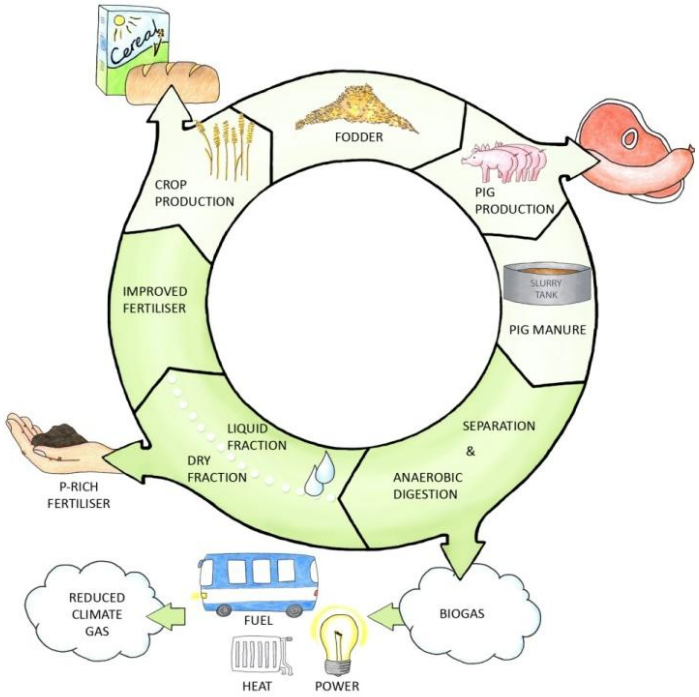
DRAFT PROSPECT: TURNING PIG MANURE FROM WASTE TO ASSET



INTRODUCTION

The Baltic Sea is a brackish sea with a unique and sensitive ecosystem. More than 90 million people live in the watershed, and benefit from it for recreation, food, transportation etcetera. Unfortunately, the Baltic Sea is also one of the most polluted seas in the world. The biggest problem is the overload of nutrients, nitrogen and phosphorus, leaching from agriculture in the surrounding countries.

The large amount of manure produced at intensive livestock farms in the region is a significant point source of nutrients. As meat consumption grows worldwide, including in the Baltic Sea Region, intensive livestock production is predicted to increase, and consequently the amounts of manure. Already today, nitrogen and phosphorus in livestock manure exceeds nutrients from human households 3 to 4 times[1].

But, this can be reversed if the nutrient and energy rich manure is treated as an asset rather than waste.

Through research projects Baltic Sea 2020 has established that biogasification of pig manure in combination with separation and "best practices" for storage and spreading of manure can reduce losses of nutrients significantly. The nutrients in manure are upgraded, recirculation of nutrients to crop production facilitated and biogas is produced for heating, electricity or upgraded to bio-fuel.

These research findings create a win - win situation for:

- *Farmers/Plant owners* - improved bio-fertilizer, reduced costs for heating, diversified sources of income
- *Society* – less dependence on fossil fuels, recirculation of nutrients, less odor problems from pig-production
- *Environment* - reduced climate gas emissions, reduced leaching of nitrogen and phosphorus

Baltic Sea 2020 has the ambition to support the establishment of a demonstration biogas plant, using manure from intensive pig production as the main substrate. Our objective is to prove the many advantages of biogasification of pig manure for farmers, society and environment. We have the capacity to facilitate the establishment of the plant by providing financial and technical support, and seek polish partners - authorities, farmers and energy producers - to build, own and operate the plant.

1 Baltic Nest Institute 2009

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BACKGROUND

The consumption of pork is increasing worldwide and in Europe. While European slaughter index has decreased for cattle, sheep and goats since the 1990s, it has increased for pigs. The major pig breeding Member States in 2007 were Spain, France, the Netherlands, Denmark, Germany and Poland[2].

Livestock production used to go hand in hand with crop production. The nutrients in livestock manure were recirculated and used as fertilizer in the fields. Since the mid 70s, intensive livestock production has evolved. European farmers have become more specialized and livestock production, especially pig production, is not automatically coupled with fodder land.

Pig manure is furthermore relatively rich in phosphorus. Overdosing phosphorus (P) is therefore common. Decomposing pig manure also produces the greenhouse gas methane (CH4) which risk evaporating to air during storing and spreading.

BEST AVAILABLE TECHNOLOGIES FOR MANURE TREATMENT- ANEROBIC DIGESTION AND SEPARATION

A research study initiated by Baltic Sea 2020 in 2009[3] identified biogasification of pig manure combined with separation of digestate as a cost effective method to reduce leakage of nutrients, at the same time providing other environmental and social benefits.

Biogas production through anaerobic digestion is a process in which microbes convert organic matter to the valuable end-products biogas and nutrient rich organic residues. Manure is a suitable organic substrate for biogas production, either by itself or co-digested with for example other agricultural wastes. The biogas can be used to produce electricity, heat or vehicle fuel. During the biogas process, the nitrogen in the substrate are converted into a more readily available form for growing plants, and the treatment in a biogas process consequently improves the fertilizing value of the treated materials. Odor of treated manure is also reduced.

Separation of the digestate, into a dry fraction with most of the P and a liquid phase with most of the N, allows for a balanced fertilization suitable to the crops.

An in-depth study initiated by Baltic Sea 2020 in 2010[4] has identified the best setup of biogas and separation technologies for pig manure. Current technologies for anaerobic digestion of pig slurry in Northern Europe have been compared and evaluated, including pre-/ post treatment and manure management during the process. Environmental and economic performances have been analyzed under the national framework conditions in the Baltic Sea region, as well as optimal solutions for local use of produced biogas. Optimal techniques for storing and spreading the manure/digestate from the stables to the fields have been identified.

The major conclusions from the report are:

- Biogasification of pig manure in combination with separation can reduce the leaching of nutrients significantly - provided that digestate is stored and spread according to best practices.
- Co substrates, such as other agricultural residues, are often needed in order to make biogasification of pig manure profitable. Since the environmental and socio-economic benefits of using pig manure as substrate for biogas production are substantial, national incentive structures should be adapted to promote the identified setup of manure treatment technologies.
- Biogasification of pig manure, using the recommended setup of technologies, can contribute to European, Baltic and national targets for water quality and renewable energy[5].

2 Eurostat (2009)

3 http://www.balticsea2020.org/attachments/199_1%20Best_Practice_Manure_Handling_final.pdf

4 Inkludera hänvisning till rapporten

5 EU Nitrates Directive, EU Water Framework Directive, EU IED Directive, EU Directive for Renewable energy.

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OBJECTIVE AND APPROACH

The overall objective for Baltic Sea 2020 in this project is to reduce the amount of N and P, originating from intensive livestock production, leaching into the Baltic Sea. This will be accomplished by promoting pig manure as substrate for biogasification, separation of manure/digestate and application of best practices for storing and spreading.

RATIONALE

In the Baltic Sea Region, there are several biogas installations using manure as substrate. The environmental and economic performance of these installations has been analysed. The conclusions are that by applying an optimal setup of technologies and manure management measures, leaching of N and P can be reduced significantly and, in addition, renewable energy and social-economic benefits are generated.

Benefits for the Farmer

- Digested manure easier to spread and incorporate in soil
- Higher yields because of higher N-efficiency in digested manure
- Easier to apply N/P in proportion to the crops' needs
- Cheaper transportation of excess manure
- Reduced costs for heating and power
- New sources of income (bio fertilizer, sales of excess gas/electricity/bio-fuel)

Benefits for Society

- Less dependence on fossil fuels
- New job opportunities (biogas plant construction and operation)
- Clean Tech Innovation opportunities
- Reduction of air pollution if produced gas replace fossil fuels for heating and transport
- Less odor from manure
- Closer co-operation between farmers, public authorities and energy companies

Benefits for the Environment

- Reduced leaching of nutrients to the aquatic environment (contributes to EU Water Framework Directive)
- Reduced need for mineral fertiliser
- Energyproduction from a renewable source (Contributes to EU Renewable Energy Directive)
- Less Green House Gas emissions (Contributes to EU Climate Policy)
- A cleaner Baltic Sea (contributes to HELCOM BSAP and EU Baltic Sea Strategy)

Moreover, the analysis concludes that in order to make biogasification of pig manure profitable, co -substrates should be used to increase the biogas yield. Current incentive structures need to be adapted to support the development of biogas plants based on pig manure. However, it is expected that energy prices will increase which would have a positive influence on business plans of biogas plants.

APPROACH

We propose that a demonstration facility is established in connection to intensive pig production. The whole chain of technologies and manure management measures needed to secure optimal recirculation of nutrients should be applied. The specific design of the installation depends on local conditions (such as numbers of pigs, numbers of farms, availability of co-substrates, distance to electricity/gas-grid etc).

Furthermore, we suggest that the installation is built and operated in cooperation with a local research institute. Environmental and economic performance should be monitored, evaluated and communicated to relevant stakeholders. Demonstration and communication needs to be a key components and visitor facilities should be part of the design.

A biogas plant, using the recommended optimal design will:

1. Demonstrate the environmental and economic performance of the plant,
2. Give attention to how this approach can contribute to European, Baltic and national targets for water quality and renewable energy,
3. Convince decision makers to carry through the needed adaptations of current incentive structures in order to promote the establishment of installations using the recommended setup of technologies.

POLAND – A FAVORABLE COUNTRY FOR A DEMONSTRATION PLANT

Poland is one of the main pig producing countries in the Baltic region. Since the major part of polish surface waters flow into the Baltic Sea, nutrients leaching from polish pig production contribute to the eutrophication of the Baltic Sea. A demonstration plant in Poland will contribute to sustainable development of pig production in Poland, and a cleaner Baltic Sea.

Poland has an ambitious policy for renewable energy, stating that biogas plants should be established in each commune (gmina), which amounts to more than 2 000 plants. The demonstration plant could function as a pilot plant, where useful experiences can be made for subsequent installations.

As for all countries around the Baltic Sea, Poland has a challenge to fulfill commitments within the HELCOM BSAP and EU regulations, e.g. the Nitrates and Water Framework Directive. Experiences from the demonstration plant will be useful in reducing nutrient discharges, reach targets and comply with regulations.

PROPOSED ROLES AND RESPONSIBILITIES

The success of a demonstration facility depends on national and local support and commitment from farmers, energy sector and authorities. The facility should preferably be owned and operated by these parties. Positive experiences from cooperatively owned biogas plants can be found in Sweden and Denmark where the participation of local authorities secure public interests in developing and operating the plant. Technical expertise and experience from similar projects will be needed as well as cooperation with research institutes.

Tentative roles and responsibilities:

National and Regional authorities – Lead partners for securing local commitment to the project, identification of permits, regulations and location, development of demonstration activities.
Pig producers/Farmers – Lead partner for securing sustainable manure management (storing, transportation, dosing and spreading)
Biogas company – Lead partner for planning, construction and operation of biogas plant.
Research Institute – Lead partner for monitoring of biogas performance and nutrient recirculation.
Baltic Sea 2020 - Coordinator of the project, bridging the planning and preparation phase and "Lead"[6] financer for the construction of the plant.

The most suitable division of roles and responsibilities will be discussed and agreed on with partners who express interest in participating in the project.

WORK AND TIME PLAN

We propose a step wise approach, where partners only commit themselves for one step at the time.

1. Feasibility study
2. Planning/developing
3. Construction and Start-up

Each new step will be conditioned on the success of the previous step, and the signing of new letters of intent.

Tentative time plan to be discussed with participating partners and adjusted as required

2011, Q2/Q3	• Identification of project partners. • Partners develop project plan and decide roles and responsibilities
2011, Q3/Q4	• Feasibility study (e.g. identification of location, permits, budget and time plan for the development phase, pig farms, co-substrates, arable land for recirculation of manure etc, research program etc)
2012	• Planning of biogas facility and manure management
2013 / 2014	• Construction, Start-up and Hand over

6 "Lead" in this case means main responsibility for securing financing for the construction of the plant.