SYNERGY BETWEEN BIOGAS PRODUCTION AND ORGANIC AGRICULTURE

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Introduction

The potentials of organic agriculture could be stronger if organic farming is combined with the production of renewable energy in the form of methane from biogas.

The yields in organic plant production are very dependent on nitrogen from legumes in the rotation. Legume crops as clover grass or alfalfa are very productive, fixate a lot of nitrogen and reduce the weed pressure and are therefore needed in most organic rotations. On farms with cattle the legume crops can be utilised as feed but on cattle free farms clover grass or alfalfa will only serve as green manure and that is costly and not very efficient. Green manure can even cause negative environmental and climate effects as nitrate leaching or evaporation of nitrous oxide. By utilizing the green manure crops for biogas production the nitrogen can be utilized more efficiently as fertilizer and the farmer can earn money from the energy production.

By combining organic farming with production of renewable energy organic agriculture will add a new valuable dimension that can enhance the support from society to promote the conversion of agriculture into organic production.

Experiences from Denmark

Organic farming in Denmark has experienced a substantial growth in the 90'es and the domestic market for organic produce is one of the largest worldwide. Despite this there is a need to speed up the conversion of Danish farms into organic production to reach the official goal of a doubling of the organic area in 2020. The dairy production is the main organic production in Denmark but a further and quicker conversion must include arable farms. Denmark has a high density of farm animals and organic plant production has been based partly on nutrients from conventional manure. It has been decided by the Danish organic farmers to phase out the use of conventional manure during the years 2015 to 2021. This will entail a great need for organic nutrients. Organic plant production on the base of green manure will in most conditions not be economic feasible and nutrients from green manure treated in biogas plants are expected to be an attractive solution.

In field trials different crops have been grown to find the potentials for biogas production. The most promising crops are clover grass and alfalfa with potential gas production of 2,300 and 3,000 Nm^3 pr. hectare. Maize has shown a little higher gas potential of 3,800 Nm^3 pr. hectare, but in contrast to clover grass and alfalfa maize need nitrogen fertilizing and emit more green house gasses. With the same gas production the net energy balance of maize is only 80 % of the net energy balance of clover grass.

From German experiences it is known that cereal yields can be raised with approximately 20 % when fertilizing is changed from traditional green manure to fertilizers from biogas fermented crops.

The energy supply in Denmark is based for 80 % on fossil energy and a governmental climate commission has formulated recommendations for a conversion to fossil free energy supply in 2050. It is anticipated that 70 % of the future energy supply will be electricity mainly from wind energy. Biomass from agriculture will be an important part of the last 30 % and biogas will be one of the most important technologies.

Model calculations have shown that a conversion of 10 % of Danish arable farms will fulfil the goal of a doubling of the organically farmed land. In the same time it will contribute with 4 % of the total reduction of green house gas emissions from agriculture.

Integration of biogas production in organic agriculture on an economic viable basis brings some important challenges. The technology for big scale fermenting of clover grass is not very well developed and has given problems for the pioneers in the field. Experiences from Germany will be used to develop a useful model for Danish organic farmers.

Integration of biogas produced from organic biomasses into the common energy supply system also offers challenges. Among the most important can be mentioned: Financial support for establishing new biogas plants that can ferment organic biomasses, sufficient prices on the produced biogas/energy and upgrading the gas to distribution in the public nature gas grid.

Conclusions

Integration of biogas production on the basis of legume crops is a promising strategy to get a better supply of organic fertilizers and thereby better yields and economy in organic production.
Production of renewable energy as an integrated part of organic agriculture will add a new valuable dimension promoting the support of organic production in the future.
Danish experiences show promising possibilities but also new challenges that have to be met.

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