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cuts carbon

CAFRE Commitment

- To provide training in energy efficiency.
- To develop and demonstrate renewable energy technologies for the agricultural industry.
- To work in partnership with the industry – Carbon Trust, Action Renewables, UFU, NNFCC & others
- To implement energy efficiency and renewable energy technologies within the CAFRE estate.

Targets 2009-2012

Industry Focus

- 2000 people trained through the Renewables Training Programme (includes energy efficiency)
- 500 farm business benchmarking energy use.
- 1000 people attending Knowledge and Technology Transfer events

Targets 2009-2012

College Estate Focus

- 30% reduction in electricity and oil consumption from 04/07 av within the CAFRE Estate
- 25% of CAFRE's energy consumption from renewable sources
- Establish a baseline for estate GHG emissions and reduce by 10% by 2012
- Obtain C Trust Standard during 2009/10 which commits the college to CO_2 reduction of 2.5% per annum
- Continue to develop technology projects which have the potential to meet CAFRE's renewable energy commitment and be adopted within rural communities in Northern Ireland

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CARBON
TRUST
STANDARD

REDUCING CO2
YEAR ON YEAR

Current position on energy usage

Energy efficiency measures

Renewable Energy Technology

Technology Projects

- Energy Efficiency audits - benchmark
- Wind Turbines
- Biomass Heating
- Renewable Crop Rotation
- Solar Power for Dairy Water Heating
- Biofuel for farm machinery
- Carbon Footprinting
- Heat Pumps – Air & Geothermal
- Anaerobic Digestion
- District Heating

Energy Efficiency

- Project partners – Carbon Trust & Farm Energy Centre
- Energy audit of N Ireland agriculture
- On farm audits in dairy sector
- Energy Efficiency Training courses
- Benchmarking

CAFRE/Carbon Trust Report

- Over £50M spent on energy in primary production (excl Beef & Sheep)
- £37.5M on electricity, £16.9M on oil
- Identified 15-20% of potential savings
- Spend to Save - £17M for £5.7M saving/yr
- Potential savings of 34,500 t CO_2/annum

On Farm Energy Audit

On Farm Energy Audit

CAFRE / Carbon Trust Report

Sector	Typical Energy use (kWh)	Best Practice energy use (kWh)	Potential Saving (£)
Cereals (per tonne)	338	218	13
Potatoes (per tonne)	194	130	7
Pigs (per pig)	36	16	2
Poultry meat (per 100kg)	66	29	4
Poultry eggs (per case)	4.8	3.0	0.2
Dairy (per cow)	1550	1210	37
Mushrooms (per tonne)	3945	2821	124
Horticulture (per metre^2)	317	170	16
Apples (per tonne)	102	61	5

Farm Energy Centre 2006

Energy Efficiency on Farm

- Better use of Nightsaver tariff
  - Eg double boiler size
- Use of plate coolers
- Time clocks correctly set
- Energy efficient lights (grants currently available)
- Vacuum on demand pumps (larger units)
- Insulation of hot water pipes and tanks
- Attend Energy Efficiency Training course

Energy Efficiency on Farm

- Over 350 farmers trained during 2008/09
- Training has resulted in annual energy savings of approx £160/dairy business.
- Reduction in CO_2 emissions of 200 tonnes
- Farmers who attend training are offered the opportunity to benchmark their energy usage.

Energy Benchmarking

Pilot Scheme to energy benchmark 100 dairy farms in 2008/09

	kWh/cow	£/cow
Lowest	118	15
Highest	466	58
Average	296	37

Solar for Dairy Washing

- Farm Development Centre
  - 21.5 m^2 evacuated tubes
  - 50% of annual hot water needs
  - Saves ~£1600 per year plus 6.2 t CO_2
  - Payback period projected at 10-12 years.

Biomass Boilers

- Horticulture Development Centre Sustainable Energy Unit
  - 320 kW Biomass boiler
  - 20m^2 Flat plate Solar panels
  - Saves ~£20000 /year plus 200 t CO_2
  - Fuelled by willow chip
  - Payback period projected at 7-8 years

Biomass Boilers

- Loughry Campus
  - 150kW Froling boiler
  - Designed for woodchip
  - Saves ~£10,000 per year
  - Payback ~6 years (without grant)
  - 20-25% of heat for campus buildings
  - Reduction of ~150 t CO_2

Biomass Boilers

- Farm Courtyard
  - 80 kW woodpellet KWB boiler
  - Fuelled by Balcas pellets

Wind Turbines

- Horticulture Development Centre
  - 5kW Iskra turbine
  - Designed for light winds
  - Low cut-in speed
- Loughry Campus
  - 15kW Proven turbine
  - 24/7 demand for refrigeration units
  - Suitable for av wind speed

Wind Turbine – Loughry

Sources of the 3 GHG's

Carbon dioxide	Fossil fuels
Methane	Enteric fermentation and manure storage
Nitrous oxide	Grazing livestock Manure management N fertiliser

GWP due to animal production

Expressed in tonnes CO_2 per tonne of product

Note: Carbon dioxide equivalent **(CO_{2e})**

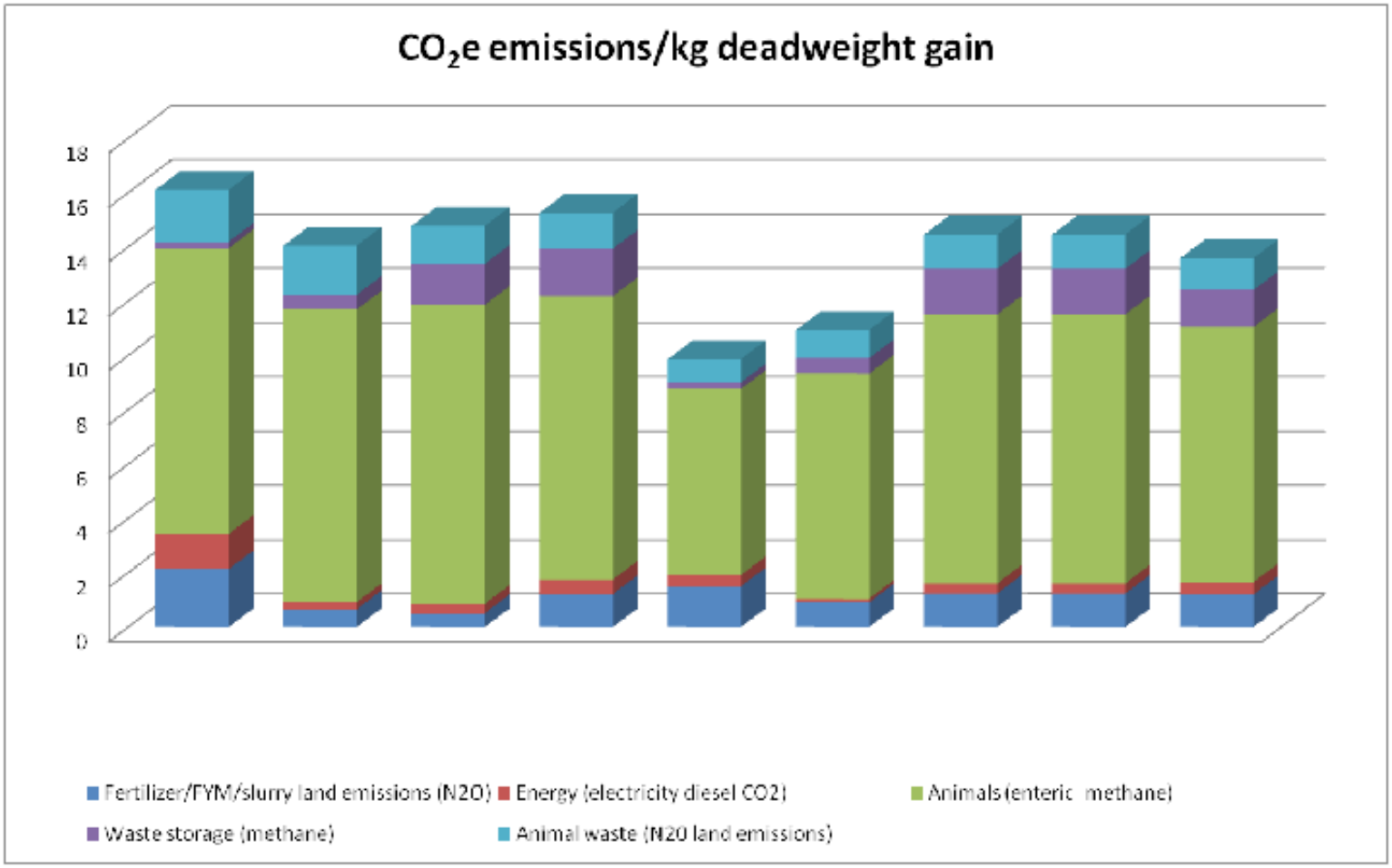
Sheep meat	17
Beef	16
Milk	10.6
Pork	6.4
Poultry meat	4.6

Cranfield DEFRA Report

Carbon footprint of beef production

- A CAFRE project to study energy use on 20 beef farms in June/July 2009
- The data was used to calculate GHG emissions
- Emissions ranged from 13 to 24 kg CO_{2e} per kg carcase beef

Contributions to the footprint



Contribution to the Carbon Footprint

- Tractor fuel 4%
- Total methane 70%
- Nitrous oxide 26%

Carbon Calculators ($kgCO_{2e}$/kg carcase)

Farm No.	Measurement System		
	FEC	CALM	CAFRE
1	14	24	H
2	16	19	H
3	15	18	H
4	13	14	M
5	14	13	L

How to reduce the footprint

- Energy efficiency

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- Energy efficiency
- Good daily live-weight gain

Daily Liveweight Gain

How to reduce the footprint

- Energy efficiency
- Good daily live-weight gain
- Good productivity – fertility, genetics, disease control

How to reduce the footprint

- Energy efficiency
- Good daily live-weight gain
- Good productivity – fertility, disease control
- Reduce Nitrogen fertiliser use

How to reduce the footprint

- Reduce Nitrogen fertiliser use
- Allow 3 days between spreading slurry and applying N
- Avoid fertiliser spreading in wet conditions


Taking steps to reduce carbon footprint of beef production

How to reduce the footprint

- Energy efficiency
- Good daily live-weight gain
- Good productivity – fertility, disease control
- Reduce Nitrogen fertiliser use
- Clover swards

Overseeding with Clover

How to reduce the footprint

- Energy efficiency
- Good daily live-weight gain
- Good productivity – fertility, disease control
- Clover swards
- Reduce Nitrogen fertiliser use
- Manure management

Use of Trailing Shoe

How to reduce the footprint

- Energy efficiency
- Good daily live-weight gain
- Good productivity – fertility, disease control
- Clover swards
- Reduce Nitrogen fertiliser use
- Manure management
- Carbon sequestration


SUBSTRATE DRYING
CONTROL ROOM
FEED HOPPER
GASOMETER
FERMENTERS
STIRRERS
CHP UNIT
END STORE
GRAIN DRYER
DRYING FLOOR
BIO G

Renewables Training Programme

- Energy Efficiency
  - Dairy farmers
  - Mushroom Growers
  - Pig farmers
  - Arable Farmers
- SRC Willow Management
  - Planting and agronomy
  - Planting mixtures, pest and disease control
  - Harvesting
  - Post Harvest Management
  - Bioremediation

Renewables Training Programme

- Introduction to Renewables
  - Climate Change and its effects – Energy Efficiency
  - Wind turbines and Mini-hydro
  - Heat from Biomass
  - Solar thermal and photovoltaic
  - Heat pumps – air & ground source
  - Anaerobic Digestion

Summary

1. Identify your current position on energy usage
2. Utilise all economic energy efficiency measures
3. Use renewable energy technology where appropriate
4. Enhance production efficiency
5. Grasp as a positive opportunity