

Market Analysis for Sustainable Organic Biogas Production

SUSTAININGAS Report D2.3

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Preface

Biogas is an important renewable energy source with impressive growth and installation rates in the EU. However, production of biogas from organic farms has not yet been sufficiently exploited. The European project SUSTAINGAS responds to the current lack of standards and information on biogas produced on organic farms. SUSTAINGAS aims at promoting sustainable biogas supply by positioning sustainable biogas products from organic farming. Nine partners from seven European countries are contributing to reach these objectives.

A definition of sustainable organic biogas has already been elaborated (see Baaske, Lancaster 2012), based upon consultations with organic farmers with biogas plants (or in a planning phase), and a comparative literature study.

This report provides a *market analysis of sustainable organic biogas production* and gives an overview of opportunities, as well as weak points and potential barriers for market development. The analysis evaluates the results of nearly 700 questionnaires with organic farmers from six countries.

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Other ongoing activities within the SUSTAINGAS are the setting of criteria and standards for organic biogas, the elaboration of tools for improved decision making and economic understanding, and knowledge transfer by sharing of best practices, handbook distribution, workshops, virtual training and webinars. Please visit the project web-site for receiving more information.

We thank all the partners and experts who contributed to this analysis, especially the organic farmers that have been interviewed.

W. Baaske

B. Lancaster

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Abbreviations

countries				
AT	Austria		IE	Ireland
BE	Belgium		IT	Italy
BG	Bulgaria		LT	Lithuania
CH	Switzerland		LU	Luxembourg
CY	Cyprus		LV	Latvia
CZ	Czech Republic		MT	Malta
DE	Germany		NL	Netherlands
DK	Denmark		PL	Poland
EE	Estonia		PT	Portugal
EL	Greece		RO	Romania
ES	Spain		SE	Sweden
FI	Finland		SI	Slovenia
FR	France		SK	Slovakia
HR	Croatia		UK	United Kingdom
HU	Hungary			

other				
a	year		ha	hectares
CHP	Combined heat and power		MW	Megawatt
el	electricity		n/a	no answer
EU	European Union		t	tons
GW	Gigawatt		toe	tons oil equivalent

1 Introduction

This chapter describes the design of the market analysis. It is based upon a definition of sustainable organic biogas. This definition is provided at the beginning.

1.1 Working definition of sustainable organic biogas

The study is based on the following product description:

Sustainable organic biogas is biogas produced with substrates mainly originating from organic agriculture, organic food production and/or nature conservation. Types of substrate used are mainly catch crops, residues from animal husbandry or crop production, material from conservation areas and/or uncontaminated biological residues. The significance of energy crops as substrates is limited since organic biogas aims to have a positive impact on food production, avoiding a competition for land use. Material from conventional agriculture is limited.*)

The digestate is used as an organic fertilizer in the organic farms' own nutrient cycle. Organic biogas aims to improve soil fertility in organic farming systems. A safe and efficient process with low emissions particularly of methane is essential for the sustainability. Positive impacts are expected on water conservation and biodiversity.

*) Criteria are expressed e.g. in the percentage of dry matter input or to the quantity of nitrogen per hectare applied as fertilizer with the digestate.

This working definition has been elaborated (Baaske, Lancaster 2012) from literature study and consultations with 40 organic farmers with biogas (or in a planning phase). The participation of the farmers in

defining sustainable organic biogas and its features give ground to expect that the definition acceptable and meets customer demands.

1.2 Design of the market analysis

The market analysis aims at finding information for addressing the market, especially hindrances and promoting factors for organic farmers to introduce sustainable organic biogas production. The market study has been based upon surveys. Target group have been organic farmers in six European countries: Austria, Bulgaria, Germany, Denmark, Spain and Poland.

Table 1: Design of the market analysis

Action characteristics	Design
Target group	organic farmers with and without biogas plants in 6 European countries
Interview response:	
<i>targeted</i>	400
<i>actual</i>	696
Split by nation:	
<i>Austria</i>	80
<i>Bulgaria</i>	28
<i>Germany</i>	336
<i>Denmark</i>	129
<i>Spain</i>	43
<i>Poland</i>	80
Type of interview	online (Germany, Denmark), by direct e-mail (Denmark, Bulgaria), face-to-face (Bulgaria), and by phone (Austria, Bulgaria, Spain, Poland), online EU-wide to organic farmers' associations
Date of the interviews	December 2012 to June 2013
Questionnaire type	half-standardized
Questionnaire pre-test	12 questionnaires

The questionnaire has been elaborated by the SUSTAINGAS project team. A **pre-test** has been carried out in several countries. The final questionnaire has been launched after confirming a logical order of the questions and not showing any difficulties and misunderstandings when talking to the farmers. This comment concerns the questionnaire itself;

it does not mean that all addressed farmers were familiar with the idea of biogas production.

Supporting response. The survey has been carried out by the SUSTAINGAS national team members. Various methods have been applied in order to achieve response to the questionnaire action: by telephone, by e-mail, face-to-face, or using an online tool. The methods have been selected with respect to achieving a high acceptance of the survey; i.e. in some countries a face-to-face approach is preferred, in other countries the online approach is the most appreciated by the target group. In total, the response exceeded the targeted number.

A high response has been attained when applying the online type of interview and direct mail, addressing a large number of farmers. On the other hand, these methods decrease the response rate, i.e. the number of received questionnaires per number of distributed questionnaires. The highest response rates have been received through telephone and face-to-face methods. The response rates vary between 5 and 50 % (median: 30 %).

Representativeness of the results. The *weighted average* provides a representation for organic farming both in the selected countries as well as in the European Union Area in general. The weighting adjusts for over- or under-representation of the countries with respect to organic farm land in the represented European regions. The weighting factors are calculated dividing targeted by actual responses.

**Representative
weighted average**

Table 2: Technical features of the action (explanation: see text)

country	AT	BG	DE	DK	ES	PL	EU
targeted	80	30	80	50	80	80	400
actual	80	28	336	129	43	80	696
weight	1.00	1.07	0.24	0.39	1.86	1.00	0.58

Confidence interval for the weighted total sample: $\pm 5,0$ %. With a probability of 95 percent and provided normal distribution, the documented value and the real value of a statistic do not differ more than this percentage. For country specific results, the confidence intervals (indicating statistical errors) increase: AT $\pm 11,2$ %, BG ± 20 %, DE $\pm 5,5$ %, DK $\pm 8,8$ %, ES ± 16 %, PL $\pm 11,2$ %.

Special features of the actions **by country**:

Austria: Telephone numbers have been collected using recent information available via strategic partners and the internet, e.g. data banks of farm-gate sales on organic farms. With respect to region the sample guarantees the territorial representation for the whole country.

Bulgaria: 30 farmers responded, 28 questionnaires have been non-empty.

Germany: Two strategic partners (associations) sent the questionnaire to their members. 11,300 or less farmers have been addressed, since it was possible that farmers got emails from both partners. In absolute terms, Germany received the highest response. That allows detailed analyses. Organic farmers with high awareness of biogas may dominate the response.

Denmark: 558 organic farmers operating more than 15 ha land have been contacted directly by e-mail, responding 138 questionnaires, 128 of them non-empty. The action has been supported by newsletters sent to farmers, an article in a magazine with a link to the questionnaire, and advertisement / small articles on two web-pages.

Spain: Half of the response stems from the autonomous region of Catalunya, a region with both high shares in organic production and biogas production. The other half of the response is distributed among other regions, especially Asturias and Galicia.

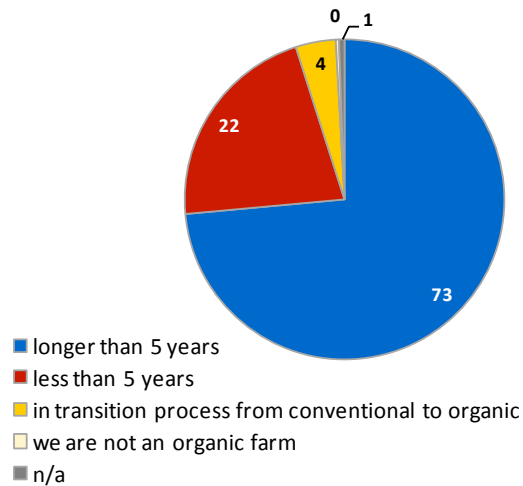
Poland: Number of contacts in a data base amounted to 335 organic farmers. Only organic farmers after the conversion period were taken into account. Farms smaller than 10 ha have been excluded from the sample. Responses were collected from each of the 16 voivodships (regions) of Poland, and varied from 1 to 12 answers per voivodship. With respect to region the sample guarantees the territorial representation for the whole country. Phone calls were addressed randomly from respective voivodships. After reaching the expected response rate in one voivodship, the next voivodship was approached, and the process continued until 80 questionnaires have been reached.

Percentage values have been rounded using standard business principles; summing up percentages may therefore differ from 100 %.

1.3 Characteristics of the sample

Most of the farms are organic since long. 73 % are organic longer than five years, 22 % less than five years, and 4 % are in the transition process from conventional to organic.

Figure 1: Since when have you been an organic farmer?

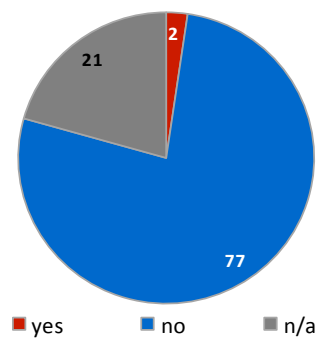


All numbers are percentages, total n=696, SUSTAINGAS 2013

Only 2 % of the respondents already operate a biogas plant, either on their own or together with other farmers. This result reflects the low diffusion rate of biogas plants in organic farming. Actually, the survey has been set in order to capture future market demands, i.e. demands of farmers *not* yet operating a biogas plant.

**Survey reflects
future markets**

Figure 2: Operation of biogas plants on own farm or together with other farmers



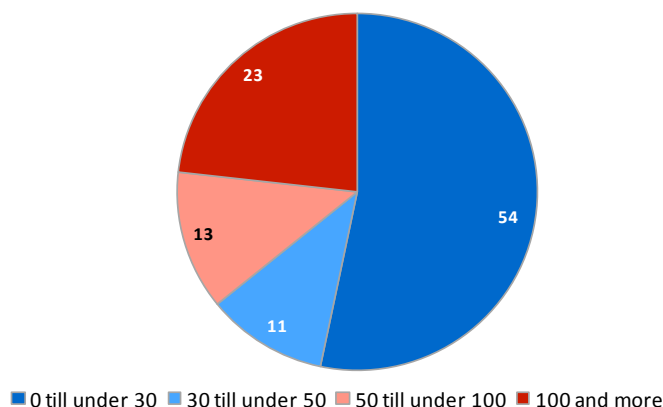
All numbers are percentages, total n=696, SUSTAINGAS 2013

Most respondents operating a biogas plant stem from Austria, where farm sizes are small and biogas plants are often run by co-operatives – this increases the number of organic farms contributing to biogas production even when the total number of biogas plants on organic farms is low. About half the number of farms (54 %) operate land areas till under 30 ha, further 11 % till under 50 ha, and further 13 % till under 100 ha. Larger farms operating land areas with 100 ha and more make 23 % of the sample. These larger operations mostly stem from Denmark and Poland.

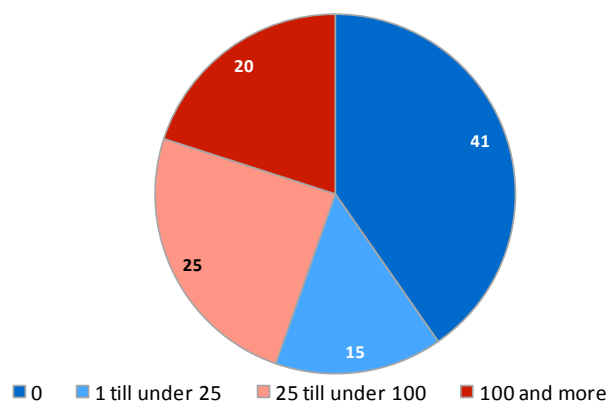
About 60 % of the farms keep animal livestock: 15 % under 25 livestock units, further 25 % 25 till under 100 livestock units, and further 20 % 100 and more livestock units. The largest operations due to animal husbandry have been captured in Denmark and Spain.

Figure 3: Size of the farms in the sample

number of farms by ha area (in%)



number of farms by livestock units (in%)



All numbers are percentages, total n=696, SUSTAIN GAS 2013

2 Market demands for sustainable organic biogas production

Organic farmers attach conditions to future engaging in biogas production. This chapter shows their priorities and expectations.

2.1 Direct purposes for using biogas

Electricity and heat generation is the most dominant purpose, biogas would be used for. More than two thirds of the sample (68 %) will use biogas in a combined heat and power generation utility, other 19 % answer with *maybe*. Organic farmers therefore assume the general application structure of conventional farmers.

**Heat and electricity
generation
predominant**

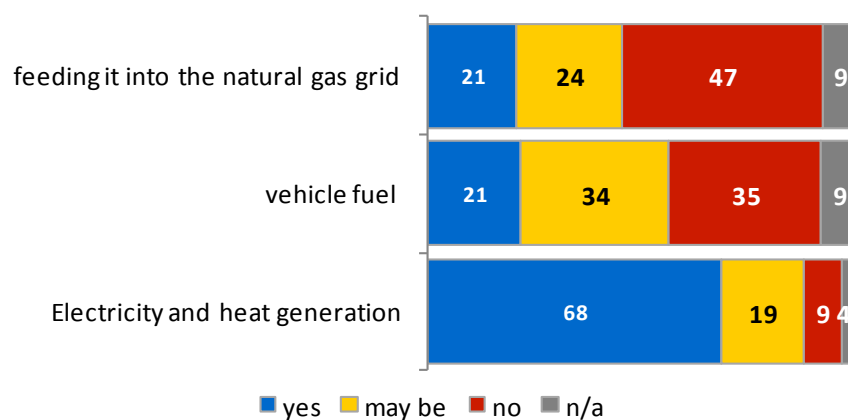
Solutions for generating heat and power, for making use and generating profits out of them have to be sought for organic farmers. Experiences from conventional farmers may be transferred.

However, the areas of application are broader, compared to the recent structure of operations. Nearly half of the organic farmers would be interested in *feeding biogas into the natural gas grid* (21 % *yes* and 24 % *maybe*). More than half of the organic farmers are interested in using biogas for *vehicle fuelling* (21 % *yes* and 34 % *maybe*). Especially the Eastern European respondents are interested in this kind of application: in Poland and Bulgaria both about one third of organic farmers definitely (*yes*) is interested in vehicle fuelling, given they would produce biogas.

**Vehicle fuelling as an
important
alternative**

Mobility applications are important for increasing acceptance for biogas production in organic farming. Farmers e.g. want to use biogas for tractors (phasing out diesel and phasing in biogas) and attain organic energy self-sufficiency.

Figure 4: What purposes would you use the biogas for? (if you already run a plant: What purposes do you use the biogas for?)



All numbers are percentages, total n=696, SUSTAINGAS 2013

Also, in case of heat production, diverse applications are foreseen. Predominantly is utilization for *heating purposes on my farm / private home*. 63 % of the respondents foresee this application definitely, further 18 % *maybe*. Even higher demands for heating the own farm or private home originate from Bulgaria and Poland (over 85 % *yes*), less acceptance is in Denmark and Spain (about 45 %).

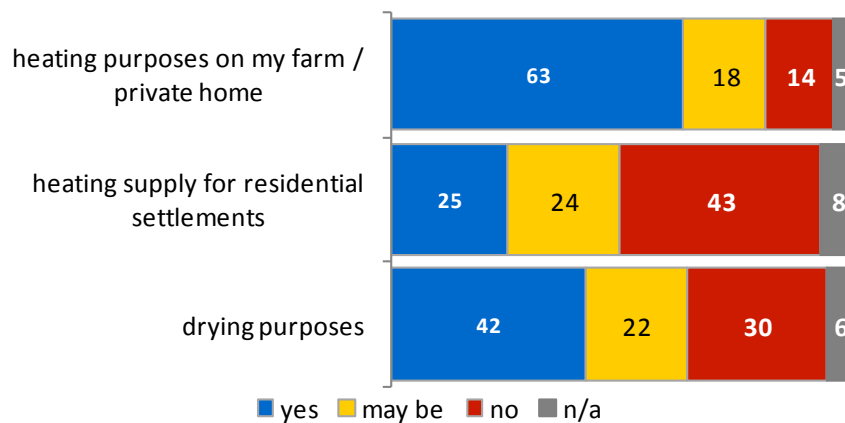
Heating supply for residential settlements needs integration into local heating networks and presupposes proximity of biogas plant's (or at least CHP's) location to human settlement areas. This utilization finds about 50 % acceptance (25 % *yes* and 24 % *maybe*), and therefore is the least desired one. Denmark's and Bulgaria's organic farmers respond above average, whereas in Austria and Poland acceptance is least. Local heating network supply has been a classical application e.g. in Austria (also powered by solid biomass). But in the last years increasing insulation in residential buildings reduces heating demands. As well, biogas plants built near residential areas face acceptance problems, so that applications must reduce in size.

Biogas for drying purposes is important to organic farmers

The second most important application for heat from biogas on organic farms is *drying purposes*. 64 % of the respondents are in favour for using heat for drying purposes, 42 % answer *yes*, 22 % *maybe*. Drying and storing is part of the processing chain for many agricultural products. On-farm drying facilities therefore allow farmers to post-process their yields (e.g. maize, wheat, seeds ...), and also forestry

products (wood chips, pellets ...) or other materials. By using heat for drying purposes, organic farmers may add value to their product, and provide services to other farmers and economic sectors. Demands for drying have been put forward especially in Austria and Bulgaria.

Figure 5: Would you use (if you already run a plant: Do you use) the waste heat for ...



All numbers are percentages, total n=696, SUSTAINGAS 2013

This question also provided an open category; respondents could specify their specific use for waste heat and give explanations. The text answers have been categorized and counted. In surveys, text answers attract attention, even when response numbers are low. This reflects the additional efforts respondents have taken when providing text answers.

Text answers are important

In the open question *Would you use the waste heat for ...* 47 answers have been achieved, and the following applications have been considered (absolute number of answers in brackets):

- greenhouse heating (8), fish farming (2), chick breeding (2)
- drying hay / forage (6), grain (3), firewood / pellets (5)
- cooling, cold storage (2)
- heat supply for campsite, public buildings, industrial park (4)
- only on-farm purposes (6)
- *other purposes*: biomethan upgrading (1), fuelling the tractor (1)

2.2 Expected on-farm effects and sustainability demands

Profits increase

Several on-farm effects may be expected from biogas plants in the respective countries. The most prominent is an *increased profit from the harvest*. 39 % confirm this issue (*yes*), and further 29 % are unsure about it (answering *maybe*). 27 % do not consider that profits from the harvest will increase. The clearest answers come from Denmark, Poland and Bulgaria, whereas Austria and Germany utter skepticism.

36 % expect *reductions in the costs of fertilizers* and soil improvements, whereas 32 % are skeptical.

It will be necessary to further clarify the economy of biogas production on organic farming:

How much will harvest and profits increase by on-farm usage of the processed materials as a fertilizer?

Under which conditions and with which long-term perspective, especially with regard to soil quality?

Situations of stress

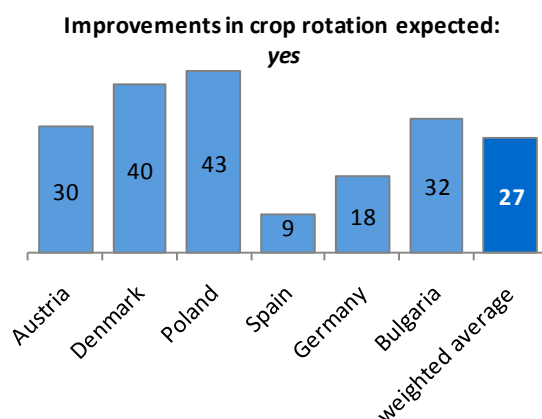
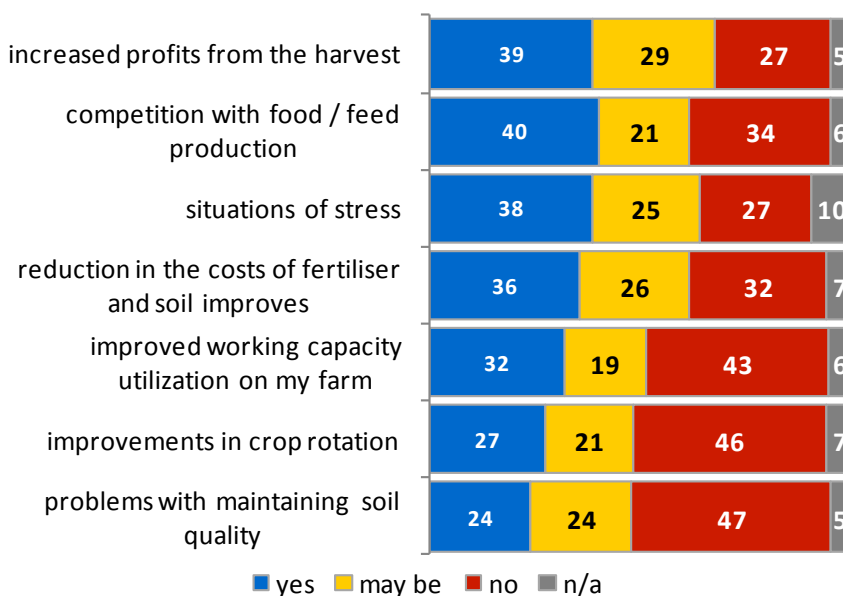
With a similar rate of importance, *situations of stress* are expected (38 % *yes*, 25 % *maybe*, 27 % *no*). German and Austrian organic farmers are most affected by that fear (45 % resp. 47 % *yes*), whereas Danish significantly keep cool (14 % *yes*, 48 % *no*). Reasons for these differences may be sought in different societal frameworks, funding schemes and their predictability, bureaucracy, individual or cultural determinants and other factors.

Further knowledge transfer and training provided for organic farmers and awareness building among consumers and politicians may help to reduce stress.

Another negative expectation originates from unclearness in availability of resources. 40 % of the organic farmers expect *competition with food or feed production*. Most competition is expected in Germany (58 %), probably originating from high biogas production density in some regions, and in Spain (56 %, despite low densities).

A sustainable biogas production in organic farming will avoid food / feed competition – this will have to be argued.

Figure 6: What would be in your opinion the effects of a biogas plant on your farm? (If you already run a biogas plant: What are the effects?)



All numbers are percentages, total n=696, SUSTAINGAS 2013

Less but also important are expectations concerning *problems with maintaining soil quality* (25 %, most often named in Germany, Austria and Bulgaria).

Improvements in crop rotation are expected by 32 %, and there is a correlation with farm sizes: Larger farms may more easily adapt their crop rotation to both the needs of organic production and biogas production, whereas smaller farms need co-operation and agreements with other organic farmers in the neighborhood in order to achieve the same.

One third of the respondents expect *improved working capacity utilization on their farm*. These advantages are most expected in Poland, Bulgaria and Spain. In Bulgaria and Poland this expectation may be triggered by the prevailing high agricultural sector share in employment.

Again, an open answer category has been provided. 125 answers have been achieved, in the majority of cases (71) positive effects have been named. One third of the respondents (48) expect negative effects. For other farmers biogas technology is not suitable (e.g. because of the size of the farm). In detail, the following positive effects have been considered (absolute number of answers in brackets):

- additional income, saving of costs for heating, fertilizing (18)
- increasing self-sufficiency in heat and power supply (18)
- better waste material use (16)
- better fertilizer balance (9)
- less odour emissions (5)
- economical risk spreading by diversification (5)

Negative expectations considered:

- ecological problems concerning humus, biodiversity, soil compaction (22)
- fears concerning a bad economy of the plant, dependency on state subsidies and other economical risks (13)
- land use competition (10)
- animal health problems (botulism ...) (2)

Sustainability – the most important issue

The responding organic farmers value and specify principles of a sustainable production of biogas. In sum, 538 answers (exclusive *I don't know*) have been achieved. The question "*Many organic farmers consider producing biogas in a sustainable way. In your view, what is*

important for a sustainable production of biogas?” seems to be highly important for organic farmers, and most of them have a clear opinion concerning sustainability priorities.

Table 3: “Many organic farmers consider producing biogas in a sustainable way. In your view, what is important for a sustainable production of biogas?” – categorized and counted text answers

answer	number of answers
economy	119
use wastes / residuals only	105
available raw materials, low distances, capacity	94
catch crops, crop rotation	48
fertilizer / C / humus balanced	41
optimal location for using heat, power, gas	38
small plants	34
knowledge, business plan, pilot projects, information	30
no competition in land use food / feed	24
co-operation with farmers and consumers, local / public support	22
technology, reliable, simple	20
financing	15
low or no input of maize	13
no bureaucracy	13
use household wastes and other materials	13
do not disturb others	9
reliable CO ₂ -balance / ecological footprint	8
other	11
no way	37
don't know	67

A country split is provided in the Annex
Absolute values, total n=696, SUSTAINGAS 2013

Most of the answers concern the *economy* of the plant. A biogas plant on an organic farm will never work sustainable, if it is not economically feasible. Feeding-in tariffs and subsidies are crucial to the economy. Especially in Eastern European countries, a proper *financing* of a plant is a predominating demand, indicating that there seems to be deficits in financing opportunities.

**Economic
sustainability**

Ethical sustainability

Organic farms very often require that only *use wastes and residuals* should be used, especially those from animal husbandry. Interestingly, many organic farmers demand that framework conditions for using *other residual wastes* should be improved. Household wastes and other materials should become feasible for organic biogas production.

It is very important that these *materials are available* to the farm, transport distances should be low. The farm needs a certain capacity in terms of raw material availability (which could also be acquired by co-operation with other organic farms).

Using *catch crops* (like clover) as an input material is an option for many organic farmers. Crop rotation should anyhow form an integral part of organic farm management. But there are also some organic farmers who oppose to use even catch crops. A low or even no input of *maize* is generally demanded. Generally, no *competition in land use* for food and feed should occur.

Environmental sustainability

There is high consensus upon the target, to *build up soil quality*, especially humus. Most of the farmers agree that biogas could contribute positively to that objective, but there are some sceptical remarks concerning long-term effects.

Another precondition for a sustainable operation of a biogas plant is the *optimal exploitation of the energy* used. This refers to the efficiency in electrical energy production as well as to the use of waste heat. Therefore, optimal locations of plants have to be chosen, e.g. in the near of heat consumers. A *reliable CO₂-balance / ecological footprint* must be argued.

Many respondents would prefer *small plants*. Because of large transportation distances, they regard large plants as being not ecological feasible. On the other hand, they understand that small plants face problems with both the economy and the technical stability. A reliable and simple *technology* is a precondition for a sustainable operation of a biogas plant.

There is a demand for technically and economically sound small biogas plants – more R&D should be invested here.

Much consideration reflects *information and knowledge*. Plants should be built according to realistic business plans, and it would be necessary to acquire knowledge from well-functioning pilot projects.

Also, social qualities are demanded. For running biogas plants, organic farmers will need *co-operation*, e.g. with other organic farmers in order to build up capacity, or co-operation with consumers, a positive relationship to local and regional authorities. *Public support* is necessary. The plant should *not disturb neighbours*. Receiving funding and complying with national regulations will afford *bureaucratic work*, and the efforts for doing this are limited.

Social sustainability

2.3 Hindrances

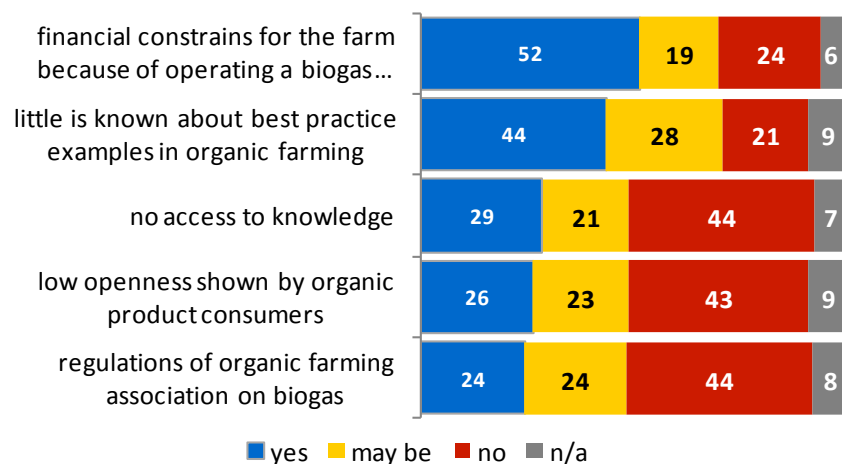
As the former paragraph already indicates, there are also hindrances that should be dealt with, in order to promote a sustainable biogas production on organic farms. In order of importance, the following hindrances have been named in the survey, question *What do you regard as a hindrance for a biogas plant on your organic farm?*

1. financial constrains for the farm because of operating a biogas plant (52 % answer *yes*, 19 % *maybe* and 24 % *no*)
2. little is known about best practice examples in organic farming (44 % answer *yes*, 28 % *maybe* and 21 % *no*)
3. no access to knowledge (29 % answer *yes*, 21 % *maybe* and 44 % *no*)
4. low openness shown by organic product consumers (26 % answer *yes*, 23 % *maybe* and 43 % *no*)
5. regulations of organic farming association on biogas (24 % answer *yes*, 24 % *maybe* and 44 % *no*)

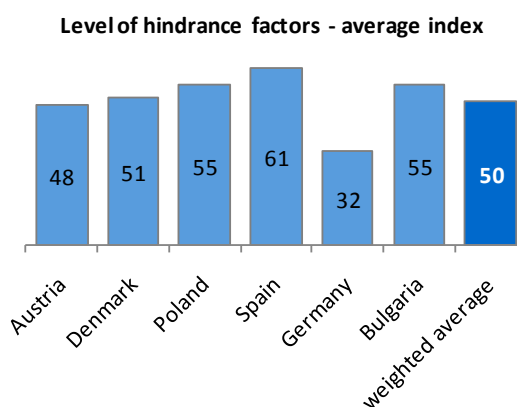
Organic farmers therefore regard financial constrains and little knowledge about best practice examples as the most dominant hindrances for a biogas plant on their farm. These hindrances are dominant in all countries, in some also a lack of knowledge. But the countries differ strongly with respect to the relevance of hindrances in total. Bulgaria, Poland and Spain are most affected from hindrances, Austria and Denmark less, and Germany least.

Financial hindrances and missing best practice

Figure 7: What do you regard as a hindrance for a biogas plant on your organic farm?



All numbers are percentages, total n=696



Index values 0=least, 100 highest
SUSTAINGAS 2013

It is an interesting observation, that *best practice examples* are demanded significantly, even more than *access to knowledge*. This especially applies to Austria, and even to Germany.

Demonstrating and establishing best practice examples and disseminating knowledge about best practices are an important issue for all countries.

Regulations of organic farming associations on biogas are the least important hindrance factor, as organic farmers state in the European

average. Though, there are important national differences. In Spain and Poland organic regulations are more critical than in other countries. In Germany, only a minority of about 9 % regard regulations of organic farming associations on biogas as being critical.

In total, 24 % of the respondents are unsatisfied with the regulations of organic farming associations on biogas. This is a relative low value, but nevertheless seems to encourage a broader discussion on biogas in organic farming.

A broader discussion on biogas in organic farming is encouraged. Members of organic farming associations should clarify and find consensus on standards. On a European level organic farming associations could transfer regulations' experiences.

This is an important issue, as many expectations cast on the promotional activities of organic farming associations, as will be pointed out in the next chapter.

188 answers have been attained by allowing textual answers to the question. The most common answer has been *my farm is too small, I do not have enough materials* (69 answers). Again, *ethical aspects* are put forward (40 answers). 24 organic farmers claim that biogas production would *not be profitable*, and further 25 that their *farm is not feasible*, either because of the production focus or because of the location.

2.4 Demands for promotion and information

Biogas from organic farms or ecological enterprises is still relatively unknown. Promotional activities therefore are very important for organic farmers who engage in biogas production. Organic farming associations and green movement networks will definitely have to play an important role in making customers aware of this issue.

Will organic associations and biogas associations co-operate?

This is a striking result. For conventional biogas production, classical biogas interest groups have been the most important supporters of public promotion. In case of biogas production on organic farms, they are still important as a promoter, but organic farmers' associations are regarded as even more important:

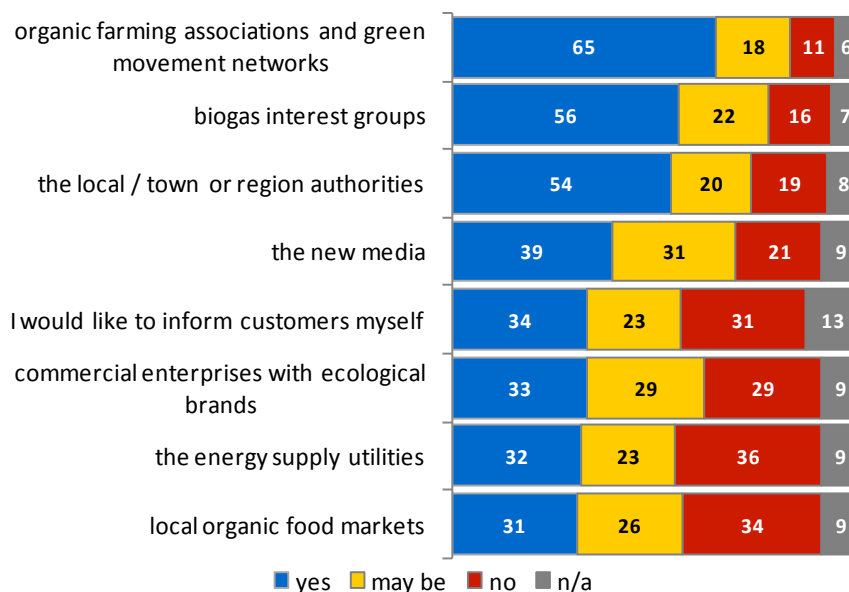
- 65 % of the organic farmers claim, that organic farmers' associations should be informing and making customers aware of this issue
- 56 % of the organic farmers expect an engagement of biogas interest groups

Both type of associations seem to be similar important for promotion of sustainable biogas from organic farming, but organic farmers slightly rely more on their own associations.

When organic farmers will position their biogas production, they will seek help from both type of association. For organic associations may become a topic they have to adapt and gain competence. For biogas associations this may seem as a new competitor entering the market.

In order to optimally strengthen the rural area, the agricultural sector and sustainable development it is strongly advised that biogas and organic associations seek for communication, mutual experience exchange and bundling of forces.

Figure 8: Biogas from organic farms/ecological enterprises is still relatively unknown. Who in your view should be informing and making customers aware of this issue?



All numbers are percentages, total n=696, SUSTAINGAS 2013

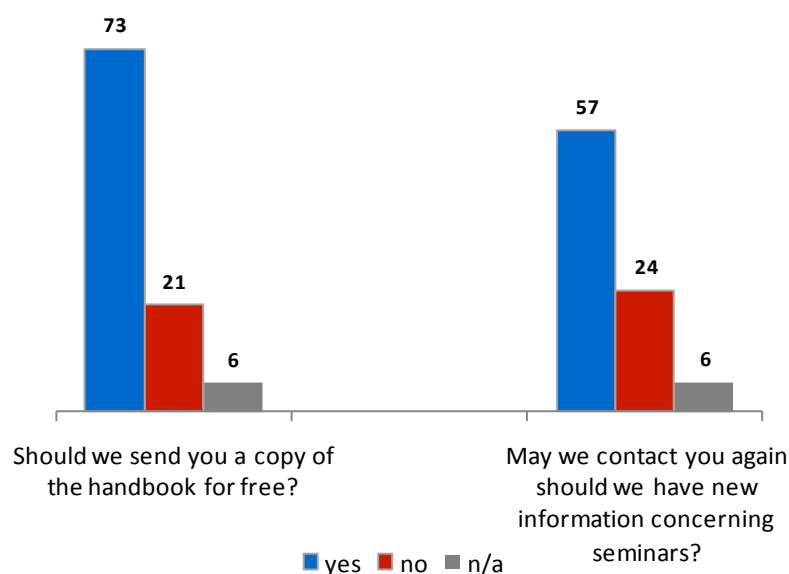
There are other information actors that will also play an important role in promotional activities for sustainable biogas from organic farms. These are especially the local / town or region authorities (54 % yes) and the new media (39 % yes). Both these communication channels need a personal engagement of the organic farmer. In most cases, the farmer will know regional and local authorities, and especially the younger generation of organic farmers is familiar with new media. But the answer category *I would like to inform customers myself* is affirmed by only 34 % of the respondents, whereas 31 % prefer to be not responsible for customer information.

There will be a need for making organic farmers aware of the necessity and the chances lying in customer information. Training and materials developed by national organic associations should ease the access of organic farmers to promotional activities directed at local / town or region authorities and the public (via the new media)

A third of the responding organic farmers also would like other actors being involved in customer information: the *energy supply*

utilities, commercial enterprises with ecological brands, and local organic food markets.

Figure 9: There will be a biogas handbook for organic farmers in some months. Should we send you a copy of the handbook for free? – May we contact you again should we have new information concerning seminars?



All numbers are percentages, total n=696, SUSTAINGAS 2013

An information demand is also reflected in the last question:

- 73 % of the responding organic farmers are interested in receiving a biogas handbook for organic farmers for free.
- 57 % of the responding organic farmers are interested in being contacted again should there be new information concerning seminars.

The highest acceptance and information need is in those countries that are today lagging behind in agricultural biogas production (Bulgaria, Poland, Spain).

3 Market potential for sustainable organic biogas production

In this paragraph, the market potential for sustainable organic biogas production is estimated, based on calculations using factual data and questionnaire responses.

3.1 Personal interest and planning

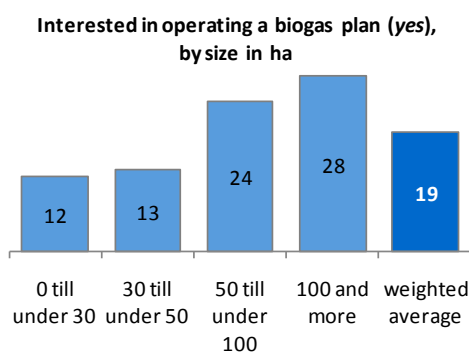
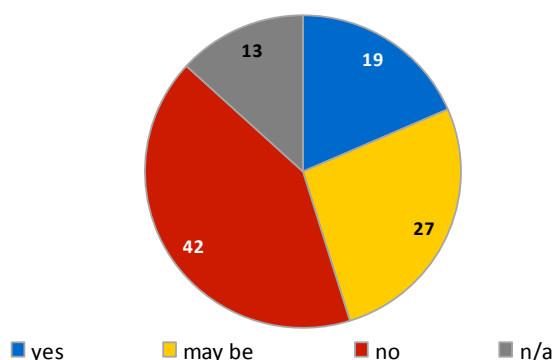
3.1.1 Personal interest

About half of the respondents of the questionnaire action show personal interest in operating a biogas plant. 19 % clearly answer with *yes*, when asked: Are you interested in operating a biogas plant? Further 27 % answer with *maybe*, and less than half of the respondents (42 %) reject. As 13 % do not answer the question, the total positive responses surmount the negative ones (47 % by 42 %). The highest personal interest rates in operating a biogas plant are observed in Bulgaria and Spain – those countries with a low penetration of biogas plants in general (see following chapter).

Generally, there is also a positive correlation with the size of farms, both in hectares farm land as well as in livestock units. 62 % of the large sized (>100 ha) organic farms are interested in operating a biogas plant; this is more than the average.

**More than 50 %
respond positively**

Figure 10: Are you interested in operating a biogas plant? Answer categories: yes, no or may be

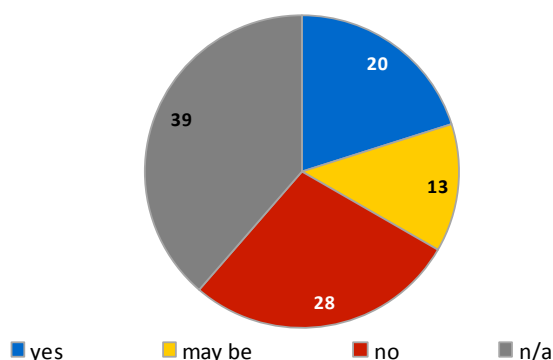


All numbers are percentages, total n=696, SUSTAINGAS 2013

Number of organic farmers interested in biogas on their own farm quite high

When asked, whether the biogas plant should be located on the own farm, there is a variety of answers. The question *On your own farm?* has only been posed to organic farmers already showing interest (*yes* or *maybe*) in operating a biogas plant. Half of the respondents are in favor (*yes* or *maybe*) of an own on-farm plant, half of the respondents opposes and therefore prefers the operation “not in my backyard”. Remark: Reference to the NIMBY principle is unsuitable here. NIMBY implies that people want to avoid the problems / side-effects connected to something that they generally approve of as necessary or positive. Here, the text is about farmers who are interested in cooperating in a biogas business, but not on their own farm. There are many possible reasons for this and only to some of them NIMBY would apply. Organic farmers might just be realistic – less than 25 % of respondents have more than 100 ha or 100 livestock units, so many could just be too small to take the lead in such a large new venture.

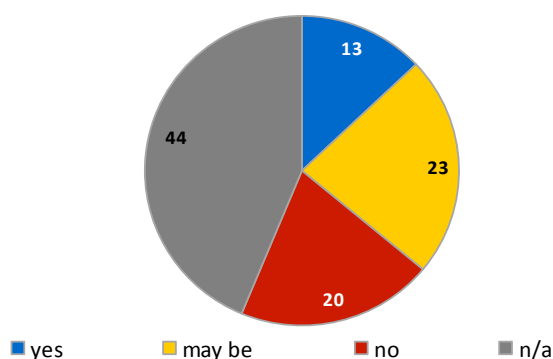
*Figure 11: When interested in operating a biogas plant (YES or MAYBE):
On your own farm? Answer categories: yes, no or may be*



All numbers are percentages, total n=696, SUSTAINGAS 2013

Most of organic farmers interested in operating a biogas plant would cooperate with other people. Experiences in Austria e.g. show, that these people would not only be other farmers (as material suppliers, operators, investors ...) but also end users (neighbors, heat users, fuel consumers, investors, promoters ...)

*Figure 12: When interested in operating a biogas plant (YES or MAYBE):
Together with other people? Answer categories: yes, no or may be*



All numbers are percentages, total n=696, SUSTAINGAS 2013

The idea of cooperation is important to many organic farmers who are interested in operating a biogas plant. This applies to all countries. Aspects of communication therefore should be part of any promotional activity.

3.1.2 Definite planning

Unfortunately, people often do not behave as they committed themselves, as unconscious factors are involved in practical decision making as well as in answering questionnaires. The questions concerning interest in operating a biogas plant have been posed right at the beginning of any interview. As a control and more tangible, a similar question has been repeated at the end of the interviews, after assessing a range of demands and expectations (described in the previous chapter): *Please assess on a scale of 0 to 10 how probable it is that you will be operating a plant within the next ten years.*

The results achieved show a high correlation: a commitment for operating a plant within the next ten years indicates an interest, and, vice versa, a pronounced interest in operating a plant means – in many cases – a definite planning for the next ten years. However, the share indicating a definite planning is less than the share showing just interest.

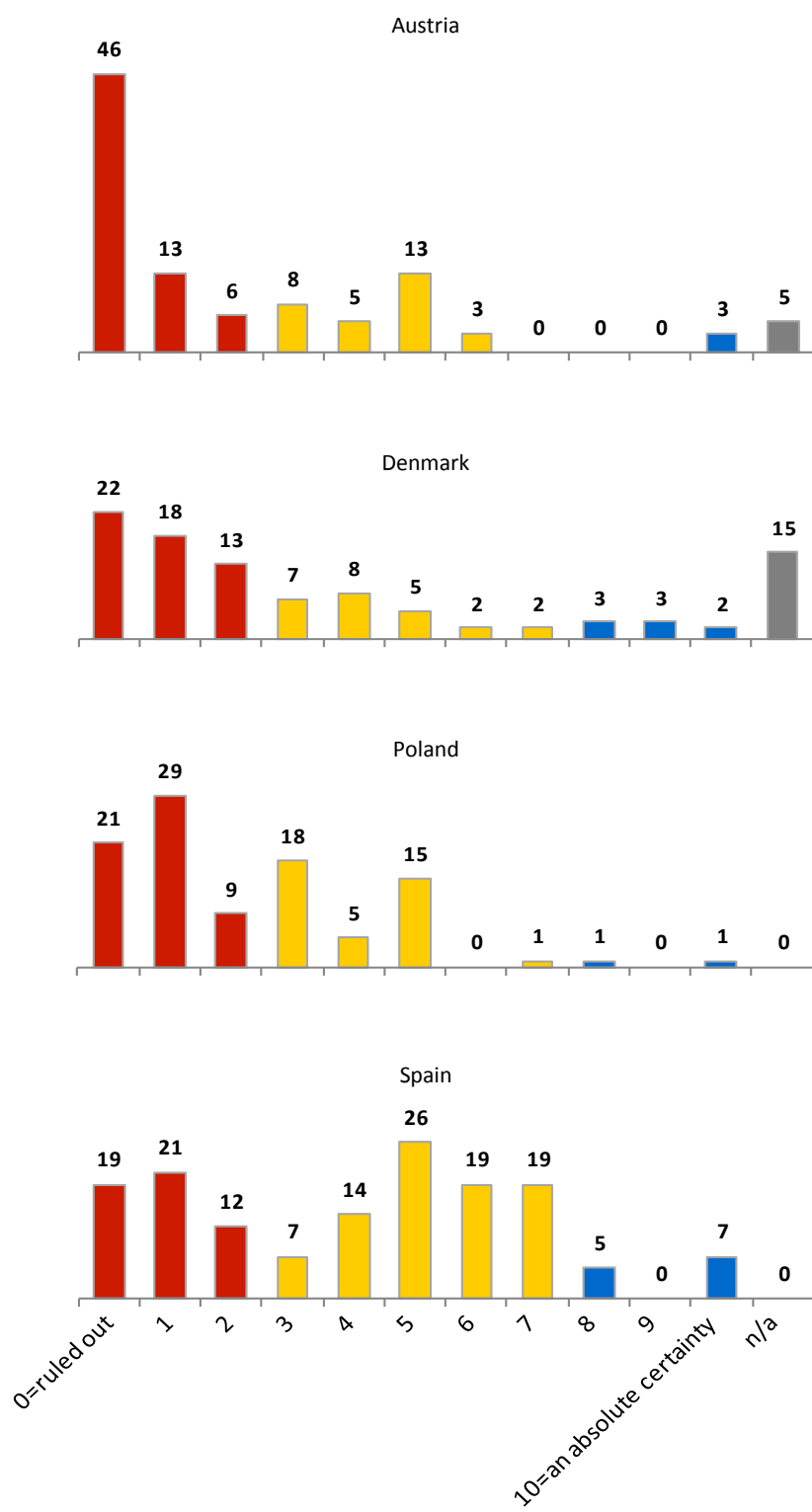
28 % of the respondents definitely rule out that they will be operating a plant within the next ten years (category 0, see last graphic in figure 13), and another 30 % rate their inclination towards a concrete planning within the categories 1 and 2 on an 11-point Likert scale.

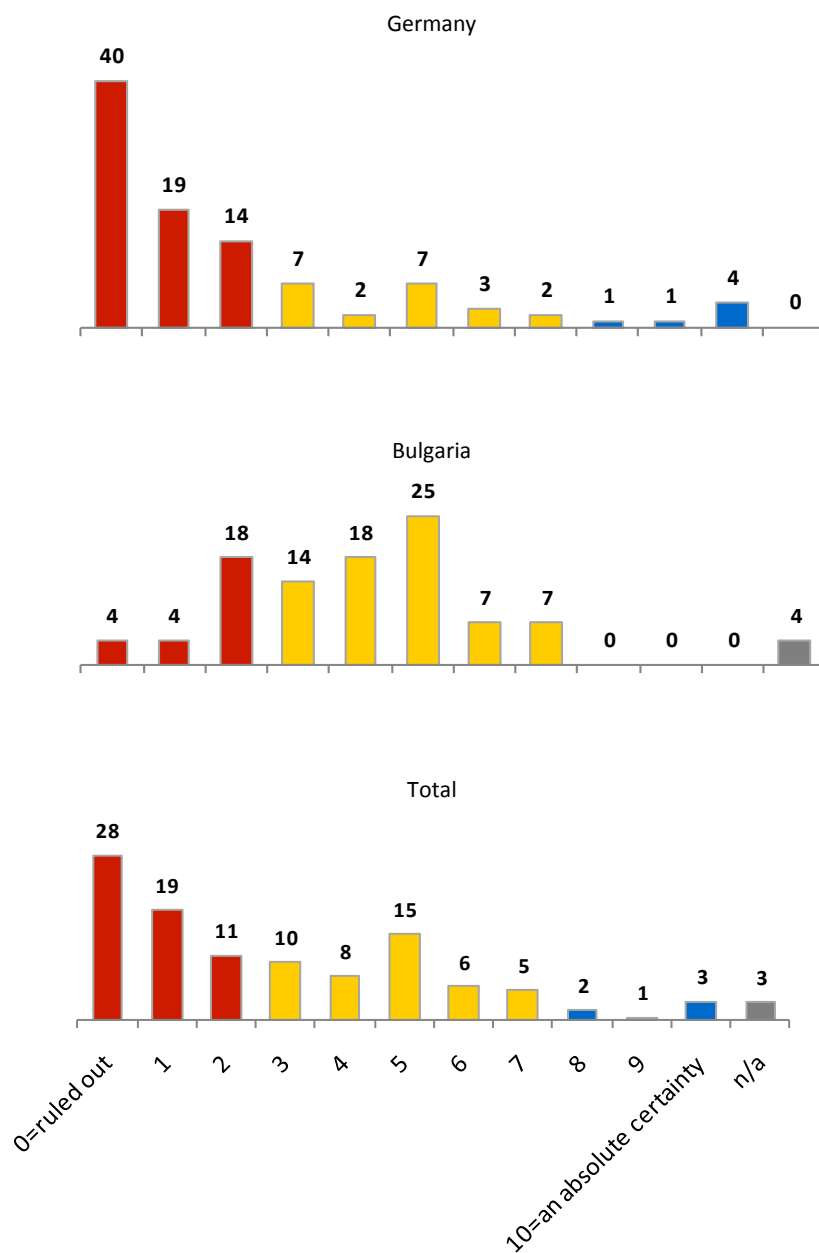
6 % commit a high willingness to operate a plant within the next ten years

A commitment of *10 absolute certainty* has been declared by 3.3 % of the respondents, and other 2.4 % are highly liable to engage in operating a biogas plant (categories 8 and 9). The positive respondents make up for 17 %, altogether (categories 6 to 10), and the indefinite are 15 % (category 5).

The most interesting subgroup is those organic farmers in category 8 to 10, meaning high willingness to engage in operating a plant within the next ten years. They account for 6 % in total, 12 % in Spain, 8 % in Denmark, 6 % in Germany, 3 % in Austria, 2 % in Poland, and 0 % in Bulgaria.

Figure 13: Please assess on a scale of 0 to 10 how probable it is that you will be operating a plant within the next ten years





Answer categories: an 11-point Likert scale, ranging from 0=ruled out to 10=an absolute certainty. All numbers are percentages, total n=696, SUSTAINGAS 2013

3.2 Actual diffusion and prognosis

The area for organic farming in the European Union amounted to 9.5 million hectares in 2011 (EU-29) with an average annual growth rate of 7.3 % during the recent six years (2005–2011), see FiBL (2013) and EC (2010).

Even in Germany – the most advanced market for biogas production in organic farming – only 0.74 % of the organic farms are operating a biogas plant. The total installed electrical capacity from biogas plants in organic farming in the European Union is still below 50 MW.

Total theoretical potential in the European Union for biogas plants supplied by organic farming amounts to roughly 4 GW_{el} installed electrical capacity in 2011. The average potential per area is 0.44 kW_{el} installed electrical capacity for organic residues stemming from 1 hectare of organic farming area (including residues from animal husbandry).

Based on a reasonably expected continuous annual growth rate of 7.3 % for organic farming in the European Union, the total potential will increase to almost 8 GW_{el} until 2020. This is a conservative approach as the trend towards organic farming and therefore the annual growth rate will rather increase in the European Union due to raising awareness of the population.

A diffusion prognosis for sustainable growth in biogas production in organic farming is connecting at least 5 % of the organic farming area to a biogas plant by 2020. This will trigger a cumulated additional installed electrical capacity of 337 MW_{el} with an investment of 1,180 million Euro resulting in 645,000 toe/a renewable energy production and 1,200,000 t CO₂/a emission reductions in 2020.

Broken down by country, yet there is no direct relationship between diffusion of biogas plants and diffusion of organic farming. Though both industries address environmental targets and both depend on public support, their penetration does not correlate. The data do not reflect a general underlying policy strategy (on a European level¹) that applies to both, organic farming *and* biogas production.

¹ with national exceptions, see e.g. action plan of the Danish Ministry of Food dealing with biogas as a promoter for organic farming. <http://fvm.dk/landbrug/indsatsomraader/oekologi/oekologisk-handlingsplan-2020/>

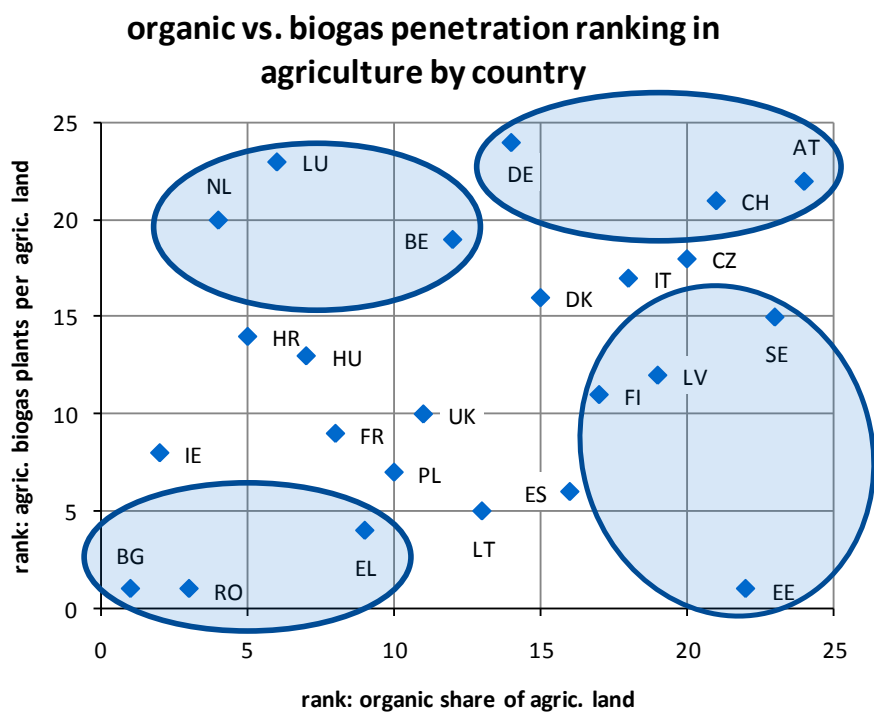
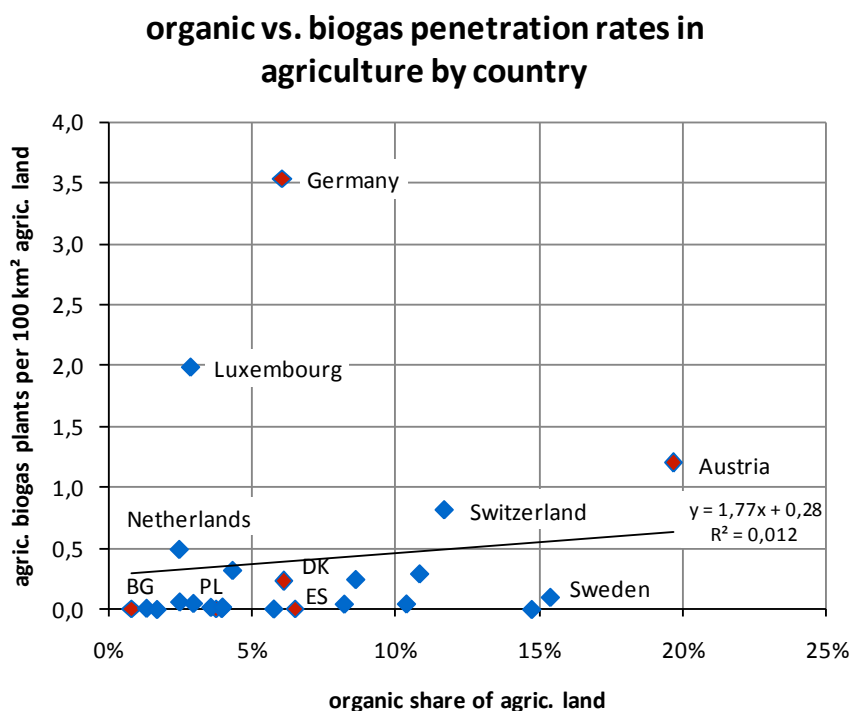
By country, diverse and as well coherent penetration of environmental industries is observed:

- **category I**
low penetration of organic farming
low penetration of agricultural biogas production
examples: Bulgaria, Romania
- **category II**
high penetration of organic farming
low penetration of agricultural biogas production
examples: Baltic Sea countries like Sweden, Finland, Estonia, Latvia
- **category III**
low penetration of organic farming
high penetration of agricultural biogas production
examples: Benelux countries Belgium, The Netherlands, Luxembourg
- **category IV**
high penetration of organic farming
high penetration of agricultural biogas production
examples: Germany, Swiss, Austria

Only in category II and IV there is also some penetration of biogas production in organic farms.

A stronger relating of energy and agricultural environmental policies should be fostered among European countries, in order to create the framework conditions for growth in sustainable renewable energy production using biogas from organic farms.

Figure 14: Penetration rates of organic farming and agricultural biogas production by country



The rank of a value in a distribution is its numbered place in the list of ordered values (here: in ascending order). Source: © Studia Schlierbach

4 Summary and consequences

The market analysis found information for addressing the market, especially hindrances and promoting factors for organic farmers to introduce sustainable organic biogas production:

Heat and electricity generation are the dominant direct purposes for using biogas on organic farms. But vehicle fuelling is an appealing alternative (yet not implemented on organic farms), especially because many organic farmers are interested in becoming self-sufficient in energy supply. Besides using biogas for heating purposes on their farm / private home, drying purposes are important to support further processing of organic and other products. Further, a most important effect is the increase of harvest yields by on-farm usage of processed materials as a fertilizer, ensuring also maintaining of soil quality.

As hindering factors for diffusion of biogas production on organic farms, the organic farmers fear situations of stress, competition with food / feed production and financial constraints. By choosing materials in a sustainable way competition with food / feed production may be avoided. Further knowledge transfer (especially concerning best practices) and training may reduce uncertainty among organic farmers. Also technological and economically sound small biogas plants for organic farmers should further be developed.

Knowledge transfer and training could best be promoted by organic farming associations in cooperation with biogas associations. For informing the customers, these organisations as well as local authorities should co-operate.

In the total sample, about 6 % of the organic farmers clearly declare or regard it as highly probable that they will operate a plant within the next 10 years (categories 8 to 10 on an 11-point Likert scale, 0 means ruled out, 10 means absolute certainty). A stronger relating of energy and agricultural environmental policies should be fostered among European countries.

The market study has been based upon surveys. Target group have been organic farmers in six European countries: Austria, Bulgaria, Germany, Denmark, Spain and Poland, and 696 respondents answered.

The results are representative for the countries studied, as well – to a certain degree as these countries represent European regions – for the EU in general.

Consequences

1. Efforts to promote organic biogas have to take into account the farmers' questions, concerns and interests. Biogas associations should cooperate with organic farming associations, to help organic farmers with their problems and plans, as well as to promote organic biogas production publicly.
2. Legal framework (including feed-in-tariffs) and state funding should be more reliable, so that the framework for organic farmers and their biogas production is clear.
3. Also the issue of using organic waste materials should be taken into account when considering the potential of biogas production on organic farms.
4. Alternative markets for biogas should be considered more, like feeding into the national gas grid or regional use of biogas as fuel.
5. For opening up these options to organic farmers, biogas upgrading and grid insertion technology will have to be further developed.
6. Downscaled or new small-scale solutions will have to be improved. There is a high need for good practice examples focused on small scale solutions (30-40 kW). Good practice examples should be specific for each country. Therefore, a demonstration project on very small scale biogas plant on organic farm would help a lot.
7. In some countries (e.g. Denmark, Germany, Austria) there is a high awareness of potential benefits of biogas in organic farming, but this is indeed theory for many farmers. Evidence in the sense of economic successful biogas plants well integrated in the farm biomass cycle is urgently needed. So the provision of more secure economic conditions for the investments as well as displaying relevant best practice examples will help the development a lot.
8. In other countries (e.g. Bulgaria, Poland, Spain) information lacks have to be tackled, due to the relatively low penetration of biogas production and organic agriculture. The political will has to improve, and the business climate should be more stable and predictable.

5 Annex

5.1 References

Wolfgang E. Baaske, Bettina Lancaster (ed.) (2012), Product Description of Sustainable Organic Biogas, SUSTAINGAS Report D2.1, 31.12.2012, www.sustaingas.eu.

EC (2010), An analysis of the EU organic sector, European Commission Directorate-General for Agriculture and Rural Development, June 2010.

FiBL, Global organic farming statistics and news, <http://www.organic-world.net/statistics-data-tables-excel.html?&L=0#c6202>, 7.10.2013.

5.2 Tables of questionnaire results

Description: The tables reflect the survey results in general (total sample) as well as the results for specific subcategories, like countries, farms by size, interest in biogas production etc.

Absolute numbers are given in the second line (number of mentions) as well as in the second last column (Total). All other numbers are percentage values. The percentage values all refer to the comparative number of mentions (line 2). This means, e.g.:

- The total sample comprises 696 observations on organic farms. 548 have been organic farmers longer than 5 years. This results in a percentage value of 79 %. These numbers are documented in the last two columns of the tables.
- For all the subcategories only the percentage values are presented. For Poland e.g., 96 % have been organic farmers longer than 5 years. This refers to a comparative value of 80 organic farms, which have been surveyed in Poland.

The *weighted average* (third last column) gives a representative figure for the six countries, not overweighing e.g. the high number of German respondents. The figure also may reflect a European result, as

the selection of the six countries reflects European regions. More details are explained in chapter 2.

Table 4: “Many organic farmers consider producing biogas in a sustainable way. In your view, what is important for a sustainable production of biogas?” – categorized and counted text answers

answer	AT	BG	DK	DE	PL	ES	Total
economy	14	6	20	14	17	29	16
use wastes / residuals only	20	0	12	18	5	0	14
available raw materials, low distances, capacity	0	29	14	14	5	6	12
catch crops, crop rotation	20	0	7	6	2	0	6
fertilizer / C / humus balanced	4	0	16	3	1	0	5
optimal location for using heat, power, gas	4	0	6	5	8	0	5
small plants	2	0	1	8	0	0	4
knowledge, business plan, pilot projects, information	2	11	2	2	6	26	4
no competition in land use food / feed	4	0	3	4	0	0	3
co-operation with farmers and consumers, local / public support	2	0	3	1	2	26	3
technology, reliable, simple	2	3	3	3	1	0	3
financing	0	29	0	1	2	0	2
low or no input of maize	2	0	0	3	0	0	2
no bureaucracy	0	23	0	0	2	3	2
use household wastes and other materials	0	0	5	1	1	0	2
do not disturb others	0	0	1	1	2	0	1
reliable CO ₂ -balance / ecological footprint	2	0	3	0	0	0	1
other	4	0	3	1	0	0	1
no way	10	0	1	8	0	0	5
don't know	6	0	1	6	43	9	9
sum	100	100	100	100	100	100	100

Percentage values, total n=696, SUSTAINGAS 2013

	F1: Since when have you been an organic farmer?		F2: Do you operate a biogas plant on your own or together with other farmers?		F3: Are you interested in operating a biogas plant?		F11.1 Livestock units				F11.2 Total hectares				Country						weighted average	Total	
	longer than 5 years	less than 5 years	yes	no	no	yes, maybe	0	1 till under 25	25 till under 100	100 and more	0 till under 30	30 till under 50	50 till under 100	100 and more	Austria	Denmark	Poland	Spain	Germany	Bulgaria		Total	%
<i>number of mentions</i>	548	108	10	347	354	302	361	101	135	99	382	75	92	147	80	129	80	43	336	28		696	100
1. Since when have you been an organic farmer?																							
n/a	0	0	0	1	1	0	1	0	0	1	1	0	1	1	0	2	0	0	0	4	0,55	4	1
longer than 5 years	100	0	100	80	81	78	78	85	77	79	73	87	82	89	88	91	96	40	77	25	73,5	548	79
less than 5 years	0	100	0	17	13	17	16	10	18	16	20	11	13	8	11	5	4	53	15	57	21,5	108	16
in transition process from conventional to organic	0	0	0	2	5	5	5	5	5	4	7	3	4	2	0	0	0	7	8	14	4,05	34	5
we are not an organic farm	0	0	0	1	1	0	1	0	0	0	1	0	0	0	1	1	0	0	0	0	0,33	2	0
2. Do you operate a biogas plant on your own or together with other farmers?																							
n/a	47	46	0	0	58	40	63	38	41	17	64	40	39	18	1	1	0	0	100	4	20,6	339	49
yes	2	0	100	0	1	2	2	0	1	2	0	3	4	2	11	1	0	0	0	0	2,33	10	1
no	51	54	0	100	41	58	35	62	58	81	35	57	57	80	88	98	100	100	0	96	77,1	347	50
3. Now there comes a series of questions, please answer them with yes, no or may be.																							
<i>Are you interested in operating a biogas plant?</i>																							
n/a	4	10	20	7	0	0	2	1	7	21	9	1	2	1	4	1	0	56	3	7	13,3	40	6
yes	18	15	60	20	0	39	17	8	16	26	12	13	24	28	20	23	13	12	12	57	18,6	118	17
no	53	43	20	42	100	0	58	56	47	24	54	67	47	37	60	38	59	0	62	11	41,8	354	51
may be	25	32	0	31	0	61	22	35	30	28	25	19	27	34	16	38	29	33	23	25	26,8	184	26
<i>When YES or MAY BE: On your own farm?</i>																							
n/a	38	14	50	62	40	25	26	47	32	47	20	48	47	53	66	88	59	0	3	29	38,8	232	33
yes	16	15	30	21	0	34	12	14	17	27	12	13	13	29	16	12	39	16	10	32	20,1	108	16
no	36	56	20	10	59	20	52	32	37	8	56	36	27	8	13	0	3	44	72	21	28	278	40
may be	10	15	0	7	1	20	9	8	14	17	13	3	13	10	5	0	0	40	15	18	13,4	78	11
<i>Together with other people?</i>																							
n/a	40	22	60	68	40	30	28	44	36	62	22	49	46	61	64	100	59	19	3	32	43,9	254	36
yes	9	17	30	10	1	21	12	8	10	8	11	4	13	9	19	0	8	16	10	32	13	71	10
no	32	31	10	8	52	11	41	27	28	11	43	27	22	13	8	0	13	16	58	18	20,4	224	32
may be	19	31	0	14	7	39	19	22	27	19	23	20	20	17	10	0	21	49	29	18	23,2	147	21
4. What would be in your opinion the effects of a biogas plant on your farm?																							
<i>(If you already run a biogas plant: What are the effects?)</i>																							
<i>reduction in the costs of fertiliser and soil improves</i>																							
n/a	2	7	20	5	3	1	4	0	4	4	4	0	4	2	9	5	0	19	0	7	6,75	23	3
yes	30	37	50	38	18	47	33	26	27	32	29	32	35	33	30	35	40	33	23	79	35,5	214	31
no	43	34	10	31	57	27	41	47	44	34	45	45	32	37	44	35	24	14	54	7	32,1	289	42
may be	25	21	20	26	22	25	22	28	26	29	22	23	29	29	18	26	36	35	23	7	26,2	170	24
<i>increased profits from the harvest</i>																							
n/a	2	6	10	6	4	2	5	1	1	1	4	3	4	2	13	4	0	2	0	25	5,38	23	3
yes	36	40	80	42	21	56	38	32	33	43	31	33	50	45	30	48	41	37	31	64	38,6	257	37
no	33	31	0	23	48	15	34	32	33	28	40	36	18	19	29	23	20	30	43	0	27,3	226	32
may be	28	22	10	29	27	27	23	36	33	27	25	28	27	34	29	25	39	30	26	11	28,8	190	27
<i>improved working capacity utilization on my farm</i>																							
n/a	3	5	20	6	4	1	5	1	2	2	4	3	5	2	14	5	0	9	0	11	6,05	24	3
yes	19	31	30	28	10	31	20	14	25	26	24	17	14	21	24	7	39	53	15	61	31,7	148	21
no	60	48	40	43	72	42	57	58	60	53	59	65	50	52	46	61	36	23	72	0	43	396	57
may be	19	16	10	23	14	25	18	27	13	19	14	15	30	24	16	27	25	14	14	29	19,4	128	18

	F1: Since when have you been an organic farmer?		F2: Do you operate a biogas plant on your own or together with other farmers?		F3: Are you interested in operating a biogas plant?		F11.1 Livestock units				F11.2 Total hectares				Country						weighted average	Total		
	longer than 5 years	less than 5 years	yes	no	no	yes, maybe	0	1 till under 25	25 till under 100	100 and more	0 till under 30	30 till under 50	50 till under 100	100 and more	Austria	Denmark	Poland	Spain	Germany	Bulgaria		Total	%	
5. What purposes would you use the biogas for? (if you already run a plant: What purposes do you use the biogas for?)	competition with food / feed production																							
	n/a	3	5	20	6	4	3	6	2	1	1	4	3	5	2	15	5	0	0	0	25	5,5	25	4
	yes	44	43	10	33	53	34	47	44	43	39	48	51	34	37	23	28	38	56	58	25	40,4	309	44
	no	35	31	60	35	29	42	32	35	38	37	32	32	42	37	54	41	23	26	33	18	33,7	240	34
	may be	17	21	10	26	15	21	15	20	19	22	16	15	18	23	9	26	40	19	10	32	21,3	122	18
	problems with maintaining soil quality																							
	n/a	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	yes	3	6	20	6	4	2	6	1	1	0	3	3	4	3	14	5	0	2	0	21	5,4	24	3
	no	28	25	0	23	36	17	28	32	22	22	30	24	23	22	24	22	20	19	31	32	24	185	27
	may be	47	44	70	48	35	59	44	40	50	57	44	45	51	49	46	53	46	56	44	25	46,9	322	46
	improvements in crop rotation																							
	n/a	23	26	10	23	25	23	22	28	27	21	23	28	22	26	16	20	34	23	25	21	23,7	165	24
	yes	3	6	20	7	5	2	6	1	3	0	4	3	4	3	18	5	0	5	0	21	6,8	28	4
	no	29	15	40	34	15	41	27	28	25	24	19	29	37	37	30	40	43	9	18	32	27,4	184	26
	may be	50	56	10	38	66	35	50	50	52	53	59	49	36	41	33	36	34	60	66	32	45,5	355	51
	situations of stress																							
	n/a	18	22	30	21	14	23	16	21	20	23	17	19	23	19	20	20	24	26	16	14	20,8	129	19
	yes	5	9	20	11	6	6	9	5	3	2	6	4	12	4	30	5	0	0	0	43	9,85	42	6
	no	42	47	50	27	53	28	47	41	41	28	46	55	38	27	44	14	31	47	57	11	38,4	292	42
	may be	29	19	30	34	21	38	22	30	30	39	25	21	24	39	16	48	43	21	21	7	26,7	190	27
	other																							
	yes	24	25	0	28	20	28	23	25	26	30	23	20	26	30	10	33	26	33	22	39	25,3	172	25
	no	2	4	10	4	1	2	1	1	4	6	3	1	2	1	8	0	1	21	0	0	6	16	2
	may be	15	11	0	27	13	15	7	25	20	16	8	20	5	29	1	0	99	28	0	0	25,6	92	13
feeding it into the natural gas grid																								
n/a	1	1	10	1	0	1	0	0	1	3	1	1	1	1	3	0	0	7	0	0	2	5	1	
vehicle fuel																								
n/a	5	6	0	11	6	5	8	7	1	1	5	5	10	3	23	8	0	0	0	39	8,53	39	6	
yes	21	25	10	24	21	22	23	16	19	24	20	23	21	26	28	32	15	16	19	14	20,7	149	21	
no	47	49	60	41	49	43	45	47	49	48	49	48	45	42	36	33	56	60	53	21	46,7	325	47	
may be	27	19	30	24	23	30	24	31	30	26	26	24	25	29	14	28	29	23	29	25	24,4	183	26	
Electricity and heat generation																								
n/a	5	8	0	11	6	5	8	7	2	0	6	5	9	3	26	7	0	0	0	36	8,78	40	6	
yes	18	18	10	25	16	19	17	25	13	14	16	19	14	22	23	22	34	14	9	32	21,2	120	17	
no	43	41	70	33	50	31	43	34	43	43	43	43	38	41	28	22	48	30	51	7	34,7	292	42	
may be	35	33	20	31	28	45	31	35	41	42	35	33	39	34	24	36	19	56	40	25	34,2	244	35	
heating purposes on my farm / private home																								
n/a	3	0	0	5	3	2	4	5	1	1	4	3	0	1	10	7	0	0	0	11	3,7	20	3	
yes	67	68	70	67	62	74	69	62	63	72	66	60	73	69	69	56	78	60	68	82	68,2	467	67	
no	12	12	10	9	18	5	12	11	12	9	12	16	9	10	10	12	8	7	14	0	9,3	80	11	
may be	18	20	20	20	18	19	16	22	24	18	18	21	18	19	11	26	15	33	18	7	19,2	129	19	
6. Would you use (if you already run a plant: Do you use) the waste heat for ...																								
n/a	5	0	0	6	4	2	6	4	2	4	6	5	2	3	13	8	0	0	3	11	5,03	33	5	
yes	60	67	30	62	65	63	64	59	60	59	61	63	62	64	61	44	85	47	63	86	63,2	430	62	
no	20	12	40	16	20	17	18	20	16	20	18	19	22	18	19	27	6	9	21	0	14,4	128	18	
may be	14	21	30	16	11	19	12	17	21	17	15	13	14	16	8	21	9	44	13	4	17,7	105	15	

	F1: Since when have you been an organic farmer?		F2: Do you operate a biogas plant on your own or together with other farmers?		F3: Are you interested in operating a biogas plant?		F11.1 Livestock units				F11.2 Total hectares				Country						weighted average	Total				
	longer than 5 years	less than 5 years	yes	no	no	yes, maybe	0	1 till under 25	25 till under 100	100 and more	0 till under 30	30 till under 50	50 till under 100	100 and more	Austria	Denmark	Poland	Spain	Germany	Bulgaria		Total	%			
7. What do you regard as a hindrance for a biogas plant on your organic farm?	heating supply for residential settlements																									
	n/a	6	6	0	9	5	4	8	6	1	5	7	7	5	4	24	7	0	0	3	18	7,63	43	6		
	yes	26	31	50	29	23	31	30	20	18	34	26	12	28	35	20	38	21	16	24	54	25	185	27		
	no	45	39	40	40	52	34	41	47	51	35	44	55	45	33	45	29	64	40	46	7	43,2	298	43		
	may be	23	25	10	23	19	31	21	28	30	25	23	27	22	29	11	26	15	44	27	21	24,2	170	24		
	drying purposes																									
	n/a	5	2	0	8	5	3	7	4	2	5	7	7	3	3	16	8	0	0	3	21	6,38	39	6		
	yes	39	43	40	43	39	43	43	35	40	34	36	40	51	43	51	34	50	28	37	57	41,7	277	40		
	no	31	31	30	28	37	23	29	36	28	31	35	27	21	26	25	26	35	40	33	4	30,2	210	30		
	may be	25	25	30	21	19	32	21	26	30	29	22	27	25	29	8	32	15	33	27	18	22	170	24		
	other																									
	yes	1	0	10	2	1	1	1	0	2	2	0	3	1	2	8	0	0	2	0	0	2	7	1		
	no	15	18	0	30	14	16	7	24	24	24	11	20	5	29	1	0	100	53	0	0	30,8	104	15		
	may be	0	1	0	1	0	1	0	0	1	2	1	0	0	0	0	0	0	7	0	0	1,4	3	0		
	regulations of organic farming association on biogas																									
	n/a	5	4	20	10	6	4	8	1	3	2	6	5	4	4	21	9	3	0	0	21	7,5	37	5		
	yes	16	18	40	21	13	16	12	16	21	20	14	17	18	16	20	9	35	47	9	14	24,4	108	16		
	no	55	57	30	44	58	51	57	49	55	53	58	43	54	51	43	57	26	35	66	43	44,4	379	54		
	may be	25	21	10	25	23	29	23	35	21	25	21	35	23	29	16	25	36	19	25	21	23,9	172	25		
	financial constrains for the farm because of operating a biogas plant																									
	n/a	4	2	30	7	5	2	6	1	3	2	5	7	3	2	15	9	3	0	0	11	5,55	29	4		
	yes	45	44	40	62	39	53	36	57	45	65	37	48	51	61	41	74	68	56	28	50	51,6	313	45		
	no	33	31	30	16	42	21	39	25	33	16	37	33	24	23	29	8	21	9	49	21	24,2	224	32		
	may be	18	23	0	14	13	24	19	17	19	17	21	12	22	14	15	9	9	35	24	18	19,1	130	19		
	low openness shown by organic product consumers																									
	n/a	6	6	30	10	8	3	9	1	3	2	6	7	8	4	26	9	3	0	0	21	8,5	41	6		
	yes	22	30	30	23	31	15	21	30	28	21	26	24	16	21	18	13	39	35	25	18	26,4	165	24		
	no	49	40	40	45	42	54	47	43	47	53	44	45	52	55	36	56	44	37	51	29	42,8	330	47		
	may be	22	25	0	22	19	27	22	27	21	24	24	24	24	20	20	22	15	28	25	32	22,8	160	23		
	no access to knowledge																									
n/a	5	2	40	9	6	3	7	1	4	4	5	7	8	2	23	9	3	0	0	14	7,38	36	5			
yes	20	33	0	33	17	27	18	23	22	34	19	19	21	31	19	32	33	42	11	50	28,8	151	22			
no	58	44	60	37	64	48	61	58	54	35	59	59	48	51	45	34	54	14	75	25	43,7	388	56			
may be	17	20	0	21	12	22	14	18	20	26	17	16	24	16	14	25	11	44	14	11	20,6	121	17			
little is known about best practice examples in organic farming																										
n/a	6	3	30	10	8	3	8	2	4	3	6	9	7	3	26	9	3	0	0	21	8,5	41	6			
yes	41	38	60	48	38	45	39	37	45	43	36	37	45	50	49	53	50	40	32	39	43,8	281	40			
no	29	23	10	16	33	24	32	30	22	20	31	29	20	23	9	16	29	12	40	7	20,5	194	28			
may be	24	36	0	25	22	29	21	32	28	33	26	24	29	24	16	22	19	49	28	32	27,6	180	26			
other																										
yes	4	1	0	7	4	3	1	6	4	7	3	7	3	3	15	0	9	5	0	7	6,33	23	3			
no	14	17	0	28	12	16	7	23	21	20	10	17	5	27	1	0	91	53	0	0	29	97	14			
may be	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			

		F1: Since when have you been an organic farmer?		F2: Do you operate a biogas plant on your own or together with other farmers?		F3: Are you interested in operating a biogas plant?		F11.1 Livestock units				F11.2 Total hectares				Country							Total	
		longer than 5 years	less than 5 years	yes	no	no	yes, maybe	0	1 till under 25	25 till under 100	100 and more	0 till under 30	30 till under 50	50 till under 100	100 and more	Austria	Denmark	Poland	Spain	Germany	Bulgaria	weighted average	Total	%
8. Biogas from organic farms/ecological enterprises is still relatively unknown. Who in your view should be informing and making customers aware of this issue? <i>the energy supply utilities</i>	n/a	6	7	20	12	6	5	9	5	3	1	8	5	4	3	25	10	0	2	0	36	9,35	44	6
	yes	34	30	30	38	31	37	29	36	33	46	28	40	33	44	25	47	51	19	29	18	32	230	33
	no	38	40	40	28	46	28	42	36	37	26	44	32	28	31	34	17	33	44	48	29	36,1	262	38
	may be	23	23	10	23	17	29	20	24	27	26	20	23	35	22	16	26	16	35	24	18	22,8	160	23
	<i>biogas interest groups</i>																							
	n/a	5	3	10	9	6	4	8	5	1	0	7	5	3	2	19	10	0	0	0	25	6,93	35	5
	yes	51	54	80	62	45	60	49	51	45	70	45	52	52	67	58	62	80	42	40	57	56	359	52
	no	22	21	0	12	32	11	24	26	20	11	25	20	23	14	14	12	11	12	33	0	15,5	151	22
	may be	21	22	10	17	18	25	19	18	33	19	24	23	22	16	10	16	9	47	27	18	22	151	22
	<i>organic farming associations and green movement networks</i>																							
	n/a	5	2	10	8	6	2	6	5	3	0	5	4	3	3	20	10	0	0	0	7	5,78	31	4
	yes	63	68	80	65	55	77	63	66	56	76	62	64	66	70	65	62	74	53	63	79	64,7	447	64
	no	15	12	0	10	24	3	16	14	12	9	17	15	11	8	9	11	11	9	19	0	11	98	14
	may be	17	19	10	17	16	17	14	15	29	15	16	17	20	19	6	17	15	37	18	14	18,4	120	17
	<i>the local / town or region authorities</i>																							
	n/a	6	3	40	10	6	4	8	6	4	0	7	7	5	2	25	10	0	0	0	21	7,83	39	6
	yes	42	61	20	53	36	58	43	51	40	58	43	37	41	59	39	34	84	58	38	75	53,7	317	46
	no	28	18	20	19	38	12	25	25	28	20	27	36	20	19	29	26	11	5	32	0	18,7	175	25
	may be	24	19	20	18	20	26	24	18	28	22	24	20	34	20	8	30	5	37	29	4	19,9	165	24
	<i>commercial enterprises with ecological brands</i>																							
	n/a	6	7	20	12	7	5	9	6	3	0	8	5	8	3	29	10	0	0	0	29	9,23	44	6
	yes	28	32	30	36	23	34	24	30	29	47	24	36	25	41	18	36	54	42	21	25	33,4	201	29
	no	41	26	30	24	51	26	41	41	39	21	41	41	33	31	39	21	30	9	52	4	28,9	262	38
	may be	25	34	20	28	18	36	26	24	29	31	28	17	35	25	15	33	16	49	26	43	28,6	189	27
	<i>local organic food markets</i>																							
	n/a	6	4	20	11	7	5	8	6	4	2	8	4	7	2	28	10	0	2	0	25	9,13	43	6
	yes	25	29	30	30	21	32	24	28	24	34	24	25	22	32	24	21	45	37	21	36	30,7	179	26
	no	43	33	20	32	52	29	42	39	42	36	40	48	39	41	36	31	39	19	51	21	34,5	284	41
	may be	25	34	30	26	20	34	26	28	30	27	28	23	33	25	13	38	16	42	28	18	25,9	190	27
	<i>the new media</i>																							
	n/a	6	7	20	11	8	4	8	7	5	1	7	5	10	3	29	10	0	2	0	21	9,03	43	6
	yes	36	41	50	39	32	45	40	38	27	41	35	33	40	45	33	30	60	26	35	64	39,4	261	38
	no	26	24	0	18	35	15	26	28	27	18	28	31	18	20	18	17	24	19	34	0	21,1	177	25
	may be	31	28	30	31	25	37	26	28	40	39	30	31	32	33	21	43	16	53	31	14	30,6	215	31
	<i>I would like to inform customers myself</i>																							
	n/a	7	15	20	16	8	9	12	8	6	1	9	5	15	5	35	10	0	2	0	61	13,2	59	8
	yes	34	25	30	31	25	41	30	26	35	40	29	32	28	41	26	19	55	33	34	21	33,6	223	32
	no	33	36	40	29	46	17	34	33	34	30	36	36	29	25	31	31	26	37	38	7	30,8	230	33
	may be	27	24	10	25	21	33	24	34	25	28	25	27	27	29	8	40	19	28	29	11	22,6	184	26
	9. Many organic farmers consider to produce biogas in a sustainable way. In your view, what is important for a sustainable production of biogas?																							
text answers																								
																							626	90

	F1: Since when have you been an organic farmer?		F2: Do you operate a biogas plant on your own or together with other farmers?		F3: Are you interested in operating a biogas plant?		F11.1 Livestock units				F11.2 Total hectares				Country							Total		
	longer than 5 years	less than 5 years	yes	no	no	yes, maybe	0	1 till under 25	25 till under 100	100 and more	0 till under 30	30 till under 50	50 till under 100	100 and more	Austria	Denmark	Poland	Spain	Germany	Bulgaria	weighted average	Total	%	
10. Please assess on a scale of 0 to 10 how probable it is that you will be operating a plant within the next 10 years.	n/a	3	3	30	5	3	4	6	0	0	2	5	3	1	1	5	15	0	0	0	4	3,18	24	3
	0=ruled out	33	32	20	26	58	4	35	40	32	17	35	51	27	20	46	22	21	19	40	4	28,3	226	32
	1	19	16	0	19	20	17	16	20	22	23	18	12	21	22	13	18	29	21	19	4	19	129	19
	2	11	19	0	11	8	18	14	10	14	7	13	7	13	13	6	13	9	12	14	18	11,2	87	13
	3	8	9	0	10	6	13	7	14	9	9	7	15	9	9	8	7	18	7	7	14	9,93	60	9
	4	5	6	0	8	1	10	5	5	4	10	6	0	1	9	5	8	5	14	2	18	7,55	37	5
	5	10	12	20	13	2	19	8	9	10	18	8	7	17	13	13	5	15	26	7	25	14,7	69	10
	6	3	6	10	4	0	5	3	0	5	6	5	1	1	3	3	2	0	19	3	7	5,78	24	3
	7	3	4	0	4	0	3	2	0	4	7	3	1	3	1	0	2	1	19	2	7	5,18	19	3
	8	2	0	0	2	1	3	1	2	4	2	1	1	2	3	0	3	1	5	1	0	1,78	12	2
	9	1	1	0	1	0	2	1	0	2	1	1	1	1	1	0	3	0	0	1	0	0,58	6	1
	10=an absolute certainty	4	0	20	2	1	3	3	1	1	9	3	1	3	4	3	2	1	7	4	0	3,25	23	3
11. And now a couple of questions about your farm. What kind of livestock do you keep?	0	51	54	70	36	59	47	100	0	0	0	67	28	40	31	48	39	29	2	67	87	40,6	363	52
	1 till under 25	16	9	0	18	16	14	0	100	0	0	13	28	11	14	25	15	30	0	11	0	15,1	101	14
	25 till under 100	19	22	10	22	18	21	0	0	100	0	12	37	39	16	24	15	24	47	17	7	24,8	135	19
	100 and more	14	15	20	23	7	18	0	0	0	100	7	7	10	39	4	32	18	51	5	7	20,1	99	14
	What land area do you farm?																							
	Total hectares:																							
	0 till under 30	51	70	10	39	58	46	71	50	35	28	100	0	0	0	39	24	25	93	73	60	53,5	384	55
	30 till under 50	12	7	20	12	14	8	6	21	21	5	0	100	0	0	16	12	16	5	9	3	10,9	75	11
	50 till under 100	14	11	40	15	12	16	10	10	27	9	0	0	100	0	28	19	6	0	11	17	12,7	92	13
	100 and more	24	11	30	34	15	30	13	20	18	58	0	0	0	100	18	45	53	2	8	20	23,3	147	21
12. There will be a biogas handbook for organic farmers in some months. Should we send you a copy of the handbook for free?	n/a	6	4	0	10	5	5	7	4	4	3	6	4	8	2	10	19	0	0	0	18	5,73	37	5
	yes	66	76	90	69	51	84	62	66	75	81	64	64	70	78	46	60	84	100	66	82	72,9	471	68
	no	29	20	10	21	44	11	31	30	21	16	30	32	23	20	44	21	16	0	34	0	21,4	188	27
	May we contact you again should we have new information concerning seminars?																							
	n/a	6	4	0	11	5	6	133	6	2	4	7	5	5	2	9	20	0	0	0	21	5,88	493	71
	yes	55	48	90	61	35	74	48	53	58	69	46	51	52	78	36	60	78	70	46	75	59,1	375	54
	no	39	48	10	29	60	20	44	41	40	27	47	44	42	20	55	20	23	30	54	4	35,2	282	41