THESIS OF DOCTORAL DISSERTATION

ELABORATION OF BIOGAS PRODUCTION TECHNOLOGY BASED ON THE ORGANIC WASTE OF A MICRO-REGION OPERATING IN A CERTAIN ECONOMICAL STRUCTURE

Sallai László

Supervisor: **Dr. Gábor Grasselli**

UNIVERSITY OF DEBRECEN

KERPELY KÁLMÁN DOCTORAL SCHOOL

2012.

1 AIMS OF THE RESEARCH

The biomass potential which can be demolished is most diverse and available in most different combination and the biogas firms to be established in firms' environment in Hungary. Before the establishment of biogas plants in each case why a problem arises as the optimal scale, technological parameters and limitations of the recipes. The literature sources also confirm the hypothesis that in order to achieve the optimal operating technology it's necessary running a scientifically well-grounded, well-developed methodology based tests have to be conducted to determine if the biogas given local circumstances, the technology used, how the base and additive technology can be produced.

The main objectives of this dissertation, that the biogas production for usable biomass potential assessment and analysis of a small region, as well as some potentially co-ferments available agricultural biomass types encountered performed technological experiments demonstrate, that the local opportunities and constraints of all, and the availability of raw materials of quantitative and qualitative characteristics of the each specific case, the best use of biogas production technology solution.

2 BACKGROUND OF THE RESEARCH

The topicality of the environment, sustainable development, bearing in mind the technical development came to the fore was the first international trends closely follow research professionals. Because is an essential task the high-quality, useful results in practice line of research of the higher education, it began assessment the production of renewable energy resources and use in several institutions almost simultaneously.

We began to plan, to implement joint and parallel experiments mainly biogas production with the researchers one such advanced research base, high-quality agricultural engineering faculty with tradition, thanks to the previously existing personal relationship.

The colleagues in Mezőtúr have been developed their own semi-automated experimental equipments system operating in representative conditions. I created the laboratory by the same one of the Szolnok University College of Technology and Agricultural Faculty, respectively. predecessor institution at my workplace during the work. The narrower financial opportunities often resulted individual solutions, mainly for gas collection, gas metering and mixing equipment in the development. I did the common investigates as the part of the liquid pork dung program in Mezőtúr, the own experiments were done with the co-fermentation of organic waste in the sub-region Hódmezővásárhely characteristic form of the cattle the barn's.

3 MATERIALS AND METHODS

3.1 Organic waste utilization in small size

Biogas production and utilization of all sizes operating in a proper case preparation allows for energy recovery, which is the main activity will improve the economy, on the other hand, this is a powerful tool of the waste management. Because biomass energy is a typically renewable energy, its energy density is low, leading to possible on site and transportation, without loss, without storage to take place. My investigations running on the pilot farm of the Department of MGK, family economic level wastes of agricultural production, micro-regional level by-products starting to assess a leading renewable energy options, define the conditions. These simulations require definition of usable biomass potential and the biogas technology within the use of energy. Partly measured, partly based on literature data I determined biogas production potential of biomass of the 50 cow farms, respectively the sample utilized for pilot farm, and then I completed the same sub-regional level. The an

alysis of the data I want to prove the influence of the local conditions and circumstances to the biogas production techniques, technology. Biogas technology is primarily a wet version of big investments by big investors spread, while the new environmental regulations on small farms for only the straw farming methods make it possible. The dry matter content of the straw manure, nature straw, in the parlour wash water and washing-disinfecting agent to question the contents of the good and commonly used techniques. My goal is to prove that the straw manure - parlour wash water substrate utilized for energy purposes, ie the conditions that affect the impact of technology certification. The same on the level of pilot farm expanding the composition of cheese factory wastewater and pig straw manure additives, all attempts at the formation rate of dosed. The sleepy fertilizer experiments 50dm3 volume, mesophilic (38 ° C), batch, first hand, then finished mixing machine, built their digester system. The formed biogas emptied daily, I measured the amount of gas and its methane content.

3.2 Co-fermentation of biomass and liquid pig dung

The large-scale manure production modeling of biogas experiments used raw material the liquid pig slurry. The additives: bran, mushroom compost, maize silage. The biogas produced is suitable for industrial by-products and wastes are defined by: the dry matter, organic matter, nitrogen content, C: N ratio, specific gas yield.

The technology of fermentation experiments, experiments in the series progress

The experimental fermenters charge, setting the treatment combinations:

We may split the process of the fermentation into sections according to the 1. table.

Table 1.: Technology of co-fermentational experiments.

serial number	1.	2.	3.	4.
periodof the process	stabilization	refilling period with fresh substance	Running-up period	Comparative experiments
treatment		Running-up period with fresh substance		
duration time	7 days	14 days	21 days	21 days

a) sampling.

b) Measurements, examined parameters

Table 2: The parameters measured during the experiment series, measuring devices, methods, frequency

serial number	measured parameter	device	method	comment
1.	Fermentor temperature (^oC)	digital thermometer		once a day, at the same time
2.	gasyield (dm^3)	gasmeter		
3.	gascontent %	GA45 gas analyser		
4.	conductivity (mS/cm)	Hydrolab	elektrometria	once a day, at the same time
5.	soluted oxigen (mg/l)			
6.	pH			
7.	salination (PSS)			
8.	Redoxpotential (mV)			
9.	BOI_5 (mg/l)	Oxi Top 110	pressure dropping	from samples selected based on professional viewpoints
10.	KOI_k (mg/l)	NANOCOLOR	fotometria	
11.	dry matter content	drying cupboard		once a day, at the same time

At the Engineering and Agricultural Faculty of Szolnok College there is an appropriate, available, semi-automatic experimental system, representing the operating circumstances, providing similar conditions suitable the formation process of the biogas, influencing change of influencing factors and all of necessary measurements of typical data.

We can dose 50 dm^3 of liquid dung mixture pro treatment to take the factors in connection with the capacity of the fermentors into account It is possible the the simultaneous examination the effect of 9 treatment combinations with in a heatable room placed, mobile by manual power, hermetically closed fermentors. We applied the continuous (filling up) system, wich is most widespread in the practice, it, can be reproduced the process sections, as the launching, load change, receipt change, according to certain expert opinions each single daily measurement combination for a separate experiment can be qualified.

3.3 The assessment and methodology of his co-fermentation experiments

Viewpoints:

- the a quantity of gas was produced
- methane content,
- the dry- and the and organic matter content of the fermented substrat
- I established a coefficient for filtering out the effect of the additives influencing the performance for the changing characteristics of the manure in the course of the pork liquid dung used as the stock, dividing the methane production by the methane production of the control. I can eliminate the effect of the quality change of manure coming forward possibly in the different times so.

3.4 The statistical methods used by the evaluation of co-fermentation experiments

I used for the statistical analysis Excel spreadsheet and SPSS for Windows 18.0. The data were analysed by variance with independent two-T sample. I examined the homogenity with Levene test. By the group pair comparison I used Tamhane test in the case of heterogenity, and LSD test in the case of homogenity. The relationship between variables was performed with correlation analysis tests (Pearson's correlation coefficient) and linear regression analysis.

4 THE MAJOR STATEMENTS OF THE DISSERTATION

4.1 Co-fermentation of organic waste of family-sized dairy farm

In the first experiment, immediate goal was to establish that the milking parlor, milk cooling equipment used to clean laundry disinfectant in water prevents the rich manure anaerobic metabolism, reduces the methane formation. The rate of formation of the fermentor can be found in most types of organic waste generated by weight, but assuming different situations, multiple assembly is simulated. According to the data shown in the third Table 11% higher dry matter content of the fermentation substrate is 6.91% higher gasreleasing, or 8.48% more methane content resulted. The literature (10Ndm^3/d/om.kg) compared to 57, respectively. 52% higher gas production is found. Dry weight basis did not increase the efficiency of investment, however, for improved utilization of the device (0.29 <0.32 Ndm^{3}methane/dm^3 digester / day) (Table 3). 5.43% dry matter content of the substrate, the maximum daily production of biogas 85Ndm^3/d, methane content 56%, and 6.03% dry matter content of the substrate, the maximum daily production of biogas 73 Ndm^3/d, 49% methane content.

Table 3.: Gas Production of co-fermentation of straw cattle manure and parlor wastewater

No. of fermentor	3.	4.
Dry matter content (%)	5,43%	6,03%
Organic matter content (%)	3,30%	3,66%
Dry matter content (kg)	2,715	3,014
Organic matter content (kg)	1,648	1,829
gasrelease *(Ndm^3/d)	521	557
average gasrelease (Ndm^3/d)	26,05	27,85
max. gasrelease	85	73
max. methane content	59	59
average methane content (%)	56,18%	57,0
average methane production (Ndm^3/d)	14,63	15,87
specific gasproduction for fermentor volume (Ndm^3/ dm^3/d)	0,52	0,56
average specific methane production for fermentor volume (Ndm^3/ dm^3/d)	0,29	0,32
Theoretical gasproduction (Ndm^3/d)**	16,5	18,3

Comment.: for 20 day batch fermentation,** 10 Ndm^3/kgom./d, [Kaltwasser, 1983]*

4.2 Biogas production of co-fermentation considered by organic wastes of pilot plant

The fermentation experiments designed to demonstrate to the Department of MGK model farms can be located on a small family-sized farms for common problems (waste management, energy supply, etc) in resolving local basis to find a solution. The air at room temperature stored partially out of the reach of the pilot farm recipe of organic waste degradation processes have been started due to the performance of fresh manure (1.12 Ndm^3 / dm^3/nap), less than half (0.54 Ndm^3 / dm^3/nap) produced. The anaerobic conditions have developed rapidly since the methane is also a surge in the second and third day has been completed (Figure 1). The stored manure Ndm^3/day high gas formation was 63 (1.26 Ndm^3 / dm^3 fermenter / day), while the fresh manure Ndm3/nap 94 (1.808 Ndm3 / dm^3 fermenter / day) (Figure 2). The average methane content of fresh manure mixture (49%) five percent had less than a year and a half contained a substrate (Table 4).

Table 4.: Gas yield of different straw manure in different condition

	stored	fresh
Dry matter content(%)	9,51	9,92
Dry matter content (kg)	4,76	4,96
organic matter content (%)	6,21	6,41
organic matter content (kg)	6,21	6,41
Average methane content (%)	54	49
gasproduction*(Ndm^3)	544	1122
Average gasproduction (Ndm^3/d)	27,2	56,04
theoreticalgasproduction	48,2	48,2
Average methane production (Ndm^3/d)	14,69	27,46
average gasyield referred for specific fermentor volume (Ndm^3/dm^3/day)	0,54	1,12
average methane yield referred for specific fermentor volume (Ndm^3/dm^3/day))	0,29	0,55

referred for 20 days fermentation; mezophilic, intermittent method 200Ndm^3/20days cattle, 445Ndm^3/20days pig manure referred organic., [Kaltwasser, 1983]*

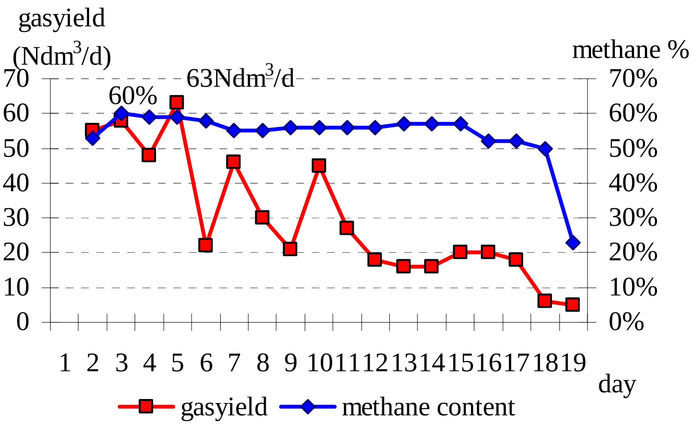


Figure 1.: Formation of biogas from straw manure stored at room temperature

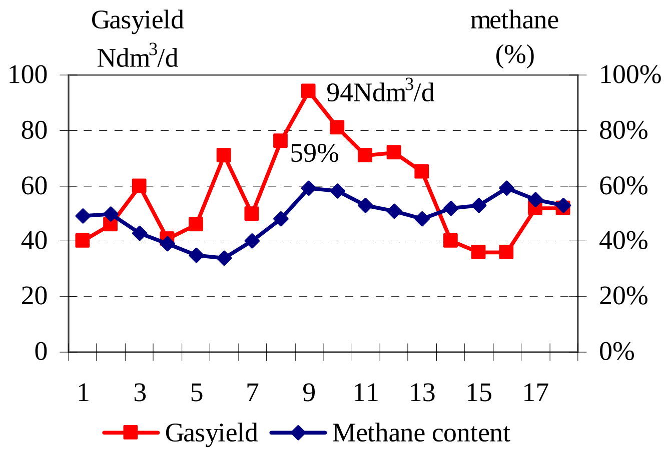


Figure 2.: Formation of biogas from fresh straw manure

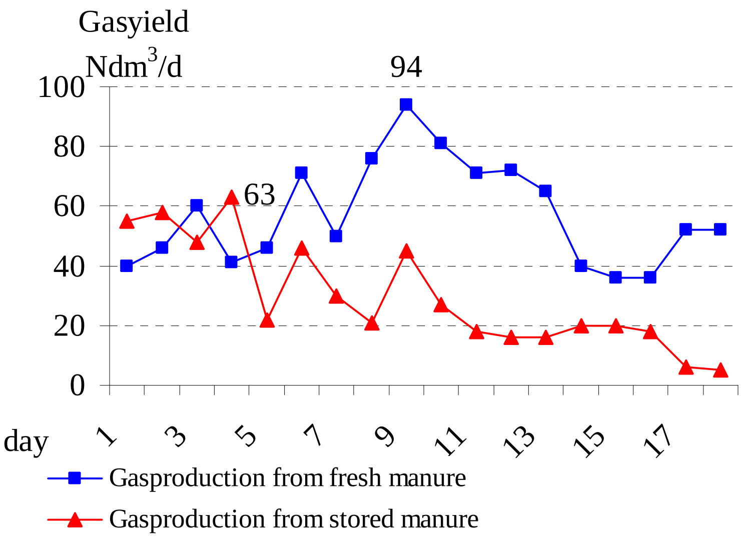


Figure 3.: Various consistency of manure gas production

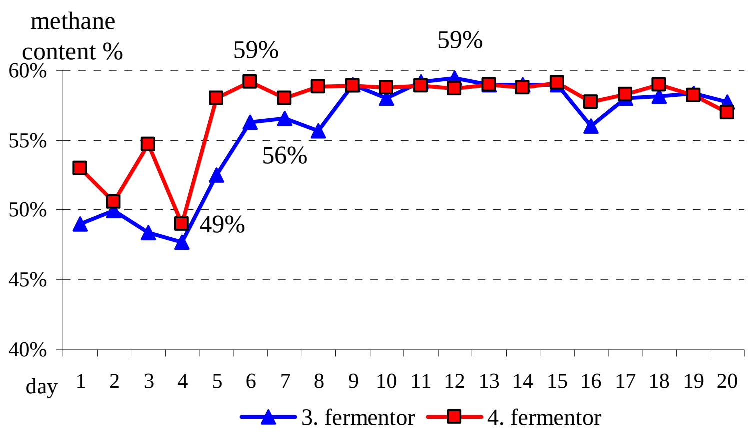


Figure 4.: The wastes of organic dairy farms (fresh straw manure and parlor wastewater) formed methane content of biogas.

The surge of methane gas in a parallel increase in intensity, followed by reduction, but not until the relatively poor long-term, value of between 50-60% (Figure 1, Figure 2, Figure 3, Figure 4). The specific data to be compared to half a year at room temperature, shielded from the air stored manure biogas yield decreases faster, the maximum is given approximately 60% of the fresh one. Although the methane content of 5% is quite a significant difference in composition between the two (Table 4), more than double the production, a methane content is not very sensitive to the use of fresh manure, the use of scale advantages. This refers to the matching of the dung production according to farm size - design, as well as added and the importance of timetable.

4.3 Co-fermentation of biomass and liquid pig manure

Among the structural conditions of a given small region of in an otherwise serious impact on the environment important for energy utilization of manure and other waste by-products with significant increases in investment for the purpose of profit-making ability. The keeping of pigs in particular, requires efficient operation of the plant size increases, leading to a significant increase in environmental damage may result. The multiple beneficial use of biogas (energy production + environmental + investment + biomanure production of hazardous waste management and utilization) does only if the possible additives energy-producing ability of the operating conditions similar to conditions previously modeled experimentally. I presented in my work on biogas methane related to different possible uses of the techniques. The experiments with varying load is simulated by varying substrate compositions, respectively the changing of manure production. The intensity if the methane production the methanogenic bacteria of the activity of a the direct measure and as such, the digester performance is highly sensitive, specific criterias. The produced gas composition and yield are features that are useful in assessing the stability of the anaerobic system. The results of the tests is rated, investment and operational areas are essential, bring practical benefits.

The aim of the experiments

The experiments conducted in accordance with the conditions of experiments designed to demonstrate that a variety of different additives increases in the quantity of gas produced and its methane content of the chosen material, the amount fed, organic - dry matter content and C/N ratio may be.

4.3.1. Experiments associated liquid pig manure with variables dry matter content

The slurry-based control (only liquid pig manure, without additives)

Various additives used, the material is always necessary to take into account the variable quality because of the pig manure production itself may change. For this reason, measurements can also be a control or variable dry matter content

The average dry matter content increases with increasing the average volume of gas in the developing and the average CO_2 content.

Nearly 35% average increase in dry matter content is approximately 35% average increase in the amount of gas, but about the same time. 15% average increase in CO_2 content caused, while methane increased by 0.2-0.3%. So the pig slurry dry matter content increased in proportion to performance improvement is following.

In the dry range (3.4 to 4.6%) of the dry matter content did not affect significantly the growth of methane. The average dry matter content 3.4% dry weight changes in control liquid pig manure R^2 = 0.5473 with strong descriptive, y = 0.0001 x^3 - + 0.0149 x^2 0.3893 x+ 1.1269 x dry matter depending on the trend of decline forecasting allow additional load growth, which may lead to increased production. The 4.59% dry matter content of dry matter changes of liquid pig slurry control R^2 = 0.6214, y = 11.048 describing the intensity x-0, 3658 depending on the trend does not indicate future growth, so that the fermentation parameters are expected to be sustainable.

Gas production of liquid pig slurry basis yielded mushroom compost added (additive: 30g 100% mushroom compost):

a. The control and the use of mushroom compost additive comparison shows that the doping effect of the increased development of the gas, the methane content has decreased. The carbon-dioxid content also increased, and decreased the amount of other gases.

b. The gas development increased to a similar increase in dry matter content compared to control, such as methane reduction, and the result is still the applicable category. (29 Ndm^3 / day / digester 30 g 100% load of mushroom compost, 16.7 Ndm^3 / day / fermentor control - +70% production increase, 54.5% methane content of 30 g 100% load of mushroom compost, methane control 58.9% - 7.5 % decrease)

Table 5.: Average gas yield of liquid pig dung basis yielded mushroom compost and silage added

load of fermentor/day; drymatter, treatment	average dry matter content (%)	gas releasing (Ndm^3/ day)	Methane content (%)	CO_2 con-tent	average methane releasing (Ndm^3/day)	specific fermentor volume referred	
						biogas-production	methane-production
Control I.	3,40	16,98	58,92		26,52	14,5	0,3
Control II.	4,59	23,04	59,07	30,64	10,3	0,41	0,26
100g/ (MC:MS=75:25) 0,20-0,22%	3,99	74,47	48,86	37,4	13,7	1,49	0,73
100g/ (MC:KS=50:50) 0,20-0,22%	3,96	58,16	40,42	30,9	28,7	1,16	0,47

4.3.2. Experiments with liquid pig slurry-based, yielded mushrooms compost and silage additives

.The yielded mushroom compost and silage additive liquid pig slurry co-fermentation experiments performed visually displayed represents the Figure 5th. The other gases (hydrogen sulfide, ammonia, etc) reduces the appearance of large-scale application conditions.

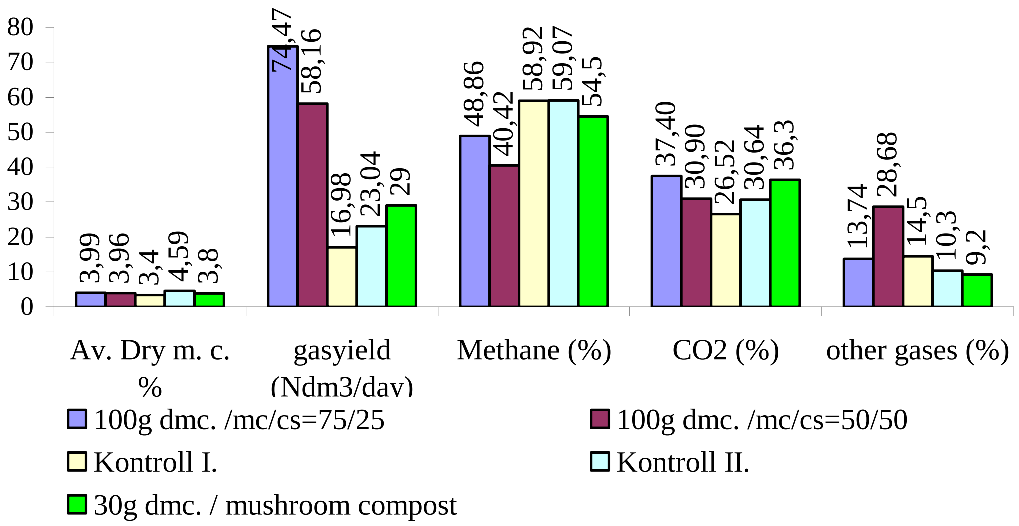


Figure 5: Average gas development parameters on liquid pig manure basis, yielded mushroom compost, as well as silage dosed

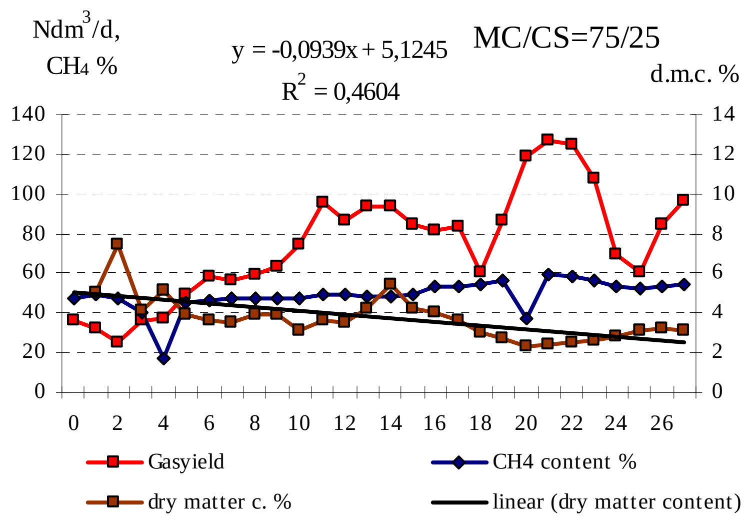


Figure 6: 10th Evolution of parameters of the yielded compost corn silage experiment MC/CS= 75:25 doped (100 dm. g. / day)

The daily 100 g solids, MC: CS ratio = 75:25 yielded mushroom compost - doped silage, R2 = 0.4604 with a close, the y = -0.0939 + 5.1245 x function can be described by changing trend of dry matter content can be described co-fermentation Ndm^3 74.47 / day average biogas production in a sustainable way can work. The daily 100 g solids, MC: CS ratio = 75:25 yielded mushroom compost - doped silage, R^2 = 0.4604 with a close, the y = -0.0939 + 5.1245 x function can be described by changing trend of dry matter content can be described co-fermentation Ndm^3 74.47 / day average biogas production in a sustainable way can work.

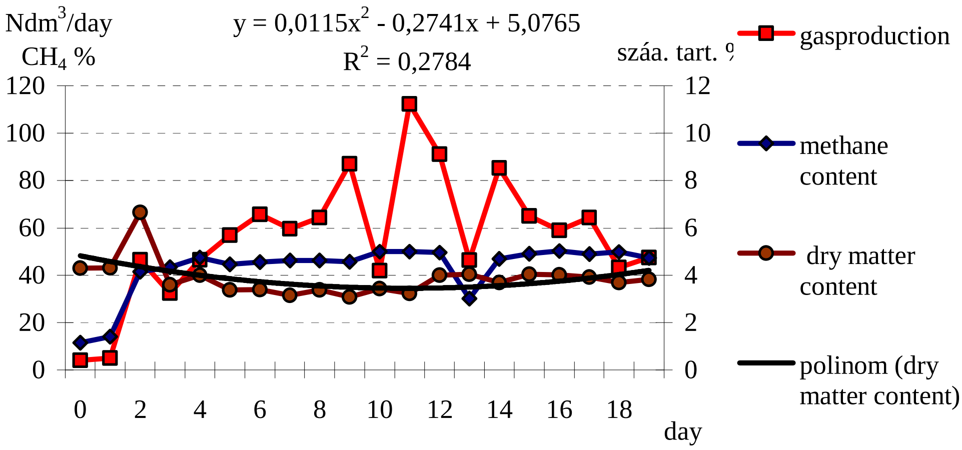


Figure 7: Evolution of the parameters of the experiment yielded MC:CS = 50:50 doped (100 dmc. / Day)

The daily 100 g solids, GK: = KS 50:50 yielded mushroom compost - corn silage, R^2 = 0.2784 with a close, y = 0.0115 x^2, - 0.2741x + 5.0765 x function can be described by changing trend of dry matter content of 58, 16Ndm^3/nap biogas production, and only avg. 40.42% methane content characterized by gas composition produces.

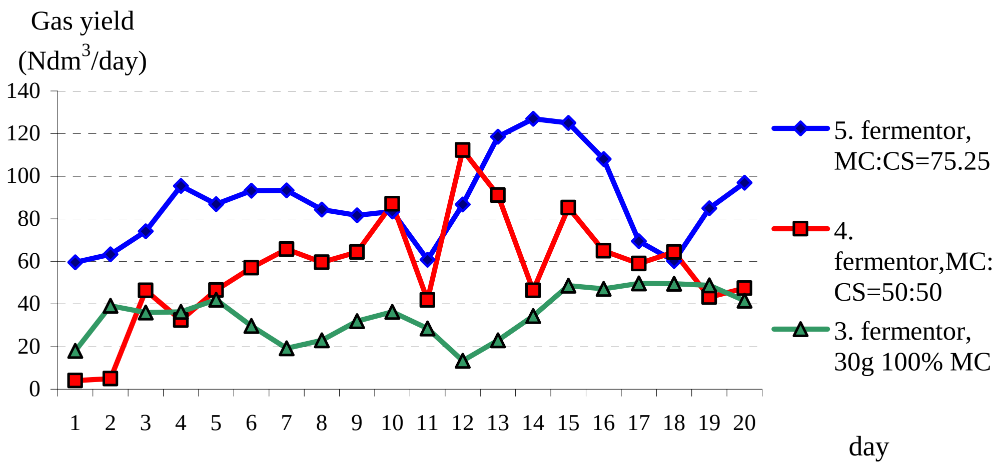
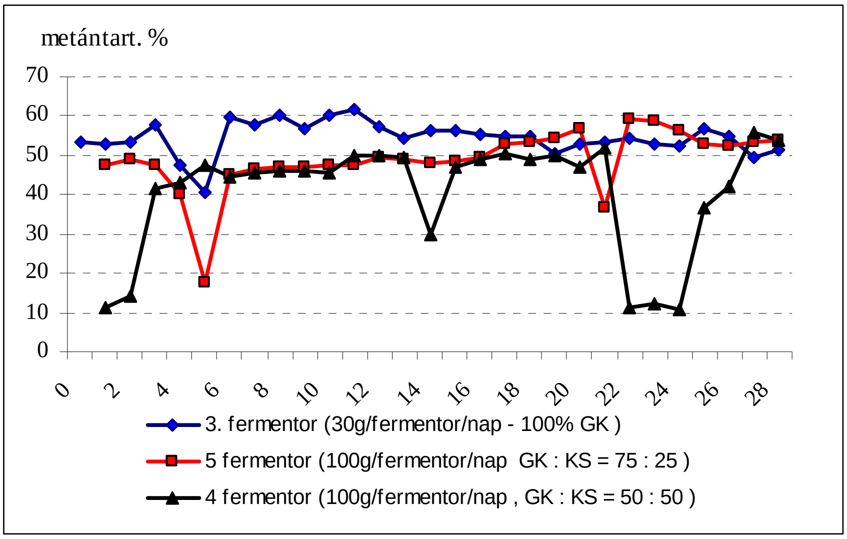


Figure 8: Gas formation trends: 3 fermentor, 30dmc. Dmc. from 0.06 to 0.07%. dose / day - 100% MC, 4th fermenter, MC:CS = 50:50; fifth fermenter MC:CS = 75:25 – dmc. from 0.20 to 0.22%. dose / day, 4% of dmc. containing of liquid pig slurry basis

The experiments show that the additive is used as by-products significantly increased the low dry matter content of organic material of liquid pig slurry biogas production, but did not reduce the methane content of biogas. The additives tested fattening than C / N ratio can be attributed.

Figure 9:Methane content yielded mushroom compost and silage dry matter content of 4%



dosis liquid pig slurry basis

The fluctuations in the methane have various technological reasons.

4.3.3. Wheat bran usability testing for biogas yield enhancement

The first test phase: overloading technology, new material loading (15 days 37 days 51 days):

Two reactors daily 6.6 vol% fresh slurry charged to the second no. 60g bran milling reactor volume per day were dosed frequently.

The untreated (control) reactor (third digester) gas production can be concluded that the period of gas production was much less than the other liquid pig slurry-based biomass. In most cases, the treated half of the reactor gas production did not reach. In the control reactor average gas production of 24 Ndm^3 biogas/dm^3/day. The mill bran dosed (second digester) over filled gas production in the period more or less different. This is because the fresh organic manure dry matter content search. Operating conditions to model the different dry matter content of fresh slurry was applied. The filling used in low solids fresh organic manure occasionally caused fluctuations in gas production.

Table 6: The average gas production in fermentors of comparative studies, with the additions of wheat bran

Second fermentor: 6.6 vol% of fresh slurry. bran +60 g; third (control) fermentor: 6.6 vol% of fresh manure;

Measured value, technology		Average gasyield (dm^3/day)/ specific values *(Ndm^3gas/day, Ndm^3gas/dm^3/day)*				
		2. sz. fermentor *(+60g dm.. bran)*	3. control	Gasyield referred to control	2. fer-mentor	3. control
		6,6 tf % fresh liquid manure			specific fermentor volume referred gasyield(dm^3/ dm3/day)	
biogas	Fresh substrat load	62,7 Ndm^3/day	24,2 Ndm^3/day	2,59	1,25	0,48
biogas	recirculation technology	42 Ndm^3/day	10,1 Ndm^3/day	4,16	0,84	0,20
Methane yield	Fresh substrat load *Ndm^3/day*	35,9 Ndm^3/day (57,26%)	13,2 Ndm^3/day (54,54%)	2,72	0,72	0,26
Methane yield	recirculation technology	24,2 Ndm^3/day; (57,62%)	6,3 Ndm^3/day; (62,38%)	3,84	0,48	0,13

The No. 2. digester gas production in the second test period already reached the 50 day dm^3/napos production, and an average of 62.6 dm^3 biogas produced per day (Table 6, Figure 5). The methane content of biogas reactors was produced in all cases exceeded 50% and sometimes even 60% (Table 6.).

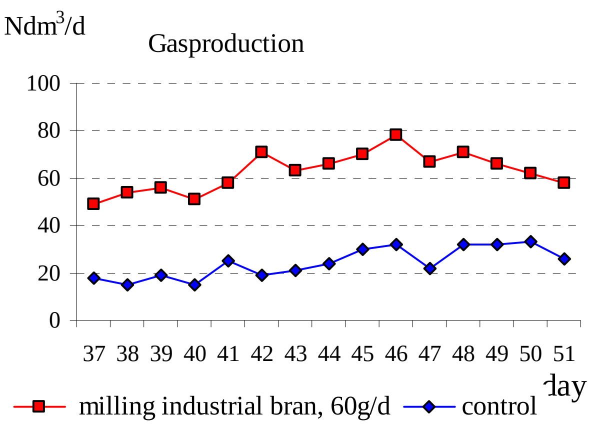


Figure 10.: During the period of gas production, technology loading fresh material while(15 days 37 days 51 days)

The co-fermentation of the bran additive and slurry during the experiments between the additive unique not only increased the formation of gas, but methane 3.5% too.

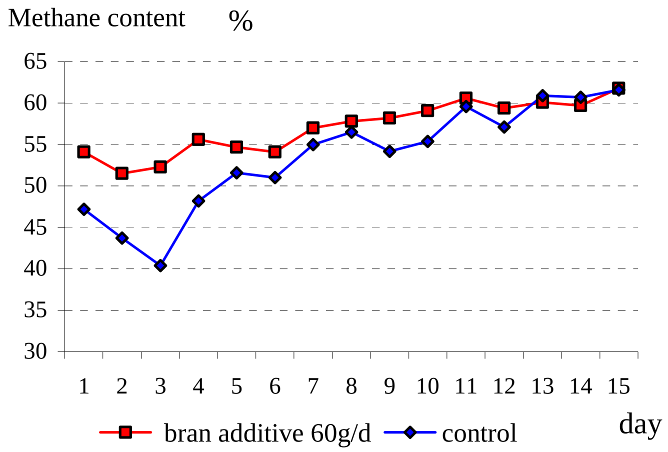


Figure11.: The methane content of biogas was produced in reactors, overloading technology, with new material (15 days 37 days 51 days)

The second test phase: overload technology, besides dosing of recycled materials (15 days, 52 - 66 days).

The test phase of the fresh slurry continuous loading is complete, and has been released, shot back to the manure collected from a separate system. The filling of the 2 no. reactors still loading the amount of milling bran 60g per day (Table 6).

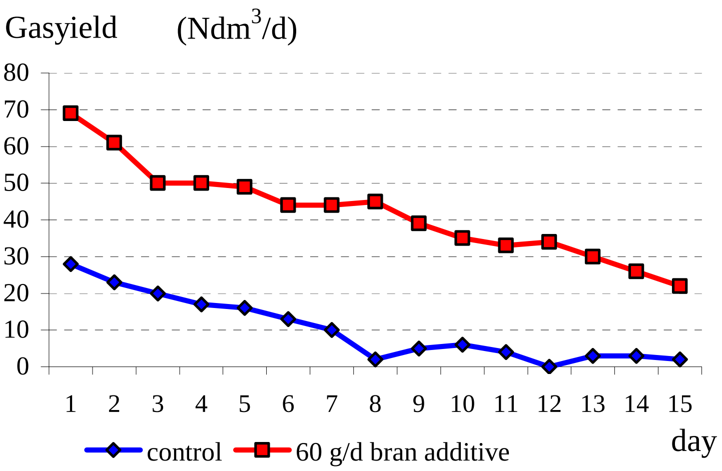


Figure 12.: Gas Production, recirculation mode No.2. fermentor: bran additive 60g/day; No.3. fermentor: control;

The beginning of the recycling-based reactors liquid pig manure steady decline in gas production was characterized by a lower input of organic matter is related to dry matter content. The methane content in the gas production is only reduced lag in the decrease in methane (Figure 12). The control digester biogas production is also stated that the amount of gas generated in the treated gas production in the reactors were less than half (Figure 12).

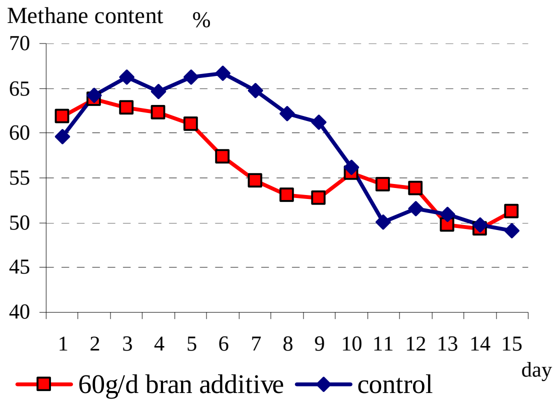


Figure 13: Methane content, recirculation mode No.2. fermentor: bran additive 60g/day; No.3. fermentor: control

5 NEW SCIENTIFIC RESULTS

The following theses have been proven with the tests and calculations by the aims of the thesis.

The biogas production and utilization opportunities in connection with extractable biogas quantity from these certain animal and food products processing by-products originated from different sized small farms are grounded from for supporting experiments.

The milking cattle manure and sewage of more than 50% higher gassing found in the literature is compared with two option (0.55 >> 0.32 Ndm^3methane/dm^3 fermentor volume / day). The Department of MGK pilot farms in relation to cheese factory and parlor wastewater, cattle and pig manure in the production in proportion to the doping of fresh manure in the literature values 16% higher and the half-year stored manure is 43.6% less gas production was measured. The proportion of the study shows that 10.14 m^3 per day plant scale, size 4.26 m^3 of biogas-works formed. The improved thermal energy equivalent of biogas farm at 84.97 MJ / day, training at the plant level is 173.97 MJ / day. The use of electric power 0.34 kW, respectively. 0,7 kW. The power used to heat an average of 0.23 kW, respectively. 0.47 kW.

Certain animal and food products processing by-products and wastes with other locally available biomass assortments with low level of organic matter content originated from different sized small farms together are utilizable for biogas production

Comparative measurements of two different (3.4 and 4.6%) dry matter control production studied, the larger decrease in methane-free dry weight increase of production. I examined with experiments the mushroom planting waste - yielded growing medium - energetic utilization of 4% dry matter slurry pigs fed alone, or by using a variable rate of corn silage.

The yielded mushroom compost additives dry matter content compared to the fermenters dry matter content 1,5%(30g) produced in amounts of 60% of energy surplus. 100g (5%) 25% corn silage chaff, 75% doping of mushroom compost is 3.6-fold, a 50% addition of a 2.7-fold methane quantity growth. The lower values of methane (48.86%, respectively around 40.42%) of the gas produced usable only under restricted conditions.

The by-products from the milling of wheat bran increased biogas yield were examined. The bran 45g dmc. / Day / digester loading, 4% dmc. 0.72 dm^3 basis liquid pig slurry containing methane / dm^3 / day operated power, which is almost tripled (2.72) is the only liquid pig manure methane control.

Certain animal and food products processing by-products and wastes generated in a given small area and inside of it different sized small farms are utilizable together for biogas production and with it the production and exploitation ratio of the renewable energy is increasable

The cattle ranch separately and the pilot farm working together fermentation of organic waste in biogas production referred to digester volume the specific power (0.55 >> 0.32 Ndm^3/dm^3 methane / day) increased by 72%, without any of the components are separately stored, dispensed and should be forming a ratio of the wet category, within the boundaries of the substrate results in pumpability.

Micro-regional level, the total amount of pig manure with bran quantiy five-thousandth of the total combined fermented 12,404.12 MWh of electricity per year surplus biogas heating value of 122,946 GJ of heat surplus can be obtained.

6 RESULTS FOR UTILIZATION

6.1 Utilization of organic waste of dairy farms

The Department of MGK training facility in the 50 cows, a family-sized dairy producers or sleepy organic manure and milking washing water that produce proportionally with measured substrate kofermentációja in the literature values 52-58% higher than the 20 days, intermittent operation relative to biogas production (Table 7). The measured methane content (56-57%) suitable for use in motor settings.

6.2 Co-fermentation of SZTE MGK pilot farms organic waste

The fresh straw pig manure, cattle straw manure, cheese factory waste water, milking wastewater of SZTE MGK biogas-doped substrate, methane release 72% higher (0.55 0.32 >> Ndm^3/dm^3 methane / day) in cattle production are works (see). It is therefore appropriate for the common fermentation wastes more energy production. In a casual, hours resting box straw manure produced during fermentation of immediate energy production can be doubled [0.29 (cached) << 0.55 (fresh) Ndm^3/dm^3/nap methane, Table 7].

Table 7: Results of experiments for energetical utilization of organic wastes of SZTE MGK organic waste.

Measured and calculated parameters		organic waste of pilot farm		family sized dairy farm	
		cattle straw manure: 14,5kg; *pig straw manure:*8,2kg; *waste water of chees firm (*without serum*):* 23,4kg; *waste water of parlour:* 3,9kg		*cattle straw manure:* (száa.: 21,3%; szea.: 12,9%);	
				3. reactor	4. reactor
				12734 g;	14137 g;
				waste water of parlour: dm.c..: 1,52 g/l; omc..: 0,592 g/l;	
		stored	fresh	37266g;	35863g;
dry matter content (%)		9,51	9,92	5,43%	6,03%
organic matter content (%)		6,21	6,41	3,30%	3,66%
average gaspro-duction (Ndm^3/ day)	biogas	27,2	56,04	26,05	27,85
	methane	14,69	27,46	14,63	15,87
average methane content (%)		54	49	56,18%	57,0%
theoretical biogas production (Ndm^3/day)**		48,2	48,2	16,5	18,3
average gasyield referred for specific fermentor volume (Ndm^3/dm^3/day)	biogas	0,54	1,12	0,52	0,56
	methane	0,29	0,55	0,29	0,32

referred for 20 days fermentation; mezophilic, intermittent method 200Ndm³/20days cattle, 445Ndm³/20days pig manure referred organic., [Kaltwasser, 1983]*

6.3 Co-fermentation of biomass and liquid pig dung

6.3.1. Control experiments with variables dry matter content associated yielded mushroom compost

The slurry-based controls, the average increase in dry matter content (3.4% - 4.6%) increase in the average releasing gas volume (16.98 -23.04 dm^3/day dm^3/ day) and 35% average dry matter content increase of nearly 35% average increase in the amount of gas caused. The pig manure loads increase in proportion to performance improvement is reported. Since most of the methane fermentation (~ 59.0%) of the liquid pig manure itself produces, so that the load level corresponding to the separation of the slurry in the liquid phase of recycling is an economical energy production can continue. This is primarily an energy-saving benefits can be. For a given entity has a number of possible forms of waste utilization simulated when varying proportions doped, or other organic by-products by adding co-fermentation experiments were performed.

6.3.2. Pure mushroom compost additive on liquid pig manure basis

The dry matter content of 30g, 100% yielded mushroom compost additives in approx. pro fermentor 2000g dry matter to liquid pig manure containing 70% increase in production (16.98 << Ndm^3/nap 29.00), respectively. Decrease of 7.5% methane content (58.9> 54.5%). This is in the methane production, 60% excess amount of energy is produced. The result is still the applicable category.

6.3.3. Experiments with corn silage and yielded mushroom compost additive on liquid pig manure basis

The additive composition change of the average daily gas production differs significantly. This is because the different additives in different C / N and the proportion of divided authority search. 100g of dry matter quantity, 75% mushroom compost and biogas system containing 25% corn silage production in relation to five times the biogas, methane production in relation to 3.6-fold in the same dry matter content compared to controls. 100g dry matter quantity, 50% mushroom compost and biogas system containing 50% corn silage in biogas production in relation to 3.7-fold, 2.7-fold relative to methane production in the same dry matter content compared to controls. The silage maize mushroom and yielded compost fermentor and the production of gas and biogas methane content of 50% corn silage additives melting significantly. A likely cause of the silage homogeneous condition be inappropriate. The system failed to reach an average methane content of 50% and greatly increased the amount of other gases. In addition to corn silage - chop conditions can also affect the size of the different starch fermentation. The mushroom compost environment, higher chop sizes less silage additives disrupt only a small biogas methane content results, which are converted in accordance with burners direct heat recovery, or, for example. micro-turbine electric power generation, too.

6.3.4. Wheat bran usability testing for biogas yield enhancement

Liquid pig manure co-fermentation basis, 6.6 V / V% loading, dm. 45 g. /day dosage of wheat bran.

Basis liquid pig manure 6.6 V / V% dosis, 45g dmc. / Day of wheat bran feeding the gas production more than doubled, to 5% methane per year. In general, crop by-products in that I have examined the treatment resulted in a decrease in methane, the gas production increased, but this is not found in wheat bran (Table 5).

Recirculation - overloaded mode

A consistently decreasing biogas production, methane deteriorating, increasing dry matter content shows that the bacteria supply nutrients to deteriorate, deplete the chain elements are not working. Thus, a continuous supply of organic manure is not possible without constant power, reliable operating system to run.

6.4 The sub-regional level to enhance biogas production, pig manure and wheat bran co-fermentation

Biomass potential of calculations in the small area where 15,000 wheat area, yield and 5t/ha 75,000 was calculated to save crops. Industrial grain processing approx. bran production 20% can be calculated. The total amount of wheat grain processing industry kb.15000 bran was formed. The 0.05 t, 4% dry matter content compared to control liquid pig manure 60g bran 2.72-fold increase in the methane production. The proportions while retaining a small region Hódmezővásárhely 66,094 tonnes estimated production of pig manure 66,094 * 0.0012 = 79.3 bran was originally based on the literature of the biogas heating value of 71,480.4 GJ / year of heat quantity of 7211.7 MWh / year of electricity from 2.72-fold , that is 19,615.82 MWh / year increase in the value of co-fermentation (Table 3).

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