



# Anaerobic Digestion

This information is extracted from two studies commissioned by the NNFCC. The first (NNFCC 07-012) undertaken by SAC, entitled 'A review of the potential for on-farm processing of various non-food crop products' and the second (NNFCC 08-006) a follow-on undertaken by Andersons, entitled 'A detailed economic assessment of Anaerobic Digestion technology and its suitability to UK farming and waste systems'. These full reports and an AD Cost Calculator can be downloaded from our website at [www.nnfcc.co.uk](http://www.nnfcc.co.uk)

Anaerobic Digestion (AD) is the conversion of organic non-woody material in the absence of oxygen into stable and commercially useful compounds. AD feedstock can be unwanted 'wastes' such as slurry or food waste, or energy crops grown specifically for feeding the digester. The outputs from the digestion process are;

- **Biogas** – a mixture of 60% methane, 40% carbon dioxide and traces of other 'contaminant' gases. This biogas is then combusted to generate heat, power or road fuel.
- **Digestate** – an inert and sterile wet product with valuable plant nutrients and organic humus. This product can be separated into 'liquor' and fibre for application to land or secondary processing.

### Benefits & Drivers

AD offers multiple benefits to the following five groups of people;

- **Farmers and entrepreneurs** – by offering favourable returns as well as legislative and agronomic benefits.
- **Food processing industry** – by offering an environmentally sensitive waste disposal option and negating increasing landfill fees.
- **Local community** – by providing a local heat and power supply, creating employment opportunities and reducing farm odour levels.
- **Environment** – by reducing volumes of waste going to landfill and GHG emissions as well as providing an organic fertiliser.
- **Government** – by helping to meet various policies and legislative targets.



Contact our Agriculture Expert,

Lucy Hopwood

Tel: +44 (0) 1904 435182

[enquiries@nnfcc.co.uk](mailto:enquiries@nnfcc.co.uk)

[www.nnfcc.co.uk](http://www.nnfcc.co.uk)

AD benefits from the implementation of a number of UK policies aimed at a range of environmental initiatives. The policies most likely to be advantageous to the AD industry are as follows;

- The Renewables Obligation (RO)
- Climate Change Levy
- The Renewable Transport Fuel Obligation (RTFO) (ending April 2010)
- Landfill Tax
- Landfill Allowance Trading Scheme (LATS)
- Energy Crop Scheme
- The Nitrates Directive



## Technical Data

Although the process of AD is relatively simple there are several system options which will be determined by feedstock type, output requirements, space and infrastructure. System options are as follows (the most common for the UK shown in **bold**);

- **Mesophilic** (25 – 45°C) or thermophilic (50 - 60°C)
- **Wet** (5 – 15% dry matter) or dry systems (over 15% dry matter)
- **Continuous** or batch flow
- **Single, double** or multiple digesters
- **Vertical tank** or horizontal plug flow

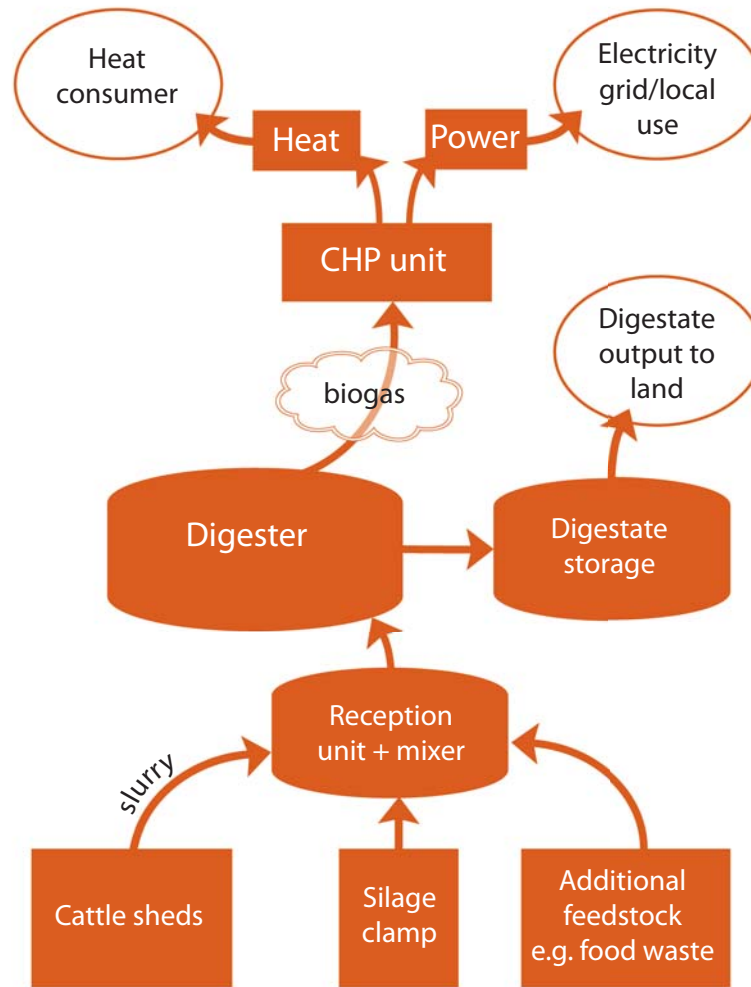
## Biogas Output from Various Feedstocks

| Feedstock        | Biogas yield (m <sup>3</sup> per tonne) | Equivalent value (£ per tonne) |
|------------------|---|--------------------------------|
| Cattle slurry    | 15 – 25                                 | 4.00 – 6.00                    |
| Pig slurry       | 15 – 25                                 | 4.00 – 6.80                    |
| Poultry          | 30 – 100                                | 8.10 – 27.00                   |
| Maize silage     | 200 – 220                               | 54.40 – 60.00                  |
| Grass silage     | 160 – 200                               | 43.50 – 54.40                  |
| Whole crop wheat | 185                                     | 50                             |
| Crude glycerine  | 580 – 1,000                             | 155 – 270                      |
| Rapemeal         | 620                                     | 168                            |

## Energy yield from 1m<sup>3</sup> biogas

|                        | Energy Value      |
|------------------------|-------------------|
| 1m <sup>3</sup> biogas | 23 MJ             |
| Electricity only       | 1.7 kWh           |
| Heat only              | 2.5 kWh           |
| CHP of biogas          | 1.7 kWh and 2 kWh |

## A Simplified AD Process Diagram



## Summary

- Economics are variable, depending on scale and feedstock mix. Income will come via various streams, each requiring careful management to maximise returns.
- Although energy generation is the main driver for AD systems in the UK, the waste handling potential is also of significant interest to the food processing and retail sector.
- Efficiency of scale and collaboration are important in AD, working with local 'waste' suppliers and heat / power users improves the economics significantly.
- Capital grant funding is available for AD, but this must be approached with caution at the risk of becoming ineligible for the higher banding of Renewables Obligations Certificates (ROCs).

## Useful Links

**The final reports for projects NNFCC 07-012 and 08-006** and our **AD Cost Calculator** can be downloaded free of charge from our website at [www.nfcc.co.uk](http://www.nfcc.co.uk)

**Further information on all aspects of AD**, including a list of existing plants and technology providers, can be accessed via England's Official Information Portal on Anaerobic Digestion, at [www.biogas-info.co.uk](http://www.biogas-info.co.uk)

## Economics

Economics can be variable, depending on scale, feedstock mix and technology. High capital costs are often quoted, but generally these assume no infrastructure already exists. If, for example, you already have good access and good slurry storage & handling facilities the costs can be significantly lower. Our Cost Calculator will give you an idea of the level of investment required. Generally, given the right mix of feedstock, scale and technology, payback can be as quick as 5–7 years.