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Att navigera i en ny tid

Sammanfattningar
av föredrag och postrar

SVERIGES LANTBRUKSUNIVERSITET SLU

Centrum för uthålligt lantbruk CUL

tyder på att populationsprocesser på både lokal och landskapsskala är viktiga för arters fortlevnad i jordbrukslandskapet.

Vi kommer också att inom projektet undersöka vilka mekanismer som gör att ekologisk odling gynnar biologisk mångfald. Tillsammans med våra befintliga resultat ger detta strategier för att utveckla den ekologiska odlingen så att effekten för biologisk mångfald blir maximal och det geografiska läget optimalt.

Projektet är en del av FORMAS' (Forskningsrådet för miljö, areella näringar och samhällsbyggande) forskningstema "Den ekologiska produktionens landskapsekologi: växtskydd och biodiversitet".

1. Rundlöf, M. & Smith, H. G. 2005. The effect of organic farming on biodiversity depends on landscape context. Submitted.
2. Nilsson, H. 2005. Farming practice and landscape effects on bumblebee diversity and abundance. MSc-thesis, Lund University.
3. Edlund, M. 2005. Will biodiversity of vascular plants increase on two different scales in organic farming? MSc-thesis, Lund University.

Two phase continuous digestion of solid manure on-farm: Design, mass and nutrient balance

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Introduction/Problem

During the last decade some so called 'dry fermentation' prototype plants were developed for anaerobic digestion of organic material containing 15–50 % total solids. These plants show added advantages compared to slurry digestion plants: Less reactor volume, less process energy, less transport capacity, less odour emissions. However on-farm dry fermentation plants are not common and rarely commercially available. This paper reports about an innovative two phase prototype biogas plant designed for continuous digestion of solid dairy cattle manure.

Methodology

Manure of a dairy stanchion barn is shifted by a hydraulic powered scraper into the feeder channel of the hydrolysis reactor. The manure is a mixture of faeces, straw and oat husks. From the feeder channel the manure is pressed via a feeder pipe to the top of the 30° inclined hydrolysis reactor of 53m^3 capacity. The manure mixes with the substrate sinking down by gravity force. After 22–25 days retention at 38 °C, the substrate is discharged by a bottomless drawer from the lower part of the reactor. Every drawer cycle removes about 0.1 m^3 substrate from the hydrolysis reactor to be discharged into the transport screw underneath. From the transport screw the substrate partly drops into a down crossing extruder screw where it is separated into solid and liquid fractions. The remaining material is conveyed back to the feeder channel and inoculated into the fresh manure. The solid fraction from the extruder screw is stored at the dung yard for composting. The liquid fraction is collected into a buffer and from there pumped into the methane reactor with 17 m^3 capacity. Liquid from the buffer and from the methane reactor partly returns into the feeder pipe to improve the flow ability. After 19–21 days retention at 38 °C the effluent is pumped into a slurry store covered by a floating canvas. In 2004 we took three times samples from the input manure, solid fraction, effluent, straw, and oat husks. Total solids and nutrient content was analysed by HS Miljölab Ltd. in Kalmar, Sweden and Novalab Ltd. in Karkkila, Finland. Volatile solids were analysed at the laboratory of MTT/Vakola. The gas yield of each reactor was measured by a gas meter (Actaris G6 RF1) and the reading was daily recorded.

Results

The plant produced in average 52 m^3 biogas d^{-1}. Maximum yield was 91 m^3 d^{-1} biogas or 0.17 m^3 methane kg^{-1} VS . The solid fraction contained 73±2 % of input VS and the effluent 10±2 %. In average 76.3 % of produced methane was used for process heating. Up to 305 kWh d^{-1} or 56 % of the produced energy was available for heating the farm estate. Composted solid fraction and effluent together contained 70-81 % of the total input nitrogen and 94-111% of input NH_4. Mass and nutrient balance is shown in the table below.

26. October 2004	FM	TS	VS	Norg	Nsol	Ntot	NH4	NOx	K	P
	kg/d	kg/d	kg/d	kg/d	kg/d	kg/d	kg/d	kg/d	kg/d	kg/d
Faeces	2175	199	176	6.05	1.63	7.68	1.08	0.56	10.02	1.40
Straw	57	44	37	0.23	0.01	0.24	0.01		0.31	0.05
Oat husks	197	181	162	0.56	0.04	0.59	0.01	0.03	1.09	0.20
Sum input	2429	424	375	6.83	1.68	8.50	1.09	0.58	11.42	1.65
Solid fraction	1189	317	282	3.65	0.75	4.40	0.52	0.23	4.63	0.84
Effluent	1176	45	31	1.65	1.29	2.94	1.18	0.12	3.76	0.60
Biogas	64	62	62							
Sum output	2429	424	375	5.29	2.04	7.34	1.70	0.34	8.40	1.44

Conclusions

The two phase prototype biogas plant in Järna is suitable for digestion of organic residues of the farm and the surrounding food processing units. The prototype put many recent research results into practice. But there is still a lack of appropriate technical solutions in terms of handling organic material of high dry matter content, and process optimisation. The innovative continuously feeding and discharging technique is appropriate for the consistency and the dry matter content of the organic residues of the farm. It is probably not suitable for larger quantities of unchopped straw or green cut.