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The Vaxtkraft Project, Vasteras, Sweden

CS 05

Introduction

This case study from Sweden shows an innovative model for combining organic waste management with farm diversification by producing biofuel and fertilisers. The project's success is, in part, a result of the local authority adopting a comprehensive approach to waste, farming and energy, and in part the signed-up participation of local residents and businesses.

Local Authority role

Swedish legislation requires all municipalities (local authorities) to draw up waste management plans covering all types of waste produced locally. The aim is to establish strategies, set goals and implement action plans to deliver sustainable waste management. As a part of this, the local authorities in this case study adopted a regional strategy for handling biowaste in 1996.

Between 1997 and 2001, all authorities introduced a waste collection system incorporating separation of biowaste at source from household and institutional kitchens.

Since 2005 this waste has been treated in the biogas plant within the Vaxtkraft project.

Photo 1.
The Biogas Plant, converting kitchen waste and ley crops to biogas and fertiliser

Context and Objectives

As well as legislation requiring local authorities to take action, local farmers were also looking to diversify and generally improve the fertility of soils suffering from over-cultivation of cereal crops. This whole project was supported by The National Federation of Swedish Farmers, LRF.

The project's objectives are to:

- demonstrate a cost effective system for producing biogas vehicle fuel and fertilizer from organic household waste and agricultural feedstock
- treat clean, source seperated organic waste from households, restaurants, schools etc.
- establish a cyclic supply chain of plant nutrients and organic material between the community and farmers, optimising the use of residuals
- extract biogas and plant nutrients from ley crops
- contribute to sustainable, organic farming practice
- provide a basis for further technical development and research
- extract high grade bioenergy from waste and farm crops with no increase in CO_2
- promote and develop high efficiency energy processes

Process/partners

The Vaxtkraft project includes:

- a biogas plant for treating organic waste and agricultural crops
- a plant for upgrading the biogas to vehicle quality and filling stations for compressed natural gas vehicles
- pipelines to transport raw and purified biogas
- storage for silage and a system for harvesting and handling ley crops
- a storage and handling system for digesting residuals

The project took around eight years from the initial idea to the planning stage and a further seven years before the project started producing biogas.

Photo 1.
The high quality fuel produced each year is the equivalent of 2.3 million litres of petrol.

Source separated waste

Much of the project's success is because of the sign-up from local people. The local authority wanted household involvement in the project to be voluntary, to help ensure that participants are motivated and will separate waste properly. A written agreement is made between household and municipality and standardised storage equipment is provided, including the use of biodegradable paper collection bags. Other options open to households are either to compost themselves or not separate and have waste collected for incineration, which also includes an energy by product. Approximately 90% of households participate, another 7% composting for themselves.

Ley crops

Participating farmers are contracted to cultivate ley crops for biogas production. The leys lie for two to three years and have a high percentage of clover to improve the soil. The leys are a part of normal crop rotation and according to current EU rules, may be grown on "set-aside" land. At sileage making time the crops are harvested and finely chopped before being stored as silage in 90 metre long plastic bags.

The biogas plant

The plant treats kitchen waste, ley crops and grease trap sludge by digestion in a closed system comprising:

- receiving hall - quality control and removal of unwanted materials
- receiving bunker - dealing with liquid waste
- pre-treatment
- digestion phase, separating into solid and liquid residues - no chemicals added. Solids used as phosphorous fertilizer, liquid as nitrogen fertilizer
- collection and treatment of exhaust gases

Biogas fuel

The biogas from the plant and nearby sewage treatment works is upgraded and used as fuel for buses, refuse collection vehicles and cars.

The fuel produced is sufficient for supplying:

- 40 city buses
- 10 refuse vehicles
- 500 cars

Fuel not sold in this way is used for:

- electricity and heat production for a district heating system

Associated costs and savings

Incoming material to the biogas pant per year:	
Source separated organic waste from households and kitchens with dry matter content of 30%	**14,000 tonnes**
Liquid waste (grease trap removal sludge) with a dry matter content of 4%	**4,000 tonnes**
Ley crops from a contracted area of 300 ha with a dry matter content of 35%	**5,000 tonnes**
Production per year:	
Biogas from biogas plant	**15,000 MWh**
Biogas from sewage treatment plant	**8,000 MHh**
Up graded biogas for fuel	
energy	**23,000 Mwh**
petrol equivalent	**2.3 million litres**
Digestion residuals	
solid; dry matter content 25-30%	**6,500 tonnes**
liquid; dry matter content 2-3%	**15,000 tonnes**

Project/spin-offs

In 2003, the Vaxkraft project became an EU demonstration project within the 5th Framework Programme,. This has added international partners to the project and led to further research and development.

Contact, sources of advice

Per-Eric Personn, Managing Director
Tel:+46 418 27575

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