

A New Paradigm for Agriculture "FOOD + BIO-ENERGY PRODUCTION"

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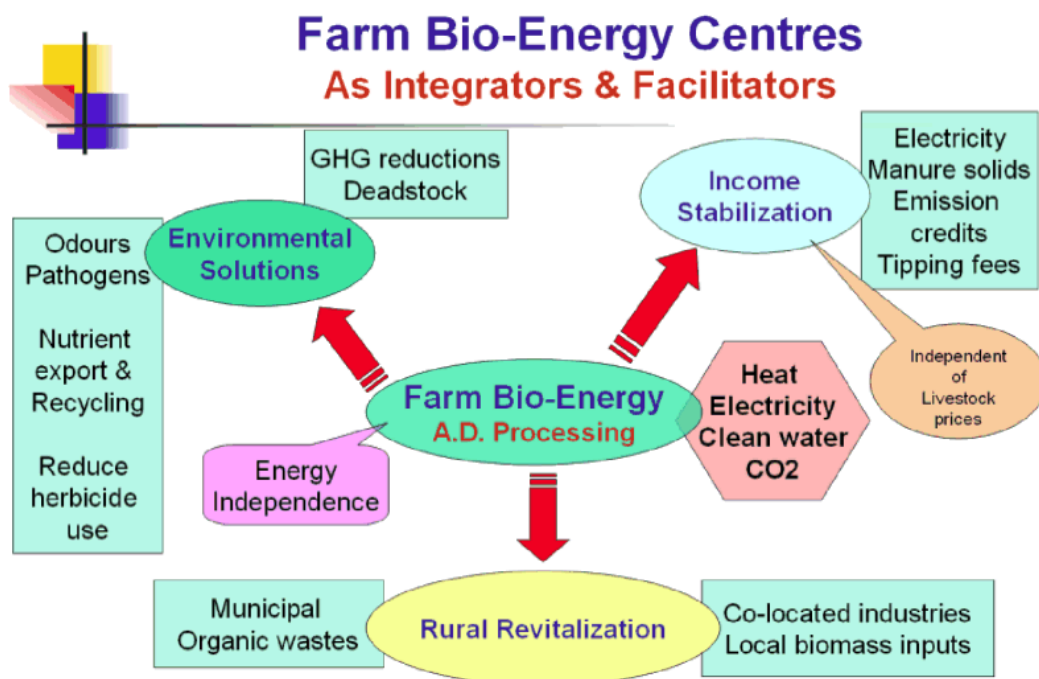
Farm-based renewable energy using anaerobic digestion technology (A.D.), which is an **"enabling technology"**, can make a positive contribution to a national renewable energy strategy by providing distributed, electricity baseload capacity (7/24 operation) or peak demand supply. Key environmental problems (odours, pathogens, Greenhouse Gases (GHGs)) would be controlled. Manure processing, using A.D. biogas co-generation systems, is the key to producing odour- and pathogen-free products, essential for providing farmers with flexibility for managing nutrients on their farms or exporting excess nutrients off-farm, and in doing so, facilitating large-scale livestock manure nutrient recycling. Furthermore, A.D. can effectively kill weed seeds during processing, resulting in substantially reduced herbicide usage on fields using processed manure slurries.

The future of confined livestock farming may well be re-defined by **"farmer-owned co-op bio-energy centres"**, which may include small **co-located bio-product industries** that consume large amounts of electrical and/or thermal energy (greenhouses - vegetables/flowers, bio-fuel plants, animal rendering plants, deadstock processing plants or even fish farms), as well as carbon dioxide (from co-gen exhaust) and recycled water. The local municipality could be a partner, who would benefit by having its organic residuals (food wastes, green wastes, etc) processed at the centralized plant.

There are several sources of revenue for Farm Bio-energy Centres, including:

1. **Sale of green electricity to the grid**, (Ontario - Std. Purchase Offer -11¢/Kwh; peak hrs - 14.5¢/Kwh).
2. **Sale of processed manure solids (in excess of on-farm nutrient requirements) as value-added organic fertilizers, or soil amendments.**
3. **Emission trading credits for reduction of greenhouse gas emissions** - First payment to US farmers for GHG emission reductions from Environmental Credit Corp (Jan 2006).
4. **Tipping fees for accepting food-grade organics from the food/beverage industry, that can boost biogas production by 25%, or even more, and**
5. **Production of bio-fuels (ethanol, E-85, or bio-diesel).**

These sources of revenue will provide a new solution for income stabilization for farmers, who have long been vulnerable to cyclic fluctuations in agricultural commodity prices for both livestock and crops.



Farm Bio-energy Centres can provide the following major benefits:

1. **Environmental Benefits** for remediating longstanding issues (odour, pathogens, GHG reduction, deadstock processing); ALSO - reducing herbicide usage by killing weed seeds in manure, as well as recycling processed manure solids for bedding, both of which reduce input costs for the farmer.
2. **Income Stabilization** through new diversified sources of income (**bio-energy revenue from animal wastes is essentially independent from cyclic livestock or crop commodity prices**);
3. **Rural Revitalization** through increased rural employment and local economic activity, including increased municipal tax base from farm-based co-operatives in rural communities. Rather than being in an adversarial position with their local municipality over zoning and environmental issues, they are now in a position to partner with their municipality to solve mutual environmental problems, while re-vitalizing their rural communities.

There are substantial positive impacts, both at input and output stages, for rural communities using decentralized bio-fuel production, if farm-scale production of bio-fuels can be stimulated with new policy approaches:

Inputs: Biomass for bio-fuel plants can be locally sourced, reducing transportation costs and associated GHG emissions, while boosting the local agricultural economy.

Outputs: A distributed network of bio-fuel refuelling stations across the landscape near the source of production would substantially reduce transportation costs and associated GHG/air quality impacts.

With the emergence of a new era in the competition for, and the uncertainty in, our dwindling fossil fuel reserves, a **once-in-a-lifetime opportunity is now available to Agriculture** – that being the development of a bio-based “carbon” economy in which bio-energy production will revolutionize and re-define the way in which we produce our food, as well as our energy, which will increasingly come from “fresh” carbon rather than fossil carbon.

However, the window of opportunity for the Agriculture Sector to take ownership of bio-fuel production at farm scale is rather brief. The sector must quickly take advantage of this opportunity during the transition from fossil to bio-fuels, otherwise traditional energy companies and large agricultural multi-national corporations will dominate the bio-fuels industry as they have with fossil fuel resources. There are already several large U.S. “manure-powered” bio-fuel plants under construction at large feedlots, which can be considered as “biorefineries”

In summary, farmers can free themselves from the vulnerability to cyclic livestock and crop commodity prices, while diversifying and stabilizing their farm incomes through generation of increasingly-valuable green energy (electrical, thermal) from livestock manure and other local biomass sources (e.g. crop and food wastes), leading to energy independence. Besides solving longstanding environmental issues commonly associated with livestock production (odours, pathogens), these new, more holistic approaches to agricultural production provide opportunities for development of rural, on-farm industries, which will revitalize, and empower rural communities (employment, tax base). Farm-based bio-fuel operations might also develop as a cooperative among several nearby farm operations in order to achieve an adequate scale of operation. Of significance, the State of Minnesota already has upwards of 300 E-85 refuelling stations distributed across their state.

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