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D5.2. Report on one-to-one activities

BIOGAS³

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

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Authors:

Michael Hegarty (IrBEA)

Noel Gavigan (IrBEA)

With the collaboration of all the BIOGAS³ consortium

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1. Introduction

One-to-one activities, led by IrBEA, were an important step towards the final objective of setting the conditions to promote new investments. This step made use of the business collaboration and the small-scale AD models developed in WP2 and WP3, and identified the most promising agro-food companies (including farms) to implement small-scale AD in the participating countries.

Guidelines were provided for selecting the agro-food industries considered most promising to be more directly involved in the project activities (see summary below in section 2). There was good scope for each partner to devise their own way to arrange and conduct one-to-one meetings. For some partners it was appropriate to hold one-to-one meetings during brokerage events, for other partners additional visits were necessary after those general events.

In all approaches, the partner informed the agro-food company about the project, the BIOGAS3 concept, the business collaboration models, the energy demand management model, and collected data for the sustainability analysis done with the smallBIOGAS software developed in WP2. Follow-up contact was arranged for timely data collection if required. The data and related analysis, centred on fair and transparent criteria and procedures, forms the basis of the selection of the agro-food industries to be more directly involved in the project activities.

IrBEA designed a tool (Excel) for conducting and recording the one-to-one meetings – the WP5 Meetings Record Template. Sheet 1 of the template is a simple client meeting form recording name, business type (food processor or farm), contact details and notes. It also contains summary detail on feasibility and sustainability drawn from Sheet 2 (Meeting Summaries). This sheet includes sections for recording: Technical Background (feedstocks, energy use on site); Site visit, Feasibility and Sustainability Analysis (feedstock t/annum, biogas/annum, capital investment cost, CO₂ reduction, payback period). There is additional space for recording workshop attendance and final round meetings.

WP5 tasks started in month 7 and continued until month 24. In the original work programme WP5 activities ended in month 16, but in reality WP5 actions were ongoing until the end of the project. In meetings, the project partners identified the most likely project developers, discussing these main points:

- Introducing the concept of Biogas & Biogas3
- Identifying business type and substrates
- Identifying potential co-substrates
- Collecting data for the Sustainability analysis/SmallBIOGAS Software

Discussions included benefits of small scale AD, self supply of energy, lower waste management costs, lower carbon footprint, financial viability, technical viability, example plants, and model plant for the target users.

2. Procedures and selection criteria for one-to-one meetings

Selecting agro-food companies/farms to participate in the programme of one-to-one meetings is based on a fair and transparent process according to specific criteria and steps. Guidance for this, based on the approved project document and developed and discussed at the project meeting in Berlin September 2014, is outlined here:

2.1. Target group screening and selection

In each partner country, this step made use of the outputs from tasks described especially in WP2, and also from WP3 and WP4.

- Select the most appropriate events/forums for each country for informing potential target groups about the possibilities for small-scale AD plants in agro-food businesses. Options included: a) presence and presentations in agro-food fairs and trade shows; b) presentations in meetings of national associations; c) participation in brokerages with agro-food companies; d) discussions with specific agro-food sector service providers, e.g. farm/food research and extension services, specific quality and sustainability initiatives, etc.
- Participate in the events/forums described above, informing about Biogas3 project and making preliminary notes with target agro-food companies on these aspects:
 - Contact details (name, phone, email)
 - Current and future energy supply, use and cost
 - Current and future waste treatment operations
 - Potential feed stocks available for AD
 - Potential use of energy and substrates from AD (heat, power, fertiliser)
 - Interest in finding out more about AD options
- Select a list of agro-food companies with potential to implement small-scale AD to be more directly involved in the project activities. Use was made of the above aspects, while for fairness and transparency the partner countries gave quantitative scores (1=low, 5=high) for the following qualitative selection criteria to complete the selection:
 - Client drive, enthusiasm and readiness to respond to partner meeting proposals within a reasonable timeframe
 - Financial viability and sustainability – feedstock (t/year), biogas (000/m3), investment cost, payback period, CO2 reduction, waste management
 - Investment initiative, e.g. pro-active seeking of development expertise and capital investment
 - Practicalities, such as location, options for energy use, knowledge and experience
- Follow-up contact with the selected agro-food companies to ask for/arrange one-to-one meetings with each (or by phone, at events, etc).

2.2. Execution of programme of one to one meetings

One-to-one meetings were held in the most appropriate place, as agreed between the project partner and each participant. During each meeting, the project partner informed the agro-food company about the Biogas3 project, business collaboration and energy demand management models, and collected data for technical analysis and feasibility and sustainability analyses to be done with the smallBIOGAS software from WP2.

Meeting and selection records for each of the partner countries are in the Annex to this report (confidential), including the following information:

Third Parties (beneficiaries) involved:

- a. Name and details of the third parties involved
- b. Type of third party (e.g. agro-food industry, biogas plant producer, investor, biomass supplier, etc.).
- c. Contact person in the third party involved (including contact details)

Selection of Third Parties:

- a. How and when the first contact with third parties was made.
- b. Who were the possible candidates, including contact details
- c. How where the involved ones selected? (used selection criteria and steps in the selection process)

Project Contribution

- a. Would the decision of investment have taken place without the input from the project? Did the idea start from the project, or are we providing support in the realisation of an existing one?
- b. Role of the project consortium and type of support provided.
- c. Estimation of the number of hours spent by the project consortium in supporting the decision.

Realisation of the Biogas Plant

- a. Concrete results.
- b. Total estimated investment for the realisation of the biogas plant with details of the main cost components.
- c. Actors selected for the realisation of the biogas plant (e.g. plant/machines supplier/installer, etc.).
- d. Method of selection of actors for the realisation (e.g. public tender, direct contact, etc.).

Schedule

- a. Main dates (beginning of planning activities, signing of contracts, starting date of works, time of completion).
- b. Current state at the time of the project.



3. Achievements

All participating partners followed the steps outlined above, firstly in making contact with agro-food companies and target groups identified in WP2, WP3 and WP4, and then following up by selecting and engaging with agro-food companies having potential to implement small-scale AD to be more directly involved in the project activities. A summary of the achievements compared to the targets for each partner country can be seen in the table below, and the totals.

	Spain		Ireland		France		Italy		Germany		Sweden		Poland		TOTAL	
First Round 1to1 meetings: target (<i>achieved</i>)	50	62	25	20	50	53	35	50	50	51	50	50	10	26	270	312
Sustainability Analysis target (<i>achieved</i>)	30	32	3	7	50	53	17	20	20	13	3	4	5	26	128	155
Second Round 1to1 meetings target (<i>achieved</i>)	10	8	5	5	10	5	12	12	10	5	10	9	3	1	60	45
Pre-contracts target (<i>achieved</i>)	2	2	1	1	2	0	2	1	2	0	1	0	0	0	10	4

The targets for first round meetings were all comfortably achieved, and in some countries considerably exceeded. Achievements in individual partner countries and descriptions of the market and support environment are described below.

3.1 Ireland

In **Ireland** IrBEA achieved solid results despite uncertainty about the legal and financial support framework. Twenty first-round one-to-one meetings occurred including 12 farmers and eight agro-food companies – 80% of the overall target. Contacts for these meetings were mainly initiated either directly or indirectly through a national ‘Future in Food’ event, two Biogas3 project workshops and a study visit to on-farm biogas sites in the UK. Taking into account that Ireland currently only has around 25 installed biogas plants of all sizes, and that a fair and transparent selection process was used to identify agro-food companies genuinely interested in the possibilities for biogas production for their businesses, this was a good achievement. The genuinely strong level of interest among first round participants proved to be important in subsequently achieving seven sustainability analyses – more than twice the target (3). This was followed by five second round one-to-one meetings (target also 5) with agro-food businesses (1 dairy farmer, 1 beef & sheep farmer, 2 cheese makers, 1 farm & prepared food manufacturer) showing sufficient interest to progress further.

One pre-contract was achieved, equalling the target. This result was with a vertically integrated enterprise with vegetable, cereals and meat production and prepared foods for sale in supermarkets and convenience foods. The company attended the first project workshop in 2015, and follow-up contact by IrBEA along with a biogas plant provider resulted in agreement to proceed with an experimental biogas plant tailored to the waste management and energy

needs of this farm and food business based in County Dublin. Apart from this pre-contract, three small-scale cheese manufacturers who participated in Biogas3 events (workshops and/or study tours) and first- and second-round meetings are very keen to conclude agreements and proceed with plant investments in the short term – probably within six to 12 months. This is an example of positive legacy and medium- to longer-term impacts of Biogas3. IrBEA provided these producers with technical information and facilitated meetings with biogas plant providers and financiers.

These achievements were realised despite there being considerable uncertainty about the details of planned legal and financial reforms for incentivising production of renewable heat and electricity in Ireland. Policy development in these areas is ongoing, and agro-food producers are watching developments closely before deciding about investments in renewable energy including biogas. The General Election on 26 February 2016 and uncertainty about the make-up of the next Government added to market uncertainty.

Besides the above results, IrBEA liaised and cooperated with a number of bodies to progress with the project. The 'Origin Green' farm/food sustainability programme administered by Bord Bia (Irish Food Board), sets specific production and processing parameters and commits farmer and food processor participants to engage directly with the challenges of sustainability, including reducing energy inputs, minimising overall carbon footprint and lessening impact on the environment to increase efficiency and competitiveness. By liaising with this programme, IrBEA was able to identify farmers/food companies potentially interested in small-scale biogas systems, and follow up with direct contact.

IrBEA and the Irish Farmers Association ran a joint study tour to the UK during the summer 2015, visiting two farm scale digesters and attending the Anaerobic Digestion and Bioresources Association (ADBA) conference. IrBEA participated in regular meetings with the Department of Agriculture (DoA) through the Animal By-Product (ABP) Regulations Forum to develop ABP regulations around farm scale digesters. DoA, IrBEA and the ABP Forum have agreed on a regulation document which is now in force. IrBEA met with Teagasc, the state agriculture research, advisory and education body, to encourage Teagasc clients interested in AD to attend Biogas3 events.

IrBEA has also used an additional tool developed to take into account seasonality factors of feedstock. Unlike many continental European farms, Irish farms operate extensive grazing systems that limit available feedstock during summer months for a farm-based slurry digester.

3.2 Spain

Summary of results

In **Spain** AINIA and FIAB achieved good results despite uncertainty about the legal framework between 2012 and 2015. Sixty-two first-round one-to-one meetings occurred including 14 farmers and forty-eight agro-food companies – 12 more than the overall target (62). Contacts for these meetings were initiated mostly by direct contacts with farmers and companies by phone and in person, based on the experiences from WP2 (task 2.2 led by FIAB) and associated members/clients of other services of AINIA. These numbers increased through the national workshops, face-to-face training, visit tours and national events (e.g. participation in fairs).



Among these contacts, it was possible to carry out 32 sustainability analyses with the most promising companies, taking into account type and amount of waste and energy needs.

After the sustainability analysis, it was offered to the most promising cases to present the results in their facilities. AINIA and FIAB gave the opportunity to all the involved national biogas plant providers to interact with the agro-food companies participating in the project and interested in a final round of meetings. As a result, it was possible to develop 8 final rounds of meetings. Two of the final rounds of meetings were done in the SEPOR Fair at the stand of AINIA, three were carried out in the facilities of the agro-food company, one was carried out in AINIA facilities contacting via Skype® with the biogas plant supplier, and two final rounds of meetings were carried out by 3-way phone conference (AINIA-biogas plant supplier-food company) due to limited availability of the agro-food company. An additional final-round meeting was planned with one company that also attended the visit tour in face-to-face training activities. This company was included in the sustainability analysis studies and had an informal meeting with the Spanish biogas plant provider LUDAN during the visit tour. Then, the feasibility study was reviewed by AINIA and a final round meeting was planned for 2nd February 2016. However, the company postponed the final-round meeting and it was not possible to develop in February 2016, before the end of the action of BIOGAS3 project. It is foreseen that the company will explore in 2016 the biogas solution but at the moment it is not a priority of the company despite estimated short payback and high benefits for them from a green marketing point of view.

Two pre-contracts were achieved thanks to final round of meetings, equalling the target. Two Spanish biogas plant providers were involved in the project and provided the contact with the companies. AINIA supported the involved stakeholders' ongoing networking activities and gave independent sustainability analysis to the agro-food companies in close contact with them making possible to have a preliminary estimation of the biogas potential from their specific substrates as well as the size of the plant, among other aspects. One of the pre-contracts signed corresponds to a plant which initiated construction during 2015 while the other pre-contract refers to a plant which the construction has not yet begun.

Moreover, AINIA is in contact with main Spanish biogas plant providers involved in the final-round of meetings. As a follow-up to these meetings, all the agro-food companies involved received detailed offers from Spanish national providers. Some of them are waiting for further support from Regional Government while others are developing in detail the concept of the plants with national providers in order to reduce as much as possible the investment costs.

Taking into account that Spain currently only has around 9 small scale biogas plants installed, and that a fair and transparent selection process was used to identify agro-food companies genuinely interested in the possibilities for biogas production for their businesses, this was a good achievement.

Brief market context

These achievements were realised despite low incentives for renewable heat and electricity from biogas for new plants in Spain and no clear regulations for self-consumption from renewable energy until October 2015. Involvement of plant providers has been important and due to their

collaboration it has been possible to develop technology models adjusted to national constraints, to show suitable current small-scale plants as well as to collaborate in launching new projects.

The 3 years 2012-2015 were characterized by a lack of feed-in tariff for electricity from biogas for new plants, high uncertainty in self-consumption regulations (electricity) until October 2015 and increasing taxes since 2012 for biogas plants (existing and new plants). Currently, the only incentive to biogas plants in Spain at national level is related to the reduction of CO₂ emissions. The biogas plants could receive an incentive of 9.7 €/t CO_{2eq} saved, during 3-4 years, from the Ministry of Agriculture, Food and Environment. In addition to that, there are some regional subsidies for thermal self-consumption (example: Extremadura Region) but not at national level. This thermal energy is used not only for heating the digesters but also for drying, heating or other industrial processes with thermal energy needs.

Additionally, authorisation permits are complex being time-consuming and equally expensive for small size biogas plants as for bigger plants.

For these reasons, the Spanish biogas market has been slow to develop (less than 50 biogas plants operating) and just a few biogas plants have been installed since 2012.

Legalization of small-scale biogas plants in Spain depends on the substrate to be used and the use of the biogas. The current and predicted situation about the legal framework in Spain at the end of 2015 is described below:

- In the case of CHP and selling the electricity to the electricity network, there are no subsidies in Spain and the market returns are not sufficient to be viable. It is not foreseen any changes in the short-term.
- For biogas use in boilers, there are no complex regulations for self-consumption. Depending on legal interpretation, a tax could be applied (hydrocarbon tax). No new regulations have been introduced recently that could negatively affect this biogas valorization use.
- New regulation about self-consumption. Royal Decree (RD) 900/2015 has recently established a new legal framework for self-consumption of biogas in Spain. The old regulation framework was not very clear (RD 413/2014) since it did not deal specifically with biogas but with all renewable energies in general.
 - In case of CHP and self-consumption, this regulation makes it practically unfeasible to work connected to the electricity network.
 - New opportunities for users not connected to the general electricity network. In case of CHP and self-consumption not connected to the general electricity network, the current regulations makes possible this option without extra payments and some projects could be feasible, in principle better than connected to the electricity network. For both very specific users with a high cost due to the contracted power (with a high occasional consumption) and consumers with very continuous electricity consumption over time.
 - New opportunities for users with 10 kW or less installed power. With the previous regulation (RD 1048/2013), users with 10 kW or less contracted power not connected to the general network were forced to pay a fee even if they would not deliver any electricity into the network. Now a Spanish biogas producer with 10 kW or less installed power not connected to the general electricity grid can use the biogas for his own electricity and thermal production without charges to the utilities. However, the installations of self-consumption (electricity) with more than 10 kW

are forced to pay a fee to support the system and could sell the electricity non self-consumed to the market.

Despite the above features of the national framework, some national providers have been able to develop viable biogas plants.

In conclusion, heat production for self-consumption from biogas is the most promising use within the Spanish legal framework (low/no taxes, depending on the interpretation of the law). In particular, the main alternatives that could be interesting under current conditions are: agro-food industries with a high energy consumption and high organic waste generated with enough agricultural plots to spread digestate; agro-food industries with small-medium energy consumption linking with waste management; and pig breeding farms (piglets heating needs).

Collaboration with plant providers and future possibilities

Among the Spanish stakeholders, it is important to highlight the collaboration of most of the national providers (NORVENTO, DABAR, JB Ingenieros, BIOVEC, LUDAN) in developing economically feasible small-scale models. They collaborated with Spanish partners of BIOGAS3 project in relation with feasible alternatives (mainly heat use) under low incentives conditions, and were readily available for networking activities.

The current self-consumption legal framework provides more opportunities to small-scale biogas plants for electricity self-consumption with 10 kWe or less than during the last 3 years. This new framework has been analyzed recently by the national providers and the biogas technology model developed by them is now looking not only for heat use of the biogas but also for small-scale installations using electricity. Alternative solutions have been provided by the national providers to the agro-food companies involved at the end of the project (November 2015 until February 2016), specifically energy management systems for farms with peaks of energy consumption at specific times during the day. National providers are trying to develop feasible solutions taking advantage of the new regulatory framework for self-consumption (electricity under 10 kW for self-consumption has no taxes). In particular, they have suggested the use of existing facilities in case of farms, such as use of storage tanks adding heating system and covering with a membrane as digesters. And also the use of hybrid engine diesel-biogas to cover peak energy demands or low cost power generators to reduce investment on biogas valorisation units.

The challenge now is to use the current facilities of the farms/agro-food industries to develop alternative solutions reducing the investment required for digesters and to find cheaper solutions to storing the energy/use the biogas in order to adapt the demand of energy to production.

3.3 France

The Biogas3 partners in France achieved solid results even though the legal and financial support framework was well below optimal. Fifty-three first-round one-to-one meetings took place (just exceeding the target of 50) including 33 farmers and 20 agro-food companies.



These agro-food businesses were identified through national and regional food and agriculture events and through ACTIA's local partners (ITERG, CRITT PACA, etc) who were requested to identify potentially interested agro-food companies through their databases, to inform them about the Biogas3 project and collect data for the sustainability analysis. Questionnaires were sent by email (along with the presentation of Biogas3 project) to collect data, followed by a phone call. The questionnaires were sent out in July/August 2014 for local partners from ACTIA and in October 2015 for IFIP (pig slaughterhouses). Those who showed keen interest about the potential for biogas production in the business operation were selected for follow-up and final round meetings. The criteria for selection included their levels of interest in saving energy, willingness and transparency to provide relevant data, and their apparent advantage to develop a biogas unit (energy consumption and organic waste availability).

A majority of the pig slaughterhouses in the first-round meetings had a high level of interest in biogas, a rather good understanding of biogas projects and had already received information from sources other than Biogas3. Some of them even have a biogas unit, a project to build a biogas unit, or had been sending some of their organic wastes to a biogas unit. However, it was observed that the social acceptability, the lack of profitability for small scale biogas and the waiting time for new feed-in tariff was a real obstacle for the majority of them and the agro-food industry in general. Regarding the food processing industries, the level of knowledge was generally lower and more uneven. Despite achieving the first-round of face-to-face meetings, those factors explain why the subsequent targets were difficult to achieve.

Sustainability analyses were performed on all 53 agro-food businesses identified in the first round one-to-one meetings. The majority of these are in the pig sector. The analyses using the smallBIOGAS tool calculated that 33 pig slaughterhouses could be sustainable. Biogas can be a great interest for such a sector because they produce considerable quantities of organic waste which can't be used in human or pet food (or other uses with a good add value) and they need quite a lot of hot water for washing equipment.

The 20 other agro-food industries on which sustainability analyses were performed are more diverse types: cheese factory, industrial bakery, agricultural cooperative (fruits), chemistry, brewery, winery, oil refinery, etc. Cheese factories have good potential for biogas production in treatment of pollution, satisfying thermal needs, and dealing with organic waste streams. Pig slaughterhouses are a good example where biogas can succeed because the organic waste which comes from the treatment unit can have a good methane potential.

Small biogas units under 100 kW is the goal. Investment costs for this scale are quite high at the moment in France. It is probably the main obstacle for their profitability. The feed-in tariff of electricity is, with the investment cost, the second key of profitability. The decree of 30 October 2015 introduced the basic feed-in tariffs, but only for units which started energy production before the 1 November 2015. For new plants, a new feed-in tariff is awaited. It is one of the main explanations for the difficulty to obtain a pre-contract.

Five second round meetings were conducted – less than the target of 10 due to the difficult market conditions as outlined above.

3.4 Italy

In Italy, fifty companies were met in the first round, exceeding the target number by 15. They included: 44 processing companies representing various agro-food sectors (milk and dairy, slaughterhouses and meat processing, wine, olive oil, fruit and vegetables processing, cereals processing, brewery, eggs production), 6 agro-food companies with annexed animal breeding and 5 farms. Contacts for these meetings were mainly initiated within the target group identified in task 2.1 with higher potential to develop a small-scale AD plant. Also, new opportunities have been created through “Tuttofood” fair (May 2015), Fieragricola 2016 (February 2016), two Biogas3 project workshops, one face-to-face meeting, and local partners' own network. The screening of interest was extended to the whole country (North, Centre and South of Italy), however the interest of the target group was evident principally in the North (Piedmont, Lombardy, Veneto and Emilia-Romagna regions) and partly in the centre (Umbria, Lazio...). The lowest interest was shown in the South.

A big contribution to target group screening and to one-to-one meetings was due to the direct contacts on the territory of the local partners (53% of total first round and 100% of the second-round). The genuinely strong level of interest among these companies proved to be an important leverage for subsequent events organised by the local partners (some companies attended more than one event) and in achieving twenty sustainability analysis, i.e. three more than the target of 17. The main group involved in sustainability analysis was food manufacturers (4 from fruit and vegetables, 2 from slaughter/meat, 2 from dairy, 2 from cereals, 1 from olive oil and 1 from wine production). Another group involved 3 companies including animal breeding and manufacturing – from pigs to sausages, from dairy cows to yogurt or cheese. A third grouping consisted of 4 farms (3 related to animal breeding and 1 related to crops cultivations).

This was followed by 12 second round one-to-one meetings (same as the target number), mediated through the professional support of technology providers and CMA. In this case were involved principally slaughterhouses (42%), farms (33%), dairy sector (17%) and grape/wine producers (8%).

One pre-contract was achieved during the project lifespan. The document was signed by a farm in Piedmont (Allevamenti Aurora Società Agricola Cooperativa). This delicate process was carried out in collaboration with Consorzio Monviso Agroenergia. The short duration of the project made it difficult to reach the target (2 pre-contracts), however there is interest by agrifood companies, driven by externalities associated with biogas energy (e.g. greening of production).

In general, even if the major number of one-to-one meetings was conducted with food manufacturers, the higher level of interest and feasibility in small-scale biogas plant was observed principally among farmers; in fact, the pre-contract was signed by a farm and other two potentially interested companies are agri-food companies with annexed farms. Normally, farms have more by-products available that represent real and concrete residues, without alternatives on the market (as sometimes instead happens with agri-food by-products).

During the project it was found that in Italy a plant powered by waste from organic by-products is profitable only if certain factors coexist: incentives for production of energy from renewable sources are currently 0,236 €/KWh (the new draft is proposing 0,223 €/kWh), minimal costs for spreading digestate on the fields, minimal or zero costs related to substrates acquisition, optimal

characteristics of the substrate (not too much dry, not too much liquid), large amount of substrates and waste to be used (in order to make biogas of around 100 kWe power).

3.5 Germany

In Germany, RENAC established contacts with agri-food companies through agri-food associations, initiatives and institutes. Events including congresses and fairs were a good opportunity for first round meetings with agro-food companies. Thus, RENAC visited the energy efficiency congress of the German Food and Beverage Association (BVE) in Frankfurt, a symposium of the "Lebensmittelwirtschaft" and the fairs Green Week and the Fruit Logistica in Berlin. Through these events RENAC was able to achieve 51 first round one-to-one meetings with agri-food companies (just over the target of 51). SMEs were interested about how to manage their residues and improve their waste and energy management, which raises their interest in biogas production and in the Biogas3 project.

However, in summer 2014 a major change in Germany's Renewable Energy Policy took place. It was decided that Germany would focus on photovoltaics and wind energy in the future development of the renewable energy sector and will drastically slow down the utilization of bioenergy. Main reasons were the comparatively higher costs of bioenergy and an increasing food vs. fuel debate. The release of the revised Renewable Energy Law (EEG) in August 2014 marked a turning point in the biogas sector in Germany leading to a major crisis for the involved companies, specifically the biogas plant manufacturers. Already in 2012 the decrease of the feed-in tariff for biogas began to show in the development on the implementation of new biogas plants per year: While in 2011, still 1,499 new biogas plants were built, this number dropped to 446 in the following year 2012. Consequently, the release of the EEG 2014 led to a further decrease in new biogas plants from 2013 to 2014 by 50%, with only 163 newly implemented biogas plants in 2014.

Hence, the amendment of the EEG 2014 has been widely criticized as a result of its consequences in the bioenergy market. In fact, the European Biogas Association described it as: "U-turn in German biogas policies will nearly stop the already weakening growth in Germany, losing its chance to reduce dependence on imported natural gas."

In this environment it was challenging to establish a second contact and follow-up with agro-food businesses although a high number of the parties of the first round meetings had shown serious interest in the BIOGAS3 project. Agro-food companies were thus reluctant to respond to the offers of RENAC to conduct an individualised feasibility study. In some cases, companies showed interest but internal circumstances did not allow them to participate in the feasibility studies (e.g. current restructuring of production units). Additionally, the agro-food industry in Germany is a very competitive market and companies are hesitant to reveal their internal production data to third parties, although this data would have been treated confidentially by RENAC.

Nevertheless, 13 agro-food companies could be identified with realistic interest in biogas production for energy self-sufficiency (target was 20). After pro-active approaches from RENAC, these companies provided RENAC with the relevant information for conducting feasibility studies. RENAC consulted with all involved agri-food companies individually after calculating the

feasibility studies by discussing the results, the potentials and implementation possibilities with each company. The involved agri-food companies appreciated these feasibility studies and will use the outcomes in some cases to present to their management level and as basis for decision making. Whenever the results of a feasibility study were not favourable for operating an economically viable biogas plant, RENAC consulted with the companies on how to achieve more positive results (e.g. cooperating with other agri-food companies in the region to increase the amount of substrates or to achieve a suitable substrate mix).

In five cases, consulted companies were interested in receiving further information about their specific cases. In order to support these companies, RENAC consulted biogas technology providers suitable for the respective circumstances of the company and brought them in contact with each other (e.g. RENAC established the contact between an interested coffee roaster with one biogas plant provider already experienced in AD for residues from coffee production).

Major efforts were taken to move forward with these companies and biogas plant providers in signing pre-contracts and in realising the projects. The contacts from the first round of meetings were contacted several times, invited to participate in WP4 training activities and offered to receive a free sustainability analysis. A final offer for sustainability analyses was sent in January/February 2016 to all agro-food companies met by RENAC in the project lifetime. Unfortunately, due to the prevailing major barriers in the biogas market in Germany these strong efforts did not result in the signing of pre-contracts during the lifetime of the Biogas3 project

However, through offering consultancy and free feasibility studies, RENAC was able support agri-food companies in evaluating their biogas options and will contribute to do this even after the end of the project.

3.6 Sweden

In Sweden, JTI participated in a range of events addressing biogas production and the agro-food industry. Through these events, contacts were established with a variety of actors: promoters of small-scale biogas solutions, food processors, slaughterhouses and farmers. In these contacts, experiences from earlier work and evaluations of existing plants were used.

A total of 50 first-round face-to-face meetings (same as the target) have been accomplished at fairs, Biogas3 events and also as a result of persons contacting JTI after they got information about the project. Additionally, some meetings came up as a result of contacts provided by biogas plant providers and technology consultants. Of the 50 meetings, 33 were with farmers, 13 with food processing industries and 7 with horse stables. A majority of the farmers in the first-round meetings had a rather good understanding of biogas projects and had already received information from sources other than Biogas3. However, that information has also revealed that it is hard to find viable business cases for small-scale biogas at farm level in Sweden. Regarding the food processing industries, the level of knowledge was generally lower and more uneven. For horse stables the knowledge level on biogas production was in general even lower.

Those companies showing the greatest interest then received further information and guidance in the second-round meetings. Nine companies received continuous consultation with several contacts during the project (target was 10). Some of these companies also participated in the

Biogas3 training. Food producing companies had in general ample substrates and typically large energy requirements, which provide good conditions for investment. However, the possibilities to handle the digestate are a challenge. For some of the participants in the second-round meetings, JTI and/or the company used the smallBIOGAS tool for sustainability analyses.

For the food producing companies, the procedure with biogas permit application is also often a challenge in addition to expanding their permit for their main business, which means that they prefer not to go through the same procedure for a side business. A major obstacle to investment in small-scale biogas plants in the food industry is that their bi-products today are attractive substrates for the co-digestion plants in Sweden. This has meant that, for example, several slaughterhouses come to the conclusion that it is cheaper to deliver the substrates to these plants. From a climate perspective it is also in many cases better that the substrates become vehicle-fuel in co-digestion plants than electricity and heat at the food company.

Agricultural farms have not had good conditions during the project period as there has been no investment support to apply for. With the low electricity and heating prices prevailing in Sweden, it has been difficult to find farms where you can make a profitable investment. However, from autumn 2015 it has been possible to apply for investment support at the Swedish Board of Agriculture, although the applications have yet not been evaluated.

Although it wasn't possible under these market conditions to achieve a pre-contract, one of the companies closest to a pre-contract was a food processor which examined the possibility of phasing out the use of oil. However, they chose not to proceed because it was difficult to find a suitable location for the biogas plant. Furthermore, their residues today become biogas at a co-digestion plant. Another company that came far in their work is an agricultural college. They also engaged a plant provider who made a preliminary study. The college is now working internally to resolve the funding issues. A third company had a comprehensive horse business, which creates large quantities of horse manure. This company has little need of heat and electricity, which means that they are interested in producing vehicle fuel. Unfortunately, it is currently difficult to find appropriate technology solutions for their size.

3.7 Poland

Fundeko achieved results considerably exceeding the target of 10 meetings and 5 sustainability analyses: 26 first-round one-to-one meetings took place including 21 farmers and 5 food companies. During these meetings data necessary for preliminary feasibility analyses were collected and practical circumstances of biogas investments discussed. Consequently, Fundeko conducted 26 sustainability analyses with the use of the smallBIOGAS tool.

Many of the contacts for these meetings were already initiated within Task 2.2 – all the farms and companies which had filled in the WP2 questionnaires were contacted later with the offer to perform sustainability analyses. Participants of Biogas3 workshops, online training module and face-to-face training were also encouraged to enter into direct contact with the Polish Biogas3 partner in order to analyse their actual prospects of installing a small-scale biogas plant. The offer of individual consultations was also advertised during presentations at national events within WP6. Some of the farmers and companies were also informed by the Agricultural

Counselling Centres in Koniskowola and in Szepietowo (hosts of the workshop and face-to-face training).

In general, a high level of interest in biogas was observed among farmers, mainly due to their awareness of non-financial benefits of biogas production, such as: reduction of odours for livestock farms, advantages of the use of digestate as fertiliser and the resulting reduction of nitrate leaching to groundwater. Focusing more on financial performance, food and beverage companies were much more reluctant to consider to even analyse possibilities of investing in a small biogas plant. They usually referred to the difficult economic situation of the existing Polish biogas plants and to the high level of regulatory uncertainty in this area in Poland. The difficult situation related to changes in the legal and financial support framework in Poland has been described in details in the D6.8 Report on communication with policy makers.

Despite the great achievements in the first-round of face-to-face meetings, only 1 second-round meeting took place compared to a target of 3 meetings. The main reason for not achieving the target was low profitability demonstrated in the conducted analysis - in 19 out of 26 sustainability studies the expected payback period was >15 years. Another barrier which prevented more second-round meetings was the reluctance of technology providers to get involved in small-scale biogas analyses. On the Polish market, only a few suppliers offer small-scale biogas solutions, and they are aware of the lack of profitability for small-scale biogas in Poland (the providers thus focus on larger projects).

The one second-round meeting was held in November 2015, right after the face-to-face training session in Szepietowo. A cattle farmer, highly interested in a mono-substrate solution for slurry from milking cows, and a provider of a small-scale biogas technology suitable for this kind of substrate, participated in this meeting. The results of the smallBIOGAS analysis were discussed and confronted with the experience of the technology provider. The technology was presented in detail and possibilities of receiving an investment subsidy were analysed. As a result of this meeting, the cattle farmer entered into cooperation with the technology provider and both parties signed a comprehensive letter of intent. This letter sets out detailed terms and conditions for further cooperation between the farmer and the provider, as well as the scope of this cooperation (e.g. all necessary arrangements with authorities, analysis of slurry sample, applications for credit and/or investment subsidy). It also defines the planned size of the plant (40 kWel) and its investment costs as well as yearly costs of the plant's surveillance and monitoring.

In December, the farmer applied for an investment subsidy of ca. 80% of eligible costs for a 40 kW biogas plant. Such subsidies have been offered within the Regional Operational Programme (ROP) of the Podlaskie Voivodship. Unfortunately, the rules for applying for investment subsidies in the ROP exclude the possibility of signing any kind of a binding agreement with a technology provider before receiving the grant decision (according to the so called "principle of incentive effect"). For that reason it was not possible to achieve a "pre-contract" signed by the farmer, although the letter of intent is largely comparable. The final investment decision of the cattle farmer will be dependent on receiving that subsidy. However, the decision of the ROP managing authority will not be announced earlier than in April or May 2016.

3. Conclusions

The one-to-one activities in WP5 were important steps to setting the conditions to promote new investments in anaerobic digestion on farms and in agro-food production companies.

Consortium partners in the seven countries used a variety of approaches and platforms in imaginative ways with local industry counterparts to identify potential participants. Guidelines on procedures and criteria for selection and the tool developed for conducting and recording the one-to-one meetings proved useful.

The main conclusions from one-to-one activities are:

- Agro-food companies were hard to involve in high numbers. However, the ones interested were very engaged in the project. Interest in AD among agro-food sector is driven by the possibilities for more efficient energy use, cheaper energy, more cost-effective waste management, diversification of economic activity, quality production of organic fertiliser as a by-product and greening of food products.
- It is necessary for technology providers to work on providing truly small scale technology. This could lead to less costly technologies that make biogas more interesting for agro-food companies.
- More activities are needed to involve policy makers and facilitate the use of waste products in the biogas production and reuse of the wastes after digestion. This could yield better regulation and incentives for the sector.
- As a result of project activities, it was possible to achieve 4 pre-contract agreements for the initiation of small-scales biogas plants in agro-food sector. However, due to the short duration of the project (2 years) and policy changes in partner countries, it was not possible to fulfil the target of pre-contracts agreements.
- Although the BIOGAS3 project ended in February 2016, the awareness and capacity built up and the tools developed will continue to achieve results and impact beyond the life of this two-year project. All the public materials developed within the project and included in the website will be available until February 2018.