CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

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Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

>> “Advanced swine manure treatment for the Huasco Valley Agroindustry”

Version number of the document: Fourth
Date: February 15 th, 2012
The document was first completed on 23/02/2007

A.2. Description of the project activity:

>> In December 2000, Agrícola Super Limitada (Agrosuper), the largest pork production company in Chile, initiated a voluntary process to implement advanced waste management systems (anaerobic and aerobic digestion of hog manure), in order to reduce greenhouse gas (GHG) emissions into the atmosphere. During the following years, especially between 2004 and 2005, Agrosuper successfully consummate several of these projects under the Clean Development Mechanism.

Thanks to this experience and incentives and with the drive of implementing new advanced swine manure treatment technologies with low-greenhouse gas emissions for all of the company’s swine barns, Agrosuper considered once more the assistance of the Certified Emission Reductions (CERs) for its swine production expansion in the north of Chile. This will be used to finance most part of the waste treatment systems.

The new facilities are part of the expansion goals from Agrosuper in order to satisfy the international demand for pork meat. The expansion will take place in the northern part of Chile in one big site, in a semi- desertic and unpopulated area. The new waste management technologies will help Agrosuper to reuse the water, minimizing the consumption of it.

This time the project proponent is Agrocomercial AS Limitada, a filial company from Agrosuper in charge of managing the production in the north of Chile.

The project consists of an advanced improvement to the common practice of swine waste treatment in the country, reducing an important volume of greenhouse gases. The technology implementation is based on activated sludge treatment plants. This project activity considers the implementation of six new aerobic treatment systems, based on activated sludge technology.

The expected result from this project activity will be a significant reduction in the volume of methane (CH_4) and nitrous oxide (N_2O) emissions compared to those emissions that would otherwise occur in a scenario with traditional swine manure treatment systems employed on the host country.

According to the Approved Consolidated Methodology ACM0010, and based on a cost analysis, the baseline treatment system is represented by the use of uncovered anaerobic lagoon. Anaerobic lagoons lead to the direct release of CH_4, N_2O and CO_2 into the atmosphere as result of the anaerobic digestion process that takes place in the lagoons.

The project activity can contribute to local sustainable development in the following aspects:

- The project activity can improve the water quality as a resource for crops irrigation.
- The project activity can reduce significantly odour, pathogen and vector control
- The project activity can generate job opportunities for local residents

A.3. Project participants:

Table A.1. Project participants.

Name of Party involved	**Private and/or public entity(ies) project participants (as applicable)**	**Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)**
Chile (host). *Chile ratified the Kyoto Protocol on August 26, 2002*	Agrocomercial AS Limitada *Private company engaged in the swine and poultry business.*	NO

Agrocomercial AS Limitada: The Company

The **"Advanced swine manure treatment for the Huasco Valley Agroindustry**" is a project developed by Agrocomercial AS Limitada, an Agrosuper filial. Agrosuper is pork, poultry, fruit and salmon producer in Chile.

Agrosuper is affiliated with the Swine Producers Association of Chile (ASPROCER) and with the private industry Association (SOFOFA). Agrosuper complies with all Chilean environmental regulations. In addition, the swine production department and all farms are certified with quality and environmental management systems under ISO 9001:2000 and ISO 14001:2000, respectively.

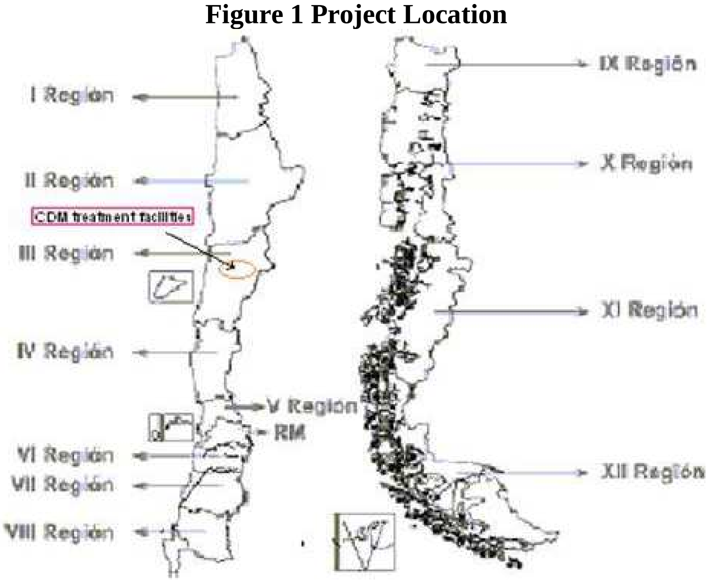
Agrocomercial AS Limitada goal is to offer the best product to the market, and at the same time, maintain a good relationship with the community through initiatives such as good environmental performance.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

>> The project is located in the North Chile (III Region), South America.

Figure 1 Project Location



A.4.1.1. Host Party (ies):

>> Chile.

A.4.1.2. Region/State/Province etc.:

>> III Region, named as Atacama Region, Province of Huasco.

A.4.1.3. City/Town/Community etc:

>> Communities of Vallenar, Freirina and Huasco.

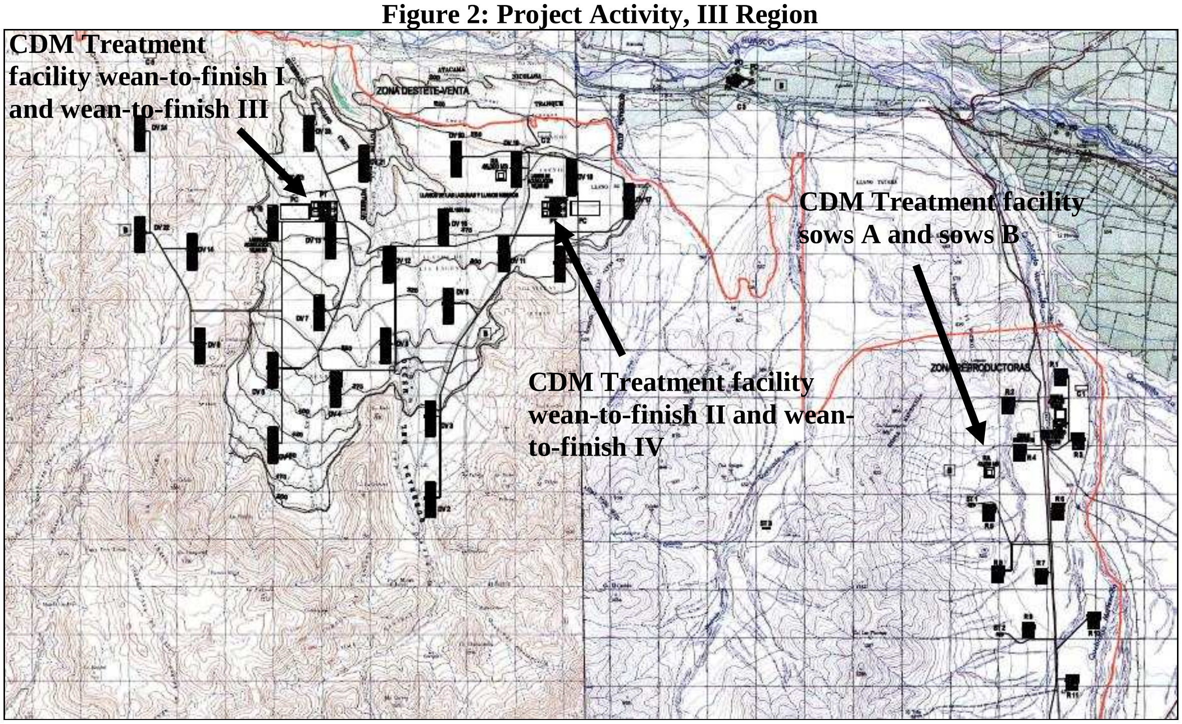
A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):

>> The next table presents the Geographic coordinate system for each advanced animal waste management system (AWMS):

Table A.2: Location of the project activity

Name of the treatment system	Type of treatment system	Farm name	Nearest location	Latitude (DD)	Longitude (DD)
Sows A	Activated sludge	Hacienda Totora	Quebrada Maitencillo	-28.583169°	-70.898028°
Wean-to-finish I	Activated sludge	Hacienda Totora	Quebrada Maitencillo	-28.541317°	-71.054925°
Wean-to-finish II	Activated sludge	Hacienda Totora	Quebrada Maitencillo	-28.541700°	-71.006142°
Sows B	Activated sludge	Hacienda Totora	Quebrada Maitencillo	-28.583169°	-70.898028°
Wean-to-finish III	Activated sludge	Hacienda Totora	Quebrada Maitencillo	-28.541317°	-71.054925°
Wean-to-finish IV	Activated sludge	Hacienda Totora	Quebrada Maitencillo	-28.541700°	-71.006142°

Figure 2: Project Activity, III Region



A.4.2. Category (ies) of project activity:

>> The proposed project activity falls into sectoral scope 13: waste management and handling and sectoral scope 15: agriculture.

A.4.3. Technology to be employed by the project activity:

>> The project is based on aerobic digestion by means of an activated sludge plant. The main components are dissolved air flotation units with Ludzack-Ettinger extended aeration treatment. The water is then recirculated to the barns or for agriculture irrigation.

Figure 3: Advanced aerobic treatment, activated sludge

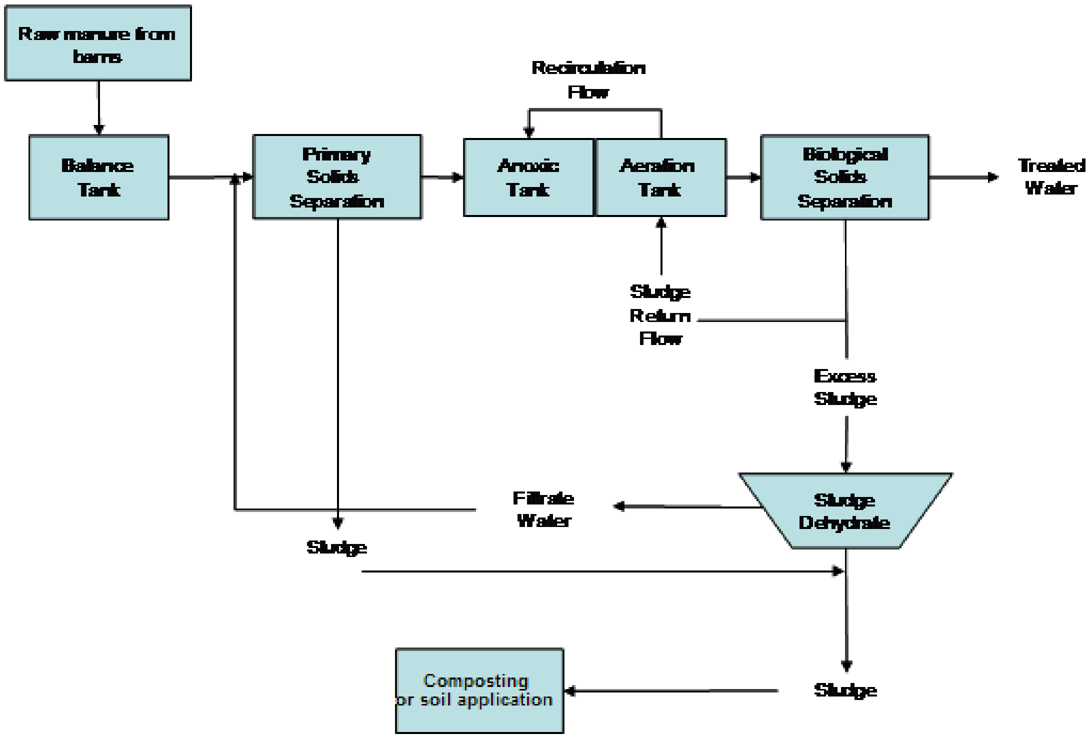
Aerobic Treatment (Activated Sludge)

The activated-sludge process is an aerobic, continuous flow, secondary treatment system that uses sludge-containing, active, complex populations of aerobic micro-organisms to break down organic matter in wastewater. Activated sludge is a flocculated mass of microbes comprised mainly of bacteria and protozoa.

The raw effluent is pumped into a balance tank, and then through a primary solids separation where an initial volume of manure is removed. The remaining effluent is transported to a dissolved air flotation unit (DAF) and then into the anoxic tank of the aerobic system, where it is mixed with an active mass of micro-organisms (referred to as activated sludge) capable of aerobically degrading organic matter into water, new cells, marginal quantities of CO_2 and other end-products. Diffused aeration maintains the aerobic environment in the basin and keeps reactor contents (referred to as mixed liquor) completely mixed.

After a specific treatment time, water is pumped to the biological solids separation stage, where the sludge and a clarified effluent are obtained. The process recycles a portion of settled sludge back to the aeration basin to maintain the required sludge concentration (within the aerobic basin). The process also intentionally wastes a portion of the separated sludge to maintain the required solid retention time for effective organic (BOD) removal.

Figure 4: Flowchart of the Aerobic Treatment



The activated sludge treatment process has sludge outflow from the initial solid separation stage and the biological solid separation stage. Total sludge is conducted to a centrifugal decanter, where moisture is diminished in order to manage sludge without liquid draining problems. The present project considers the appropriate management of sludge in aerobic and controlled conditions. The sludge management will be based on composting treatment**.** This is consistent with what has been approved for the respective Environmental Impact Assessment Study**.** The purpose of the composting process is to achieve definitive sludge stabilization, and allowing the refinement of the sludge through it's transformation as compost.

A.4.4. Estimated amount of emission reductions over the chosen crediting period:

>> The following table represents the emission reductions through the first crediting period, initially considering that the project will start its operation on January 1st 2012, only if world market conditions and international demand for pork meat are in line with the pork production capacity of the Huasco project. If these conditions are not in line with the projects capacity, the start of the project could be delayed.

Table A.4 Emission Reduction

Years	Annual emission reductions (tCO2e/year)
2012	205,352
2013	547,606
2014	821,408
2015	1,026,758
2016	1,026,758
2017	1,026,758
2018	1,026,758
Total estimated reductions (tonnes of CO_2e)	**5,681,398**
Total number of crediting years	**7**
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	**811,629**

A.4.5. Public funding of the project activity:

>> Not applicable. There is no public funding involved in this Project.

SECTION B. Application of a baseline methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the project activity:

>>The applicable approved baseline methodology for this project is **"Consolidated baseline methodology for GHG emission reductions from manure management systems"**, referenced as ACM0010 version 5, released after the 42th meeting of the Executive Board on September 2008. It can be found on the CDM-Executive Board website under the following link:

http://cdm.unfccc.int/EB/042/eb42_repan08.pdf

In order to demonstrate additionality, Approved Consolidated Methodology ACM0010 refers to the latest version of the "**Tool for the demonstration and assessment of additionality**" (version 5.2), released after the 39th meeting of the Executive Board on May 2008. It can be found on the CDM-Executive Board website under the following link:

http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.pdf

Approved Consolidated Methodology ACM0010 refers to the latest version of the following tools:

"**Tool to calculate baseline, project and/or leakage emissions from electricity consumption**" (version 1), EB39.
http://cdm.unfccc.int/methodologies/Tools/tool_electricity_consumption_v1.pdf

"**Tool to calculate the emission factor for an electricity system**" (version 02), EB50.
http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.pdf

B.2. Justification of the choice of the methodology and why it is applicable to the project activity:

>> Approved Consolidated Methodology ACM0010, is applicable to the project activity since the project fulfils all the methodological principles. The following list justifies the applicability conditions.

- Farms where livestock populations, comprising of cattle, buffalo, swine, sheep, goats, and/or poultry, is managed under confined conditions: The project activity comprises swine population managed under confined conditions.
- Farms where manure is not discharged into natural water resources (e.g. rivers or estuaries): This has been replicated in order to represent the different baseline scenarios, and no plausible scenario considers discharge of raw manure to rivers or estuaries.
- In case of anaerobic lagoons treatments systems, the depth of the lagoons used for manure management under the baseline scenario should be at least 1m: The anaerobic lagoon considered in the baseline scenario has a depth of 4,5 meters.
- The annual average temperature in the site where the anaerobic manure treatment facility in the baseline existed is higher than 5°C.: The annual average temperature in the site is 17.96 ºC.
- In the baseline case, the minimum retention time of manure waste in the anaerobic treatment system is greater than 1 month: In order to assure a proper treatment, the retention time of the manure in the anaerobic lagoon is greater than 1 month. The exact value calculated for HRT is 91 days; this is calculated through the quotient between the useful volume of the lagoon and the estimated daily flow for the project activity.
- The AWMS/process in the project case should ensure that no leakage of manure waste into ground water takes place, e.g., the lagoon should have a non-permeable layer at the lagoon bottom: In the project case, all the lagoons will have a non-permeable layer on the bottom.

The proposed project activity complies with all the applicability conditions of the methodology; therefore it is applicable for the proposed project activity.

B.3. Description of the sources and gases included in the project boundary:

>> Figures 5 and 6 show the baseline and project activity boundaries. These diagrams also serve as a schematic figure to represent a carbon balance of each scenario, in each project initiative, using the equations presented in the approved methodology:

Figure 5: Baseline scenario boundary

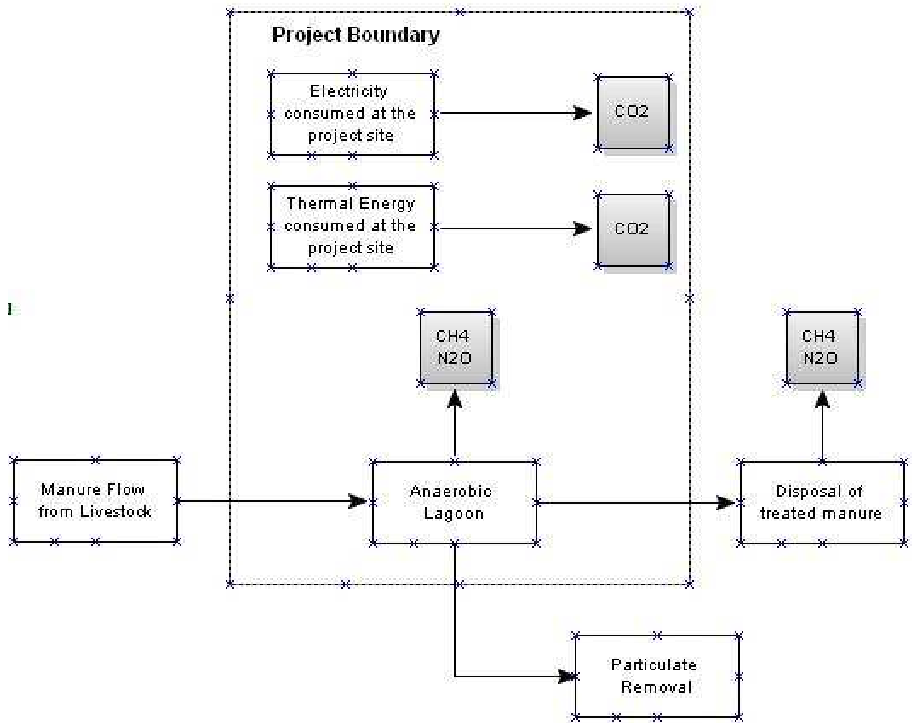
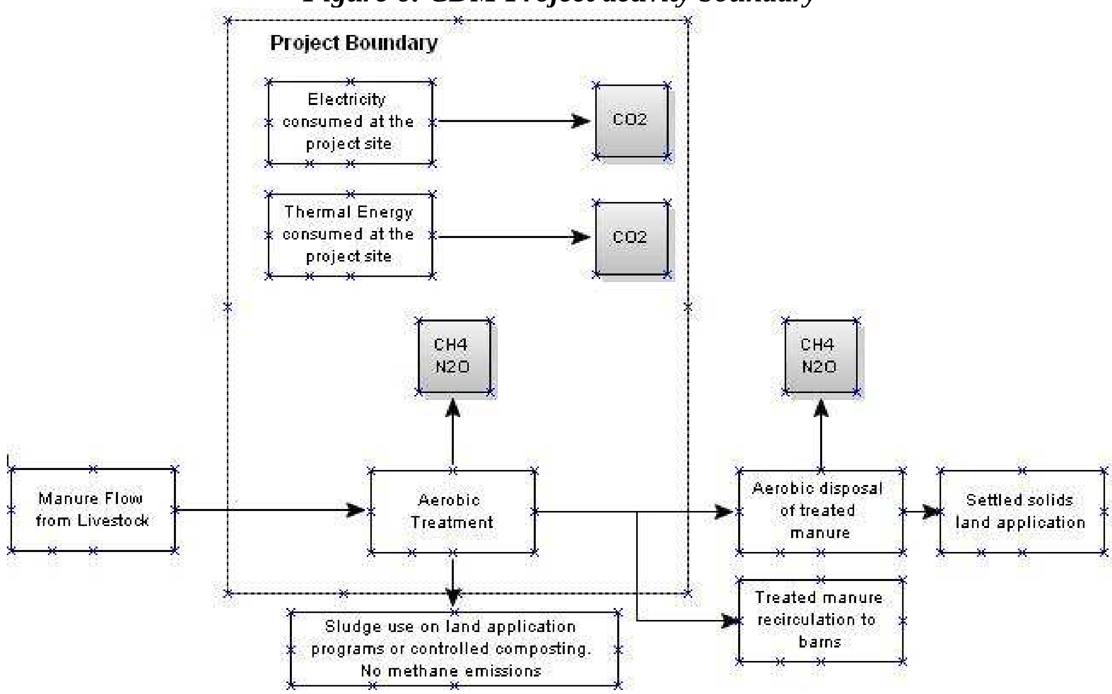


Figure 6: CDM Project activity boundary



The sources and gases included in the project boundary are summarized in the table B.5 below.

Table B.5. Emission sources for each scenario

	Source	Gas	Included?	Justification/Explanation
Baseline	Direct emissions from uncovered anaerobic lagoon	CH_4	Included	The major source of emissions in the baseline
		N_2O	Included	.
		CO_2	Excluded	CO_2 emissions from the decomposition of organic waste are not accounted
	Emissions from electricity consumption/thermal energy generation	CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative
		CO_2	Excluded	Electricity is not consumed in the baseline. Thermal energy is not generated in the baseline
Project Activity	Direct emissions from activated sludge process	CH_4	Included	
		N_2O	Included	
		CO_2	Excluded	CO_2 emissions from the decomposition of organic waste are not accounted
	Emissions from onsite electricity consumption	CH_4	Excluded	Excluded for simplification. This emission source is assumed to be very small
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small
		CO_2	Included	This is an important emission source

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

>> The methodology determines the baseline scenario through the following steps:

Step I: Define alternative scenarios to the proposed CDM project activity;

Step II: Barriers analysis;

Step III: Investment analysis;

Step IV: Baseline revision at renewal of crediting period.

Step I: Define alternative scenarios to the proposed CDM project

Identify realistic credible alternative scenarios that are available either to the project participants or to other potential project developers for managing the manure.

The list of possible baseline scenario alternatives considered was selected from the 2006 IPCC Guidelines for National Greenhouse Gases Inventories (Chapter 10, Table 10.17). The list was a bridged in view of environmental constraints, current facility infrastructure and Agrocomercial AS Limitada internal policies. These alternative scenarios should include:

1) Aerobic Treatment i.e. the proposed project activity not being registered as CDM project activity
2) Solid Storage
3) Liquid/slurry

4) Uncovered anaerobic lagoon
5) Pit storage below animal confinements
6) Storage lagoon
7) Solid Separation – Composting
8) Deep bedding

The dry lot system, deep bedding and composting have been excluded because is not applicable to the conditions of the swine's barns.

Eliminate alternatives that are not in compliance with all applicable legal and regulatory requirements.

1) Aerobic treatment i.e. the proposed project activity not being registered as CDM project activity. Activated sludge technology is one of the most advanced wastewater treatment in the world. The investment and operational costs are much higher compared to other treatment technologies. The implementation of activated sludge technology in swine manure is unlikely due to high contaminants concentration and not possible without CDM. Therefore, this scenario is not a plausible baseline scenario.

2) Solid Storage: This kind of system is not applicable for manure that has low solid content. Due to washing and flushing systems of the barns, swine waste in these projects is liquid, therefore pumped from the barns to the waste treatment systems.

3) Liquid slurry: Is not the standard actually implemented in Chile, since it is more frequent in cold climates, where only liquid manure is stored and not treated in tanks. For Mediterranean and / or tropical climates open anaerobic lagoons are the standards usually implemented for swine manure treatment.

4) Anaerobic Lagoon: The majority of the Chilean swine barns have introduced the open lagoon system as the standard management waste system (ASPROCER); this has strict relation with the recommended technologies exposed on the Clean Development Agreement signed in 2005 between the Chilean Government and the national pork industry in order to enhance the level of swine manure treatment in the country. Anaerobic lagoon technology has become the common practice implemented by the Pork industry in Chile mainly due to its lower cost, and it's consistency with the Chilean Clean Production Agreement for swine production. Therefore, this represents one of the likely economically attractive scenarios for Agrocomercial AS Limitada pork production.

5) Pit Storage: Agrocomercial AS Limitada has evaluated the possibility of constructing this kind of waste management technology. The farm operates under a competitive market in Chile and involves large farm size. Therefore, this technology is not common in the country. The quantity of manure produced is too large to implement complex storage structure under the barns, and for this reason will be excluded. Also, the excreted volume accumulated under the barns produces enteric fermentation gas, which could intoxicate swine livestock if it is not blown out of the barns.

6) Storage Lagoon: This system does not consider decay in volatile solids or nitrogen content in treated manure. The storage lagoon does not comply with the waste treatment quality standards detailed in the environmental impact assessment study. Depending on storage design, this system will not be efficient enough for odour and vector control. So the exclusion of this potential baseline scenario can be justified.

7) Solid Separation – Composting: Composting systems are not adapted to large volumes of water, or moisture contents. This dry aerobic system can only be applied after solid separation stages of activated sludge. For this reason it is excluded from the list of possible baseline scenarios. Compositing practices

in Chile are more common for other type of solid waste treatment and are presented as other CDM project activities.

8) Deep bedding: Although deep bedding is possible, present in Chile and Agrosuper has some experience in working with it, it is not the production system that better adapts to large swine populations. In the first place, too much logistic would need to be implemented regarding solid (bedding) removal and fresh material input for each breeding or growing stage. This is for example 500 trucks per day per farm during this bedding process and therefore not applicable to our operations. On the other hand, breeding farms maintain a very high sanitary standard, therefore avoid all kinds of material inputs into the farms and the entrance of bedding is too risky regarding swine sanitary and disease aspects.

Step II: Barrier analysis

Technology barriers: To implement an activated sludge, a significant level of waste and barns that are close to each other is required in order to have continuous flow. Maintenance requirements involved in this technology, including a detailed monitoring program of its performance level, must also be considered.

Legal constrains: The implementation of this project activity by Agrocomercial AS Limitada highly exceeds current Chilean regulations for swine waste treatment. Apart from existing legislation in Chile that establishes water quality parameters that do not allow manure to be discharged into watercourses, there is no legislation in place that requires specific swine manure treatment in the country. Besides from the advancements in manure management made by Agrocomercial AS Limitada in this project activity, the remainder of the swine industry lags behind in the adoption and implementation of manure management technologies. In Chile, the basic methods of swine manure management do not provide for the reduction of GHG emissions. There are no expectations that Chilean legislation will require future implementation of an aerobic treatment, due to the significant investments required, without economic compensation.

Step III: Investment analysis

The following economic comparison between each waste management scenario, will exclude least-probable scenario, in order to identify the baseline scenario. For each scenario, all costs and economic benefits are being illustrated in a transparent and complete manner.

Table B.6. NPV Comparison

Baseline Scenario (US$)	Year 0	Year 1-4	Year 5	Year 6-9	Year 10
WASTE TREATMENT: ANAEROBIC LAGOON					
Equipment costs (Irrigation equipment)	0				
Fair value					0
Installation costs	-2,405,211				
Maintenance costs					
Additional costs (Operation, consultancy, engineering, irrigation costs**,** drying solids, sludge removal and land application in 5th year).			-966,400		-966,400
SUBTOTAL	**-2,405,211**	**0**	**-966,400**	**0**	**-966,400**

TOTAL Baseline Scenario	**-2,405,211**	**0**	**-966,400**	**0**	**-966,400**
NPV (US$) (discount rate = 10 %)	**-3,377,859**				
IRR (%)	**undefined**				

Proposed Project (US$)	**Year 0**	**Year 1-4**	**Year 5**	**Year 6-9**	**Year 10**
WASTE TREATMENT: ACTIVATED SLUDGE					
Equipment costs (primary solids separators + activated sludge plant)	-1,829,268				
Fair value					182,927
Installation costs	-6,153,917				
Maintenance costs		-128,049	-128,049	-128,049	-128,049
Additional costs (Operation, consultancy, engineering, irrigation costs**,** drying solids, sludge removal and land application in 5th year).		-805,065	-805,065	-805,065	-805,065
SUBTOTAL	**-7,983,185**	**-933,114**	**-933,114**	**-933,114**	**-750,187**
TOTAL Proposed Project	**-7,983,185**	**-933,114**	**-933,114**	**-933,114**	**-750,187**
NPV (US$) (discount rate = 10 %)	**-13,646,239**				
IRR (%)	**undefined**				

There are no potential revenues involved in any of these scenarios. The assumptions and parameters considered in the analysis were chosen to be conservative.

The applied discount rate value of 10% is based on weighted average cost of capital (WACC) of Agrosuper. This value is used by the project developer in order to make the investment decisions.

It can be seen that due to the non existence of positive cash flows, we must base our economic analysis on a comparison of net present value (NPV) parameters, between scenarios.

The following table presents the NPV of each scenario analyzed:

Table B.7. NPV Comparison for Sows A

	Anaerobic Lagoon	**Aerobic Treatment**
NPV (US$) (discount rate = 10 %)	**-3,337,859**	**-13,646,239**

Because there are no positive cash flows involved, a cost-effective economic comparison is adequate to recognize the best waste management scenario, with the lower costs. It can be seen that the anaerobic lagoon is the most attractive course of action, thus the prevailing practice. The project initiative has ranges of NPV far more negative than the other scenarios presented, so it can be assured that the project scenario is additional compared to the baseline.

Step IV: Baseline revision

The project participant, at the renewal of each credit period, will take into account changes in the relevant relevant national and/or sectoral regulations between two crediting periods as well as any increase in the

animal stock above the pre project animal stock. This assessment will be undertaken by the verifying DOE.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):

>> The baseline determination demonstrates that the baseline is different from the proposed project activity not undertaken as a CDM project activity, therefore it may be concluded that the project is additional.

Agrosuper has a long history of developing CDM projects. With help of CDM it has changed most of its waste treatment facilities from open lagoons to Biodigesters and Activated sludge treatment plants.

As stated in the PDD, there are no further incentives than the CDM to implement this advance technology. Nor financial incentives nor legal requirements.

Agrosuper was in fact the first agroindustrial company worldwide to use the CDM incentives to implement this technology, starting in the year 2000, when the development of the CDM was still unclear, but some companies were already taking positions in case the CDM and the Kyoto Protocol gets finally ratified.

The following information shows a timeline of Huasco CDM project, including evidence of main actions related to project implementation, CDM previous consideration and actions to secure CDM status in parallel to the project implementation.

Table B.5. Huasco CDM timeline

Huasco CDM timeline	Date	Evidence	Name document
Awareness of CDM	10-08-2000	Letter sent from Agrosuper to Chilean DNA	"Letter to CONAMA"
Environmental Impact Statement to DNA	08-02-2005	Evidence of the date of submission to DNA and project sheet	http://www.e-seia.cl/seia-web/ficha/fichaPrincipal.php?id_expediente=1075666&idExpediente=1075666
Request for registration to "Methane capture and combustion from swine manure treatment for Pocillas and La Estrella" (0033)	22-06-2005	Registration request form	"PocillasLaEstrella_F-CDM-REG_2005-06-22"
Environment voluntary agreement	30-09-2005	Evidence of the date of Agreement	"Legal constrains (APL II)"
Technology quotes	24-02-2006	Order confirmation from Nijhuis Water	"Equipment quotes"

		Technology	
Request for registration to "Advanced swine manure treatment in Maitenlahue and La Manga" (0458)	08-06-2006	Registration request form	"F-CDM-REG_Maitenlahue-La Manga"
Decision to implement project	01-09-2006	News on website APA - ASPROCER(Asociación Productores de Cerdos)	"Decision to implement project"
Investment costs [API]	27-11-2006	Form agreement API signed	"Investment costs (API)"
Civil works	10-01-2007	Invoice Patricio Soto y Cia	"Civil works (Patricio Soto)"
Preparation PDD	23-02-2007	First Project design document	"Huasco PDD May_07 v2 modified 10.07.2007"
DNV contract (validation)	17-05-2007	Form agreement signed	"DNV contract"
Start the first process validation	02-06-2007	PDD sent to UNFCCC, version 1	"PDD version 1"
Decision to stop project	10-10-2007	News on website APA - ASPROCER(Asociación Productores de Cerdos)	" Project stopped"
Start the second stage of validation process	15-05-2010	PDD sent to UNFCCC, version 3	"PDD version 3"
Decisive factor in restarting the project (Negotiation of Emission Reduction)	06-10-2010	E-mail by potential buyers of CERs	"RV Interés contratación créditos de carbono - Repsol YPF"
Decisive factor in restarting the project	03-01-2011	E-mail from Huasco Valley Manager	"Buenas noticias de Huasco"
Decisive factor in restarting the project (Negotiation of Emission Reduction)	21-06-2011	E-mail by potential buyers of CERs	"RV Compra de CERs del proyecto Advanced swine manure treatment for the Huasco Valley Agroindustry"
Start of operation of Maitencillo Plant	15-08-2011	Monitoring Plan	"STP-PLA-R-002 ELECTRICIDAD MAITENCILLO"
Start of operation of Nicolasa Plant	07-09-2011	Monitoring Plan	"STP-PLA-R-016 ELECTRICIDAD PLA NICOLASA"
Letter of Approval (LoA)	22-09-2011	Form LoA signed	"Autorizacion MDL - Huasco - 22 SEP 2011"

by the DNA of Chile			

The documents supporting that the incentive from the CDM was seriously considered in the decision to proceed with the project activity were presented to the DOE and are attached to the current version of the PDD.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

>> The tools for representing emission calculation for any wastewater treatment component in each scenario are available in Approved Consolidated Methodology ACM0010.

The formulae used to estimate baseline emissions, project emissions and leakages are described below.

Baseline emissions

EQ. 1: Baseline emissions

$$BE_y = BE_{CH4,y} + BE_{N2O,y} + BE_{elect/heat,y}$$

EQ. 2: Baseline CH_4 emissions related to anaerobic lagoon

$$BE_{CH4,,y} = GWP_{CH4} \bullet D_{CH4} \bullet \sum (MCF_j \bullet 0.94 \bullet Bo,_{LT} \bullet N_{LT} \bullet VS_{LT,y} \bullet MS\%_{Bl,j})$$

EQ. 3: Baseline N_2O Emissions related to anaerobic lagoon

$$BE_{N2O,y} = GWP_{N2O} \bullet CF_{N2O\text{-}N,N} \bullet (1/1000) \bullet (E_{N2O,D,y} + E_{N2O,ID,y})$$

According to Methodology ACM0010, direct and indirect N_2O emissions must be calculated for each treatment stage and for leakages. For the anaerobic lagoon, direct N_2O emissions are considered to be negligible, based on the absence of oxidized forms of nitrogen entering system in combination with low potential for nitrification and denitrification in the system. This assumption is supported on published IPCC values for the direct emission factor for the anaerobic lagoon, which is equal to zero.

EQ. 4: Direct N_2O Emissions

$$E_{N2O,D,y} = \sum (EF_{N20,D,j} \bullet NEX_{LT},_y \bullet N_{LT} \bullet MS\%_j)$$

EQ. 5: Indirect N_2O Emissions

$$E_{N2O,ID,y} = \sum (EF_{N20,ID,j} \bullet F_{gasm} \bullet NEX_{LT},_y \bullet N_{LT} \bullet MS\%_j)$$

EQ. 6: Baseline CO_2 Emissions

$$BE_{elect/heat,y} = EG_{Bl,y} \bullet CEF_{Bl,elect,y} + HG_{Bl,y} \bullet CEF_{Bl,therm,y}$$

Where

BE_y: Baseline emissions in year y, in tCO_2e/year.
$BE_{CH4,y}$: Baseline methane emissions in year y, in tCO_2e/year.

$BE_{N2O,y}$: Baseline N_2O emissions in year y, in tCO_2e/year.
$BE_{elec/heat,y}$: Baseline CO_2 emissions from electricity and/or heat used in the baseline, in tCO_2e/year.
GWP_{CH4}: Approved Global Warming Potential (GWP) of CH_4.
D_{CH4}: CH_4 density (0.67 kg/m^3 at room temperature, 20 ºC, and 1 atm pressure).
MCFj : Methane conversion factor (MCF) for the anaerobic lagoon.
$B_{0,LT}$: Maximum CH_4 production capacity from manure per animal for a defined livestock population N_{LT}: Livestock of a defined population for year y. (m_3 CH_4/kg-dm).
N_{LT} : Livestock of a defined population for year y.
$VS_{LT,y}$: Volatile solid excretion per day on a dry-matter basis for a defined livestock population in kg-dm/animal/day, for year y. For this project it will be considered the use of corrected default IPCC values.
$MS\%_j$: Fraction of manure handled in system j.
GWP_{N2O}: Approved Global Warming Potential (GWP) for N_2O.
$CF_{N2O-N,N}$: Conversion factor N_2O-N to N (44/28).
$E_{N2O,D,y}$: Direct Nitrous oxide emissions from the system j of the manure management systems in tons of CO_2 equivalents per year.
$E_{N2O,ID,y}$: Indirect Nitrous oxide emissions from the system j of the manure management systems in tons of CO_2 equivalents per year.
F_{gasm}: Percent of managed manure nitrogen for livestock category that volatilises as NH_3 and NO_x in the manure management system.
$NEX_{LT,y}$: Monthly average nitrogen excretion per head of a defined livestock population.
$EG_{Bl,y}$: Amount of electricity in the year y that would be consumed at the project site in the absence of the project activity (MWh) for operating AWMS.
$CEF_{Bl,elec,y}$: Carbon emissions factor for electricity consumed at the project site in the absence of the project activity (tCO_2/MWh).
$HG_{Bl,y}$: Quantity of thermal energy that would be consumed in year y at the project site in the absence of the project activity (MJ) using fossil fuel for operating AWMS.
$CEF_{Bl,therm,y}$: CO_2 emissions intensity for thermal energy generation (tCO_2 e/MJ).

Project emissions

EQ. 7: Project emissions

$$PE_y = PE_{aer,y} + PE_{N2O,y} + PE_{elect/heat,y}$$

EQ. 8: Project CH_4 emissions related to the aerobic treatment

$$PE_{aer,y} = GWP_{CH4} \bullet D_{CH4} \bullet 0.001 \bullet F_{Aer} \bullet \prod[1- R_{VS,n}] \bullet \sum (Bo,_{LT} \bullet N_{LT} \bullet VS_{LT,y} \bullet MS\%_{aer}) + PE_{Sl,y}$$

EQ. 9: Project N_2O Emissions related to the aerobic treatment

$$PE_{N2O,y} = GWP_{N2O} \bullet CF_{N2O-N,N} \bullet 1/1000 \bullet (E_{N2O,D,y} + E_{N2O,ID,y})$$

For the activated sludge system, indirect N_2O emissions are considered to be negligible, due to fast rate of the reactions that occur in this process. The following are the main equations involved in the process:

Denitrification:

$6\ NO_3^- + 2CH_3OH \rightarrow 6NO_2^- + 2CO_2 + 4H_2O$
$6\ NO_2^- + 3CH_3OH \rightarrow 3N_2 + 3CO_2 + 3H_2O + 6OH^-$
$6\ NO_3^- + 5CH_3OH \rightarrow 3N_2 + 5CO_2 + 7H_2O + 6OH^-$

Nitrification:

$2\ NH_4^+ + 3O_2 \rightarrow 2NO_2^- + 4H^+ + 2H_2O$

$2NO_2^- + O_2 \rightarrow 2NO_3^-$

$NH_4^+ + 2O_2 \rightarrow NO_3^- + 2H^+ + H_2O$

The level of dissolved oxygen and the quantity of organic matter in the aeration lagoon guarantee these reactions occur in the system.

EQ. 10: Direct N_2O Emissions

$$E_{N2O,D,y} = \sum (EF_{N20,D,j} \bullet NEX_{LT,y} \bullet N_{LT} \bullet MS\%_j)$$

EQ. 11: Indirect N_2O Emissions

$$E_{N2O,ID,y} = \sum (EF_{N20,ID,j} \bullet F_{gasm} \bullet NEX_{LT,y} \bullet N_{LT} \bullet MS\%_j)$$

EQ. 12: Project CO_2 Emissions

$$PE_{elect/heat,y} = EL_{Pr,y} \bullet (1+TDL) \bullet CEF_d + HG_{Pr,y} \bullet CEF_{Pr,therm,y}$$

.

According to Methodology ACM0010 version 5, the emission factor for the electricity system will be calculated with the latest information available for every verification period

The grid emission factor has been calculated using the Annex 14: “Tool to calculate the emission factor for an electricity system”, Version 02.

The Project Developer choose to determine the CO2 emission factor by calculating the Operating and Build Margin coefficients of the SIC (Central Interconnected System of the Republic of Chile) grid and estimate the Combined Margin emission factor.

The Operating Margin was calculated using method (b) described in Annex 14, Simple adjusted Operating Margin. The Build Margin was calculated taking into account the 20% of the total generation in 2007. The Generation was obtained directly from the CDEC-SIC. The data correspond to the Central Interconnected System of the Republic of Chile (SIC), where the project activity is located.

The simple adjusted operating margin was calculated using the ex post option, with the most recent data, corresponding to 2007. The build margin was calculated using data for 2007.

The estimated operating margin is 0,749 tCO2/MWh and the build margin is 0,490 tCO2/MWh. Then, assuming the default values defined on page 16, Annex 14, it is possible to calculate the Combined Margin emission factor:

$$EF = 0.5 \cdot 0.749 + 0.5 \cdot 0.490 = 0.619\, tCO_2 / KWh$$

The lambda used in the Operating Margin calculation was obtained from the load curve for the SIC for the year 2007, equal to 0,000.

Where

$PE_{Aer,y}$: Methane emissions from AWMS that aerobically treats the manure in t CO2e/year.

$PE_{N2O,y}$: Nitrous oxide emission from project manure waste management system in t CO2e/year.
$PE_{elec/heat}$: Project emissions from use of heat and/or electricity in the project case in t CO2e/year.
0.001: Methane emissions from aerobic treatment.
F_{Aer}: Fraction of volatile solid directed to anaerobic digester.
$PE_{SL,y}$: CH_4 emissions from sludge management in the second treatment stage of the manure management system during the year y in tons of CO_2 equivalent.
MCF_{sl} : Methane conversion factor (MCF) for treatment of sludge in the second treatment stage in percent.
$R_{VS,n}$: Fraction of volatile solid treated in AWMS stage n prior to the step in which are calculated.
$EL_{Pr,y}$: Amount of electricity in the year y that is consumed at the project site in the project case (MWh).
CEF_d: Carbon emissions factor for electricity consumed at the project site during the project activity (tCO_2/MWh). Factor is zero if biogas is used to produce electricity.
$HG_{Pr,\ y}$: Quantity of thermal energy consumed in year y at the project site in the project case (MJ).
$CEF_{Pr,therm,y}$: CO2 emissions intensity for thermal energy generation (tCO2e/MJ).
TDL: Technical and distribution losses for power consumption of the project.

Leakage

EQ. 13: Leakage

$$LE_y = (LE_{P,N2O}-LE_{B,N2O})+(LE_{P,CH4}-LE_{B,CH4})$$

Where

LE_y: Net leakage emissions released from the storage (if applicable) and land application of the treated manure, in tCO_2e/year.
$LE_{P,N2O}$: Are the N_2O emissions released during project activity from the storage (if applicable) and land application of the treated manure, in tCO_2e/year.
$LE_{B,N2O}$: Are the N_2O emissions released during baseline scenario from land application of the treated manure, in tCO_2e/year.
$LE_{P,CH4}$: Are the CH_4 emissions released during project activity from the storage (if applicable) and land application of the treated manure, in tCO_2e/year.
$LE_{B,CH4}$: Are the CH_4 emissions released during baseline scenario from land application of the treated manure, in tCO_2e/year.

i) N_2O leakage emissions

Project N_2O leakage emissions are the emissions released during project activity from the storage (if applicable) and land application of the treated manure. Baseline N_2O leakage emissions are the emissions released during the baseline scenario land application of the treated manure.

N_2O leakage emissions are estimated as the net of those released under project activity and those released in the baseline scenario.

<u>Project N_2O leakage emissions from storage (if applicable):</u>

EQ. 14: Project N_2O leakage emissions from storage (if applicable)

$$LE_{N2O,y} = GWP_{N2O} \cdot CF_{N2O-N,N} \cdot (1/1000) \cdot (E_{N2O,D,y} + E_{N2O,ID,y})$$

Leakages form the storage (if applicable) are calculated using N_2O emission factor from IPCC default values for liquid/slurry without natural crust cover, due to the non-existence of any crust cover.

According to Methodology ACM0010, direct and indirect N_2O emissions must be calculated for each treatment stage and for leakages. If the project includes a storage lagoon, direct N_2O emissions will be considered to be negligible, based on the absence of oxidized forms of nitrogen entering system in combination with low potential for nitrification and denitrification in the system. This assumption is supported on published IPCC values for the direct emission factor for the storage lagoon, which is equal to zero.

EQ. 15: Direct project N_2O leakage emissions from storage (if applicable)

$$E_{N2O,D,y} = \prod[1- R_{N,n}] \bullet \sum (EF_{N20,D,j} \bullet NEX_{LT},_{y} \bullet N_{LT} \bullet MS\%_{j})$$

EQ. 16: Indirect project N_2O leakage emissions from storage (if applicable)

$$E_{N2O,ID,y} = \prod[1- R_{N,n}] \bullet \sum (EF_{N20,ID,j} \bullet F_{gasm} \bullet NEX_{LT},_{y} \bullet N_{LT} \bullet MS\%_{j})$$

<u>Project N_2O leakage emissions from land application of treated manure:</u>

EQ. 17: Project N_2O leakage emissions from land application of treated manure

$$LE_{P,N2O} = GWP_{N2O} \bullet CF_{N2O-N,N} \bullet (1/1000) \bullet (LE_{N2O,Land}+LE_{N2O,runoff}+LE_{N2O,vol})$$

EQ. 18: Direct project N_2O leakage emissions from application of manure waste

$$LE_{N2O,Land} = EF_{1} \bullet \prod[1- R_{N,n}] \bullet \sum (NEX_{LT,y} \bullet N_{LT})$$

EQ. 19: Indirect project N_2O leakage emissions due to leaching and run-off

$$LE_{N2O,runoff} = EF_{5} \bullet F_{leach} \bullet \prod[1- R_{N,n}] \bullet \sum (NEX_{LT,y} \bullet N_{LT})$$

EQ. 20: Indirect project leakage emissions from the nitrogen that volatilises as NH3 and NOx

$$LE_{N2O,vol} = EF_{4} \bullet \prod[1- R_{N,n}] \bullet F_{gasm} \bullet \sum (NEX_{LT,y} \bullet N_{LT})$$

<u>Baseline N_2O leakage emissions from land application of treated manure:</u>

EQ. 21: Baseline N_2O leakage emissions from land application of treated manure

$$LE_{B,N2O} = GWP_{N2O} \bullet CF_{N2O-N,N} \bullet (1/1000) \bullet (LE_{N2O,Land}+LE_{N2O,runoff}+LE_{N2O,vol})$$

EQ. 22: Direct baseline N_2O leakage emissions from application of manure waste

$$LE_{N2O,Land} = EF_{1} \bullet \prod[1- R_{N,n}] \bullet \sum (NEX_{LT,y} \bullet N_{LT})$$

EQ. 23: Indirect baseline N_2O leakage emissions due to leaching and run-off

$$LE_{N2O,runoff} = EF_{5} \bullet F_{leach} \bullet \prod[1- R_{N,n}] \bullet \sum (NEX_{LT,y} \bullet N_{LT})$$

EQ. 24: Indirect baseline leakage emissions from the nitrogen that volatilises as NH3 and NOx

$$LE_{N2O,vol} = EF_4 \bullet \prod[1- R_{N,n}] \bullet F_{gasm} \bullet \sum (NEX_{LT,y} \bullet N_{LT})$$

Where

$LE_{N2O,land}$: Direct nitrous oxide emission from application of manure waste, in Kg N_2O-N/year.
$LE_{N2O,ru\ noff}$: Indirect nitrous oxide emission due to leaching and run-off, in Kg N_2O-N/year.
$LE_{N2O,vol}$: Indirect nitrous oxide emission due to volatilization and re-deposition, in Kg N_2O-N/year.
EF_1: Emission factor for direct emission of N2O from soils.
EF_5: Emission factor for indirect emission of N2O from runoff.
F_{leach}: Fraction of all N added to/mineralised in managed soils in regions where leaching/runoff occurs that is lost through leaching and runoff.
EF_4: Emission Emission factor for N2O emissions from atmospheric deposition of N on soils and water surfaces.
F_{gasm}: Fraction of animal manure N that volatizes as NH_3 and NO_X.

ii) CH4 leakage emissions

Project CH_4 leakage emissions are the emissions released during project activity from the composted sludge, the storage (if applicable) and land application of the treated manure. Baseline CH_4 leakage emissions are the emissions released during the baseline scenario land application of the treated manure.

CH_4 leakage emissions are estimated as the net of those released under project activity and those released in t he baseline scenario.

Project CH_4 leakage emissions from composted sludge:

EQ. 25: CH_4 Emissions related to the composted sludge

$$PE_{SL,y} = GWP_{CH4} \bullet D_{CH4} \bullet MCF_{sl} \bullet 0.94 \bullet F_{Aer} \bullet \prod[1- R_{VS,n}] \bullet \sum(Bo,_{LT} \bullet N_{LT} \bullet VS_{LT,y} \bullet MS\%_j) \bullet (nd_{sludge,y}/nd_y)$$

Where

$nd_{sludge,y}$: Number of days in year y where the sludge was composted.

Project CH_4 leakage emissions from storage (if applicable):

EQ. 26: Project CH_4 leakage emissions related to the storage (if applicable)

$$LE_{storage,y} = GWP_{CH4} \bullet D_{CH4} \bullet MCF_{li/slu} \bullet 0.94 \bullet F_{Storage} \bullet \prod[1- R_{VS,n}] \bullet \sum (Bo,_{LT} \bullet N_{LT} \bullet VS_{LT,y} \bullet MS\%_{stl})$$

Leakages from the storage (if applicable) are calculated using Methane Conversion Factor from IPCC default values for liquid/slurry without natural crust cover, due to the non-existence of any crust cover.

Project CH_4 leakage emissions from land application of treated manure:

EQ. 27: Project CH_4 leakage emissions from land application of treated manure

$$LE_{P,CH4} = GWP_{CH4} \bullet D_{CH4} \bullet MCF_d \bullet \prod[1- R_{VS,n}] \bullet \sum (B_{O,LT} \bullet N_{LT} \bullet VS_{LT,y} \bullet MS\%_j)$$

Baseline CH_4 leakage emissions from land application of treated manure:

EQ. 28: Baseline CH_4 leakage emissions from land application of treated manure

$$LE_{B,CH4} = GWP_{CH4} \bullet D_{CH4} \bullet MCF_{d} \bullet \prod[1- R_{VS,n}] \bullet \sum (B_{O,LT} \bullet N_{LT} \bullet VS_{LT,y} \bullet MS\%_{j})$$

Where

$LE_{Storage,y}$: Methane emissions from storage l(if applicable) in t CO2e/year.
$F_{Storage}$: Fraction of volatile solid directed to storage (if applicable)..
$MCF_{li/slu}$: Methane conversion factor (MCF) for treatment of manure in the storage (if applicable).

MCF_{d}: Methane conversion factor (MCF) assumed to be equal to 1.

Estimation of Volatile Solids and Nitrogen Excretion

The Volatile Solids (VS) rate and the Nitrogen Excretion (N) rate are estimated using IPCC values, due to Agrocomercial AS Limitada has a management system which monitor and register average weight of animals. Therefore estimation of VS and N using site specific average animal weight is more precise and reduces the uncertainty regarding other estimation formula such as dietary intake.

The Volatile Solids rate and the Nitrogen Excretion rate are estimated separately for breeding and market swine, taking into account the number and average weight of animals for each type of swine, from Agrocomercial AS Limitada and default data from IPCC.

Taking into account the regional characteristics given in 2006 IPCC Guidelines for National Greenhouse Gas Inventories, volume 4, chapter 10, Table 10.14, the most appropriate region is North America due to the baseline and project scenarios are liquid-based systems. This criterion was used in order to choose the value for $B_{0,lt}$, $W_{default}$,$VS_{default}$ and N_{rate}.

i) Volatile solids:

The correction of volatile solids in raw manure is linear and it is a function of the weight quotient, with the purpose of making this parameter representative. In order to quantify emission reductions, the IPCC default values are corrected as follows:

EQ. 29: Adjusted IPCC default values of volatile solids

$$VS_{site} = (W_{site} / W_{default}) \bullet VS_{default} \bullet nd_{y}$$

Where:

$VS_{site:}$ Adjusted volatile solid excretion per day on a dry-matter basis for a defined livestock population at the project site in kg-dm/animal/day.
$W_{site:}$ Average animal weight of a defined population at the project site in kg.
$W_{default:}$ Default average animal weight of a defined population in kg.
$VS_{default:}$ Default value (IPCC or US-EPA) for the volatile solid excretion per day on a drymatter basis for a defined livestock population in kg-dm/animal/day.
nd_{y}*:* Number of days in year y where the treatment plant was operational.

ii) Nitrogen excretion

The nitrogen content in raw manure is obtained from corrected IPCC default values. The correction of nitrogen excretion in raw manure is linear and it is a function of the weight quotient, with the purpose of

making this parameter representative. In order to quantify emission reductions, the IPCC default values are corrected as follows:

EQ. 30 : Nitrogen excretion rate for raw manure in kg/head/day

$$NEX_{site} = (W_{site} / W_{default}) \bullet NEX_{default}$$

Where

NEX_{site}: Adjusted annual average nitrogen excretion per head of a defined livestock population in kg N/animal/year.
w_{site}: Average animal weight of a defined population at the project site in kg.
$w_{default}$: Default average animal weight of a defined population in kg.
$NEX_{default}$: Default value (IPCC) for the nitrogen excretion per head of a defined livestock population in kg N/animal/year.

$NEX_{default}$ is calculated based on data from IPCC.

EQ. 31: Nitrogen excretion rate default from IPCC

$$NEX_{default} = (N_{rate} / 1000) \bullet W_{default} \bullet nd_y$$

Where

N_{rate}: Default N excretion rate in kg N/1000 kg animal/day.

Emission reductions

EQ. 32: Emission reductions

$$ER_y = BE_y - PE_y - LE_y$$

Where

ER_y: Emission reductions for the year y in tCO_2e

Net leakage of N2O and CH4 are only considered if they are positive.

B.6.2. Data and parameters that is available at validation:

Data/Parameter:	$\mathbf{R_{VS,n}}$
Data unit:	Fraction
Description:	VS degradation factor
Source of data used:	US-EPA 2001, Chapter 8, Table 8-10 for anaerobic lagoon and project proponent data for aerobic treatment and storage (if applicable).
Value applied:	75% for anaerobic lagoon, 90% for aerobic treatment and 20% for storage lagoon if this storage method is used.
Justification of the choice of data or description of measurement methods and procedures actually applied:	Archive electronically during project plus 5 years
Any comment:	The most conservative value for the given technology is used.

Data/Parameter:	$\mathbf{EF_{N2O,D,j}}$
Data unit:	kg N_2O-N/ kg N
Description:	N2O emission factor for direct emissions
Source of data used:	IPCC 2006 Guidelines
Value applied:	$EF_{N2O,D,j}$ (EF_3): 0 for anaerobic lagoon and storage lagoon (if this storage method is used) and 0.005 kg N_2O-N/ kg N for aerobic treatment with forced aeration.
Justification of the choice of data or description of measurement methods and procedures actually applied:	Archive electronically during project plus 5 years
Any comment:	---

Data/Parameter:	$\mathbf{EF_{N2O,ID,j}}$
Data unit:	kg N_2O-N/ kg NH_3-N and NO_X-N
Description:	N2O emission factors for indirect emissions
Source of data used:	IPCC 2006 Guidelines
Value applied:	$EF_{N2O,ID,j}$ (EF_4): 0.01 kg N_2O-N/ kg NH_3-N and NO_X-N
Justification of the choice of data or description of measurement methods and procedures actually applied:	Archive electronically during project plus 5 years
Any comment:	---

Data/Parameter:	$\mathbf{F_{gasm}}$
Data unit:	(kg NH3-N+ NOx-N emmited)/ kg N deposited
Description:	Fraction of N lost due to volatilization
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	0.2
Justification of the choice of data or	Archive electronically during project plus 5 years

description of measurement methods and procedures actually applied:	
Any comment:	---

Data/Parameter:	**EF_1**
Data unit:	kg N_2O-N/ kg N
Description:	N_2O emission factor from soil
Source of data used:	IPCC 2006 Guidelines
Value applied:	EF_1: 0.01 kg N_2O-N/ kg N
Justification of the choice of data or description of measurement methods and procedures actually applied:	Archive electronically during project plus 5 years
Any comment:	---

Data/Parameter:	**EF_4**
Data unit:	kg N_2O-N/ kg NH_3-N and NO_X-N
Description:	N_2O emission factor from volatilization
Source of data used:	IPCC 2006 Guidelines
Value applied:	EF_4: 0.01 kg N_2O-N/ kg NH_3-N and NO_X-N
Justification of the choice of data or description of measurement methods and procedures actually applied:	Archive electronically during project plus 5 years
Any comment:	---

Data/Parameter:	**EF_5**
Data unit:	kg N_2O-N/ kg N
Description:	N_2O emission factor from runoff water
Source of data used:	IPCC 2006 Guidelines
Value applied:	EF5: 0.0075 kg N_2O-N/kg N
Justification of the choice of data or description of measurement methods and procedures actually applied:	Archive electronically during project plus 5 years
Any comment:	---

Data/Parameter:	**F_{leach}**
Data unit:	kg N/kg N deposited
Description:	Fraction of N leached
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	0.3
Justification of the choice of data or description of measurement methods and procedures actually	Archive electronically during project plus 5 years

applied:	
Any comment:	---

Data/Parameter:	**nd_y**
Data unit:	Number
Description:	Number of days treatment plant was operational in year y
Source of data used:	Project proponent
Value applied:	365
Justification of the choice of data or description of measurement methods and procedures actually applied:	Archive electronically during project plus 5 years
Any comment:	---

Data/Parameter:	**$MS\%_{Bl,j}$**
Data unit:	Fraction
Description:	Fraction of manure handled in system j in the baseline
Source of data used:	Project proponent
Value applied:	100%
Justification of the choice of data or description of measurement methods and procedures actually applied:	Archive electronically during project plus 5 years
Any comment:	---

Data/Parameter:	**GWP_{CH4}**
Data unit:	tCO_2e/tCH_4
Description:	Global warming potential for CH_4
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	21 for the first commitment period
Justification of the choice of data or description of measurement methods and procedures actually applied:	---
Any comment:	Shall be updated according to any future COP/MOP decisions

Data/Parameter:	**GWP_{N2O}**
Data unit:	tCO_2e/tN_2O
Description:	Global warming potential for N_2O
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	310 for the first commitment period
Justification of the choice of data or description of measurement methods and procedures actually applied:	---
Any comment:	Shall be updated according to any future COP/MOP decisions

Data/Parameter:	**D_{CH4}**
Data unit:	t/m^3
Description:	Density of methane
Source of data used:	Technical literature
Value applied:	0.00067 t/m3 at room temperature 20ºC and 1 atm pressure
Justification of the choice of data or description of measurement methods and procedures actually applied:	Archive electronically during project plus 5 years
Any comment:	Value given in ACM0010

Data/Parameter:	**MCF_d**
Data unit:	Fraction
Description:	Methane conversion factor for leakage calculation
Source of data used:	---
Value applied:	1
Justification of the choice of data or description of measurement methods and procedures actually applied:	Archive electronically during project plus 5 years
Any comment:	Assumed to be equal 1 according to ACM0010

Data/Parameter:	**$CF_{N2O-N,N}$**
Data unit:	---
Description:	Conversion factor
Source of data used:	Technical literature
Value applied:	1.57
Justification of the choice of data or description of measurement methods and procedures actually applied:	Archive electronically during project plus 5 years
Any comment:	Equal to 44/28 according to molecular weight.

Data/Parameter:	**$VS_{default}$**
Data unit:	kg/animal/day
Description:	Default value for the volatile solid excretion per day on a dry-matter basis
Source of data used:	IPCC 2006, table 10A-7, chapter 10, volume 4
Value applied:	0.27 kg/animal/day for market swine. 0.5 kg/animal/day for breeding swine.
Justification of the choice of data or description of measurement methods and procedures actually applied:	Archive electronically during project plus 5 years
Any comment:	---

Data/Parameter:	$\mathbf{W_{default}}$
Data unit:	kg
Description:	Default average animal weight of a defined population
Source of data used:	IPCC 2006, table 10A-7, chapter 10, volume 4
Value applied:	46 Kg for market swine 198 Kg for breeeding swine
Justification of the choice of data or description of measurement methods and procedures actually applied:	Archive electronically during project plus 5 years
Any comment:	---

B.6.3. Ex-ante calculation of emission reductions:

Considering the size of the Huasco project breeding and market swine barns will be built and loaded gradually. The wastewater treatment systems will be implemented according to the amount of breeding and market swine population in the barns. The wastewater treatment plants will startup with a fraction of the total design flow, which will increase regularly to achieve total treatment design capacity. This procedure is based on load to be in accordance with design and design yields will be accomplished.

The ex-ante calculation of the baseline emission, project emission and leakage considers a gradual increase in the number of animals for the project. The gradual growth to achieve this ex-ante emission reduction may occur in several years. The emission reductions will increase yearly until the total ex-ante livestock population is achieved, depending of the growth dynamics of the meat production and demand.

The general equations and assumptions are already explained in Chapter B.6.1 and all the data used to estimate ex-ante emission reductions can be found in Annex 3. For each year of the first crediting period, the emission reductions are calculated in the same way, increasing only the number of heads and the electricity consumption. Thus, in this section are presented calculations for the complete project.

The ex-ante calculations of emission reductions for the complete project are detailed below.

Baseline emissions

EQ. 1: Baseline emissions

$$BE_y = BE_{CH4,y} + BE_{N2O,y} + BE_{elect/heat,y}$$

$$1{,}124{,}208 = 1{,}107{,}662 + 16{,}545 + 0$$

EQ. 2: Baseline CH_4 emissions related to anaerobic lagoon

$$BE_{CH4,,y} = GWP_{CH4} \bullet D_{CH4} \bullet \sum (MCF_j \bullet 0.94 \bullet Bo,_{LT} \bullet N_{LT} \bullet VS_{LT,y} \bullet MS\%_{Bl,j})$$

For breeding swine: $157{,}942 = 21 \bullet 0.67/1000 \bullet 77\% \bullet 0.94 \bullet 0.48 \bullet 150{,}000 \bullet 215.52 \bullet 100\%$

For market swine: $949{,}720 = 21 \bullet 0.67/1000 \bullet 77\% \bullet 0.94 \bullet 0.48 \bullet 1{,}488{,}902 \bullet 130.56 \bullet 100\%$

$$BE_{CH4,,y} = 1,107,662$$

MCFj is calculated based on default values from IPCC:

$$MCF_j = (MCF_{T2} - MCF_{T1}) \cdot (T_j - T_1) / (T2 - T1) + MCF_{T1}$$

$$77\% = (77\% - 76\%) \cdot (17.96 - 17) / (18 - 17) + 76\%$$

EQ. 3: Baseline N_2O Emissions related to anaerobic lagoon

$$BE_{N2O,y} = GWP_{N2O} \cdot CF_{N2O-N,N} \cdot 1/1000 \cdot (E_{N2O,D,y} + E_{N2O,ID,y})$$

$$16,545 = 310 \cdot 1.57 \cdot 1/1000 (0 + 33,964)$$

EQ. 4: Direct N_2O Emissions

$$E_{N2O,D,y} = \sum (EF_{N20,D,j} \cdot NEX_{LT,y} \cdot N_{LT} \cdot MS\%_j)$$

For breeding swine: 0 = 0 • 20.5 • 150,000 • 100%

For market swine: 0 = 0 • 9.3 • 1,488,902 • 100%

$$E_{N2O,D,y} = 0$$

EQ. 5: Indirect N_2O Emissions

$$E_{N2O,ID,y} = \sum (EF_{N20,ID,j} \cdot F_{gasm} \cdot NEX_{LT,y} \cdot N_{LT} \cdot MS\%_j)$$

For breeding swine: 6,145 = 0.01 • 0.2 • 20.5 • 150,000 • 100%

For market swine: 27,819 = 0.01 • 0.2 • 9.3 • 1,488,902 • 100%

$$E_{N2O,ID,y} = 33,964$$

EQ. 6: Baseline CO_2 Emissions

$$BE_{elect/heat,y} = EG_{Bl,y} \cdot CEF_{Bl,elect,y} + HG_{Bl,y} \cdot CEF_{Bl,therm,y}$$

There is not electricity consumption or thermal energy consumption.

$$BE_{elect/heat,y} = 0$$

Project emissions

EQ. 7: Project emissions

$$PE_y = PE_{aer,y} + PE_{N2O,y} + PE_{elect/heat,y}$$

$$84,537 = 1,531 + 41,363 + 41,643$$

EQ. 8: Project CH_4 emissions related to the aerobic treatment

$$PE_{aer,y} = GWP_{CH4} \cdot D_{CH4} \cdot 0.001 \cdot F_{Aer} \cdot \prod[1- R_{VS,n}] \cdot \sum (Bo,_{LT} \cdot N_{LT} \cdot VS_{LT,y} \cdot MS\%_{aer}) + PE_{Sl,y}$$

For breeding swine: 218 = 21 • 0.67/1000 • 0.001 • 100% • (0.48 • 150,000 • 215.52 • 100%) + 0

For market swine: 1,313 = 21 • 0.67/1000 • 0.001 • 100% • (0.48 • 1,488,902 • 130.56 • 100%) + 0

$$PE_{aer,y} = 1,531$$

EQ. 9: Project N_2O Emissions related to the aerobic treatment

$$PE_{N2O,y} = GWP_{N2O} \cdot CF_{N2O-N,N} \cdot 1/1000 \cdot (E_{N2O,D,y} + E_{N2O,ID,y})$$

$$41,363 = 310 \cdot 1.57 \cdot 1/1000 \cdot (84,909 + 0)$$

EQ. 10: Direct N_2O Emissions

$$E_{N2O,D,y} = \sum (EF_{N20,D,j} \cdot NEX_{LT},_{y} \cdot N_{LT} \cdot MS\%_{j})$$

For breeding swine: 15,362 = 0.005 • 20.5 • 150,000 • 100%

For market swine: 69,547 = 0.005 • 9.3 • 1,488,902 • 100%

$$E_{N2O,D,y} = 84,909$$

EQ. 11: Indirect N_2O Emissions

$$E_{N2O,ID,y} = \sum (EF_{N20,ID,j} \cdot F_{gasm} \cdot NEX_{LT},_{y} \cdot N_{LT} \cdot MS\%_{j})$$

No indirect emissions are considered for the activated sludge. Therefore, $E_{N2O,ID,y} = 0$

EQ. 12: Project CO_2 Emissions

$$PE_{elect/heat,y} = EL_{Pr,y} \cdot (1+TDL) \cdot CEF_{d} + HG_{Pr,y} \cdot CEF_{Pr,therm,y}$$

$$46,371 = 73,444 \cdot (1+0.2) \cdot 0.619 + 0$$

There is not thermal energy consumption at the project site.

Leakage

EQ. 13: Leakage

$$LE_y = (LE_{P,N2O} - LE_{B,N2O}) + (LE_{P,CH4} - LE_{B,CH4})$$

$$-233{,}207 = ((1{,}655 + 9{,}431) – 47{,}154) + ((50{,}202 + 122{,}491 + 12{,}953) – 382{,}785)$$

$$-233{,}207 = (11{,}085 – 47{,}154) + (185{,}646 – 382{,}785)$$

i) N_2O leakage emissions

Project N_2O leakage emissions from storage (if applicable):

EQ. 14: Project N_2O leakage emissions from storage (if applicable)

$$LE_{N2O,y} = GWP_{N2O} \bullet CF_{N2O\text{-}N,N} \bullet (1/1000) \bullet (E_{N2O,D,y} + E_{N2O,ID,y})$$

$$1{,}655 = 310 \bullet 1.57 \bullet (1/1000) \bullet (0 + 3{,}396)$$

EQ. 15: Direct project N_2O leakage emissions from storage (if applicable)

$$E_{N2O,D,y} = \prod[1- R_{N,n}] \bullet \sum (EF_{N20,D,j} \bullet NEX_{LT,y} \bullet N_{LT} \bullet MS\%_j)$$

For breeding swine: 0 = (1- 90%) • 0 • 20.5 • 150,000 • 100%

For market swine: 0 = (1- 90%) • 0 • 9.3 • 1,488,902 • 100%

$$E_{N2O,D,y} = 0$$

EQ. 16: Indirect project N_2O leakage emissions from storage (if applicable)

$$E_{N2O,ID,y} = \prod[1- R_{N,n}] \bullet \sum (EF_{N20,ID,j} \bullet F_{gasm} \bullet NEX_{LT,y} \bullet N_{LT} \bullet MS\%_j)$$

For breeding swine: 614 = (1- 90%) • 0.01 • 0.2 • 20.5 • 150,000 • 100%

For market swine: 2,782 = (1- 90%) • 0.01 • 0.2 • 9.3 • 1,488,902 • 100%

$$E_{N2O,D,y} = 3{,}396$$

Project N_2O leakage emissions from land application of treated manure:

EQ. 17: Project N_2O leakage emissions from land application of treated manure

$$LE_{P,N2O} = GWP_{N2O} \bullet CF_{N2O\text{-}N,N} \bullet 1/1000 \bullet (LE_{N2O,Land} + LE_{N2O,runoff} + LE_{N2O,vol})$$

For breeding swine: 1,706 = 310 • 1.57 • 1/1000 • (2,458 + 553 + 492)

For market swine: 7,725 = 310 • 1.57 • 1/1000 • (11,128 + 2,504 + 2,226)

$LE_{P,N2O}$ = 9,431

EQ. 18: Direct project N_2O leakage emissions from application of manure waste

$LE_{N2O,Land} = EF_1 \bullet \prod[1- R_{N,n}] \bullet \sum (NEX_{LT,y} \bullet N_{LT})$

For breeding swine: 2,458 = 0.01 • (1 – 90%) • (1 – 20%) • 20.5 • 150,000

For market swine: 11,128 = 0.01 • (1 – 90%) • (1 – 20%) • 9.3 • 1,488,902

EQ. 19: Indirect project N_2O leakage emissions due to leaching and run-off

$LE_{N2O,runoff} = EF_5 \bullet F_{leach} \bullet \prod[1- R_{N,n}] \bullet \sum (NEX_{LT,y} \bullet N_{LT})$

For breeding swine: 553 = 0.0075 • 0.3 • (1 – 90%) • (1 – 20%) • 20.5 • 150,000

For market swine: 2,504 = 0.0075 • 0.3 • (1 – 90%) • (1 – 20%) • 9.3 • 1,488,902

EQ. 20: Indirect project leakage emissions from the nitrogen that volatilises as NH3 and NOx

$LE_{N2O,vol} = EF_4 \bullet \prod[1- R_{N,n}] \bullet F_{gasm} \bullet \sum (NEX_{LT,y} \bullet N_{LT})$

For breeding swine: 492 = 0.01 • 0.2 • (1 – 90%) • (1 – 20%) • 20.5 • 150,000

For market swine: 2,226 = 0.01 • 0.2 • (1 – 90%) • (1 – 20%) • 9.3 • 1,488,902

Baseline N_2O leakage emissions from land application of treated manure:

EQ. 21: Baseline N_2O leakage emissions from land application of treated manure

$LE_{B,N2O} = GWP_{N2O} \bullet CF_{N2O-N,N} \bullet (1/1000) \bullet (LE_{N2O,Land}+LE_{N2O,runoff}+LE_{N2O,vol})$

For breeding swine: 8,531 = 310 • 1.57 • 1/1000 • (12,290 + 2,765 + 2,458)

For market swine: 38,623 = 310 • 1.57 • 1/1000 • (55,638 + 12,519 + 11,128)

$LE_{P,N2O}$ = 47,154

EQ. 22: Direct baseline N_2O leakage emissions from application of manure waste

$LE_{N2O,Land} = EF_1 \bullet \prod[1- R_{N,n}] \bullet \sum (NEX_{LT,y} \bullet N_{LT})$

For breeding swine: 12,290 = 0.01 • (1 – 60%) • 20.5 • 150,000

For market swine: 55,638 = 0.01 • (1 – 60%) • 9.3 • 1,488,902

EQ. 23: Indirect baseline N_2O leakage emissions due to leaching and run-off

$LE_{N2O,runoff} = EF_5 \bullet F_{leach} \bullet \prod[1- R_{N,n}] \bullet \sum (NEX_{LT,y} \bullet N_{LT})$

For breeding swine: 2,765 = 0.0075 • 0.3 • (1 – 60%) • 20.5 • 150,000

For market swine: 12,519 = 0.0075 • 0.3 • (1 – 60%) • 9.3 • 1,488,902

EQ. 24: Indirect baseline leakage emissions from the nitrogen that volatilises as NH3 and NOx

$LE_{N2O,vol} = EF_4 \bullet \prod[1- R_{N,n}] \bullet F_{gasm} \bullet \sum (NEX_{LT,y} \bullet N_{LT})$

For breeding swine: 2,458 = 0.01 • 0.2 • (1 – 20%) • 20.5 • 150,000

For market swine: 11,128 = 0.01 • 0.2 • (1 – 20%) • 9.3 • 1,488,902

ii) CH4 leakage emissions

Project CH_4 leakage emissions from composted sludge:

EQ. 25: CH_4 Emissions related to the composted sludge

$PE_{SL,y} = GWP_{CH4} \bullet D_{CH4} \bullet MCF_{sl} \bullet 0.94 \bullet F_{Aer} \bullet \prod[1- R_{VS,n}] \bullet \sum(Bo,_{LT} \bullet N_{LT} \bullet VS_{LT,y} \bullet MS\%_j) \bullet (nd_{sludge,y}/nd_y)$

12,953 = 1,847 + 11,106

Breeding;

1,847=21•0.00067•(1/100)•0.94•(100/100)•(90%)•0.48•150,000•216•(100/100)•(365/365)

Market;

11,106=21•0.00067•(1/100)•0.94•(100/100)•(90%)•0.48•1,488,902•131•(100/100)•(365/365)

Project CH_4 leakage emissions from storage (if applicable):

EQ. 26: Project CH_4 leakage emissions related to the storage (if applicable)

$LE_{storage,y} = GWP_{CH4} \bullet D_{CH4} \bullet MCF_{li/slu} \bullet 0.94 \bullet F_{Storage} \bullet \prod[1- R_{VS,n}] \bullet \sum (Bo,_{LT} \bullet N_{LT} \bullet VS_{LT,y} \bullet MS\%_{stl})$

For breeding swine:

7,158 = 21 • 0.67/1000 • 34.88% • 0.94 • 100% • (1 – 90%) • (0.48 • 150,000 • 215.52 • 100%)

For market swine:

43,043 = 21 • 0.67/1000 • 34.88% • 0.94 • 100% • (1 – 90%) • (0.48 • 1,488,902 • 130.56 • 100%)

$MCF_{li/slu}$ is calculated based on default values from IPCC:

$$MDF_j = (MCF_{T2} - MCF_{T1}) \bullet (T_j - T_1) / (T_2 - T_1) + MCF_{T1}$$

$$34{,}88\% = (35\% - 32\%) \bullet (18 - 17) / (17.96 - 17) + 32\%$$

$$LE_{storage,y} = 50{,}202$$

<u>Project CH_4 leakage emissions from land application of treated manure:</u>

EQ. 27: Project CH_4 leakage emissions from land application of treated manure

$$LE_{P,CH4} = GWP_{CH4} \bullet D_{CH4} \bullet MCF_d \bullet \prod[1- R_{VS,n}] \bullet \sum (B_{O,LT} \bullet N_{LT} \bullet VS_{LT,y} \bullet MS\%_j)$$

For breeding swine:

$$17{,}466 = 21 \bullet 0.67/1000 \bullet 100\% \bullet (1 - 90\%) \bullet (1 - 20\%) \bullet (0.48 \bullet 150{,}000 \bullet 215.52 \bullet 100\%)$$

For market swine:

$$105{,}025 = 21 \bullet 0.67/1000 \bullet 100\% \bullet (1 - 90\%) \bullet (1 - 20\%) \bullet (0.48 \bullet 1{,}488{,}902 \bullet 130.56 \bullet 100\%)$$

$$LE_{P,CH4} = 122{,}491$$

<u>Baseline CH_4 leakage emissions from land application of treated manure:</u>

EQ. 28: Baseline CH_4 leakage emissions from land application of treated manure

$$LE_{B,CH4} = GWP_{CH4} \bullet D_{CH4} \bullet MCF_d \bullet \prod[1- R_{VS,n}] \bullet \sum (B_{O,LT} \bullet N_{LT} \bullet VS_{LT,y} \bullet MS\%_j)$$

For breeding swine:

$$54{,}582 = 21 \bullet 0.67/1000 \bullet 100\% \bullet (1 - 75\%) \bullet (0.48 \bullet 150{,}000 \bullet 215.52 \bullet 100\%)$$

For market swine:

$$328{,}203 = 21 \bullet 0.67/1000 \bullet 100\% \bullet (1 - 75\%) \bullet (0.48 \bullet 1{,}488{,}902 \bullet 130.56 \bullet 100\%)$$

$$LE_{P,CH4} = 382{,}785$$

<u>Estimation of Volatile Solids and Nitrogen Excretion</u>

i) Volatile solids:

EQ. 29: Adjusted IPCC default values of volatile solids

$$VS_{site} = (W_{site} / W_{default}) \bullet VS_{default} \bullet nd_y$$

For breeding swine: $215.52 = (233.82 / 198) \bullet 0.5 \bullet 365$

For market swine: $130.56 = (60.94 / 46) \bullet 0.27 \bullet 365$

ii) Nitrogen excretion

EQ. 30: Nitrogen excretion rate for raw manure in kg/head/day

$$NEX_{site} = (W_{site} / W_{default}) \bullet NEX_{default}$$

For breeding swine: 20.5 = (233.82 / 198) • 17.3

For market swine: 9.3 = (60.94 / 46) • 7.1

EQ. 31: Nitrogen excretion rate default from IPCC

$$NEX_{default} = (N_{rate} / 1000) \bullet W_{default} \bullet nd_y$$

For breeding swine: 17.3 = (0.24 / 1000) • 198 • 365

For market swine: 7.1 = (0.42 / 1000) • 46 • 365

EQ. 32: Emission reductions

$$ER_y = BE_y - PE_y - LE_y$$

1,039,671 = 1,124,208 – 84,537

Net leakages are not considered because they are negative.

B.6.4. Summary of the ex-ante estimation of emission reductions:

>> The following table represents the emission reductions results of the project activity during the first crediting period.

Table B.10 Summary of emission reductions for the entire project during the first crediting period

Years	**Estimation of project activity emissions (tCO2e/year)**	**Estimation of baseline emissions (tCO2e/year)**	**Estimation of leakage (tCO2e/year)**	**Estimation of overall emission reduction (tCO2e/year)**
2012	19,490	224,842	-46,476	205,352
2013	51,972	599,577	-130,518	547,606
2014	77,958	899,366	-195,777	821,408
2015	97,449	1,124,207	-244,721	1,026,758
2016	97,449	1,124,207	-244,721	1,026,758
2017	97,449	1,124,207	-244,721	1,026,758
2018	97,449	1,124,207	-244,721	1,026,758
Total (tonnes of CO_2e)	**539,213**	**6,220,611**	**-1,351,655**	**5,681,398**

B.7. Application of the monitoring methodology and description of the monitoring plan:

B.7.1. Data and parameters monitored:

Agrosupers's swine production system is currently certified under ISO9001:2000 quality standards and ISO 14000:2000 ambient standards. Therefore the inspection of each individual farm is done by accredited ISO9001 and 14000 internal and external auditors.

Data/Parameter:	**MCF_{T1} anaerobic lagoon**
Data unit:	Fraction
Description:	Methane correction factor for Temperature 1 lower than Temperature of the project site
Source of data to be used:	IPCC 2006 Guidelines
Value of data applied for the purpose of calculating expected emissions reductions in section B.6	76%
Description of measurements methods and procedures to be applied:	Monitor annually and archive electronically during project plus 5 years
QA/QC procedures to be applied:	---
Any comment:	---

Data/Parameter:	**MCF_{T2} anaerobic lagoon**
Data unit:	Fraction
Description:	Methane correction factor for Temperature 2 higher than Temperature of the project site
Source of data to be used:	IPCC 2006 Guidelines
Value of data applied for the purpose of calculating expected emissions reductions in section B.6	77%
Description of measurements methods and procedures to be applied:	Monitor annually and archive electronically during project plus 5 years
QA/QC procedures to be applied:	---
Any comment:	---

Data/Parameter:	**MCF_{T1} storage (if aplicable)**
Data unit:	Fraction
Description:	Methane correction factor for Temperature 1 lower than Temperature of the project site
Source of data to be used:	IPCC 2006 Guidelines
Value of data applied for the purpose of calculating expected emissions reductions in section B.6	32% for storage lagoon
Description of measurements	Monitor annually and archive electronically during project plus 5

methods and procedures to be applied:	years
QA/QC procedures to be applied:	---
Any comment:	---

Data/Parameter:	**MCF_{T2} storage (if applicable)**
Data unit:	Fraction
Description:	Methane correction factor for Temperature 2 higher than Temperature of the project site
Source of data to be used:	IPCC 2006 Guidelines
Value of data applied for the purpose of calculating expected emissions reductions in section B.6	35% for storage lagoon
Description of measurements methods and procedures to be applied:	Monitor annually and archive electronically during project plus 5 years
QA/QC procedures to be applied:	---
Any comment:	---

Data/Parameter:	**MCFsl**
Data unit:	Fraction
Description:	Methane correction factor
Source of data to be used:	IPCC 2006, table 10.17,chapter 10, volume 4
Value of data applied for the purpose of calculating expected emissions reductions in section B.6	1%
Description of measurements methods and procedures to be applied:	Monitor annually and archive electronically during project plus 5 years
QA/QC procedures to be applied:	---
Any comment:	MCF for composting – passive windrow and a temperature equal to 17.96 ºC

Data/Parameter:	**Bo_{lt}**
Data unit:	m3 CH4/kg-dm
Description:	Maximum methane production
Source of data to be used:	IPCC 2006 Guidelines
Value of data applied for the purpose of calculating expected emissions reductions in section B.6	For breeding and market swine is 0.48 m3 CH4/kg-dm
Description of measurements methods and procedures to be applied:	Monitor annually and archive electronically during project plus 5 years
QA/QC procedures to be applied:	---
Any comment:	---

Data/Parameter:	**$VS_{LT,y}$**
Data unit:	kg dry matter/animal/day
Description:	Volatile solid excretion per animal per day
Source of data to be used:	IPCC 2006 Guidelines
Value of data applied for the purpose of calculating expected emissions reductions in section B.6	For breeding swine is 0.5 kg dry matter/animal/day and for market swine is 0.27 kg dry matter/animal/day
Description of measurements methods and procedures to be applied:	Monitor annually and archive electronically during project plus 5 years
QA/QC procedures to be applied:	---
Any comment:	---

Data/Parameter:	**N_{rate}**
Data unit:	kg N/1000 kg animal/day
Description:	Annual average nitrogen excretion per 1000 kg of defined livestock population
Source of data to be used:	IPCC 2006 Guidelines
Value of data applied for the purpose of calculating expected emissions reductions in section B.6	For breeding swine is 0.24 kg N/1000 kg animal/day and for market swine is 0.42 kg N/1000 kg animal/day
Description of measurements methods and procedures to be applied:	Monitor annually and archive electronically during project plus 5 years
QA/QC procedures to be applied:	---
Any comment:	---

Data/Parameter:	**$R_{N,n}$**
Data unit:	Fraction
Description:	Nitrogen degradation factor
Source of data to be used:	US-EPA 2001, Chapter 8, Table 8-10 for anaerobic lagoon and project proponent data for aerobic treatment and storage (if applicable).
Value of data applied for the purpose of calculating expected emissions reductions in section B.6	60% for anaerobic lagoon, 90% for aerobic treatment and 20% for storage if applicable.
Description of measurements methods and procedures to be applied:	Monitor annually and archive electronically during project plus 5 years
QA/QC procedures to be applied:	---
Any comment:	The most conservative value from US-EPA 2001 for the given technology is used.

Data/Parameter:	**T1**
Data unit:	ºC
Description:	Temperature lower than the average ambient temperature at project site

Source of data to be used:	Project proponent
Value of data applied for the purpose of calculating expected emissions reductions in section B.6	17 ºC
Description of measurements methods and procedures to be applied:	Monitor annually and archive electronically during project plus 5 years
QA/QC procedures to be applied:	---
Any comment:	---

Data/Parameter:	**T2**
Data unit:	ºC
Description:	Temperature higher than the average ambient temperature at project site
Source of data to be used:	Project proponent
Value of data applied for the purpose of calculating expected emissions reductions in section B.6	18 ºC
Description of measurements methods and procedures to be applied:	Monitor annually and archive electronically during project plus 5 years
QA/QC procedures to be applied:	---
Any comment:	---

Data/Parameter:	**T**
Data unit:	ºC
Description:	Annual average ambient temperature at project site
Source of data to be used:	Project proponent
Value of data applied for the purpose of calculating expected emissions reductions in section B.6	17.96 ºC
Description of measurements methods and procedures to be applied:	Monitor annually and archive electronically during project plus 5 years
QA/QC procedures to be applied:	---
Any comment:	Value from the Chilean agro climatic map

Data/Parameter:	$\mathbf{W_{Site}}$
Data unit:	Kg
Description:	Weight of livestock
Source of data to be used:	Project proponent
Value of data applied for the purpose of calculating expected emissions reductions in section B.6	233.82 kg or breeding swine and 60.94 kg for market swine
Description of measurements methods and procedures to be applied:	Monitor monthly and archive electronically during project plus 5 years
QA/QC procedures to be applied:	---

Any comment:	For market swine, the Project considers weighting every single animal at the entrance of the barns and at the exit of the barns, obtaining an annual average weight. Therefore, the weighting procedures are more accurate than random sampling. For breeding swine, every one of the 3 species is distributed into 3 different weight categories, each divided in 7 different age categories. Every single head is weighted at the entrance and at the exit of the barns; therefore the parameter Wsite is an average of the weight of every single animal, with no need to use sampling procedures.

Data/Parameter:	$\mathbf{N_{LT}}$
Data unit:	Number
Description:	Average livestock population used in both baseline and project case emissions estimation
Source of data to be used:	Project proponent
Value of data applied for the purpose of calculating expected emissions reductions in section B.6	Refer to Annex 3
Description of measurements methods and procedures to be applied:	Monitor monthly and archive electronically during project plus 5 years
QA/QC procedures to be applied:	---
Any comment:	The PDD should describe the system on monitoring the number of livestock population.

Data/Parameter:	$\mathbf{nd_{sludge,y}}$
Data unit:	Number
Description:	Number of days of sludge managed in composting system
Source of data used:	Project proponent
Value of data applied for the purpose of calculating expected emissions reductions in section B.6	365
Description of measurements methods and procedures to be applied:	Archive electronically during project plus 5 years
QA/QC procedures to be applied:	---
Any comment:	

Data/Parameter:	**F_{aer}**
Data unit:	Fraction
Description:	Fraction of volatile solids directed to aerobic treatment
Source of data to be used:	Project proponent
Value of data applied for the purpose of calculating expected emissions reductions in section B.6	100%
Description of measurements methods and procedures to be applied:	Monitor annually and archive electronically during project plus 5 years
QA/QC procedures to be applied:	---
Any comment:	---

Data/Parameter:	**$EL_{pr,y}$**
Data unit:	MWh/year
Description:	Electricity used in Project AWMS
Source of data to be used:	Project proponent
Value of data applied for the purpose of calculating expected emissions reductions in section B.6	Refer to Annex 3
Description of measurements methods and procedures to be applied:	Monitor annually and archive electronically during project plus 5 years
QA/QC procedures to be applied:	Electricity meters will undergo maintenance/calibration subject to appropriate industry standards. The accuracy of the meter readings will be verified by receipts issued by the purchasing power company.
Any comment:	---

Data/Parameter:	**$MS\%_j$**
Data unit:	Fraction
Description:	Fraction of manure handled in system j in project activity
Source of data to be used:	Project proponent
Value of data applied for the purpose of calculating expected emissions reductions in section B.6	For anaerobic lagoon is 100%, for aerobic treatment is 100% and for storage (if applicable) is 100%
Description of measurements methods and procedures to be applied:	Monitor annually and archive electronically during project plus 5 years
QA/QC procedures to be applied:	---
Any comment:	---

Data / Parameter:	**Type**
Data unit:	---
Description:	Type of barns and AWMS
Source of data to be used:	Project proponent

Value of data applied for the purpose of calculating expected emissions reductions in section B.6	---
Description of measurements methods and procedures to be applied:	Archive electronically during project plus 5 years
QA/QC procedures to be applied:	---
Any comment:	Barns and AWMS layout and configuration

Data / Parameter:	**Regulations**
Data unit:	---
Description:	Existence and enforcement of relevant regulation
Source of data to be used:	Project proponents
Value of data applied for the purpose of calculating expected emissions reductions in section B.6	---
Description of measurements methods and procedures to be applied:	---
QA/QC procedures to be applied:	Quality control for the existence and enforcement of relevant regulations and incentives is beyond the bounds of the project activity. Instead, the DOE will verify the evidence collected.
Any comment:	---

Data/Parameter:	**$NEX_{lt,y}$**
Data unit:	kg N/kg animal/year
Description:	Annual average nitrogen excretion per kg of defined livestock population
Source of data to be used:	IPCC 2006 Guidelines for N_{rate} and $W_{default}$ with project proponent information for $W_{site.}$
Value of data applied for the purpose of calculating expected emissions reductions in section B.6	20,5 kg N/animal/year
Description of measurements methods and procedures to be applied:	Monitor annually and archive electronically during project plus 5 years
QA/QC procedures to be applied:	---
Any comment:	Calculation obtained for breeding swine

Data/Parameter:	**$NEX_{lt,y}$**
Data unit:	kg N/kg animal/year
Description:	Annual average nitrogen excretion per kg of defined livestock population
Source of data to be used:	IPCC 2006 Guidelines for N_{rate} and $W_{default}$ with project proponent

	information for $W_{site.}$
Value of data applied for the purpose of calculating expected emissions reductions in section B.6	9,3 kg N/animal/year
Description of measurements methods and procedures to be applied:	Monitor annually and archive electronically during project plus 5 years
QA/QC procedures to be applied:	---
Any comment:	Calculation obtained for market swine

Data/Parameter:	**$TDL_{j,y}$**
Data unit:	-
Description:	Average technical transmission and distribution losses for providing electricity to source j in year y
Source of data to be used:	For scenario A use as default values of 20% for project or leakage electricity consumption sources
Value of data applied for the purpose of calculating expected emissions reductions in section B.6	20%
Description of measurements methods and procedures to be applied:	---
QA/QC procedures to be applied:	---
Any comment:	---

Data/Parameter:	**CEF_d**
Data unit:	tCO_2/MWh
Description:	Combined margin emission factor for the grid
Source of data to be used:	Calculate the combined margin emission factor, using the procedures in the latest approved version of the "Tool to calculate the emission factor for an electricity system"
Value of data applied for the purpose of calculating expected emissions reductions in section B.6	0.619 tCO2/MWh
Description of measurements methods and procedures to be applied:	Calculated with the latest information available for every monitoring period.
QA/QC procedures to be applied:	---
Any comment:	---

B.7. 2 Description of the monitoring plan:

>> Livestock population: Very high accuracy as this kind of data is used for managing swine production and for economical reasons. Detailed counting is done during every rotation by two parties (delivering farm and receiving farm or slaughterhouse). Inlet program of pigs and swine mortality is continually contrasted with slaughterhouse or receiving farm registers. Data use and plausibility checks by many persons daily working with all this information.

Average weight: Very high accuracy as this kind of data is used for managing swine production and for economical reasons. The weighting system is calibrated frequently, having accuracy better than 1%. Average weight of fixed sets of pigs (and therefore the whole population of a "farm") is determined at inlet and outlet using calibrated weighting installations (balance). A growing tendency curve is correcting differences to a linear weight increase. This is acceptable to be used for determining the average weight.

Electricity consumption: The electricity consumption will be measured continuously using an electricity meter installed at the project site. Electricity meters will undergo maintenance/calibration subject to appropriate industry standards. The accuracy of the meter readings will be verified by receipts issued by the purchasing power company. The uncertainty of the meters will be obtained from the manufacturers.

Parameters from published sources: Parameter taken from published sources will be updated using the latest published version of each document.

B.8. Date of completion of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies)

Date of completion of the application of the baseline study and monitoring methodology (DD/MM/YYYY):

30/04/2007

Name of the responsible person(s)/entity(ies):

CantorCO2e
Sergio Vives
Benjamin 2935 Piso 7, Santiago, Chile
Telephone Number: (56-2) 233 2113
svives@cantorco2e.com
The entity is not a project participant.

SECTION C. Duration of the project activity / Crediting period

C.1 Duration of the project activity:

This project applies for a crediting period of 7 years with the potential for subsequent renewal(s).

C.1.1. Starting date of the project activity:

>> 19/05/2006.

C.1.2. Expected operational lifetime of the project activity:

>>50 years (expected)

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

>> 01/01/2012.

C.2.1.2. Length of the first crediting period:

>> 7 years

C.2.2. Fixed crediting period: Not applicable

C.2.2.1. Starting date:

>> **Not applicable**

C.2.2.2. Length:

>> **Not applicable**

SECTION D. Environmental impacts

D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

>> The construction of waste treatment must be submitted to the Environmental Impact Assessment System, in order to comply with the Chilean Environmental Legislation. Agrocomercial AS Limitada following that procedure, and in accordance with Chilean Law, submitted an Environmental Impact Assessment study to the National Commission for the Environment (CONAMA) that approved and authorized a complete agro industrial project scheme that include the construction of barns with advanced waste treatment systems, reducing potential impacts to the environment.

All these affirmations will be confirmed by the endorsement of the project given by the Designated National Authority (CONAMA), in its Host country approval process.

The CDM project activity can be stated as a relevant improvement for sustainable development, distressing local (odours) and global environmental pressures. This advanced system (aerobic treatment) minimizes the release of odours related to swine manure management, because organic matter is stabilized by forced aeration.

The substitution of traditional manure waste treatment (uncovered anaerobic lagoon) by this advanced treatment also creates environmental benefits related to effluent quality. In the advanced treatment, this effluent has a low organic matter and nutrients content that does not imply a potential risk of groundwater or river contamination.

The environmental impacts due to the development of this project can be summarized as ancillary benefits:

a) Odour is greatly reduced by aerobic treatment

b) Pathogen and vector control

c) Achieve the effective recuperation of wastewater as a resource for crops irrigation

Any additional information regarding the Environmental Impact Assessment of the project is available for the validation audit.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

>> In accordance to Chilean environmental legislation, specifically article 10 of Law 19.300 and Supreme Decree No. 95 of 2001 that modifies Supreme Decree No.30 of 1997, if an activity can cause significant impact to the environment has to present an Environmental Impact Assessment Study.

This project was completely approved on January 6th 2006, by resolution Nº03/2006 of the Regional Commission for the Environment of Atacama (3rd Region).

Any additional information regarding the Environmental Impact Assessment of the project is available for the validation audit.

SECTION E. Stakeholders' comments

E.1. Brief description how comments by local stakeholders have been invited and compiled:

>> As stated in Section D, the Project went through the Environmental Impact Assessment procedure. This procedure requires a local stakeholder comments period. On February 25th 2005, at the Public Hall of the Huasco Municipality, a meeting was held with the Huasco community, regarding the process of the local stakeholder participation process. The same was done with the communities of Freirina and Vallenar, on February 25th 2005 and March 10th 2005, respectively. Every public comment at these meetings is available on the official environmental resolution that qualifies the approval for the project.

As a publicity measure to maintain the community duly informed, the National or Regional Environment Commission, as corresponds, shall publish every month on the first working day, in the Official Gazette and in a national or regional journal, a list of the projects and activities that were submitted to the Chilean Environmental Impact Assessment System during the previous month. Additionally, the relevant Commission shall deliver a copy of the list to the municipalities of the places where the works or activities envisaged in the project under evaluation are to be carried out.

Agrosuper launched its first advanced waste management system (Peralillo Biodigester) in 2001, being the first CDM project of the company and one of the first baseline methodologies and CDM initiatives registered in the country. The presence of a Minster of State and the Executive Director of CONAMA and other regional authorities was considered as a very important support to the efforts done by the company. The local news and even CNN published information about this new project of the company. At that time all comments made reference to the major environmental improvement done by the company by incorporating this first Digester.

The presence of Agrosuper in seminars and workshops in Chile, to present the relevant aspects of the CDM project was requested by the National Environmental Authorities many times. Agrosuper went to all those events to explain the main characteristics of the CDM project. Under the organisation of

Prochile, the Environmental Commission for the Atacama 3rd Region (COREMA), and the Atacama companies environmental net, during June of 2005, it was held the Second CDM and carbon market seminar, named as "Opportunities in the north of Chile".

In order to show their facilities and the technological improvements done in the last years, Agrosuper has a program in which invites the neighbouring community of the Project areas to visit their plants. The same is planned to be done with the Agrocomercial AS Limitada CDM project activities at the Huasco Valley.

Agrosuper has developed two promotional films in this field: one regards the CDM and Agrosuper's projects involvement and a second more didactic, about the treatment components for an advanced waste management system. Both of these films are available in the Agrosuper web site (www.agrosuper.com), since 2004.

E.2. Summary of the comments received:

>> The project received comments during the environmental impact assessment process, by authorities and stakeholders. The comments and clarifications are detailed in the Environmental Qualification Resolution Nº03/2006, which approves the project, and which is available for the validation audit.

All comments and the whole EIA (environmental impact study) process can be downloaded from www.seia.cl

E.3. Report on how due account was taken of any comments received:

>> All clarifications done by the authorities were clarified and incorporated in due time. This allowed the environmental approval of the project, as stated in Section D. The comments and clarifications are detailed in the Environmental Qualification Resolution Nº03/2006, that approves the project, and which is available for the validation audit.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Agrocomercial AS Limitada
Street/P.O.Box:	Camino La Estrella Nº 401
Building:	
City:	Rancagua
State/Region:	6th Región
Postfix/ZIP:	
Country:	Chile
Telephone:	56-72-201 111
FAX:	56-72-201 124
E-Mail:	cavives@agrosuper.com
URL:	www.agrosuper.com
Represented by:	
Title:	Deputy Manager of Corporate Affairs
Salutation:	Mr.
Last Name:	Vives
Middle Name:	
First Name:	Carlos Andrés
Department:	Corporate Affairs
Mobile:	
Direct FAX:	56-72-201 124
Direct tel:	56-72-201 111
Personal E-Mail:	cavives@agrosuper.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

Not applicable. There is no public funding for the Project.

Annex 3

BASELINE INFORMATION

The following section includes the references used for calculating emissions in the baseline and project scenarios.

3.1 General Data

The next table presents the effective operation days considered for each year of the first crediting period of the project.

Annex 3. Table 1: Effective operation days for Huasco Operation

Year	Effective operation days
2012	365
2013	365
2014	365
2015	365
2016	365
2017	365
2018	365

The following table presents number of swine heads and average swine weight for breeding and market swine.

Annex 3. Table 2: Number of heads and average weight for breeding and market swine

Year	Breeding Swine		Market Swine	
	Number of heads	Average weight	Number of heads	Average weight
2012	30.000	233,82	297.780	60,94
2013	80.000	233,82	794.081	60,94
2014	120.000	233,82	1.191.121	60,94
2015	150.000	233,82	1.488.902	60,94
2016	150.000	233,82	1.488.902	60,94
2017	150.000	233,82	1.488.902	60,94
2018	150.000	233,82	1.488.902	60,94

*Source: Specific hog operations data from Agrícola Super Limitada

The detailed number of heads associated to each treatment system is presented in the table below.

Annex 3. Table 3: Detailed number of heads

Year	Number of heads					
	Sows A	Wean-to-finish I	Wean-to-finish II	Sows B	Wean-to-finish III	Wean-to-finish IV
2012	30.000	297.780	-	-	-	-
2013	80.000	372.225	372.225	-	49.631	-
2014	80.000	372.225	372.225	40.000	372.225	74.446
2015	80.000	372.225	372.225	70.000	372.225	372.227
2016	80.000	372.225	372.225	70.000	372.225	372.227
2017	80.000	372.225	372.225	70.000	372.225	372.227
2018	80.000	372.225	372.225	70.000	372.225	372.227

3.2 Volatile Solids rate and Nitrogen Excretion rate

The next table presents the default values used to estimate the Volatile Solids rate and the Nitrogen Excretion rate.

Annex 3. Table 4: Default values

Parameter	Unit	Value	Source
Average default weight (breeding swine)	Kg	198	IPCC 2006, table 10A-8, chapter 10, volume 4
Average default weight (market swine)	Kg	46	IPCC 2006, table 10A-7, chapter 10, volume 4
Average default weight (breeding swine)	kg/animal/day	0.5	IPCC 2006, table 10A-8, chapter 10, volume 4
Average default weight (market swine)	kg/animal/day	0.27	IPCC 2006, table 10A-7, chapter 10, volume 4
N excretion rate (breeding swine)	Kg N/1000 Kg animal/day	0.24	IPCC 2006, table 10.19, chapter 10, volume 4
N excretion rate (market swine)	Kg N/1000 Kg animal/day	0.42	IPCC 2006, table 10.19, chapter 10, volume 4

3.3 Emissions from manure management systems

The next table presents the GWP values for each GHG under consideration:

Annex 3.Table 5: Global Warming Potential

GHG	Global Warming Potential (GWP)
Carbon Dioxide	1
Methane	21
Nitrous Oxide	310

The following table presents the values used for methane density, Bo and Conversion factor from $N\text{-}N_2O$ to N_2O.

Annex 3. Table 6: Default values

Parameter	Unit	Value	Source
Methane density	t/m3	0.00067	Recommended in ACM0010
Maximum CH4 producing potential of the volatile solid generated (Bo)	m3 CH4/ kg-dm	0.48	IPCC 2006, tables 10A-7 and 10A-8, chapter 10, volume 4
Conversion factor N2O-N to N2O	kgN2O/ kgN2ON	1.57	Is N2O molecular weight/ N2 molecular weight

The next table summarises the CH_4 conversion factors (MCFs) for the different types of manure management systems involved in the project and baseline scenario.

Annex 3. Table 7: MCF for different systems

Parameter	Unit	Value	Source
Anaerobic lagoon	%	77	IPCC 2006, table 10.17, chapter 10, volume 4
Aerobic treatment	%	0.1	Recommended in ACM0010
Composting – passive windrow (sludge)	%	1	IPCC 2006, table 10.17, chapter 10, volume 4
Storage lagoon	%	34.9	IPCC 2006, table 10.17, chapter 10, volume 4
MCFd	%	100	Recommended in ACM0010

MCF values for the anaerobic lagoon, composting and storage lagoon are given by temperature. The annual average temperature for Huasco is 17.96 ºC.

The next table presents the relevant emission factors involved in the emission reduction of nitrous oxide.

Annex 3. Table 8: Nitrous oxide emission factors for different systems

Parameter	Description	Unit	Value	Source
EF3 anaerobic lagoon	Direct N2O emission factor for the anaerobic lagoon	kg N2O-N/kg N	0	IPCC 2006, table 10.21, chapter 10, volume 4
EF3 aerobic treatment	Direct N2O emission factor for the aerobic treatment with forced aeration	kg N2O-N/kg N	0.005	IPCC 2006, table 10.21, chapter 10, volume 4
EF3 storage (if applicable)	Direct N2O emission factor for the storage (if applicable)	kg N2O-N/kg N	0	IPCC 2006, table 10.21, chapter 10, volume 4
EF1	Direct emission of N2O from soils	kg N2O-N/kg N	0.01	IPCC 2006, table 11.1, chapter 11, volume 4
EF5	Indirect emission of N2O from leaching and runoff	kg N2O-N/kg N	0.0075	IPCC 2006, table 11.3, chapter 11, volume 4
EF4	Indirect emission of N2O from volatilization and deposition of N on soils and water surfaces	kg N2O-N/(kg NH3-N + NOx-N emmited)	0.01	IPCC 2006, table 11.3, chapter 11, volume 4
Fleach	Fraction of all N added to soils that is lost through leaching and runoff	kg N/kg N deposited	0.3	IPCC 2006, table 11.3, chapter 11, volume 4
Fgasm	Fraction of animal manure N that	(kg NH3-N+	0.2	IPCC 2006, table 11.3,

	volatizes as NH3 and NOX	NOx-N emmited)/ kg N deposited		chapter 11, volume 4

3.4 Volatile Solids and Nitrogen Excretion reduction at each treatment stage

The following table presents Volatile Solids and Nitrogen Excretion reduction at each treatment stage.

Annex 3. Table 9: Volatile Solids and Nitrogen Excretion reduction at each stage

Parameter	Rvs	Rn	Source
	%	%	
Anaerobic lagoon	75	60	US-EPA 2001, table 8-10, chapter 8
Aerobic treatment	90	90	Project proponent
Storage (if applicable)	20	20	Project proponent

3.5 CO_2 emissions from electricity consumption

The following table presents the electricity consumption needed to calculate the emissions for electricity consumption in the project case. In a conservative approach, the baseline electricity consumption is considered to be zero.

Annex 3. Table 10: Electricity consumption for each year

Year	Electricity consumption [MWh/year]						
	Sows A	Wean-to-finish I	Wean-to-finish II	Sows B	Wean-to-finish III	Wean-to-finish IV	TOTAL
2012	3.349	11.340	0	0	0	0	14.689
2013	8.931	14.174	14.174	0	1.890	0	39.170
2014	8.931	14.174	14.174	4.466	14.174	2.835	58.755
2015	8.931	14.174	14.174	7.815	14.174	14.175	73.444
2016	8.931	14.174	14.174	7.815	14.174	14.175	73.444
2017	8.931	14.174	14.174	7.815	14.174	14.175	73.444
2018	8.931	14.174	14.174	7.815	14.174	14.175	73.444

3.6 CEF estimation

The emission factor is a measure of the amount of greenhouse gas emissions that will be displaced with the operation of the project activity. According to the tool, the emission factor is calculated in a transparent and conservative manner as a combined margin (CM) defined as the combination of the operating margin (OM) and the build margin (BM) as follows:

$$EF_y = 0.5 * EF_{OMy} + 0.5 * EF_{BMy}$$

Where

$EF_{OM,y}$: Operating margin for the year y.
$EF_{BM,y}$: Build margin for the year y.

From the “Tool to calculate the emission factor for an electricity system”, page 5, option “Ex-post” is chosen. Therefore the emission factor is determined with the latest information available for every verification period. For ex-ante emission reduction calculation, data from 2007 is used.

In order to calculate the operating margin, the first step is to define low-cost/must-run power sources.

Annex 3.Table 11 Power Plants Database

Power plant 2007	Low-cost/must-run	Power plant 2007	Low-cost/must-run
Abanico	Yes	Loma Alta	Yes
Aconcagua	Yes	Los Molles	Yes
Alfalfal	Yes	Los Quilos	Yes
Antilhue TG	No	Los Vientos	No
Antuco	Yes	Maitenes	Yes
Arauco	Yes	Mampil	Yes
Bocamina	No	Nehuenco	No
Campanario	No	Nehuenco 9B	No
Candelaria	No	Nehuenco II	No
Canela	Yes	Nueva Aldea I	Yes
Canutillar	Yes	Nueva Aldea II	Yes
Capullo	Yes	Nueva Aldea III	Yes
Celco	Yes	Nueva Renca	No
Chacabuquito	Yes	Otros (Autoprod)	-
Chiburgo	Yes	Palmucho	Yes
Cholguán	Yes	Pangue	Yes
Cipreses	Yes	Pehuenche	Yes
Colbún+Mach	Yes	Petropower	No
Constitución	Yes	Peuchén	Yes
Coronel TG	No	Pilmaiquén	Yes
Curillinque	Yes	Pullinque	Yes
D.de Almagro	No	Puntilla	Yes
Degan	No	Queltehues	Yes
El Rincón	Yes	Quilleco	Yes
El Toro	Yes	Ralco	Yes
Eyzaguirre	Yes	Rapel	Yes
Florida	Yes	Renca	No
Guacolda I	No	Rucúe	Yes
Guacolda II	No	S. Fco. Mostazal (EV 25)	No
Horcones TG	No	San Ignacio	Yes
Huasco TG (ex Huasco Fuel)	No	San Isidro	No
Hornitos	Yes	San Isidro II	No
Hco-Vapor (Ex Huasco Vapor)	No	Sauz+Szito	Yes
Isla	Yes	Taltal	No
Lag. Verde	No	Valdivia	Yes

Lag. Verde TG	No	Ventanas 1	No
Laja	Yes	Ventanas 2	No
Licantén	Yes	Volcán	Yes

Calculation of Lambda:

Using equation N°9 of the Methodological Tool, the Lambda was calculated for 2007:

Annex 3.Table 12: Calculated Lambda Values

	2007
Number of hours per which low-cost/must-run sources are on the margin	0
Lambda	0.0000

For the simple OM emission factor, option B and therefore equation 3 of the methodological tool was used. Using the calculated lambdas and simple OM on equation 8 of the methodological tool, the simple adjusted OM is obtained:

Annex 3.Table 13: Simple adjusted OM

	2007
Simple adjusted OM [tCO2e/GWh]	749.00

Using equation 13 of the methodological tool, the Build Margin (BM) is then calculated using the top 20% generators by power generation @ 2007, using the latest information available:

Annex 3.Table 14: Build Margin

	Total 2007
Build Margin [tCO2e/GWh]	490.00

The combined margin is the calculated using equation 14 of the methodological tool. The selected weighting of the Operating Margin and Build Margin emission factors used will be the default values as suggested on the methodological tool. The weights used at this time are 50% BM and 50% OM.

Annex 3.Table 15: Combined Margin

	Ton CO2e/GWh
Combined Margin [tCO2e/GWh] 50%-50%	619.00

Annex 4

MONITORING PLAN

The following table presents the monitoring plan followed by Agrocomercial AS Limitada. In order to achieve certified emission reductions, after each validation and verification process. The data collected will be archived during the complete crediting period and will be reserved five years after this period.

Annex 4. Table 1. Monitored data by Agrocomercial AS Limitada

DATA VARIABLE	DATA UNIT	DATA ORIGIN
Animal Population	Heads	Daily animal Stock and inlet program of pigs (Net inlet considering mortality). Information managed by Agrocomercial AS Limitada
Average Weight of Animals	Kg	Pavilion test and growing tendency curves. Information managed by Agrocomercial AS Limitada
Electricity consumption	MWh/year	Electricity used in Project AWMS. Information managed by Agrocomercial AS Limitada
$MS_{Aerobic\ treatment}$	%	Fraction of manure handled in aerobic treatment. Information managed by Agrocomercial AS Limitada
$MS_{Storage}$	%	Fraction of manure handled in the storage (if applicable). Information managed by Agrocomercial AS Limitada.