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D4.2 Report of the Workshops and Visit Tours

BIOGAS³

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

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Authors:

Volker Jaensch (RENAC)

Katharina Hartmann (RENAC)

With the collaboration of all project partners

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1 Introduction

Training and dissemination events as well as online courses offer attractive possibilities to share knowledge, spread information and discuss topics with the general public and specific target groups. The variety of training activities is multifaceted and is generally chosen according to the respective topic, the intensity of the courses and the learning goals.

For BIOGAS3 a series of seminars, workshops, visit tours as well as face-to-face trainings, online trainings and live-webinars was chosen in order to facilitate and promote the building up of skills, raising awareness and create networking opportunities.

In order to set a focus especially on the agro-food industry and their stakeholders, trainings were designed to present the project BIOGAS3 and the elaborated results, offer consultancy to the target group regarding possibilities for biogas projects and give further information on the technical, economic and environmental aspects of the implementation and realisation of small-scale biogas plants in agro-food companies.

To improve the status of biogas production in agro-food industries and to further promote the topic in the partner countries, the project partners aimed to inform and involve as many people as possible during the project period.

Throughout the project period from 2014 – 2016 training activities (including Webinars, workshops, visit tours, online trainings and face to face trainings) took place. These events did not only receive a high resonance with numerous participants but furthermore a mainly positive feedback from the participants that attended the courses.

This report will provide the reader with gathered information and reporting on the workshops and visit tours that have been conducted within the total reporting period.

2 Regional Workshops and Visit Tours

Regional workshops and visit tours were offered free of charge and conducted in all partner countries of BIOGAS3: France, Germany, Ireland, Italy, Spain, Sweden and Poland. One-day workshops were carried out in order to present the biogas small-scale concept to the target group. Furthermore workshops aimed at providing the ground for business to business meetings between agro-food companies and biogas plant providers and other key actors to facilitate business collaboration models.

To impart a deeper insight into the biogas technology and functionality of the biogas process, one-day visit tours to small-scale biogas plants treating agro-food waste were organized. All participants of the workshops were invited to join the visit tour.

Within the project period (March 2014 – February 2016) 13 BIOGAS3 workshops had been conducted successfully (Table 1) with an audience of altogether 320 participants.

Table 1: Schedule of Conducted Workshops in Project Period

Workshops		
Country	Date	Location/ Event
Spain I	18.09.2014	Workshop "Futuro sostenible del Biogás Agroindustrial", Valencia
Spain II	23.04. - 24.04.2015	Biogas3 Workshop at Barcelona TecnoAlimentaria fair (BTA) + visit tour, Barcelona
Spain III	17.09.2015	Biogas3 Workshop, Undués de Lerda, Zaragoza
Germany I	25.02.2015	Biogas3 Workshop "Vergärung von Kaffeehäutchen", Hamburg
Germany II	15.04.2015	Biogas3 Workshop + visit tour with Food Processing Initiative, Bad Sassendorf
France I	19.03.2015	Biogas3 Workshop + visit tour, Le Temple Sur Lot
France II	17.06.2015	Biogas3 Workshop, National Biogas Exhibition, Paris
Sweden	31.03. - 01.04.2015	Biogas3 Workshop + visit tour, Jälla College, Uppsala
Poland	19.05. - 20.05.2015	Biogas3 Workshop + visit tour, Agricultural Counseling Centre, Końskowola
Ireland I	21.05.2015	Biogas3 Workshop + visit tour, Springhill Court Hotel, Kilkenny
Ireland II	30.06. - 01.07.2015	Biogas3 Study Tour, Visiting 3 biogas plants and "UK AD&Biogas" fair
Italy I	26.06.2015	Biogas3 Workshop, Milan
Italy II	02.02.2016	Biogas3 Workshop + visit tour, Tortona

The organisation of each workshop was adapted to the specific conditions of every partner country. In some cases conducting a one-day workshop including a visit tour on a second day became impossible due to various reasons such as the isolated location of the biogas plant, the workshop location without proximity of a biogas plant or the availability of participants etc. In these cases, a second workshop or separate visit tour date was set up.

Additionally the offer of two separate workshop days in possibly two separate locations also contributed to reaching a wider target group of the workshops and visit tours. Two or more separate days were organised in the countries Spain, Germany, France, Ireland and Italy.

3 Workshops and Visit Tours in Partner Countries

Workshops and visit tours were conducted by the work package leader and the local project partner of the partner countries as well as supporting partners of the BIOGAS3 team. All participants of the workshops were invited to join the visit tour and participate in all other BIOGAS3 events like face-to-face and online training.

The following subchapters deal with the organisation, realisation and follow up of the conducted workshops and visit tours.

The workshops were used as a format to present the small-scale biogas concept to the target groups. This was realised by several presentations held by the respective project partners, local external experts and stakeholders (e.g. biogas plant providers) and RENAC (when present). The offers and results of BIOGAS3 were presented, including the presentation of the smallBiogas software. Participants were invited to contact BIOGAS3 partners in order to conduct an individualised feasibility study.

Throughout the workshop day and the visit tours, participants had the chance to meet technology providers and key actors in the frame of business to business meetings. In some cases, the workshops were organised as part of a national fair or congress to facilitate the possibilities of knowledge exchange among participants and funding business collaboration models.

The BIOGAS3 Workshops were promoted by each partner through dissemination channels, such as press releases and social media (Facebook, Twitter, LinkedIn, etc.). Additionally, all Workshops were publicized on the Biogas3 and RENAC website. Information on the Workshop events were furthermore disseminated during the course of other events whether belonging to the project itself (for instance, during a webinar session) or other congresses, fairs and national events (e.g. during presentations of Biogas3 as well as business or informal meetings with interested parties).

The promotion of the events usually consisted of an agenda of day, including the expert presentations taking place and visit tours. All pertinent agendas are included in the Report on the Training Materials (Task D4.1).

Registrations for the Workshops were possible through the website of the project, which included links to RENAC's website where participants could fill in their personal information to register. It was also possible to register via e-mail directly with the local partner.

In the light of the above, a detail of each Workshop session is offered below.

3.1 Spain

3.1.1 1st Spanish Workshop – 18.09.2014

The first BIOGAS3 Workshop was conducted on the 18th September 2014 at AINIA's technology center facilities in Valencia. It was co-organised with FP7 project ADWISE and the participants received information from BIOGAS3 project as well as from ADWISE focused on optimisation of volatile fatty acids detection of anaerobic digesters through optical systems in order to improve process control of anaerobic digesters. The Workshop with the topic "The sustainable future of agroindustrial biogas" started with an introduction into the topic of small-scale biogas plants for energy self-sufficiency held by Paz Gomez and Javier Claros (AINIA). This was followed by a site visit of AINIA's pilot biogas plant, which demonstrated on-site information about anaerobic digestion and process control systems to participants. After the site visit Gracia Silvestre (AINIA) spoke about optimized control systems of biogas plants and Begoña Ruiz (AINIA) presented the topic of biomethane production in agroindustrial biogas plants. In the afternoon a second biogas plant was visited "la Granja San Ramón". Expenses of the Workshop were shared with ADWISE project.

The workshop was attended by 27 participants (Figure 1) with various professional backgrounds: Engineering companies, agro-food companies, agricultural associations, biogas associations, research institutes and universities. Subsequently, this mix of participants facilitated lively discussions and a fruitful exchange of ideas and experiences.



Figure 1: Group picture of participants of the Spanish Workshop

3.1.2 2nd Spanish Workshop – 23.–24.04.2015

The second Spanish workshop took place on the 23rd April 2015 as part of the fair Barcelona TecnoAlimentaria (BTA), an international exhibition of machinery, technology and intermediate for the food and drink industry and the agro-food trade in Spain. AINIA booked a speakers corner and a stand on the fair to present the BIOGAS3 project and held business to business

meetings. On the second day (24th April 2015), participants were transported from the fair to the site of a small-scale biogas plant in Gimenezs, Lleida offered.

The workshop started with the introduction to the BIOGAS3 project by Andrés Pascual (head of Environment, Bioenergy and Industrial Hygiene at AINIA) followed by the presentation of the economic calculation tool smallBiogas and how to use the tool in order to calculate and evaluate the feasibility of biogas projects by Paz Gómez (AINIA). Subsequently Katharina Hartmann (RENAC) spoke about implementation possibilities of small biogas plants in agro-food companies and Paz Gómez presented the results of the business collaboration models as well as examples of small-scale biogas plants in Spain elaborated within BIOGAS3. Questions were raised and discussions ranged basically on the topics of the functionality of the smallBiogas tool, business collaboration models and upcoming activities of BIOGAS3 (Webinar, On-line training, etc.). The presentations were followed by two rounds (one hour each) of business to business meetings between plant providers and biogas or agro-food consultants and AINIA. Each BtB meeting was moderated by Paz Gomez or Andrés Pascual. Due to the attendance of the workshop by FIAB, the project BIOGAS3 was furthermore presented to a wide range of participants of the fair, since Federico Morais and Concha Avila engaged in discussions about BIOGAS3 activities with passing participants.

On the second day, interested participants were picked up and transported to the biogas plant "Capdevila Torrent Ramaders" in Almacelles (Lleida). During the site visit the biogas plant constructor "Ecobiogas" as well as the operator of the biogas plant were present and spoke about their experiences. This plant uses and digests animal manure (from sows, laying hens and cows). The biogas produced in the small-scale biogas plant is used in a CHP unit (power: 100 kWe installed) and a boiler (power: 200 kWth). All the energy produced is used in a farm of 4,000 sows. 100 % of the thermal energy needs of the farm are covered through the use of the biogas. Electrical energy is partially covered with the energy from the biogas but it is still necessary to have an external source of electrical energy. The plant is a good example of sustainable use of the digestate, and the operator spoke about the agricultural utilisation of it in the local plots.

Altogether 23 participants attended the workshop and visit tour, with the background in biogas plant production, biogas consulting, biogas upgrading providers, research institute owned by the Government of Catalonia belonging to the Department of Agriculture, Food Industries and Heat Exchangers suppliers.

In general the feedback of the workshop was very positive. Participants could rate their answers according to a range from very good (1) to very poor (5).

a. Course organization

	Average
Communication from before the course	1,6
Training location	1,9
Training equipment	1,9

b. Course content

	Average
Did this training match your needs and expectations?	2,2
How was the balance of theory within the course?	2,0
How was the balance of practical learning within the course?	2,4
How would you assess your personal learning progress?	2,6
Was there enough time for interaction / discussion?	2,0

What was the highlight of the course? What would you recommend about it?

- *The calculation tool*
- *Examples of small scale plants*
- *The development of business models*

What could be improved in future courses? Was there any subject missing?

- *Description of the equipment of the plant*

c. Site visit

	Average
How did you like the plant sightseeing?	1,3

The general expectations of the participants have been fulfilled through the workshop and the presentations of experts as well as the discussions and exchange of experiences was welcomed. Participants acknowledged the balance of the content between theory and practice.



3.1.3 3rd Spanish Workshop – 17.09.2015

The third Spanish workshop was conducted on the 17th September 2015 in Zaragoza City (Sala Mirador, Centro de Historia) and Undués de Lerda (Zaragoza province, where a biogas plant was

visited). The BIOGAS3 workshop was held in collaboration with the DELOS project and included a technical presentation of small-scale biogas production in agro-food companies during the morning given by Paz Gómez and a visit tour to a small-scale biogas plant located in the North of the province of Zaragoza in the afternoon.

The visit tour included a discussion of participants of the workshop moderated by Óscar Bertomeu (BIOVEC) and Paz Gómez (AINIA). Paz Gómez gave the appropriate introduction to the small-scale plant and concept. The visit tour of the biogas plant was guided by Óscar Bertomeu, while Paz Gómez was available to answer participants' questions during the visit tour. All the components of the plant were described: the management of substrates, AD process parameters, energy management (use of biogas in a boiler; support of gas-oil in case of problems with the biogas production, emergency situations) and digestate application.

During the event and especially the time during the bus ride from Zaragoza City to Zaragoza Province, several discussions took place and business to business meetings were facilitated among the participants by Óscar Bertomeu and Paz Gómez. The main topics were:

- Who can implement a biogas plant or be interested? The biogas plant provider explained that farmers or industries in rural areas are the most interested.
- Implementation of a small-scale biogas plant. Some Spanish biogas plant providers could manage the project, permits and building of the biogas plant. Sometimes, the pretreatments required to remove the packaging material are one of the most expensive components of the plants, for several kind of wastes.
- The difficulties of running a biogas plant. Further trainings on how to operate a biogas plant and feeding of the substrate should be offered.
- Discussion about other European cases like UK and other legislations and framework conditions. Similar political measures could contribute in Spain to small-scale biogas plants promotion.

The one-day workshop including the biogas plant visit was visited by 24 participants from different backgrounds: biogas plant operators, Spanish Biogas Association, regional hydrogen foundation, waste water treatment operators, biogas plant providers, technical staff of technology centres, professors from Universities, researchers and consultants. The participants highlighted the visit tour as a good opportunity to see a feasible biogas plant operating in Spain.



3.2 Germany

3.2.1 1st German Workshop – 25.02.2015

The first German workshop was conducted on the 25th February 2015. This workshop was organized in cooperation with the German Coffee Association (Deutscher Kaffeeverband e.V.). While compiling information on the potentials and barriers of biogas production in the agro-food industry in Germany at the beginning of the project, RENAC established good contacts to representatives of agro-food associations in Germany. The coffee association seemed particularly interested in the project and especially in finding a solution for their member companies to reduce their high energy demands and improve their residue management. For this reason, they contacted RENAC in order to organise a joint workshop. Together RENAC and the German coffee association organised the contents and planned the workshop jointly. Further, during WP3 a good contact had been established to a German biogas plant provider, Novis GmbH, who already had theoretical and practical experience in coffee skins as a biogas substrate. RENAC invited Dr. Helle (CEO of Novis) as lecturer to the workshop and held good contact with him ever since.

Subsequently, an event between the Coffee Association and RENAC on the topic of “Utilization of Coffee Skins” was jointly organized and held in the premises of the Coffee Association in Hamburg. The Coffee Association invited their members to participate in the workshop and Mr Johannes Hielscher from the association moderated the event. After a short welcome, Volker Jaensch (RENAC) presented the BIOGAS3 project, gave an introduction into the topic and presented the smallBiogas tool. Afterwards Dr. Thomas Helle (novis GmbH) spoke about the energetic utilization of residues of coffee production. In the second half of the workshop further possibilities for the utilization of coffee residues as fodder were discussed. During the breaks participants took the opportunity to individually getting in contact with Dr. Helle and Volker Jaensch to consult their experiences concerning biogas production.

Altogether 25 participants attended the workshop, mainly involved in producing coffee in Germany in small, medium and large scale: coffee roaster, coffee retailer and coffee refinement.

In general the feedback of the workshop was very positive.

When participants were asked, if the workshop met their expectations and what they liked most about the workshop, they responded:

- *Yes/ Outlook on current opportunities*
- *Very clear and understandable presentation*
- *Flexibility while expiration*
- *Yes! The pathway to small biogas plants, support and consultation*
- *Yes, it was adequate and extensive*

The general expectations of the participants have been fulfilled through the workshop and the presentations of experts as well as the discussions and exchange of experiences was welcomed. Participants acknowledged the balance of the content between theory and practice.

Four of the participants were interested in further free consultation for the energy self-sufficiency of their company and five people liked to receive further information of the BIOGAS3 project. Four of the participants could imagine to install a biogas plant at their company or to participate in a biogas cooperation with other companies, if appropriate circumstances and framework conditions were given.

Following up on the workshop, RENAC kept contact with interested coffee roasters and conducted six sustainability analysis with companies. One coffee roaster was especially interested and RENAC with the support of Dr. Helle (Novis) was able to support this company with valuable information on the market during a final round meeting. Since the circumstances and conditions for the company (in terms of space and area available) are not in place yet, the company will contact and consult RENAC again, whenever they decide for future steps towards energy self-sufficiency. This is expected to happen after the end of the project (autumn 2016).



3.2.2 2nd German Workshop – 15.04.2015

The second German workshop was conducted on the 15th April 2015 in cooperation with the Food Processing Initiative (FPI e.V.), North Rhine-Westphalia. Due to its network and connection to the agro-food industry in the region of the workshop, the FPI e.V. was a valuable contact and gave good support for the BIOGAS3 workshop. The contact remained throughout the project phase. RENAC organised and planned the event in agreement with FPI and invited external biogas plant providers as speakers. The event took place at Haus Düsse, an agricultural sample farm with a sample biogas plant, run by the agricultural ministry of North Rhine-Westphalia. The workshop was planned like an afternoon event, to attract participants, who are (due to workload for example) unable to attend a workshop.

After a presentation given by Katharina Hartmann (RENAC) of BIOGAS3, and an introduction to the topic of energy self-sufficiency through sustainable biogas production from agro-food residues and a short presentation of the smallBiogas tool, RENAC had invited several biogas plant operators to speak about their experiences. RENAC had contacted all biogas plant providers listed in the BIOGAS3 handbook, to ask about their contribution in the workshop. Three providers responded and held a presentation. Camilo Wilches (Biogas Weser-Ems GmbH&Co.KG) spoke about cost-efficient solutions for treating organic residues in the agro-food industry and presented best practise examples. Volkmar Göldner (dynaHeat HPE) presented his experiences with micro and small-scale CHP plants for agro-food wastes and to conclude Dr.

Benno Brachthäuser (4Biogas GmbH & Co.KG) gave a presentation on the feasibility of small-scale biogas plants for energy self-sufficiency. He not only pointed out the legal and financial framework in Germany, but spoke also about alternative financing opportunities in terms of corporate or project finance.

Most relevant discussion topics were:

- Feasibility of biogas plants, due to the changed regulatory and financial framework (feed-in tariffs) in Germany
- Utilisation, separation and sanitization of specific substrates (e.g. bakery residues)
- How can biogas plants contribute to energy self-sufficiency if company has production peaks
- Utilisation of digestate, possibilities for cooperation with farmers

During the breaks business to business meetings took place: The participants and biogas plant providers engaged in lively discussions and an exchange of experiences. Agro-food companies directly consulted the biogas plant providers with specific questions concerning their substrates and possibilities on how to realise and implement a biogas plant.

At the end of the presentations, the group went to the connected agricultural biogas plant. This agricultural sample plant was implemented in 2002 and runs on energy crops. The plant has an installed electrical capacity of 240kW and the produced electricity is fed into the national grid and receives reimbursement from feed-in tariffs.

The one-day workshop in Bad Sassendorf was visited by 14 participants from different backgrounds: agro-food companies, policymaker from state agricultural ministry, research centers, consultants, municipal waste experts and biogas plant providers.

In general the feedback of the workshop was very positive. Participants could rate their answers according to a range from very good (1) to very poor (5).

a. Course organization

	Average
Communication with BIOGAS ³ Teams before the Food Forum	1,6
How did you like the event?	1,8

b. Course content

	Average
Did this training match your needs and expectations?	1,9
How was the balance of theory within the course?	1,8
How was the balance of practical learning within the course?	1,6

Was there enough time for interaction / discussion?	1,7
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What was the highlight of the course? What would you recommend about it?

- *I have expected more participants, but the exchange was very good*

c. Site visit

	Average
How did you like the plant sightseeing?	2

Four of the participants were interested in further free consultation for the energy self-sufficiency of their company and six people would like to receive further information of the BIOGAS3 project. Five of the participants could imagine to install a biogas plant at their company or to participate in a biogas cooperation with other companies, if appropriate frameworks are given, and one of these could only imagine it in a cooperation.

The general expectations of the participants have been fulfilled through the workshop and the presentations of experts as well as the discussions and exchange of experiences was welcomed. Participants acknowledged the balance of the content between theory and practice.



3.3 France

3.3.1 1st French Workshop – 19.03.2015

The first French workshop was held on the 19th March 2015 on the ground of the cheese dairy farm Fromagerie Baechler in Le Temple Sur Lot close to Agen in the south of France.

The workshop organised by IFIP and ACTIA started with an introduction into the topic and a presentation of the BIOGAS3 project held by Volker Jaensch (RENAC). Alexandre Rugani (IFIP) continued with a presentation on the basics of biogas production, feasibility aspects of biogas production, potential substrates of the agro-food industry and introduced the smallBiogas and Méthasim tool to the audience, including a demonstration about the functionality of the tools. After the lunch break Pauline Beraud from the plant provider VALBIO gave some practical examples and technical backgrounds of biogas plants built by VALBIO.

Throughout the workshop among other things the technology of a biogas plant was discussed. About the practical operation of a biogas plant participants were interested in the management of the process, the digestate management and the costs.

During this workshop Laura Marley (ANIA) from the FabBiogas project was invited by IFIP and ACTIA to present the contents of the FabBiogas project in France. Considering similar aspects between the two projects (biogas production in agro-food industry) it was decided to conduct a common presentation also for the second French BIOGAS3 workshop.

To conclude this first workshop, the biogas plant (built by VALBIO) of the Fromagerie Baechler was visited. This biogas plant digests around 5 Mio l of treated milk per year and produces around 5,170 kWh/d.



The one-day workshop in Le Temple Sur Lot was visited by 19 participants from different backgrounds: agro-food companies (distilleries, dairy producer) and associations, energy suppliers, biogas plant providers, consultants and journalists.

In general the feedback of the workshop was very positive. Participants could rate their answers according to a range from very good (1) to very poor (5).

a. Course organization

	Average
Communication of BIOGAS3 team before the course	2
Training location	1,7
Training equipment	1,7

b. Course content

	Average
Did this training match your needs and expectations?	2
How was the balance of theory within the course?	2
How was the balance of practical learning within the course?	2
How would you assess your personal learning progress?	2
Was there enough time for interaction / discussion?	3

What was the highlight of the course? What would you recommend about it?

- *Presentation in general*
- *Visit an industrial site*
- *Visit to the dairy & exchange with the CEO of VALRIO*

What could be improved in future courses? Was there any subject missing?

- *1-2 h additional time for the participants to exchange*

c. Site visit

	Average
How did you like the plant sightseeing?	1

- *Excellent interventions from industrial partner VALBIO -*
- *Transparency in answers and questions*

The general expectations of the participants have been fulfilled through the workshop and the presentations of experts as well as the discussions and exchange of experiences was welcomed. Participants acknowledged the balance of the content between theory and practice.

3.3.2 2nd French Workshop – 17.06.2015

The second French workshop was held in Paris on 17th June 2015 during the national event of Biogas Exhibition "Expobiogaz" in Paris. The workshop was organized by Laura Marley from ANIA in the context of FabBiogas project. The advertising was done by each BIOGAS3 partner (AINIA, ACTIA, IFIP) within their own network.

Pascal Levasseur (IFIP) held a similar presentation as in the first workshop (basic references of biogas production, profitability, potential substrates of the agro-food industry, digestate management, best practise examples, smallBiogas tool and Méthasim). He adapted the presentation to meet the requirements of BIOGAS3 in terms of small-scale biogas units as well as FabBiogas in terms of medium to larger-scale units. Since the fair is one of the most important platforms for biogas plant providers to present themselves, the participants (including agro-food companies) of the workshop had the possibility for many business to business meetings.



The workshop in Paris was visited by 27 participants from different backgrounds: school and research center, agro-food companies and associations, agricultural chambers, energy suppliers, biogas plant providers, consultants, elected member and journalists. Subsequently, this mix of participants facilitated lively discussions, exchange of ideas and experiences.

The workshop was generally positively evaluated. Participants were given the opportunity to rate their answers according to a range from very good (1) to very poor (5).

a. Course organization

	Average
Communication of BIOGAS3 team before the course	1,3
Training location	1,5
Training equipment	1,3

b. Course content

	Average
Did this training match your needs and expectations?	2,3
How was the balance of theory within the course?	1,7
How was the balance of practical learning within the course?	1,7
Was there enough time for interaction / discussion?	1,7

What was the highlight of the course? What would you recommend about it?

- *Operation of the biogas field*
- *Funding and grant projects*
- *Mapping of the deposit for a good view of the potential of the biogas industry in Lorraine*
- *Presentation of the methodology*
- *Deposits and funding*

3.4 Sweden

The Swedish workshop took place from the 31st March till the 1st of April 2015 at the premises of the agricultural college Jällagymnasiet in Uppsala.

The first day of the workshop dealt with the theoretical basics of biogas production in the agro-food industry and was held in one of the seminar rooms of the college. After a short round of introductions of the participants, Katharina Hartmann (RENAC) gave an introduction into the topic and presented the BIOGAS3 project as well as the economic tool smallBiogas. Throughout the day, Henrik Olsson (JTI) lead through the workshop with several presentations on the topics of biogas production in general (including the technical and biological fundamentals), about functionality of biogas plants and practical considerations as well as feasibility aspects and implementation possibilities of biogas projects in agro-food companies. The day was also characterized by many raised questions and discussions on for example the potential of substrates and financing possibilities of biogas plants.

On the second day the biogas plant of the agricultural college was visited by the participants. Beforehand, Mats Gustavsson (MMG-konsult) who constructed and built the biogas plant spoke about his experiences and expertise in the field of biogas. After the agricultural biogas plant was visited, Cecilia Norén from the agricultural board (Länsstyrelsen Stockholm) spoke about public financial instruments for the support of biogas plants. To conclude the day, Henrik Olssen initiated a discussion with the participants, answered their questions and exchanged experiences with Katharina Hartmann in terms of the differences in feed-in tariffs between Sweden and Germany. During both workshop days, participants had the possibility for business to business meetings, to exchange knowledge and experiences with each other; agro-food companies, consultants, researchers and plant providers discussed various topics during the coffee and joint lunch breaks.

Throughout the workshop among other things the economy of biogas production in Sweden was discussed, in particular the potential for financing of biogas plants through grant subsidies. Another discussion topic was the possibility of biogas upgrading to natural gas quality and its utilization paths.



The two-day workshop in Uppsala was visited by 11 participants from different backgrounds: agro-food companies (leather factory, slaughter company, salad producer, horse farmer), biogas plant operators, associations, equipment and biogas plant providers, Swedish agricultural board, regional municipalities and educational institutes.

In general the feedback of the workshop was very positive. Participants could rate their answers according to a range from very good (1) to very poor (5).

a. Course organization

	Average
Communication from before the course	1,7
Provision of information/training material	1,9
Training location	1,9
Training equipment	1,9

b. Course content

	Average
Did this training match your needs and expectations?	1,5
How was the balance of theory within the course?	1,6
How was the balance of practical learning within the course?	1,6
How would you assess your personal learning progress?	1,8
Was there enough time for interaction / discussion?	1,7

What was the highlight of the course? What would you recommend about it?

- *Microbiology and economics*
- *Study visit to the biogas plant was a good complement to the theory*
- *Open atmosphere and interesting discussions*
- *Networking and info on the research front*
- *The practical part, visit tour and presentation of MMG Consultant (plant provider)*
- *Particularly interesting with MMG Consultant (plant provider)*
- *Good mix of content*

What could be improved in future courses? Was there any subject missing?

- *Better explanation of terms in the theoretical part*
- *Better structured lectures*

c. Site visit

	Average
How did you like the plant sightseeing?	1

Five of the participants were interested in further free consultation for the energy self-sufficiency of their company and nine people would like to receive further information of the BIOGAS3 project. Four of the participants could imagine to install a biogas plant at their company or to participate in a biogas cooperation with other companies, if appropriate frameworks are given.

The general expectations of the participants have been fulfilled through the workshop and the presentations of experts as well as the discussions and exchange of experiences was welcomed. Participants acknowledged the balance of the content between theory and practice.

3.5 Poland

The Polish workshop and visit tour took place from the 19th to the 20th May 2015 at the Agricultural Counselling Centre in Końskowola.

The first day of the workshop dealt with an introduction into the topic of sustainable small-scale biogas from agro-food waste for energy self-sufficiency and a presentation about the BIOGAS3 project by Malgorzata Kachniarz (FUNDEKO). In this part the BIOGAS3 video was shown. Technical background of biogas production was given by Lukasz Lepecki (FUNDEKO), who also demonstrated the economic tool smallBiogas with an example of application. Due to similarities between the projects, Marek Amrozy (NAPE) was invited by FUNDEKO to speak about his EU-project BioEnergyFarmII (small-scale manure biogas plants on farms), that he presented after Lukasz Lepecki. Katharina Hartmann (RENAC) then spoke about the feasibility of biogas plants in agro-food companies, about biogas project planning and realization and gave best practice examples. In the next presentation Malgorzata Kachniarz explained about the legal and financial framework conditions for biogas production in Poland, including possible sources of investment subsidies, and presented the BIOGAS3 small-scale technology handbook. To conclude the first workshop day, three plant providers presented their biogas plants (Mega Belzyce, Biopolinex and Bioelectric). Before the workshop, all identified technology providers of small scale biogas plants were invited to the workshop. Three of them (Bioelectric, Mega and Biopolinex) accepted the invitation and came to the workshop in person. The other technology providers' offer was presented by Malgorzata Kachniarz on the basis of the information gathered within WP3 BIOGAS3 Handbook. During both workshop days, participants had the possibility for business to business meetings, to exchange knowledge and experiences with each other; agro-food companies, consultants, researchers and plant providers discussed various topics during the coffee and joint lunch breaks.

On the second day participants were offered to visit a biogas plant close to the training location – in Koczergi¹. Koczergi biogas plant is a two-step digester (with separate hydrolysis) equipped with a 1.2 MW_{el} CHP engine. Biogas is produced from maize silage (from own fields) and vegetable processing waste from external suppliers. The electrical energy is sold to the national grid, and the thermal energy is used on site to heat the neighboring greenhouses (4 ha, tomato). The digestate is used as fertilizer on own fields and sold to the neighboring farms of max. 20 km distance (the plant owner has undergone the formal procedure and received a permit of the Minister of Agriculture allowing to sell the digestate). The visit participants were very satisfied with the opportunity to see how such plant functioned, what were the main technological components as well as the steering panel. They asked questions about inconveniences related to odours and the plant owner explained the only source of odors was the maize silage storage, but it was not a problem because the plant is located in a sufficient distance from dwellings. The plant owner, Mr. Mariusz Gołacki, has talked about the difficult financial situation of the plant caused by the drop of green certificates prices and instability of legal provisions in Poland.

The two-day workshop in Konskowola was visited by 28 participants from different backgrounds: agro-food companies, farmers, RES advisors, biogas plant providers, agricultural advisors, regional authorities and research institutes. FUNDEKO designed and printed out a poster advertising the event. The posters were distributed in the Lubelskie region of workshop by the workshop host – the Agricultural Counselling Centre of Końskowola. FUNDEKO designed, printed and handed out Certificates of Attendance for all the training participants.

In general the feedback of the workshop was very positive. Participants could rate their answers according to a range from very good (1) to very poor (5).

a. Course organization

	Average
Communication from FUNDEKO before the course	1,1
Provision of information/training material	1,2
Training location	1,2
Training equipment	1,2

b. Course content

	Average
Did this training match your needs and expectations?	1,4
How was the balance of theory within the course?	1,4
How was the balance of practical learning within the course?	1,4
How would you assess your personal learning	1,4

¹ There are no small scale biogas plants in the whole region.

progress?	
Was there enough time for interaction / discussion?	1,3

What was the highlight of the course? What would you recommend about it?

- *Comprehensive information in one place*
- *Small biogas plant concept, examples of small-scale biogas plants, barriers and perspectives.*
- *Visit tour in the biogas plant.*
- *Learning about SmallBiogas tool; financial aspects of a small biogas plant.*
- *Practical advices and hints.*
- *Presentation of small-scale biogas technologies.*
- *Wonderful presentation.*
- *Examples of small biogas plants and the tool for biogas plant analysis.*
- *SmallBiogas tool presentation.*
- *Meeting technology providers, learning about technology costs.*

What could be improved in future courses? Was there any subject missing?

- *A more detailed analysis of costs and benefits.*
- *Threats and risks in case of inappropriate operation of a small biogas plant.*
- *How to use the heat in summer time.*

Nine of the participants were interested in further free consultation for the energy self-sufficiency of their company and nine people would like to receive further information of the BIOGAS3 project. Four of the participants could imagine to install a biogas plant at their company or to participate in a biogas cooperation with other companies, if appropriate frameworks are given.

The general expectations of the participants have been fulfilled through the workshop and the presentations of experts as well as the discussions and exchange of experiences was welcomed. Participants acknowledged the balance of the content between theory and practice.



3.6 Ireland

3.6.1 1st Irish Workshop – 21.05.2015

IrBEA organized the BIOGAS3 workshop and site visit in cooperation with their partners Origin Green on the 21st May 2015 in Kilkenny. Origin Green is the only sustainability programme in the world that operates on a national scale, uniting government, the private sector and food producers through Bord Bia, the Irish Food Board.

Noel Gavigan (IrBea) started the workshop with an introduction of the project BIOGAS3 and the basics of small-scale biogas production in the agro-food industry. His presentation was followed by Padraig Brennan (Bord Bia), who presented the Origin Green Programme. Afterwards, on best practice example, the Dairygold biogas plant at Castlefarm, was presented by the plant operator Gabriel Kelly (Dairygold EHS). This project has the potential to treat wastes from other Dairygold facilities such as WWTP sludge thus reducing dependence on land spread. Irish Dairy Board (IDB) are centralizing production of Kerrygold at this facility as a direct result of this investment. Katie Brown (RENAC) spoke about the implementation possibilities of small-scale biogas plants in agro-food companies, demonstrated the smallBiogas tool and gave examples from Germany. This was followed by the presentation of Angie Bywater (Methanogen). This biogas plant operator has been on the market for over 20 years and is based in Shropshire, England. They introduced many of their commercial, experimental and educational projects and gave an impression about investment costs and considerations for O&M.

There were opportunities to ask questions after all presentations and during the breaks business to business meetings between participants took place. Since most of the participants were involved in farming most of the questions addressed issues such as

- Utilization of digestate
- Investment costs of biogas plants
- Possibilities for business collaboration models to ensure constant supply of feedstock
- Additional benefits (such as disposal of 'waste'), benefits of classifying 'waste' as 'byproducts'

In the afternoon the biogas plant at Camphill community was visited by the group. The plant has been installed in 1998. The plant receives revenues through gate fee (a certification that is provided to food producers for safe disposal of their food "byproducts"). The substrates derive mainly from Dublin and consist of 5,000 t cow slurry and 4,000 t food waste. The plant consists of two digesters: 1 x 700 m³ and 450 m³. Biogas plant sells the gas to the Camphill Community. Due to the high gate fees they can charge, the biogas plant paid for itself after only 3 years. The income from the biogas plant finances the building of new buildings for the Camphill Community.

The workshop in Kilkenny was visited by 47 participants from different backgrounds: agro-food companies, biogas plant operators, associations, equipment and biogas plant providers, agricultural board, regional municipalities and educational institutes.

In general the feedback of the workshop was very positive. Participants could rate their answers according to a range from very good (1) to very poor (5).

a. Course organization

	Average
Communication from before the course	1,9
Provision of information/training material	1,8
Training location	1,8
Training equipment	1,9

b. Course content

	Average
Did this training match your needs and expectations?	1,9
How was the balance of theory within the course?	2
How was the balance of practical learning within the course?	2
How would you assess your personal learning progress?	2
Was there enough time for interaction / discussion?	1,8

What was the highlight of the course? What would you recommend about it?

- *Site visit.*
- *Noel Gavigan 's Introduction*
- *Understanding what other EU countries have done in AD and there Pro's + Con's*
- *Past experience's.*
- *Theory Case Studies*
- *Overall very good.*
- *Getting insight into various activities taking place in the market.*
- *Particularly interesting with MMG Consultant (plant provider)*
- *Good mix of content*

What could be improved in future courses? Was there any subject missing?

- *To steer people in the direction so that they end up with an AD system which EU policy wants.*
- *More technical information on latest academic research.*

c. Site visit

	Average
How did you like the plant sightseeing?	2

Twelve of the participants were interested in further free consultation for the energy self-sufficiency of their company and 15 people would like to receive further information of the BIOGAS3 project. Seven of the participants could imagine to install a biogas plant at their company or to participate in a biogas cooperation with other companies, if appropriate frameworks are given.

The general expectations of the participants have been fulfilled through the workshop and the presentations of experts as well as the discussions and exchange of experiences was welcomed. Participants acknowledged the balance of the content between theory and practice.



3.6.2 2nd Irish Workshop – 30.06.-01.07.2015

The second Irish Workshop was organized as a combined event from the plant visits of the Face-to-Face Trainings (Task 4.3) and the Workshops (Task 4.2). From the 30th June to the 1st July 2015 a BIOGAS3 study tour to Wales was organized by IrBea. The first day of the tour, the group of participants visited three biogas plants as part of the Face to Face Trainings, more information on these visits can be found in the report D4.4 Report of the Face to Face Trainings.

Day two of the tour was spent at the UK ADBA (Anaerobic Digestion and Bioresources Association) Trade Show in Birmingham, the big annual flagship event in the UK for biogas. Where participants had the chance to see the newest developments in AD technology, get in contact with biogas plant providers and have business to business meetings. The fair is visited annually by around 3,000 people from key sectors including farming, food and drink, local authorities, waste management, utilities, transport, etc., making the event a suitable framework for meeting key industry players and suppliers.

The workshop was attended by 16 participants from Ireland guided by IrBea.



Source: ADBA, <http://adbioresources.org/uk-ad-biogas-2015/features/conference/conference-programme-day-one/>

3.7 Italy

3.7.1 1st Italian Workshop – 26.06.2015

The first Italian workshop took place on the 26th June 2015 at Assolombarda in Milan. The location was chosen according to the strict contact of the hosting with the territory and the production companies. The workshop was organized by Tecnoalimenti and DEIAFA.

The workshop was opened by welcoming remarks from Marianna Faraldi (Tecnoalimenti) who also moderated the event. Katharina Hartmann (RENAC) introduced the project. This was followed by a presentation from Daniele Rossi, representative of Confagricoltura (The General Confederation of Italian Agriculture) and Assobirra (beverage production) on the topic of "Energy and competitiveness for agribusiness". Remigio Berruto (DEIAFA) presented the latest results and outcomes of the project BIOGAS3 and introduced the smallBiogas software tool and the handbook. The organisers had invited several technology providers and stakeholders to speak about their experiences in agri-food industries: Andrea Chiabrando (Staengineering Srl and CMA² representative) on "Technical aspects of biogas production and the legislative framework in agrofood industries", Daniele Chiodini (Austep S.p.A.) on a success story and the experiences of technology providers and Gabriele Boccasile (Unità Organizzativa Interventi per la competitività e l'innovazione tecnologica delle aziende, Regione Lombardia) on "Valorisation of by-products of agro-livestock activities in the small plants context, management and authorization". Maurizio Notarfonso from Federalimentare had been invited to present the project FabBiogas by speaking about "enhancement of residues from agro-food industries for the production of biogas". After the presentations participants had the time for business to business meetings that were moderated by Remigio Berruto or Marianna Faraldi.

The workshop in Milan was visited by 24 participants from different backgrounds: agro-food companies (e.g. mills, farms with livestock), biogas plant operators, consultants on energy,

² Consorzio Monviso Agroenergia

associations, equipment and biogas plant providers, agricultural board, regional municipalities and educational institutes.

In general the feedback of the workshop was very positive. Participants could rate their answers according to a range from very good (1) to very poor (5).

a. Course content

	Average
Did this training match your needs and expectations?	1,7
How was the balance of theory within the course?	1,5
How was the balance of practical learning within the course?	1,5
How would you assess your personal learning progress?	1,6

What was the highlight of the course? What would you recommend about it?

- *Inter-disciplinary approach to the topic*
- *Topic of biomethane - incentives and feasibility limits*
- *the speech of Chiabrando*
- *regulatory issues GSE and technical issues*
- *plants convenience and incentives*
- *Very interesting and exhaustive: good!*
- *success stories of Austep + technical and regulatory issues of Chiabrando*

What could be improved in future courses? Was there any subject missing?

- *Entering in details on the technical-scientific aspects*
- *To foresee more time for speakers*

The general expectations of the participants have been fulfilled through the workshop and the presentations of experts as well as the discussions and exchange of experiences was welcomed. Participants acknowledged the balance of the content between theory and practice.



3.7.2 2nd Italian Workshop – 02.02.2016

The second Italian workshop took place on the 2nd February 2016 in the Scientific and Technology Park in Valle Scrivia, Tortona. Also in this case, the location was chosen according to the strict contact of the hosting with the territory and the production companies.

The workshop was opened by welcoming remarks from Remigio Berruto from the University of Turin (DEIAFA), he furthermore introduced the Biogas3 project and the latest project results. Then Marianna Faraldi (Tecnoalimenti) presented the software tool smallBiogas and simulated a feasibility study. Andrea Chiabrando (CMA) was invited to speak about technical and legislative aspects of biogas production in agro-food industries.

In the afternoon the biogas plant of Fava Marcello, in Villaromagnano (Tortona, Alessandria) was visited by the group. (The plant was chosen close to the workshop venue, for facilitating the logistic). The plant was implemented in 2012 (it still takes the incentive rate 0.28 €/kW) with an installed electrical capacity of 1MW. The plant is fed with 20 tons/ day of bovine livestock wastes, with an addition of sorghum silage or triticale or damp corn semolina (residues of starch producers) up to a total amount of 50-55 tons/ day (including wastewater). The biogas is combusted in a cogeneration unit and produces electricity, sold to the manager of Energy Services The plant produces about 7700 MWh electrical net per year, about 8400 gross. The total cost of the plant was around 4 million euro, paid off in four years.

During this workshop, participants had the possibility for business to business meetings, to exchange knowledge and experiences with each other.



The workshop in Tortona was attended by 37 participants from different backgrounds: agro-food companies (such as farms with livestock, winemakers), operators on plants from renewable sources (e.g. CMA, Asja,), operators in energy sector, equipment and biogas plant providers, consultants and educational institutes.

In general the feedback of the workshop was very positive. Participants could rate their answers according to a range from very good (1) to very poor (5).

a. Course content

	Average
Did this training match your needs and expectations?	2,2
How was the balance of theory within the course?	2,3
How was the balance of practical learning within the course?	2,3
How would you assess your personal learning progress?	2,2

b. Site visit

	Average
How did you like the plant sightseeing?	1,8

What was the highlight of the course? What would you recommend about it?

- *high level of content and useful and practical details*
- *excellent overview of the situation in the past, present and future biogas market*
- *interesting, well-articulated, times have been respected*
- *involvement of young professionals allowed to touch the work behind the production of biogas*
- *very significant technical and practical content, thanks*

What could be improved in future courses? Was there any subject missing?

- *Arguments to be developed in more time. I hope you will organize other similar events (opinion of two people)*

The general expectations of the participants have been fulfilled through the workshop and the presentations of experts as well as the discussions and exchange of experiences was welcomed. Participants acknowledged the balance of the content between theory and practice.

4 Conclusion

Since the start of the workshop training activities of the project in February 2015 until the end of the project (29th February 2016) 13 BIOGAS3 workshops and several visit tours have been organized. In total 320 people participated in the workshop events of the BIOGAS3 project in Spain, Germany, France, Sweden, Poland, Ireland and Italy. The workshops aimed at disseminating the project's contents, offer business to business meetings between agro-food companies and biogas plant providers and discuss the results with the target group. On request of people unable to attend the workshops, the contents and information of the workshops were spread even beyond the group of participants.

The support of local stakeholders allowed partners to enlarge the scope of the BIOGAS3 Workshops, given that the former contributed greatly in the provision of practical knowledge: during the Workshop sessions. For instance, technology providers shared their expertise and, during the visit tours, biogas plant owners disclosed their practical experience in order to enhance the understanding of the attendants in the specificities and technicalities of the functionality of a biogas plant. Due to the vast experience of the national stakeholders as well as the involvement of practical examples, participants increased their practical knowledge and hands-on experience.

The conducted workshops and site visits received overall a very positive feedback and featured interesting discussions and facilitated and promoted interactions between the target group and plant providers. Altogether 320 people from seven different countries participated in the 13 workshops and visit tours.

This demonstrates the strong demand for capacity building for the topic of energy self-sufficiency through sustainable small scale biogas production in the agro-food industry.

Thanks to the contribution and involvement of all project partners regarding not only the means of promotion of the Workshops, but also the careful selection of venues and places where they were carried out and which parties were engaged, the Workshops were successfully implemented in all member countries of BIOGAS3, which is clearly echoed by the high interest of an amount of participants that exceeded initial expectations.