AWMS GHG Mitigation Project MX05-B-02, Sonora, México

UNFCCC Clean Development Mechanism
Project Design Document

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CLEAN DEVELOPMENT MECHANISM
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CONTENTS

SECTION A. General description of project activity

A.1 Title of the project activity:

AWMS GHG Mitigation Project, MX05-B-02, Sonora, México

A.2 Description of the project activity:

General: Worldwide, agricultural operations are becoming progressively more intensive to realize economies of production and scale. The pressure to become more efficient drives significant operational similarities between farms of a "type," as inputs, outputs, practices, genetics, and technology have become similar around the world.

This is especially true in livestock operations (swine, dairy cows, etc.) which can create profound environmental consequences, such as greenhouse gas emissions, odour, and water/land contamination (including seepage, runoff, and over application), that result from storing (and disposing of) animal waste. Confined Animal Feeding Operations (CAFOs) use similar Animal Waste Management System (AWMS) options to store animal effluent. These systems emit both methane (CH_4) and nitrous oxide (N_2O) resulting from both aerobic and anaerobic decomposition processes.

This project proposes to apply to swine CAFOs (located in northwest México) a GHG mitigation methodology, which is applicable to intensive livestock operations. The proposed project activities will mitigate AWMS GHG emissions in an economically sustainable manner, and will result in other environmental benefits, such as improved water quality and reduced odour. In simple terms, the project proposes to move from a high-GHG AWMS practice, an open-air lagoon, to a lower-GHG AWMS practice, an ambient temperature anaerobic digester with capture and combustion of resulting biogas.

Purpose: The purpose of this project is to mitigate animal effluent related GHG by improving AWMS practices.

Contribution to sustainable development:

In January 2000, the Food and Agriculture Organization of the United Nations began a two-year project in Central México to study the effects of pork production operations on the environment.[1] The project revealed issues, which require immediate attention. In some operations, residuals are discharged into receiving bodies (land or water) without previous treatment. In other farms, management practices and treatment systems are inadequate, resulting in contamination higher than allowable limits. When residuals *are* applied to agricultural land, they are generally applied to the surface and not homogenously distributed in the soil. Further, nutrient content from such application is not normally considered to aid in the reduction of inorganic fertilizers.

Establishing a positive model for livestock operations is essential. In the last ten years, Mexican swine production grew by 28%. In 2001, the swine population in México was 17,583,683[2]. The commercial swine industry in Sonora is made up of only about 174 producers, who own about 136,000 sows with an

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[1] http://www.fao.org/WAIRDOCS/LEAD/X6372S/X6372S00.HTM Reporte de la Iniciativa de la Ganadería, en Medio Ambiente y el Desarrollo (LEAD) – integración por Zonas de la Ganadería y de la Agricultura Especializadas (AWI) – Opciones para el manejo de Efluentes de Granja Porcícolas de la Zona Centro de México

[2] http://www.siea.sagarpa.gob.mx/ar_compec_pobgan.html

annual production of 2.4 million market hogs. The State produces about 14% of México's pork production. The average herd has about 600 to 800 sows. According to the Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación (SAGARPA), the State of Sonora has recently established itself as the leading producer of pork in México, with a production of more than 201,000 tonnes a year.[3] In 2002, the swine population of Sonora was 1,143,378.[4] Considering that a typical hog produces 5.8 kilograms of effluent daily (Table A1), some 2.4 million metric tons of hog waste is produced annually in Sonora alone. Introducing progressive AWMS practices throughout Sonora has the potential to reduce approximately 1 million tonne[5] of carbon dioxide equivalent (CO2e) each year.

Table A1. Daily production of effluent by type of porcine[6]

Stage	Manure kg/day	Manure and Urine kg/day	Volume litres/day	Volume m^3/animal/month
25-100 kg	2.3	4.9	7.0	.25
Gestating sows	3.6	11.0	16.0	.48
Nursing sows	6.4	18.0	27.0	.81
Boar pig	3.0	6.0	9.0	.28
Piglet	0.35	0.95	1.4	.05
Average	2.35	5.8	8.6	.27

Furthermore, the proper handling of this large quantity of CAFO animal waste is critical to protecting human health and the environment. Because of the practices employed by farmers, the design, location, and management practices of livestock operations are critical components in ensuring an adequate level of protection of human health and the environment.[7]

This methane recovery project activity will upgrade livestock operations infrastructure and will enable the use of renewable energy sources. The infrastructure improvement and renewable energy enablement is in direct alignment with President Vicente Fox's national goals and objectives for agriculture, livestock, rural development, fishing and nutrition as outlined in the Mexican government's *Plan Nacional de Desarrollo, 2001 –2006* (National Development Plan, 2001 -2006).[8]

This project activity will have positive effects on the local environment by improving air quality (by reducing the emission of Volatile Organic Compounds (VOCs) and odour, for instance) and will set the stage for future on-farm projects (such as changes in land application practices) that will have an additional positive impact on GHG emissions with an attendant potential for reducing groundwater contamination problems.

This project activity will also increase local employment of skilled labour for the fabrication, installation, operation and maintenance of the specialized equipment. Finally, this voluntary project activity will

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[3] http://atn-riae.agr.ca/latin/e3362.htm

[4] http://www.siea.sagarpa.gob.mx/ar_compec_pobgan.html

[5] Approximate calculation using IPCC model and emission factors.

[6] Kruger I, Taylor G, Ferrier M (eds) (1995) 'Australian pig housing series: effluent at work' (NSW Agriculture: Tamworth); another outstanding reference for manure output is: Lorimor, Powers, et.al "Manure Characteristics", Manure Management Series, MWPS-18, Section 1; pg 12.

[7] Speir, Jerry; Bowden, Marie-Ann; Ervin, David; McElfish, Jim; Espejo, Rosario Perez, "Comparative Standards for Intensive Livestock Operations in Canada, México, and the U.S.," Paper prepared for the Commission for Environmental Cooperation.

[8] http://www.sagarpa.gob.mx/Dgg/sectorial.htm

establish a model for world-class, scalable animal waste management practices, which can be duplicated on other CAFO livestock farms throughout México, dramatically reducing livestock related GHG and providing the potential for a new source of revenue and green power.

The proposed GHG mitigation project uniquely satisfies the Mexican government priorities for environmental stewardship and sustainability while positioning rural agricultural operations to develop and use renewable ("green") power. Indeed, it does so with no negative consequences and with a series of environmental and infrastructure co-benefits (some of which are outlined in Section F).

Because the proposed project establishes an advanced AWMS and includes means for subsequently establishing on-farm electricity generation, the project participants believe the farm managers will adopt – and continue to practice – AWMS practice changes that result in meaningful, and permanent, GHG emission reductions.

A.3 Project participants:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
México (host)	• AgCert International plc* • AgCert México Environmental Services, S. de R.L. de C.V.	No

***Herein referred to as AgCert. On June 6, 2005, AgCert International Ltd. became a publicly listed company on the London Stock Exchange, hence the name change to AgCert International plc.

A.4 Technical description of the project activity:

A.4.1 Location of the project activity:

A.4.1.1 Host Party(ies):

The host party for this project activity is México.

A.4.1.2 Region/State/Province etc.:

The sites are located in the state of Sonora.

A.4.1.3 City/Town/Community etc:

The farms participating in this project activity are in the northwestern Mexican state of Sonora. All sites associated with the project activity are located in or around the cities of Ciudad Obregón, Navojoa, and Hermosillo. (Figure A1)

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

The physical locations of the sites involved in this project activity are shown in Figure A1 and listed in Table A2.

SPR Alianza para la Produccion Soles de RL[9] has nine sites in Ciudad Obregón. They are:

- Los Laureles is a 2,600 sow farrow to finish operation,[10] which uses one primary open lagoon (150 meters (length) x 80 meters (width) x 3 meters (depth)), built in 2001, for its AWMS. The site has 11 containment areas, which were built in 2001, to house the animals through the various stages of production.

- Las Palomas is a 13,200 animal nurser and finisher operation, which uses four primary open lagoons (80m x 50m x 2.5m), built in 2002, for its AWMS. The site has five containment areas, which were built in 2002, for its animals.

- Soles I is a 2,600 sow farrowing operation, which uses three primary open lagoons for its AWMS and utilizes the surface spread method for effluent disposition. The first lagoon (35m x 95m x 8m) was built in 1978; the second (35m x 95m x 8m) and third (20m x 87m x 8m) in 1984 and 1996, respectively. The facility has 16 containment areas, which were built in 1979, for its animals.

- Soles II is a 1,270 sow farrowing operation, which uses two primary lagoons, built in 1978 and 1984, for its AWMS and utilizes the surface spread method for effluent disposition. These lagoons measure 12m x 55m 8m and 17m x 84m 8m. The facility has 12 containment areas for its animals; these barns were built in 1989. Soles II and Soles I will share one proposed anaerobic digester.

- La Tina is a 2,700 animal nurser and finisher operation, which uses one primary open lagoon (100m x 30m x 3m), built in 1980, for its AWMS. The facility has ten containment areas for its animals; these barns were also built in 1980.

- Melchor Ocampo is a nurser and finisher operation, which uses three primary open lagoons (33m x 46m x 2.5m), built in 1974, for its AWMS. The facility has ten containment areas for its animals; these barns were built in 1980.

- Providencia is a 3,150 animal finishing operation, which uses two primary open lagoons (100m x 50m x 2m), built in 1975, for its AWMS. The facility has seven containment areas for its animals; four of these barns were built in 1975. Three barns were built in 2002.

- Anahuac is a medium sized finishing operation of approximately 1,000 animals. It uses a small lagoon for its AWMS. The facility has four containment areas, which were built in 1975, for its animals. It will share one proposed anaerobic digester with the site Providencia.

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[9] www.soles.com.mx

[10] A ‘farrow to finish operation’ is defined as a production system that contains all production phases, from breeding to gestation to farrowing to nursery to grow-finishing to market.

- Francisco Marquez is 666 sow farrow to finish operation, which uses one primary open lagoon (50m x 20m x 3m) built in 1978, for its AWMS. The facility has 23 containment areas, which were built in 1978, to house the animals through the various stages of production.

Ontagota is a 1,600 sow farrow to finish operation, which uses two primary open lagoons (80m x 25m x 3.5m) and one secondary open lagoon (150m x 25m x 3.5m) for its AWMS. All three lagoons were built in 1980. The facility has 28 containment areas, which were built between 1980 and 2002, to house its animals through the various stages of production. This site is located in Ciudad Obregón.

Grupo Sonqui has a 1,635 sow farrow to finish operation on two sites, Sonqui I and Sonqui II. Both sites use one primary open lagoon each for its AWMS and utilize the surface spread method of effluent disposition. The lagoon (40m x 12m x 3m) on Sonqui I was built in 1998; the lagoon (30m x 10m x 3m) on Sonqui II was built in 1995. The two sites have a total of 16 containment areas to house animals through the various stages of production. These sites are in Navojoa.

Victor Gracia-Esquivel (Granja Elsa) is a 1,250 sow farrow to finish operation, which uses five lagoons (43m x 31m, 43m x 31m, 31m x 31m, 75m x 37m and 50m x 25m) built in 1976, for its AWMS. The facility has 37 containment areas, which were built between 1976 and 2003, to house animals through the various stages of production. Granja Elsa is located in Navojoa.

Porcicola Kino, SA de CV has two sites in Hermosillo. They are:

- Santa Lucia is a 640 sow farrow to finish operation, which uses two primary open lagoons for its AWMS and utilizes the surface spread method of effluent disposition. These lagoons (30m x 20m x 2m and 60m x 50m x 4m) were built in 1980 and 1986. The facility has 34 containment areas, which were built in 1980. Two additional containment areas were built in 1986.

- La Mocha is a 960 sow farrow to finish operation, which uses one lagoon for its AWMS. The site has 55 containment areas, which were built between 1980 and 1986, to house animals through the various stages of production.

Dinamica del Pacifico, SPR de RL has three sites in Hermosillo. They are:

- Granja Dany is an 800 sow farrow to finish operation, which uses two lagoons for its AWMS. The facility has 20 containment areas, which were built in 2003 and 2004, to house animals through the various stages of production.

- Granja Santa Fe/Sacramento is a 2,000 sow farrow to finish operation, which uses four primary open lagoons (120m x 8m 1.3m) for its AWMS and utilizes the irrigation method of effluent disposition. The facility has 18 containment areas to house animals through the various stages of production.

- Las Praderas is a 5,200 animal finishing operation, which uses one primary open lagoon (3m deep) built in 2004, for its AWMS and utilizes the surface spread method of effluent disposition. The facility has nine containment areas, which were built between 2001 and 2003, to house its animals.

Oviachic is a 600 sow farrow to finish operation, which uses one open lagoon (30 m in diameter and 2.5 m deep) built in 1979, for its AWMS and utilizes the surface spread method of effluent disposition. The facility has 11 containment areas, built between 1979 and 2004, to house animals through the various stages of production. Oviachic is in Navojoa.

Santa Barbara is a 770 sow farrow to finish operation in Ciudad Obregón. There is one open lagoon for AWMS, and the site utilizes the surface spread method of effluent disposition; this lagoon (100m x 30m x 4m) was built in 1979. The facility has 14 containment areas, which were built between 1979 and 2004, to house animals through the various stages of production.

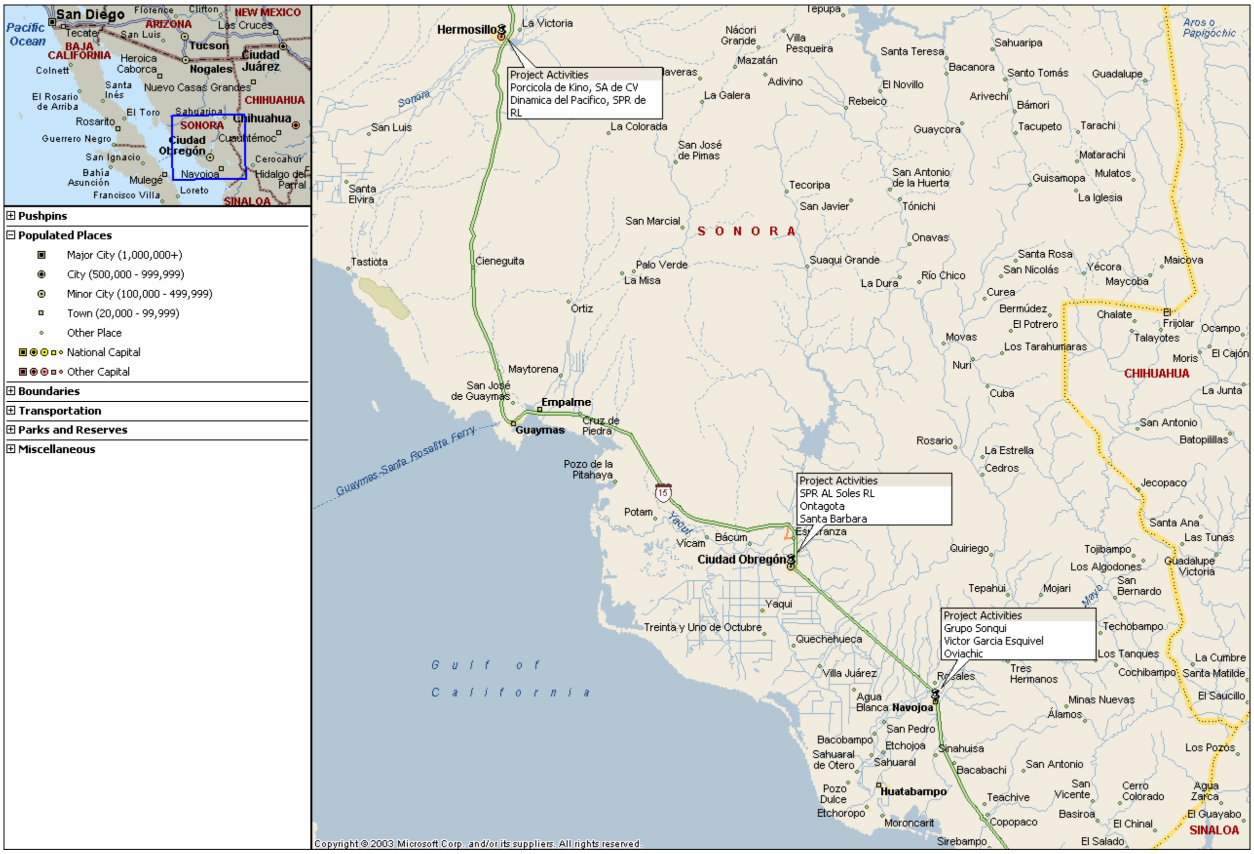

Figure A1. Project Activity locations in the Mexican State of Sonora

Table A2. Detailed physical location and identification of project site

Farm/Site Name	Address	Town/State	Contact	Phone	Animal Category
SPR Alianza Para la Produccion Soles de RL	Chihuahua 125 Norte	Ciudad Obregón Sonora 85000	Miguel H. Olea-Ruiz	+52.644.414-1151	Main Office
Los Laureles	Domicilio, predio El Limón camino tesopaco a paredones a 17 km de tesopaco		Ing. Ricardo Monsivais Gonzalez		Swine, F-F
Las Palomas	Domicilio: predio Las Palomas km. 12 camino hornos a tesopaco		Miguel H. Olea-Ruiz		Swine, Finishing, Nursing
Soles I	Calle base y 15 cuadrilátero v, San José de Bacum, Son		Ricardo Monsivais		Swine, Farrowing
Soles II	Calle base y 15 cuadrilátero v, San José de Bacum, Son				Swine, Farrowing
La Tina	Calle 1500 ej. La Tina, Valle del Yaqui, son				Swine, Finishing, Nursing
Melchor Ocampo	Domicilio conocido ej. Melchor Ocampo, Valle del Mayo, Son				Swine, Finishing, Nursing
Providencia	Domicilio conocido ej. La Providencia, Valle de Alamos, Son				Swine, Finishing
Anahuac	Domicilio conocido ej. Anahuac, Valle de Alamos, Son				Swine, Finishing
Francisco Marquez	Domicilio conocido ej. Francisco Marquez son	Municipio de Guaymas, Sonora 85507	Ricardo Monsivais González		Swine, F-F

Farm/Site Name	Address	Town/State	Contact	Phone	Animal Category
Ontagota, SPR de RL	Calle 300 y 3 Valle del	Ciudad Obregón Sonora 85000	Jorge E. Ramírez-Paredes	+52.644.413-9310	Swine, F-F
Grupo Sonqui, SPR de RL	Block 1520 Valle del Yaqui	Navojoa, Sonora 85000	Rafael Sonqui	+52.644.416-2195	Swine, F-F
Victor Garcia Esquivel (Granja Elsa)	500 Mts Camino Quiriego-Fundicion	Navojoa, Sonora 85160	Ernesto Garibaldi-Campista	+52.644.430-0056	Swine, F-F
Porcicola de Kino, SA de CV	Perif. Pte. y Colosio No. 231	Hermosillo, Sonora, 83248	Gustavo Borbon García	+52.662.216-5060	Main Office
Santa Lucia	Carretera a Kino km 28 1/2		MVZ David Saldiva	+52.662.142-0883	Swine, F-F
La Mocha	Carretera a Kino km 70, a 4 km. De la carretera				Swine, F-F
Dinamica del Pacifico, SPR de RL	Periférico Poniente 231	Hermosillo, Sonora, 83200	Benjamín Aguilar-Gutiérrez	+52.662.216-5285	Main Office
Granja Dany	Carretera a Tecoripa km 14 (Pasando turbo gas de CFE)	Hermosillo, Sonora, 83248	MVZ Alfonso Echave	+52.662.256-2735	Swine, F-F
Granja Santa Fe/Sacramento	Carretera a La Mesa del Seri Km 8		Gustavo Borbon-García	+52.662.216-5285	Swine, F-F
Las Praderas	Carretera a La Mesa del Seri Km 8				Swine, Finishing
Oviachic, SPR de RL	Block 1626	Navojoa, Sonora 85000	Jorge A. Valenzuela	+52.644.413-9477	Swine, F-F
Santa Barbara	Calle 18 entre 1500 y 1600 Valle del Yaqui	Ciudad Obregón Sonora 85000	Jorge A. Valenzuela	+52.644.413-9477	Swine, F-F

A.4.2 Category(ies) of project activity:

The category of the project activity is in Sectoral Scope 13 - Waste Handling and Disposal, and Sectoral Scope 15 - Agriculture.

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

The technology to be employed by the project activity includes the installation of new covered lagoons creating an anaerobic digester. The system will be comprised of a lined and covered lagoon creating a digester with sufficient capacity and Hydraulic Retention Time (HRT) to nearly eliminate the volatile solids loading in the effluent. The liner and cover consist of a synthetic high density polyethylene (HDPE) geomembrane, which are joined together by means of an anchor trench around the perimeter. HDPE is the most commonly used geomembrane in the world and is well suited for use in this project. HDPE is an excellent product for large applications that require UV, ozone and chemical resistance. The digester has been designed to permit solids residue removal without breaking the gas retention seal. Processed effluent from the lagoon cells will be routed to the clarification lagoon(s) and captured gas will be removed and combusted.

Figure A2 depicts two approaches to mitigate AWMS GHG emissions. The minimum configuration consists of an anaerobic digester and a flaring system as described above. The optional upgrade incorporates the use of a cogeneration, or other renewable energy system to produce on-farm "green energy, using methane produced by the digester as fuel. The minimum configuration flare is retained to burn methane not required by the renewable energy equipment. The project activity at some sites may include both the flare and other renewable energy equipment.

Care was given to use compatible components in the design of the AWMS. For example, the geomembrane cover has a tensile and tear strength which far exceeds the flare over-pressure release threshold. Furthermore, the flare combustion capacity exceeds the estimated GHG production forecasts.

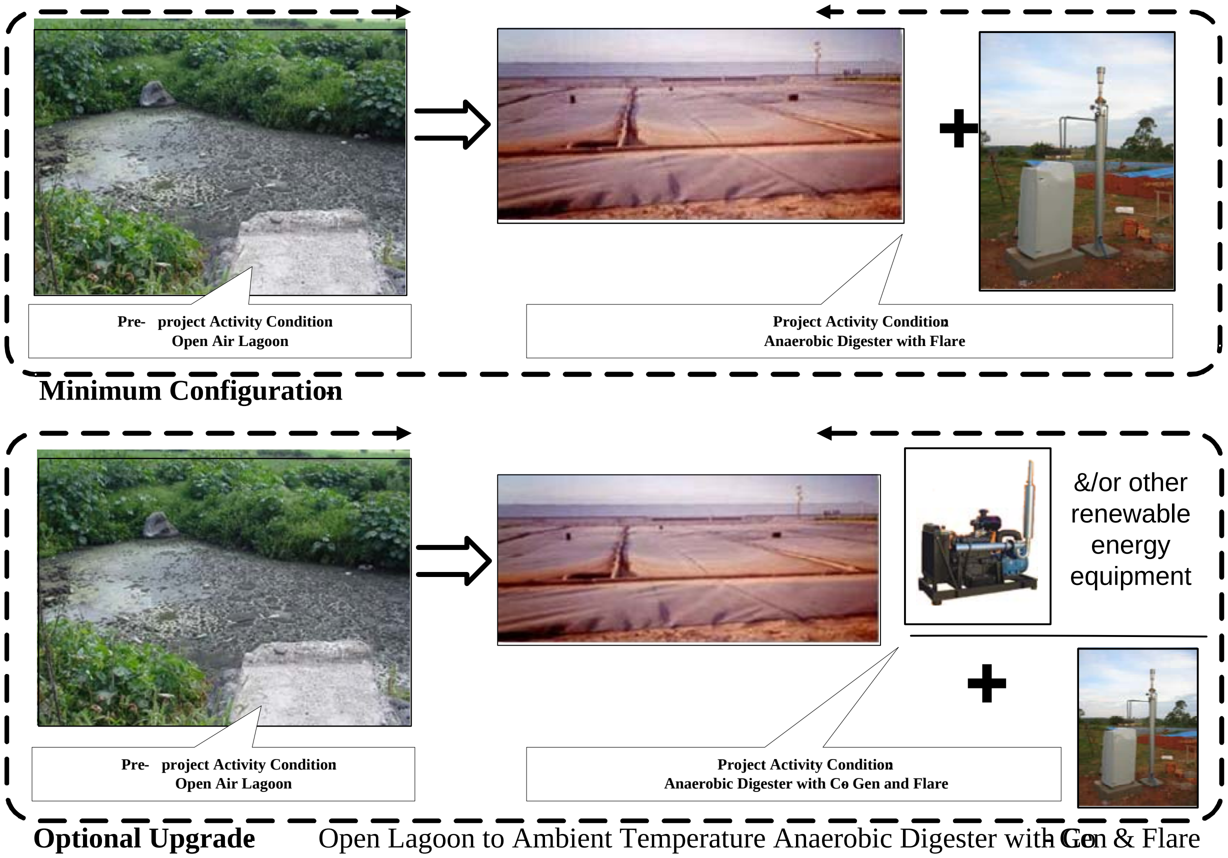

Figure A2. Project Activity Configurations.

In the case that project activity sites choose to implement the optional upgrade, the project developer has analyzed the predicted methane production and likely usage patterns to determine an appropriate generator size. Analysis indicated an average unit sizing of 62 KVA of energy.

The project developer shall provide to the validating DOE technical characteristics of the subsystems and material employed in the project.

Technology and know-how transfer:

The project developer is implementing a multi-faceted approach to ensure the project, including technology transfer, proceeds smoothly. This approach includes careful specification and design of a complete technology solution, identification and qualification of appropriate technology/services providers, supervision of the complete project installation, farm staff training, ongoing monitoring (by the project developer) and developing/implementing a complete Operations & Maintenance plan using project developer staff. As part of this process, the project developer has specified a technology solution that will be self-sustaining, i.e., highly reliable, low maintenance, and operate with little or no user intervention. The materials and labour used in the base project activity are sourced from the host country whenever economically possible.

By working so closely with the project on a “day to day” basis, the project developer will ensure that all installed equipment is properly operated and maintained, and will carefully monitor the data collection and recording process. Moreover, by working with the farm staff over many years, the project developer will ensure that the staff acquires appropriate expertise and resources to operate the system on an ongoing/continuous basis.

A.4.4 Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed CDM project activity, including why the emission reductions would not occur in the absence of the proposed project activity, taking into account national and/or sectoral policies and circumstances:

Anthropogenic GHG Reductions

Anthropogenic GHGs, specifically methane and nitrous oxide, are released into the atmosphere via decomposition of animal manure and a nitrification/denitrification process associated with volatilization of nitrogen. Currently, this farm-produced biogas is not collected or destroyed.

The proposed project activity intends to improve current AWMS practices. These changes will result in the mitigation of anthropogenic GHG emissions by controlling the lagoon's decomposition processes and collecting and combusting the biogas.

The figure listed in Section A.4.4.1 is based upon the current animal head count for the farms involved in this project activity. The proposed project activity AWMS will be sized to accommodate each farm's maximum expected animal capacity.

There are no existing, pending, or planned national, state, or local regulatory requirements that govern GHG emissions from agricultural operations (specifically, pork production activities) as outlined in this PDD. The project participants have solicited information regarding this issue during numerous conversations with local and state government officials and through legal representation and have determined there is no regulatory impetus for producers to upgrade current AWMS beyond an open air lagoon. The following paragraphs discuss the Mexican pork industry and how conditions hinder changes in AWMS practices.

Mexican pork producers face the same economic challenges as farmers in other nations due to increased worldwide pork production and low operating margins. Farm owners focus on the bottom line. Odour benefits, potential water quality enhancements, and the incremental savings associated with heating cost avoidance, are rarely enough to compel farmers to upgrade to an (expensive) advanced AWMS system.[11] Unless the AWMS upgrade activity affords the producer the means to (partially) offset the practice change cost (via the sale of Certified Emission Reduction (CER) credits, for instance) the open lagoon will remain the common AWMS practice – *and all AWMS GHG biogas will continue to be emitted*.

The proposed AWMS practice changes in the participating sites will afford these farms the financial means (via CER revenues) to adopt and maintain an advanced AWMS with reductions in GHG emissions and associated environmental co-benefits (including reduced water contamination).

[11] DiPietre, Dennis, PhD, Agricultural Economist, (18 June 2003) Private communication

A.4.4.1 Estimated amount of emission reductions over the chosen crediting period:

THE TOTAL ESTIMATE OF EMISSIONS REDUCTION OVER THE 10 YEAR PROJECT PERIOD IS 1,216,890 TONNES OF CO_2 EQUIVALENT (121,689 ANNUALLY)

A.4.4.1 - Estimated Emission Reductions over chosen Crediting Period	
Years	**Annual estimation of emission reductions in tonnes of CO_2e**
Year 1	121,689
Year 2	121,689
Year 3	121,689
Year 4	121,689
Year 5	121,689
Year 6	121,689
Year 7	121,689
Year 8	121,689
Year 9	121,689
Year 10	121,689
Total estimated reductions (tonnes CO_2e)	1,216,890
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	121,689

A.4.5 Public funding of the project activity:

There is no official development assistance being provided for this project.

SECTION B. Application of a baseline methodology

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

This project activity utilizes the CDM approved baseline methodology AM0016/Version 02 entitled "*Greenhouse gas mitigation from improved Animal Waste Management Systems in confined animal feeding operations*."

B.1.1 Justification of the choice of the methodology and why it is applicable to the project activity

This baseline methodology was chosen because it offers a GHG emissions model that can be used to characterize baseline emissions for livestock operations at the project activity sites. Specifically, the methodology is applicable because:

1. The captured gas is being flared; and
2. The captured gas is being used to produce energy (e.g., electricity/thermal energy), but no emission reductions are claimed for displacing or avoiding energy from other sources.[12]
3. The farms with livestock populations managed under confined conditions operate in a competitive market.
4. The livestock populations are comprised of swine animals, an applicable animal type.
5. The AWMS system, including both the baseline scenario and the manure management systems introduced as part of the project activity, is in accordance with the regulatory framework in the country, excluding the discharge of manure into natural resources (e.g., rivers or estuaries).
6. On-farm project systems introduce AWMS practice and technology changes to reduce GHG emissions.
7. The project farm systems provide a reduction of GHG emissions resulting from the AWMS improvements.
8. The project farm systems establish a sound framework for sustaining these improvements over time to provide economic sustainability and ensure that mitigation measures result in a continuous, verifiable, reduction of GHGs.

B.2 Description of how the methodology is applied in the context of the project activity:

The methodology calls for the classification and categorization of the farm system to include animal type, population, AWMS in use/projected, climate, region, etc. This data is used to properly select lookup table parameters.

[12] Although in this project no emission reductions are claimed for displacing or avoiding energy from other sources, all possible financial revenues and/or emission leakages will be taken into account in the analysis.

Table B1. Farm Data Characterization

Farm System		AWPS		AWMS				Other	
	Site	Animal Category	Genetics	Base-line	#	Project	#	Region - Climate	Population Data
SPR Alianza Para la Produccion Soles de RL (Grupo Soles)									
	Los Laureles	Swine	Annex I Country	Lagoon	1	Anaerobic Digester	1	Latin America - Temperate	See Annex 3
	Las Palomas	Swine	Annex I Country	Lagoon	4	Anaerobic Digester	1	Latin America - Temperate	See Annex 3
	Soles I	Swine	Annex I Country	Lagoon	3	Anaerobic Digester	1	Latin America - Temperate	See Annex 3
	Soles II	Swine	Annex I Country	Lagoon	2			Latin America – Temperate	See Annex 3
	La Tina	Swine	Annex I Country	Lagoon	1	Anaerobic Digester	1	Latin America - Temperate	See Annex 3
	Melchor Ocampo	Swine	Annex I Country	Lagoon	3	Anaerobic Digester	1	Latin America – Temperate	See Annex 3
	Providencia	Swine	Annex I Country	Lagoon	2	Anaerobic Digester	1	Latin America - Temperate	See Annex 3
	Anahuac	Swine	Annex I Country	Lagoon	1			Latin America - Temperate	See Annex 3
	Francisco Marquez	Swine	Annex I Country	Lagoon	1	Anaerobic Digester	1	Latin America – Temperate	See Annex 3
Ontagota SPR de RL		Swine	Annex I Country	Lagoon	3	Anaerobic Digester	1	Latin America - Temperate	See Annex 3
Grupo Sonqui, SPR de RL									
	Sonqui I	Swine	Annex I Country	Lagoon	1	Anaerobic Digester	1	Latin America - Temperate	See Annex 3
	Sonqui II	Swine	Annex I	Lagoon	1	Anaerobic	1	Latin	See Annex 3

Farm System		AWPS		AWMS				Other	
	Site	Animal Category	Genetics	Base-line	#	Project	#	Region - Climate	Population Data
			Country			Digester		America - Temperate	
Victor Gracia Esquivel (Granja Elsa)		Swine	Annex I Country	Earthen Basin	5	Anaerobic Digester	1	Latin America - Temperate	See Annex 3
Porcicola de Kino, SA de CV									
	Santa Lucia	Swine	Annex I Country	Lagoon	2	Anaerobic Digester	1	Latin America - Temperate	See Annex 3
	La Mocha	Swine	Annex I Country	Lagoon	1	Anaerobic Digester	1	Latin America - Temperate	See Annex 3
Dinamica del Pacifico, SPR de RL									
	Granja Dany	Swine	Annex I Country	Lagoon	2	Anaerobic Digester	1	Latin America – Temperate	See Annex 3
	Granja Santa Fé/Sacramento	Swine	Annex I Country	Lagoon	4	Anaerobic Digester	1	Latin America – Temperate	See Annex 3
	Las Praderas	Swine	Annex I Country	Lagoon	1	Anaerobic Digester	1	Latin America – Temperate	See Annex 3
Oviachic		Swine	Annex I Country	Lagoon	1	Anaerobic Digester	1	Latin America - Temperate	See Annex 3
Santa Barbara		Swine	Annex I Country	Lagoon	1	Anaerobic Digester	1	Latin America - Temperate	See Annex 3

The methodology further calls for the application of the Emission Factor Determination Test, again in order to select the appropriate IPCC lookup parameters. The project developer applied the "Emission Factor Determination Test" described in AM0016 to ascertain that "developed" country emission factors are appropriate for use with the project activity, as host country factors are not available (IPCC factors used to determine national GHG inventory), developed nation genetics are used, and the farm employs formulated feed rations. Moreover, the farm uses a data management system that enables verification of farm attributes.

Table B2. Emission Factor Determination (EFD) Test Results

Farm System	EFD Test Question				Result
	1	2	3	4	
SPR Alianza Para la Producción Soles de RL (Grupo Soles)	No	Yes	Yes	Yes	Use developed nation default EFs
Ontagota SPR de RL	No	Yes	Yes	Yes	Use developed nation default EFs
Victor Gracia Esquivel (Granja Elsa)	No	Yes	Yes	Yes	Use developed nation default EFs
Grupo Sonqui, SPR de RL	No	Yes	Yes	Yes	Use developed nation default EFs
Porcicola de Kino, SA de CV	No	Yes	Yes	Yes	Use developed nation default EFs
Dinamica del Pacifico, SPR de RL	No	Yes	Yes	Yes	Use developed nation default EFs
Oviachic, SPR de RL	No	Yes	Yes	Yes	Use developed nation default EFs
Agropecuaria Santa Bárbara, SPR de RL	No	Yes	Yes	Yes	Use developed nation default EFs

The data obtained from the above activities is required for the use in the equations identified in Section D and the results described in Section E of this document.

The following steps were then used to determine the baseline scenario:

Step 1: List of Possible Baseline Scenarios

The following list of scenario alternatives was derived from different AWMS presented in the approved methodology:

- Daily spread
- Solid Storage
- Dry lot
- Liquid/Slurry
- Anaerobic lagoon
- Pit storage below animal confinements
- Anaerobic Digester
- Deep litter
- Composting
- Poultry Manure
- Aerobic treatment

Step 2: Identify Plausible Scenarios

Listed below are the proposed project activity and other plausible scenarios for the project farm operations and conditions. Justification for including or excluding a scenario from consideration is provided.

Included scenarios:

- *Liquid Slurry*: Most of the barriers to this technology relate to the cost required to store the volumes of liquid necessary from confined animal operations. It is a viable technology alternative and has been considered.
- *Anaerobic Lagoon*: The relevant technical/regulatory barrier relating to this scenario is that lagoon systems, by law, must be constructed to protect drinking water. The anaerobic stabilization lagoon represents project farm current practice. It is generally considered to be the most economical, efficient, and reliable AWMS, and is the most common AWMS technology in the developed and developing world.
- *Anaerobic digester*: The barriers to this technology are developed in section B.4 as part of an additionality test. This scenario has been included as the “proposed project activity.”

Excluded scenarios:

The overall criterion used in evaluating potential scenarios is to assess the ‘practicality’ and economics of a technology/approach. Said differently, is a given technology/system both practical to implement and economically attractive to be adopted? Applying this criterion resulted in excluding the scenarios listed below:

- *Daily spread*: This technology is less effective than the open lagoon system currently in use. Animal waste generated from project farm production operations would only be applied to land at certain periods throughout the growing season so a storage system would also be required. Further, the application of animal waste directly to the field (under aerobic conditions) has the potential to result in higher release of Nitrous Oxide (N_2O) emissions, a gas which has a GWP 310 times worse than CO_2. Finally, the incorporation of this solution requires additional manpower resources. It has been excluded as a plausible scenario.
- *Solid Storage*: 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.
- *Dry lot:* This AWMS has been excluded because it is not applicable to the conditions of the barns which incorporate the use of slats and paved pens.
- *Pit Storage below animal confinements*: Installing pit storage would require excavation underneath each of the existing barns or actual replacement (which is more likely). Further, reliable, uninterrupted electric supply is essential; if power fails, the animal herd will be quickly killed by the accumulation of toxic fumes, including hydrogen sulphide (H_2S). Because power in rural México is not reliable, pit storage has been excluded as a plausible scenario.
- *Deep litter*: Pig farmers have found tending deep litter bedding systems so laborious and unpleasant, that this approach has been replaced with liquid-manure or solid-manure systems. It becomes difficult to optimize the composting process with large numbers of animals; this is counter to achieving economies of scale associated with large animal counts (typical of the CAFO approach). Farms seek the most cost effective solution meeting local regulatory and farm

conditions, and, therefore, use liquid manure systems.[13] Further, the deep litter practice is not often used in México and has been excluded from consideration.

- *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 plausible scenarios.
- *Poultry manure*: This AWMS has been excluded as it is a management technique associated with poultry operations. The project sites are pork production operations. This scenario has been excluded from the list of plausible scenarios.
- *Aerobic treatment*: Aerobic treatment is typically suited for separated slurry or diluted effluents. Solids in manure increase the amount of oxygen needed and also increase the energy needed for mixing. The biggest drawbacks to aerated lagoons are (a) the cost of energy to run the aerators; (b) biosolids production, which is higher than in anaerobic systems; and (c) the potential for release of ammonia if the aeration level is not correct. This scenario has been excluded from the list of plausible scenarios.

Therefore, the list of plausible scenarios has been reduced to two alternative scenarios and one proposed project activity scenario:

Plausible alternative scenarios:	(i)	Liquid/Slurry
	(ii)	Anaerobic Lagoon
Proposed project activity scenario:	(i)	Anaerobic digester

Step 3: Economic Comparison

Tables B3 through B7 illustrate the economic comparison between plausible baseline scenarios and the proposed project activity scenarios. Data presented has been based on potential project activity at the sites in México. This comparison was prepared by AgCert and reviewed by a swine industry economist.[14]

The comparison was made using a 10% discount rate, which might be typically used in a developed nation. As shown in Figure B1, this rate is extremely conservative in México as the calculated rate can exceed 17%.[15]

	Mexico
Cost of Equity Capital	20.53%
Industry beta adjustment	0.41%
Operational - Sovereign Risks	
Macroeconomics	-2.78%
Political/Legal	0.00%
Force Majeure	0.00%
Financial Risks	-0.70%
Adj. Project Discount Rate:	17.46%

Figure B1. Mexican discount rate.

[13] Klemola, Esa and MalKKi, Sirkka, Handling of Manure in Deep-Litter Pig Houses, 1998, http://www.ramiran.net/doc98/FIN-ORAL/MALKKI.pdf

[14] DiPietre, Dennis, PhD, Agricultural Economist, formal communication

[15] http://faculty.fuqua.duke.edu/~charvey/Teaching/BA456_2003/Despegar/Despegar.ppt#591,25, Project's Risks Cost of Capital Implications

Table B3. Economic analysis of the liquid/slurry AWMS baseline scenario.

AWMS: LIQUID SLURRY				
COSTS AND BENEFITS	**Year 1**	**Year 2**	**Year n**	**Year n+1**
Equipment costs (pump & piping)	$ (283,674)	$ -	$ -	$ -
Installation costs of a slurry system	$ (31,204)	$ -	$ -	$ -
Maintenance costs	$ (1,752)	$ (1,752)	$ (1,752)	$ (1,752)
Other costs (e.g. operation, transportation, consultancy, engineering, etc.)	$ (6,000)	$ (6,000)	$ (6,000)	$ (6,000)
Revenues from the sale of electricity or other project related products, when applicable	$ -	$ -	$ -	$ -
SUBTOTAL	$ (322,630)	$ (7,752)	$ (7,752)	$ (7,752)
TOTAL BASELINE	$ (322,630)	$ (7,752)	$ (7,752)	$ (7,752)
NPV (US$) (10% discount rate)	($336,600)			
IRR (%)	undefined			

Table B4. Economic analysis of the anaerobic lagoon AWMS baseline scenario.

AWMS: ANAEROBIC LAGOON				
COSTS AND BENEFITS	**Year 1**	**Year 2**	**Year n**	**Year n+1**
Equipment costs (geomenbrane, pump & piping)	$ (8,562)	$ -	$ -	$ -
Installation costs of a lined lagoon system	$ (5,246)	$ -	$ -	$ -
Operations and maintenance costs	$ (100)	$ (100)	$ (100)	$ (100)
Other costs (e.g. consultancy, engineering, etc.)	$ (500)	$ -	$ -	$ -
Revenues from the sale of electricity or other project related products, when applicable	$ -	$ -	$ -	$ -
SUBTOTAL	$ (14,408)	$ (100)	$ (100)	$ (100)
TOTAL BASELINE	$ (14,408)	$ (100)	$ (100)	$ (100)
NPV (US$) (10% discount rate)	($13,657)			
IRR (%)	undefined			

Table B5. Economic analysis of the anaerobic digester with flare AWMS project activity scenario.

AWMS: AMBIENT TEMPERATURE ANAEROBIC DIGESTER WITH FLARE				
COSTS AND BENEFITS	**Year 1**	**Year 2**	**Year n**	**Year n+1**
Equipment and Installation costs (excavation, lined lagoon, cover, manure transfer piping)	$ (126,146)			
Flare and fence	$ (7,825)			
Maintenance costs	$ (2,283)	$ (2,283)	$ (2,283)	$ (2,283)
Other costs (e.g. operation, consultancy, engineering, etc.)	$ (15,000)	$ -	$ -	$ -
Revenues from the sale of electricity or other project related products, when applicable	$ -	$ -	$ -	$ -
SUBTOTAL	$ (151,255)	$ (2,283)	$ (2,283)	$ (2,283)
TOTAL BASELINE	$ (151,255)	$ (2,283)	$ (2,283)	$ (2,283)
NPV (US$) (10% discount rate)	($150,260)			
IRR (%)	undefined			

Table B6. Economic analysis of the anaerobic digester w/ cogeneration/flare AWMS project activity scenario.

AWMS: AMBIENT TEMPERATURE ANAEROBIC DIGESTER W/CO-GEN /FLARE				
COSTS AND BENEFITS	**Year 1**	**Year 2**	**Year n**	**Year n+1**
Equipment and Installation Costs (excavation lined lagoon, cover, manure transfer piping)	$ (126,146)			
Flare, fence, generator, and/or co-gen	$ (40,500)			
Maintenance costs	$ (3,917)	$ (3,917)	$ (3,917)	$ (3,917)
Other costs (e.g. operation, consultancy, engineering, etc.)	$ (25,000)	$ -	$ -	$ -
Revenues from the sale or use of electricity or other project related products, when applicable	$ 9,500	$ 9,500	$ 9,500	$ 9,500
SUBTOTAL	$ (186,063)	$ 5,583	$ 5,583	$ 5,583
TOTAL BASELINE	$ (186,063)	$ 5,583	$ 5,583	$ 5,583
NPV (US$) (10% discount rate)	($137,963)			
IRR (%)	undefined			

Table B7. Sensitivity analysis

Sensitivity Analysis (by Farm Size)								
Farm Size	**Liquid Slurry**		**Anaerobic Lagoon**		**Anaerobic Digester**		**AD with Generator**	
	NPV	**IRR**	**NPV**	**IRR**	**NPV**	**IRR**	**NPV**	**IRR**
500	($175,354)	UND	($21,640)	UND	($105,520)	UND	($89,017)	UND
1,000	($336,600)	UND	($35,715)	UND	($150,260)	UND	($137,963)	UND
1,200	($338,189)	UND	($38,219)	UND	($158,694)	UND	($142,192)	UND
2,400	($441,179)	UND	($59,457)	UND	($230,476)	UND	($213,974)	UND
Note: Anaerobic lagoon costs would have to increase 4.5 X before they would approimate the NPV of the AD w/CoGen								

As shown in the above tables, none of the above scenarios yield potential revenues. Because there are no positive cash flows, the economic analysis compares Net Present Value (NPV) parameters between the different scenarios. An economic comparison suffices to identify the best AWMS scenario - favouring those with lower costs. In this instance, it can be seen that the anaerobic lagoon AWMS, the prevailing practice, is the most economically attractive course of action.

Both configurations of the project activity scenario, ambient temperature digester with or without cogeneration, have ranges of NPV that are far more negative than the baseline scenario. The cost of implementing this system (in either configuration) is much higher than the cost of an open lagoon system, so it is determined that the project is “additional” from an economic perspective. The economic value ascribed to project generated electricity is the offset “retail” cost the farm pays for this supply.

A sensitivity analysis was performed to determine whether any variables or inputs could cause significant variations in the results.

Animal Waste Management Systems are sized or scaled to accommodate the number of animals present at a given farm. The volumetric storage requirement scales linearly with the number of animals (so long as population mixes are similar, for instance: farrow-to-finish compared to farrow-to-finish.

The deep pit solution typically accommodates up to approximately 1,200 animals per building, so as animal population rises there can be a “discontinuity” in the costs as additional buildings have to be brought “online.” The other solutions can be scaled without such discontinuities. Indeed, a volume increase can often be accommodated with a modest material/equipment change plus an incremental increase in excavation costs.

In summary: With regards to the two AWMS solutions of greatest interest (open lagoon vs. digester) there are no variables whose minor variation causes significant variations in the result.

Conclusion: The most likely plausible scenario, the anaerobic lagoon, is the "baseline scenario." The proposed project activity scenario is not an "economically attractive" course of action and therefore it is not the baseline scenario.

The application of baseline methodology Steps 4 and 5 follow in the next section, B.3.

B.3 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:

In the absence of the project activity, the project farm would not change its AWMS practice. As noted earlier in Section A.4.4, pork producers do not have the motivation or resources (especially financial resources) to change their AWMS: there are no laws or regulatory directives driving such change and even if a producer were so inclined, it has been demonstrated in Table B5 that they would find the upgrade costs prohibitive. This, in itself, demonstrates additionality between the baseline scenario and project activity scenario. Additionally, Step 4 of the methodology requires a barrier assessment of the proposed project activity:

Step 4: Assessment of barriers.

Absent CDM project activities, the proposed project activity has not been adopted on a national or worldwide scale due to the following barriers:

a) *Investment Barriers***:** This treatment approach is considered one of the most advanced AWMS systems in the world. Only a few countries have implemented such technology because of the high costs involved in the investment compared to other available systems and due to regionalized subsidies for electric generation. The Mexican energy market does not currently offer incentives for small-scale sell of biogas produced energy back into the grid. The investment required to produce energy by utilizing biogas is still too high compared to electricity prices in México.

   Producers view the AWMS as a stage that is outside of the production process and have difficulty financing changes that should be undertaken. Even banks have been unwilling to finance such activities absent government guarantees or other incentives.

b) *Technology barriers***:** Anaerobic digester systems have to be sized to handle projected animal/effluent volumes with a Hydraulic Retention Time (HRT) consistent with extracting most/all CH_4 from the manure. These systems become progressively more expensive on a 'per animal' basis as farm animal population (i.e., farm size) is decreased. Moreover, operations and maintenance requirements involved with this technology, including a detailed monitoring program to maintain system performance levels, must also be considered. Worldwide, few anaerobic digesters have achieved long-term operations, due primarily to inappropriate operations and maintenance.

c) *Legal barriers***:** The implementation of this project activity by these farms highly exceeds current Mexican regulations for swine waste treatment. Apart from existing legislation in México that establishes water quality parameters that require that water supplies be protected from contamination, there is no legislation in place that requires specific swine manure treatment as it relates to the emission of GHG.

Per local and state officials as well as the project developer's legal consul, there were no existing laws or regulations, nor were any anticipated, that would require these farms to change their open lagoon AWMS practice in order to mitigate GHG emissions.

Step 5: Timeline of development and analysis of baseline scenario.

Background

Please note that the planning, construction, and operation of the improved AWMS at the sites listed in this PDD began prior to actual registration as a CDM project activity using the prompt start provision (paragraph 13 of decision 17/CP.7). As shown in Figure B2, the availability of the CDM was considered throughout project inception through completion. Further, the infrastructure and data management system at AgCert was developed with the prime goal of managing data related to CDM project activities.

DATE	ACTIVITY
Jan 2003	AgCert establishes locations worldwide to perform CDM environmental projects in the agricultural industry
Mar 2003	AgCert begins development of proposed new methodology for CDM activities
May 2004	AgCert opens discussions with candidate project participants the potential for conducting a CDM Project Activity
Jun 2004 – Jun 2005	Site Survey, Data Collection, Baseline Analysis, PDD preparation
Sep 2004	Project start date. AgCert and farm owners execute activities to undertake a Clean Development Mechanism project. Initiated construction engineering and planning activities.
Jan 2005	Broke ground at first construction site
January 27, May 12, May 13, 2005	Stakeholders' meeting held at the Asociación Ganadera Local de Porcicultores de Cajeme in Ciudad Obregón; at the Sala de Consejo de la Asociación Ganadera Local de Porcicultores de Navojoa (Navojoa Pork Association Center) in Navojoa; and at the Salón Querubin 2 del Hotel San Angel in Hermosillo.
Mar 2005	AgCert submits to the Mexican DNA the first draft of this PDD.
Aug 2005	Projected completion of construction, flare operational at all sites

Figure B2. Project activity timeline

Analysis

An analysis was performed to assess whether the basis in choosing the baseline scenario is expected to change during the crediting period and the results follow:

a) *Economic performance*: Given that (1) the technology required to implement the proposed project activity is both specialized and "advanced," (2) the demonstrated demand for this technology in México is minimal, and (3) inflation rates in developing nations typically range from 5% to 60% (2002 est.), there is no reason to expect that implementation costs will drop so dramatically that the economic models summarized in tables B4 and B5 will become invalid.

b) *Legal constraints*: There is no expectation that Mexican legislation will require future use of digesters due to the *significant* investments required. Further, there is no expectation that México will pass any legislation which deals with the GHG emissions (see Step 4c above). Indeed, the developer is aware of no Latin American or other worldwide location requiring either the use of digesters or the constraints of agricultural GHG emissions. Qualitatively, this is the most likely "risk" area associated with possible changes in the baseline scenario. Overarching environmental regulations have to balance creating a legislative framework that enables agricultural production against social pressures to make industrialized livestock operations "good neighbours." México has successfully grown this sector, building upon low operating costs and technically expert labour. They have recently demonstrated environmental sensitivity by requiring lagoon liners.

c) *Common practice*: While past practices cannot predict future events, it is worth noting that sites included in this project activity have been in existence for many years, during which time, the prevailing AWMS practice used was open lagoons.

Such anaerobic lagoon systems are economically feasible, reliable, effective, and satisfy regulatory and social requirements, and there is no reason to expect that these conditions will change in the foreseeable future.

B.4 Description of how the definition of the project boundary related to the baseline methodology selected is applied to the project activity:

The project boundary is defined in Figure B3. It describes the basic layout of the project farm in a schematic format. The proposed project boundary considers the GHG emissions that come from AWMS practices, including the GHG resulting from the capture and combustion of biogas. The project activity site uses a system of one or more lagoons. Proposed AWMS practice changes include the construction of an ambient temperature digester comprised of one or more cells that capture the resulting bio-gas which is then combusted. The project boundary considers these practice changes as well as future options that the producer may elect to use.

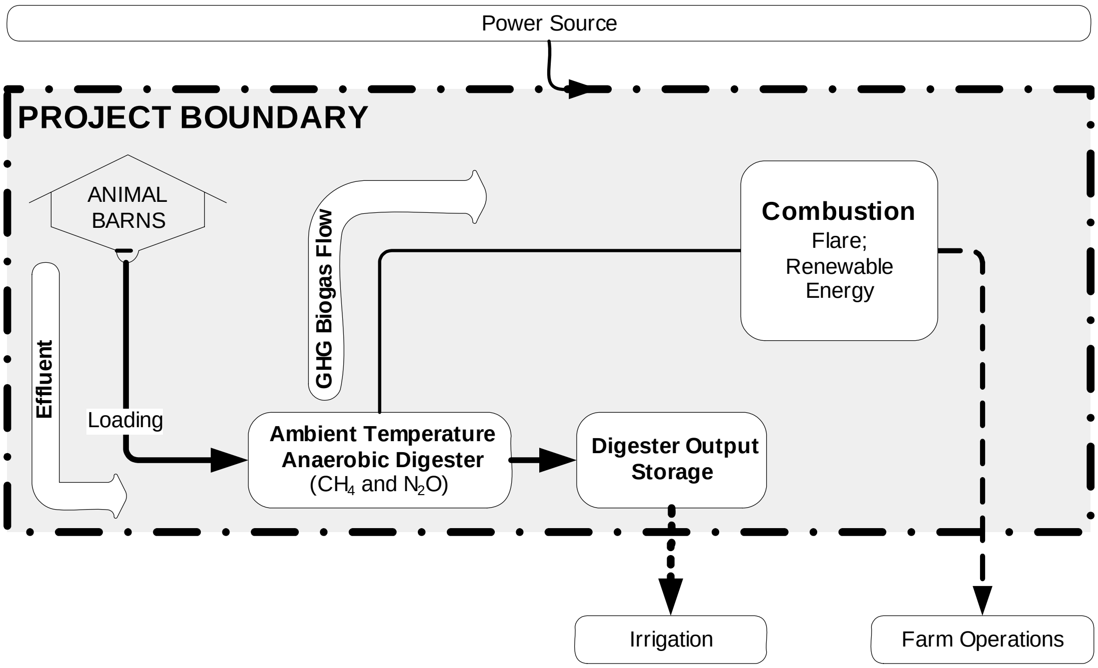

Figure B3. Project Boundary

The project boundary does *not* consider the effects of enteric emissions, nor does it include barn-related emissions, whether directly or indirectly associated with the animals, as these emissions are not affected by the proposed practice changes.

B.5 Details of baseline information, including the date of completion of the baseline study and the name of the person(s)/entity(ies) determining the baseline:

The final draft of this baseline section was completed on 15/03/2005. The name of entity determining the baseline is AgCert.

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1 Starting date of the project activity:

The starting date of the project activity is 08/09/04.

C.1.2 Expected operational lifetime of the project activity:

The expected operational lifetime of the project activity is 11y 9m.

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

The project activity will use a fixed crediting period.

C.2.1 Renewable crediting period

C.2.1.1 Starting date of the first crediting period: N/A

C.2.1.2 Length of the first crediting period: N/A

C.2.2 Fixed crediting period:

C.2.2.1 Starting date:

The starting date of the fixed crediting period is 01/06/05.

C.2.2.2 Length:

The length of the crediting period is 10y 0m

SECTION D. Application of a monitoring methodology and plan

D.1 Name and reference of approved monitoring methodology applied to the project activity:

The project activity utilizes the CDM approved monitoring methodology AM0016/Version 02 entitled "*Monitoring Greenhouse Gas Emissions from improved Animal Waste Management Systems in confined animal feeding operations*."

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

This monitoring methodology was chosen because it offers a GHG emissions model that can be used to characterize baseline and project activity emissions. Specifically, the methodology is applicable because:

1. The captured gas is being flared.
2. The captured gas is being used to produce energy (e.g., electricity/thermal energy), but no emission reductions are claimed for displacing or avoiding energy from other sources.[16]
3. The farms have livestock population managed under confined conditions and operate in a competitive market.

[16] Although in this project no emission reductions are claimed for displacing or avoiding energy from other sources, all possible financial revenues and/or emission leakages will be taken into account in the analysis performed.

4. The livestock populations are comprised of swine animals, an applicable animal type.
5. The AWMS, including both the baseline scenario and the manure management systems introduced as part of the project activity, is in accordance with the regulatory framework in the country, excluding the discharge of manure into natural resources (e.g., rivers or estuaries).
6. The on-farm project systems introduce an AWMS practice and technology to reduce GHG emissions.
7. The project farm systems result in a reduction of GHG emissions due to the AWMS improvements.

D.2.1 Option 1: Monitoring of the emissions in the project scenario and the baseline scenario

AM0016 monitoring methodology is a broad based methodology that can be applied to various animal categories, waste management systems, and data types. As such, the methodology defines a superset of ID numbered parameters available for application in individual project activity scenarios. Individual projects will not require monitoring of the entire superset of parameters. The selection of such parameters is dependent on the result of the data characterization and emission factor determination test (Paragraph B.2). The following subset of parameters has been identified for use at the project activity sites:

D.2.1.1 Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:

ID number	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived?	Comment
1. $Population_{month}$	Integer, Classification	Herd/breed counts per type	#, Type	m	Entrance – exit records of animals to the barn	100%	electronic	Animal counts by population classification and genetics. Classification data also includes mortality and days resident.
6. BA	Classification	Type of AWMS	Type	m	Entrance – exit records of animals to the barn	100%	electronic	AWMS type used to select appropriate parameters from IPCC lookup tables
9. TR	Integer, volume	Temperature	^oC, cm	m	Monthly	100%	electronic	Used to determine climate conditions for selection of appropriate parameters from IPCC lookup tables
12. CF	Volume	Biogas produced	M^3	m	Cumulative monthly production recorded monthly	100%	electronic	QC/QA check. This parameter enables verification of the anaerobic digestion process. Considered over several months, this parameter helps establish “typical” performance for an anaerobic digester.
13. CD	Percent	CO_2 concentration	%	m	Quarterly	100%	electronic	QC/QA check. This parameter monitors digester operation.
14. INT	N/A	Operational status	N/A	m	Weekly	100%	electronic	Operational status of all project equipment is checked. This parameter helps ensure proper digester operation.

D.2.1.2 Description of formulae used to estimate project emissions (for gas, source, formulae/algorithm, emission units of CO_2 equ.)

Equations 9, 10, 11, 13, 14, 15, and 16 from Approved Methodology AM0016 are used to determine project activity emissions.

Four options are available for the determination of volatile solids (V_s) excretion rate used with equation 11. Two of the four originate from lookup tables, IPCC and country-specific. If lookup references were not available, then the V_s could have been determined via calculation based on feed nutrition content and animal weight, e.g., equations 1 and 2 in AM0016. IPCC default values for V_s. were selected for use at the project activity sites. Furthermore, country specific factors are not available.

Two options are available for the determination of methane conversion factors (MCF) used with equation 11. One originates from IPCC lookup tables and the other can be calculated using equation 8 in AM0016. IPCC default values were selected for use at the project activity sites.

Four options are available for the determination of nitrogen excretion (N_{ex}) rate used with equations 15 and 16. Two of the four originate from lookup tables, IPCC and country-specific. If lookup references were not available, then the N_{ex} could have been determined via calculation based on feed nutrition content and animal weight, e.g., equations 3 and 4 in AM0016. IPCC default values were selected for use at the project activity sites. Furthermore, country specific factors are not available.

- Equation 9, Baseline methane (CH_4) emissions in CO_2e:

$$CO_{2eq\ methane} = CH_{4\ annual} * GWP_{CH4}/1000$$

- Equation 10, Baseline methane (CH_4) annual emissions:

$$CH_{4\ annual} = \sum_{mj} EF_{month} * Population_{month} * MS\%j$$

- Equation 11, Animal group emission factor:

$$EF_{month} = V_s * n_m * B_0 * 0.67kg/m^3 * MCF_{month}$$

- Equation 13, Baseline nitrous oxide (N_2O) emissions in CO_2e:

$$CO_{2equiv\ N2O} = GWP_{N2O} * N_2O_{total\ annual}/1000$$

- Equation 14, Baseline nitrous oxide (N_2O) annual emissions:

$$N_2O_{total\ annual} = \sum_{mj} (N_2O_d + N_2O_i) * Population_{month} * MS\%j$$

- Equation 15, Direct nitrous oxide (N_2O) emissions:

$$N_2O_d = N_{ex\ month} * EF_3 * (1- F_{gasm}) * C_m$$

- Equation 16, Indirect nitrous oxide (N_2O) emissions:

$$N_2O_i = N_{ex\ month} * EF_4 * F_{gasm} * C_m$$

D.2.1.3 Relevant data necessary for determining the baseline of anthropogenic emissions by sources of GHG within the project boundary and how such data will be collected and archived.

ID number	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived?	Comment
1. $Population_{month}$	Integer, Classification	Herd/breed counts per type	#, Type	m	Entrance – exit records of animals to the barn	100%	electronic	Animal counts by population classification and genetics. Classification data also includes mortality and days resident.
6. BA	Classification	Type of AWMS	Type	m	Entrance – exit records of animals to the barn	100%	electronic	AWMS type used to select appropriate parameters from IPCC lookup tables
9. TR	Integer, volume	Temperature and rainfall	^{o}C, cm	m	Monthly	100%	electronic	Used to determine climate conditions for selection of appropriate parameters from IPCC lookup tables

D.2.1.4 Description of formulae used to estimate baseline emissions (for gas, source, formulae/algorithm, emission units of CO_2 equ.)

Equations 9, 10, 11, 13, 14, 15, and 16 from Approved Methodology AM0016 are used to determine baseline emissions.

Four options are available for the determination of volatile solids (V_s) excretion rate used with equation 11. Two of the four originate from lookup tables, IPCC and country-specific. IPCC default values for V_s were selected for use at the project activity sites. Furthermore, country specific factors are not available.

Two options are available for the determination of methane conversion factors (MCF) used with equation 11. One originates from IPCC lookup tables and the other can be calculated using equation 8 in AM0016. IPCC default values were selected for use at the project activity sites.

Four options are available for the determination of nitrogen excretion (N_{ex}) rate used with equations 15 and 16. Two of the four originate from lookup tables, IPCC and country-specific. IPCC default values were selected for use at the project activity sites. Furthermore, country specific factors are not available.

- Equation 9, Baseline methane (CH_4) emissions in CO_2e:

$$CO_{2eq\ methane} = CH_{4\ annual} * GWP_{CH4}/1000$$

- Equation 10, Baseline methane (CH_4) annual emissions:

$$CH_{4\ annual} = \sum_{mj} EF_{month} * Population_{month} * MS\%j$$

- Equation 11, Animal group emission factor:

$$EF_{month} = V_s * n_m * B_0 * 0.67kg/m^3 * MCF_{month}$$

- Equation 13, Baseline nitrous oxide (N_2O) emissions in CO_2e:

$$CO_{2equiv\ N2O} = GWP_{N2O} * N_2O_{total\ annual}/1000$$

- Equation 14, Baseline nitrous oxide (N_2O) annual emissions:

$$N_2O_{total\ annual} = \sum_{mj} (N_2O_d + N_2O_i) * Population_{month} * MS\%j$$

- Equation 15, Direct nitrous oxide (N_2O) emissions:

$$N_2O_d = N_{ex\ month} * EF_3 * (1- F_{gasm}) * C_m$$

- Equation 16, Indirect nitrous oxide (N_2O) emissions:

$$N_2O_i = N_{ex\ month} * EF_4 * F_{gasm} * C_m$$

D.2.2 Option 2: Direct monitoring of emission reductions from the project activity (values should be consistent with those in section E):

D.2.2.1 Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:

ID number	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

ID number	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

D.2.2.2 Description of formulae used to calculate project emissions (for each gas, source, formulae/algorithm, emission units of CO_2 equ.):

D.2.3 Treatment of Leakage in the Monitoring Plan.

D.2.3.1 If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project activity

ID number	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
16. EP_y	Electricity	Power	kWh	m	Monthly	100%	electronic	Electricity used for project equipment
19. EP_p	Electricity	Power	kWh	m	Monthly	100%	electronic	Electricity produced through co generation of the captured methane

D.2.3.2 Description of formulae used to estimate leakage (for each gas, source, formulae/algorithm, emission units of CO_2 equ.)

Equations 17 to 23 from Approved Methodology AM0016 are used to determine project activity leakage.

Equation 17 will be used to determine electrical leakage on a continual basis.

The project developer used equations 18 through 23 in a one-time analysis to confirm that the change in AWMS (project activity) did not adversely affect GHG emissions due to land application, runoff and ammonia volatilization. The results of the analysis show that there is no change in GHG emissions in these areas by the incorporation of an anaerobic digester.

- Equation 17, Project activity electricity emissions in CO_2e:

$$EE_y = (EP_{y\text{-}project} – EP_{p\text{-}project} - EP_{y\text{-}baseline}) * EC_y / 1000$$

- Equation 18, Land leakage:

$$Land\ Leakage = Project\ activity\ land\ emissions – Baseline\ land\ emissions$$

- Equation 19, Direct nitrous oxide (N_2O) emissions from land application:

$$N_2O_{land} = N_{ex} * N * (1\text{-}F_{gasm}) * EF_1 * C_m$$

- Equation 20, Indirect nitrous oxide (N_2O) emissions from runoff:

$$N_2O_{runoff} = N_{ex} * N * (1\text{-}F_{gasm}) * F_{leach} * EF_5 * C_m$$

- Equation 21, Indirect nitrous oxide (N_2O) emissions from ammonia volatilization:

$$N_2O_i = N_{ex} * N * EF_4 * F_{gasm} * C_m$$

- Equation 22, Total nitrous oxide (N_2O) emissions:

$$N_2O_{total} = (N_2O_{land} + N_2O_i + N_2O_{runoff}) / 1000$$

- Equation 23, Total nitrous oxide (N_2O) emissions in CO_2 equivalent:

$$N_2O_{CO2\text{-}equiv} = GWP_{N2O} * N_2O_{total}$$

- And, the following equation was used to sum the land application and electricity leakage:

$$L_o = EE_y + N_2O_{CO2\text{-}equiv}$$

D.2.4 Description of formulae used to estimate emission reductions for the project activity (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

Equations 24 and 26 from Approved Methodology AM0016 are used to determine project activity emission reductions:

- Equation 24, Total emissions in metric tonnes CO_2e:

$$Total\ Emissions_{mt} = CO_{2eq\ methane} + CO_{2equiv\ N2O}$$

- Equation 26, Net emission reductions:

$$ER_{net} = BE - PE - L_o$$

D.3	**Quality control (QC) and quality assurance (QA) procedures are being undertaken for data monitored.**	
Data *(Indicate table and ID number e.g. 3.-1.; 3.2.)*	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
D2.1.1-1	Low	Work instructions for the collection of this data point are available in O&M Manual
D2.1.3-1	Low	Work instructions for the collection of this data point are available in O&M Manual
D2.1.1-6	Low	Work instructions for the collection of this data point are available in O&M Manual
D2.1.3-6	Low	Work instructions for the collection of this data point are available in O&M Manual
D2.1.1-9	Low	Work instructions for the collection of this data point are available in O&M Manual
D2.1.3-9	Low	Work instructions for the collection of this data point are available in O&M Manual
D2.1.1-12	Low	Work instructions for the collection of this data point are available in O&M Manual
D2.1.1-13	Low	Work instructions for the collection of this data point are available in O&M Manual
D2.1.1-14	Low	Work instructions for the collection of this data point are available in O&M Manual
D2.3.1-16	Low	Work instructions for the collection of this data point are available in O&M Manual
D2.3.1-19	Low	Work instructions for the collection of this data point are available in O&M Manual

AgCert’s monitoring and reporting plan has been developed under the organization’s pending ISO 9001 and ISO 14001 Quality and Environmental Management System. Additionally, AgCert has been privileged to be afforded the opportunity to comment on draft ISO 14064, Guidelines for measuring, reporting, and verifying entity project-level GHG emissions and has applied the main concepts to its QC and QA procedures.

D.4 Please describe the operational and management structure that the project operator will implement in order to monitor emission reductions and any leakage effects, generated by the project activity

AgCert has a trained staff located in the host nation to perform O&M activities including but not limited to monitoring and collection of parameters, quality audits, personnel training, and equipment inspections. The associated O&M Manual has been developed to provide guidance (work instructions) to individuals that collect and/or process data. AgCert staff will perform audits of farm operations personnel on a regular basis to ensure proper data collection and handling.

AgCert has designed and implemented a unique set of data management tools to efficiently capture and report data throughout the project lifecycle. On-site assessment (collecting Geo-referenced, time/date stamped data), supplier production data exchange, task tracking, and post-implementation auditing tools have been developed to ensure accurate, consistent, and complete data gathering and project implementation. Sophisticated tools have also been created to estimate/monitor the creation of high quality, permanent, ERs using IPCC formulae.

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

D.5 Name of person/entity determining the monitoring methodology:

AgCert determined the monitoring methodology for use at this project activity.

SECTION E. Estimation of GHG emissions by sources

E.1 Estimate of GHG emissions by sources:

The **methane (CH_4)** emissions for the project activity were calculated using AM0016 equations 9, 10, and 11. Within these equations several key parameters and emission factors were utilized.

The **nitrous oxide (N_2O)** emissions for the project activity were calculated using Equations 13, 14, 15, and 16. Within these equations several key parameters and emission factors were utilized.

The **carbon dioxide (CO_2)** emissions (power consumed by project equipment) for the project activity were calculated using Equation 17. Within this equation a coefficient factor was utilized.

The following is a table of annual GHG emissions by source in CO_2 Equivalents:

E1 - Project Activity Emissions				
Sys	Source	GHG Emissions (CO_2e)		
		CH_4	N_2O	
1	SPR Alianza Para la Producción Soles de RL (Grupo Soles)	4,739	1,118	
2	Ontagota SPR de RL	1,026	242	
3	Victor Gracia Esquivel	1,381	326	
4	Grupo Sonqui SPR de RL	2,138	504	
5	Porcicola de Kino, SA de CV	2,172	512	
6	Dinamica del Pacifico, SPR de RL	2,030	479	
7	Oviachic, SPR de RL	770	182	
8	Agropecuaria Santa Bárbara, SPR de RL	955	225	
		15,211	3,588	**18,799** metric tonnes

E.2 Estimated leakage:

The leakage estimate for the project activity was calculated using Equations 17 through 23 from the *Emission Reductions* section of AM0016 and Section D.2.3.2 of this document, as well as increased power consumption:

Increased Power Consumption

Electrical demand as a consequence of the project activity is not expected to increase significantly. Additional electrical power will run low voltage sensors, and meters. The total power increase is expected to be less than one kWh/year. However, power consumption will be monitored to determine if any leakage occurs as a result of the project activity.

Total Estimated Leakage Emissions

The following tables give the estimated project leakage:

E2 - Total Leakage Emissisons										
Sys	Source	GHG Emissions (CO_2e)								
		Baseline			Project			Change		
		CH_4	N_2O	CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	CO_2
	Land Application									
1	SPR Alianza Para la Producción Soles de RL (Grupo Soles)		6,391			6,391			0	
2	Ontagota SPR de RL		1,383			1,383			0	
3	Victor Gracia Esquivel		1,862			1,862			0	
4	Grupo Sonqui SPR de RL		2,882			2,882			0	
5	Porcicola de Kino, SA de CV		2,928			2,928			0	
6	Dinamica del Pacifico, SPR de RL		2,735			2,735			0	
7	Oviachic, SPR de RL		1,038			1,038			0	
8	Agropecuaria Santa Bárbara, SPR de		1,287			1,287			0	
	AWMS Electrical Power									
1	SPR Alianza Para la Producción Soles de RL (Grupo Soles)			0			2.08			2.08
2	Ontagota SPR de RL			0			0.26			0.26
3	Victor Gracia Esquivel			0			0.26			0.26
4	Grupo Sonqui SPR de RL			0			0.52			0.52
5	Porcicola de Kino, SA de CV			0			0.52			0.52
6	Dinamica del Pacifico, SPR de RL			0			0.78			0.78
7	Oviachic, SPR de RL			0			0.26			0.26
8	Agropecuaria Santa Bárbara, SPR de			0			0.26			0.26
							Total:	0	0	5

5 metric tonnes

AWMS Electrical Power project leakage is calculated using emission factors from OECD: Road-Testing Baselines for GHG Projects in the Electric Power Sector, Table 3-1(c), p.19. As directed in the methodology, electrical leakage from project activity is offset by the "green" energy produced using the captured methane. The following table describes the calculation and was the basis for the figure used above for the *AWMS Electrical Power – Project - CO_2* parameter.

Source	Est kwh consumed/produced per yr	kg CO2e emitted per kwh produced - Mexico	metric tonnes CO2e
Leakage	500	0.5230	0.2615
Green energy produced	0	0.5080	0
			0.2615

E.3 The sum of E.1 and E.2 representing the project activity emissions:

The total project emissions are given below as the sum of the totals provided in Sections E.1 and E.2:

E3 - Total Project Activity Emissions				
Source	GHG Emissions (CO_2e)			
	CH_4	N_2O	CO_2	
E1 - Project Emissions	15,211	3,588	0	
E2 - Leakage	0	0	5	
Total:	15,211	3,588	5	**18,804** metric tonnes

E.4 Estimated anthropogenic emissions by sources of greenhouse gases of the baseline:

The following sections describe the baseline emission calculations and the resulting emissions expressed in terms of CO_2 equivalents.

The baseline was calculated using Equations 9, 10 and 11 for methane emissions and Equations 13, 14, 15 and 16 for nitrous oxide emissions. These equations were customized from the *Emission Reductions* section of AM0016 and Section D.2.1.4 of this document. Within these equations several key parameters and emission factors were utilized.

E4 - Baseline Emissions				
Sys	Source	GHG Emissions (CO_2e)		
		CH_4	N_2O	
1	SPR Alianza Para la Producción Soles de RL (Grupo Soles)	42,664	1,118	
2	Ontagota SPR de RL	9,232	242	
3	Victor Gracia Esquivel	12,428	326	
4	Grupo Sonqui SPR de RL	19,242	504	
5	Porcicola de Kino, SA de CV	19,548	512	
6	Dinamica del Pacifico, SPR de RL	18,264	479	
7	Oviachic, SPR de RL	6,932	182	
8	Agropecuaria Santa Bárbara, SPR de RL	8,595	225	
		136,905	3,588	**140,493** metric tonnes

E.5 Difference between E.4 and E.3 representing the emission reductions of the project activity:

The project activity emission reductions under each scenario are obtained by differencing the totals listed in Sections E.4 and E.3, as shown in the table that follows:

E5 - Total Project Activity Emission Reductions			
Source	**GHG Emissions (CO_2e)**		
E4 - Est. Baseline Emissions	140,493		
E3 - Project Activity Emissions	18,804		
Total:	121,689	**121,689**	metric tonnes

E.6 Table providing values obtained when applying formulae above:

E6 - Project Activity Emissions				
Year	**Estimation of Project Activity Emissions Reductions (tonnes CO_2e)**	**Estimate of Baseline Emissions Reductions (tonnes CO_2e)**	**Estimate of Leakage (tonnes CO_2e)**	**Estimation of Emission Reductions (tonnes CO_2e)**
Year 1	18,799	140,493	5	121,689
Year 2	18,799	140,493	5	121,689
Year 3	18,799	140,493	5	121,689
Year 4	18,799	140,493	5	121,689
Year 5	18,799	140,493	5	121,689
Year 6	18,799	140,493	5	121,689
Year 7	18,799	140,493	5	121,689
Year 8	18,799	140,493	5	121,689
Year 9	18,799	140,493	5	121,689
Year 10	18,799	140,493	5	121,689
Total (tonnes CO_2e)**:**	187,990	1,404,930	50	1,216,890

Values for the parameters/factors used in the formulae in previous sections are listed with their sources and comments in the table that follows:

Table E1-1. Parameter/Factor Values and References

Parameter/Factor	Value	Source/Comment
Baseline		
CH_4 GWP	21	Intergovernmental Panel on Climate Change, *Climate Change 1995: The Science of Climate Change* (Cambridge, UK: Cambridge University Press, 1996)
ID1	Annex 3	Animal population used to estimate baseline and project emission estimates was based on a 12 month period of actual operation

Parameter/Factor	Value	Source/Comment
		production data (See Annex 3).
ID1	Annex 3	Mortality rate
ID1 (n_m)	Annex 3	Days resident in system
ID14	100%	AWMS operation status
MS%j	100%	Percent of effluent used in system.
V_S	0.5	Obtained from 1996 IPCC, Appendix B, Table B-6, p. 4.46
B_o	0.45	Obtained from 1996 IPCC, Appendix B, Table B-6, p. 4.46
MCF_{month}	0.90	Obtained from 1996 IPCC, Appendix B, Table B-6, p. 4.46
N_2O GWP	310	Intergovernmental Panel on Climate Change, *Climate Change 1995: The Science of Climate Change* (Cambridge, UK: Cambridge University Press, 1996)
C_m	1.5714	Conversion factor from [N_2O – N] to N_2O (Cm=44/23)
F_{gasm}	0.2	Obtained from 1996 IPCC, Table 4-19, p. 4.94
EF_3	0.001	Obtained from IPCC 2000 Table 4.12, Section 4.4.1.2, p. 4.43
EF_4	0.01	Obtained from IPCC 2000 Table 4.18 Section 4.8.1.2, p. 4.73
N_{ex}	20	Obtained from 1996 IPCC, Table 4-20, p. 4.99
Project Activity		
CH_4 GWP	21	Intergovernmental Panel on Climate Change, *Climate Change 1995: The Science of Climate Change* (Cambridge, UK: Cambridge University Press, 1996)
ID1	Annex 3	Animal population used to estimate baseline and project emission estimates was based on a 12 month period of actual operation production data (See Annex 3).
ID1	Annex 3	Mortality rate
ID1 (n_m)	Annex 3	Days resident in system
ID14	100%	AWMS operation status
MS%j	100%	Percent of effluent used in system
V_S	0.5	Obtained from 1996 IPCC Appendix B, Table B-6, p. 4.46
ID1		Days resident in farm
B_o	0.45	Obtained from 1996 IPCC, Appendix B, Table B6, p. 4.46
MCF_{month}	0.10	Obtained from 1996 IPCC Appendix B, Table B-6, p. 4.46
N_2O GWP	310	Intergovernmental Panel on Climate Change, *Climate Change 1995: The Science of Climate Change* (Cambridge, UK: Cambridge University Press, 1996)
C_m	1.5714	Conversion factor from [N_2O – N] to N_2O (Cm=44/23)
F_{gasm}	0.2	Obtained from 1996 IPCC, Table 4-19, p. 4.94
EF_3	0.001	Obtained from IPCC 2000 Table 4.12, Section 4.4.1.2, p. 4.43
EF_4	0.01	Obtained from IPCC 2000 Table 4.18 Section 4.8.1.2, p. 4.73

Parameter/Factor	Value	Source/Comment
N_{ex}	20	Obtained from 1996 IPCC, Table 4-20, p. 4.99
	Leakage	
N_{ex}	20	Obtained from 1996 IPCC, Table 4-20, p. 4.99
ID1	Annex 3	Animal population used to estimate baseline and project emission estimates was based on a 12 month period of actual operation production data (See Annex 3).
ID1	Annex 3	Mortality rate
ID1 (n_m)	Annex 3	Days resident in system
F_{gasm}	0.2	Obtained from IPCC 1996, Table 4-19, p. 4.94
EF_1	0.0125	Obtained from IPCC 1996, Table 4-18, p. 4.39
C_m	1.5714	Conversion factor from [N_2O – N] to N_2O (Cm=44/23)
F_{leach}	0.3	Obtained from IPCC 1996, Table 4-24, p. 4.106
EF_5	0.025	Obtained from IPCC 1996, Table 4-23, p. 4.105
EF_4	0.01	Obtained from IPCC 2000 Table 4.18 Section 4.8.1.2, p. 4.73
ID16	500 kwh/yr	Electricity consumed by project activity equipment
ID19	90,000kwh/yr	Electricity generated by project activity equipment using captured methane
ECy	0.523kg CO2 / kwh	The GHG Indicator: UNEP Guidelines for Calculating Greenhouse Gas Emissions for Businesses and Non-Commercial Organisations, Appendix 8.2, Table 12 (1990 calculation**)** http://www.uneptie.org/energy/tools/ghgin/docs/GHG_Indicator.pdf
ECy	0.508kg CO2 / kwh	The GHG Indicator: UNEP Guidelines for Calculating Greenhouse Gas Emissions for Businesses and Non-Commercial Organisations, Appendix 8.2, Table 12 (1996 calculation) http://www.uneptie.org/energy/tools/ghgin/docs/GHG_Indicator.pdf

Table E1-1. Uncertainty Parameters

Uncertainty Parameter for GHG Mitigation Project Estimates	
Uncertainty:	**How Addressed:**
o Data collection inaccuracies o Animal type o Animal population, group/type, mortality rates o Genetics o Choice of appropriate emission coefficients o Data security o Animal health	o Accurate data collection is essential. The farms included in this project activity use a standardized industry database package which captures a wide range of incremental production data to manage operations and enable the farm to maximize both productivity and profitability. AgCert uses some data points collected via this system. o AgCert employed the emission factor determination test to assist in the selecting of appropriate IPCC "developed" or "developing" country values. o AgCert has a rigorous QA/QC system that ensures data security and data integrity. AgCert performs spot audits data collection activities. o AgCert has a data management system capable of interfacing with producer systems to serve as a secure data repository. Project activity data related uncertainties will be reduced by applying sound data collection quality assurance and quality control procedures. o Strict bio-security procedures are observed and adhered to.

SECTION F. Environmental impacts

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

There are no negative environmental impacts resulting from the proposed project activity.

Beyond the principal benefit of mitigating GHG emissions (the primary focus of the proposed project); the proposed activities will also result in positive environmental co-benefits. They include:

- Reducing atmospheric emissions of Volatile Organics Compounds (VOCs) that cause odour,
- Lowering the population of flies and associated enhancement to on-farm bio-security.

The combination of these factors will make the proposed project site more "neighbour friendly."

F.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:

All of the impacts on the environment are considered to be significantly positive.

SECTION G. Stakeholders comments

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

AgCert invited stakeholders to several meetings in Sonora to explain the UNFCC CDM process and proposed project activity. These meetings were presided over by Leo Perkowski, AgCert's Director of Climate Change Programs, and Michael Mirda, AgCert Project Coordinator for Mexico.

AgCert issued invitations to government officials at the federal, state, and local levels. Furthermore, AgCert published announcements of the meetings in *El Imparcial*, the newspaper which covers the state of Sonora.

These public announcements appeared in:

1. *El Imparcial* on January 17 and 25, 2005. The announcement invited stakeholders to a meeting at the Asociación Ganadera Local de Porcicultores de Cajeme in Ciudad Obregón on January 27, 2005. The meeting was presided over by Mr. Perkowski. He was assisted by Miguel Cervantes, Executive Secretary, Mexican Committee for the Reduction of Greenhouse Gases (COMEGEI).

2. *El Imparcial* on May 5, 2005. This announcement invited stakeholders to a meeting at the Sala de Consejo de la Asociación Ganadera Local de Porcicultores de Navojoa (Navojoa Pork

Association Center) in Navojoa on May 12, 2005. An announcement of the meeting, which was presided over by Mr. Mirda, was also posted on the state pork association's bulletin board.

3. *El Imparcial* on May 5, 2005. This announcement invited stakeholders to a meeting at the Salón Querubin 2 del Hotel San Angel in Hermosillo on May 13, 2005. An announcement of the meeting, which was presided over by Mr. Mirda, was also posted on the state pork association's bulletin board.

All invitations were in the Spanish language. The meeting was attended by project participants and farm representatives. Project participants were also notified by telephone in regards to the meetings in Hermosillo and Navojoa. A full list of attendees and the meeting minutes are available on request.

Both Mr. Perkowski and Mr. Mirda gave presentations, which covered the following topics: purpose of the meeting, background on global warming and the Kyoto Protocol, UNFCCC CDM process, process and responsibilities of the project, participants, equipment to be used for evaluation and audits, information management system, an example of project, benefits from the project (environmental and economic), and where to get further information.

At the Ciudad Obregón meeting, Mr. Cervantes also covered in detail the following topics: climate change; global warming; CDM process; and the Mexican government's role in project development.

AgCert has also participated as a speaker and described in detail this project in the Mexican government sponsored CDM workshops being presented throughout México.

G.2 Summary of the comments received:

After the presentation, attendees were afforded the opportunity to ask questions regarding the proposed project activities.

Questions asked at the various presentations included whether the project met National Water Commission requirements; whether the project met rules and environmental laws; what size farm could participate; if the methane gas could reduce energy costs or be used for heating; whether poultry farms were eligible; and what were the dimensions of the lagoons.

After the Navojoa presentation, the president of the Navojoa Pork Association commented on the CNA's (National Water Commision) regulations and requirements with the pork producers in the region. He understood and communicated to the attendees that through this CDM project, producers will be on their way to solving water quality issues.

All producers were interested in an alternative combustion system, such as generators, water heaters, etc. The producers understand that the project's purpose is to mitigate greenhouse gases, so the current proposal is a flare system that would combust the biogas.

Overall, the comments from the attendees at the three stakeholders' meetings in Sonora were positive and supportive of the project.

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

None required.

ANNEX 1.

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ANNEX 2.

INFORMATION REGARDING PUBLIC FUNDING

The implementation of this project is not dependent on any Official Development Assistance resource or any other resources from any international development-funding agency.

ANNEX 3.

BASELINE INFORMATION

SPR Alianza Para la Producción Soles de RL (Grupo Soles) Farm Data: Los Laureles (Jan – Dec 2004)

Sow	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	2,946	2,887	2,895	2,929	2,933	3,006	2,883	2,880	2,872	2,867	2,909	2,586
Mortalities	19	16	22	21	20	18	46	26	23	24	13	23
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Gilt	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	436	465	470	448	446	469	450	440	471	504	453	427
Mortalities	0	0	0	0	0	0	0	0	0	0	0	0
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Boar	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	71	61	66	57	55	53	53	49	49	48	47	61
Mortalities	0	2	1	1	0	0	0	1	0	1	1	0
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Finisher	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	737	771	774	786	803	852	858	897	890	921	939	897
Mortalities	5	6	7	10	7	21	15	8	13	24	23	17
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Nurse/Wean	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	305	296	331	324	325	283	323	334	359	372	298	303
Mortalities	7	3	3	11	5	6	5	0	5	2	4	11
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0

SPR Alianza Para la Producción Soles de RL (Grupo Soles) Farm Data: Las Palomas (Jan – Dec 2004)

Finisher	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	5,426	4,577	2,480	3,934	3,324	2,462	3,324	3,329	3,981	5,017	5,169	4,486
Mortalities	62	45	68	59	69	74	68	61	69	121	186	97
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Nurse/Wean	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	7,367	8,456	11,530	10,030	9,722	10,571	9,863	10,342	9,711	7,074	8,097	8,748
Mortalities	70	73	117	95	149	158	133	122	97	119	93	90
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0

SPR Alianza Para la Producción Soles de RL (Grupo Soles) Farm Data: Soles I (Jan – Dec 2004)

Sow	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	2,392	2,428	2,391	2,440	2,487	2,511	2,474	2,470	2,470	2,472	2,443	2,613
Mortalities	12	19	76	19	11	24	24	19	19	18	11	25
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Gilt	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	581	599	697	558	583	598	646	675	672	502	584	615
Mortalities	4	3	5	0	1	4	0	6	3	4	4	5
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Boar	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	9	9	9	11	11	11	11	11	11	11	11	11
Mortalities	0	0	0	0	0	0	0	0	0	0	0	0
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0

SPR Alianza Para la Producción Soles de RL (Grupo Soles) Farm Data: Soles II (Jan – Dec 2004)

Sow	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	1,298	1,319	1,349	1,362	1,350	1,347	1,280	1,282	1,292	1,317	1,312	1,273
Mortalities	7	8	9	14	13	12	19	19	9	13	10	12
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Gilt	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	441	459	445	366	374	382	416	446	375	366	415	458
Mortalities	3	2	0	0	1	2	1	1	1	0	1	2
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Boar	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	62	64	59	51	51	50	47	46	44	44	44	44
Mortalities	2	0	2	1	0	1	3	1	2	0	0	0
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0

SPR Alianza Para la Producción Soles de RL (Grupo Soles) Farm Data: La Tina (Jan – Dec 2004)

Finisher	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	3,417	3,360	2,730	0	3,165	2,594	2,533	0	3,069	2,817	2,736	1,214
Mortalities	73	57	58	47	113	237	57	46	48	152	33	16
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Nurse/Wean	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	3,638	747	3,405	3,310	3,519	2,874	3,275	3,214	303	3,335	3,292	2,518
Mortalities	32	26	210	95	40	45	71	61	11	18	43	40
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0

SPR Alianza Para la Producción Soles de RL (Grupo Soles) Farm Data: Melchor Ocampo (Jan – Dec 2004)

Finisher	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	3,058	2,681	173	3,651	3,458	3,151	2,112	4,758	4,523	4,298	2,719	0
Mortalities	222	77	50	59	166	107	75	44	91	119	154	33
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Nurse/Wean	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	0	0	0	0	0	0	3,140	3,210	1,371	1,248	0	0
Mortalities	0	0	0	0	0	0	10	78	14	74	28	0
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0

SPR Alianza Para la Producción Soles de RL (Grupo Soles) Farm Data: Providencia (Jan – Dec 2004)

Finisher	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	2,929	1,244	1,801	4,407	4,150	3,021	4,552	4,289	3,747	2,138	415	3,146
Mortalities	47	19	18	21	58	49	48	80	70	49	22	55
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0

SPR Alianza Para la Producción Soles de RL (Grupo Soles) Farm Data: Anahuac (Jan – Dec 2004)

Finisher	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	949	2,324	2,253	1,906	1,016	2,387	2,231	1,956	537	1,171	281	238
Mortalities	34	23	48	33	16	37	67	30	12	12	14	9
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0

SPR Alianza Para la Producción Soles de RL (Grupo Soles) Farm Data: Francisco Marquez (Jan – Dec 2004)

Sow	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	655	671	654	668	661	665	670	660	655	618	638	666
Mortalities	0	1	0	0	4	1	2	5	7	5	4	2
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Gilt	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	16	28	25	35	35	0	17	27	0	62	37	33
Mortalities	6	2	0	0	2	1	1	0	0	1	1	2
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Boar	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	10	10	10	9	15	15	15	14	14	14	14	14
Mortalities	1	0	0	0	0	0	0	1	0	0	0	0
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Finisher	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	1,298	1,685	2,120	1,672	2,196	2,500	2,253	2,168	2,132	2,135	2,258	2,257
Mortalities	10	2	4	11	14	20	13	15	25	11	22	28
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Nurse/Wean	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	2,092	2,264	2,125	2,357	2,171	2,081	1,894	2,086	2,027	2,186	2,123	1,887
Mortalities	6	10	12	9	9	23	19	30	19	40	22	37
Days Unpopulated	3	3	3	3	3	3	3	3	3	3	3	3

Ontagota, SPR de RL Farm Data (Jan – Dec 2004)

Sow	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	1,515	1,498	1,527	1,541	1,516	1,547	1,551	1,504	1,460	1,530	1,561	1,611
Mortalities	9	8	8	8	11	13	10	15	6	9	7	6
Days Unpopulated	7	7	7	7	7	7	7	7	7	7	7	7
Gilt	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	57	88	88	81	87	72	89	89	89	108	110	71
Mortalities	1	1	2	1	2	2	2	2	1	1	1	1
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Boar	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	12	13	14	12	12	12	12	11	11	13	13	11
Mortalities	0	0	0	0	0	0	0	0	0	0	0	0
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Finisher	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	4,852	5,063	5,035	5,504	5,745	6,291	6,181	6,003	6,039	6,009	6,301	6,106
Mortalities	150	157	76	105	109	155	173	126	248	192	151	275
Days Unpopulated	7	7	7	7	7	7	7	7	7	7	7	7
Nurse/Wean	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	3,574	3,864	3,890	4,129	4,218	3,752	4,083	4,216	4,420	4,128	3,549	3,583
Mortalities	143	112	121	111	177	109	159	160	221	256	106	68
Days Unpopulated	7	7	7	7	7	7	7	7	7	7	7	7

Victor Garcia Esquivel Farm Data: Granja Elsa (Jan – Dec 2004)

Sow	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	1,218	1,232	1,231	1,258	1,408	1,247	1,273	1,322	1,274	1,227	1,149	1,250
Mortalities	72	74	74	75	84	75	76	79	76	74	69	75
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Gilt	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	132	152	177	119	129	85	133	60	123	118	118	85
Mortalities	1	2	2	1	1	1	1	1	1	1	1	1
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Boar	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	4	4	4	4	5	4	4	4	2	3	3	3
Mortalities	0	0	0	0	0	0	0	0	0	0	0	0
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Finisher	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	6,453	6,428	6,415	6,404	6,555	6,903	7,203	7,084	6,637	6,145	5,607	5,830
Mortalities	697	694	693	693	708	746	778	765	717	664	606	630
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Nurse/Wean	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	3,021	3,345	3,383	3,745	3,983	4,151	4,015	3,760	3,789	3,629	3,278	3,300
Mortalities	151	185	169	187	199	208	201	188	189	181	164	165
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0

Grupo Sonqui, SPR de RL Farm Data: Sonqui I (Jan – Dec 2004)

Sow	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	1,575	1,575	1,575	1,575	1,575	1,575	1,575	1,575	1,575	1,575	1,575	1,575
Mortalities	16	19	16	19	16	19	19	16	16	19	16	19
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Gilt	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	200	200	200	200	200	200	200	200	200	200	200	200
Mortalities	0	0	0	0	0	0	0	0	0	0	0	0
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Boar	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	94	94	94	94	94	94	94	94	94	94	94	94
Mortalities	0	0	0	0	0	0	0	0	0	0	0	0
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Finisher	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	6,900	6,920	6,902	6,903	6,900	6,905	6,906	6,907	6,910	6,911	6,912	6,915
Mortalities	138	138	138	138	138	138	138	138	138	138	138	138
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Nurse/Wean	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	3,654	3,654	3,654	3,654	3,654	3,654	3,654	3,654	3,654	3,654	3,654	3,654
Mortalities	146	139	146	117	153	153	153	153	153	153	153	153
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0

Grupo Sonqui, SPR de RL Farm Data: Sonqui II (Jan – Dec 2004)

Sow	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	675	692	731	704	706	696	669	615	580	581	588	62
Mortalities	0	0	0	0	0	0	0	0	0	0	0	0
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Gilt	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	41	44	0	0	0	0	15	24	35	39	0	0
Mortalities	0	0	0	0	0	0	0	0	0	0	0	0
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Boar	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	15	16	15	15	16	16	16	16	16	15	15	15
Mortalities	0	0	0	0	0	0	0	0	0	0	0	0
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Finisher	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	3,800	3,800	3,800	3,800	3,800	3,800	3,800	3,800	3,800	3,800	3,800	3,800
Mortalities	38	38	38	38	38	38	38	38	38	38	38	38
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Nurse/Wean	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	1,414	1,509	1,681	1,755	1,602	1,483	1,634	1,550	1,573	1,539	890	1,729
Mortalities	0	0	0	0	0	0	0	0	0	0	0	0
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0

Porcicola de Kino, SA de CV Farm Data: Santa Lucia (Jan – Dec 2004)

Sow	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	649	663	682	704	711	708	690	681	675	676	669	643
Mortalities	4	4	9	5	8	3	5	7	7	5	4	6
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Gilt	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	50	50	50	50	50	50	50	50	50	50	50	50
Mortalities	0	0	0	1	1	1	1	1	2	2	1	0
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Boar	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	20	20	20	20	20	20	20	20	20	20	20	20
Mortalities	0	0	0	0	1	0	0	0	1	0	1	0
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Finisher	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	4,004	5,420	5,560	3,920	5,324	5,472	5,068	4,536	5,584	4,308	3,940	4,996
Mortalities	32	173	83	188	133	279	623	100	112	34	16	5
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Nurse/Wean	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	2,014	2,764	2,902	1,982	2,720	2,762	2,722	2,412	3,190	2,950	2,148	2,652
Mortalities	10	53	70	22	57	25	19	14	16	18	69	29
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0

Porcicola de Kino, SA de CV Farm Data: La Mocha (Jan – Dec 2004)

Sow	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	944	985	1,007	1,010	1,004	983	979	969	942	950	951	959
Mortalities	23	47	78	34	78	78	69	78	91	45	47	12
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Gilt	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	35	83	140	70	70	70	70	70	70	70	70	70
Mortalities	1	1	1	1	1	1	1	1	1	1	1	1
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Boar	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	7	7	7	7	7	7	7	7	7	7	7	7
Mortalities	0	0	0	0	0	0	0	0	0	0	0	0
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Finisher	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	5,184	5,807	5,494	5,886	5,903	5,730	5,625	5,683	5,580	5,617	5,934	5,806
Mortalities	104	110	154	165	425	166	326	290	419	281	303	244
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Nurse/Wean	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	2,832	2,890	3,352	3,484	3,437	4,049	4,061	3,738	3,649	3,628	3,957	3,468
Mortalities	122	55	84	84	76	126	89	120	99	91	99	142
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0

Dinamica del Pacifico, SPR de RL Farm Data: Granja Dany (Jan – Dec 2004)

Sow	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	287	450	428	908	837	751	975	855	993	812	814	807
Mortalities	0	0	2	3	2	3	8	7	25	3	14	19
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Finisher	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	2,206	258	0	0	186	974	1,629	2,298	2,707	2,735	3,044	3,331
Mortalities	0	0	0	0	0	6	17	21	68	98	95	72
Days Unpopulated	7	7	7	7	7	7	7	7	7	7	7	7
Nurse/Wean	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	0	0	104	687	1,034	858	1,216	1,401	1,375	1,762	1,493	1,456
Mortalities	0	0	0	6	10	14	7	16	15	23	19	28
Days Unpopulated	0	0	3	3	3	3	3	3	3	3	3	3

Dinamica del Pacifico, SPR de RL Farm Data: Sante Fe/Sacremento (Jan – Dec 2004)

Sow	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	1,878	1,843	1,795	1,804	1,841	1,852	1,877	1,897	1,913	1,965	1,976	2,014
Mortalities	4	4	2	4	2	5	7	26	6	6	6	2
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Boar	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	18	18	18	18	18	24	23	23	23	23	23	23
Mortalities	0	0	0	0	0	0	0	0	0	0	0	0
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Finisher	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	6,980	6,622	5,654	5,312	5,986	5,161	5,031	6,018	5,713	4,949	4,782	5,572
Mortalities	5	7	4	5	3	2	4	9	3	3	3	2
Days Unpopulated	7	7	7	7	7	7	7	7	7	7	7	7
Nurse/Wean	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	4,945	5,171	5,462	6,348	5,534	4,907	5,499	5,324	5,325	4,506	4,224	4,325
Mortalities	2	4	2	1	1	1	1	2	1	2	2	2
Days Unpopulated	3	3	3	3	3	3	3	3	3	3	3	3

Dinamica del Pacifico, SPR de RL Farm Data: Las Praderas (Jan – Dec 2004)

Finisher	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	2,615	4,492	5,762	5,672	4,914	5,764	5,416	3,702	4,253	5,708	5,608	5,232
Mortalities	0	0	5	1	4	1	1	5	2	2	1	1
Days Unpopulated	0	0	7	7	7	7	7	7	7	7	7	7

Oviachic, SPR de RL Farm Data (Jan – Dec 2004)

Sow	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	605	617	622	629	623	630	662	650	655	641	626	613
Mortalities	4	5	4	6	2	3	4	6	2	7	3	6
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Gilt	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	92	79	118	105	85	98	104	107	99	98	116	116
Mortalities	1	2	0	0	1	0	0	0	0	0	3	1
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Boar	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	3	3	6	6	6	6	6	6	6	6	5	5
Mortalities	0	0	0	0	0	0	0	0	0	0	0	0
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Finisher	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	3,875	3,747	3,883	3,970	4,115	3,914	4,006	3,855	4,181	3,936	4,029	3,880
Mortalities	43	42	33	35	26	40	42	36	38	30	46	60
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Nurse/Wean	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	1,731	1,850	1,987	2,059	1,806	2,072	1,900	2,099	1,795	2,155	1,964	1,872
Mortalities	36	26	30	27	25	17	25	24	21	25	49	34
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0

Santa Barbara Farm Data (Jan – Dec 2004)

Sow	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	782	793	794	793	792	785	783	780	775	774	775	769
Mortalities	3	4	5	1	4	9	10	8	9	5	2	0
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Gilt	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	89	91	95	89	101	106	111	110	100	92	88	83
Mortalities	0	0	0	0	1	0	1	2	0	0	0	0
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Boar	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	4	4	4	4	4	7	7	5	7	7	6	6
Mortalities	0	0	0	0	0	0	0	0	0	0	0	0
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Finisher	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	4,479	4,578	4,691	5,151	4,968	4,897	5,116	4,968	4,830	5,016	4,875	5,020
Mortalities	67	37	56	53	37	52	59	52	71	53	55	47
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0
Nurse/Wean	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Population	2,403	2,527	2,627	2,291	2,550	2,595	2,388	2,470	2,548	2,279	2,432	2,229
Mortalities	26	40	55	36	52	85	68	46	32	36	27	28
Days Unpopulated	0	0	0	0	0	0	0	0	0	0	0	0

ANNEX 4.

MONITORING PLAN

The project developer, in conjunction with its in-country suppliers/partners, have developed an operation and maintenance (O&M) plan and have reviewed the plan with the producer (Attachment 1). The plan lists operation and maintenance requirements including but not limited to:

a. A description of the planned start-up procedures, normal operation, safety issues, and normal maintenance items.

b. Alternative operation procedures in the event of equipment failure.

c. Instructions for safe use and/or flaring of biogas.

d. Inspection criteria

e. Work instructions for the measurement and recording of key GHG parameters, e.g., animal counts, mortalities, days in system, etc., as well as instructions for quality control measurements and other information collection, as appropriate.