



Sustainable small-scale biogas production from agro-food waste for energy self-sufficiency

English Live-Webinar, 17th September 2015

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IEE/13/477/SI2.675801



Welcome to the BIOGAS³ Webinar

Before we start, please note the following:

- Make sure your headset or loudspeakers are connected properly, so you can hear the presenters speak
- You do not need a webcam, videos take up too much bandwidth
- Only the presenter will speak, all participant's microphones will be muted.
- Please use the chat in the lower right corner to leave messages in the chat. RENAC staff will answer your questions as soon as possible



Agenda

1. Introduction BIOGAS³
2. Project results
3. Project services
4. Functionality of Online Training

A close-up photograph of a lush green field. In the foreground, there are several large, four-leaf clovers with distinct white variegation on their leaves. They are surrounded by tall, thin blades of grass. The background is a dense field of similar vegetation, slightly out of focus.

BIOGAS³

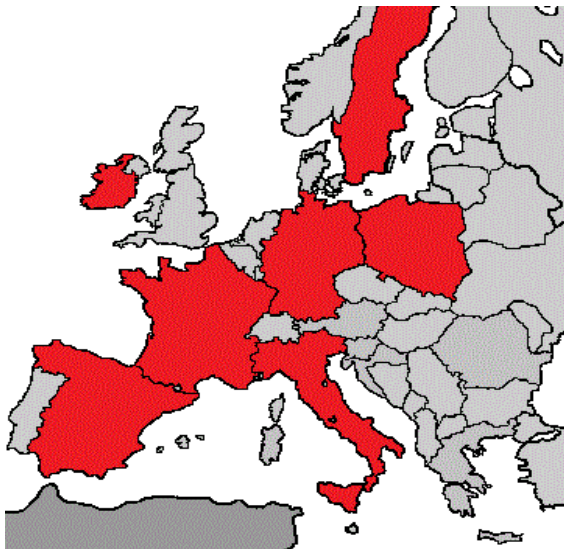
About BIOGAS³

- Biogas3 implemented within the EU-Programme Intelligent Energy Europe, aiming to promote renewable energies through small scale biogas plants in agro-food industries for self-consumption



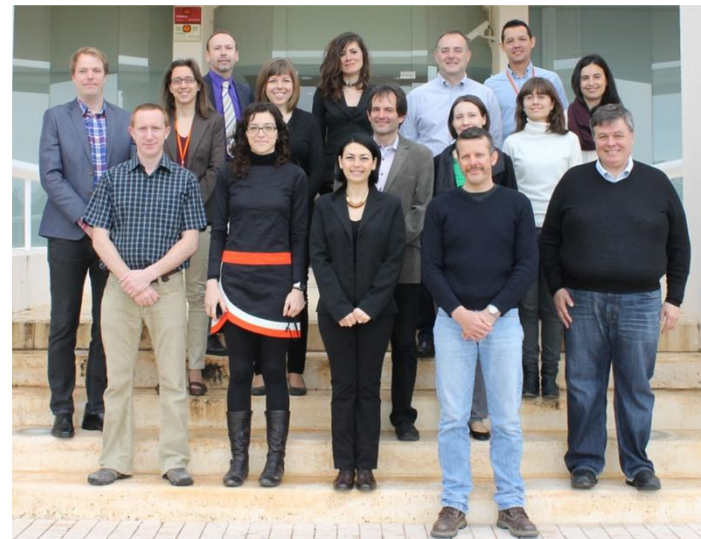
Contribution to secure, sustainable and competitively priced energy for Europe by promoting new and renewable energy sources and supporting energy diversification.

The team of BIOGAS³



Partner Organisations:

AINIA, FIAB (Spain)
 ACTIA, IFIP (France)
 TCA, DEIAFA (Italy)
 RENAC (Germany)
 FUNDEKO (Poland)
 JTI (Sweden)
 IrBEA (Ireland)



ainia
 centro tecnológico

UNIVERSITÀ
 DEGLI STUDI
 DI TORINO
 ALMA UNIVERSITAS
 TAURINENSIS



irbea | irish
 bioenergy
 association



ACTIA



renac
 renewables academy

FIAB
 ALIMENTAMOS
 EL FUTURO
 2020

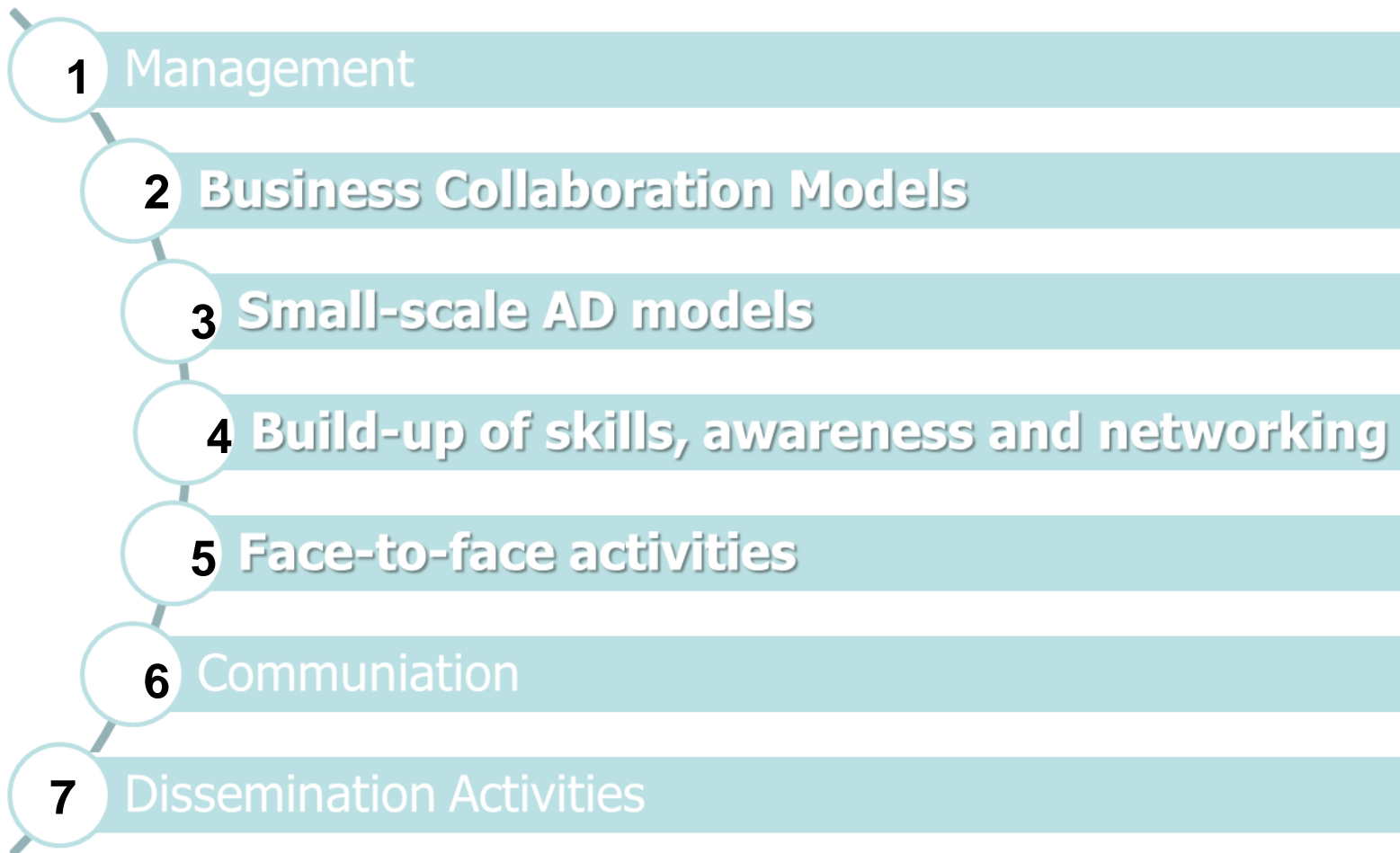
TECNOALIMENTI

FundEko

ifip

www.biogas3.eu

About BIOGAS³

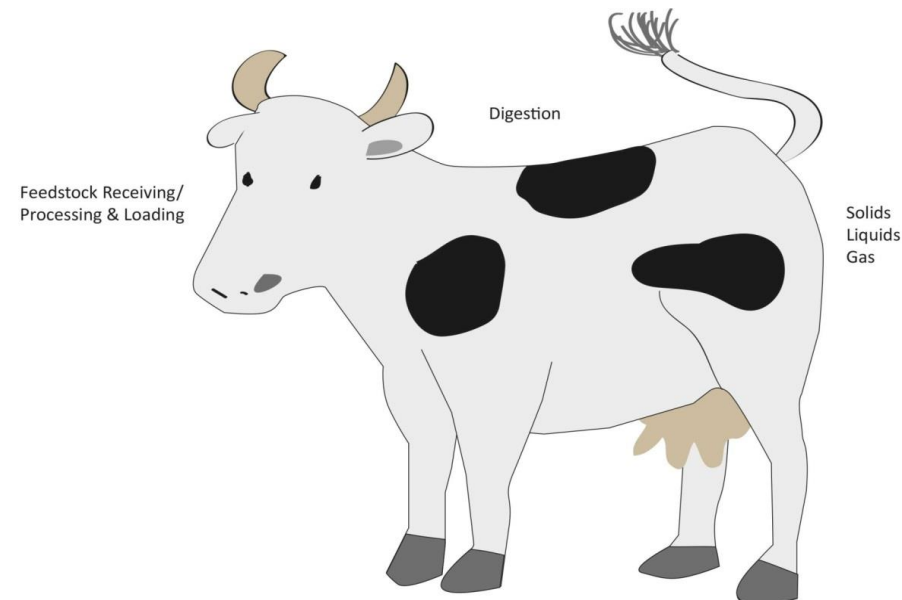


Background of BIOGAS³

- 20-20-20 goals of the EU
- Characterization of agro-food industry:
 - Industry with high amounts of residues
 - Residues need to be transported, reutilized or disposed
 - Subject to national regulations due to hygiene, restrictions etc.
 - Mostly waste management is combined with high costs for company

What is biogas?

- Organic material is decomposed to Biogas under the absence of oxygen
- Anaerobic Digestion is a complex microbiological process
(*does also occur in nature: rumen of cows, wetlands*)
- The climate damaging effect of methane is 21 times higher than of CO₂ (*Biogas consists of 50 – 70 % methane*)
- Produced forms of energy:
 - electricity
 - heat
 - vehicle fuel



Which materials can produce biogas?

- **Agricultural waste**

- Animal slurries
- Harvest residues
- Grass

- **Food processing waste**

- Meat/fish processing waste
- Dairy waste
- Brewery spent grains
- Vegetable waste
- Waste from prepared food factories
- Sludge from waste water treatment plants



Potential Substrates

Substrate	DM	Biogas yield	Methane-content	Primary energy	Electricity (net)	Heat (net)	Value Electricity	Value Heat
					35%	90%	16c/kWh	5c/kWh
Unit:	[%]	[m ³ /ton FM]	%	kWh/t	kWh/t	kWh/t		
Pig manure	6	20	60	120	42	108	6.72 €	5.40 €
Whey	8,5	58,5	53	310	109	279	17.44 €	13.95 €
Brewer´s yeast	25	152	62	942	330	848	52.77 €	42.39 €
Potato slip	19	108	54	540	189	486	30.24 €	24.30 €
Slaughterwastes	15	60	55	300	105	270	16.80 €	13.50 €
Residues from bakeries	77	570	53	3021	1027	2719	169.18 €	135.95 €
Maize silage	35	216	52	1123	393	1011	62.88 €	50.54 €

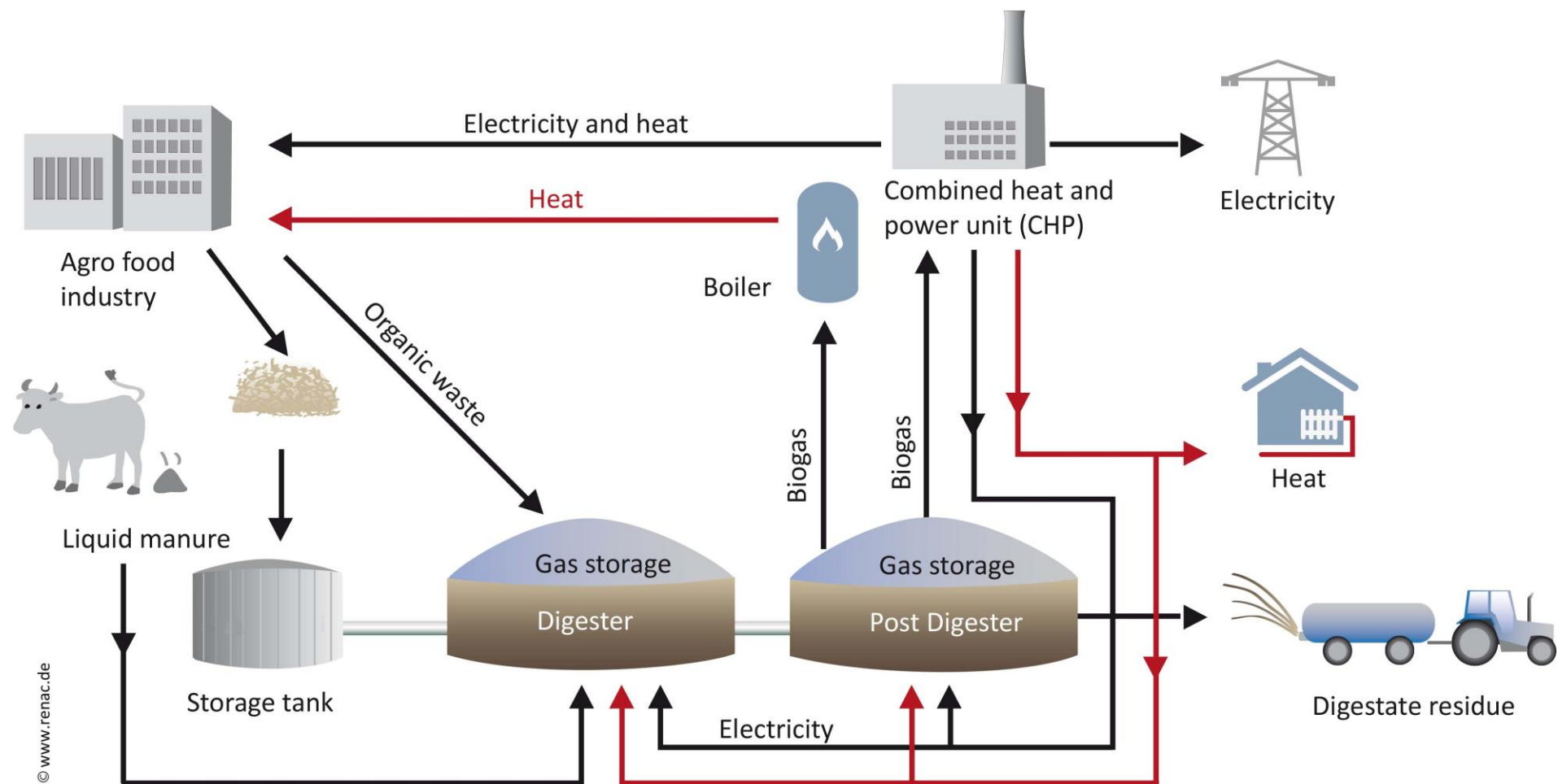
Biogas Technology

How can AD technology support agro-food companies?

- Recycling organic residues → time and cost savings
- Providing company with own produced electricity and heat
 - Covering energy demand of company and contributing to energy self-sufficiency of company
 - Improving company's energy efficiency
 - Independence of energy providers and market prices (e.g. feed-in tariffs)
 - Reduction of energy costs
 - Sustainability of processes

AD implemented in agro-food industry

A holistic approach



Example of a farm small-scale biogas plant

Quelle: Report von Bio4Gas GmbH

Dairy farm, Gießen (Germany)



Small-scale biogas plant (installed capacity 75 kW).

Feedstocks: cattle slurry (10.950 m³/year)

Energy use: heat for self-consumption, electrical energy is fed into local power grid

Digester:	600 m³
Biogas valorisation unit:	75 kW boiler
Energy production:	630 MWh_{el}/a; 740 MWh_{th}/a
Investment:	€500.000,--

Estimated payback period = 6 years

Data obtained from a report of Bio4Gas GmbH

Example of a farm small-scale biogas plant

Quelle: Report eines BIOREGIONS Projekt (www.bioregions.eu)

Fahringer farm, Rettenschöss (Austria)

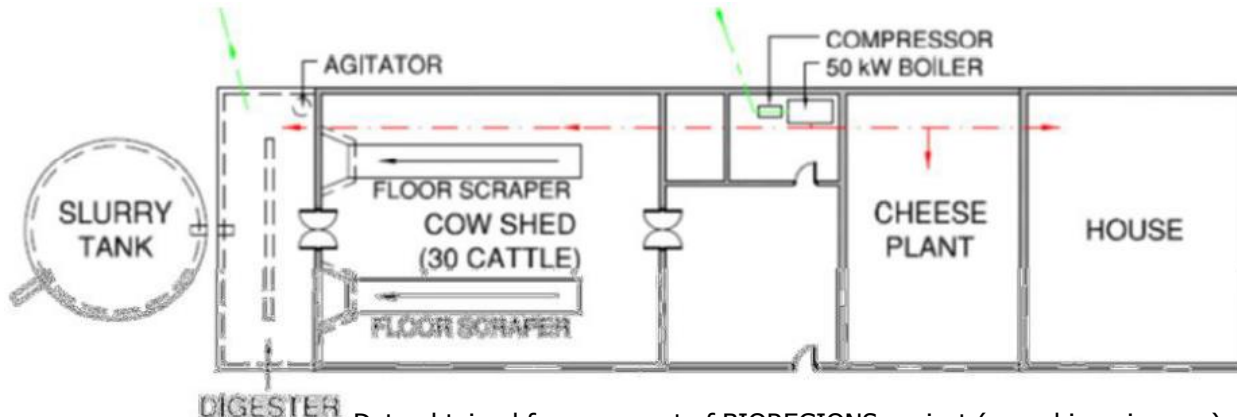


Small-scale biogas plant (self-built, low-cost).

Feedstocks: whey, cattle slurry (from 50 cows)

Energy use: Heat for the housing and the cheese plant

Digester:	150m³
Biogas valorisation unit:	50kW boiler
Gas production:	150-180m³ biogas/day
Investment:	€35.000,--



Data obtained from a report of BIOREGIONS project (www.bioregions.eu)

Example of a farm small-scale biogas plant

Methanogen, Waterford



Feedstocks: waste water treatment sludge waste

Energy use: **Heat** to heat digester and to heat domestic house

Built 1992 – running ever since

Digester: 2 x 70m³ insulated concrete tanks, Fibreglass top

Biogas valorisation unit: 50kW heat output, running 24h/d

Energy production: 1,200kWh/day

Investment: €35.000,-- , payback period: 6 years

Example of a food waste small-scale biogas plant

Data from SEAB energy (seabenergy.com)

University of Southampton Science Park (UK)



Small-scale biogas plant, containerized

Feedstocks: 410 l/d of kitchen food waste, cooking oil and spent alcoholic drinks

Energy use: Electricity and heat used in the business park offices and research labs

Biogas valorisation unit:	8 kW CHP engine
Biogas production:	46 m³/d
Electricity production:	35 MWh/a
Investment:	€ 120.000,--

Annual operation and maintenance costs:	6.000 €
Energy savings:	3.380 €
Heat savings:	1.810 €
Waste management savings:	12.470 €
Digestate value:	1.170 €

Payback period: 4 years (with feed-in tariffs). Estimated 9 years without feed-in tariffs.


What can BIOGAS³ do for me?

- Free training courses & workshops
 - On-line and face-to-face
 - Choice of basic courses, specialised workshops, webinars...
- Personalised feasibility studies
 - With the software smallBIOGAS, to check if your feedstock and site are suitable for a small-scale biogas plant.
- Networking and one-to-one activities
 - Contact to specialised biogas plant technologists and technology centres that will help you to outline the best project
- Implementation of new small-scale biogas plants




SmallBiogs Software Tool & Usage Guide

New study | My studies | Logout



New study



1 Where?

General data

Name:

Country: Ireland

Spain
 France
 Italy
 Germany
 Poland
Ireland
 Sweden

Administrative division

Munster

Annual average temperature (°C): 9,9

The results obtained from the use of the tool provide to the user an orientation about the viability of a small-scale biogas plant. For this reason, the authors recommend further consultation with expert centres before carrying out a project of biogas plant and are not responsible for any damages resulting from the use made of the tool smallBIOGAS.

☐ Accept conditions



[next >>](#)

2

3

4

5

Co-funded by the Intelligent Energy Europe Programme of the European Union

'smallBIOGAS'

Usage guide to use the software and interpret the results

BIOGAS³

Sustainable small-scale biogas production from agro-food waste for energy self-sufficiency

Date:
August 2014

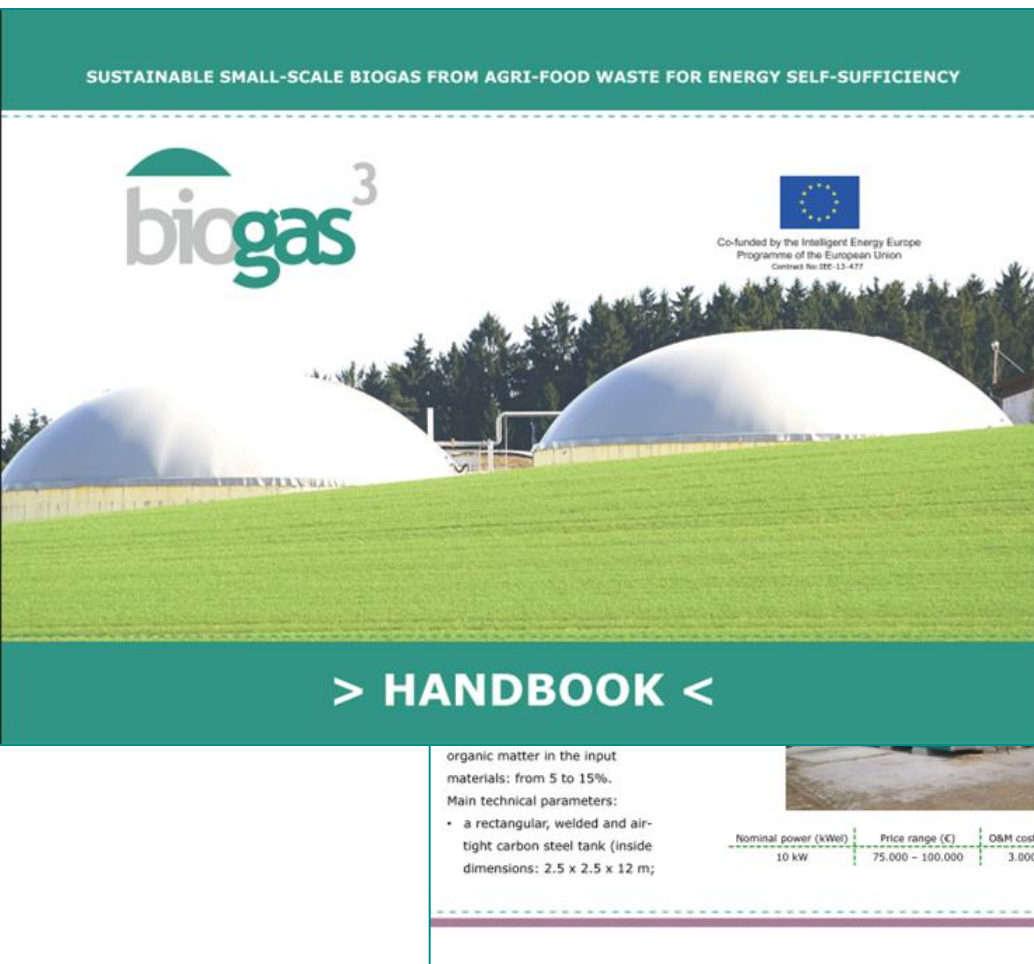
Authors:
BIOGAS³ Consortium

DATA OF THE PROJECT: Programme: Intelligent Energy Europe (IEE) - ALTENER Key action: Promotion and dissemination projects Grant Agreement: IEE/13/477/SI2.675801 Start / end date: 1 st March 2014 – 28 th February 2016	CONTACT: Coordinator: Bogiula Ruiz (ADNIA) Telephone: +34 961 366090 E-mail: bruiz@adnia.es Website: www.biogas3.eu
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Biogas³ Handbook

http://www.biogas3.eu/eng/handbook_ad_en.html

SUSTAINABLE SMALL-SCALE BIOGAS FROM AGRI-FOOD WASTE FOR ENERGY SELF-SUFFICIENCY



biogas³

Co-funded by the Intelligent Energy Europe Programme of the European Union
Contract No IEE-13-477

> HANDBOOK <

organic matter in the input materials: from 5 to 15%.

Main technical parameters:

- a rectangular, welded and air-tight carbon steel tank (inside dimensions: 2.5 x 2.5 x 12 m;

Nominal power (kW _{el})	Price range (€)	O&M cost (Euro/year)
10 kW	75,000 – 100,000	3,000 – 6,000

biogas³ 52

all-in-one

eGmina, Infrastruktura, Energetyka Sp. z o.o.
Established since: 2006

Złota 54, 45-643 Opole POLAND

Tel/Fax: +48 77 416 70 84
Mobile: +48 662 389 472

www.egie.pl
kontakt@egie.pl

Number of small-scale plants sold this far: < 5




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> NITRATE LEACHING

EG91/676/EWG, Nitrates Regulation
Wasserhaushaltsgesetz (WHG, §2, 44, 47)
Oberflächengewässerverordnung (OGewV)
Grundwasserverordnung (GrWV)

> RISK OF EMISSION OF METHANE AND AMMONIA DURING APPLICATION

DüngemittelV (§6-Schadstoffgrenzwerte
Contamination limits)
Bundes-Immissionsschutzgesetz (BImSchG)

> ODOUROUS COMPOUNDS

Bundes-Immissionsschutzgesetz (BImSchG, §3)
Codice Civile (gute landwirtschaftliche Praxis)

> TRANSPORT SYSTEM

Düngemittelverkehrskontrolle (DVK)
Verordnung über das Inverkehrbringen und Befördern von Wirtschaftsdünger (WdüngV)

Online Training



Presentation



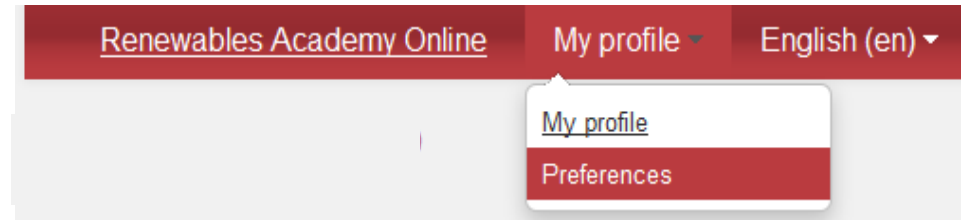
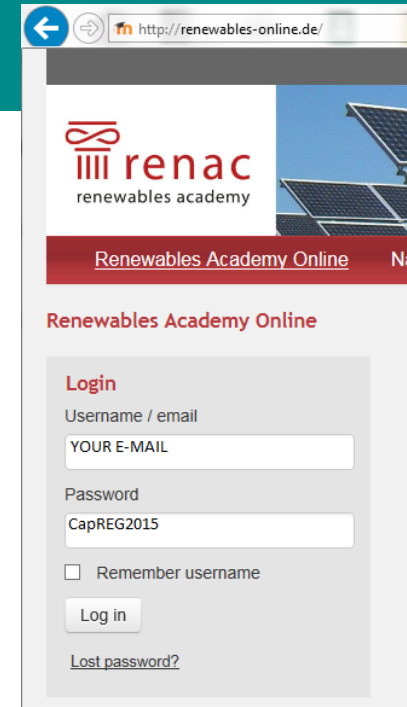
Online Training

1. Log-in

- visit www.renewables-online.de (works best with Firefox and Google Chrome)
- Access data has been provided (username = email address, password in email, has to be changed by you when you have logged in for the first time)

2. Profile settings

- Personalize your profile settings
- In this section you can also
 - upload your profile picture
 - set your local time
 - change your password
 - change messaging settings
 - change the language of the platform menus (please note: this will not change the language of course content)

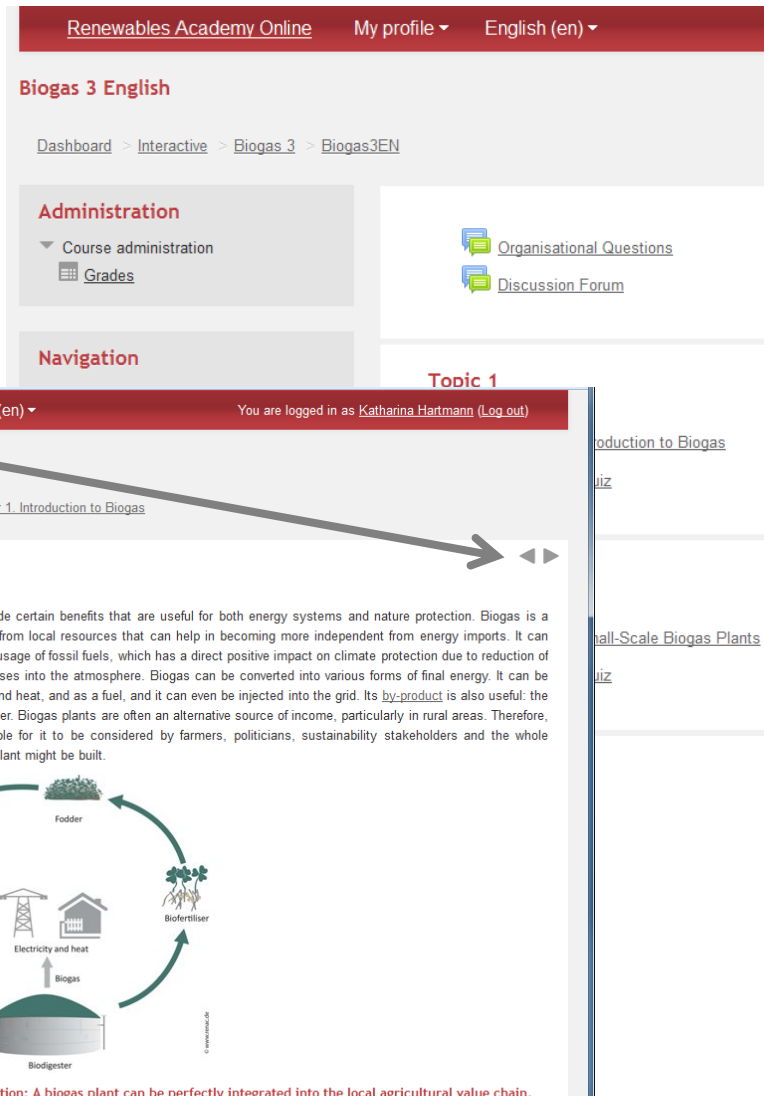


Online Training

3. Structure of the BIOGAS3 Online Training

- Six chapters with respective subchapters

4. Change chapters via the table of contents or via the arrows at the side of the screen page



Renewables Academy Online My profile English (en)

Biogas 3 English

Dashboard > Interactive > Biogas 3 > Biogas3EN

Administration

- Course administration
 - Grades

Navigation

Topic 1

Introduction to Biogas

2 Benefits of biogas

Biogas production can provide certain benefits that are useful for both energy systems and nature protection. Biogas is a renewable energy produced from local resources that can help in becoming more independent from energy imports. It can contribute to the decreased usage of fossil fuels, which has a direct positive impact on climate protection due to reduction of emissions of greenhouse gases into the atmosphere. Biogas can be converted into various forms of final energy. It can be used to produce electricity and heat, and as a fuel, and it can even be injected into the grid. Its by-product is also useful: the digestate is a valuable fertiliser. Biogas plants are often an alternative source of income, particularly in rural areas. Therefore, it is very useful and desirable for it to be considered by farmers, politicians, sustainability stakeholders and the whole community where a biogas plant might be built.

Table of contents

- 1 Introduction to biogas
- 2 Benefits of biogas
- 3 Chemical properties of biogas
- 4 Anaerobic digestion
- 5 Important parameters for biogas generation
 - 5.1 Hydraulic retention time (HRT)
 - 5.2 Organic load
 - 5.3 Temperature
 - 5.4 pH-value
 - 5.5 C/N ratio
 - 5.6 Ammonia
- 6 Environmental benefits of biogas

Administration

- Book administration
 - Print book
 - Print this chapter
- Course administration

Life cycle of biogas production: A biogas plant can be perfectly integrated into the local agricultural value chain.

Online Training

5. Forum

- One forum for organisational issues, where participants can ask any question regarding the functioning or organisation of the online course
- One forum for discussion of the course content, regarding learning material and exchange of experiences with BIOGAS3 staff and other participants



Online Training

6. Exam

- To obtain a BIOGAS3 certificate participants can take a short (20min) exam (passing mark: 70%).
- In January, participants will be asked if they would like to participate in a test
- In case of positive answers, the test will be offered in the respective languages

Exam / Examen



Exam



7. Evaluation

- We will distribute an online questionnaire in all languages to participants, to evaluate the Online Training at the end

Thank you for your attention



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