Calculation method

N/A

Comments

Monitoring frequency to be determined to attend 90% confidence level and 10% precision. To assure that the monitoring frequency provides a 90% confidence level and 10% precision, the adequate frequency will be determined through a statistical analysis of the methane fraction variation, based on methane fraction data gathered on a group of farms per region during a certain period time. The results will be analyzed to guarantee that the required confidence/precision level has been met and the monitoring frequency will be, at least, monthly. For details, please see Section regarding the Sampling Plan.

The equipment used can directly measure methane content in the biogas. The methane content measurement will be carried out close to a location in the system where a biogas flow measurement takes place, and on the same basis (wet or dry) as required by the methodology.

Monitoring operational procedure POP-05 can be found at the Brascarbon Operational Procedure Manual

Data / Parameter	T_{biogas}
Data unit	^{o}C
Description	Temperature of the biogas at operation conditions
Source of data	Brascarbon Monitoring Report System
Description of measurement methods and procedures to be applied	Measurement with a local thermometer, with the same equipment as the methane content and at the same time, in the sampling point at piping to the flare. Measurement according with Operational Procedure POP-06.
Frequency of monitoring/recording	Periodical. To assure. that the monitoring frequency provides a 90% confidence level and 10% precision. The adequate frequency will be determined through a statistical analysis of the methane fraction variation, based on methane fraction data gathered on a group of farms per region during a certain period time. According with the data/parameter table 6 of the methodology AMS III.D version 21.0, The fraction of methane in the biogas should be measured with a continuous analyser (values are recorded with the same frequency as the flow) or, with periodical measurements at a 90/10 confidence/precision level by following General guidelines for sampling and surveys for SSC project activities, or, alternatively a default value of 60% methane content can be used The option chosen was periodical measurements at a 90/10 confidence/precision level. For details, please see Section regarding the Sampling Plan.
Value monitored	The values of Tbiogas can be found in the spreadsheet calculation file “ER Calculation MR02 - BCA-BRA-19_v4” in the folder MDy-PEpower,y,ex-post.
Monitoring equipment	Biogas Analyser [1][2] Calibration Control

Site ID	Farm Name	Biogas Analyser Serial Number	Calibration Certificate Number	Last Calibration Date [3]	Expiration Date
BCA-323MS1-19	Lote 23, Quadra 27				
BCA-324MS1-19	Partes do Lotes Rurais N° 24 e N°26				
BCA-325MS1-19	Lotes 35,37 e 39 Quadra 39				
BCA-326MS1-19	Lote Rural N 56 Quadra 34	BM 11042	RBC.0902.22.rev.00	20/07/2022	19/01/2023
BCA-327MS1-19	Quadra 61, Lote 43	BM 11042	RBC.0025.23.rev.00	10/01/2023	09/06/2023
BCA-328MS1-19	Lote 04 e 06 Quadra 61, Lotes 03,05,07	BM 11042	RBC.0123.23.rev.00	07/05/2023	06/11/2023
BCA-329MS1-19	Sitio Nossa Senhora Aparecida - Parte	BM 11042	RBC.0450.23.rev.00	03/11/2023	02/05/2024
BCA-330MS1-19	Lote 45, quadra 61				
BCA-331MS1-19	Lote 42 Q 8				
BCA-332MS1-19	Parte dos Lotes 46/48 Quadra 48				

Monitoring equipment type:	Biogas Check Portable Digital Analyzer from Geotech/Landtech

	<table><tr><td>Accuracy class:</td><td>• **CH4:** ± 0.5% from 0-5% CH4 content; ± 1.0% from 5-15% CH4 content; ± 3.0% from 15%-full scale CH4 content • **Temperature:** ± 0.2°C (Biogas check analyzer accuracy) ± 0.5°C (temperature probe accuracy) • **Pressure**: ± 4mbar typically and ±15 mbar maximum</td></tr><tr><td>Calibration frequency:</td><td>Every 6 months</td></tr></table>
QA/QC procedures to be applied	Check the registers in the generated documents and thermometer calibration
Purpose of the data	Calculation of Baseline Emissions
Calculation method	N/A
Comments	Monitoring frequency to be determined to attend 90% confidence level and 10% precision. To assure that the monitoring frequency provides a 90% confidence level and 10% precision, the adequate frequency will be determined through a statistical analysis of the methane fraction variation, based on methane fraction data gathered on a group of farms per region during a certain period time. The results will be analyzed to guarantee that the required confidence/precision level has been met and the monitoring frequency will be, at least, monthly. For details, please see Section regarding the Sampling Plan. The equipment used can directly measure methane content in the biogas. The methane content measurement will be carried out close to a location in the system where a biogas flow measurement takes place, and on the same basis (wet or dry) as required by the methodology. Monitoring operational procedure POP-05 can be found at the Brascarbon Operational Procedure Manual

Data / Parameter	$D_{CH4,y}$
Data unit	t/m^3
Description	Density of the methane combusted
Source of data	Brascarbon Monitoring Report System
Description of measurement methods and procedures to be applied	Calculation according to the Operational Procedure POP-07. Use of the formula considering pressure, temperature and molecular mass of methane
Frequency of monitoring/recording	Monthly
Value monitored	The values of DCH4,y can be found in the spreadsheet calculation file“ER Calculation MR02 - BCA-BRA-19_v4” in the folder MDy- PEpower,y,ex-post.
Monitoring equipment	N/A
QA/QC procedures to be applied	Check and approve the density value calculation.
Purpose of the data	Calculation of Baseline Emissions
Calculation method	N/A
Comments	Monitoring operational procedure POP-07 can be found at the Brascarbon Operational Procedure Manual. Reference: Tool to determine project emissions from flaring gases containing methane.

Data / Parameter	Q_{DM}
Data unit	N/A
Description	Sludge soil application
Source of data	Brascarbon Monitoring Report System
Description of measurement methods and procedures to be applied	Supervision in the field
Frequency of monitoring/recording	Defined according to the digester performance
Value monitored	Sludge was not removed during this monitoring period.
Monitoring equipment	N/A
QA/QC procedures to be applied	Check the registers in the generated documents.
Purpose of the data	N/A
Calculation method	N/A
Comments	Monitoring operational procedure POP-09 can be found at the Brascarbon Operational Procedure Manual

Data / Parameter	FE or $\eta_{flare,\,h}$
Data unit	%
Description	Enclosed Flare Efficiency
Source of data	Brascarbon Monitoring Report System
Description of measurement methods and procedures to be applied	Enclosed flare (low height) is used in the entire project. Brascarbon registers the gas flow sent to the flares and the combustion temperature of the flares every minute. A 80% efficiency for a specific hour is considered if the following conditions are met for all minutes in that specific hours: (i) all temperature records are above or equal to 500° Celsius and (ii) the temperature of the flare (TEG.m) and the flow rate of the residual gas to the flare (FRG,m) are within the manufacturer's specification for the flare (SPECflare). (iii) The flame is detected in minute m (Flamem). Otherwise, a 0% efficiency for the specific hour is applied if at any minute the records of temperature measurement are below 500° Celsius or the flare is operating outside of the manufacturer's specification (SPECflare). This discount will be applied to the volume of that specific hour since it is a more conservative approach than to discount in the average of the flare efficiency percentage for any giving hour.
Frequency of monitoring/recording	Every 1 minute measurement and registration by a CLP of flare temperature and biogas flow rate. Data is recovered monthly for Flare Efficiency hourly calculation
Value monitored	80%
Monitoring equipment	N/A
QA/QC procedures to be applied	Check the registers in the generated documents. The enclosed flare will regularly undergo a maintenance process subject to the appropriate industrial standards and/or manufacturer´s specifications in order to ensure measurement accuracy.

	The Monitoring Operational Procedure POP-08 was developed to calculate the flare efficiency and it can be found at the Brascarbon Operational Procedure Manual.
Purpose of the data	Calculation of Baseline Emissions and Project Emissions
Calculation method	N/A
Comments	The Monitoring Operational Procedure POP-08 was developed to calculate the monthly efficiency and it can be found at the Brascarbon Operational Procedure Manual.

Data / Parameter	$ER_{y,ex\text{-}post}$
Data unit	t CO2e
Description	Ex-post emission reductions achieved by the project activity based on monitored values for the year “y”.
Source of data	Calculated. Data for calculation gathered according with Brascarbon Monitoring Report System
Description of measurement methods and procedures to be applied	Comparison of the baseline with the actual measured data according to the operational procedure POP-17. The minimum value between the $BE_{ex\text{-}post}$ and MD_y will be chosen for the calculation of the $ER_{y\ ex\text{-}post}$.
Frequency of monitoring/recording	Yearly
Value monitored	The values of ERy,ex-post can be found in the spreadsheet calculation file “ER Calculation MR02 - BCA-BRA-19_v4” in the folder ERy ex-post.
Monitoring equipment	N/A
QA/QC procedures to be applied	Check the ER calculation and the registers in the generated documents.
Purpose of the data	N/A
Calculation method	According with the formulas presented in the current Section
Comments	Used to cap the maximal emission reduction in any year. Monitoring operational procedure POP-17 can be found at the Brascarbon Operational Procedure Manual

Data / Parameter	FFR
Data unit	N/A
Description	Formulated Feed Rations
Source of data	Brascarbon Monitoring Report System
Description of measurement methods and procedures to be applied	According to the Operational Procedure POP-14
Frequency of monitoring/recording	Monthly
Value monitored	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	Check the registers and/or food purchases records on the farm.
Purpose of the data	Calculation of Baseline Emissions (to validate B0 and VS values used)
Calculation method	N/A
Comments	Monitoring operational procedure POP-14 can be found at the Brascarbon Operational Procedure Manual

Data / Parameter	P_{biogas}
Data unit	mbar
Description	Pressure of the biogas at operation conditions
Source of data	Brascarbon Monitoring Report System
Description of measurement methods and procedures to be applied	Measurement with portable local pressure gauge, with the same equipment as the methane content and at the same time, in the sampling point at piping to the flare. Measurement according with Operational Procedure POP-13.
Frequency of monitoring/recording	Periodical. To assure. that the monitoring frequency provides a 90% confidence level and 10% precision. The adequate frequency will be determined through a statistical analysis of the pressure variation, based on pressure data gathered on a group of farms per region during a certain period time. According to the data/parameter table 6 of the methodology AMS III.D version 21.0, the pressure of the biogas at the flow measurement site is not measured by a continuous analyser, the frequency of periodical measurements at a 90/10 statistical confidence/precision level shall be determined following the "Standard for sampling and surveys for CDM project activities and programme of activities". The minimum sample size required would be dependent on the variability in the values of pressure, which will be determined in the sampling plan. For details, please see Section regarding the Sampling Plan.
Value monitored	The values of Pbiogas can be found in the spreadsheet calculation file "ER Calculation MR02 - BCA-BRA-19_v4" in the folder MDy-PEpower,y,ex-post.
Monitoring equipment	Biogas Analyser [1][2] Calibration Control

Site ID	Farm Name	Biogas Analyser Serial Number	Calibration Certificate Number	Last Calibration Date [3]	Expiration Date
BCA-323MS1-19	Lote 23, Quadra 27				
BCA-324MS1-19	Partes do Lotes Rurais N° 24 e N°26				
BCA-325MS1-19	Lotes 35,37 e 39 Quadra 39				
BCA-326MS1-19	Lote Rural N 56 Quadra 34	BM 11042	RBC.0902.22.rev.00	20/07/2022	19/01/2023
BCA-327MS1-19	Quadra 61, Lote 43	BM 11042	RBC.0025.23.rev.00	10/01/2023	09/06/2023
BCA-328MS1-19	Lote 04 e 06 Quadra 61, Lotes 03,05,07	BM 11042	RBC.0123.23.rev.00	07/05/2023	06/11/2023
BCA-329MS1-19	Sitio Nossa Senhora Aparecida - Parte	BM 11042	RBC.0450.23.rev.00	03/11/2023	02/05/2024
BCA-330MS1-19	Lote 45, quadra 61				
BCA-331MS1-19	Lote 42 Q 8				
BCA-332MS1-19	Parte dos Lotes 46/48 Quadra 48				

Monitoring equipment type:	Biogas Check Portable Digital Analyzer from Geotech/Landtech
Accuracy class:	• **CH4:** ± 0.5% from 0-5% CH4 content; ± 1.0% from 5-15% CH4 content; ± 3.0% from 15%-full scale CH4 content • **Temperature:** ± 0.2°C (Biogas check analyzer accuracy) ± 0.5°C (temperature

		probe accuracy) • **Pressure**: ± 4mbar typically and ±15 mbar maximum
	Calibration frequency:	Every 6 months
QA/QC procedures to be applied	Check the registers in the generated documents and equipment for measurement calibration	
Purpose of the data	Calculation of Baseline Emissions	
Calculation method	N/A	
Comments	Monitoring frequency to be determined to attend 90% confidence level and 10% precision. To assure that the monitoring frequency provides a 90% confidence level and 10% precision, the adequate frequency will be determined through a statistical analysis of the methane fraction variation, based on methane fraction data gathered on a group of farms per region during a certain period time. The results will be analyzed to guarantee that the required confidence/precision level has been met and the monitoring frequency will be, at least, monthly. For details, please see Section regarding the Sampling Plan. The equipment used can directly measure methane content in the biogas. The methane content measurement will be carried out close to a location in the system where a biogas flow measurement takes place, and on the same basis (wet or dry) as required by the methodology. Monitoring operational procedure POP-05 can be found at the Brascarbon Operational Procedure Manual	

Data / Parameter	GENETIC SOURCE
Data unit	N/A
Description	Genetic source from annex I party
Source of data	Brascarbon Monitoring Report System
Description of measurement methods and procedures to be applied	Data and records from the confined feed animal operation. According Operational Procedure POP-15
Frequency of monitoring/recording	Annually
Value monitored	Western Europe
Monitoring equipment	N/A
QA/QC procedures to be applied	Check data and records from the farm operation
Purpose of the data	Calculation of Baseline Emissions (to validate Bo and VS values used)
Calculation method	N/A
Comments	Monitoring operational procedure POP-15 can be found at the Brascarbon Operational Procedure Manual

Data / Parameter	$MS_{\%\ i,y}$
Data unit	Fraction
Description	Fraction of manure handled in project emissions in system “i”, year “y”.
Source of data	Brascarbon Monitoring Report System
Description of measurement methods and procedures to be applied	During the site inspection, checking if changes in the adopted waste management system and surroundings of the digester was modified from the original proposal project activity. Use of the annex attached at the operational procedure POP-02
Frequency of monitoring/recording	Annually, based on daily measurement and monthly aggregation
Value monitored	During the site inspection, it was confirmed that no changes in the manure management system occurred and all the manure was handled in the project facilities. Value is therefore 1
Monitoring equipment	N/A
QA/QC procedures to be applied	A copy of the documents is submitted to the central office to the Quality Coordinator, who will verify the data, controlling it through an electronic system and ensuring its integrity.
Purpose of the data	Calculation of Project Emissions
Calculation method	N/A
Comments	Monitoring operational procedure POP-02 can be found at the Brascarbon Operational Procedure Manual

Data / Parameter	$N_{da,y}$
Data unit	Number
Description	Number of days animal is alive in the farm, in year “y”
Source of data	Brascarbon Monitoring Report System
Description of measurement methods and procedures to be applied	Checking of the documentation located at the confined animal production and use of the operational procedure POP-03
Frequency of monitoring/recording	Annually, based on monthly records
Value monitored	Please see explanation in data/parameter NLT,y
Monitoring equipment	N/A
QA/QC procedures to be applied	Information is cross-checked with the documents available at the confined feed operation including, when available, animal purchase and sale records or information on food purchase records.
Purpose of the data	Calculation of Baseline Emissions
Calculation method	N/A
Comments	Monitoring operational procedure POP-03 can be found at the Brascarbon Operational Procedure Manual

Data / Parameter	$N_{p,y}$
Data unit	Number
Description	Number of animals produced annually of type “LT” in year “y”
Source of data	Brascarbon Monitoring Report System
Description of measurement methods and procedures to be applied	Checking of the documentation located at the confined animal production and use of the table annexed at the operational procedure POP-03
Frequency of monitoring/recording	Annually, based on monthly records
Value monitored	Please see explanation in data/parameter NLT,y
Monitoring equipment	N/A
QA/QC procedures to be applied	Information is cross-checked with the documents available at the confined feed operation including, when available, animal purchase and sale records or information on food purchase records.
Purpose of the data	Calculation of Baseline Emissions
Calculation method	N/A
Comments	Monitoring operational procedure POP-03 can be found at the Brascarbon Operational Procedure Manual

Data / Parameter	nd_y
Data unit	Number
Description	Number of days in year "y" where the treatment plant was operational
Source of data	Brascarbon Monitoring Report System
Description of measurement methods and procedures to be applied	The number of days the animal manure management system is operational can be determined by the POP 24 – days of functioning, where it is monitored the number of days in a year "y" that the treatment plant has operated. According to the operational procedure POP-24
Frequency of monitoring/recording	Annually, based on daily records and monthly aggregation
Value monitored	The values of ndy can be found in the spreadsheet calculation file "ER Calculation MR02 - BCA-BRA-19_v4" in the folder BEy ex-post – PEy ex-post.
Monitoring equipment	N/A
QA/QC procedures to be applied	The documentation should be sent to the central office to the Quality Coordinator, who will verify the data, controlling and ensuring its integrity.
Purpose of the data	Calculation of Baseline Emissions
Calculation method	N/A
Comments	Monitoring operational procedure POP-24 can be found at the Brascarbon Operational Procedure Manual In compliance with applicability condition 3(c) of methodology AMS-III.D version 21, the project sites are confirmed to present suitable climatic conditions for anaerobic methane generation in the baseline scenario. Specifically, meteorological data obtained from IMASUL and INMET (Meteorological Institute of Brazil) for the project location indicate that the minimum monthly average temperature remains above 5 °C throughout the year, which supports the validity of the methodology's applicability condition.

	Based on this, it is appropriate to consider ndy = 365, as methane would be continuously generated in the absence of the project activity. This assumption aligns with paragraph 16(c) of AMS-III.D v.21.

Data / Parameter	$VS_{LT,y}$
Data unit	kg dry matter/animal/year
Description	Volatile solids for livestock *LT* entering the animal manure management system in year *y*
Source of data	Calculated. Data for calculation gathered according with Brascarbon Monitoring Report System
Description of measurement methods and procedures to be applied	N/A
Frequency of monitoring/recording	Annually
Value monitored	The values of ndy can be found in the spreadsheet calculation file "ER Calculation MR02 - BCA-BRA-19_v4" in the folder BEy ex-post – PEy ex-post.
Monitoring equipment	N/A
QA/QC procedures to be applied	Check the registers in the generated documents. Control and assure the correct calculation of the parameter.
Purpose of the data	Calculation of Baseline Emissions
Calculation method	N/A
Comments	The four conditions to apply B0 value of developed countries are fully applicable to developed countries can be used provided the following four conditions are satisfied: - *The genetic source of the livestock originates from an Annex I Party;* Genetics and nutrition adopted for these farms as so as in western Europe. More details or information of the genetics can be obtained at the producers or at the Associação Brasileira dos Criadores de Suinos (Brazilian Swine Association) – http://www.abcs.org.br/. The genetic source of the livestock is therefore in compliance with this

methodology requirement, which can be confirmed and verified by the genetic documents of the animals of each farm. These evidences were provided and assessed to assure their applicability to this requirement.

- *The farm uses formulated feed rations (FFR) which are optimized for the various animal(s), stage of growth, category, weight gain/productivity and/or genetics;*

The formulated feed rations are created according with the characteristics of the animals, their stage of growth, category, weight gain and genetics. Each farm possesses their FFR composition according with the type of animal(s) accommodated, which was confirmed and verified. These evidences were provided and assessed to assure their applicability this requirement.

- The use of FFR can be validated (through on-farm record keeping, feed supplier, etc.);

The formulated feed rations are part of the management system of the farms and therefore, each site possesses on-farm records which attest the FFR used. These evidences are also monitored on a monthly basis, according monitoring plan for the parameter FFR, as described in section 5.3, and the PP internal procedure POP 14.

- The project specific animal weights are more similar to developed country IPCC default values.

The Wsite value considered for each category of swine is the result of an average weight of the animals of all farms included in the project, and this value was applied in the baseline calculation.

Finishers is the animal category that represents majority of all animals from the farms included in this PD, over 80% of the total number of animals (only three farms have other types of animals but not as significant as finishers). Finishers are considered to be “market swine” and presented an average weight of 90kg among all farms included in the PD by the time of the project’s registration (and this was the value adopted for the parameter Wsite). Taking into account the figures presented in Table 10 A-7 from the the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, chapter 10, the weights that are more similar to the project situation are those from the Western Europe region (50 kg) – the values form Latin America (28 kg), where the project is located, is even lower than Western Europe’s.

This situation is also observed for the remaining four categories of swine (nursery and boars for market swine, guilts and sows for breeding swine): the values are more similar to those adopted in Western Europe than in Latin America, especially regarding the Breeding Swine (guilts and sows) and in the Market Swine (boars) which presented an average weight of 210kg and 230 kg respectively, among all farms included in the PD by the time of the project’s registration (and this was the value adopted for the parameter Wsite). Taking into account the figures presented in Tables 10 A-7 and 10 A-8 from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, chapter 10, the weights that are more similar to the project situation are those from the Western Europe region (198kg for Breeding Swine and 50 kg for Market Swine) – the values form Latin America (28kg for both classes of Breeding and Market Swine), where the project is located, is much lower than Western Europe’s. Only in the category nursery (also Market Swine), which roughly represents 30% of all animals from the farms included in this PD, have an average weight of 20 kg, closer to the Latin America values than the Western Europe values.

Data / Parameter	$Flame_m$
Data unit	Flame on or Flame off
Description	Flame detection of flare in the minute m
Source of data	Brascarbon Monitoring Report System
Description of measurement methods and procedures to be applied	Measure will be made using a fixed installation optical flame detector
Frequency of monitoring/recording	Once per minute.
Value monitored	ON/OFF
Monitoring equipment	Ultraviolet flame sensor Model C7035
QA/QC procedures to be applied	Check the registers in the generated documents. The enclosed flare will regularly undergo a maintenance process subject to the appropriate industrial standards and/or manufacturer´s specifications in order to ensure measurement accuracy. The Monitoring Operational Procedure POP-08 was developed to calculate the flame and it can be found at the Brascarbon Operational Procedure Manual.
Purpose of the data	Calculation of Project Emissions
Calculation method	N/A
Comments	No comments.

4.3 Monitoring Plan

The methodology applied to this project activity is AMS-III.D./version 21.0, Methane recovery in animal manure management systems. The simplified monitoring methodologies are applicable to this project activity because they provide a method to accurately measure and record the GHG emissions that will be captured and combusted by the project activity.

Each individual farm will be monitored independently according with the parameters described in the following section 5.3 and monitored according with the monitoring plan described in the section 5.4.

All data monitored and required for verification and issuance is kept for a minimum of two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later. All parameters are deeply controlled by operational procedures developed by Brascarbon. A list and the procedures contained in the Brascarbon Operational Procedures Manual are mentioned in this section.

Brascarbon trained several regional technicians who will be responsible for the maintenance and the monitoring system based in ISO 9001 (Brascarbon Operational Procedure Manual). The company conducts internal auditing procedures according to the POP 26 – INTERNAL AUDITS.

a) Sampling design

According to methodology AMS-III.D version 21.0 requirements, the parameter methane content in biogas will be measured with periodical measurements to attend 90% confidence level and 10% precision level.

Since the biogas is flowing continuously, the study population can be thought of as all the possible methane content measurements in a certain period– so large as to be almost infinite. The sampling method to be applied will be systematic sampling with a random start date which is appropriate for this type of population.

The sample size/adequate frequency of measurements will be determined using data from ex-ante methane content measurements gathered on a group of farms located in the same region during a certain period time and will be done in accordance with the Guidelines for Sampling and Surveys for CDM Project Activities and Programme of Activities. The collected data will be analyzed in order to assess compliance with the 90/10 confidence/precision level.

The monitoring plan will concentrate on ensuring the emission reductions are accurately accounted within the project boundary. Brascarbon introduced operational procedures, from the Brascarbon Operational Procedures Manual, to facilitate the monitoring system of the parameters described in the the following table presents the monitoring plan followed by Brascarbon in order to achieve certified emissions reductions, after each validation and verification process.

Table 5 – Monitoring Plan

ID	DATA	Data Type	Data Unit	Data Variable	Frequency	Measured(m) Calculated(c) Estimated(e) Documented(d)	Proportion of the data to be monitored	How will the data be archived?	For how long is archived data to be kept?	Comment
1	T_f	Temp	°C	Flare Temperature	Every 1 minute	M	100%	electronic	Until end of CP + 2 years	Use for flare efficiency
2	Site Inspection	Document	----	----	Annually	D	100%	electronic	Until end of CP + 2 years	General Site Inspection
3	$N_{LT,y}$	Number	-	Nr, Of heads	Monthly	C	100%	electronic	Until end of CP + 2 years	Used to quantify the methane generation potential
4	$BG_{burnt,y}$	Volume	m^3	Biogas produced	Every 1 minute	M	100%	electronic	Until end of CP + 2 years	Cumulative biogas production
5	W_{CH4}	Fraction	%	Methane content	TBD(*)	M	100%	electronic	Until end of CP + 2 years	Concentration in wet basis
6	T_{biogas}	Temp	°C	Biogas Temperature	TBD(*)	M	100%	electronic	Until end of CP + 2 years	Use to biogas density calculation
7	D_{CH4}	Mass	tonne/m^3	Density	Monthly	C	100%	electronic	Until end of CP + 2 years	Density
8	FE	Efficiency	%	Temperature and flare operation parameters	every 1 minute data	C	100%	electronic	Until end of CP + 2 years	Efficiency determined by the burning temp and flare operation parameters
9	QDM	Supervision	--	---	Every Batch Disposed	E	100%	electronic	Until end of CP + 2 years	Sludge disposed outside project boundary
10	W_{site}	Mass	kg	Average Animal weight	Quarterly	D	100%	electronic	Until end of CP + 2 years	Average Animal weight
11	$ER_{y,ex\text{-}post}$	Mass	tonne	CO_2e	Annually	C	100%	electronic	Until end of CP + 2 years	Yearly methane potential generation
12	FFR	------	---	Feed Formulation	Monthly	D	100%	electronic	Until end of CP + 2 years	Feed Formulation Rations
13	P_{biogas}	Pressure	mbar	Biogas Pressure	TBD(*)	M	100%	electronic	Until end of CP + 2 years	Biogas pressure
14	Genetic Source	Document	-------	genetic	Annually	D	100%	electronic	Until end of CP + 2 years	Genetic Source
15	$MS_{\%i,y}$	fraction	%	Manure handled	Annually, based on daily measurement and monthly aggregation	E	100%	electronic	Until end of CP + 2 years	General Site Inspection
16	$N_{da,y}$	number	days	days	Annually, based on monthly records	M	100%	electronic	Until end of CP + 2 years	Nr. Of days animal is alive
17	$N_{p,y}$	number	heads	Nr of heads	Annually, based on Monthly records	M	100%	electronic	Until end of CP + 2 years	Nr. Of heads per category annually

18	ndy	number	Days	days	Annually, based on daily records and monthly aggregation	M	100%	electronic	Until end of CP + 2 years	Number of days the treatment plant was operational
19	VSLT,y	Mass	kg	Volatile solids for livestock	Annually	C	100%	electronic	Until end of CP + 2 years	Volatile solids for livestock LT entering the animal manure management system in year y
20	Flamem	On/Off	N/A	Flame detection of flare in the minute m	Every minute	M	100%	electronic	Until end of CP + 2 years	Flamem is measured every minute and assesses if the flame is on or off.

(*)TBD: to be determined to attend 90% confidence level and 10% precision. The monitoring frequency will be, at least, monthly.

The following table presents the explanation of the QA/QC procedures of the monitoring plan followed by BRASCARBON in order to achieve certified emission reductions, after each validation and verification process:

Table 6 – QA/QC procedures of the monitoring plan

ID	DATA VARIABLE	UNCERTAINTY LEVEL	DATA UNIT	DATA ORIGIN
1	T_f	Low	°C	Register from the measurement system, information managed by Brascarbon,
2	Site Inspection	Low	-----	Register information managed by Brascarbon
3	$N_{LT,y}$	Low	Nr, Of heads by category	Register from the measurement system, information managed by Brascarbon,
4	$BG_{burned,y}$	Low	m^3	Register from the measurement system, information managed by Brascarbon,
5	W_{CH4}	Low	%	Register from the measurement system, information managed by Brascarbon,
6	T_{biogas}	Low	°C	Register from the measurement system, information managed by Brascarbon,
7	D_{CH4}	Low	t/m^3	Register from the measurement system, information managed by Brascarbon,
8	FE	Low	%	Register information managed by Brascarbon,
9	QDM	Low	---	Register from the measurement system, information managed by Brascarbon,
10	W_{site}	Low	Kg	Register from the measurement system, information managed by Brascarbon,
11	$ER_{y,ex\text{-}post}$	Low	t CO_2e	Register from the measurement system, information managed by Brascarbon,
12	FFR	Low	-----	Register from the measurement system, information managed by Brascarbon,
13	P_{biogas}	Low	mbar	Register information managed by Brascarbon.
14	Genetic Source	Low	-----	Register information managed by Brascarbon.
15	$MS_{\%i,y}$	Low	%	Register information managed by Brascarbon.
16	$N_{da,y}$	Low	days	Register information managed by Brascarbon.
17	$N_{p,y}$	Low	Nr, Of heads by category	Register information managed by Brascarbon.
18	ndy	Low	days	Register information managed by Brascarbon.
19	$VS_{LT,y}$	Low	kg	Register information managed by Brascarbon.
20	$Flame_m$	Low	ON/OFF	Register information managed by Brascarbon.

BRASCARBON has implemented the Operation Procedures Manual and forms to capture and report monitored data and maintenance activities throughout the project lifecycle. On-site assessment, supplier production data, task tracking, and post-implementation auditing tools have been developed to ensure accurate, consistent, and complete data gathering and project implementation.

By coupling these capabilities with an ISO-based quality and environmental management system, BRASCARBON enables transparent data collection and verification.

Procedures from Brascarbon Operation Procedures Manual to ensure accurate and consistent data for monitoring system have been developed as indicated in the following table:

Table 7 – Procedures from Brascarbon Operation Procedures Manual

ID	DATA /PARAMETERS/TITLE	RESPONSIBLE	PROCEDURE	COMENTS
1	T_f	TR	POP 1	Flare Temperature
2	SITE INSPECTION MS% i,y $VS_{LT,y}$	TR	POP 2	General site Inspection
3	$N_{LT,y}$ $N_{aa,y}$ $N_{p,y}$	TR	POP 3	Number of heads
4	$BG_{burnt,y}$	TR	POP 4	Biogas produced and burnt
5	W_{CH4}	TR	POP 5	Methane content
6	T_{biogas}	TR	POP 6	Biogas Temperature
7	D_{CH4}	QC	POP 7	Methane Density
8	FE $Flame_m$	TR	POP 8	Flare Efficiency Flame on or Flame off
9	QDM	TR	POP 9	Sludge Mass
10	TRAINING	QC	POP 11	General training of procedures and safety issues
11	MAINTENANCE	OM	POP 12	Up-date of the maintenance activities
12	P_{biogas}	TR	POP 13	Biogas pressure
13	FFR	TR	POP 14	Formulated Feed Rations
14	GENETIC SOURCE	TR	POP 15	Genetic source
15	W_{site}	TR	POP 16	Average animal weight
16	$ER_{ex\text{-}post}$	QC	POP 17	Yearly emissions reductions ex-post
17	Ndy	QC	POP 24	Number of days the treatment plant was operational

Legend:

A: Annually	TR: Regional Technician
Q: Quarterly	QC: Quality Control
M: Monthly	TBD: to be determined to attend 90% confidence level and 10% precision. The monitoring frequency will be, at least, monthly.
S: Semesterly	OM: Operation Manager

Monitoring of the Flare Temperature

The temperature of the flare will be controlled by a logic system, able to store the flare temperature continuously. The sensor - thermo coupling - is installed in the flare body.

The signal from the thermocouple is sent to the PLC where the information of the temperature is recorded every each minute.

The file information from the logic system will be recovered monthly, by using a pen drive and the file will be sent to the QA/QC officer to manage the information for further verification. Then, a spreadsheet in excel will be available from the system to show the temperature per minute per day. The system PLC and the thermocouple will be powered by solar cell – no use of energy from the grid. A 12 volts battery is also included in the system to save energy to be used during the night or days lack of sun. The battery capacity is for 240 hours.

In the operational procedure POP 1 is the form 01.001 where the temperature information is managed according to the specification mentioned above. All QA/QC procedures are described in the operational procedure related to the maintenance and/or calibration of the equipment.

PEN DRIVE

PLC

Site Inspection.

A check list included in the procedure POP 2 – Site Inspection - number 02.001 is the basic orientation to guide the technicians during inspection in the field to follow all items related to the project activity installation.

Attached on it, the MS% i,y - Fraction of manure handled in the system during the year, is included to be inspected during the each farm visit.

No changes in the manure managing system will be permitted during the project activity. Variables to be monitored: SITE INSPECTION and MS%i,y.

Average number of animals.

To calculate the average number of animals per category LT in the year y (NLT,y) the operational procedure has the forms 03.003 and 03.001 in the operational procedure POP 3 (average number of animals) where it takes into account of the number of days the animal is alive in the year y (Nda,y) and the number of animals produced per category LT in the year y (Np,y).

The days of animals alive and the total animal produced is also monitored with the same procedure and the formulary 03.003.

The formula used to the calculation is indicated in the PD section B.4, step 2, equation 4. Variables to be monitored: N LT,y, N day,y and N p,y.

Measurement of the volumetric flow rate of the biogas and residual gas.

The operational procedure POP 4- Measurement of the biogas flow rate, is a guide that explains to the technicians how to obtain the biogas flow rate.

The control of the flow rate is by a PLC (see picture in the POP 1 description above) installed in the control panel in the project activity site.

The panel is equipped with solar cells that supply energy to the system. A battery (capacity for 10 days lack of sun) and the flow rate transmitter device to receive information from the thermal mass meter. The flow meter used in the project activity is a thermal mass flow meter.

The system is very reliable and supplied by Endress+hauser, leader of measurement system of liquids and gases. Example of the meter used in the project activity:

The information recorded in the PLC is recovered by the use of a pen drive and the file containing the information will be send to the QA/QC officer to manage information for further verification. A spreadsheet in excel is available from the system to show the flow rate per minute per day.

The variables measured with this procedure are: BG burnt,y and FV RG,h..

The data monitored is controlled in the form 04.001 attached in the operational procedure POP 04.

Methane content determination.

The POP 5- Methane content was prepared to guide the technicians how to obtain the methane content using electronic equipment.

The methane content is obtained by BIOGAS or TESTO electronic equipment.

The concentration of methane is measured in few seconds before starting the measurement button.

The equipment operation and the devices to be used are described in the operational procedure, as well as in the equipment manual.

Both equipment are able to measure the methane concentration in the biogas or in the flare residual gas.

The variables measured with this equipment are: WCH4 and fvCH4,RG,y.

All QA/QC procedures are described in the operational procedure related to the maintenance and/or calibration of the equipment.

The data monitored is controlled in the form 04.001.

Biogas temperature measurement.

The biogas temperature is obtained by an electronic equipment BIOGAS.

The methane temperature is measured in few seconds after inserting the thermocouple in the biogas line device.

The equipment operation and the devices to be used are described in the operational procedure, as well as in the equipment manual.

All QA/QC procedures are described in the operational procedure related to the maintenance and/or calibration of the equipment.

The variable measured with this equipment is: T biogas.

The data monitored is controlled in the form 04.001 described in the operational procedure POP 6 – Biogas temperature measurement.

Density of the methane determination.

The POP 7- Density of the Methane - is a guide to calculate the methane density. The form 07.001 attached in the operational procedure shows the data to be filled to make the calculation. The methane density calculation is in accordance with the Tool to determine the mass flow of a greenhouse gas in a gaseous stream version 3.0

The variable monitored with this procedure: DCH4.

Flare efficiency.

According with the of version 04 of the tool Project emissions from flaring, in its step 2 – Determination of flare efficiency, for determining the efficiency of combustion of enclosed flares there is the option to apply a default value or determine the efficiency based on monitored data. The operational procedure POP 8 – Flare efficiency was developed to monitor and calculate the flare efficiency.

In the case of enclosed flares, project participants may choose between two options to determine the flare efficiency for minute m (ηflare,m). The PP has chosen Option A – Apply a default value for flare efficiency.

The flare efficiency for the minute m (ηflare,m) is 90% when the following two conditions are met to demonstrate that the flare is operating:

The temperature of the flare (TEG.m) and the flow rate of the residual gas to the flare (FRG,m) is within the manufacturer's specification for the flare (SPECflare) in minute m; and

The flame is detected in minute m (Flamem).

Otherwise ηflare,m is 0%.

All the flares in the project are considered, as per definition of the tool as low height, hence a default value of 80% flare efficiency is applied to the entire project. All data and parameters that are required to monitor whether the flare operates within the range of operating conditions according to manufacturer´s specifications will be continuously monitored. The temperature and biogas flow rate will be monitored minute by minute by a sensor installed in the enclosed flare and are registered by a CLP. The data stored in the CLP is recovered monthly by the use of a pen drive and the file containing the information will be sent to the QA/QC officer to manage the information. Brascarbon developed the formulary 08.001 in the operational procedure to monitor the hourly flare efficiency according to the criteria above mentioned.

The variable monitored with this procedure: FE.

Biogas pressure.

The biogas pressure is obtained by an electronic equipment BIOGAS and procedures described in the operational procedure POP 13- Biogas pressure.

The operating pressure of the biodigestor is atmospherically.

The equipment operation and the devices to be used are described in the operational procedure, as well as in the equipment manual.

All QA/QC procedures are described in the operational procedure related to the maintenance and/or calibration of the equipment.

The variable measured with this equipment is: P biogas. The data monitored is controlled in the form 04.001.

Formulated feed rations.

Monitoring and controlling of the formulated feed rations used per animal category per confined feed animal operation.

The variable monitored: FFR.

Reference of the operational procedure: POP 14 – formulated feed rations monitoring.

Genetic Source.

Monitoring and controlling of the genetic source in the project activity per farm. The variable monitored: GENETIC SOURCE.

Reference of the operational procedure: POP 15 – Genetic Source Monitoring.

Animal weight.

The data collection is realized quarterly by each farm owner, together with ASSUGLORIA (Associação de Suinoclutores de Glória de Dourados)and provided to the PP. ASSUGLORIA is the Pig Producers Association to whom the farms contained in the PD are associated; its main role is to act as a third party responsible for the assurance of all the logistics associated with the swine producers, providing the animal nutrition, genetics and all the overall animal weight.

The quarterly weight of the animals for each producer of the PD is made following ASSUGLORIA's internal procedure, that is not under the PP's control – the association selects the animals based on a random sampling approach applied in each category, since it is infeasible to weight each animal individually in the farms belonging to the project (these farms can more than 5,000 animals each). In addition, each project site presents the actual animal weight by using Brascarbon form 16.001 after a cross-check by the PP, using the real information after each batch of animals exits each farm; the template was designed to quarterly report animal weight per category.

The values of the quarterly weights presented by ASSUGLORIA (following the association's internal procedures) to the PP are cross-checked against two different credible sources:

Reference figures from EMBRAPA (an undisputed Brazilian Agricultural Research Corporation nationally recognized for these scope) for each category; and

Figures provided by ASSUGLORIA when each of the swine batches exits each farm (each batch stays around 5 to 6 months per farm), as explained below. Here ASSUGLORIA provides invoices with 100% of the animals weight (and number), allowing a full cross- check with the weight values provided and assuring that all the information is accurate.

If the PP verifies during the cross-check any discrepancy between the values provided quarterly and the full weighting and counting of the animals in the invoices provided by ASSUGLORIA each time any batch exits a giving farm, those values will be updated accordingly with these real figures.

The current practice of swine farms in Brazil is that each farm receives new batches of animals every 5 to 6 months (which is also the average time that a batch stays in a farm) and the producer, together with ASSUGLORIA, performs regular and periodical visits to each farm in order to assess and evaluate the correct development of each batch in terms of growing/weighting of the animals (according with what is expected at each growing stage of a given batch). It is important to highlight that both the farm owners ASSUGLORIA rely on the quality of the values measured since their sole professional occupation is the pig production and, therefore, it is within their best interests to have a correct and reliable way to assess the weighting of the animals (which is their business) based on their experience and internal procedures.

Every 5 to 6 months (depending on each batch and farm), the animal batches leave the farms and they are, in this specific situation, 100% weighted by the producers, together with ASSUGLORIA – this weighting is undertaken to the totality of animal presented in the batch since the profits associated with the animal production are weight based. The results are cross-checked against reference figures from EMBRAPA (the Brazilian Agricultural and Livestock Research Corporation, a recognized federal institution responsible for studies and research in these scopes). According with ASSUGLORIA a possible range of +/- 5kg within the animal growing, related to the figures from EMBRAPA, is considered a normal fluctuation and therefore admissible.

Each time a batch exits a farm, ASSUGLORIA provides the invoices to attest the feasibility of the figures adopted, allowing a complete and thorough cross-check by PP of all the data used for this parameter.

Quarterly the data from the feed operations are checked and transferred to the form.

Records available in the feed operations will be copied and filed at Brascarbon office and attached with the form 16.001.

The variable monitored: W site.

Methane mass flow rate in the residual gas.

The residual mass flow rate can be determinate by the POP 17 – Emissions reductions ex-post, where it calculates all parameters to determine the emissions reductions ex-post.

To be calculated according to the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream version 3.0". An operational procedure POP 17 includes the instruction to the calculation.

According with the step 1 – Determination of the methane mass flow in the residual gas of this tool, this parameter should be determined using another tool, namely Tool to determine the mass flow of a greenhouse gas in a gaseous stream. In second tool, there are several options to determine the Mass flow rate of methane in the residual gaseous stream. Option 2 - Simplified calculation without measurement of the moisture content was chosen by the PP.

Within this option, option A will be applicable by the demonstration that the gaseous stream is dry. The PP will demonstrate that the temperature of the gaseous stream (Tt) is less than 60ºC (333.15 K) at the flow measurement point.

Hence this parameter will be calculated according with Equations 5 and 6 of the tool. This means:

$$F_{i,t} = V_{t,db} \times v_{i,t,db} \times \rho_{i,t}$$ Equation (5)

With:

$$\rho_{i,t} = \frac{P_t \times MM_i}{R_u \times T_t}$$ Equation (6)

Where:

$F_{i,t}$	=	Mass flow of greenhouse gas *i* in the gaseous stream in time interval *t* (kg gas/h)
$V_{t,db}$	=	Volumetric flow of the gaseous stream in time interval *t* on a dry basis (m^3 dry gas/h)
$v_{i,t,db}$	=	Volumetric fraction of greenhouse gas *i* in the gaseous stream in a time interval *t* on a dry basis (m^3 gas *i*/m^3 dry gas)
$\rho_{i,t}$	=	Density of greenhouse gas *i* in the gaseous stream in time interval *t* (kg gas *i*/m^3 gas *i*)
P_t	=	Absolute pressure of the gaseous stream in time interval *t* (Pa)
MM_i	=	Molecular mass of greenhouse gas *i* (kg/kmol)
R_u	=	Universal ideal gases constant (Pa.m^3/kmol.K)
T_t	=	Temperature of the gaseous stream in time interval *t* (K)

The formulary 17.001 (CER spreadsheet) is used to determine the variables above mentioned.

Number of days the treatment plant was operational.

The number of days the treatment plant was operational can be determinate by the POP 24 – days of functioning, where it is monitored the number of days in a year "y" that the treatment plant has operated.

The variables monitored with this procedure: ndy

Volatile solids.

The four conditions to apply B0 value of developed countries are fully applicable to developed countries can be used provided the following four conditions are satisfied:

The genetic source of the livestock originates from an Annex I Party;

Genetics and nutrition adopted for these farms as so as in western Europe. More details or information of the genetics can be obtained at the producers or at the Associação Brasileira dos Criadores de Suinos (Brazilian Swine Association) – http://www.abcs.org.br/.

The genetic source of the livestock is therefore in compliance with this methodology requirement, which can be confirmed and verified by the genetic documents of the animals of each farm. These evidences were provided and assessed to assure their applicability to this requirement.

The farm uses formulated feed rations (FFR) which are optimized for the various animal(s), stage of growth, category, weight gain/productivity and/or genetics;

The formulated feed rations are created according with the characteristics of the animals, their stage of growth, category, weight gain and genetics. Each farm possesses their FFR composition according with the type of animal(s) accommodated, which was confirmed and verified. These evidences were provided and assessed to assure their applicability this requirement.

The use of FFR can be validated (through on-farm record keeping, feed supplier, etc.);

The formulated feed rations are part of the management system of the farms and therefore, each site possesses on-farm records which attest the FFR used. These evidences are also monitored on a monthly basis, according monitoring plan for the parameter FFR, as described in section B.7.1, and the PP internal procedure POP 14.

The project specific animal weights are more similar to developed country IPCC default values.

The Wsite value considered for each category of swine is the result of an average weight of the animals of all farms included in the project, and this value was applied in the baseline calculation.

Finishers is the animal category that represents majority of all animals from the farms included in this PD, over 80% of the total number of animals (only three farms have other types of animals but not as significant as finishers). Finishers are considered to be "market swine" and presented an average weight of 90kg among all farms included in the PD by the time of the project's

registration (and this was the value adopted for the parameter Wsite). Taking into account the figures presented in Table 10 A-7 from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, chapter 10, the weights that are more similar to the project situation are those from the Western Europe region (50 kg) – the values form Latin America (28 kg), where the project is located, is even lower than Western Europe's.

This situation is also observed for the remaining four categories of swine (nursery and boars for market swine, guilts and sows for breeding swine): the values are more similar to those adopted in Western Europe than in Latin America, especially regarding the Breeding Swine (guilts and sows) and in the Market Swine (boars) which presented an average weight of 210kg and 230 kg respectively, among all farms included in the PD by the time of the project's registration (and this was the value adopted for the parameter Wsite). Taking into account the figures presented in Table 10 A-7 from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, the weights that are more similar to the project situation are those from the Western Europe region (198kg for Breeding Swine and 50 kg for Market Swine) – the values form Latin America (28kg for both classes of Breeding and Market Swine), where the project is located, is much lower than Western Europe's. Only in the category nursery (also Market Swine), which roughly represents 30% of all animals from the farms included in this PD, have an average weight of 20 kg, closer to the Latin America values than the Western Europe values.

Therefore, is fair to consider that "the project specific animal weights are more similar to developed country IPCC default values" condition is fulfilled and that the VS adopted values for developed counties is in full compliance with the methodology requirements.

Monitoring System.

The monitoring system will be followed according to the Brascarbon Operations Procedures Manual, detailed to attend all necessary controls in the site.

Operational / Monitoring Procedures

Operational / Monitoring procedures listed above.

Quality Assurance/Control: QA/QC.

The measuring instruments will be calibrated by the manufacturers' representatives on a manufacturer recommendation basis. The certification of calibration will be controlled by QA/QC officer. Also, the QA/QC officer will be responsible to assure that all Brascarbon Operations Procedures will be executed based in the ISO 9001.

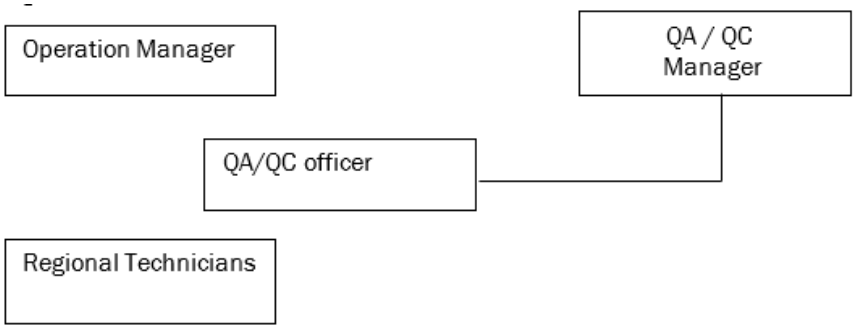
Training.

The training of the technicians and all employees is provided by the Operations Manager. The topics of the training are as below:

1. General explanation of the project.
2. Explanation of the procedures of the Operations Procedure Manual.
3. Procedures and preparations for the star-up.
4. Maintenance procedures.
5. Biogas safety instructions.
6. Biogas measurement.
7. Safety Issues.

The training document and the equipment manuals are stored for easy reference in the Brascarbon office.

Organization.



Operation Manager

Engineer, responsible for the project maintenance and monitoring data collection.

QA/QC Manager

Engineer, responsible for the monitoring operation and emissions for the project activity.

Regional Technicians

Technician, responsible for the monitoring and maintenance of the site projects according to the procedures in the Operations Procedure Manual.

Maintenance.

For maintenance of the equipment and to attend the monitoring system, BRASCARBON will use the practices recommended by the equipment supplier for repairs, calibration, etc. The regular maintenance in the site project boundary will be according to the Brascarbon Operation Procedures Manual for all items considered in the project such as the digester, flare, measuring systems, piping, electrical parts and others.

The PP has internal procedures in case of any emergency cases like failure of equipment other than electricity meters (e.g. flow meters or gas analyzers etc.). POP 02 and POP 12 are entirely related with onsite inspections by the regional technicians which are trained for all the onsite procedures, including emergency, according with POP 11. Additionally, the PP has the POP 26 exclusively for internal audits which will also assess the correct understanding and onsite implementation of all the safety and emergency measures. Finally, several specific POP, like 01 and 04 (related with the flare and biogás flow) also have specific instructions for any case of malfunction.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

Equation 1

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

Where:

BEy – Baseline emissions in year "y" (tCO2e)

GWPCH4 – Global Warming Potential (GWP) of CH4 (28)

DCH4– CH4 density (0.00067 t/m3 at room temperature (20 °C) and 1 atm pressure).

LT– Index for all types of livestock

J – Index for animal waste management system

MCFj – Annual methane conversion factor (MCF) for the baseline animal waste management system "j"

B0,LT – Maximum methane producing potential of the volatile solid generated for animal type "LT" (m3 CH4/kg dm)

NLT,y – Annual average number of animals of type "LT" in year "y" (numbers)

VSLT,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"

UFb – Model correction factor to account for model uncertainties (0.94)

Where VSLT,y can be determined by scaling default IPCC values to adjust for a site-specific average animal weight according to Equation 2:

Equation 2

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

Where:

Wsite – Average animal weight of a defined livestock population at the project site (kg)

Wdefault – Default average animal weight of a defined population, this data is sourced from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (kg)

VSdefault – Default value for the volatile solid excretion rate per day on a dry-matter basis for a defined livestock population (kg dm/animal/day)

Ndy – Number of days in year "y" where the treatment plant was operational.

As explained in the previous section, the values used for the parameters B0 and VS are those applied for Western Europe.

Table 8. summarizes the BEy,ex post for each farm during the current monitoring period. The detailed calculations are available in the CER calculation spreadsheet (folder BEy ex-post – PEy ex-post).

Table 8. – Baseline Emissions (BEy,ex post) in the current monitoring period

ID	Site ID	Farm/Site	$BE_{y,ex\text{-}post}$ (t CO_2e)
1	BCA-323MS1-19	Lote 23 Quadra 27	25,295
2	BCA-324MS1-19	P. L. N 24 e N 26 Q. 37	4,815
3	BCA-325MS1-19	Lotes 35, 37 e 39 Quadra 39	4,844
4	BCA-326MS1-19	Lote Rural N 56 Quadra 34	4,903
5	BCA-327MS1-19	Quadra 61 Lote 43	5,059
6	BCA-328MS1-19	Lote 4 e 6 Quadra 61	4,847
7	BCA-329MS1-19	Sitio N. S. A.	4,827
8	BCA-330MS1-19	Lote 45 Quadra 61	10,472
9	BCA-331MS1-19	Lote 42 Q. 28	5,247
10	BCA-332MS1-19	Parte dos lotes 46 e 48	5,204
TOTAL			75,513

5.2 Project Emissions

According to the simplified baseline and monitoring methodology for a small-scale CDM project Type-III (AMS.III.D – version 21.0), project emissions consist of:

(a) Physical leakage of biogas in the manure management systems which includes production, collection and transport of biogas to the point of flaring/combustion or gainful use (PEPL,y);

(b) Emissions from flaring or combustion of the gas stream (PEflare,y);

(c) CO2emissions from use of fossil fuels or electricity for the operation of all the installed facilities (PEpower,y).

(d) CO2 emissions from incremental transportation distances (PEtransp,y)

(e) Emissions from the storage of manure before being fed into the anaerobic digester (PEstorage,y)

Equation 3 (equation 6 of the meth)

$$PE_y = PE_{PL,y} + PE_{flare,y} + PE_{power,y} + PE_{transp,y} + PE_{storage,y}$$

Where:

PEy – Project emissions in year "y" (tCO2e)

PEPL,y – Emissions due to physical leakage of biogas in year "y" (tCO2e)

PEflare,y – Emissions from flaring or combustion of the biogas stream in the year "y" (tCO2e)

PEpower,y – Emissions from the use of fossil fuel or electricity for the operation of the installed facilities in the year "y" (tCO2e)

PEtransp,y – Emissions from incremental transportation in the year "y" (tCO2e), as per relevant paragraph in AMS-III.AO

PEstorage,y – Emissions from the storage of the manure in the year "y" (tCO2e)

(C) Emissions due to physical leakage of biogas can be determinate as follows:

Equation 4 (equation 7 of the meth)

$$PE_{PL,y} = 0.10 \times GWP_{CH4} \times D_{CH4} \times \sum_{i,LT} B_{0,LT} \times N_{LT,y} \times VS_{LT,y} \times MS\%_{i,y}$$

Where:

PEPL,y – Emissions due to physical leakage of biogas in year "y" (t CO2e)

GWPCH4 – Global Warming Potential (GWP) of CH4 (28)

DCH4 – CH4 density (0.00067 t/m3 at room temperature (20 ºC) and 1 atm pressure).

LT – Index for all types of livestock

I – Index for animal waste management system

B0,LT – Maximum methane producing potential of the volatile solid generated for animal type "LT" (m3 dm)

NLT,y – Annual average number of animals of type "LT" in year "y" (numbers)

VSLT,y – Volatile solids for livestock "LT" entering the animal manure management system in year "y" (o matter weight basis, kg dm/animal/year)

MS%i,y – Fraction of manure handled in system "i" in year "y"

(D) Emissions from flaring determinate as follows:

According with the tool Project emissions from flaring version 4, the calculation procedure in this tool determines the project emissions from flaring the residual gas (PEflare,y) based on the flare efficiency (ηflare,m) and the mass flow of methane to the flare (FCH4,RG,m). The flare efficiency is determined for each minute m of year y based either on monitored data or default values.

The project emissions calculation procedure is given in the following steps:

(a) STEP 1: Determination of the methane mass flow of the residual gas;

(b) STEP 2: Determination of the flare efficiency;

(c) STEP 3: Calculation of project emissions from flaring.

Step 1: Determination of the methane mass flow in the residual gas

The “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” shall be used to determine the following parameter:

The following requirements apply:

(a) The gaseous stream tool will be applied to the residual gas;

(b) The flow of the gaseous stream will be measured continuously;

(c) CH4 is the greenhouse gas i for which the mass flow will be determined;

(d) The simplification offered for calculating the molecular mass of the gaseous stream is valid (equations 3 and 17 in the tool); and

(e) The time interval t for which mass flow should be averaged is every minute m.

According with the “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” version 03, The mass flow of a greenhouse gas i in a gaseous stream (Fi,t) is determined through measurement of the flow and volumetric fraction of the gaseous stream.

Option A was chosen

The flow measurement on a dry basis is not doable for a wet gaseous stream. Therefore, it is necessary to demonstrate that the gaseous stream is dry to use this option. According with the tool, there are two ways to do this:

(a) Measure the moisture content of the gaseous stream (CH2O,t,db,n) and demonstrate that this is less or equal to 0.05 kg H2O/m3 dry gas; or

(b) Demonstrate that the temperature of the gaseous stream (Tt) is less than 60ºC (333.15 K) at the flow measurement point.

The temperature of the biogas is less than 60ºC, and that will be demonstrated during the monitoring of the parameter, according with the MP.

Step 2: Determination of flare efficiency

The flare efficiency depends on the combustion efficiency of in the flare and the time that the flare is operating. For determining the efficiency of enclosed flares project participants shall choose to determine the efficiency based on monitored data or the option to apply a default value. For open flares a default value must be applied. The time the flare is operating is determined by using a flame detector and, for the case of enclosed flares, in addition the monitoring requirements provided by the manufacturer’s specifications for operating conditions shall be met.

In the case of enclosed flares, project participants may choose between the following two options to determine the flare efficiency for minute m (ηflare,m) and shall document in the PD which option is selected:

(a) Option A: Apply a default value for flare efficiency;

(b) Option B: Measure the flare efficiency.

Option A was chosen

Option A: Default value

The flare efficiency for the minute m (ηflare,m) is 90% when the following two conditions are met to demonstrate that the flare is operating:

(a) The temperature of the flare (TEG.m) and the flow rate of the residual gas to the flare (FRG,m) is within the manufacturer's specification for the flare (SPECflare) in minute m; and

(b) The flame is detected in minute m (Flamem).

Otherwise ηflare,m is 0%.

It is important to highlight that the flares are considered a low height so, in line with the tool, a conservative approach should be applied, and 10 percentile points should be subtracted to the flare efficiency. Hence the flare efficiency adopted in the current PD will be the default value of 80%.

In line with the monitoring plan, if any minute of any hour presents a temperature value below 500ºC the entire hour will be discount form the CER calculation. This discount will be applied to the volume of that specific hour since it is a more conservative approach than to discount in the average of the fla re efficiency percentage.

Step 3: Calculation of project emissions from flaring

Project emissions from flaring are calculated as the sum of emissions for each minute m in year y, based on the methane mass flow in the residual gas (FCH4,RG,m) and the flare efficiency (ηflare,m), as follows:

Equation 5 (equation 15 of the Tool 6)

$$PE_{flare,y} = GWP_{CH4} \times \sum_{m=1}^{525600} F_{CH4,RG,m} \times (1 - \eta_{flare,m}) \times 10^{-3}$$

Where:

PEflare,y – Project emissions from flaring of the residual gas stream in year y, tCO 2e

GWPCH4 – Global Warming Potential of methane valid for the commitment period, tCO2e/tCH4

FCH4,RG,m – Mass flow rate of methane in the residual gas in the minute m, kg/h

ηflare, m – Flare efficiency in the minute m

(C) Emissions from use of fossil fuels or electricity for the operation:

No fossil fuel or electricity will be used in the project, therefore, PEpower,y = zero.

(D) Emissions from incremental transportation:

No incremental transportation will occur in the project activity, and therefore, PEtransp,y = 0

(E) Emissions from storage of the manure:

The manure will not be stored in the entire project. Each day all the manure is washed and sent to the digester, therefore, PEstorage,y = 0.

Table 9 summarizes the project emissions for the current monitoring period (PEy,ex-post)and more detailed information can be obtained in the CER calculation spreadsheet (folder BEy ex-post – PEy ex- post).

Table 9 – Project Emissions (PEy,ex-post) in the current monitoring period

ID	Site ID	Farm/Site	$PE_{y,ex\text{-}post}$ (t CO_2e)
1	BCA-323MS1-19	Lote 23 Quadra 27	7,505
2	BCA-324MS1-19	P. L. N 24 e N 26 Q. 37	1,518
3	BCA-325MS1-19	Lotes 35, 37 e 39 Quadra 39	1,534
4	BCA-326MS1-19	Lote Rural N 56 Quadra 34	1,516
5	BCA-327MS1-19	Quadra 61 Lote 43	1,538
6	BCA-328MS1-19	Lote 4 e 6 Quadra 61	1,513
7	BCA-329MS1-19	Sitio N. S. A.	1,542
8	BCA-330MS1-19	Lote 45 Quadra 61	3,115
9	BCA-331MS1-19	Lote 42 Q. 28	1,617
10	BCA-332MS1-19	Parte dos lotes 46 e 48	1,604
TOTAL			23,002

5.3 Leakage Emissions

According to the simplified baseline and monitoring methodology AMS-III.D - version 21 and the tool "Project and leakage emissions from anaerobic digesters" (version 02), no leakage calculation is required if the storage of digestate or the composting of digestate is occurring within the project boundary, these emissions will be considered as project emissions, (in line with paragraph 25 of the tool).

5.4 GHG Emission Reductions and Carbon Dioxide Removals

The calculation of the emission reductions is based on the equations used on the approved methodology AMS.III.D – Version 21 – "Methane recovery in animal manure management systems" and data from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, volume 4, chapter 10.

For baseline emissions calculation see Table 4 and Table 5.

The project emissions for this project activity are defined as the amount of methane that would be emitted to the atmosphere during the crediting period due to the project activity. In this case an anaerobic digester is considered the project activity and estimated emissions are determined as follows:

Step 1: Emission Reductions

Equation 6 (equation 10 of the meth)

$$ER_{y,ex\ post} = min\left[\left(BE_{y,ex\ post} - PE_{y,ex\ post}\right), \left(MD_y - PE_{power,y,ex\ post}\right)\right]$$

Where:

$ER_{y,ex\ post}$	=	Emission reductions achieved by the project activity based on monitored values for year *y* (t CO_2e)
$BE_{y,ex\ post}$	=	Baseline emissions calculated using equation 1 (for projects using option in paragraph 17a) using ex post monitored values of $N_{LT,y}$ and if applicable $VS_{LT,y}$. For projects using option in paragraph 17b), the ex post monitored values for $Q_{manure,j,LT,y}$ and $SVS_{j,LT,y}$ are used
$PE_{y,ex\ post}$	=	Project emissions calculated using equation 6 using ex post monitored values of $N_{LT,y}$,$MS\%_{i,y}$, $MS\%_{l}$, AI_l, $Q_{res\ waste,y}$ and if applicable $VS_{LT,y}$
MD_y	=	Methane captured and destroyed or used gainfully by the project activity in year *y* (t CO_2e)
$PE_{power,y,ex\ post}$	=	Emissions from the use of fossil fuel or electricity for the operation of the installed facilities based on monitored values in the year *y* (t CO_2e)

The emission reductions which will be achieved by the project activity ex post will be determined through direct measurement of the amount of methane flared. Biogas flared or combusted, (MDy) shall be determined using the flare efficiency and methane content of biogas.

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

The emission reductions which will be achieved by the project activity ex post will be determined through direct measurement of the amount of methane flared. Biogas flared or combusted, (MDy) shall be determined using the flare efficiency and methane content of biogas.

Where:

$BG_{burnt,y}$ = Biogas flared or combusted in year *y* (m^3)

$w_{CH4,y}$ = Methane content in biogas in the year *y* (volume fraction)

FE = Flare efficiency in the year *y* (fraction)

Table 10 – Methane captured and destroyed (MD_y) in the current monitoring period

ID	Site ID	Farm/Site	MD_y (t CO_2e)
1	BCA-323MS1-19	Lote 23 Quadra 27	18,015
2	BCA-324MS1-19	P. L. N 24 e N 26 Q. 37	3,781
3	BCA-325MS1-19	Lotes 35, 37 e 39 Quadra 39	3,856
4	BCA-326MS1-19	Lote Rural N 56 Quadra 34	3,730
5	BCA-327MS1-19	Quadra 61 Lote 43	3,722
6	BCA-328MS1-19	Lote 4 e 6 Quadra 61	3,742
7	BCA-329MS1-19	Sitio N. S. A.	3,881
8	BCA-330MS1-19	Lote 45 Quadra 61	7,422
9	BCA-331MS1-19	Lote 42 Q. 28	3,972
10	BCA-332MS1-19	Parte dos lotes 46 e 48	3,943
TOTAL			56,064

Table 11 – ERy, ex-post in the current monitoring period

SITE ID:	SITE NAME	MD, (t CO_2e)	$PE_{...}$ (t CO_2e)	MDy - $PE_{...}$ (t CO_2e)	$BE_{...}$ (t CO_2e)	$PE_{...}$ (t CO_2e)	$BE_{...} - PE_{...}$ (t CO_2e)	$ER_{...}$ = min [($BE_{y,ex\text{-}post} - PE_{y,ex\text{-}post}$), ($MD_y - PE_{power,y,ex\text{-}post}$)] (t CO_2e)
BCA-323MS1-19	Lote 23 Quadra 27	18 015	0	18 015	25 295	7 505	17 790	17 790
BCA-324MS1-19	P. L. N 24 e N 26 Q. 37	3 781	0	3 781	4 815	1 518	3 297	3 297
BCA-325MS1-19	Lotes 35, 37 e 39 Quadra 39	3 856	0	3 856	4 844	1 534	3 310	3 310
BCA-326MS1-19	Lote Rural N 56 Quadra 34	3 730	0	3 730	4 903	1 516	3 387	3 387
BCA-327MS1-19	Quadra 61 Lote 43	3 722	0	3 722	5 059	1 538	3 521	3 521
BCA-328MS1-19	Lote 4 e 6 Quadra 61	3 742	0	3 742	4 847	1 513	3 334	3 334
BCA-329MS1-19	Sitio N. S. A.	3 881	0	3 881	4 827	1 542	3 285	3 285
BCA-330MS1-19	Lote 45 Quadra 61	7 422	0	7 422	10 472	3 115	7 357	7 357
BCA-331MS1-19	Lote 42 Q. 28	3 972	0	3 972	5 247	1 617	3 630	3 630
BCA-332MS1-19	Parte dos lotes 46 e 48	3 943	0	3 943	5 204	1 604	3 600	3 600
TOTAL		56 064	0	56 064	75 513	23 002	52 511	52 511

The Table 11 above presents all the components which are calculated for each farm in order to comply with the methodology requirements for emission reductions determination, Due to the amount of information and methodology particularities, and in order to improve the reading of each parameter for all the farms, it was decided to include the emission reduction table in a different format from the one stated in the Monitoring Report Form, Version 07,0 which is more designed for a one site only project activity.

Vintage period	Baseline emissions (tCO_2e)	Project emissions (tCO_2e)	Leakage emissions (tCO_2e)	Reduction VCUs (tCO_2e)	Removal VCUs (tCO_2e)	Total VCUs (tCO_2e)
01-Jan-2023 to 31-Dec-2023	75,513	23,002	0	52,511	0	52, 511
Total	**75,513**	**23,002**	**0**	**52,511**	**0**	**52,511**

Comparison of emission reductions or net anthropogenic removals achieved with estimates in the registered PD.

Amount achieved during this monitoring period (t CO2e)	Amount estimated ex ante for this monitoring period in the PD (t CO2e)
52,511 tCO2e	57,930 tCO2e

The project is not required to assess permanence risk.

Vintage period	Baseline emissions (tCO_2e)	Project emissions (tCO_2e)	Leakage emissions (tCO_2e)	Buffer pool allocation (tCO_2e)	Reductions VCUs (tCO_2e)	Removals VCUs (tCO_2e)	Total VCU issuance (tCO_2e)
01-Jan-2023 to 31-Dec-2023	75,513	23,002	0	0	52,511	0	52,511
Total	**75,513**	**23,002**	0	**0**	**52,511**	**0**	**52,511**

Table 12 – ERy, ex-post vs PD in the current monitoring period

SITE ID	SITE NAME	$ER_{y,ex\text{-}post}$ in the MP ($t\ CO_2e$)	PD (t CO2e)	% achieved	Variation
BCA-323MS1-19	Lote 23 Quadra 27	17 790	18 306	97%	-3%
BCA-324MS1-19	P. L. N 24 e N 26 Q. 37	3 297	3 946	84%	-16%
BCA-325MS1-19	Lotes 35, 37 e 39 Quadra 39	3 310	3 946	84%	-16%
BCA-326MS1-19	Lote Rural N 56 Quadra 34	3 387	3 946	86%	-14%
BCA-327MS1-19	Quadra 61 Lote 43	3 521	3 946	89%	-11%
BCA-328MS1-19	Lote 4 e 6 Quadra 61	3 334	3 946	84%	-16%
BCA-329MS1-19	Sitio N. S. A.	3 285	3 946	83%	-17%
BCA-330MS1-19	Lote 45 Quadra 61	7 357	8 056	91%	-9%
BCA-331MS1-19	Lote 42 Q. 28	3 630	3 946	92%	-8%
BCA-332MS1-19	Parte dos lotes 46 e 48	3 600	3 946	91%	-9%
TOTAL		52 511	57 930	91%	-9%

Vintage period	Ex-ante estimated reductions/ removals	Achieved reductions/ removals	Percent difference	Explanation for the difference
01-Jan-2023 to 31-Dec-2023	57,930	52,511	-9%	The difference observed (-9%) in mainly due to the minor average number of animals of the ex-post monitoring when compared with the registered PD figures.
Total	**57,930**	**52,511**	**-9%**	

APPENDIX 1: COMMERCIALLY SENSITIVE INFORMATION

As stated in section 1.19 of the present document, there is no commercially sensitive information regarding the project activity, hence the table below will not have any information.

Section	Information	Justification