



Carbon Footprint - Girtridge




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Sources of GHG's



| Greenhouse gas (GHG) | Where from on the farm? | |
|--|--|--|
| Carbon dioxide CO₂ | Burning fossil fuels. Use of oil, diesel and electricity on farm. Can make up around 10% of the farms emissions. Lifetime in atmosphere; 20 to 200 years. |  |
| Methane CH₄ | Natural bi-product of enteric fermentation. Can make up around 40% of emissions depending on farm type. Methane is 25 times more potent than CO ₂ . Approx. 12 yrs in atmosphere. |  |
| Nitrous oxide N₂O | Soils naturally produce nitrous oxide but levels can be increased by cultivation and N fertiliser. Can make up around 50%+ emissions depending on farm activities. Nitrous oxide is 289 times more potent than CO ₂ . Approx. 115 yrs in atmosphere. |  |

What is a Farm Carbon Footprint?



- Estimate of carbon emissions i.e. greenhouse gases (GHG) produced from:
 - Whole farm
 - Enterprise
 - Product

- GHG emissions calculated include:
 - Carbon dioxide (CO₂)
 - Methane (CH₄)
 - Nitrous oxide (N₂O)

How are GHG emissions calculated?



- Farm specific information about the land, crops, livestock, energy and waste converted into CO₂, CH₄ and N₂O
- Emissions from CO₂, CH₄ and N₂O are converted to carbon dioxide equivalents (CO₂e) and are expressed per unit of saleable product i.e.
 - Beef , sheep, pigs, broilers - kg CO₂e / kg dwt
 - Crops - kg CO₂e / kg grain, etc
- Whole process is commonly known as carbon footprinting or carbon auditing

Measure of efficiency



- Results can be benchmarked; highlights areas where emissions are higher, hence improvements can potentially be made, improving efficiency

| Quick glance enterprise emissions | | | |
|--|--------------------------------|-------------------|--------------|
| | * kg CO ₂ e/ kg dwt | Opportunity Level | Comparison |
| Enteric fermentation | 19.74 | Low | 19.76 |
| Manure management | 7.63 | Medium | 7.61 |
| Fertiliser | 5.02 | Medium | 3.15 |
| Purchased feed | 1.38 | Medium | 1.30 |
| Purchased bedding | 1.04 | Low | 1.51 |
| Fuel | 0.78 | Low | 1.07 |
| Electricity | 0.06 | Low | 0.20 |
| Other | 1.45 | Low | 1.62 |
| Total emissions ** | 37.10 | Medium | 36.22 |
| <i>Other: crop residues, lime, transport and waste</i> | | | |

Example Beef AgRE report



Sector: Beef
 Enterprise type: Spring calving upland suckler cows
 System: Breeder/finisher
 Group:
 Producer:
 Farm: App beef farm

Region: Perth and Kinross
 Year calc relates: End Jun 2016
 Reporting date: 12th Sep 2016
 Report reference: Spring calving upland Compared to: Beef Enterprises (system specific)
 2012 to 2016 (16) reports

Quick glance enterprise emissions

| | * kg CO ₂ e/ kg dwt | Opportunity Level | Comparison |
|---------------------------|--------------------------------|-------------------|--------------|
| Enteric fermentation | 19.74 | Low | 19.76 |
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Other: crop residues, lime, transport and waste

Physical performance of enterprise

| | Value | Comparison |
|----------------------------------|-------|------------|
| Area of land utilised (ha) | 127 | 356 |
| Female breeding stock (no) | 146 | 136 |
| Heifer sale weight (kg lwt/head) | 361 | 446 |
| Steer sale weight (kg lwt/head) | 381 | 492 |
| Young bulls sale weight (kg lwt) | - | 132 |
| Purchased feed use (kg/cow) | 1,055 | 2,292 |
| Homegrown fodder use (kg/cow) | 7,336 | 8,668 |
| Live weight gain (kg/day) | 0.94 | 0.90 |
| Mortality (%) | 2 | 4 |
| Calving percentage (%) | 90 | 91 |
| Cow cull rate (%) | 18 | 11 |

Whole farm sustainability indicators

| | | | | | |
|---------------|--------|-------|-----------------------|------|--------------------|
| Nitrogen Use | 85.65 | kg/ha | Water use | - | litres |
| Phosphate Use | 18.93 | kg/ha | Stocking density | 1.43 | LU/ha |
| Potash Use | 18.93 | kg/ha | Sequestration | - | tCO ₂ e |
| Waste | 250.00 | kg | Renewable energy used | - | kWh |

Emissions by gas and benchmark comparison

CO₂: 7.47 kg CO₂e/unit output
 CH₄: 21.02 kg CO₂e/unit output
 N₂O: 8.60 kg CO₂e/unit output



* Your carbon footprint is expressed in units of CO₂ equivalents (CO₂e) per unit of output e.g. kg CO₂e per kg dwt of cold carcase. This allows the efficiency of the enterprise to be compared. The main greenhouse gases emitted by agriculture are CH₄ = Methane (Predominantly from animal digestion); N₂O = Nitrous oxide (Predominantly from manure and fertiliser); CO₂ = Carbon dioxide (Predominantly from burning of fossil fuels).

** Total emissions may differ due to rounding. Emissions may be skewed on a year to year basis due to timing of sales therefore results are best monitored over a three year (minimum) period.

Mitigation 5 key action areas



1. Energy and Fuel use



2. Renewables



3. Locking in Carbon



4. Best use of fertilisers



5. Optimise livestock productivity



Action Areas and measures



- **Energy and fuel use**
 - Monitoring of electricity and fuel use
 - Switching off machines when not in use
 - Planning work to minimise journeys

- Example of savings on a beef farm:
 - A daily 15 min reduction in operation time of tractor and feeder waggon reduced fuel use by 600 litres, saving £450 and 1.9 tonnes of CO₂ per year

- Example of savings on an arable farm:
 - Assuming 105 litres used per ha, 10% reduction in red diesel saved £2,500 and reduced carbon footprint by 2% per kg grain sold

Action Areas and measures cont..



- Renewable Energy
 - Undertake an energy audit to investigate scope for renewable activities (wind, solar, hydro-electric power, AD, ground source heat pumps, biomass)

Action Areas and measures cont..



- Locking carbon into the soil
 - Consider reduced tillage
 - Minimise machinery operations
 - Build soil organic matter
 - Manage existing woodlands and create new ones

Action Areas and measures cont..



- **Best use of fertilisers**
 - Prepare nutrient management plans
 - Analyse soils and manures
 - Target nutrient applications according to time, conditions and amount required
 - Maintain and check calibration of fertilisers and manure spreaders
 - Consider precision farming technologies

- **Example of savings on an arable farm:**
 - Reducing bagged N use by 8%, saved £3,120 and reduced carbon footprint by 11% per kg grain sold

Action areas and measures cont...



- **Optimising productivity**
 - Good livestock and crop husbandry practices
 - Improved health of livestock and crops
 - Reducing soil compaction and improved land drainage

- Example of savings on a beef farm:
 - Silage analysis and sheep rationing reduced purchased pre-lambing concentrates 13.5 tonnes, saving just under £3,000 and 4.84 tonnes of CO₂e

- Example of savings on an arable farm:
 - Increasing yields by 0.4t/ha (5%) increased crop sales and
 - reduced emissions by 6% per kg grain sold

Girtridge Emissions



- Total CO_{2e} emissions from farming
 - 1,064,632 kg CO_{2e} (1064 tonnes)
- Beef
 - 968,775 kg CO_{2e} (968 tonnes)
- Sheep
 - 82,632 kg CO_{2e} (83 tonnes)
- Forage
 - 13,226 kgCO_{2e} (13 tonnes)

AgRE report – Girtridge - Beef



Sector: Beef
 Enterprise type: Finishing of beef bred or continental cross calves
 System: Finisher
 Group:
 Producer:
 Farm: Girtridge

Region: Not specified
 Year calc relates: End May 2017
 Reporting date: 5th Jul 2017
 Report reference: Carbon Audit Girtridge 2017 Compared to: Beef Enterprises (system specific) 2013 to 2017 (5) reports

Quick glance enterprise emissions

| | * kg CO ₂ e/ kg dwt | Opportunity Level | Comparison |
|---------------------------|--------------------------------|-------------------|--------------|
| Enteric fermentation | 14.26 | Medium | 10.60 |
| Manure management | 5.91 | High | 4.18 |
| Fertiliser | 6.70 | Medium | 3.30 |
| Purchased feed | 0.60 | Low | 0.62 |
| Purchased bedding | - | Low | 0.05 |
| Fuel | 1.32 | High | 0.68 |
| Electricity | 0.04 | Low | 0.10 |
| Other | 1.49 | High | 0.46 |
| Total emissions ** | 30.33 | High | 19.99 |

Other: crop residues, lime, transport and waste

Physical performance of enterprise

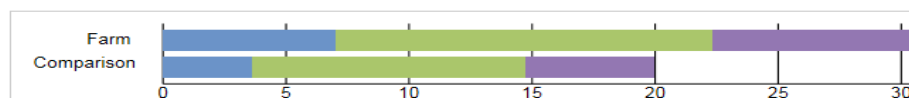
| | Value | Comparison |
|----------------------------------|-------|------------|
| Area of land utilised (ha) | 133 | 76 |
| Female breeding stock (no) | 10 | - |
| Heifer sale weight (kg lwt/head) | 645 | 586 |
| Steer sale weight (kg lwt/head) | 720 | 650 |
| Young bulls sale weight (kg lwt) | - | - |
| Purchased feed use (kg/head) | 162 | 339 |
| Homegrown fodder use (kg/head) | 5,576 | 5,692 |
| Live weight gain (kg/day) | 0.95 | 0.81 |
| Mortality (%) | - | 0 |
| Calving percentage (%) | 88 | - |
| Cow cull rate (%) | - | - |

Whole farm sustainability indicators

| | | | | | |
|---------------|--------|-------|-----------------------|----------|--------------------|
| Nitrogen Use | 108.63 | kg/ha | Water use | 1,012.69 | litres |
| Phosphate Use | 22.12 | kg/ha | Stocking density | 1.19 | LU/ha |
| Potash Use | 39.60 | kg/ha | Sequestration | 4.03 | tCO ₂ e |
| Waste | 160.00 | kg | Renewable energy used | - | kWh |

Emissions by gas and benchmark comparison

■ CO₂ : 7.01 kg CO₂e/unit output
 ■ CH₄ : 15.32 kg CO₂e/unit output
 ■ N₂O : 7.99 kg CO₂e/unit output



AgRE report – Girtridge - Sheep

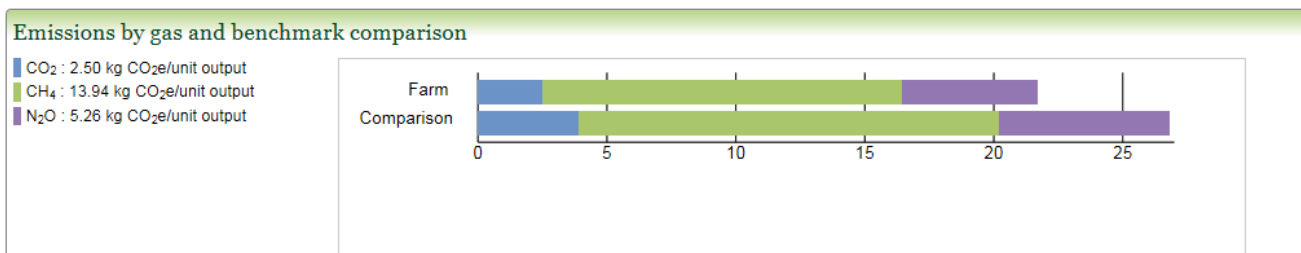


Sector: Sheep
Enterprise type: Crossbred ewe flock
System: Finisher
Group:
Producer:
Farm: Girtridge

Region: Not specified
Year calc relates: End May 2017
Reporting date: 5th Jul 2017
Report reference: Carbon Audit Girtridge 2017 Compared to: Sheep Enterprises (system specific) 2013 to 2017 (11) reports

| Quick glance enterprise emissions | | | | Physical performance of enterprise | | |
|--|--------------------------------|-------------------|--------------|------------------------------------|-------|------------|
| | * kg CO ₂ e/ kg dwt | Opportunity Level | Comparison | | Value | Comparison |
| Enteric fermentation | 13.59 | Low | 15.88 | Area of land utilised (ha) | 10 | 418 |
| Manure management | 4.64 | Low | 5.56 | Female breeding stock (no) | 120 | 440 |
| Fertiliser | 2.11 | Low | 3.08 | Lamb sale weight (kg lwt/head) | 45.00 | 42.89 |
| Purchased feed | 0.17 | Low | 0.80 | Lamb sale weight (kg dwt/head) | 20.25 | 19.46 |
| Purchased bedding | - | Low | 0.11 | Wool sales (kg) | 370 | 1,279 |
| Fuel | 0.95 | Medium | 0.44 | Purchased feed use (kg/ewe) | 10 | 56 |
| Electricity | 0.02 | Low | 0.09 | Homegrown feed use (kg/ewe) | 107 | 376 |
| Other | 0.21 | Low | 0.85 | Mortality (%) | 7 | 4 |
| Total emissions ** | 21.70 | Low | 26.80 | Lambing percentage (%) | 189 | 164 |
| <i>Other: crop residues, lime, transport and waste</i> | | | | Ewe cull rate (%) | 33 | 33 |

| Whole farm sustainability indicators | | | | | |
|--------------------------------------|--------|-------|-----------------------|----------|--------------------|
| Nitrogen Use | 108.63 | kg/ha | Water use | 1,012.69 | litres |
| Phosphate Use | 22.12 | kg/ha | Stocking density | 1.19 | LU/ha |
| Potash Use | 39.60 | kg/ha | Sequestration | 4.03 | tCO ₂ e |
| Waste | 160.00 | kg | Renewable energy used | - | kWh |



Group activity?



- What Actions do you think Girtridge could take to reduce the businesses carbon footprint?

Girtridge - Actions



- Highest opportunities for improvement (Beef)
 - Enteric Fermentation (Medium)
 - Manure Management (High)
 - Fertiliser (Medium)
 - Fuel (High)
 - Other (High)
- Highest opportunities for improvement (Sheep)
 - Fuel (Medium)

Reducing the footprint



- **Enteric fermentation**
- Measured on kg CO_{2e}/kg dwt
 - therefore increase dwt sales
 - Reduce period to slaughter
 - Remove breeding herd or increase output
- **Manure Management**
 - Graze outside for longer

Reducing the footprint



- **Fertiliser**
 - Analyse soils/slurry
 - Make best use of home produced manures and slurries
 - Apply slurries/manures when crop is growing
 - Consider application method /weather conditions
 - Apply to crop requirements
 - Consider adding legumes (clover) to grassland
 - Keep Soil pH optimum
- **Fuel**
 - Consider min till
 - Reduce unnecessary journeys
 - Record fuel usage/Switch off machines

Reducing the footprint



- Other
 - Move to rotational grazing (less crop residues)
 - Set Stocked 60% utilisation
 - Rotational grazing 80 % utilisation
 - Reduce external haulage for internal movements
 - Reduce mortality (sheep enterprise)
- Consider sequestration by forestry
- Energy offset (renewables)

Questions?

