# Carbon Audits, energy use and the livestock bedding trial.

Rumbletonrig
Climate Change Focus Farm

Notes from meeting on 30th November 2017

*The eighth meeting of the Climate Change Focus Farm discussion group at Rumbletonrig took a more detailed look at carbon footprinting, energy use and the alternative bedding trial.*

## Carbon footprinting—what can it tell you?

As part of the climate change project, a carbon audit has been completed each year by SAC Consulting's Andy Baird. The highlights so far are;

- Carbon footprint at Rumbletonrig has fallen by 25% between 2015 and 2017 (Table 1)
- Total farm emissions have reduced slightly by 2% between 2015 and 2017
- A significant increase in net farm output is the main factor in lowering the carbon footprint
- Output in 2017 was 131% of that in 2015, mainly due to better grain yields in harvest 2016.

**Table 1. Carbon Footprinting at Rumbletonrig**

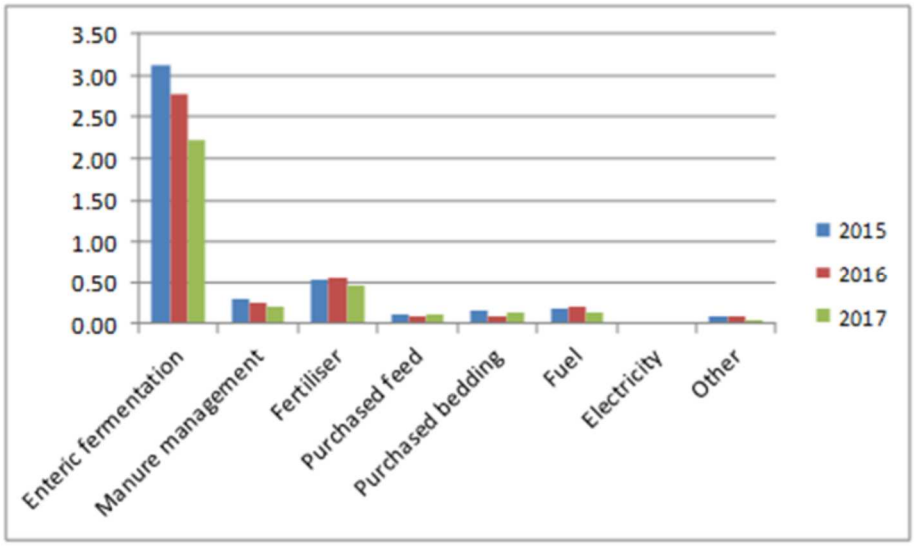
| | May 2017 | May 2016 | May 2015 |
|---|---|---|---|
| **Total farm emissions (kg $CO_2e$)** | 3,443,936 | 3,424,683 | 3,521,107 |
| **Woodland sequestration (kg $CO_2e$)** | 147,342 | 147,342 | 147,342 |
| **Net farm output* (kg)** | 758,007 | 630,264 | 577,695 |
| **Farm carbon footprint, excluding sequestration (kg $CO_2e$ / kg output)** | **4.54** | **5.37** | **6.03** |

The emission of greenhouse gases are generated from a variety of farm activities (Figure 1). Enteric fermentation and fertilisers stand out because of the higher carbon equivalents associated nitrous oxide which is 25 x greater and methane 289 x greater.

Enteric fermentation is a natural biological process in ruminants so a reduction in daily emissions is very limited at grass.

Research at SRUC has shown that some animal feeds do have lower emissions, for example straw based diets and higher fat feeds having lower emissions than silage, but these impacts will be limited to housed cattle.

**Figure 1. Emissions by type of activity at Rumbletonrig**




Focus Farm meetings are free to attend and all farmers are welcome. Find us on Facebook or follow us on Twitter @SACFarm4Climate, or contact farm facilitator Donald Dunbar on 01835 823 322, email donald.dunbar@sac.co.uk for more information.

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We can have an impact on enteric fermentation per kg of output by improving herd or flock productivity and efficiency by;

- Improved herd fertility and reduced calf mortality
- Faster weight gains from
  - ◊ improved genetics,
  - ◊ grazing management
  - ◊ winter rations resulting in faster growth rates and earlier slaughter reducing lifetime emissions
  - ◊ calving replacements at 2 years of age rather than 3 years

There are a number of actions that can be managed at farm level to reduce emissions and save cost, these can be grouped under five key areas:

- Using energy and fuels efficiently
- Developing renewable energy
- Locking carbon into the soil and vegetation
- Optimising the application of fertiliser and manures
- Optimising livestock management and storage of waste

# Energy Audit - save on fuel bills and cut carbon

An energy audit was completed earlier in the year by SAC Consulting Jim Campbell who presented the findings (Table 2) and identified area where potential saving could be made (Table 3).

**Table 2. Results from Energy audit.**

| | Estimated Demand | Rumbletonrig Actual Usage | Actual as % of Estimate |
|---|---|---|---|
| Electric | 28700 | 16245 | 57 |
| Red Diesel | 24600 | 33666 | 137 |
| White Diesel | - | 3610 | |
| Kerosene | 6100 | 10780 | 176 |
| Petrol | - | 240 | |

- Recorded electricity use at the farm is lower than expected and is in part due to moist grain storage.
- Diesel usage is higher than expected which can partly be accounted for by the off farm work undertaken and use of tractors to transport straw over a relatively long distance.

**Table 3. Potential savings**

| Measures | Estimated Cost (£) | Payback period excl any grant funding* |
|---|---|---|
| Initiate more detailed electricity and fuel usage recording and analysis of data | 0 | Immediate |
| Consider yield mapping and variable rate spreading to save on inputs | £8,000 to £10,000 | 6 years |

** Estimated demand for kerosene is based on 400 tonne of grain being dried from around 20% mc. Actual usage will be very dependant on the season*

# How else could fuel use be reduced?

**Electricity Meters** - More detailed electricity usage records would allow high usage tasks to be identified and monitored. Smart meters allow usage information to be interrogated online (half-hourly). Alternatively regular manual meter reading would also build a picture and identify trends and energy intensive operations and areas for further investigation.

**Fuel records** - Recording fuel usage against specific tasks and equipment can provide useful data which can be used to inform decisions on equipment purchase and management methods. The more information the better and as a minimum a record of the vehicle filled, date, amount and current tasks will soon build up a picture of where and when fuel is being used and allow comparison between seasons, vehicles, drivers etc.

**Yield mapping** - For cereal and forage crops, this can provide evidence to support decisions on distribution of fertilisers, pesticides and seed rates. Savings on inputs can be complimented by fuel savings where data justifies a change in cultivation techniques or reduced passes through the crop. Further adoption of this technology provides considerable scope to build up a robust data set over time. Costs for yield monitoring equipment vary depending on new or a retro fit to an existing machine. A sum of £2,000 is realistic for an initial estimate. Variable spreading equipment costs are typically £8,000 to £10,000 with savings varying greatly, but a £14 to £15 per hectare reduction in fertiliser costs has typically been shown.

**Road Haulage of Straw** - Road transport by agricultural tractor over long distances is not particularly efficient and where large quantities require to moved it is more fuel efficient to use HGVs designed for road use. The transport of 700 to 800 bales over 20 miles from tractor/trailer to HGV has the potential to save around 300 litres of diesel. Financial savings however may be minimal when other costs are considered. John has increased the farms slatted accommodation this year to limit straw requirement and alternative bedding products could also have a role.

**Renewable Energy Options** – The farmhouse has a wood pellet boiler providing water and space heating. Further renewable energy investments could be used at a small scale to provide power to the farm such as anerobic digestion (AD), hydro, wind turbine or solar photovoltaic (PV) panels. The viability of farm scale renewables is enhanced were imported energy is offset, however Rumbletonrig does not have such daily demand to make the considerable investment attractive. In addition the incentives available have been reduced. Anerobic digestion has therefore not been considered and there is no suitable hydro resource on the farm.

Wind energy is theoretically possible, as the site has moderate wind speed, however visual impact of wind would cause planning hurdles and more importantly the electrical network in the area is constrained therefore consent to export energy will be limited.

Solar photovoltaic (PV) panels can be mounted on shed roofs or on the ground. A 50 kWp array could be installed to provide electricity to the farm with any surplus being exported. The roof pitches all face either east or west so ground mounted panels facing due south would provide a yield benefit.

# Bedding Cattle on Wood Fines

Following the poor harvest weather, cattle farmers across the country are being affected by the availability of straw for bedding livestock. With the price for a tonne of delivered straw now approaching £140/tonne it is little surprise that farmers are looking for alternatives.

John has agreed to try a court of wood fines which are made from recycled mixed wood destined for burning in biomass plants. Once chipped the wood is passed over a grader to remove the smaller wood fines portion that are unsuitable for burning.
Discussion identified a number of methods to bed with wood fines which included:

- Fill court with even 10cm layer of wood fines and topped up every 7 – 10 days.
- Deep fill the court 30 - 60cm. Farmers who use this method recommend forming a slope across the court towards ground level at the feed barrier. The area next to the feed barrier becomes more heavily soiled and is periodically removed to a midden by forklift bucket. The movement of cattle up and down the slope brings fresh material to the floor level.

For both systems periodic shallow raking with a forklift muck grape or tractor mounded grubber. The deep bedding option is more suited to farmers unable to maintain a store of wood fines for topping up.

When sourcing recycled wood fines it is important to confirm the grader is fitted with an electro magnet to remove metal from nails, screws and fittings. Also establish if the processed wood has any coatings such as paper, paint or those applied to worktops.

As the wood is a recycled material farmers may require a Paragraph 15 Exemption from SEPA to allow the material to be spread to land. If the wood is untreated (free from paint and coatings) no exemption is required. Spreading rates should kept below 10t/ha as the high wood content (carbon) can deprive following crops of available nitrogen.

Further information on alternative bedding materials are contained in The Bedding Materials Directory which can be found at www.beefandlamb.ahdb.org.uk

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