Innovation in Biomass Security of Supply

Dr John Gilliland OBE
The EU Challenge
EU 27 Energy Action Plans for 2020

53% of Renewables by 2020, to come from Biomass

Bentsen & Felby 2012
The UK Challenge of Biomass Security

- CCC’s view on Biomass Security & Land Availability

Power and heat sectors may require ~30m tonnes of solid biomass in 2020 (Source: UK Renewables Roadmap 2011) = Total amount currently used by all wood consuming sectors (primarily construction, wood panels, pulp and paper).
The Availability of Wood in Ireland

Supply-Demand Balance ('000m³) - All Ireland

- 2011
- 2020

CHP
CoFiring
Heat Only
Total Demand
Potential Supply

Henry Philips 2010
Ireland’s Simultaneous Challenge

A 33% increase from the output of Agriculture by 2020
“Sustainable Intensification?!”

Can Integrating Biomass into Food Production deliver all four Priorities simultaneously?
UK River Water Quality

UK still has considerable way to go on Water Quality
(Environment Agency, UK)
Growing Willows as a Biological Filter

Willow as a Riparian Strip, Catching Defuse Pollution Improving Biological Water Quality

(AFBI NI)
Reduction of Nitrates in Ground Water

“Willows could be particularly attractive option, mitigating leaching, while providing a high yielding crop,”

Hansen 2004
UK Wild Bird Populations

Figure 1: Populations of wild birds, 1970 to 2010

United Kingdom

Seabirds (19)

All (121)

Water and wetland birds (1975=100)

Woodland birds (38)

Farmland birds (19)

UK still has considerable way to go on Biodiversity
(DEFRA, UK)
Growing Willows as a Biodiversity Enhancer

Fig 2.1 Density of birds recorded within the edge zone of SRC (first 25 metres of SRC) and arable control plots edge zone during each year of the project.

Figure 5.3: Species composition and abundance of butterflies seen on coppice and arable control plots in 2002.

Increasing Flora and Fauna
(DTI Ecology Monitoring of UK Willow Coppice)
GHG, Life Cycle Analysis of Food, now being developed

<table>
<thead>
<tr>
<th></th>
<th>UK Beef</th>
<th>UK Lamb</th>
<th>UK Pork</th>
<th>UK Chicken</th>
<th>UK Potato</th>
</tr>
</thead>
<tbody>
<tr>
<td>t of CO2e/t of Product</td>
<td>13.9</td>
<td>14.6</td>
<td>4.0</td>
<td>2.7</td>
<td>0.15</td>
</tr>
<tr>
<td>Energy used in Production, GJ/t</td>
<td>31.3</td>
<td>22.0</td>
<td>23.3</td>
<td>16.9</td>
<td>1.4</td>
</tr>
</tbody>
</table>

But – Be wary of Perverse Outcomes from using First Generation, Carbon Calculators – No Sequestration!!

Essential - “Whole Farm, Carbon Balance Sheet!” where Products associated with “Net” & not “Gross” Emissions
Perennial Energy Crops GHG Savings

GHG savings from solid biomass used in electricity and heating

Comparing to EU fossil fuel:
- FR chips (EU)
- FR pellets (EU wood process fuel)
- FR pellets (tropical/wood process fuel)
- FR pellets (tropical/NG process fuel)
- FR charcoal (EU)
- FR charcoal (tropical)
- Bagasse briquettes (wood process fuel)
- Bagasse briquettes (NG process fuel)
- Bagasse bales
- Palm kernel shells
- Miscanthus
- SRC chips (EU)
- SRC pellets (EU/wood process fuel)
- SRC pellets (tropical/wood process fuel)
- SRC pellets (tropical/NG as process fuel)

(EU Commission)
Growing Willows as a Carbon Sequester

Sequestering 2 to 5t/ha of GHGs per Year
In the Soil & not removed when harvested
(Teagasc 2010)
Growing Willows as a Biosecurity Corridor

Corridors of trees reduce spread of livestock diseases e.g. Johne’s and BVD Diseases, Improving productivity and reducing GHGs per litre of milk/per kg of beef, Scotland
Cleaning Society’s Dirty Water!!

Trialled at City of Derry Sewage Works, since 1996

City of Derry Sewage Treatment Works

Pumped to willows

Irrigation System

Eg. Drumkee, Compliant Willow Waste Water Treatment

Reductions - 30% Cost & 1,500% GHGs
Innovation - Accessible for Small Farmers

The Bio Baler & The Round Bale Boiler
Innovation - Gurteen College, Ireland

400 ha – 30 ha SRC Willow
- 370 ha Conventional Farming

All woodchip used to heat College
Planted for Multifunctional Use
- Riparian Strips
- Proposed biofiltration dairy washings

Built into the Learning Experience

Multifunctional Willow Production in support of Food Production !!!
Innovation delivers “Sustainable Intensification”

Sustainable Farming

- Profitability & the Next Generation
- Improving Water & Biodiversity
- C. Change Adaptation & Mitigation
- Food & Energy, & Security

Smart Planting of 5-10% of a Farm, with Perennial Energy crops mitigates Food Production’s Environmental Footprint

Synergy – Not Conflict!!!!