Farming for a Better Climate

Improving carbon efficiencies at Castlemains - key focus farm findings.

Castlemains Farm is owned and run by Bob, Kathryn, Craig and Euan Simpson in the village of Dirleton, near North Berwick in East Lothian.

The farm covers 235ha, growing winter wheat, winter barley, spring barley and oilseed rape with 4ha of permanent pasture. Previously, Bob grew his own potatoes but as machinery and labour costs increased, the family decided to change to a contractor grower. Various contractors on the farm now grow potatoes, Brussel sprouts and vining peas.

As well as working as an agronomist, Craig is heavily involved with the decision making and running of the farm. Bob and Craig volunteered as a Climate Change Focus Farm to explore practical and low cost measures that could benefit the business and reduce the farm carbon footprint.

Fuel savings from min-till

With soil organic matter levels in mind, Bob has moved away from conventional methods of establishing oilseed rape (OSR) by ploughing, to one pass power harrow sowing and rolling.

For the 2018 harvest, Bob purchased a rape sowing kit to fit on his Kverneland sub soiler cultivator tool. During the project, Bob trialled different minimum tillage machines when establishing OSR. The Kverneland machine, with subsoiler tines and a section of discs followed by a packer roller, went straight into the stubble. Half of the field was sown with the 3m conventional drill after the subsoiler.

Table 1 outlines the fuel savings per hectare through a change in practice. Over 18.44ha of winter oilseed rape sown in 2017, this equated to 345 litres or £189 with red diesel at 55ppl and a saving of 921 kg CO_2e.

Table 1: Comparison of fuel use between conventional and minimum tillage techniques at Castlemains

	Fuel use - Conventional (l/ha)	Fuel use - Min Till (l/ha)
Plough	29.75	-
Powerharrow/sow	18.9	-
Sub soiler drill	-	21
Roll	2.88	2.88
Fuel used per ha (litres)	**51.53**	**23.88**

Case Study

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- Energy and fuel use
- Renewable energy
- Lock carbon into soils and vegetation
- Optimise the application of fertilisers and manures
- Optimise livestock management and the storage of manure and slurry

For more information, visit our webpages at Farmingforabetterclimate.org or find us on Facebook and follow us on Twitter @SACFarm4Climate

Farming for a Better Climate is funded by the Scottish Government

Websites

www.farmingforabetterclimate.org
www.soilassociation.org
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Key focus farm findings - Castlemains

Tyre selection and management to improve soil health & fuel efficiency

One of the discussion group meetings highlighted the damage incorrect tyre pressures or wrong tyre choice can have on farm soils. A flotation tyre, designed to run at much lower pressures but still be suitable for road work, was fitted to one side of a laden trailer and compared to a super single tyre fitted on the other (photo right). Using an area of stubble ground, the flotation tyre was inflated to 24psi, the super single road tyre was inflated to 70psi, with the unwheeled soil between the tyre tracks used for comparison. Using a penotrologger, the soil run over by the super single required almost twice the force at 30cm to penetrate the soil compared with the soil run over by the flotation tyre (Figure 1). Rutting caused by the super single was also visible on the stubble ground, and caused considerable damage on a wetter area of fallow ground.

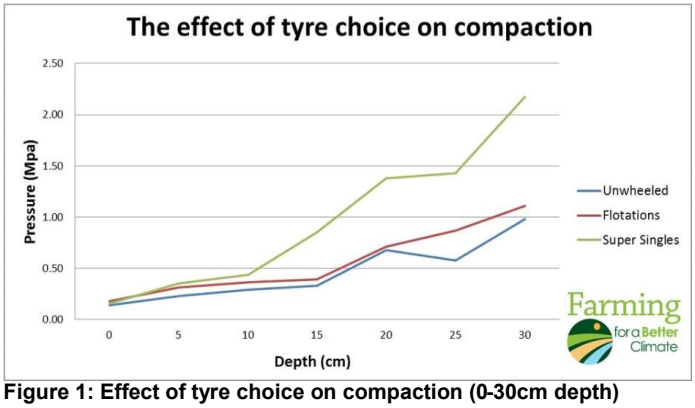

Figure 1: Effect of tyre choice on compaction (0-30cm depth)

Whilst this is an extreme example of how tyre choice and inflation pressures can cause soil compaction, it showed the importance of understanding the implications of tyre choice for trailers and tractors based on size, power and working implements. Correct tyre choice could lead to savings in fuel, with less wheel slippage as power is converted to traction more effectively, less compaction which requires less fuel to rectify, and better soil structure and condition. All of these factors can reduce the farm carbon footprint and increase efficiency.

Using organic matter to improve soils and nutrient management

Soil organic matter (OM) status ranged from 4.9% to 5.5%. To build Castlemains soil OM, Bob was applying mushroom compost. Quantities applied were matched to crop nutrient needs, based on soil analysis. For his spring barley the application rate for mushroom compost, based on the soil analysis result was 100kg P/ha and 83kg K/ha. The mushroom compost met the P & K requirements for the spring barley and saved the equivalent of £3,203 in bagged fertiliser applications for this crop. In addition to using the mushroom compost, Bob now also applies hen-pen (poultry manure) on winter OSR. Pre sowing, hen-pen is applied at 11t/ha which covers the P & K requirements for the crop. Even with good nutrient management already in place, Bob still had scope to further tweak fertiliser applications to maximise nutrient use efficiency at Castlemains. Bob used PLANET Scotland, a free to download and use nutrient management software available at www.planet4farmers.co.uk.

Key carbon findings

- Overall, total emission at Castlemains fell by 26% during the project. Bob saved over £14,000 with no loss of production as a result of low or no cost practical measures around fertiliser and fuel use.
- The measure of on-farm greenhouse gas emissions in relation to saleable product, also referred to as 'emission intensity' increased by 5% from 0.306 CO_2e to 0.322 CO_2e per kg of saleable output. This was a refection of the loss in sales from the potato crop, as Bob stopped growing potatoes after Year 1.
- Bob saved 12,120 litres of fuel (giving a carbon saving of 32,385kg CO_2) as a result of no longer growing potatoes, adopting min till operations, the new dryer and crop conditions as a result of the weather. Savings on fuel were around £6,600 based on red diesel prices at £0.55 per litre.
- For practical ways to reduce your farm carbon footprint,visit www.farmingforabetterclimate.org