

North Talisker Sheep Stock Club Carbon Audit Report BRN: 122362

**For the year ending
September 2019**

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Introduction to resource efficiency

Reducing Greenhouse Gas (GHG) emissions from agriculture is essential for Scotland to meet its carbon reduction commitments and to improve farm efficiency and profitability. Before any improvements can be made it is necessary to establish a baseline of farm performance and resource use efficiency.

The amount of GHG emissions produced on farm in a year can be determined using a carbon calculator. This measure of emissions is known as a carbon footprint (i.e. kg CO₂e per kg output), also referred to as a carbon audit or resource use efficiency audit.

The three main greenhouse gases produced from agriculture include:

- Carbon dioxide (CO₂), produced by burning fossil fuels such as coal, oil and diesel to produce energy and disposal of waste plastic and carcasses.
- Methane (CH₄), produced as a natural by-product of animal digestion and from organic manure.
- Nitrous oxide (N₂O) which is released during the application of inorganic and organic fertiliser to the soil, from urine deposition by grazing animals, cultivations of soils and changes in land use and vegetation.

AgRE Calc©, SAC Consulting's Agricultural Resource Efficiency Calculator, has been used to estimate the type, source and extent of GHG emissions produced from a farm and its enterprises. It calculates emissions from the above sources to the farm gate, including emissions associated with purchased inputs. Any emissions that arise after outputs have left the farm are not included. AgRE Calc© also calculates the amount of carbon sequestered by woodlands.

Calculated emissions are displayed in terms of CO₂e (CO₂ equivalents) as an emissions intensity i.e. CO₂e per unit of output. Presenting emissions in this way allows comparisons to be made with other farms or enterprises and allows farm production to be taken into account.

Farms with a low carbon footprint are generally the most efficient. AgRE Calc© benchmarks carbon footprint results against similar enterprises; this process highlights areas where improvements could potentially be made helping to reduce emissions and improve efficiency of the farm business.

Introduction to the farm business

This carbon audit report has been prepared for North Talisker Sheep Stock Club, located in the west of the Isle of Skye. There are 63 shares in the club, with 58 shareholders. A committee of 8 manages the club. There has recently been a change in the committee and management and they are keen to review the efficiency of the business. To this end, an Integrated Land Management Plan has been applied for, alongside this carbon audit. The business manages approximately 1,300ha of ground, with the vast majority consisting of rough grazings, with a few improved or semi-improved hill parks. There is a woodland area of approximately 10ha, and they have a successful hydro scheme.

Sheep Flock: The sheep flock consists of 740 NCC ewes and gimmers, all bred pure. All lambs are sold store, and replacements are home bred. Hoggs are away wintered. The majority of the sheep flock are housed at lambing time. The sheep are fed a straw or hay based diet when inside, supplemented with concentrate and blocks.

Carbon footprint results

Total farm emissions and output

North Talisker SSC's carbon footprint for the year ending September 2019 was 43.39kg CO₂e per kg of output, Table 1.

Table 1. Total emissions and the farm carbon footprint

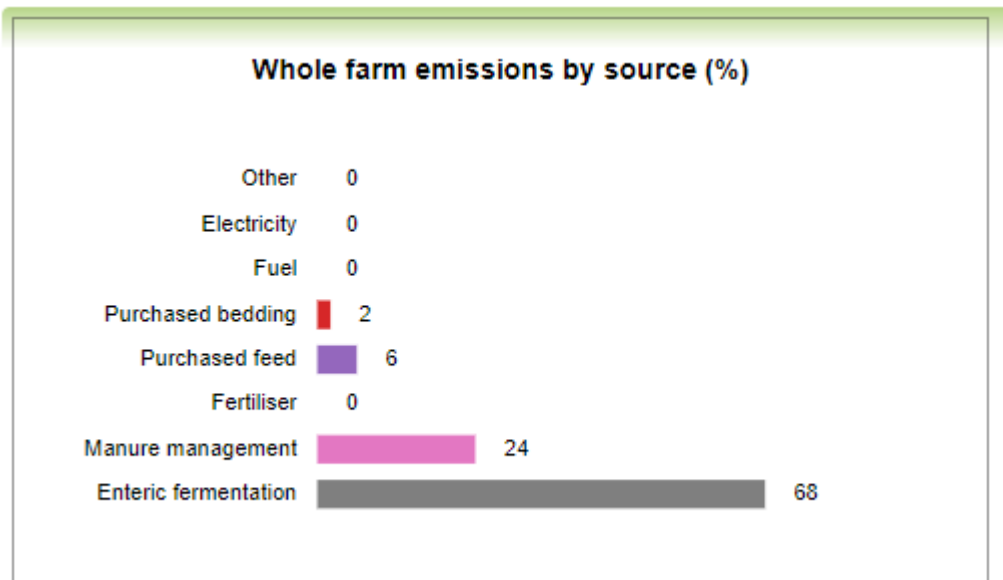
	Year end September 2019
Total farm emissions (kg CO ₂ e)	357,857
Net farm output* (kg)	8,248
Farm carbon footprint, excluding sequestration (kg CO ₂ e / kg output)	43.39
Woodland sequestration (kg CO ₂ e)	109,989

*output: meat - kg dwt CCW

Emissions by activity

Enteric fermentation related emissions accounted for the majority, 68%, of total emissions produced by the SSC. This is typical of an extensive livestock business (Chart 1). Emissions from manure management were the next highest source at 24%, which reflects the lambing period, where the majority of sheep are housed for lambing. Purchased feed makes up 6% of emissions and purchased bedding 2%. No or very low levels of emissions were from electricity, fuel, fertiliser, and others (such as lime and wastes) sources. This reflects the low input nature of the business.

Chart 1. Sources of emissions



For the greatest impact on the farm’s carbon footprint, mitigation actions, where possible should focus on changes in farm management practices that will reduce emissions from sources that generate higher levels of emissions or sources that are higher than benchmarks, see the following section.

Resource use and carbon footprint benchmarking

The carbon footprint results for North Talisker SSC’s enterprises were benchmarked against the average carbon footprint of similar enterprises and the Opportunity Level (High, Medium or Low) of the likelihood for improvement gauged against the similar enterprises calculated. If emissions from the enterprise are lower than the ‘comparison’, the opportunity level will show as ‘**Low**’. If emissions for the enterprise are up to and including 25% higher than the average, the opportunity level will be ‘**Medium**’, and where emissions are more than 25% higher the opportunity level will be ‘**High**’.

The carbon footprint of the sheep enterprise was marginally higher than similar enterprises (Table 2), indicating that there may be some scope for emissions to be reduced.

Table 2. Enterprise carbon footprints and benchmarks

	North Talisker SSC	Average*
Sheep (kg CO ₂ e / kg dwt)	47.51	46.01 (54 reports)

**AgRE Calc© database of farms at time report was prepared*

Emissions from purchased bedding are more than 25% greater than comparative enterprises (Table 3). This is due to the housing period around lambing, which is uncommon for similar enterprises surveyed. Similarly, manure management is higher than comparison businesses, again due to the housing period. Enteric fermentation and purchased feed are also both higher than comparison businesses.

Table 3. Source of emissions and opportunity level for improvement per enterprise

Source	Sheep
Enteric fermentation	Medium
Manure management	Medium
Fertiliser	Low
Purchased feed	Medium
Purchased bedding	High
Fuel	Low
Electricity	Low
Other*	Low

*crop residues, lime, external transport and waste

Performance and farm management practices

Following a further review of the emission results, farm performance and discussions with committee members about farm management practices the following was identified. Key performance indicator comparisons can be found in the AgRE reports included at the end of this report.

Sheep

- The main reason for the slightly higher carbon footprint than comparison businesses is the lower output.
- The low output was driven by the higher than usual barren rate for the business. This was partly due to the changeover in management, leading to less focus on the sheep.
- In addition, the business experiences losses from predation, particularly sea eagles.
- The new committee are keen to explore options to improve the business in the future. The ILMP can be used to examine these issues. Options to be considered can include finishing lambs/hoggs and lambing system (indoor or out).

Fertiliser, grassland and feed

- There has been mixed success with the sheep's current diet, which has primarily been straw based. There is potential in the upcoming ILMP to have an in-depth look at alternative diets, such as draft based diets. Improved nutrition of the ewes will have numerous benefits.
- Due to lambing inside, the business buys more bedding and has higher manure management emissions than comparison businesses. This is another area that would benefit from closer attention at the ILMP, to investigate the positives and negatives of this system.
- There is potential to improve hill parks, through application of lime and fertiliser based on soil analysis.

Electricity, fuel and renewables

- Electricity and fuel use contribute a very small amount to farm emissions. There is limited scope to reduce either of these, primarily due to the extensive nature of the business.
- Small savings could be made by changing lighting over to more energy efficient bulbs.
- The SSC already has a successful hydro scheme, which generates power in excess of that every likely to be used on the SSC. Given the success of the current scheme, consideration should be given to the possibility of another scheme.

Woodland

- Woodland currently sequesters approximately 31% of the total farm emissions, from approximately 10ha of ground. Given the extensive nature of the business, there may be scope for new plantings. This would have carbon sequestration benefits, but well planned plantings can also provide benefits for livestock in the form of shelter.

Mitigation

Mitigation action plan

Suggested actions for North Talisker SSC that have the potential to reduce emissions and save costs are summarised below.

Technical advice should always be sought before making any business changes.

Optimising livestock management and storage of waste - Increasing livestock output and improved handling of manure will help to reduce the carbon footprint. Positive actions will help to reduce emissions for enteric fermentation and manure management.		
Action	Example of benefits	Sources of information
Increase lambing percentage, particularly reducing barren ewes.	An increased number of lambs weaned will increase output from the farm, reducing the farm carbon footprint.	http://beefandlamb.ahdb.org.uk/wp-content/uploads/2018/04/Ewe-fertility-for-better-returns.pdf https://www.teagasc.ie/animals/sheep/nutrition/ https://www.sruc.ac.uk/info/120732/live_lambs/2070/live_lambs_technical_advice
Reduce lamb mortalities	Reducing lamb mortality will increase output from the farm, reducing the farm carbon footprint.	http://beefandlamb.ahdb.org.uk/wp-content/uploads/2015/11/BRP-Reducing-lamb-losses-for-better-returns-manual-14-231115.pdf https://www.farmingforabetterclimate.org/wp-content/uploads/2018/02/improving_ewe_efficiency_2_pre_lambing.pdf
Regularly review the farms animal health plan	Healthy livestock perform more efficient resulting in better profits and a lower carbon footprint.	http://www.qmscotland.co.uk/sites/default/files/health_planning_aug_2015.pdf
Analyse purchased forages and have livestock rations prepared based on these results. Explore the possibility of alternative diets making use of locally available	Knowing how forages have analysed can save money on purchased concentrates.	https://www.fas.scot/article/benefits-analysing-silage-asap/ Local feed suppliers or SAC Consulting at Portree provide silage analysis and ration advice. Diets can be reviewed as part of your ILMP, in addition to exploring the practicalities of using draff.

Optimising livestock management and storage of waste - Increasing livestock output and improved handling of manure will help to reduce the carbon footprint. Positive actions will help to reduce emissions for enteric fermentation and manure management.		
Action	Example of benefits	Sources of information
products, such as draff.		
Review current system, particularly with regard to lambing inside, and the potential to finish lambs.	An increased sale weight will increase output from the farm, reducing the farm carbon footprint.	ILMP already applied for and accepted. These potential changes can be explored further with your chosen advisor.

Optimising the application of fertiliser and manures - More efficient use of fertiliser and manure will have a positive impact on both the carbon footprint and the bottom line of the farm.		
Action	Example of benefits	Sources of information
Analyse soils before any improvement works commence.	Using soil analysis results to inform fertiliser and manure applications will ensure that excess nutrients are not applied.	https://www.farmingforabetterclimate.org/wp-content/uploads/2018/02/Valuing_Your_Soils_PG.pdf

Using energy and fuels efficiently - Fuel and energy efficiency represents win-win opportunities in terms of decreasing costs and mitigating emissions.		
Action	Example of benefits	Sources of information
Consider installing low energy bulbs.	Compact fluorescent bulbs will use 80% less energy than conventional bulbs and should be used where lights are regularly switched on for more than a few minutes.	https://www.sruc.ac.uk/downloads/file/2779/energy_auditing

Developing renewable energy - Renewable energy production can provide attractive paybacks as well as helping to reduce emissions.		
Action	Example of benefits	Sources of information
Explore the potential for further renewables	Can offset CO ₂ production and provide an income to the business.	https://www.fas.scot/downloads/fas-farm-renewables-brochure-25-4-2017/ https://www.farmingforabetterclimate.org/downloads/practical-guide-micro-hydro/ https://www.farmingforabetterclimate.org/downloads/practical-guide-wind-energy/

Developing renewable energy - Renewable energy production can provide attractive paybacks as well as helping to reduce emissions.		
Action	Example of benefits	Sources of information
		https://www.farmingforabetterclimate.org/downloads/practical-guide-solar-pv/

Locking carbon into the soil and vegetation - Soils and vegetation are a valuable store for carbon.		
Action	Example of benefits	Sources of information
Review scope for new woodland plantings.	<p>Management of existing woodlands or new planting can provide opportunities to improve business efficiency, reduce costs and reduce the farm carbon footprint.</p> <p>Woodland locks carbon into both the soil and vegetation and could form part of a carbon offset scheme, reducing the farm carbon footprint.</p> <p>Creation of new woodlands will sequester carbon helping to offset the production of farm emissions</p>	<p>https://www.sruc.ac.uk/downloads/file/2792/farm_woodlands_and_carbon</p> <p>https://www.ruralpayments.org/publicsite/futures/topics/all-schemes/forestry-grant-scheme/</p> <p>https://www.farmingforabetterclimate.org/wp-content/uploads/2018/01/Craigengillan_new_woodlands.pdf</p>

AgRE Reports

A summary of the resource efficiency and performance of North Talisker SSC's enterprises compared to similar enterprises are included in the following AgRE Reports.

AgRE Report - Agricultural Resource Efficiency

Sector: Sheep
 Enterprise type: Extensive hill ewe flock
 System: not specified
 Group:
 Producer:
 Farm: North Talisker SSC

Region: Highlands
 Year calc relates: End Sep 2019
 Reporting date: 9th Oct 2019
 Report reference: Carbon Audit 2019 Compared to: Sheep Enterprises (system specific) 2015 to 2019 (54) reports

Quick glance enterprise emissions

	* kg CO ₂ e/ kg dwt	Opportunity Level	Comparison
Enteric fermentation	32.44	Medium	31.23
Manure management	11.18	Medium	10.45
Fertiliser	-	Low	1.41
Purchased feed	3.02	Medium	1.55
Purchased bedding	0.79	High	0.01
Fuel	-	Low	0.87
Electricity	-	Low	0.04
Other	0.09	Low	0.44
Total emissions **	47.51	Medium	46.01

Other: crop residues, lime, transport and waste

Physical performance of enterprise

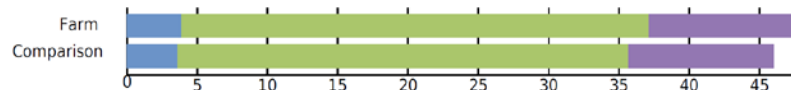
	Value	Comparison
Area of land utilised (ha)	1,314	1,535
Female breeding stock (no)	784	944
Lamb sale weight (kg lwt/head)	30.00	32.23
Lamb sale weight (kg dwt/head)	13.50	14.52
Wool sales (kg)	1,500	2,417
Purchased feed use (kg/ewe)	75	61
Homegrown feed use (kg/ewe)	-	98
Mortality (%)	5	6
Lambing percentage (%)	69	99
Ewe cull rate (%)	22	25
Enterprise net output (kgs)	8,248	13,060

Whole farm sustainability indicators

Nitrogen Use	-	kg/ha	Water use	-	litres
Phosphate Use	-	kg/ha	Stocking density	0.23	LU/ha
Potash Use	-	kg/ha	Sequestration	109.99	tCO ₂ e
Waste	25.00	kg	Renewable energy used	-	kWh

Emissions by gas and benchmark comparison

■ CO₂ : 3.87 kg CO₂e/unit output
 ■ CH₄ : 33.26 kg CO₂e/unit output
 ■ N₂O : 10.38 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.

Improve efficiency and environmental credentials

What does a carbon footprint actually tell you?

There is a strong correlation between efficiency, profitability and low carbon emissions. The lower your carbon footprint the more effective inputs have been at generating saleable product i.e. increased utilisation of costly inputs. Each farm and system have natural limitations but, within this context, the process can identify carbon 'hotspots' on farm and is therefore a steer to improve efficiency and reduce greenhouse gas emissions.

How accurate does the information need to be?

The more accurate the information entered, the more meaningful the output. Where possible on farm records should be used to provide accurate farm-level data.

AgRE report guide

A: Quick glance enterprise emissions The 'opportunity level' (high, medium or low) is the likelihood for improvement gauged against other farms in that sector.

B: Physical performance of enterprise It is much easier to relate to performance indicators, actual sales, feeds and other inputs used. This becomes particularly useful when comparing years and for group comparisons.

C. Whole farm sustainability indicators Sustainability is the ability to deliver a product the customer wants year after year without adversely impacting the environment. Carbon is, however, only one part of the wider sustainability 'formula', some wider indicators are shown in this section.

D. Whole farm emissions by gas and benchmarking comparison Carbon footprinting similar farm types allows a business to benchmark environmental performance against a group average.

E. Potential actions to reduce emissions Examples of practical measures that could reduce emissions are shown below. Technical advice should be sought before making any business changes.



Farm Advisory Service

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