

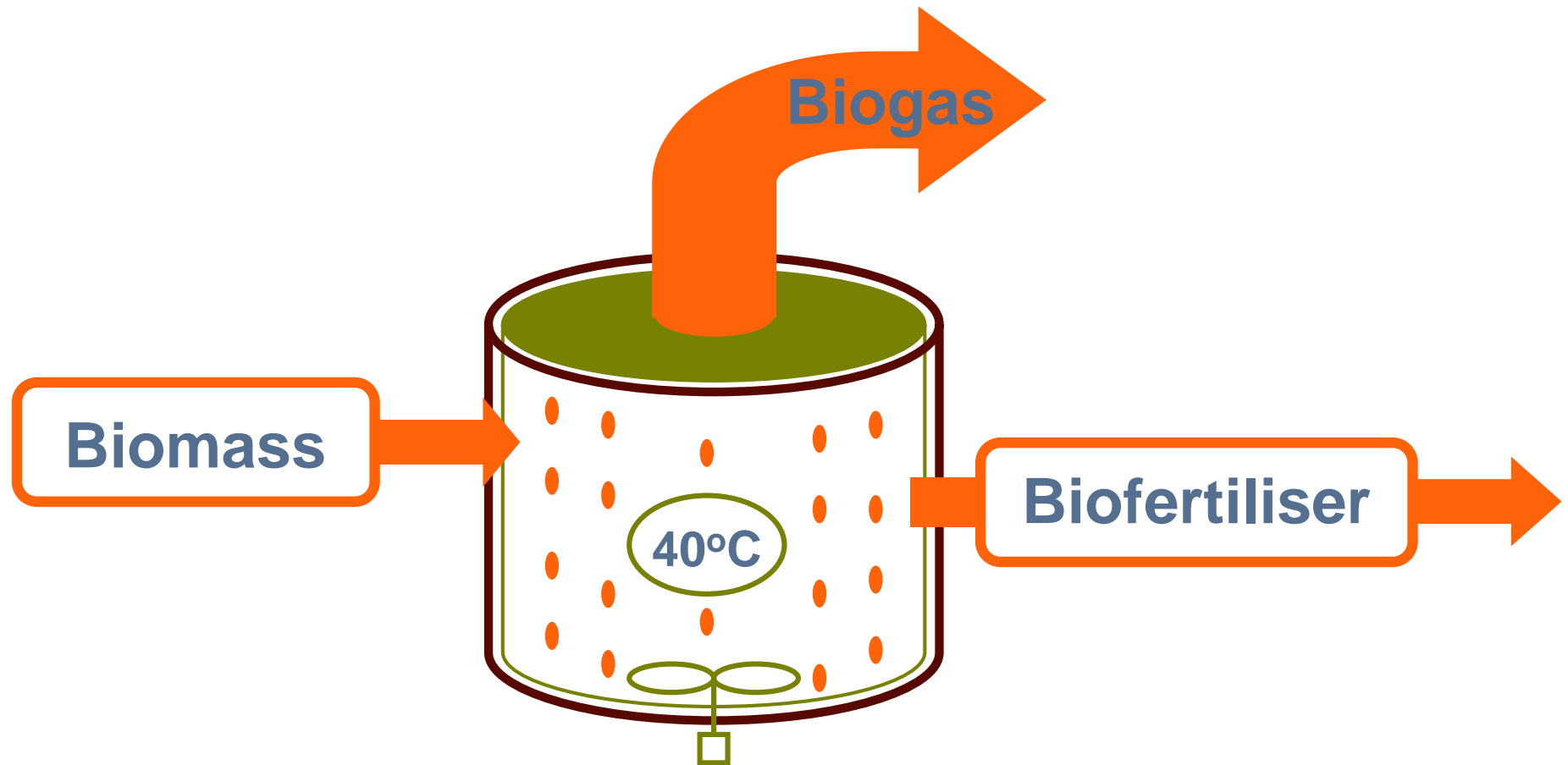
Anaerobic Digestion

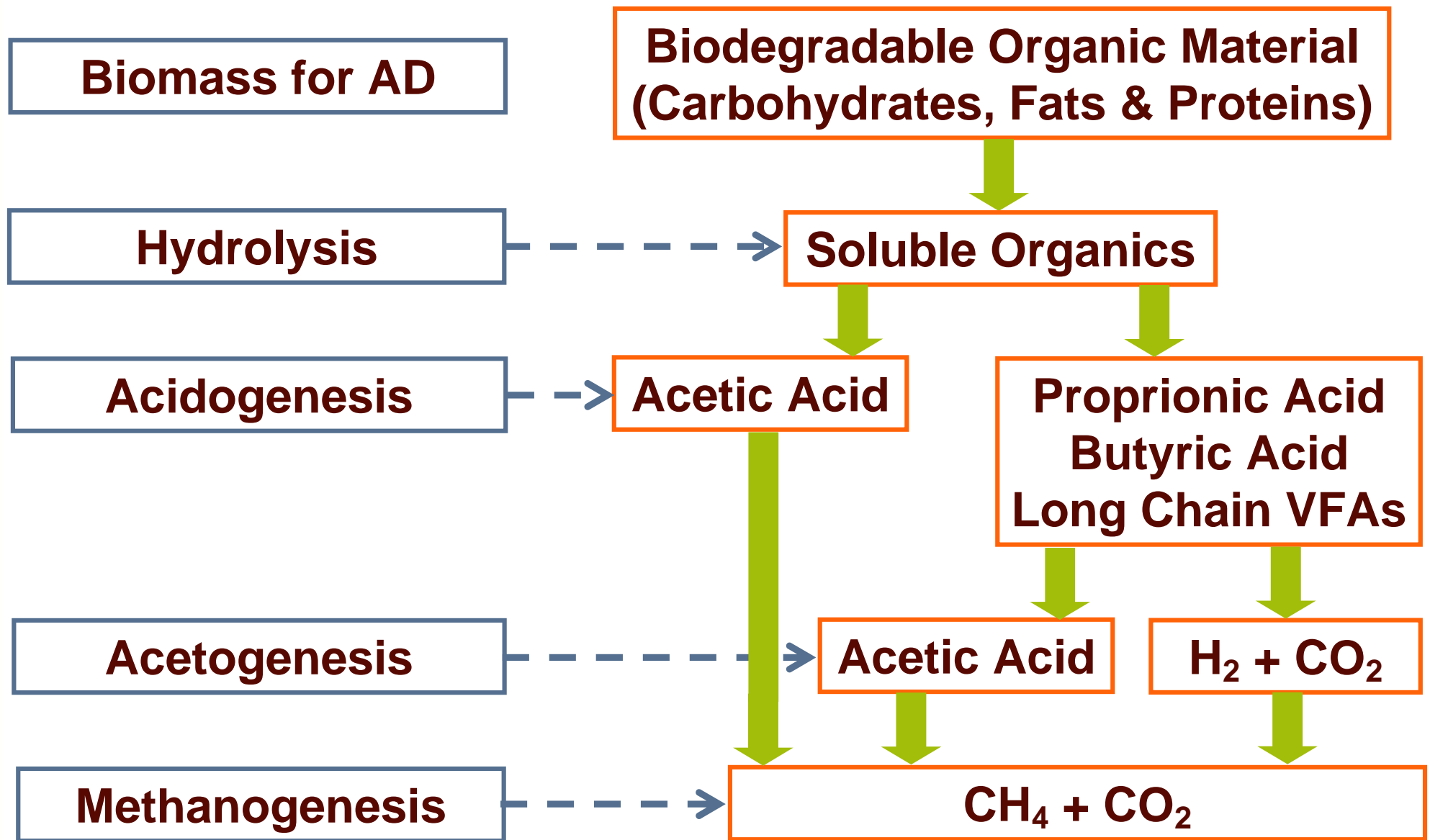
Michael Chesshire
Technology Director
BiogenGreenfinch

Cambridge University Energy Network, 4th May 2010

BIOGEN
Greenfinch

Anaerobic Digestion a Natural Biological Process





Biomass for AD

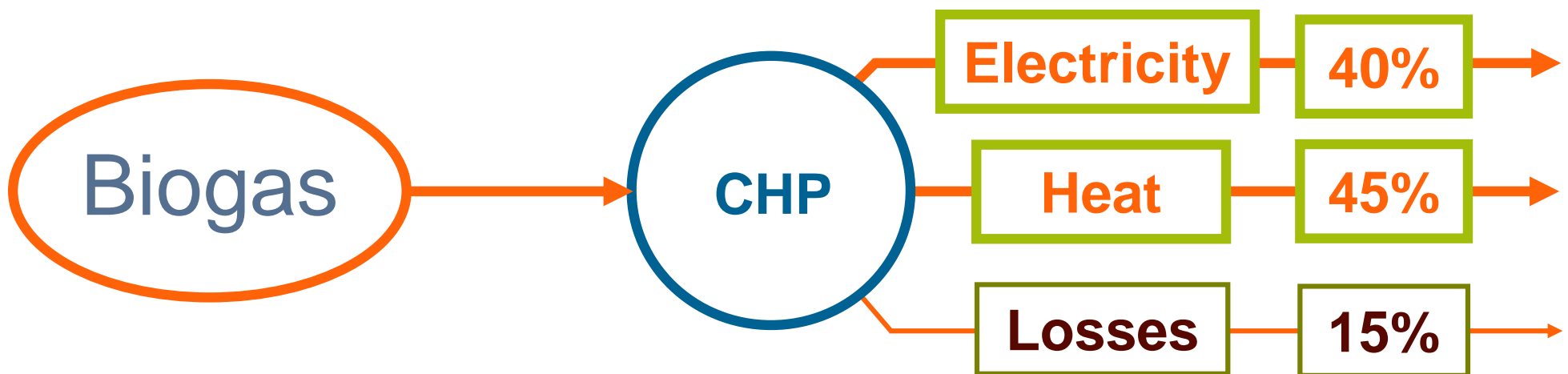
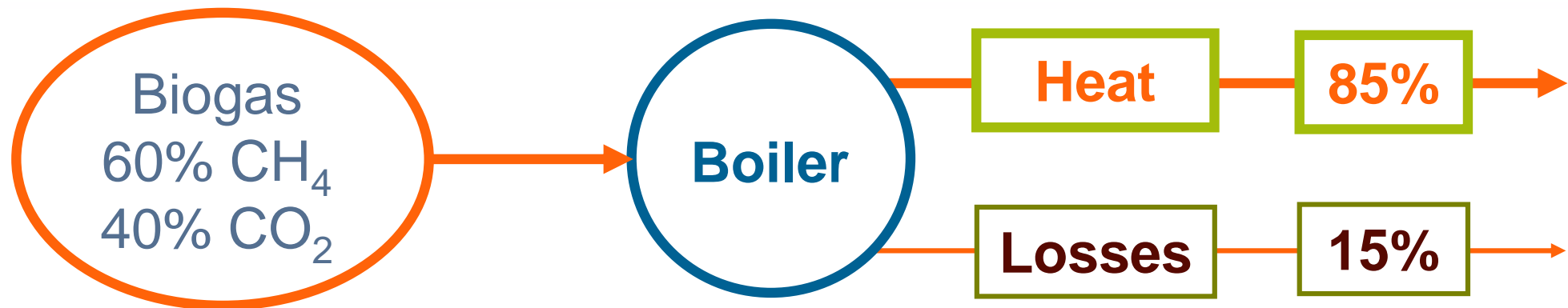
Livestock Manure

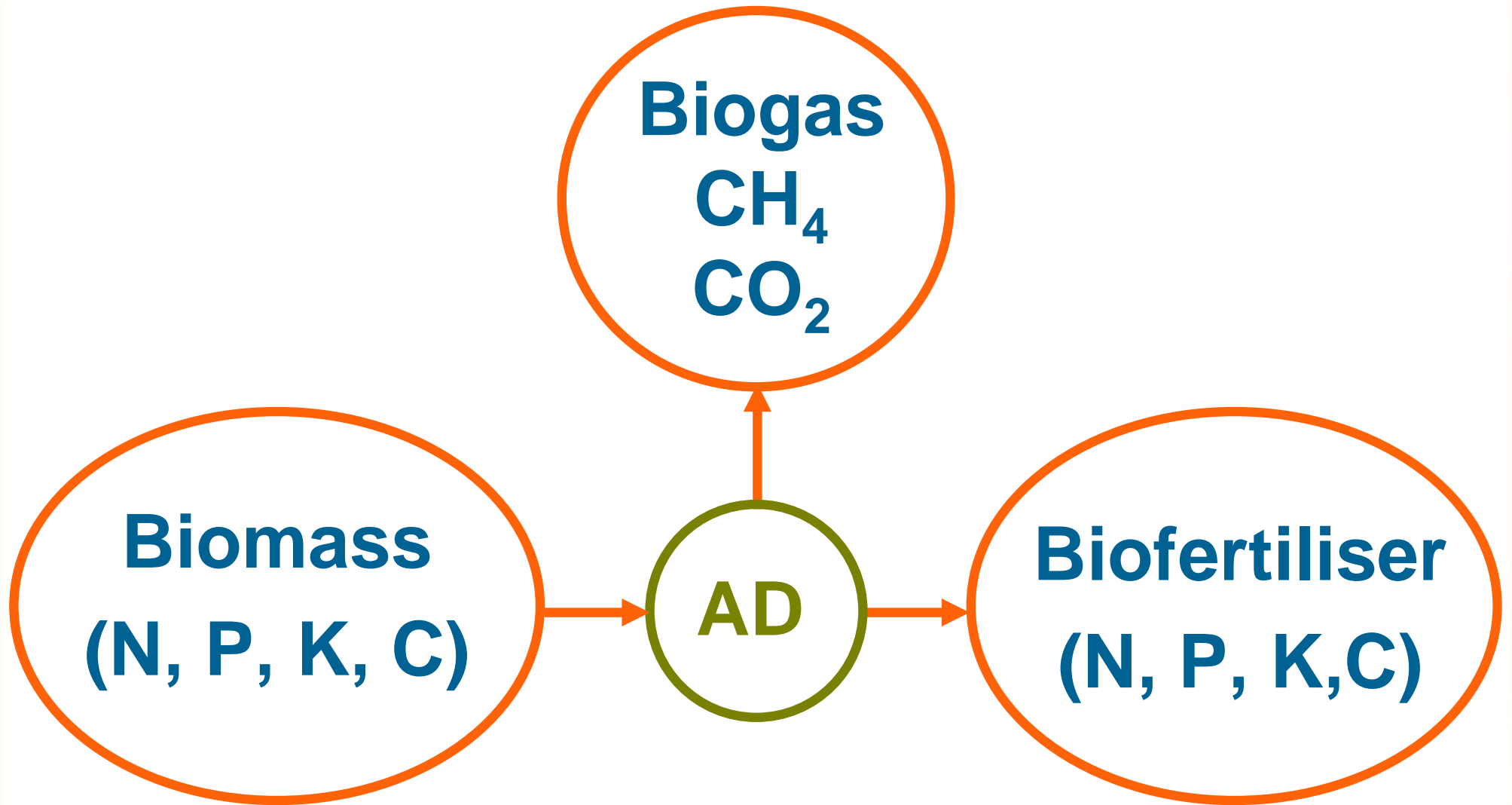
Energy Crops

Food Waste

Sewage Sludge

Fats & Oils





The Global Environment

AD is a low-carbon process which contributes to the reduction of greenhouse gas emissions:-

by preventing the uncontrolled emissions of CH₄ to the atmosphere (21 times more powerful than CO₂);

by beneficial use of biofertiliser, displacing mineral fertilisers (the production of 1 tonne of nitrogen results in the emission of 2 tonnes of CO₂);

by reducing the transport of waste; and

by the production of renewable energy (displacing fossil fuels).

The Local Environment

In addition to its low-carbon benefits, AD is beneficial for human health & the local economy:-

reduction of pathogenic organisms, e.g. salmonella & e.coli;

reduction of odours;

reduction of potential water pollution;

reduction of weed seeds;

reduced dependence on artificial fertilisers;

improved soil fertility;

as well as for the production of local energy.

Examples of Anaerobic Digesters



Household biogas plant in Kerala



Sewage sludge digester in Ruthin, Wales



Farmer co-operative biogas plant in Denmark



Combined heat & power unit

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Community biogas plant in Sweden



Biogas upgrade plant

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Biomethane bus in Sweden



Farm digester in Finland



Biomethane Volvo – 0.5m³ manure or 60kg of kitchen waste per 100km

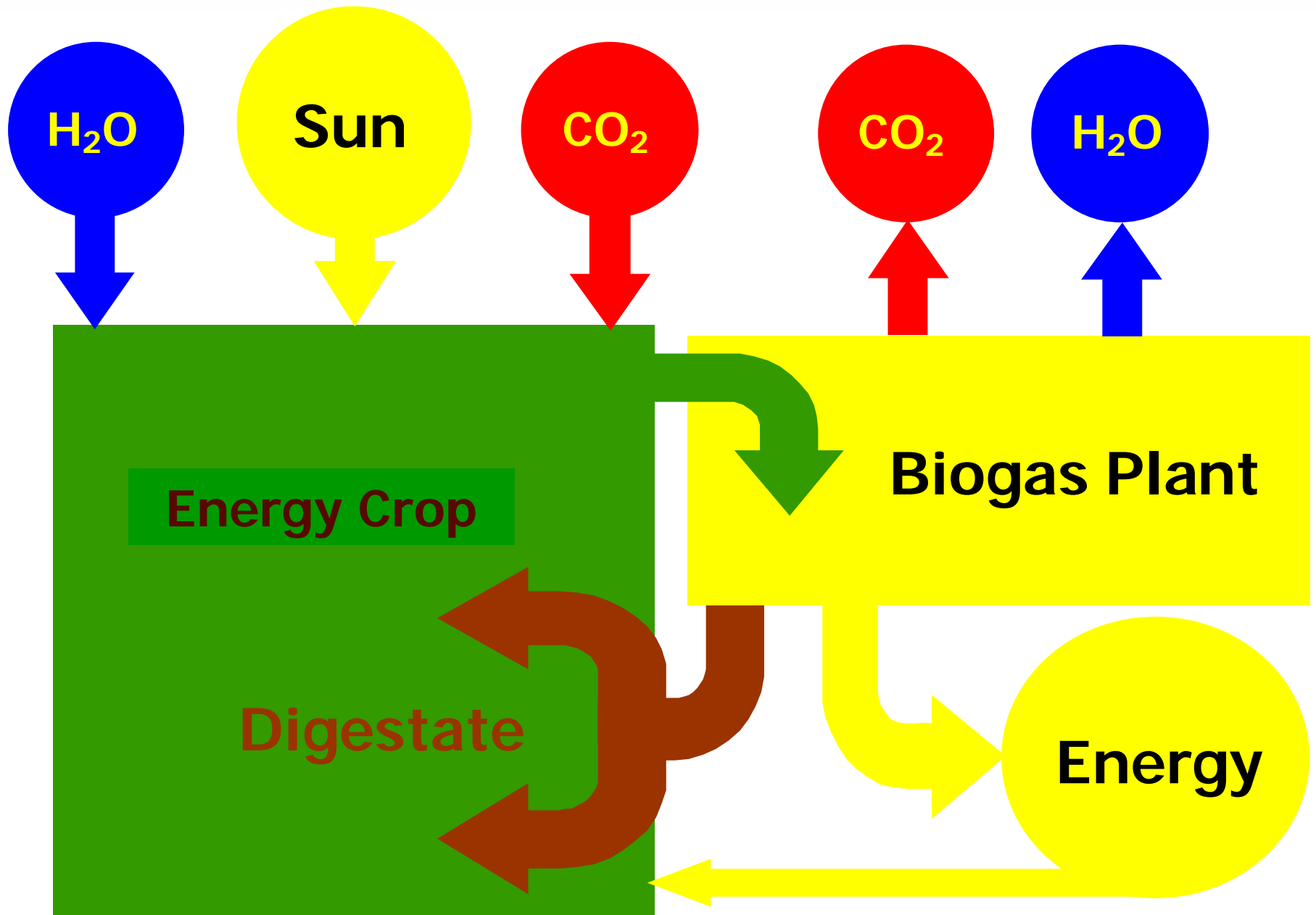


Biogas plant on dairy farm in North Ayrshire



Kompogas dry digester in Switzerland

Anaerobic Digestion of Energy Crops





Maize silage clamp



Co-digestion of manure & maize silage in Germany

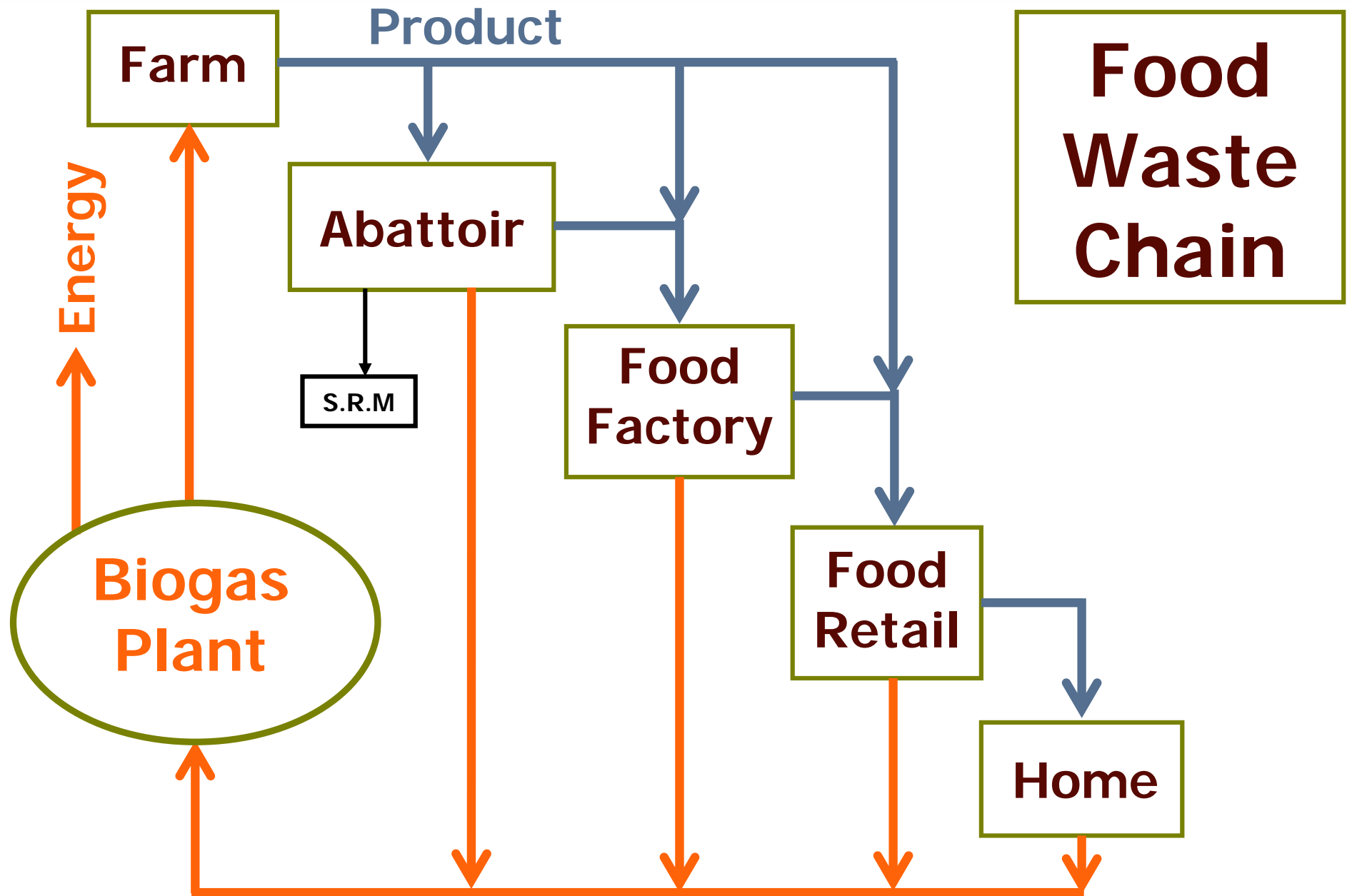


Ryegrass biogas plant in Shropshire



Aga fuelled on biogas

Anaerobic Digestion of Food Waste



UK Context

WRAP estimates that each UK household produces about 250kg of food waste per year, representing one third of food purchased.

In total households produce 7 million tonnes of food waste per year.

There is a further 10 million tonnes from commercial catering and from food processing.

This food waste must be diverted from landfill, and has the potential for the production of renewable energy through AD.

Food Waste R&D 1996 to 2003



1996 to 1998 – Restaurant Waste



1999 to 2001 – Kitchen Waste



2001 to 2003 – Pathogen Research



Kitchen caddy, corn starch bags & kerbside bin



Kerbside bins ready for collection in Ludlow



Electric collection vehicle



Ludlow biodigester under construction

Cambridge University Energy Network, 4th May 2010



Ludlow biodigester



Food waste in reception hall



Shredded food waste



Process tanks



CHP & boiler



Co-digestion of pig slurry & food waste at Twinwoods, Bedfordshire



Spreading digestate at Twinwoods, Bedfordshire



BiogenGreenfinch 45,000 tonne per year food waste digester at Westwood, Northamptonshire

Future of AD in UK

- There are likely to be two types of plant**

1 – On-Farm AD Plant



Agri-Food & Biosciences Institute, Northern Ireland

1 – On-Farm AD Plant

Processing material arising on the farm, e.g. manure, energy crops & vegetable waste.

Land available for beneficial use of digestate.

Planning normally straightforward.

Environmental permitting supposedly light-touch.

Scale typically from 100kW to 1.0MW.

Capital cost typically from £500k to £2.5m.

Annual income typically from £120k to £1.2m.

Revenue costs depend on feedstock.

2 – Commercial AD Plant



45,000 tonnes per year BiogenGreenfinch food waste AD plant in Northamptonshire

2 – Commercial AD Plant

Processing domestic food waste, commercial food waste, food processing waste, possibly with farm materials.

Land required for beneficial use of digestate.

Planning a challenging & lengthy process.

Environmental permitting very stringent.

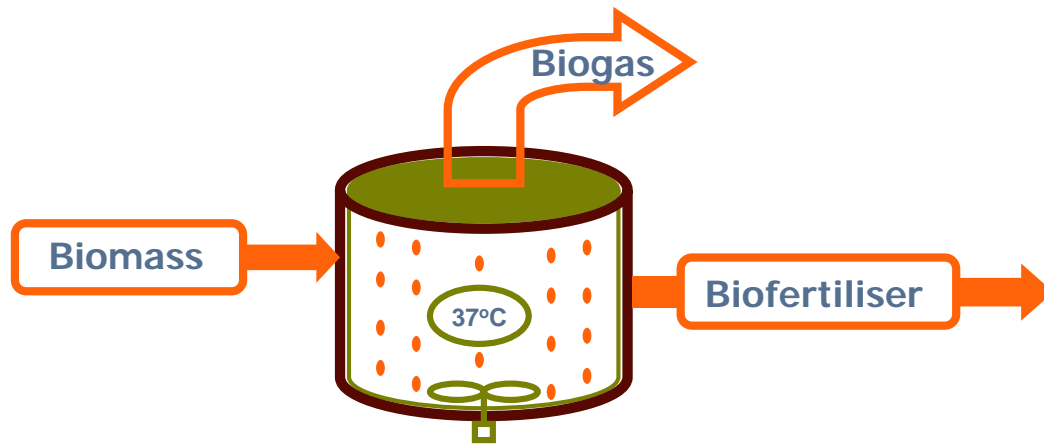
Scale typically from 1.0MW to 2.0MW.

Capital cost typically from £5.0m to £10.0m.

Annual income typically from £2.0m to £4.0m.

High revenue costs.

Anaerobic Digestion A Low-Carbon Process



Thank you

