Anaerobic Manure Treatment: A Source of Green Energy for Farmers

In all countries where livestock is raised, managing their droppings (collection, storage, and spreading) contributes to surface and groundwater contamination as well as the emission of nauseating odours and greenhouse gases (GHG). Even the application of strict regulatory measures is not enough to eliminate these effects on the environment and neighbouring populations. But the future could very well be different…

Over the past few years, Dr. Daniel Massé, a researcher at Agriculture and Agri-Food Canada (AAFC), has perfected an anaerobic treatment system for hog slurry which not only eliminates odours, but also enables energy production from the methane generated by the digestion of the hog slurry, as well as the creation of a natural fertilizer that is better balanced for agricultural soils. This new and patented transformation process has been implemented and tested on a large scale, as well as commercialised for farmers by the Quebec company Bio-Terre Systems Inc.

The low-temperature anaerobic treatment system offers many advantages for farmers, the population in general, as well as for the environment. The process focuses on the three components of slurry:

- Biogas – Anaerobic microorganisms stimulate the production of a biogas that is rich in methane (70%), which is then transformed into electricity. In Quebec's climatic conditions, the system's bioreactors produce between 20 to 37 m3 of biogas per cubic metre of slurry.
- Bio-liquid – The bioreactors produce an odourless, pathogen-free liquid manure. For farmers, it is a richer fertilizer that is better absorbed by soils than the raw slurry, and it also improves crop yields.
- Biosolid – The pathogen-free mud sediment can be transported to composting and reclamation centres, or it may be exported to other land areas for agricultural conversion.

The benefits of such a system for the environment are significant. As specified in the report presented by Bio-Terre Systems Inc. to the Commission on the Future of Agriculture and the Agri-food Industry of Quebec in 2008, "This technology, when applied to the entire animal production in Quebec, will enable the production of almost 150 MW of electrical energy, while reducing greenhouse gases by over 3,000,000 tons of CO^2 per year."

Dr. Massé, creator of the new process, stated, "we have succeeded in developing a strong and easy-to-use technology which can also be incorporated into farming operations. Although the system is primarily aimed at farms, we are also currently studying the

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feasibility of these methanisation units taking charge of the organic residues of agri-food companies as well as organic municipal wastes." With regard to the residue and the carcasses generated by abattoirs, the experiments have already concluded that the anaerobic microorganisms present in the bioreactors can "digest" and transform them without any problems.

There is already a strong international demand for the process. Bio-Terre Systems Inc. is currently in close contact with the United States for the future construction of 60 anaerobic slurry transformation systems. AAFC and Bio-Terre Systems Inc., research partners in this adventure, are awaiting the necessary additional patents before responding to international demand. Mexico is talking about building a pilot project, while Spain, Poland and even China have expressed their interest in this innovative technology.

In Canada there are currently operational systems in Quebec, Ontario and Manitoba. According to Mr. Richard Royer, administrator of the Bio-Terre Systems Inc. consortium, "barely three years ago, there was a lot more talk about ploughing in and composting waste, and now there is a keen interest developing for the methanisation of organic waste."

Pilot projects offer a promising future. In the Beauce region of Quebec, the methanisation unit (a farm with 5,000 hogs per year) has been continuously producing electricity for 6 months, which is then transported on the Hydro-Québec network. In Manitoba, the methanisation unit (a farm with 18,000 hogs per year) will be ready to produce heat and electricity in 2010. From now to 2010-2011, Mr. Royer expects spin-offs of between $5 and $10 M in revenues with the sale of hog slurry anaerobic digestion units. A part of this money will be used to carry out research for new applications, such as with chicken manure.

On the worldwide scale, this new technology will bring about a significant reduction in greenhouse gases without stifling the growth of livestock production. It will ensure an ecological management of organic municipal waste. It will also help to provide the regions in question with a sustainable source of energy. Once the system is implemented farmers will, for their part, be energy self-sufficient. They will also gain a source of income from the sale of their surplus electricity, their organic residue treatment service offered to municipalities or from carbon credits.

The Canadian government, in its support for these types of innovative scientific projects, offers our modern economies a source of alternative energy that will enable better environmental protection through more sustainable farming practices.

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