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Case studies:

**Methane capture & biogas projects at poultry farms in
Moldova & Georgia**

Project development & methodological issues

Fichtner (Germany) in a Consortium with Fraunhofer ISI (Germany), Linden (UK) and CESI (Italy) carried out from April 2004 to September 2006 the project EuropeAid/111523/C/SV/Multi- Lot No.2

“Technical Assistance to Armenia, Azerbaijan, Georgia and Moldova with respect to their Global Climate Change Commitments”, on behalf of the Tacis Program of the European Commission. Within the project, CDM PDDs were developed for “METHANE CAPTURE & BIOGAS-TO-ENERGY CDM PROJECTS FOR POULTRY FARMS”. The PDD for Moldova covers 5 poultry farms with 900,000 chickens, the one for Georgia 2 poultry farms with around 400,000 chickens. In the following, some details of the Moldovan project are described.

1. Description of the project activity

The purpose of the project is to result in methane capture and power & heat generation for five poultry farms in Moldova. This project represents a bundle of CDM project activities. The emission reductions to be claimed under this CDM project have been calculated by taking into account a combination of several “Approved baseline and monitoring methodologies”. The project will claim CO₂e emission reductions from two components.

Project component 1 refers to the mitigation of five poultry farm’s effluent related Greenhouse Gas (GHG) by improving the farm’s Animal Waste Management System (AWMS) practices. To determine CH₄ and N₂O emission reductions, AM0016 “Greenhouse gas mitigation from improved Animal Waste Management Systems in confined animal feeding operations” had been applied initially. However, this methodology has been put on hold by EB24 in May 2006, and meanwhile by EB26 in September 2006 it was replaced by ACM0010 „Consolidated baseline methodology for GHG emission reductions from manure management systems”.

Project component 2 refers to the generation of renewable electricity using biogas that will be used by poultry farms to cover own electricity needs and surplus can be sold to the grid, both replacing electricity supplied by the grid. Appendix B of the simplified modalities and procedures for small-scale CDM project activities was referred to, in particular the “Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories Type I - Renewable Energy Projects AMS-I.D. Renewable electricity generation for a grid” was applied.



2. Detailed description of project component 1: Mitigation of 5 poultry farm's effluent related GHG by improving the farm's AWMS practices

The trends towards confined feeding operations has resulted in large, concentrated quantities of manure that cannot easily be disposed of, and has raised public concern over social and environmental impact of livestock operations (swine, dairy, poultry and etc.). This is particularly true for poultry farms in the Republic of Moldova. As a result of Concentrated Animal Feeding Operations (CAFOs) it drives to make changes to the way manure is handled, which will lead to reduce methane (CH₄) and nitrous oxide (N₂O) from anaerobic decomposition processes.

The proposed project in the Republic of Moldova consists of an advanced technological improvement compared to the common practise of poultry waste treatment today. The technology to be implemented will be an anaerobic digester with after fermentation and a sludge treatment with means of a separator at each poultry farm. GHG emissions (particularly CH₄ emissions) will be reduced compared to manure storage in open lagoons by producing and finally utilising biogas for electricity generation.

The financial viability of the project depends on the generation of revenues from the sales of Certified Emission Reductions (CERs) and the sales of electricity and heat. Theoretically, additional revenue streams could be possible such as through the sales of solid and liquid fertilisers. However, currently such markets do not exist in Moldova and in particular in the areas surrounding the poultry farms.

Currently, poultry manure practices are expected to continue in the future without the CDM project. This would mean that poultry manure continues to be discharged to open anaerobic lagoons. It is expected that farmers will open new open lagoons very soon due to the existing lagoons reaching their capacity. Such open lagoons (or as in some places also called lakes) represent the predominant treatment process of liquid waste from poultry production at all project sites and in the country in general. Open anaerobic lagoons lead to the direct release of CH₄ and N₂O into the atmosphere as the result of the anaerobic digestion process that takes place inside. Besides, the current open lagoons present also a severe environmental problem due to groundwater contamination of not properly tightened lagoons, and due to severe odour in the surroundings of the lagoons.

The construction of a bio-digesters with connected CHP unit at each poultry farm will result in the following:

- A fundamental change of the poultry manure practices from anaerobic lagoons to an advanced manure management system. According to the expected operational design, farm managers have to adjust the flow of manure discharge and ensure manure delivery to the biogas digester.
- Avoid the creation of new anaerobic lagoons that otherwise soon would be built. The existing open lagoons will not be further used but remain at project site only for the purpose of taking up processed liquid.
- Effectively mitigate groundwater contamination and odour from treatment of the poultry manure.
- Provide the possibility for using treated manure as fertiliser (as solid and liquid fraction) for agricultural use. As there is currently no market for such kind of organic fertilisers in the Republic of Moldova and in particular nearby the participating farms it is hoped that the project can at least pave the way for upgrading the manure into commercial production of fertiliser and developing such new markets.



- Reduce CO₂, CH₄ and N₂O emissions.
- Support the promotion of renewable energy technology in Moldova and create a greater awareness among private sector businesses to duplicate similar activities in comparable locations. Duplication is in principle possible for other poultry farms but also cattle and pig farms in the country.

3. Detailed description of project component 2: Generation of electricity from biogas as a renewable energy source with on-site electricity use and surplus sales to the national grid.

Through the electricity generation on-site from biogas the project could claim CO₂ emission reductions from the provision of renewable electricity generation for the grid. Since the generating output will be below 15 MW installed capacity this component is 'small-scale' as referred to CDM terminology. Such renewable electricity generation will result in CO₂ emission reductions that otherwise would have to be supplied by fossil fuel-fired power plants. The produced electricity will foremost be used to cover electricity needs of the five poultry farms. Excess electricity will be fed to the grid.

Renewable electricity generation to the extent possible will result in the following:

- Make farmers independent from power supply as purchased from the national / regional grid
- Further diversify the national fuel mix for power production in Moldova
- Help reducing CO₂ emissions from fossil fuel based power production

The Internal Combustion (IC) engine for power generation will also produce heat. This heat can be used for heating the barns and farm building but as well for providing constant temperature in the fermenter and after fermenter. It thus can replace additional fossil fuels currently used such as natural gas and oil, that otherwise would need to be purchased from regional suppliers. However, CO₂e emission reductions for substituting current heat supply will not be claimed under this project. Investment into expensive installations for monitoring own heat production and thus substituting heat supply does not justify its inclusion in the project. The approach therefore is conservative because GHG reductions will be greater than the claimed CERs.

4. Project implementation and monitoring

The operation of all bio-digesters and CHP plants will take place through a single project company created for operation of these biogas plants. Farmers, whose core business is egg and meat production and not primarily energy-from-manure-treatment, will not be put in the position to run and monitor the Biogas plants. This solution is considered the most practical for the Republic of Moldova to ensure that operational risks such as possible breakdowns of the technology would not lead to a full shut-down of the facility over a longer time period. This project company can also bear project development cost and ensure proper financing and implementation.

More information on IC engines working principles and it's benefits can be found in these web sites:

<http://conceptengine.tripod.com/conceptengine/id3.html>

http://www.chemeng.ed.ac.uk/~mbiggs/mjbc_teaching/engineering1/2003-04/ohs/lecturehandouts3.pdf