Annex 6.1

Project Information Sheet
# Project Information Sheet

**SUstainable Poultry Production thru' Environmental Recycling (SUPPER)**

## Programme area:
Priority 3.3 'Food and drink sector', influencing the food chain 'from farm to fork' by reducing the environmental impact of meat / meat products (specifically poultry).

## Coordinator:
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## Partners:
DLV Plant, Netherlands  
Irish Farmers Association, Ireland  
Mercury Consulting, Ireland  
Blue Moon Farms, UK

## Website:
www.bhsl.ie/rd

## Benefits (max. 150 characters incl. space):
On-farm recycling of poultry litter into fertiliser, thermal and electrical energy resulting in environmental, biosecurity and health benefits.

## Keywords:
- Poultry litter, fluidised bed combustion, recycling  
- A1.4.7 - Raising of poultry  
- A1.6.2 - Support activities for animal production  
- C28.2.1 - Manufacture of ovens, furnaces and furnace burners  
- D35.1.1 - Production of electricity  
- E39.0.0 - Remediation activities and other waste management services

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## Type of solution
Product (FBC technology of various sizes) and process (poultry farm management).

## Duration:
27/07/2011 – 26/01/2014 (Extended to 26/04/2014)

## Budget:
€ 1,488,215 (EU contribution: €744,102, 50%)

## Contract number:
ECO/10/277246 /SI2.598308

### Summary

SUPPER provides an on-site conversion system for used litter from poultry farms. SUPPER uses fluidised bed technology to recycle poultry litter into a high grade fertiliser, usable heat for recirculation in poultry sheds and electrical energy. The delivery of an on-site biomass solution for a poultry farmer enables the elimination of the need for disposal of by-products off-site (thereby increasing bio-security), creates a new value-add fertiliser product, reduces dependence on external energy sources, facilitates the export and sale of electricity and increases the sustainable performance of the farmer's business. This not only reduces business risk and operating costs but also allows the farmer pass on benefits to customers who increasingly are demanding enhanced environmental performance from producers.

### Achieved results

The following are the results achieved at the end of the SUPPER project:

1. **Effected change in EU Animal By-Product (ABP) regulations to clearly facilitate the on-farm use of used poultry litter as an ABP.** This removes the most critical blockage to introducing SUPPER to the wider market in the UK and Europe.
2. **Four systems are installed at the end of the project, however now that the regulatory issue has been resolved, interest is increasing and new contracts are being signed.**
3. SUPPER has been proved to impact positively on the environment through Life Cycle Assessment. Extensive testing has demonstrated reduced emissions. LPG has been replaced for heating with used poultry litter.

4. Performance testing has demonstrated increased health and wellbeing of poultry, shorter rearing cycle and higher Feed Conversion Ratio.

5. The economic model for poultry farming has changed and now delivers additional value add from the replacement of LPG heating and the opportunity to export excess energy as renewable electricity to the grid.

The information sheet will be published in the Eco-Innovation website. The EACI reserves the right to edit the information sheet for content and length.
Annex 6.2

Trade Show Report 2013 - bhsl
Ecobuild, ExCel, London 4th – 6th March

Ecobuild, the world’s leading event for sustainable design, construction and the built environment was held in ExCel, London. The 2012 event brought together more than 57,000 industry professionals. This Expo was held over 3 days, with more than 1,500 exhibitors. Visitors were also able to attend more than 130 free of charge conference and seminar sessions.

This year’s 2013 figures have not yet been disclosed. There was no REA pavilion for all its members at this year’s Expo, as apparently some members complained or disapproved of last year’s layout of the Pavilion. As a result, Ecobuild just reserved and cut off a section for all “Renewable Energy” companies. Thus, bhsl stand was located in a mixed arena at one side there was a domestic fuel stoves and at the other side there was a company selling domestic gas boilers. While our stand was located near to Econergy, NFU and Eco Angus, there weren’t many of the typical key installers represented at Ecobuild, this year. On the other hand, Carillion had 3 stands spread out over the 2 Halls as they were also sponsors of the Expo and Waitrose were being presented with a Sustainable Building Award for the Waitrose Store in Bracknell.

Conclusion:
We did get to meet and network with some of the keys players; Richard Landen, Waitrose guys (Jim Burnett and Toby), Garry Kimber who is over the larger CHP projects in E.ON and Geoff Lord from Hoval. This has helped to solidify some existing business relationships and initiated new industry contacts. However, we have felt that this year there was a drop in attendance and in general exhibition stands were of lower quality and many stands had not been booked up so the halls looked empty, also the focus this year was more on domestic products rather than commercial, so taking all this into account, these are the reasons we would not exhibit at the next Expo in 2014.

World Biomass Power Markets, Amsterdam 16th – 17th May 2013

We exhibited to a capacity crowd of nearly 400 biomass power professionals at this sold out exhibition. For 3 solid days there were informative presentations and industry leading debate. We formed new alliances and renewed some old acquaintances.

The event had daily workshops with some of the World’s pre-eminent experts on biomass presenting their findings from their recent studies to a fully packed room of nearly 100 industry professionals. Companies such as Npower Tilbury, DONG Energy, GDF Suez/Laborelec and Ontario Power Generation each provided in-depth case studies. It was one of the best conferences we had attended.

The 2 day conference itself was equally successful, with over 70 speakers (more than a third of which were power producers) and a combined 24 hours of presentations and panel debate. The morning session was standing room only as more than 350 people packed in to the main room to hear keynote addresses from the CEO of MGT Power and the Head of Bioenergy at the UK Green Investment Bank. Both keynotes remained bullish on the long term future of biomass but cautioned
that tough battles lay ahead. This was immediately followed by the Utility Panel – some of the leading authorities on biomass firing from some of the world’s largest power producers discussed what they saw as the most likely challenges and opportunities to their business over the coming year.

The presentations and discussions were of the highest-level, when we moved into the smaller breakout groups format, the sessions remained well attended right the way through until the end of the final day. The exhibition was buzzing throughout, the conversation lively and the networking constant, productive leads were generated, contacts were made, and valuable information was exchanged.

Well worth attending.

**Renewables Event, NEC, Birmingham 10th – 11th Sep.**

We exhibited at The Renewables Event at the NEC in Birmingham. There were over 7000 professionals from the private and industrial sectors in attendance.

This is a new event designed to explore renewable energy solutions for the private and public sector. More than 80 leading manufacturers, suppliers and service providers offered advice, products and services to help visitors grasp the implications of introducing renewable energy into their business. The event helped commercial energy users to source viable energy solutions for the biomass, biogas and CHP projects.

We met key decision makes who were looking for alternative material handling solutions for various biomass projects. We were introduced to many system providers/designers. This show is well worth it and we have rebooked for 2014.

**EBEC/NextGen, Stoneliegh, Birmingham 9th – 10th Oct**

We exhibited at the EBEC/NextGen event which attracted over 2,200 visitors (professional and entrepreneurs planning or running commercial renewable energy generation and efficiency projects). There were decision makers with budgets from the agri-rural, urban and industrial sectors, looking to source the latest technologies, equipment and services.

This was a well organised exhibition that has gone from strength to strength. It would be seen as the leading UK exhibition in the biomass industry. There was a seminar program that had been developed to cater for the experienced and not so experienced biomass user. These catered for the needs of site owners, industry professionals and entrepreneurs. They were designed as an education journey from concept to completion and viewers were able to join an invaluable two days of knowledge sharing with over 80 of Europe’s leading experts.
We were able to meet exiting clients and users of our equipment and developed new relationships with potential users. This was a great networking opportunity and there were numerous discussions about new and planned opportunities for the FBC system and associated material handling. We are booked to attend again in 2014.
Annex 6.3

SUPPER Conference Paper
Environmental Analysis of the Use of Poultry Manure as Fuel for Combustion on Broiler Farms: A Case Study

A. Dimache, J. O’Connor, D. Kearney

Abstract:
Fluidised Bed Combustion (FBC) technology is not new. It has been used in power plants for the last three decades and is considered very efficient for biomass combustion. The novelty of the FBC application in BHSL’s case consists of the combustion of poultry manure on farm with the same thermal efficiency (over 86%) as the combustion of biomass (e.g. wet wood chips). BHSL has successfully miniaturised the power plant design to produce up to 2 MWh heat in a unit which is small enough to locate on the site where the fuel is generated – ideal for agricultural and by product applications with high heat demands. BHSL’s FBC 500 boiler is capable of 500 kWh thermal output, which is sufficient to provide hot water at 85°C required for distribution to poultry sheds for rearing broilers from day-old to fully grown. A case study was conducted in order to measure the efficiency of the BHSL energy system for broiler production and also to evaluate its environmental benefits. Environmental benefits were measured using Life Cycle Assessment (LCA), which compared the environmental impact of 3 scenarios: (1) where the poultry manure is used for land spreading as a fertiliser and the broiler houses are heated with LPG; (2) where the poultry manure is used for combustion in the FBC 500 to generate heat, most of which is used to heating the broiler houses; (3) where the poultry manure is used for the production of steam and electricity generation with the residual steam used for heating the poultry sheds (combined heat and power – CHP). The results of the analysis show that when poultry manure is used for combustion, a reduction up to 95% in LPG use, as well as reductions in eutrophication potential of 26-32% and acidification potential of 31-40% can be achieved. An improvement in birds’ welfare was also noticed as a result of the use of dry heat that can be supplied to the broiler houses by poultry manure conversion.

1. Introduction
Climate change and resource depletion (in particular fossil fuel) have been recognised in the past two decades as a serious threat at international, European and national level. In recent times there has been a surge in the number of policies established in response to these problems. The European Union is the leading organisation in addressing climate change, with numerous policies established to date. The “20-20-20” targets (European Commission, 2014a) for reduction in EU greenhouse gas emissions, improvement in the EU’s energy efficiency and raising the share of EU energy consumption produced from renewable resources are well-known and have been recently revised by the 2030 Framework for Climate and Energy Policies (European Commission, 2014b). In order to deliver the 2020 targets, the Commission has adopted the Climate and Energy Package (European Commission, 2014a) that comprises of various pieces of legislation, including the Effort Sharing Decision (European Commission, 2014) – which establishes binding annual greenhouse gas emission targets for Member States from sectors not included in the EU Emissions Trading System (EU ETS). Agriculture, transport, residential and waste processing are the main sectors outside the EU ETS, and these contribute approximately 60% of the EU’s total emissions (European Commission, 2014a). A
recent EPA report (EPA, 2013) show that agriculture and transport are the key contributors to emissions in the non-ETS sectors. The agriculture sector emissions are largely made up of emissions from enteric fermentation (45%) – this is when methane is produced by animals’ digestive processes – manure management (27%) and nitrogen application to soils (22%) (EPA, 2013).

In this context, bioenergy technologies that convert biomass (including manure) into different forms of energy including power, heat and combined heat & power (CHP) can be a viable solution for agriculture, the contribution to the European targets being two-fold: (1) reduced emissions due to manure management and fertiliser application and (2) increased use of renewable resources to produce energy.

This paper presents an innovative use of Fluidised Bed Combustion (FBC) technology for combustion of poultry manure to generate heat, which is used for heating broiler houses. This novel and patented solution offers the opportunity to turn poultry litter which is currently a cost into an income stream by using it to generate heat (and thus significantly reduce the fuel requirement) and sell the by-product (ash) as high-potash fertiliser. The benefits that arise from this are positive environmental impact, energy security and turning a cost item into a profit item. The advantages of the FBC solution are proved by a case study conducted on a large farm in the UK by the originators of the FBC system, the Irish company, BHSL, as part of the SUPPER European project funded by the ECO Innovation programme.

2. Sustainable Heating for the Poultry Industry

Broiler farming is a low margin business where propane is a significant proportion of the overall cost; this cost is likely to increase over time in line with other fossil fuels. Each broiler produces approximately 1.2 kg of poultry manure that the farmer is responsible for disposing of (Moore, 2013). Currently, the principal methods of poultry manure disposal are:

- Land spreading as fertiliser. Poultry litter has long been recognised for its beneficial fertilising impact on crop production as it is considered a relatively cheap source of nutrients. Poultry litter increases the soil organic carbon content, increases soil porosity and enhances soil microbial activity (Nykatawa, Reddy, & Sistani, 2001). There are different approaches in place depending on national policies (e.g. a poultry farmer in Ireland has to pay to get it removed from his farm; in contrast, farmers in the UK are paid for their poultry litter to be used as a fertiliser).
- Re-use as compost material for mushroom growers. This is a viable solution when there are mushroom growers in the vicinity of the farm.
- Stock piling of manure. This is done when the weather is not suitable for land spreading or there is insufficient available land or it is restricted by regulations. Stock piling can lead to leaching of nutrients and bacteria into the groundwater. Loss of nitrogen is a problem here and reduces the commercial value of the product as a fertiliser (Kelleher, Leahy, Henihan, & O'Dwye, 2002).

The alternative to disposal is the use of bioenergy technologies to convert biomass into different forms of energy including power, heat, combined heat & power (CHP) and liquid biofuels. One of these technologies is fluidised bed combustion (FBC). The calorific power of poultry litter when used as a fuel is about half that of coal (Moore, 2013).
2.1. Fluidised Bed Combustion (FBC)
Fluidised bed combustion (FBC) technology (Oka, 2004) is a form of combustion which became commercial in the 1970s. It offers high thermal efficiency and low toxic emissions (CO, NOx) due to good control over combustion conditions. Fluidised bed technologies also offer the advantage of a high tolerance of moisture content and type of biomass used.

One emerging application of FBC is the potential to couple an Organic Rankine Cycle (ORC) power generator to a biomass hot-water source (Peterson & Haase, 2009). ORC technology uses hot water to heat a compressed working fluid that has a lower boiling point than water. In this manner, electricity can be produced from low-temperature (approximately 85°C and greater), low-pressure sources such as biomass hot-water boilers (Peterson & Haase, 2009). (Kelleher, Leahy, Henihan, & O’Dwyre, 2002) identified some advantages of the FBC technology used for manure combustion:

- It can facilitate the use of poultry litter close to where it is produced.
- It can use fuels with a relatively high moisture and ash content.
- It incurs low cost of fuel preparation.

Until March 2014 poultry litter was categorised as waste. As a result, it fell under waste regulations: any burning of waste requires the flue of the boiler to have a Continuous Emissions Monitoring System (CEMS) connected to it and it has to monitor more items (HCl, CO, NOx, SOx, dioxins and particulates) than if it was considered a by-product (Environment Agency, 2011). In March 2014 a major change in Regulation 142/2011 regarding “the use of animal by-products as a fuel in combustion plants” was achieved. This opened the way for on-farm processing of poultry manures – and potentially other manures in the future.

2.2. The BHSL solution
BHSL is a small Irish company with a history in the poultry sector since 1960. BHSL supplies and operates Fluidised Bed Combustion heating systems suitable for low-value biomass such as poultry litter, wet wood chips and spent mushroom compost. The multi fuel biomass Boiler FBC 500 offered by BHSL has greater than 87% thermal efficiency while running at 75% maximum continuous rating with wet wood chips (49% moisture content). The FBC 500 is certified by the Carbon Trust and qualifies for Enhanced Capital Allowances (ECA). BHSL has successfully miniaturised the power plant design to produce up to 1 MWh heat in a unit which is small enough to locate where the biomass fuel is created – ideal for agricultural and by product applications with high heat demands. These on-site units are suitable for a range of biomass including wet wood chips, poultry litter, spent mushroom compost and other manures and sludge, with the same high thermal efficiency (over 86%).

The BHSL solution for applications in broiler farming is presented in Figure 1.
Litter from one batch provides clean, dry, renewable heat to sustain the next batch. Poultry litter is a valuable fuel – the litter from one chicken can provide the heating needs of 3 chickens, leaving a surplus which can be used for electricity generation. Once a house is cleared of birds the litter is loaded into a bio secure fuel storage and handling system called a Toploader (see Figure 2). The air required for the FBC is drawn from this storage structure, creating negative air pressure and ensuring no leakage of odours or pathogens. Fuel handling is fully automated so farm staff have no further contact with litter after loading it in. Litter is conveyed to the FBC unit at the rate of 5 tonnes per day. The FBC 500 provides 500 kWh hot water which is pumped to fan-controlled radiators in the poultry houses. The system applies strict emissions controls.

The system is remotely monitored and managed 24/7. A daily report (see Figure 3) is generated for the farmer, containing detailed information such as:

- Daily House Information:
  - Temperature
  - Relative humidity
• Crop Information
  o Litter sample analysis (e.g. uric acid and moisture)
  o Bird performance & welfare (e.g. pododermitis).

### UpHouse Daily Report for 17/10/2013

<table>
<thead>
<tr>
<th>Date</th>
<th>UpHouse Unit 8</th>
<th>UpHouse Unit 9</th>
<th>Unit Total kW</th>
<th>Avg Unit Available%</th>
<th>Short Fall kW</th>
<th>Total Farm kW</th>
<th>Farm1 %</th>
<th>Farm2 %</th>
<th>LPG kW</th>
<th>Total Diesel Litres</th>
<th>Elect. Kw</th>
<th>RHI Tier 2</th>
<th>Value £</th>
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</thead>
<tbody>
<tr>
<td>17/10/2013</td>
<td>60</td>
<td>460</td>
<td>520</td>
<td>100%</td>
<td>0</td>
<td>520</td>
<td>14%</td>
<td>86%</td>
<td>0</td>
<td>0</td>
<td>59</td>
<td>262</td>
<td></td>
</tr>
</tbody>
</table>

### Poultry Summary

<table>
<thead>
<tr>
<th>Farm</th>
<th>Bird Age</th>
<th>Temp C</th>
<th>Humidity %</th>
<th>Valve %</th>
<th>Flow C</th>
<th>Return C</th>
<th>Outside Temp C</th>
<th>Outside RH %</th>
</tr>
</thead>
<tbody>
<tr>
<td>UpHouse Farm 1</td>
<td>35</td>
<td>20.1</td>
<td>54.2%</td>
<td>0.2%</td>
<td>86</td>
<td>85</td>
<td>15.0</td>
<td>75.9%</td>
</tr>
<tr>
<td>UpHouse Farm 2</td>
<td>9.6</td>
<td>29</td>
<td>61.1%</td>
<td>9.8%</td>
<td>86.2</td>
<td>83.7</td>
<td>15.0</td>
<td>75.9%</td>
</tr>
</tbody>
</table>

### Heat Supply (kW)

**Figure 3. Daily report sample**

**3. Case Study**

BHSL has worked closely with two leading British poultry farmers to fine-tune the technology and also to build up a bank of performance data. A case study was carried out as part of the ECO Innovation project SUPPER, involving Uphouse Farm in Norfolk, which grows 850,000 birds in 16 sheds and had installed two FBC 500 (500kW) burners to provide heat. The farm uses about half of the poultry litter produced, stored in an enclosed, automated system provided by BHSL.

**3.1. Environmental Benefits**

A Life Cycle Assessment (LCA) study was carried out to compare the environmental impact of three scenarios:
1) **Fertilizer use scenario (Baseline).** In this scenario, all manure was assumed to be used as fertilizer (with credits given for the value of N, P and K in manure). With this application, the manure has both environmental credit (replacement of synthetic fertilizers in crop production), and environmental burden (emissions to water and atmosphere and energy use from manure management).

2) **Heat only scenario.** In this scenario, it was assumed that part of the manure is used as a fuel to produce heat and the remaining is used as fertilizer (as in the Scenario 1 above). The heat offsets the need for fossil fuel, in this case LPG. Also, the ash from the BHSL energy system is used as fertilizer with only P and K as valued plant nutrients.

3) **Combined heat and power scenario (CHP).** In this scenario, it was assumed that all the manure is used as a fuel to produce heat and electricity. Some electricity may be exported and so displaces the need to generate it elsewhere. The ash from the FBC 500 energy system is used as fertilizer with only P and K as valued plant nutrients.

All the data for the environmental model were provided by BHSL:

- The total amount of manure produced and the amount used as a fuel per year
- LPG and electricity use for the baseline system
- The amount of LPG used and the amount avoided when using the BHSL systems
- Electricity use, including the electricity requirement for running the system
- The amount of electricity and heat produced by the BHSL systems
- The amount of ash produced per unit of manure used as a fuel
- The plant nutrient concentration of ash
- Total quantities of trace combustion gases released (NO\(_x\), SO\(_2\), CO)
- Weight and main constituents of the equipment.

In addition, data on bird performance (including body weight, feed conversion ratio and mortality) were provided by BHSL. These data were collected from three farms applying the BHSL heating system and included several production cycles before and after installing the BHSL system.

In the Fertilizer use scenario (baseline), the final age of the birds was assumed to be 36 days, the final weight 2059 g and the feed conversion ratio 1.72 kg/kg. For the other scenarios, the bird performance was adjusted based on the provided data. The structural model for the broiler production system calculated all of the inputs required to produce the functional unit of 1000 kg of expected edible carcass weight, allowing for breeding overheads, mortalities and productivity levels.

The results of the LCA analysis were grouped under the following categories of impact:

- **Global Warming Potential (GWP)** - a measure of the greenhouse gas emissions to the atmosphere.
- **Eutrophication Potential (EP)** - used to assess the over-supply (or unnatural fertilisation) of nutrients as a result of nutrients reaching water systems by leaching, run-off or atmospheric deposition.
- **Acidification Potential (AP)** - an indicator of potential reduction of soil pH (and causing damage to some building materials, like limestone).
• **Primary Energy Use** - quantified in terms of the primary energy needed for extraction and supply of energy carriers, including gas, oil, coal, nuclear and renewable.
• **Land Occupation** - the area of the land required to produce a unit of the product. In the case of poultry production, this mainly consists of the arable land for producing crops for feed.
• **Abiotic Resource Use** - the use of non-renewable raw materials, such as fossil fuels and minerals.

The results show that generally there are environmental benefits from using manure as a fuel on a farm compared to the fertilizer use scenario, as the environmental impacts were reduced in most of the main categories. The main reductions occurred in the categories of Eutrophication Potential (26-32%) and Acidification Potential (31-40%). This is a result of considerable reductions of ammonia emissions and, to a lesser extent, nitrate leaching when the manure is used as a fuel instead of as a fertilizer.

The main benefits of the BHSL system are in reducing ammonia emissions from manure management (storage and land application), rather than from housing itself. The differences between pH or the proportion of total ammoniacal nitrogen (TAN) that is present in ammonia form (which is potentially volatilised) was not statistically significant. Hence, no differences in emissions from housing could be assumed based on the litter samples provided.

In general, when using manure as a fuel, the farm LPG use is considerably reduced (by 89 - 95%), which also reduced the greenhouse gas emissions (Global Warming Potential). However, there is a need for extra electricity to run the plant, pump hot water to houses and deliver greater ventilation levels in the broiler house when the BHSL system is used and this reduced the potential GWP benefits.

**3.2. Other benefits**

One of the most important benefits of the BHSL system is optimal ventilation, therefore providing more heat and drawing a greater volume of air through the house in order to manage humidity, with the result of improved bird welfare. Gases associated with LPG combustion are no longer present, resulting in dryer litter and better growing conditions. As a consequence, the farm can experience advantages such as:

• Improvements in Food Conversion Ratio (FCR) (see Figure 3)
• Reduced mortality of the birds
• Reduction in common skin irritations such as hock burn and footpad dermatitis
• Reduced ammonia emissions as litter is dryer
• Improved working conditions for staff
• Less time spent managing litter.
Another benefit of the BHSL system is reduction of operation cost. As the owner of Uphouse Farm mentioned, “the energy output through my two 500 kW burners is just the same as with woodchip, yet the cost of my raw material is just £12-15/t (based on its sale value) compared with £70/t for woodchip and approaching £200/t for pellets. So long as people buy my chickens, I will be producing my own fuel for almost nothing –so it’s incredibly sustainable”. Supplementary revenue can be created by selling the ash left over after the burning process as a high-quality fertiliser.

4. Conclusions

BHSL has proven that their solution for heat production by poultry manure combustion in an FBC unit is a viable environmental and cost solution for farmers. Providing basically free fuel for heat production, it is an economically sound solution. The BHSL solution is an integrated system that provides not only heat for the broiler houses, but also bio secure storage and automatic feeding to the FBC unit. The optimal ventilation offered by the system has a positive impact on the birds’ welfare, which is another benefit for the farmer.

With reduced emissions to air and soil the BHSL solution is environmentally friendly. Also, it employs a proven technology that uses renewable energy sources. Considering the 6 billion per annum total EU production of broilers (BHSL, 2014) with a potential of 7.2 million tonnes of litter annually, BHSL’s innovative FBC system can play a significant role in helping Europe meet its energy and emission targets.

5. References


Moore, C. (2013). *Can chicken litter be economically utilised at farm scale for energy production and improve the profitability of the chicken farmer by reducing costs and increasing revenues?* Master thesis, DCU.


Annex 6.4

Utrecht Conference

Overview

Jack O’Connor presentation
Seminar program: VIV Utrecht May 20, 2014

Poultry manure into green energy and fertilizer

Speaker 1:
Mr. Hans de Feijter
Projectmanager BMC Moerdijk BV, The Netherlands
BMC powerplant on poultry manure in the Netherlands; from manure to power and minerals.
www.bmcmoerdijk.nl

Speaker 2:
Mr. Jack O.Connor
Director BHSL, Ireland
Fluidized bed combustion of boiler manure to heat the broiler houses.
www.bhsl.ie

Speaker 3:
Mr. Theo Bijman
Division Manager biogas technology, Nijhuis Water Technology BV, The Netherlands
Biogas from poultry waste: a case
www.nijhuis-water.com

Speaker 4:
Mr. Gerd Warchol
Director of M-E-E, Germany
Oil and gas from poultry manure through pyrolysis.
www.M-E-E.biz

Speaker 5:
Mr. Henk Haaring
Director of Dorset Green Machines BV, The Netherlands
Poultry manure into rich organic fertilizer
www.dorset.nu
Sustainable Heating for the Poultry Industry
BHSL Company Overview

- Irish Green Energy Company
- Founded in 2004
- Family-run Business with History in Poultry Industry since 1960
- On-site and Bio-secure Energy Solution for the Poultry Industry
- Contracts and Installations:
  - Ireland
  - UK
  - South Africa
  - US
Poultry Industry Pains

Environment & Regulation

Energy Intensive

Low Margin & High Volume

Bird Welfare
The Solution

- optimal ventilation
- biofeedstock
- energy
- fluidised bed combustion
- biosecure storage
- automatic
The BHSL Solution

- Litter is stored in bio-secure building
- Litter is conveyed to a Fluidised Bed Combustion (FBC) Unit at the rate of 5 tons per day
- FBC provides 500 kWth hot water which is pumped to fan-controlled radiators in poultry houses
- System applies strictest emissions standards
- Remotely monitored and managed 24/7
Heat Delivery

Choretime Cubo
Recirculation

Wall Mounted Radiator
Smart Management System

- 24/7 Smart Management System
- Poultry House Monitoring
- Detailed Reporting for Customer
Performance Reporting

Gather Daily House Information:
- Temperature
- Relative Humidity
- CO2
- Bird Weight
- Water Litres
- Feed KG

Gather Crop Information
- Litter Sample Analysis (e.g. uric acid and moisture)
- Bird Performance & Welfare (e.g. podo)
Benefits to Poultry Industry

- **Environment Improvement**
  - Reduced Odour
  - Low-Carbon Poultry Production
  - No Land Spreading
  - No Litter Transport
  - Recycle Ash Economically

- **Renewable Energy**
  - No More Propane
  - More Efficient Heating than Propane
  - Sufficient Energy in Litter for Heat and Electricity Generation

- **Increased Profits**
  - Fixed Energy Cost
  - Protection from Seasonal Heating Cost Swings
  - Ash Income
  - Carbon Credits Potential
  - Improved Profits through Improved FCR

- **Bird Welfare**
  - Easier to Control Humidity
  - Optimal Ventilation rather than Minimum Ventilation
  - Dryer Litter
  - Improved Bird Welfare
Benefits: Bird Welfare

- The ability to control moisture levels in the house directly effects litter conditions and the production of ammonia.

- Ammonia is a leading contributor to disease, poor welfare, and poor bird performance in the poultry industry.
Optimal Ventilation

- A clean source of abundant heat to optimise environmental conditions
Optimum ventilation provides more heat and draws a greater volume of air through the house in order to manage house humidity and litter moisture.

- Keeping house humidity below 60% results in dryer litter.
- Dry litter contains less available water for bacteria to use in a process that creates ammonia.
- Controlling ammonia significantly helps environmental conditions. Improving bird welfare, performance and the wider environment.
Results: Feed Conversion

Average FCR Change with BHSL: -0.04
Results: Mortality Change

Average Mortality Change with BHSL: -0.4 %
European Union support

- 2011 – bhsl awarded major grant by the EU Eco-Innovation Programme to overcome barriers to commercialisation for on-farm recycling of poultry litter – the SUPPER project
- The primary barrier was regulatory, involving the classification of poultry manure – as a Waste or as an Animal By-Product
- In March 2014, bhsl managed to achieve a major change in Regulation 142/2011 regarding “the use of animal by-products as a fuel in combustion plants”, which opens the way for on-farm processing of poultry manures – and potentially other manures in the future.
- This involved an investment of more than 1m€ in extensive testing at Uphouse Farms and legal opinion.
- Now seen as a case example of how a small organisation can make a profound difference in EU legislation, with potential positive implications for the agriculture and horticulture sectors.
Results: Environmental Benefits

A Life Cycle Assessment (LCA) was carried out to compare the environmental impact of 3 scenarios:

- Manure used to produce heat and electricity (CHP)
- Manure used to produce heat only
- Manure used as fertiliser

Best for the environment due to reduced ammonia emissions and replacement of fossil fuel.
The results of a full Life Cycle Cost (LCC) analysis showed that the use of manure to produce heat is attractive. Results:

- Payback period: 5 years
- Positive NPV (Net Present Value)
- For batch sizes of 70,000 birds, 6 batches a year
UK Poultry Farmer of the Year

Biomass boilers ready to turn litter into a profit

Two of the country’s largest poultry producers are looking at using biomass boilers to turn litter into a profit. The idea is to capture the heat and energy from the litter, which is rich in nutrients, and use it to generate electricity. This not only helps reduce the environmental impact of the poultry industry but also provides a new revenue stream for farmers. The system involves the use of biomass boilers that convert the litter into biogas, which can then be used to generate electricity. The biogas is produced through anaerobic digestion, a process that breaks down organic matter in the litter. The resulting biogas can be used to power small-scale electricity generators, providing a valuable source of income for farmers. This innovative approach to waste management is a positive step towards sustainable agriculture and renewable energy.
Interested in this system

Contact jack@biomass.ie

www.biomass.ie

THANK YOU FOR LISTENING!
REPORT ON DISSEMINATION AND PROMOTION ACTIVITIES

Supper project DLV Plant B.V. Sept. 2012 - June 2014

To: SUPPER project
From: Cees Oele, Jan Gielen
Date: June 2014
INTRODUCTION

During the last project DLV Plant, as discussed on 19-07-2012 and 02-12-2013, would work on market studies concerning poultry and SMC possibilities for farm-sized FBC-combustors in the Netherlands or elsewhere in Europe, including feasibility studies, business plans, possibilities on grants and information to overcome barriers on legality. Were possible, dissemination of on-farm combusting would be promoted. This part describes the realised dissemination activities with the objective to inform producers of all kinds of manure like poultry, pig-slurry and SMC, the possibilities of on-farm incinerators to gain energy from their waste. Another objective was to inform as much people as possible about the ‘green’ and sustainable features of FBD power plants, to gain public opinion for a clean image.

The meetings were organised at the location of a Mushroom-producer (Lage Randweg 16, Uden) were a prototype of a SMC-incinerator was constructed. The message of the dissemination was to get the interest of producers of manure all over the world in such a small scale incinerators, like the innovation of the poultry incinerator as constructed by BSHL. The fabricants of incinerators were mentioned in the information part.

MEETINGS ORGANISED IN THE NETHERLANDS

INFORMATION DAY DNP NOVEMBER 22, 2012

The National Mushroom day (DNP) is intended as a meeting place for Dutch mushroom growers and Dutch companies throughout the total supply chain. Current issues in the sector can be discussed together. Networking is an important part of this informative and fun day for those who professionally are engaged with mushrooms in the Netherlands. For the fourth time DNP was held, now for the first time on a mushroom farm. Including organization and exhibitors, a total of about 425 people have been visiting this day. Therefore this was the busiest DNP to date. Although many had applied previously there were also about 100 persons from the mushroom sector without registration.

TREE GROWERS DECEMBER 12, 2012.

From a practical network group in tree production, about 20 tree growers were introduced to renewable energy. Although the energy need in nursery stock is low, some are interested to produce raw materials for energy generation.

SMEs (SMALL AND MEDIUM ENTERPRISES) PROVINCE ANTWERP BELGIUM MARCH 11, 2013.

A group of 22 SME owners from Belgium was informed about small-scale energy production.

VISIT MUSHROOM GROWERS FROM ITALY APRIL 2, 2013.

Two farm owners from the large Consortio group were informed about the possibilities of biomass (SMC) combustion for energy generation.
**INSURANCE ADVISORS MEETING APRIL 9, 2013.**
Sixteen advisors of Achmea and Rabobank Interpolis were introduced to small-scale energy generation. Subject: underwriting and risks.

**ENERGY CLUSTER SOUTH HOLLAND APRIL 11, 2013.**
SMEs from South Holland, ECN (Energy Centre Netherlands) and Imtech (9 people)

Subject: interests in similar project regarding Floriade,

**MEETING ZLTO REGION UDEN APRIL 15, 2013.**
35 Farmers (dairy farmers, poultry, pig raisers and Horticulturists from region Uden visited the climate-neutral mushroom cultivation. The manure producers were very interested in this on-farm manure burner

**VISIT FOREIGN MUSHROOM GROWERS APRIL 16, 2013.**
Five companies from different countries came for a visit (8 visitors).

**DLV PLANT MUSHROOMS SHORT COURSE MUSHROOM CULTIVATION APRIL 2013 AND APRIL 2014.**
In both years a group of approximately 14 participants (a total of 28) from all parts of the world were introduced to high-tech mushroom cultivation.

**SMEs FROM UDEN APRIL 24, 2013.**
Twenty SME companies from the area Uden show interest in equipment

**EU-INFORMATION DAY 10 MAY 2013.**
An open day was held regarding ecosystems as part of the EU information days. Despite the publicity, there were only 2 people showing up. In the course of the week an additional 9 foreign visitors were received.

**MUSHROOM DAYS 29 TO 31 MAY 2013.**
During these days DLV Plant Mushrooms organized 2 excursions. A total of 43 visitors from various countries around the world were visiting the facility.

**STUDY GROUP BIO-ENERGY GREENHOUSES JUNE 26, 2013.**
About 20 people attended this knowledge network meeting at the facility, organized by Energy Matters.

**UDEN RESIDENTS MEETING SEPTEMBER 5, 2013.**
For energy-conscious residents (about 150 people) the Uden municipality organized a meeting about sustainability.

**TRADE MISSION UKRAINE ON SEPTEMBER 25, 2013**
IMC (as a facilitator of NUSEP) organised in collaboration with NUSECO an incoming trade mission of the Ukraine. There were about 20 participants, mainly energy producers. The emphasis in the Ukraine is the economically justified use of energy, such as by the use of more efficient techniques and better monitoring. But also the market for alternative energy in Ukraine is in rapid development, for example in form of in-firing of biomass, solar energy and the utilization of waste heat. The gas price rose sharply for Ukrainian customers and the driving factor of the government is the desire to become less dependent on Russian gas. The Ukrainian participants in this incoming mission are engineering companies that realize such projects for Ukrainian customers and municipal power companies. There is a strong demand for the expertise of the numerous Dutch suppliers of components, as well as specialist consultants and engineering firms. Currently very topical!

As part of an assignment business case on renewable energy, 5 students visited the plant. Visit of organizations such as BOM, Rabobank, ODM-Brabant.

Korean Trade Mission
A group of 26 Koreans were interested in the FBC Power Plant with a visit on 14 October 2013.

DLV Plant Mushrooms Theme Days Composting and Growing, October 21-25, 2013.
International participants from around the world (about 7) visited the facility as part of the training subject on sustainable energy. Remark: basically all courses given by DLV Plant Mushrooms have a program that includes a visit and introduction to high-tech sustainable mushroom cultivation.

Vietnamese Trade Missions
In total 27 professionals visited the FBC on 30-10-2013, 28-02-2014 and 12-03-2014

Presentation Supper Results 5 June 2014.
During this meeting entrepreneurs received practical and concrete examples and tips to help their own company to a climate neutral production process. In addition, the audience got an overview of the options for developing to such a process. This excursion was for companies that want to make their production process climate-neutral. The results of the Supper project were presented, as a possible solution to covert waste in energy. A various group (15 entrepreneurs) joined the meeting like people Caterpillar, bulb producers and environmental consultants and engineers.

The meeting was organized by RVO (Ministry of Economic Affairs of the Netherlands)
OTHER PRESENTATIONS

In addition other presentations were held, that included also a section about sustainable energy production by means of an FBC system. Below a short summary of these presentations:

- 27-5-2013 Christiaens workshop (international workshop on new developments in mushroom industry)
- 15/18-10-2013 Presentation Biofungi Conference Hungary
- 6-11-2013 Presentation Hessischer Pilztag Germany
- 23/25-4-2014 Presentation Euromycel conference Poland

INDIVIDUAL CONTACTS INSIDE/OUTSIDE THE NETHERLANDS

Below a list of individual contacts that showed interest and were informed about sustainable energy production by means of an FBC system. Some contacts also visited the facility; others were informed during a personal meeting and a few by means of e-mail contacts:

- 11-3-2013 John van Helden, Fancom, NL (contacts about Poultry sector)
- 25-3-2013 Nesad Smailbegovic RVO (Ministry of Economic Affairs NL)
- 26-3-2013 Rob Maas, Funghi, NL (growers organisation)
- 16-4-2013 Consortio Italy (Giorio Grespan, Romeo Fuser) (visited facility with Gilles van der Lans)
- 16-4-2013 David Tolson, Australia (visited facility with technical advisor)
- 22-5-2013 Uri Rosenzweig, Tekoa Farms, Israel
- 2-9-2013 vd Boomen, Gemert, NL (SMC drying project)
• 10-1-2014 Eric Dunlap, Kaolin Mushroom Farm, USA
• 21-2-2014 Brendan McKenna, Ireland (question customer)
• 17-4-2014 Michael Manale, Romanens Pilzkulturen, Switzerland (visited facility)
• 28-5-2014 James Rothwell, UK (grower / consultant)
• Bercvenne, NL (Ies Hooglugs + Leon Knoops) (project plans)
• Wayne Collingwood, Meadow Mushrooms, NZ (visit planned in September 2014)
Annex 6.6

Farming Today – BBC4 Screenshot
Rural housing; Chicken litter; Meat production

As house prices sour in rural areas, people living and working in the countryside are being pushed out. This is according to a report out today from the National Housing Federation. It says the biggest problem is in the South West, in the countryside surrounding Bristol and Bath as well as the areas around London.

From the middle of July, chicken producers will be able to burn waste ‘litter’ on the farm to provide heating for their chicken sheds. It’s taken several years for the European Commission to agree the safety rules. Anna Hill meets Nigel Joice in Norfolk where he’s been running a trial system, burning litter on his broiler chicken farm for two years.

In a week where producers, processors and retailers will meet to discuss the fall in beef prices, Farming Today is looking at the finances behind the production of livestock. Charlotte Smith speaks to Professor Liam Sinclair from Harper Adams University about how the UK compares to other countries.

Presented by Charlotte Smith and produced by Lucy Bickerton.
Annex 6.6(b)

Uphouse Farm – Poultry Farm of the Year
The 2014 Pig and Poultry Marketing Awards took place yesterday lunchtime (8th May) on the shores of the South Bank. Our guests congregated at the London Marriott County Hall to celebrate innovation in the industry and reward production excellence, marketing communications and knowledge transfer throughout the whole of the pig and poultry food chain. Yesterday, Pig & Poultry Marketing magazine awarded and promoted companies and individuals nationally for their innovation, their forward thinking attitudes, and for their constant striving for the best looking and best tasting product, as well as the veterinary practices and marketing companies who support them. These businesses are integral in showing others the way that hard work, dedication and ideas, can make a difference, and we were delighted to welcome them as our guests!

The winner’s photos have now been released and more will become available online – www.farmbusiness.cc, click AWARDS. Make sure you keep an eye on the Farm Business website for pictures of a successful (but wet!) afternoon!

Our host for the day was award-winning, independent agronomist Sean Sparling, of Sparling Agronomy Services. A passionate ambassador for agriculture and food production, Sean is a highly sought after dinner speaker, which he combines with performing mind-boggling close up magic!

We also welcomed one of the UK’s most talented chefs, Phil Vickery, who gave an excellent speech on the story behind his latest bestseller, Pork, which won the Gourmand World Cookbooks Award last year - many of our guests took home a signed copy!

Poultry of the Year Category – sponsored by Zoetis

HIGHLY COMMENDED

FROGMARY GREEN FARM

Our judges highly commended Frogmary Green Farm for the Bragg’s highly proactive approach to engaging consumers with the broiler industry and continuing to produce chicken to the highest welfare standard, whilst making a conscious effort to ‘think green’ and protect the environment.
HIGHLY COMMENDED

CAPESTONE ORGANIC POULTRY

One of the UK’s top independent poultry producers, Capestone is a fully integrated organic farm and processing site, with the rearing, producing and processing of all poultry taking place on site. Our judges were particularly taken with Capestone’s community engagement and investment in the farmers of tomorrow!

WINNER

UPHOUSE FARM

Father and son team, Nigel and Patrick Joice have been working hard to achieve environmental ambitions, investing £1.8 million pounds in their own ‘Energy House’, burning poultry manure to heat their chicken houses. Their forward thinking and performance figures really impressed the judges.
Annex 6.7

Extract from NFU website
NFU discusses poultry litter win with minister

Last updated: 15 Jul 2014

Defra Minister, George Eustice has today met with NFU member and poultry farmer Nigel Joice, the NFU and BiHSL to discuss the recent EU lobbying successes the combustion of poultry litter on farms.

The meeting coincides with the date (15th July) in which all poultry farmers across the EU will be allowed to combust poultry litter on-farm to create energy. This issue has been the subject of sustained NFU lobbying over several years.

The UK poultry industry has a chance to become more sustainable - both economically and environmentally - thanks to new European regulations which will allow them to make use of chicken litter for on-farm energy, the NFU said today.

Any farmer wishing to combust poultry litter on-farm must contact their local AHVLA office as all boilers must be approved by AHVLA. A copy of the application form can be found by clicking here.

If the farm is permitted under Environmental Permitting Regulations then a permit variation will also need to be applied for via the Environment Agency.
New poultry litter rules a 'massive boost'

Last updated: 06 Jun 2014

The UK poultry industry has a chance to become more sustainable – both economically and environmentally – thanks to new European laws which will allow them to make use of chicken litter for on-farm energy, the NFU said today.

From July 15, all poultry farmers across the EU will be allowed to compost poultry litter on-farm to create energy. The issue has been the subject of sustained NFU lobbying over several years.

NFU poultry board chairman Duncan Priestner said: “This represents a massive, positive development for the poultry industry, an industry which embraces new technology and is keen to make use of on-farm by-products, both to the benefit of business and the environment, by relying less on traditional energy sources.

“There are also a number of other benefits, including healthier birds, minimised biosecurity risks and opportunities to use nutrient-rich ash on farmland.

“Our poultry farmers will be able to take advantage of these opportunities, and we are working closely with government to ensure it keeps regulatory burden to a minimum, costs down, re-enforces its commitment to supporting renewable energy and sustainable food production and that systems are in place to approve construction plants as soon as possible.”

NFU member and Norfolk-based poultry farmers Nigel and Patrick Jolce, who produce 5.8million birds per year, have been trialling the system since 2012.

Their two 500kw biomass burners have managed to produce up to 93 per cent of the farm’s heat requirements and this research has helped to shape legislation.

The changes are part of the Animal By-Product Implementing Regulations, which allow certain combination of poultry litter for fuel, which have now been published in the European Union’s Official Journal. Read more here.

NFU, Defra, EA and AHVLA staff during a site visit to Nigel and Patrick Jolce’s farm.