Greenhouse Gas Mitigation

How can crops contribute?

Crops for Energy

- Fossil Fuel Replacement
- Indigenous energy supply
- Promotion of Rural Development
- GHG mitigation

Biofuels

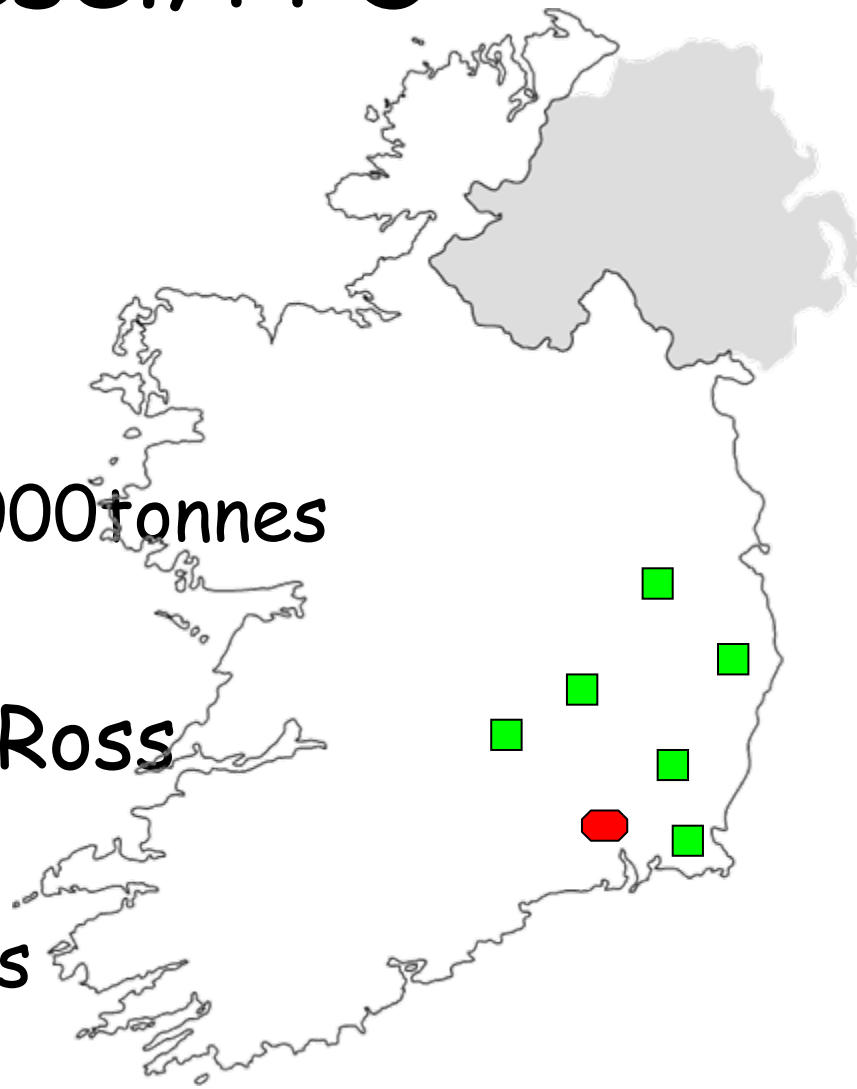
- Available biofuels from crops at present
  - Pure Plant Oil and Biodiesel from oilseed rape
  - Bioethanol from wheat/ beet

Targets

- EU target of 5.75% by 2010
- National target of >10% by 2020
- 5% biodiesel blend in CIE fleet
- Use of 100% Pure Plant Oil (PPO) in local authority fleets

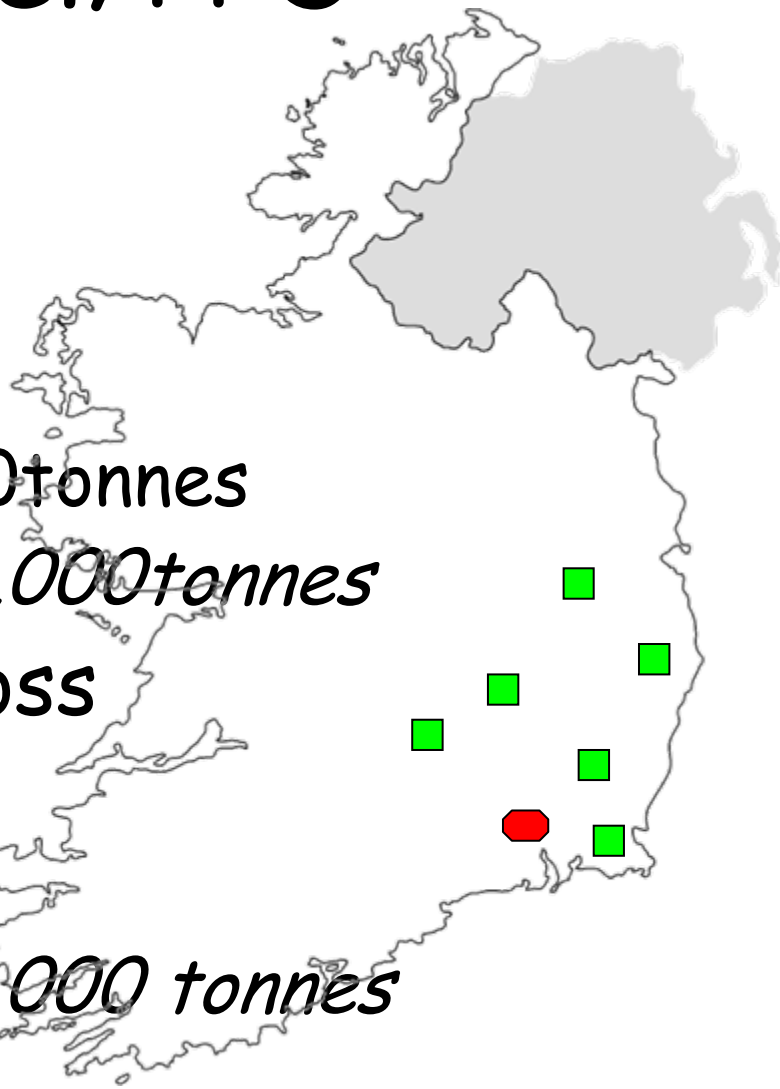
Biodiesel/PPO

- Pure Plant Oil
  - Established industry
  - 5 crushing plants
  - Current capacity ~10,000tonnes
- Biodiesel plant – New Ross
  - 2008 Start
  - Capacity 30,000 tonnes



Biodiesel/PPO

- Pure Plant Oil
  - Established industry
  - 5 crushing plants
  - Current capacity ~10,000tonnes
  - *Possible expansion to 25,000tonnes*
- Biodiesel plant – New Ross
  - 2008 Start
  - Capacity 30,000 tonnes
  - *Possibly expansion to 50,000 tonnes*



Bioethanol

- Not currently produced from agricultural crops in Ireland
- Four proposals granted excise relief under MOTR II
- Cost of minimum viable plant ~€100m
- Minimum viable plant 100million litres
- First generation bioethanol plant could serve as a basis for a 2nd generation ligo-cellulosic plant

Biofuels GHG Mitigation

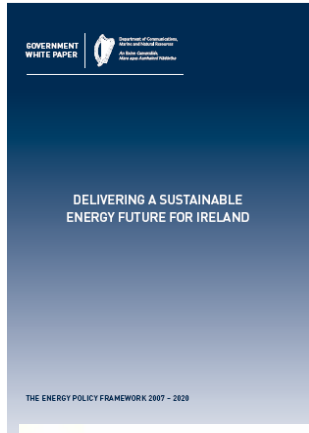
- Possible Production of Biofuels
  - 29 million litres of PPO (0.9 PJ)
  - 57 million litres Biodiesel (1.9 PJ)
  - 100 million litres of Bioethanol (2.1 PJ)
- Resultant savings in transport sector minus emissions from production/distribution
- **Up to 270,000 t CO_2 eq**
- GHG savings at present 87,000 t CO_2 eq

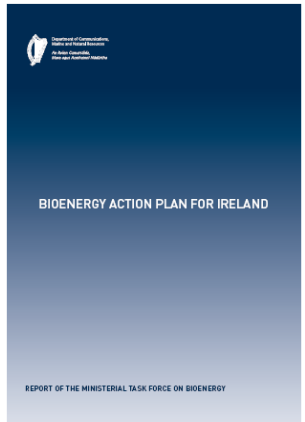
Biofuels Summary

- Expansion of existing first generation production would lead to possible CO_2 savings of 0.27 MT
- Significantly greater production and GHG mitigation potential from 2nd generation Biofuels
- Research Needs
  - Improved sustainability for first generation biofuels
  - Upscaling of research into 2nd generation biofuels t

Heat and Electricity

- **Government Targets**
- 33% of Renewable Electricity by 2020
  - 30% Biomass Co-firing in Peat burning power stations
  - Promotion of biomass fuelled CHP
- 5% of renewable heat by 2010
- 10% of renewable heat by 2020



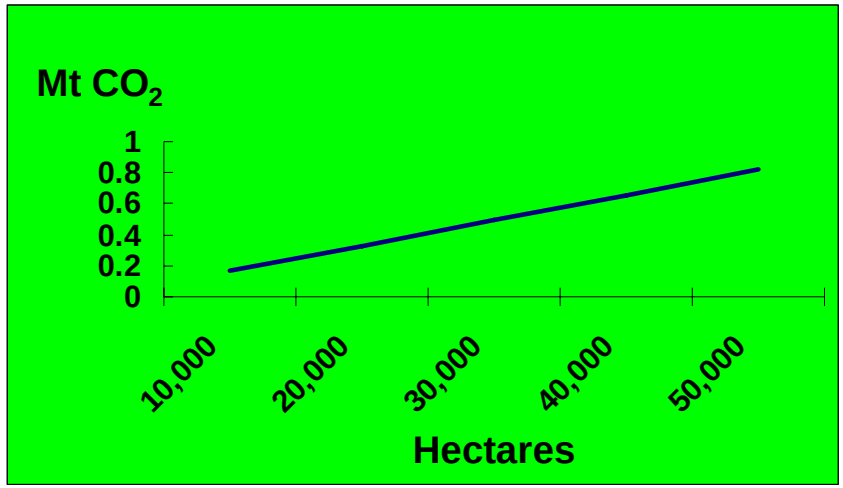


Energy Crops

- Principal Candidates
  - Miscanthus
  - Short Rotation Coppice
  - Switchgrass
  - Reed Canary Grass
- New Crops!
  - Much to learn
  - How best to farm?
  - How best to use the energy?

Electricity from Energy Crops

- **30% Co-firing Target**
  - Replacement of ~0.91 million tonnes of peat
- **Mitigation potential**
  - Dependent on total acreage of energy crops grown
  - Percentage of total energy crops co-fired
  - 30% co-firing - all energy crops would save **0.83MT** in the ET sector



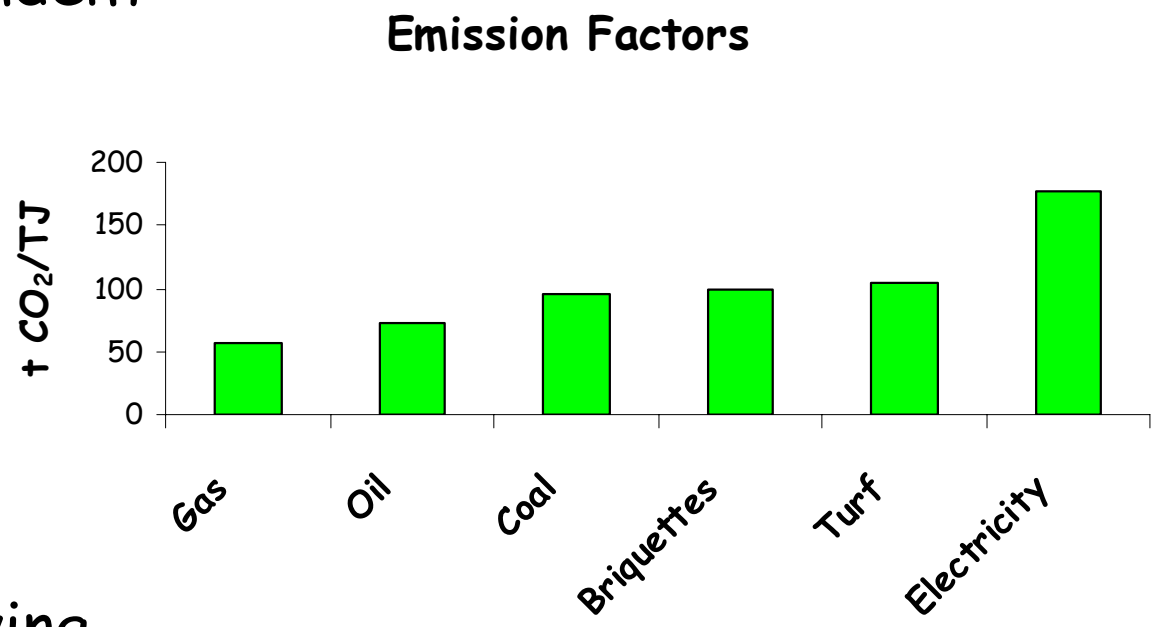
Heat from Energy Crops

- SRC willow most likely candidate
- Commercial Heat – most likely market
- 12% Heat Target 27 PJ
- Energy crops contribution??

  up to 15PJ (109,000ha)

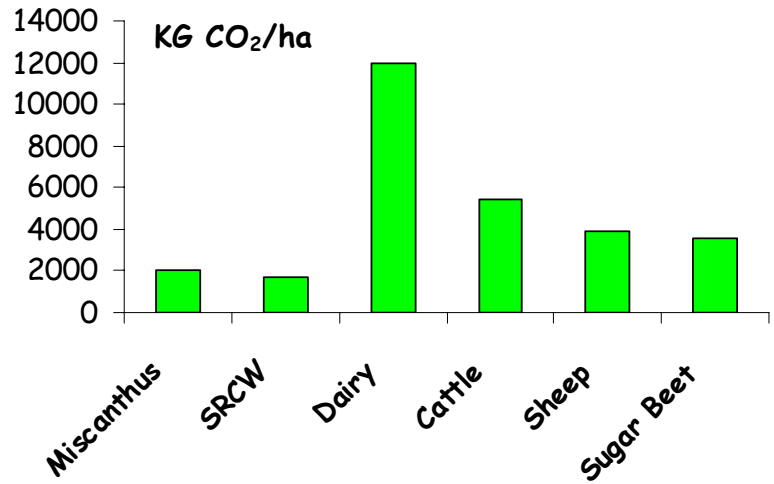
Heat GHG savings

- GHG savings dependent on what fuels are replaced
- Replacing 12PJ
  4PJ Kerosene
  4PJ Gas
  4PJ Electric heat
- Resultant GHG saving 1.7 MT CO_2



Agriculture GHG Savings?

- Energy Crops – absence of animal emissions, low fertilizer/pesticide inputs
- Favourable GHG balance compared to other activities
- Impact on agricultural inventory depends on whether animal numbers or fertilizer use is diminished at a national level



Styles & Jones (2008). EPA report

Soil Carbon

- Initial loss of carbon from conversion of grasslands to energy crops before soil C builds up again
- Increase in C – sequestration in tillage soils converted to energy crops
  - Miscanthus 1 t C ha^{-1} $annum^{-1}$
  - SRC ~ 0.6 t C ha^{-1} $annum^{-1}$

How Much will be grown?

- Adoption of Energy Crops
  - Economic Factors
  - Social Factors
    - Current Farming System
    - Education Level
    - Successor?
  - Existence of Supply Chains

Energy Crops Conclusions

- Significant Potential for GHG mitigation from energy crops
- Relatively new crops. Research needed to
  - Optimise the agronomy of these species
  - How best to farm these species
  - Maximise energy & GHG benefit

Summary

- Potential GHG Mitigation from Crops
- Biofuels 270,000 t CO_2
- Electricity 830,000 t CO_2
- Heat 1,700,000 t CO_2
- C sequestration 50,000 t CO_2
- **Total 2.85 MT CO_2**

Relevant Questions

- How best to use this potential to complement other measures?
- What policies promote best use of this potential?
- How to minimise any effect on other agricultural sectors –feed price
- How to maximise benefit to farmers

Thank You