AgroCycle – Developing a circular economy in Agriculture

Trisha Toop\textsuperscript{a}, Shane Ward\textsuperscript{b}, Thomas Oldfield\textsuperscript{b}, Maria Hull\textsuperscript{a}, Michael K Theodorou\textsuperscript{a}

\textsuperscript{a}Agricultural Centre for Sustainable Energy Systems (ACSES), Animal Production Welfare and Veterinary Sciences, Harper Adams University, Newport, Shropshire, TF10 8NB, UK
\textsuperscript{b}School of Biosystems and Food Engineering, University College Dublin, Belfield, Dublin, 4, Ireland.

* Corresponding author. Tel.: +44 (0) 1952 815154.
\textit{E-mail address:} ttoop@harper-adams.ac.uk
The project

• Led by the School of Biosystems & Food Engineering, University College Dublin
• EC funded H2020 in collaboration with the Government of the People’s Republic of China and the Hong Kong Government
• 3 year project, 26 partners: EU, China, Hong Kong
• €7 million from EC plus ca. €1 million from Government of the People’s Republic of China and the Hong Kong Government and direct resources inputs from the Chinese and HK partners (CAU, NJIT; and RESET Carbon from HK)
AgroCycle partners

- 8 EU Countries
  - Ireland
  - Spain
  - United Kingdom
  - Germany
  - Belgium
  - Italy
  - Greece
  - Croatia

- 23 EU partners, 2 from Mainland China and 1 from Hong Kong
1st International Conference on Sustainable Energy and Resource Use in Food Chains

RCUK Centre for Sustainable Energy Use in Food Chains
AgroCycle Objective

• To deliver sustainable waste valorisation
• Address European policy target of reducing food waste
  • 50% by 2030
• Contribute to the change occurring in China in relation to sustainability
AgroCycle Approach

• A full systems approach
• Developing a ‘Circular Economy’ around the agri-food chain:
  • Pre- and post-farm gate
  • Food and agri-products processing sector
  • Wholesale and retail
  • Waste processing – valorisation incl. bio-fuels, high value-added biopolymers, energy & micro fuel cells.
• Consumer
Evaluating the potential for small scale anaerobic digestion (AD) technology that can be applied on farm to provide local heat and energy recovery from mixed agricultural wastes
Challenges of on-farm poultry litter AD

• Litter from broiler production identified for investigation
• Mixture of manure, wood shavings and straw
• High nitrogen content typically 30 kg N / t
• Microbial risk from handling and spreading
• Currently ploughed into agricultural land dry
• High dry matter content typically 60%
• Not suitable for current AD systems without liquid addition
  • Dry AD dry matter 20 to 40%
  • Wet AD dry matter 10 to 15%
Combined expertise to tackle challenges

Carton Bros - Manor Farm
Poultry farm production in Ireland

Keenan Alltech
Agricultural feedstock handling and feedstock supplements

PlanET Biogas
Global suppliers of anaerobic digestion plants at various scales

Innovation for Agriculture
Agricultural resources and expertise in the UK

Portagester Systems
Specialists in multi-stage anaerobic digestion technology

Enviroeye Engineering
Consulting Engineers
Mechanical and electrical consulting engineering company
Multi-stage agricultural waste treatment

**Step-1 Loading**
- Broiler Poultry Litter (On-site)
- Straw (Imported)
- Other on-site Agri wastes

**Keenan**
- Fill
- Mix
- Chop

**Stage 1**
- Liquid from poultry litter digestion
- Cattle slurry (on-site)
- Other mixed Agricultural wastes

**Step-2 Digestion**
- **Portagester**
  - Integrated heater
  - Integrated digestate collection
- Digestate Tank (To PlanET unit)

**Stage 2**
- PlanET (at HAU)
  - Solid and liquid feed
  - Integrated heating
  - Continuous system

**Step-3 Discharge & Cleaning**
- Digestate liquid to HAU AD unit
- Digestate solids to Land Plot in North Dublin
- Return empty trailer to site
- Back to Step 1

- Digestate To land
- Back to Step 1

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Substrate mixing

- Keenan Alltech
- Chop and mix substrates
Dry batch AD

- Portagester Systems
- Batch thermophilic dry AD
Wet AD

- PlanET Biogas
- Wet AD system
- Dry and wet feed
Evaluation of digestate application to land

• Mixed agricultural wastes will be assessed for biogas production and digestate nutrient composition

• Residues from AD mixes will be assessed for
  • Chemical composition
  • Plant growth
  • Microbial effects on soil

• Trails will be conducted at laboratory and field scale
Projected outcomes

• Development of novel AD system for broiler litter utilisation
• Sustainability analysis of the developed system
  • Social
  • Environmental
  • Economic
• Demonstration on farm at production premises and Harper Adams University
• Resource and expertise provision for the development of a PgC in Sustainable Energy at Harper Adams University
Contact Details

Project Co-ordinator: Professor Shane Ward

Email: agrocycle@ucd.ie
Website: www.agrocycle.eu
Twitter: @AgroCycle_EU