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Introduction

Reducing greenhouse gas (GHG) emissions from agriculture is essential if Scotland and other nations are to meet their carbon reduction goals. Emission reductions can also help improve farm sustainability, efficiency, and profitability. Before introducing improvements, it is crucial to establish a baseline of farm emissions and resource use efficiency.

Agrecalc is an online **Agricultural Resource Efficiency Calculator** that estimates the type, source, and extent of GHG emissions produced from a whole farm, individual farm enterprises, and farm products.

The three main GHGs assessed by Agrecalc and their sources include:

1. **Nitrous oxide** (N₂O) released during application of synthetic and organic fertilisers, manure deposition by grazing animals, and decomposition of crop residues.
2. **Methane** (CH₄) produced from manure management and as a by-product of enteric fermentation during ruminant digestion.
3. **Carbon dioxide** (CO₂) produced by burning fossil fuels to produce energy, embedded in purchased inputs and disposal of waste.

Agrecalc calculates emissions from the above sources up to the farm gate, including emissions associated with purchased inputs. The tool does not currently include any emissions that arise after outputs have left the farm.

Results include emissions in CO₂ equivalents (CO₂-eq) and emissions intensity (CO₂-eq per unit output), commonly known as a carbon footprint. This enables comparisons across farms and enterprises.

Farms with a low carbon footprint are typically most efficient. Agrecalc benchmarks carbon footprint results against similar enterprises, which highlights areas for improvement, potentially helping to boost the efficiency of farm businesses.

Agrecalc assesses the following enterprises and their products:

- **Livestock:** beef, sheep, dairy, poultry, and pigs
- **Grassland:** pasture, silage, hay, and other forages
- **Crops:** cereals, oilseeds, root vegetables, vegetables, fruits, and more

We also include carbon sequestration from farm woodlands, hedges, and grassland and arable soils.

Getting Started

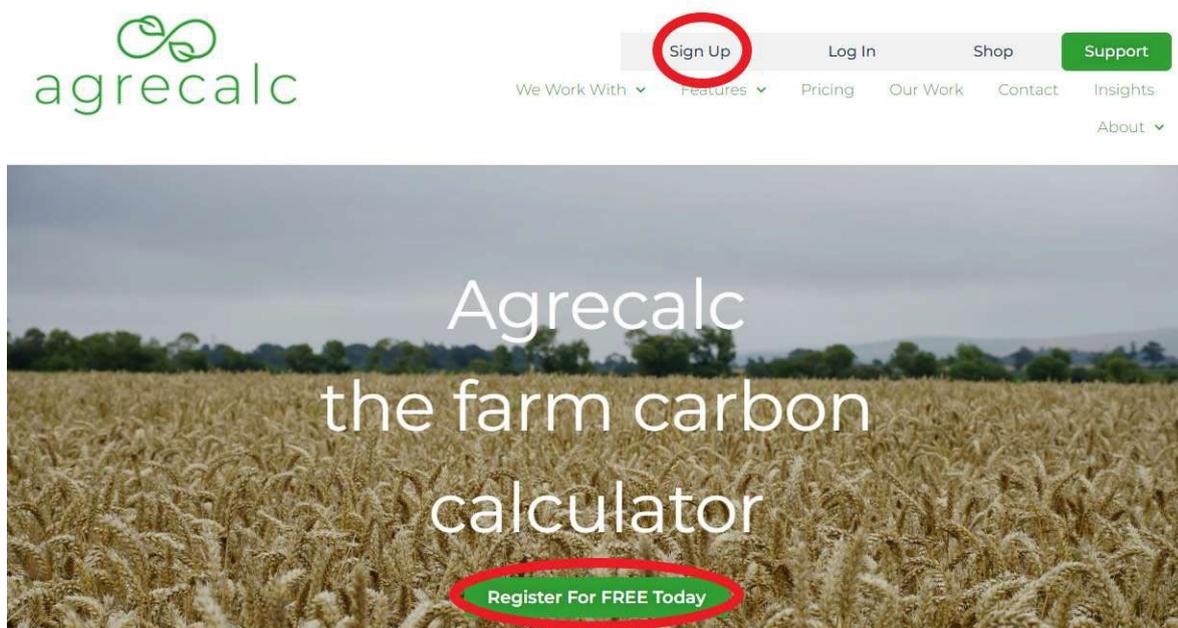
Software requirements

Agrecalc operates best on a modern, standards-compliant web browser, from a desktop or laptop computer. While it will work on tablets or smartphones, a larger screen and physical keyboard will ease data entry.

We recommend one of the following web browsers for using Agrecalc: Chrome, Safari, Opera, Firefox, or Internet Explorer 9 or above.

User registration

To begin, go to www.agrecalc.com and register a new account.



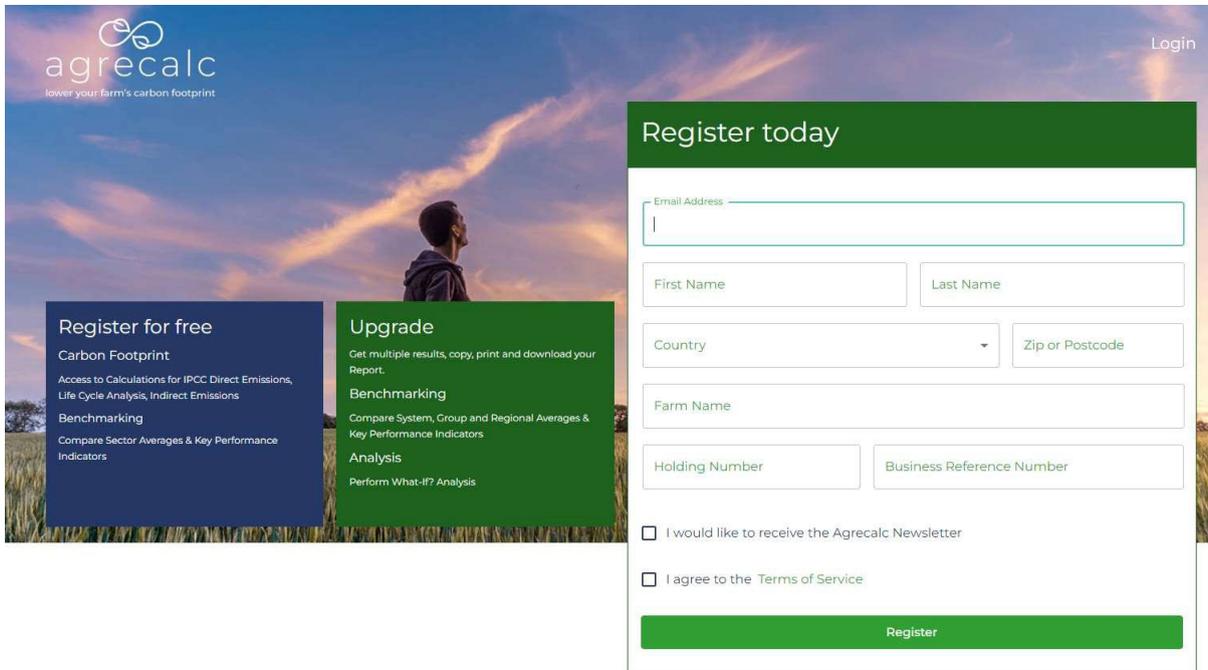
After selecting ‘Sign Up,’ enter your information in the form shown below.

When you register, you will have to enter a few details about your farm. You can always edit these details in the “My Farm” section in the top right menu. Agrecalc requires the following farm details:

- Farm name
- Holding number
- Business reference number

- Farm zip code

If you are not a farm user, register through this form and then contact us to upgrade the system access for your account.



The screenshot shows the Agrecalc registration interface. On the left, there are two promotional boxes:

- Register for free:** Carbon Footprint (Access to Calculations for IPCC Direct Emissions, Life Cycle Analysis, Indirect Emissions), Benchmarking (Compare Sector Averages & Key Performance Indicators).
- Upgrade:** Get multiple results, copy, print and download your Report; Benchmarking (Compare System, Group and Regional Averages & Key Performance Indicators); Analysis (Perform What-If? Analysis).

 The main registration form on the right is titled 'Register today' and contains the following fields:

- Email Address (text input)
- First Name (text input) and Last Name (text input)
- Country (dropdown menu) and Zip or Postcode (text input)
- Farm Name (text input)
- Holding Number (text input) and Business Reference Number (text input)
- Two checkboxes: 'I would like to receive the Agrecalc Newsletter' and 'I agree to the Terms of Service'.
- A green 'Register' button at the bottom.

Once you complete the form, select 'Register.' If all relevant boxes are complete, a verification email will arrive in the specified email account. Follow the link in this email to set your password and activate your account.

Logging in

To start using Agrecalc, first log in from www.agrecalc.com with your email and password.



agrecalc

Log in

Email Address
admin

Password
.....

Please remember me

Log In

Forgot your password? [Click here](#)



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Terms & Conditions

Creating a new farm report

To create a report from your account, navigate to “Farm Reports” on the left-hand menu. Select ‘Create Report.’



agrecalc

admin M ...

Farm Reports

Report Data Entry

Report Results

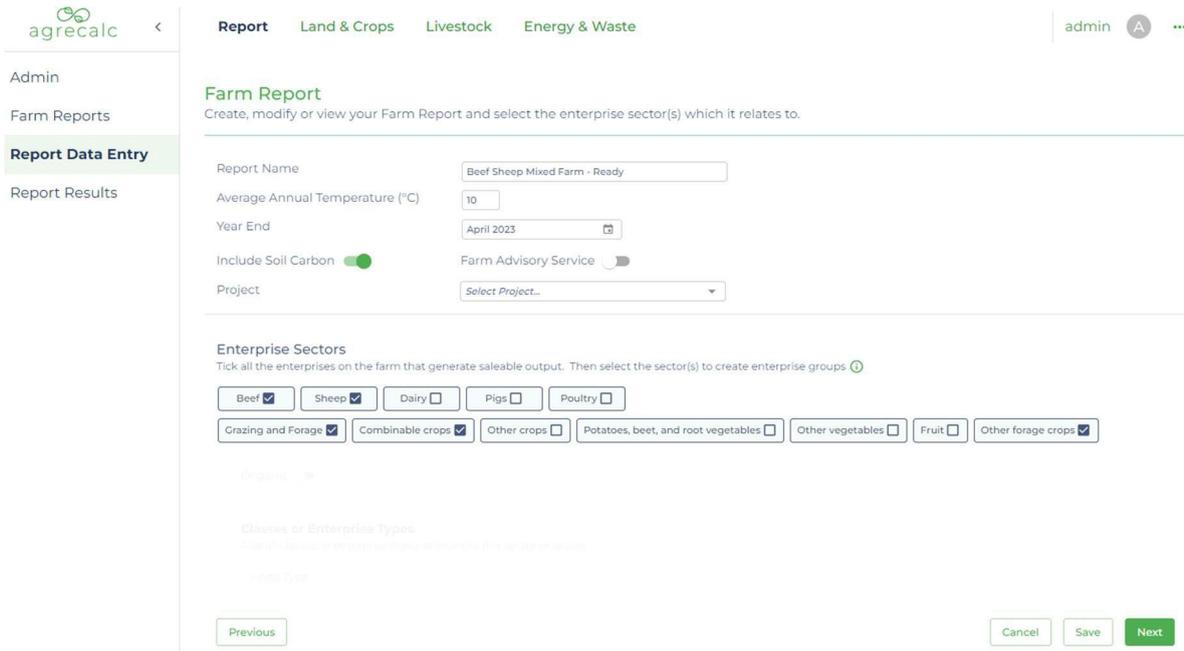
Admin

Farm Reports

Create

Name	Report End Date	Last Updated	Status	Actions
Test Report 1	February 2023	February 3, 2023 10:56 AM	Pending	⋮
Test Report 2	February 2023	February 3, 2023 10:56 AM	Pending	⋮
Test Report 3	February 2023	February 3, 2023 10:56 AM	Pending	⋮

On the “Farm Report” screen that appears, shown below, enter general information about the farm business. First, give the report a descriptive name, such as “Farm X carbon report 2022”.



Report Land & Crops Livestock Energy & Waste

admin A

Farm Report

Create, modify or view your Farm Report and select the enterprise sector(s) which it relates to.

Report Name: Beef Sheep Mixed Farm - Ready

Average Annual Temperature (°C): 10

Year End: April 2023

Include Soil Carbon:

Farm Advisory Service:

Project: Select Project...

Enterprise Sectors
Tick all the enterprises on the farm that generate saleable output. Then select the sector(s) to create enterprise groups

Beef Sheep Dairy Pigs Poultry

Grazing and Forage Combinable crops Other crops Potatoes, beet, and root vegetables Other vegetables Fruit Other forage crops

Previous Cancel Save Next

Average temperature is set to a default of 10°C. Leave this figure.

For year end, select the end month and year for the 12-month reporting period. The 12-month period is commonly the most recent financial year end, but it can be any 12-month period you would like to assess (such as crop year).

Click on each sector present on the farm. For livestock sectors, add a group for each herd/flock present on the farm. Within each group, select the livestock age classes present from the drop-down lists. Within each crop sector, select the relevant crop types present from the drop-down lists.

Enterprise system types

Agrecalc uses typical livestock enterprise types for benchmarking. Choose the type that most reflects the management of each livestock group. The tables and lists below detail all types currently included in Agrecalc.

For beef and sheep enterprises, select a system in addition to enterprise type. Options for beef include breeder/finisher, finisher, breeder/store, and breeder/finisher plus purchases. Options for sheep include finisher and store/finisher.

You may also mark any enterprise as organic for benchmarking purposes.

Dairy Enterprise Types:

- Cross bred producing 5,500 litres
- All year-round calving producing 8,000 litres
- Traditional producing 6,500 litres
- All year-round calving producing 9,500 litres

Pig Enterprise Types:

- Indoor breeding
- Indoor breeding/finishing
- Indoor finishing
- Outdoor breeding
- Outdoor breeding/finishing
- Outdoor finishing

Poultry Enterprise Types:

- Cage layers
- Indoor broilers
- Duck layer
- Free range layers
- Free range broilers
- Pullet rearing
- Table ducks
- Farmed turkeys

Beef Enterprise Types:

Enterprise type	Definition
Spring calving hill suckler cows	Less favourable area (LFA) extensive hill ground, calving Jan-June
Spring calving lowland suckler cows	Non-less favourable area (LFA), calving Jan-June
Autumn calving lowland suckler cows	Non-less favourable area (LFA), calving July - December
Finishing beef bred or cross calves	Rearer finishers, cereal-based and forage-based enterprises
Spring calving upland suckler cows	Less favourable area (LFA), calving Jan-June
Autumn calving upland suckler cows	Less favourable area (LFA), calving July -December
Intensive finishing of Holstein dairy bred bulls	Cereal & forage- based finishing of dairy beef calves

Sheep Enterprise Types:

Enterprise type	Definition
Extensive hill ewe flock	Hill ewe flocks grazed extensively on rough grazing with limited access of improved pastures
Cross bred ewe flock	Mid-season lambing flocks
Good hill ewe flock	Hill ewe flocks grazed extensively on kinder/grassier hills or rough grazing with some access to improved pastures.
Early lambing ewe flock	January/February lambing flocks targeting the spring lamb sale market or pedigree breeding.
Draft ewe flock	Replacement females sourced as draft hill type ewes. Commonly crossed to Leicester type rams to produce mule females or crossed to a terminal sire for store or finished lamb production.
Late lambing ewe flock	Late lambing flocks generally characterised by outdoor lambing and low supplementation
Finishing store lambs	Purchase of store lambs for finishing, no breeding stock

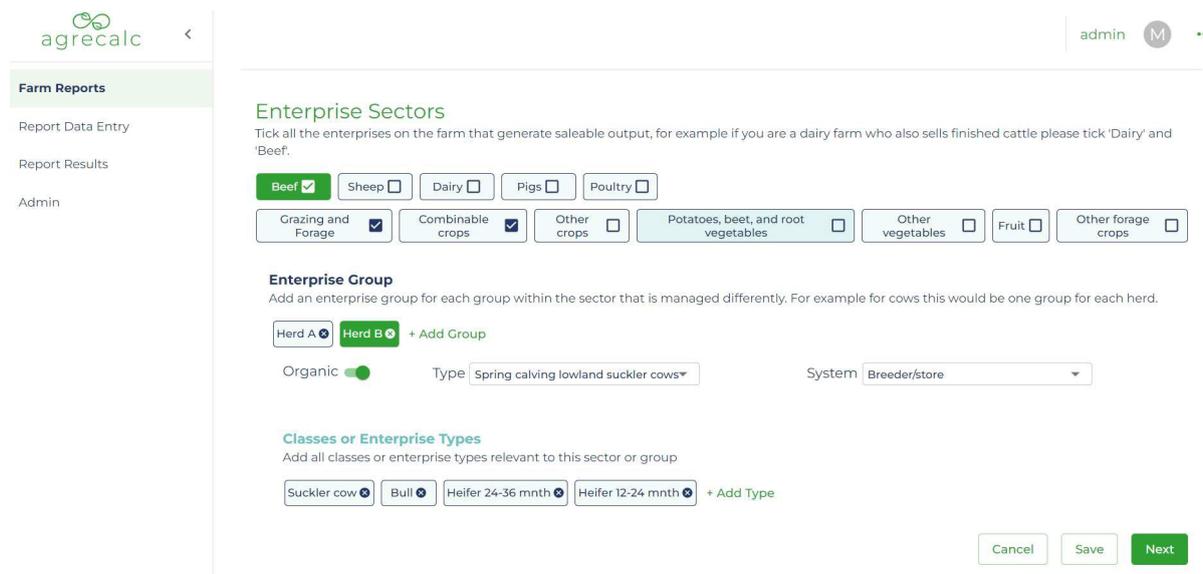
Livestock classes and crops grown

To finalise the creation of a farm report, Agrecalc requires information about the livestock classes in each livestock group and crops grown.

For each livestock group, identify all livestock classes present on the farm in the reporting year. The table on the following page details all classes currently included in Agrecalc. If the farm has other livestock classes, choose the class that most closely matches.

Select all crops grown from the lists within the following sectors: forage; combinable crops; potatoes, beets, and root vegetables; other vegetables; fruit; and other crops. Our crop list currently includes all common crops in the UK and Europe. If your farm includes greening EFAs, select the biodiversity land use category to enter data on these areas.

Once you finish entering the details of your new report, select “Save” or “Next.” Data will automatically save when “Next” is selected. You are now ready to start entering farm-level data for carbon foot-printing.



Enterprise Sectors
Tick all the enterprises on the farm that generate saleable output, for example if you are a dairy farm who also sells finished cattle please tick 'Dairy' and 'Beef'.

Beef Sheep Dairy Pigs Poultry

Grazing and Forage Combinable crops Other crops Potatoes, beet, and root vegetables Other vegetables Fruit Other forage crops

Enterprise Group
Add an enterprise group for each group within the sector that is managed differently. For example for cows this would be one group for each herd.

Herd A Herd B + Add Group

Organic Type: Spring calving lowland suckler cows System: Breeder/store

Classes or Enterprise Types
Add all classes or enterprise types relevant to this sector or group

Suckler cow Bull Heifer 24-36 mnth Heifer 12-24 mnth + Add Type

Cancel Save Next

Sector	Class	Definition
Beef & Dairy	Cow	Cows and calved heifers
	Bull	Uncastrated male cattle used for breeding
	Heifer 24-36 mnth	Heifers older than 24 months before their first calf
	Heifer 12-24 mnth	Young female cattle, between 12 and 24 months old
	Heifer 0-12 mnth	Young female cattle, less than 1 year old
	Steer 24-36 mnth	Castrated male cattle older than 24 months
	Steer 12-24 mnth	Castrated male cattle between 12 and 24 months old
	Steer 0-12 mnth	Castrated male cattle younger than 12 months
	Entire 12-24 mnth	Uncastrated male cattle older than 12 months
	Entire 0-12 mnth	Uncastrated male cattle younger than 12 months
Sheep	Ewes	Female sheep after their first lamb
	Tups	Uncastrated male sheep used for breeding
	Hogg	Ewe lamb for breeding 6-12 mnth
	Gimmer	Ewe lamb for breeding older than 12 mnth
	Shearling	Tups / Rams for breeding 6-12 mnth
	Lambs	Lambs up to 6 months or slaughter age
Pigs	Sows	Female pig after their first litter, generally older than 1 year
	Gilts	Female pigs before their first litter, often younger than 1 year
	Boars	Uncastrated male pigs used for breeding
	Finisher	Pigs intended for slaughter over 66kg in weight
	Grower	Pigs intended for slaughter between 32 and 66 kg in weight
	Weaner	Pigs between 7 and 31 kg in weight
	Suckling piglets	Pigs less than 7kg in weight (before weaning)
Poultry	Hens	Adult female chickens, one year of age or more
	Pullets	Female chickens between 12 weeks & one year old
	Cockerels	Male chickens between 12 weeks & one year old
	Cocks/roosters	Adult male chickens, one year of age or more
	Broilers	All chickens for meat production, beyond the hatchery
	Chicks	Chickens under 12 weeks in age
	Ducks	All ducks
	Turkeys	All turkeys

Data Entry – General

This guidance help clarify the data entry process in Agrecalc by breaking down each data entry field in Agrecalc. There are 3 data collection sections which can be found along the top menu in the data entry view:

1. Land and crops
2. Livestock
3. Energy and waste

To enter data into one of these data entry sections, select the relevant section from the menu on the top of the page. Agrecalc data entry has no set order, but we recommend starting with the Land & Crops section.

Enter all data in the units specified in the column headers.

To ensure data collected is accurate, use available farm records. Farmer estimates or industry default values can help fill any gaps. SAC consultant validators will assess the feasibility of all data entered. Consultants represent a vital step in our quality control process.

Within each data entry section, certain cells are highlighted red. This indicates where multiple fields must total at 100%.

The enterprises selected in the ‘Farm Report’ section will be visible and can be found by scrolling down each data entry page. If you need to add or remove enterprises or classes, return to the “Report” data entry page on the upper menu and add or remove the relevant enterprises.

Once you have finished entering data in one page, click “next” to move to the next page, and auto-save will save your data. Alternatively, you can manually save the data by selecting ‘Save’ at the bottom of each page.

Data Entry - Land and Crops

Agrecalc requires information about crops grown, crop inputs, yields and crop use in the chosen 12-month period. If the 12-month period falls between crop years, use data from the crop year with a harvest date within the 12-month period.

Note all data must be recorded in the units specified in the column headers. **All areas must be input as hectares.**

The data should ideally come from farm records, such as the Single Application Form (SAF), records kept for Scottish Quality Crops (SQC), Nitrate Vulnerable Zone (NVZ) fertiliser records, or other sources.

The information collected in this section helps calculate:

- Direct and indirect N₂O emissions from crop residues and nitrogen fertilisers (inorganic and imported organic manure).
- CO₂ emissions associated with the production of purchased inorganic fertilisers, lime, and pesticides.
- Soil carbon sequestration

Land Area & Crops

Crop areas (owned, tenanted, and seasonal)



	Owned and Tenanted Land (ha)	Seasonal land (ha)	Annual occupancy of seasonal land (%)	Number of years crop is in the ground (yrs)	Fraction of land converted to current use in last 20 years (%)	Land use before conversion (if applicable)	Clover in grass sward (%)
Grazing and Forage							
Pasture grazing (112.7 ha)	102.7	10	50	25	100	Arable	20
Silage & graze (43 ha)	33	10	50	10	100	Perennial crop/tree crop	15
Combinable crops							
Feed spring wheat (34.8 ha)	24.8	10	50	1	100	Grassland	
Feed winter barley (62.08 ha)	52.08	10	50	1	100	Grassland	

Record the areas of each land use and crop grown in hectares.

You may record areas of roads, yards, and buildings if you wish to cross check with the farm's IACS map, but this is not essential.

Record the areas of Ecological Focus Area (EFA), field margins, and buffer strips used to meet Greening requirements under biodiversity areas. Areas of EFA nitrogen-fixing crops, catch crops and cover crops should be recorded under the most relevant crop types.

Areas for crops harvested more than once in the 12-month period, such as silage, should be the area of the first cut. Make a note of the areas of later cuts as well, as they are required to calculate the total quantity (tonnes) of silage produced.

Do not record areas of grassland or crops let out. If the farm rented seasonal land to grow crops, record this area and the percentage of the year the farm business managed the land (6 months = 50%).

Enter the total length of hedges on your farm. For hedges that lie on shared boundaries with other farms, claim half of the length of all boundary hedges.

Number of years crop is in the ground

This is the average number of years between ploughing or reseeding, which helps calculate emissions from crop residues during the reporting period.

For annual crops, this value is always one.

For perennial grassland, the value used should be the average age of the rough grazing, pasture, or grass ley. For hill ground which is not ploughed, enter a value of 250. For other perennial crops, enter the lifespan of each crop in years before reseeding or replanting.

Land use conversion

Enter the fraction of your total area for each enterprise which has been **permanently** converted from another land use type in the last 20 years. This excludes annual rotational changes.

Clover in grass sward (%)

For forage enterprises, estimate the fraction of total grass cover contributed by clover. Enter 0% if clover does not grow in your pasture. See AHDB guidance on visual assessment: <https://ahdb.org.uk/news/how-to-assess-the-clover-content-of-your-pastures>

Fertiliser and Lime



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Fertiliser & Lime

Enter information on all inorganic fertilisers and lime applied to farm soils.

	Fertiliser / Lime	Total N (%)	Total P (%)	Total K (%)	Quantity (t)	Contains nitrification / urease inhibitor	Add	Delete
Grazing and Forage								
Pasture grazing (112.7 ha)	Other N fertiliser	22	14		8.1	<input type="checkbox"/>		
	Lime				10	<input type="checkbox"/>		
	PK compound		15	14.5	10	<input type="checkbox"/>		
	NPK compound (urea, TSP & MOP)	15	15	14.5	15.8	<input checked="" type="checkbox"/>	+	
Silage & graze (43 ha)	Ammonium nitrate	34.5			5.2	<input checked="" type="checkbox"/>		
	Lime				10	<input type="checkbox"/>		
	NPK compound (AN, AP & MOP)	15	15	14.5	10	<input type="checkbox"/>		
	PK compound		20	30	8.4	<input type="checkbox"/>	+	
Combinable crops								
	Single super phosphate		20		10	<input type="checkbox"/>		

Select the types of fertiliser products and/or lime applied to each crop. You can add or remove products by clicking the icons in the add and delete columns. The percentage of N, P (P_2O_5) and K (K_2O) contained in each fertiliser will automatically populate based on fertiliser type, but you may edit these to more specific values.

If you are not able to collect data on fertiliser types, you can calculate the total amount of N, P, K applied and record this as:

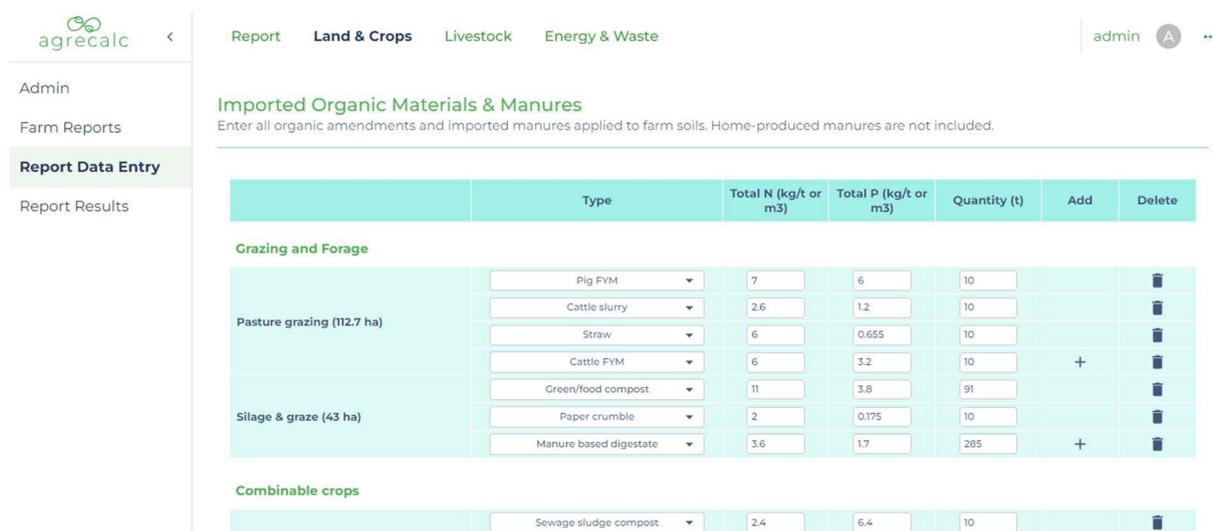
- “Urea,” 100% N 0% P 0% K, Quantity of urea-N applied
- “Other N,” 100% N 0% P 0% K, Quantity of non-urea N applied
- “Other P,” 0% N 100% P 0% K, Quantity of P_2O_5 applied
- “Other K,” 0% N 0% P 100% K, Quantity of K_2O applied

Enter the quantity (tonnes) of each fertiliser product and/or lime requirement applied to each crop. For multiple applications of the same product, enter the total quantity applied across all applications.

For lime, to ensure consistency and avoid spikes in emissions, lime should be inputted as the annual lime requirement = the total quantity applied / the number of years between applications (e.g. 7.2t/ha applied every 8 years = 0.9t lime per ha per year).

For fertiliser information recorded as an application rate per acre or hectare or in total units of N, P or K, you must calculate total tonnes of each fertiliser product applied to individual crops.

Imported Organic Materials & Manures



	Type	Total N (kg/t or m ³)	Total P (kg/t or m ³)	Quantity (t)	Add	Delete
Grazing and Forage						
Pasture grazing (112.7 ha)	Pig FYM	7	6	10		🗑️
	Cattle slurry	2.6	1.2	10		🗑️
	Straw	6	0.655	10		🗑️
	Cattle FYM	6	3.2	10	+	🗑️
Silage & graze (43 ha)	Green/food compost	11	3.8	91		🗑️
	Paper crumble	2	0.175	10		🗑️
	Manure based digestate	3.6	1.7	285	+	🗑️
Combinable crops						
	Sewage sludge compost	2.4	6.4	10		🗑️

Select the type of imported organic manure and enter the total quantity (tonnes) of the manure applied to each crop. Only enter details of imported organic manure in this section. You can add or remove products by clicking the icons in the add and delete columns. For multiple applications of the same product, enter the total quantity applied across all applications.

Standard N and P values for each organic manure type will prepopulate for the selected manure type. If specific N and P is known from manure analysis, record this information as kg of nutrient per t or m³, depending on the unit used to enter the quantity of manure.

Home produced manure applied to crops that are sold off the farm should be entered in the transferred manure section.

Transferred Manure

This section allocates non-exported manures from livestock applied to grassland and crop enterprises on the farm.

For solid manure transferred from each livestock enterprise, allocate manure managed through solid storage (FYM) and deep bedding to crop enterprises by % of non-exported manure. For example, if 50% of manure is exported and all remaining manure was applied to feed wheat, transferal to the wheat crop would be 100%.

For liquid manure transferred from each livestock enterprise, allocate manure managed as liquid slurry or digestate or stored in pits to crop enterprises as a % of non-exported manure. For example, if 50% of slurry is exported from the farm and all remaining manure was applied to a grassland area, transferal to the grassland would be 100%.

For poultry manure, allocate all manure of across crop enterprises as a % of non-exported manure as described above.

For livestock enterprises irrelevant to the farm, leave inputs for transferred manures blank.

Pesticides

Agrecalc requires the area (hectares) of each crop treated with an herbicide, insecticide, and fungicide. This is the area for each individual treatment, not the area multiplied by the number of treatments.

Although herbicides can have significant impacts on biodiversity, they represent an exceedingly small portion of your total carbon footprint. As such, Agrecalc does not require exact quantities used.

Agrecalc only requires this information for combinable crops, potatoes, beet and root vegetables, other vegetables, fruit, and other crops.

Agrecalc uses data on the average number of spray treatments from Pesticide Survey Statistics to calculate pesticide, herbicide, and fungicide emissions, details below. Depending on the number of spray treatments the farm makes, you may need to adjust areas treated proportionally. For

example, if 10 ha of feed wheat received two fungicide treatments, you would reduce the area by one third i.e., enter 6.66 ha.

	Herbicide sprays (n)	Insecticide sprays (n)	Fungicide sprays (n)
Combinable crops			
Wheat	3	1	3
Winter barley	2	1	2
Spring barley	2	0	2
Oats	2	1	2
Minor cereals	2	0	2
Oilseed rape	3	2	3
Field beans/peas	2	2	2
Potatoes, beet, and root vegetables			
Seed potatoes	3	5	11
Early potatoes	3	1	9
Maincrop ware potatoes	3	1	11
Maincrop processing potatoes	3	1	12
Sugar beet/swedes/turnips	4	0	2
Processing peas	3	1	1
Fruit			
Strawberries	2	3	9
Raspberries	2	2	4
Blueberries	2	2	2
Blackberries	2	3	4

Crop Production & Use

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Crop production & use

To calculate product level emissions, enter data for crop stocks, yield, harvest, and sales.

	Opening stock (t)	Percentage of crop removed (%)	Harvested dry matter (%)	Harvested or forage yield (t/ha)	Total crop production (t)	Sold (t)	Home saved for seed (t)	Fed or used for bedding (t)	Remaining stock (t)
Grazing and Forage									
Pasture grazing - Grazing (112.7 ha)		60							
Silage & graze - Silage (43 ha)		80	19	27.3	900.9	1		899.9	
Combinable crops									
Feed spring wheat - Grain (34.8 ha)		90	84	6.2	153.76000	153			0.760000
Feed spring wheat - Straw (34.8 ha)				5.5				136.3	0.0999999

Percentage of crop removed

The percentage of the crop removed at harvest relates to the amount of above ground biomass removed.

For grassland, this input value should be based on grazing and/or cutting intensity. This field helps estimate soil carbon sequestration. Use the following values as a guide for grassland and forage enterprises:

- Very extensive grazing (<20%)
- Extensive grazing (20-50%)
- Moderate grazing and/or cutting (50-70%)
- Intensive grazing and/or cutting (70-95%)
- Very intensive grazing and/or cutting (>95%)

Typical figures for grassland, forage and combinable crops are:

- Rough Grazing (50%)
- Pasture grazing (60%)
- Silage & graze and hay & graze (80%)
- Other forage crops and combinable crops (90%)

If straw from a combinable crop is incorporated, reduce the value by the estimated amount of biomass incorporated. For example, assuming 90% biomass is harvested from a wheat crop (10t/ha of grain and 5t/ha of straw), total biomass removed would be 15t/ha. Total biomass of the growing crop (100% biomass) would be 16.6t/ha (15t/ha divided by 90%). If straw was

incorporated, the percentage of crop removed would be 60% (10t/ha divided by 16.6t/ha).

Harvested dry matter (%)

Agrecalc requires crop dry matter percentage to calculate dry matter yields for forage and combinable crops. Agrecalc assumes typical dry matter percentages for all other crops.

Forage analysis should include dry matter percentage for silage, whole crop, or forage maize. If a forage analysis is not available, use farmer estimates or typical values for similar enterprises.

Moisture readings from harvested grain must be converted to dry matter percentages.

Harvested or forage yield

Enter fresh weight produced in tonnes per hectare (i.e., yields) from harvested crops. Record straw yields in the separate row for straw.

Yield data in tonnes per acre must be converted to tonnes per hectare.

For crops harvested more than once in the 12-month period, use yields from each harvest to calculate average total yield per hectare. For example, if silage is cut twice, based on the yield from each cut and the areas of grassland cut each time, calculate the total quantity (tonnes) of silage produced. Divide this figure by the area of silage cut for first cut to calculate the average yield per hectare for the silage crop.

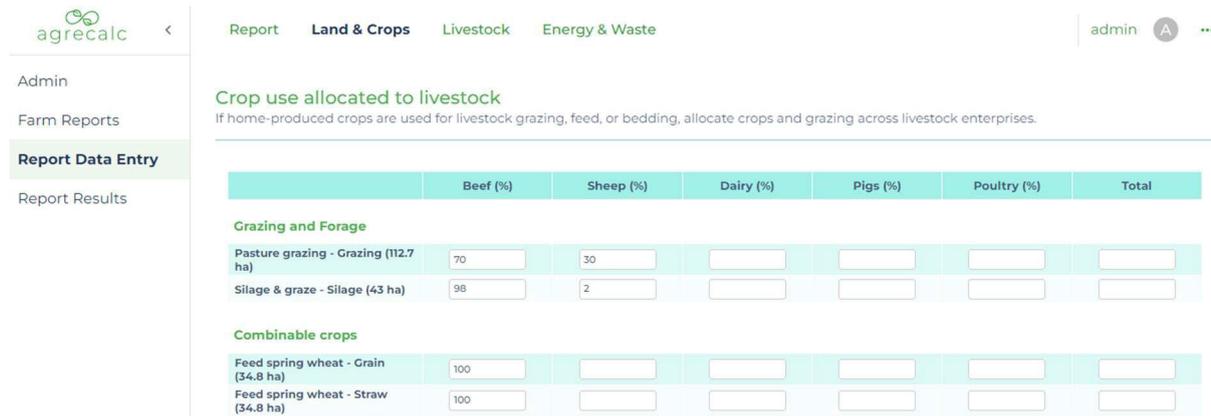
If the farmer does not know what the crop yields were, use your knowledge of what was typical for that year and the farm and in discussion with the farmer derive what the yields should be. If required, use the SAC Farm Management Handbook as a guide.

Crop use

Enter the total quantity (tonnes) of each crop sold, home saved for seed, fed to livestock, or used for livestock bedding.

If there is a carry-over of stock from a prior year or stock from the reporting year remains in store, the opening stock and closing stock fields can help cross check the quantities of each crop used.

Crop Use Allocated to Livestock



	Beef (%)	Sheep (%)	Dairy (%)	Pigs (%)	Poultry (%)	Total
Grazing and Forage						
Pasture grazing - Grazing (112.7 ha)	70	30				
Silage & graze - Silage (43 ha)	98	2				
Combinable crops						
Feed spring wheat - Grain (34.8 ha)	100					
Feed spring wheat - Straw (34.8 ha)	100					

If the farm business has livestock, grassland and utilised crops need to be allocated to the relevant livestock enterprises. This section is only applicable to farms with livestock.

For rough grazing and pasture grazing, identify how long each livestock group spends on the land and calculate this as a percentage of the year, or work out the number of livestock units grazing the land and convert this to a percentage.

For all other crops, including forage crops, calculate the quantity fed or used by each livestock group as a percentage of the total fed or used.

All homegrown feed and bedding used on-farm must be allocated across livestock enterprises. The total should be 100% for each crop enterprise.

Biochar

Biochar is a charcoal-like product, used as a soil amendment to boost soil function and carbon sequestration.

If biochar is applied, select the type of organic material used to produce this biochar and the temperature range at which this material was pyrolyzed. Then enter the total quantity of biochar applied.

Soil Carbon Sequestration



- Admin
- Farm Reports
- Report Data Entry
- Report Results

Report
Land & Crops
Livestock
Energy & Waste

admin A ...

Soil Carbon Sequestration

To estimate soil carbon sequestration, a few further details about soil and land management are required.

	Tillage Practice	Grazing system (and length of grazing period)	Percentage of rotation under fallow	Percentage of rotation under perennials	Fallow cover crop type	Cover or companion crop type	Soil Carbon stock (if known tC/ha)
Grazing and Forage							
Pasture grazing (112.7 ha)	Full tillage	Set stocking short (8-14 days)					
Silage & graze (43 ha)	Full tillage	Rotational/lax (4-7 days)					
Combinable crops							
Feed spring wheat (34.8 ha)	Full tillage		20	30	Please Select	N fixing	200
Feed winter barley (62.08 ha)	Full tillage		5	30	Please Select	N fixing	200

Grazing regime

For grassland enterprises, select your grazing type from the dropdown list based on the average number of days livestock graze before moving pasture. For example, if a flock is moved every week (on average over the year, if/when the sheep are not indoors), the grazing period between rest intervals would be 7 days.

Tillage practice

Select one option from below that best represents your tillage practice. Please only select reduced tillage if used exclusively without full tillage events in between.

- Full tillage: complete soil inversion – ploughing, heavy discing, power harrowing
- Minimum tillage: partial soil inversion only through reduced cultivation
- Zero tillage: direct drilling of crops without cultivation

Fallow periods and perennials in rotation

Agrecalc requires information about crops in the rotation for arable areas only. This includes the fraction of rotation under fallow and the fraction of rotation under perennials. Fallow land is arable land that has no crop production or grazing on it from 15 January to the 15 July inclusive. This could include land in Ecological Focus Areas, Higher or Entry level schemes. The fraction of rotation should consider the full rotation over multiple years. For example, 1 fallow year every 5 years = 20%.

Cover and companion crops

If cover crops or companion crops are used, select from the drop-down menu whether the species planted is N-fixing. Leguminous crops such as lucerne are N-fixing. Fallow cover crops are unharvested crops grown between harvested crops. This could include short term leys on fallow land. Companion crops are unharvested crops grown alongside harvested crops. This could include cereals undersown with grass/clover ley.

Soil carbon stock

If you have tested your soil organic carbon (SOC), enter the average SOC stock for each crop enterprise in tonnes per hectare to 30cm soil depth. Only enter soil organic carbon measurements taken to ISO 23400:2021 standards.

If you do not have SOC stock information which meets the required standard, please leave this field blank. We will use default soil carbon stocks based on your post code.

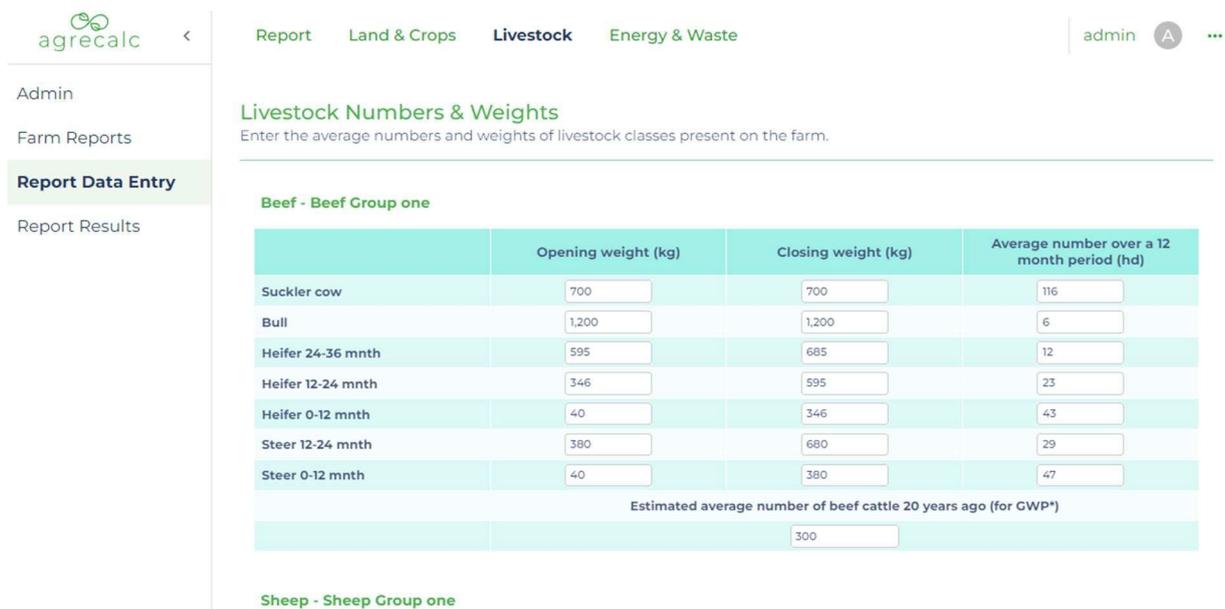
Data Entry – Livestock

Agrecalc requires information about farm livestock and their management in the 12-month period. Farm records, such as computer software packages, livestock movement records, invoices, or other documented sources offer good data sources.

The information collated in this section helps calculate:

- Direct and indirect N₂O emissions from the storage and application of organic manure.
- CH₄ emissions from ruminant enteric fermentation (beef, sheep, dairy) and manure management.
- CO₂ emissions from embedded emissions associated with purchased feed and bedding.

Livestock Numbers and Weights



Report Land & Crops **Livestock** Energy & Waste admin A ...

Livestock Numbers & Weights

Enter the average numbers and weights of livestock classes present on the farm.

Beef - Beef Group one

	Opening weight (kg)	Closing weight (kg)	Average number over a 12 month period (hd)
Suckler cow	700	700	116
Bull	1,200	1,200	6
Heifer 24-36 mnth	595	685	12
Heifer 12-24 mnth	346	595	23
Heifer 0-12 mnth	40	346	43
Steer 12-24 mnth	380	680	29
Steer 0-12 mnth	40	380	47
Estimated average number of beef cattle 20 years ago (for GWP*)			
		300	

Sheep - Sheep Group one

Livestock numbers

For each applicable livestock class, enter the average number of livestock managed by the farm over the 12-month period.

For pigs and poultry, Agrecalc calculates average numbers of livestock over the year from the number of animals per batch, batches per year, and length of time in each age class.

Livestock opening and closing weights

Enter the average opening and closing live weights for each applicable livestock class over the reporting period.

If animals remain in the class for less than a year, opening and closing weight should be the average weight of individuals when they enter this class and the average weight when they leave the class.

If individual animals remain in a single age class for more than 1 year (i.e., suckler cows, etc.), opening and closing weights should be the averages across all individuals in the class at the start of the year and the average across all individuals in the class at the end of the year.

If the farmer does not know what the average opening and closing live weights are, use your knowledge of what is typical for the breed and in discussion with the farmer derive what the weights should be.

For lambs only, Agrecalc also requires average live weight at weaning.

Purchases, Sales, & Deaths



The screenshot shows the Agrecalc web interface. The top navigation bar includes 'Report', 'Land & Crops', 'Livestock', and 'Energy & Waste'. The user is logged in as 'admin'. The main heading is 'Purchases, Sales & Deaths' with a sub-note: 'To calculate product level emissions, enter livestock sales and purchases as well as other livestock products sold from the farm.'

The report is for 'Beef - Beef Group one' and contains the following table:

	Purchases		Sales			Deaths
	Number of purchases	Average live weight (kg)	Number of sales	Average live weight (kg)	KO% (if sold dead weight)	Number of deaths
Suckler cow	<input type="text"/>	<input type="text"/>	20	713	53	9
Bull	<input type="text"/>	<input type="text"/>	1	740	53	<input type="text"/>
Heifer 24-36 mnth	<input type="text"/>	<input type="text"/>	1	618	53	<input type="text"/>
Heifer 12-24 mnth	<input type="text"/>	<input type="text"/>	31	640	53	1
Heifer 0-12 mnth	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	53	5
Steer 12-24 mnth	<input type="text"/>	<input type="text"/>	48	720	53	<input type="text"/>
Steer 0-12 mnth	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	53	9
	Milk produced (l)		Milk (BF%)		Milk (P%)	
	2,200		4.3		3.2	

For each applicable livestock class, enter the number of livestock purchased and sold, average purchase and sale weights, and deaths over the 12-month period. If the killing out percentage for meat is known, enter this information as well. KO% is the total carcass weight divided by liveweight before slaughter multiplied by 100.

Agrecalc also requires quantities of other sales for sheep, dairy, and poultry enterprises. This includes kg of wool, litres of milk (including butter fat percentage and protein percentage) and number of eggs.

Ideally, find input data for this section in farm records, such as computer software packages, invoices, herd or flock registers, or other documented sources.

Performance

Beef and Dairy

Enter age of first calving, calving percentage, calf birth weight, slaughter or sale age and average daily live weight gains of growing cattle.

Calving percentage = the number of calves born alive or dead as a percentage of the number of cows that went to the bull.

Enter average daily live weight gain from farm records or use calculated values or farmer estimates.

Average daily live weight gain for cattle is prepopulated with typical values that can be used in the absence of more specific data.

Sheep

Enter the lambing percentage and percentage of lambs that were singles, twins, and triplets.

Lambing percentage = the number of lambs born dead or alive as a percentage of the number of sheep and gimmers that went to the tup.

Find information on the percentage of singles, twins and triplets in scanning results or other records.

Pigs

Enter average daily live weight gains, number of piglets born per litter, number of piglets reared per litter and the numbers of litters per sow per year for the relevant pig classes.

Find this information in farm records or use farmer estimates. Average daily live weight gains can also be calculated. Average daily live weight gain is prepopulated with typical values that can be used in the absence of more specific data. To calculate daily live weight gain, you will also need birth weight and number of days until sale.

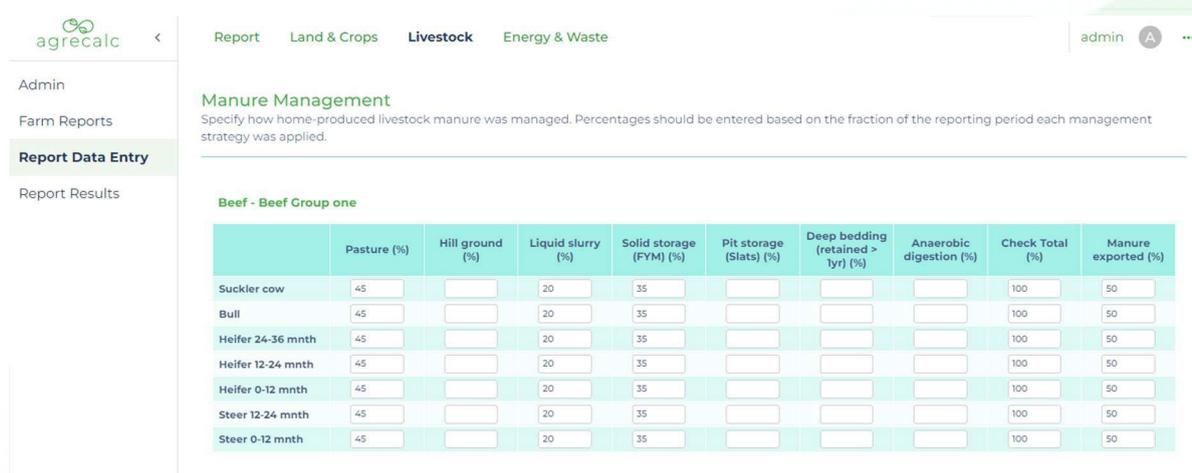
Poultry

Enter information on slaughter age for poultry broiler enterprises.

Agrecalc requires the temperature at housing for poultry broiler, pullet or laying enterprises. This should be the average temperature over the 12-month assessment period.

Average daily live weight gain is prepopulated with typical values that can be used in the absence of more specific data.

Manure Management



The screenshot shows the 'Manure Management' report in the Agrecalc system. The interface includes a navigation menu on the left with options like 'Admin', 'Farm Reports', 'Report Data Entry', and 'Report Results'. The main content area is titled 'Manure Management' and includes a sub-header 'Beef - Beef Group one'. Below this is a table with 10 columns: Pasture (%), Hill ground (%), Liquid slurry (%), Solid storage (FYM) (%), Pit storage (Slats) (%), Deep bedding (retained > 1yr) (%), Anaerobic digestion (%), Check Total (%), and Manure exported (%). The table contains 8 rows of data for different beef categories, with pre-filled values for 'Pasture (%)' (45) and 'Manure exported (%)' (50).

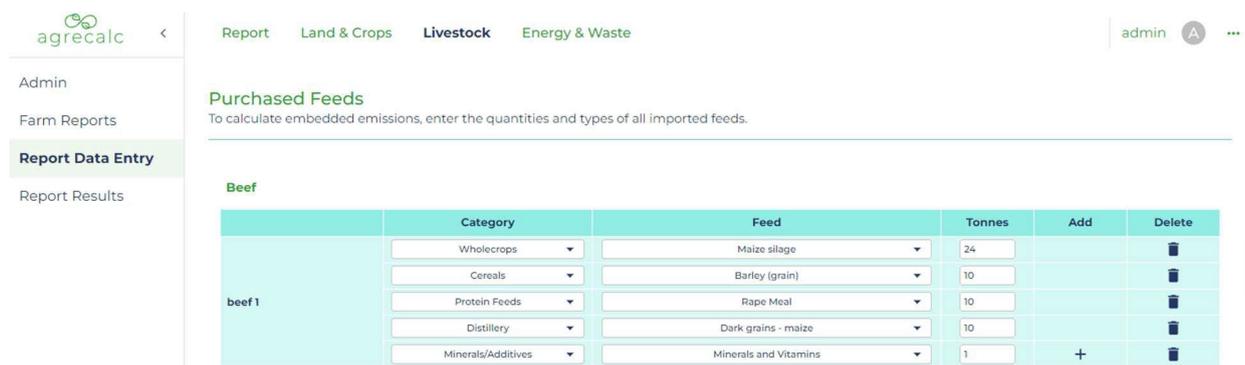
	Pasture (%)	Hill ground (%)	Liquid slurry (%)	Solid storage (FYM) (%)	Pit storage (Slats) (%)	Deep bedding (retained > 1yr) (%)	Anaerobic digestion (%)	Check Total (%)	Manure exported (%)
Suckler cow	45		20	35				100	50
Bull	45		20	35				100	50
Heifer 24-36 mnth	45		20	35				100	50
Heifer 12-24 mnth	45		20	35				100	50
Heifer 0-12 mnth	45		20	35				100	50
Steer 12-24 mnth	45		20	35				100	50
Steer 0-12 mnth	45		20	35				100	50

For each applicable livestock class, enter information on the percentage of time livestock are grazing on in-bye fields, on hill ground or housed using the various manure systems below:

- Liquid slurry
- Pit storage (slats)
- Solid storage (FYM)
- Deep bedding
- Anaerobic digestion
- Poultry with or without litter

The percentage of time the livestock are either grazing or housed must add up to 100%. If the farm exports manure after storage rather than applying it to crops on the farm, enter the percentage of manure exported.

Purchased Feed



	Category	Feed	Tonnes	Add	Delete
beef 1	Wholecrops	Maize silage	24		
	Cereals	Barley (grain)	10		
	Protein Feeds	Rape Meal	10		
	Distillery	Dark grains - maize	10		
	Minerals/Additives	Minerals and Vitamins	1	+	

For each livestock group, enter the total quantity of each type of purchased feed used in tonnes. For each feed imported to the farm, choose the category, and then select the feed type from the corresponding drop-down list. Our list of feed ingredients and concentrates was developed with livestock nutrition specialists at SAC consulting.

Invoices can help check purchased quantities but consider opening and closing stocks when calculating feed use for the reporting period. The carbon audit should include feed used during the reporting period rather than feed purchased during the reporting period.

Feeds and feed ingredients currently included in the Agrecalc database are listed below, by drop-down categories in the data entry form.

Forage (grass)

- Hay
- Grass - grazing
- Grass - close graze
- Grass silage - poor
- Grass silage - average
- Grass silage - good
- Grass silage - dairy
- Big Bale Silage
- Dried Grass

Wholecrops

- Lucerne Silage
- Wholecrop cereals - wheat
- Wholecrop cereals - barley
- Wholecrop cereals - Triticale
- Wholecrop Peas
- Arable Silage
- Maize silage
- Red clover silage
- Dried Lucerne

Straws

- Straw (wheat)
- Straw (barley)
- Straw (oats)
- Straw (pea)
- Ammonia Treated Straw (Barley)
- Sodium Hydroxide Treated Straw (Barley)

Cereals

- Wheat (grain)
- Crimped Wheat
- Wheat (grain) caustic soda
- Wheat (grain) urea
- Wheat (grain) commercial urea treatment
- Barley (grain)
- Crimped Barley
- Barley (grain) urea treated
- Barley (grain) commercial urea treatment
- Barley (moist)
- Oats (grain)
- Maize (grain)
- Triticale (grain)
- Rye

Fodder & Root Crops

- Potatoes (brock)
- Potatoes (ware)
- Waste vegetables
- Fodder beet (bulb)
- Fodder beet (tops)
- Kale
- Rape
- Turnips (bulbs)
- Swedes
- Sugar beet roots
- Carrots

Protein Feeds

- Soya meal Hipro (Any origin 46%)
- Soya meal Hipro (Brazilian 48%)
- Lo Pro Soyabean meal (40%)
- Sopralin
- Soyabean Full Fat
- Field beans
- Peas
- Vegetable protein concentrate
- Rape Meal
- Rape Meal - expeller
- Rapeseed - full fat
- Cold Pressed Rapeseed Treated (Neolac)
- Expelled Rapeseed meal (Neopro)
- Hot Pressed rapeseed protected expeller (NovaPro)
- Fishmeal
- Maize gluten feed (20% protein)
- Maize gluten Prairie meal (60% protein)
- Milk powder
- Whey Permeate

Fats

- Soya Bean oil
- Fat 50%
- Protected palm oil

Distillery

- Dark grains - barley
- Dark grains - wheat
- Dark grains - maize
- Draff/ brewers grains (23% DM)
- Pot ale syrup

Co-products

- Soya hulls
- Wheat feed pellets
- Sugar beet pulp pellets
- Citrus pellets
- Sunflower Meal EC (29%)
- Sunflower Meal Hipro (38%)
- Palm Kernel expeller
- Molasses - beet
- Molasses - cane
- Biscuit meal
- Bread meal
- Confectionery by-product

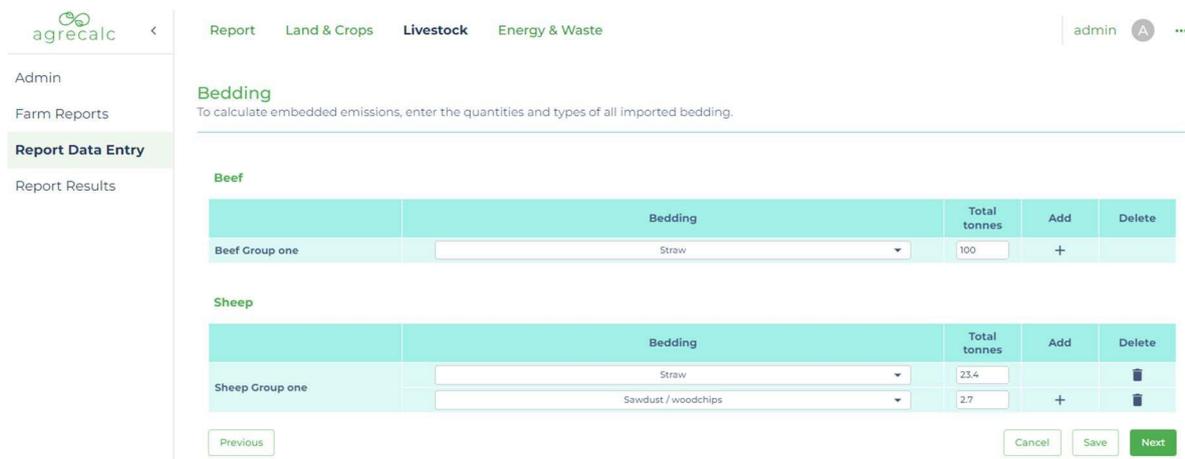
Minerals/Additives

- Methionine
- Lysine
- Threonine
- Tryptophan
- Valine
- Phytase
- Magnesium chloride
- Monocalcium phosphate
- Dicalcium phosphate
- Calcium carbonate
- Calcium formate
- Salt
- Limestone flour
- Minerals and Vitamins
- Additives
- Pre-mix

Concentrates

- Beef nuts (16% protein)
- Other beef blends
- Ewe nuts (12.5 ME, 18% protein)
- Lamb Finisher nuts (12.5 ME, 15% protein)
- Dairy and calf nuts (13ME,18% protein)
- Dairy and calf nuts (12.5 ME, 16% protein)
- Other dairy blends (13.5ME, 20% protein)
- Dairy Dry Cow Nuts
- Dairy Heifer rearing Nuts
- Poultry broiler starter pellet
- Poultry broiler grower pellet
- Poultry broiler pre-breeder pellet
- Poultry broiler finisher
- Poultry broiler withdrawal
- Poultry layer starter
- Poultry layer producer
- Pig gilt
- Pig sow feed gestation
- Pig sow feed lactation
- Pig creep feed
- Pig weaner feed
- Pig grower feed
- Pig finisher feed
- Other dairy blends (22% protein)

Purchased Bedding



For each livestock group, enter the total quantity of each type of purchased bedding used in tonnes.

Invoices can help check purchased quantities but consider opening and closing stocks when calculating bedding use for the reporting period.

Feed Ration



If known, enter digestibility and crude protein percentage of the diet for each livestock age class. For pigs and poultry, Agrecalc also requires gross energy and metabolizable energy from feed. If these percentages are not known, Agrecalc prepopulates these fields with typical values for the enterprise type that can be used in the absence of more specific data.

For beef and dairy, we also collect data on methane inhibitors in this section. Agrecalc currently only considers 3NOP as a methane inhibitor from feed additives due to strong published evidence. Only enter data on 3NOP if it is fed above a minimum dose of 60-90 mg/kg DM at least 5x daily. We are constantly re-evaluating the evidence to improve our model of methane inhibitors and add additional products to Agrecalc.

Data Entry – Energy & Waste

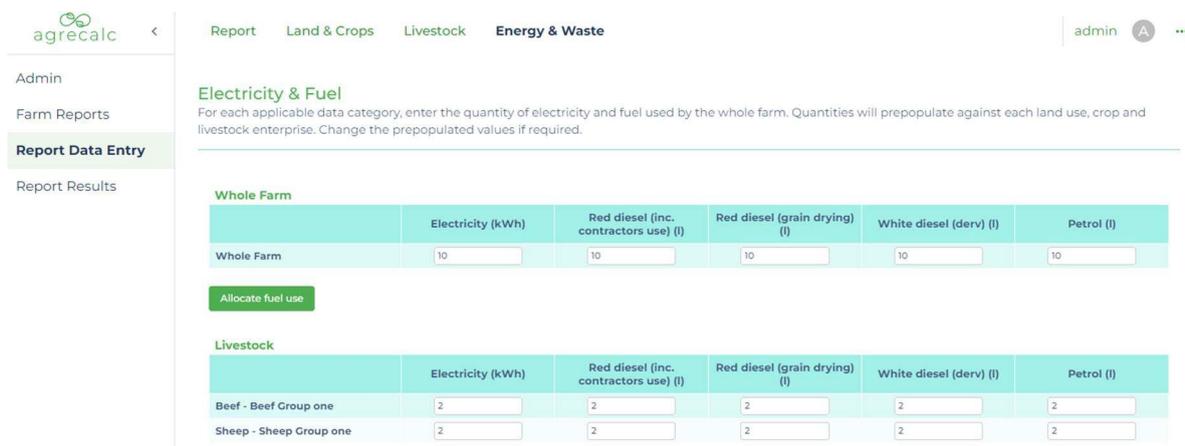
This section records energy use and waste production at the whole farm and enterprise level. If enterprise-level data is unavailable, Agrecalc will allocate whole farm inputs. Energy and waste used or produced by the farmhouse, diversification activities, or enterprises excluded from the report should be deducted from the whole farm input.

Enter collected data into the relevant whole farm boxes. The 'Allocate fuel use' button automatically allocates total usage of electricity, fuel, renewable electricity, and renewable heat to individual enterprises and/or crops. Alter these values as needed.

The information collated in this section helps calculate:

- Direct and indirect CO₂ emissions from burning fossil fuels and disposal of waste.

Electricity & Fuel



Electricity & Fuel
For each applicable data category, enter the quantity of electricity and fuel used by the whole farm. Quantities will prepopulate against each land use, crop and livestock enterprise. Change the prepopulated values if required.

Whole Farm	Electricity (kWh)	Red diesel (inc. contractors use) (l)	Red diesel (grain drying) (l)	White diesel (derv) (l)	Petrol (l)
Whole Farm	10	10	10	10	10

Allocate fuel use

Livestock	Electricity (kWh)	Red diesel (inc. contractors use) (l)	Red diesel (grain drying) (l)	White diesel (derv) (l)	Petrol (l)
Beef - Beef Group one	2	2	2	2	2
Sheep - Sheep Group one	2	2	2	2	2

Enter total quantity (kWh) of electricity used for farming. Electricity meter readings on electricity bills can provide a whole farm input.

Enter the total quantity of red diesel, red diesel used to dry grain, white diesel, petrol, kerosene, LPG, mains gas and coal used by the farming enterprises. Find this information on invoices and be sure to consider opening and closing stocks when calculating fuel use.

The tables below include typical quantities of energy used to dry grain and for selected field operations. These can help cross check quantities used or allocated.

Estimated fuel & electricity use for drying grain

Starting Moisture %	Heating oil use (litre/t)		Electricity (kWh/t)	
	Grain	Oilseed rape	Grain	Oilseed rape
8		2		7
10		7		14
12		11		21
14	0	15	4	27
15	2	18	7	30
16	4	20	11	34
18	9	24	17	40
20	13	29	24	47
22	18	33	30	54
24	22	37	37	60
26	26		44	
28	31		50	
30	35		57	

* High temp, grain dried to 14% moisture, rape dried to 7% moisture
Source: SRUC, SaveFuel 1.0

Estimated fuel use in selected machinery operations

	Fuel consumption	Time for operation	Diesel use
	(l/hour)	(hours/ha)	(l/ha)
Subsoiling	18.9	1.11	21.00
Ploughing (6 furrow)	26.8	1.11	29.75
Heavy Cultivation	26.8	0.71	19.13
Light Cultivation	8.6	0.47	4.02
Power harrow	26.8	1.00	26.78
Fertiliser spreading	8.6	0.18	1.57
Grain drilling 3m	18.9	0.53	9.95
Rolling 7.3m light	8.6	0.33	2.88
Potato Planting 2 row	10.8	1.33	14.40
Mowing 3m	18.4	0.49	9.01
Baling straw	26.8	0.50	13.39
Forage harvesting	61.2	0.40	24.48
Spraying 24m	10.8	0.18	1.96
Towing (trailer)	16.2	0.40	6.48
Combine harvesting	37.8	0.31	11.63
Potato harvesting 2 row	21.6	2.29	49.37

Source: SRUC, SAC Farm Management Handbook 2021

Renewable electricity and heat



Renewable Heat
Enter quantities of heat produced and used on-farm from various renewable sources.

Whole Farm

	Renewable heat production					Renewable heat use
	Logs/ chips (kWh)	Wood pellets (kWh)	Grass/ straw (kWh)	Biogas (kWh)	Total produced (kWh)	Total used on farm (kWh)
Whole Farm	2	2	2	2	2	14

Allocate renewable heat

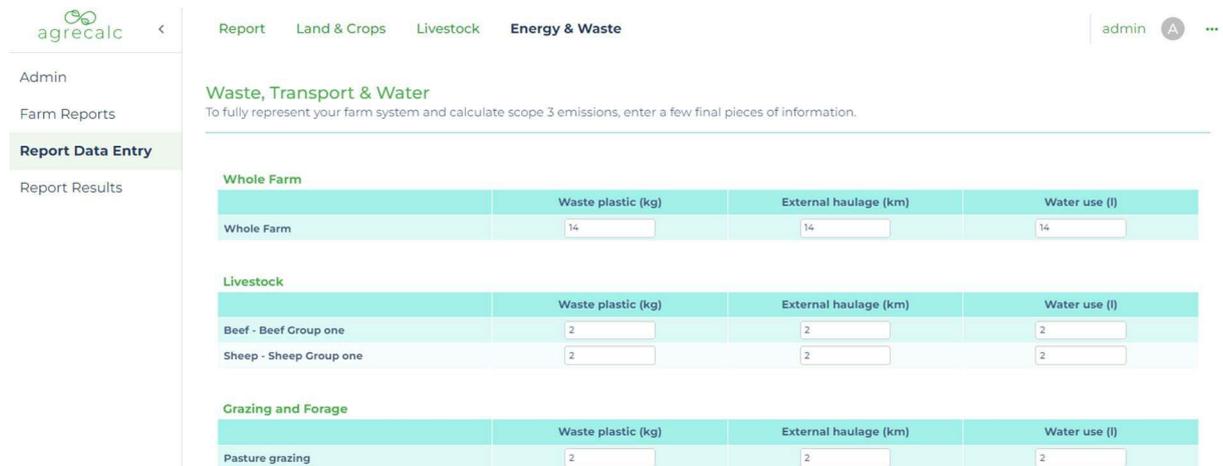
Livestock

	Renewable heat production					Renewable heat use
	Logs/ chips (kWh)	Wood pellets (kWh)	Grass/ straw (kWh)	Biogas (kWh)	Total produced (kWh)	Total used on farm (kWh)
Beef - Beef Group one						2
Sheep - Sheep Group one						2

Enter the quantity (kWh) of renewable electricity produced from wind, solar PV, hydro, and biogas. Only include the energy **produced** from technologies owned by the farm business. Agrecalc also requires total quantity of renewable electricity **used** by farming enterprises.

Enter the quantity (kWh) of renewable heat produced from wood logs/chips, wood pellets, grass/straw, and biogas. Only include the quantities produced from technologies owned by the farm business. Agrecalc also requires the total quantity of renewable heat **used** by farming enterprises.

Plastic, Transport, & Water



Whole Farm			
	Waste plastic (kg)	External haulage (km)	Water use (l)
Whole Farm	14	14	14

Livestock			
	Waste plastic (kg)	External haulage (km)	Water use (l)
Beef - Beef Group one	2	2	2
Sheep - Sheep Group one	2	2	2

Grazing and Forage			
	Waste plastic (kg)	External haulage (km)	Water use (l)
Pasture grazing	2	2	2

Enter the total quantity (kg) of plastic waste produced.

Only enter distance travelled (kilometres) using external haulage if the farm uses external transport for internal activities (such as using a haulage company to take livestock to grass lets or taking harvested crops to storage).

If available, enter the quantity (litres) of water used. Agrecalc does not use this data to calculate emissions, but this input helps create a holistic representation of resources used by the farm.

Water, transport, and waste can be manually allocated to individual enterprise and/or crops. Otherwise, Agrecalc will distribute these inputs evenly across farm enterprises.

Results

The Agrecalc results portal includes the following sub-sections:

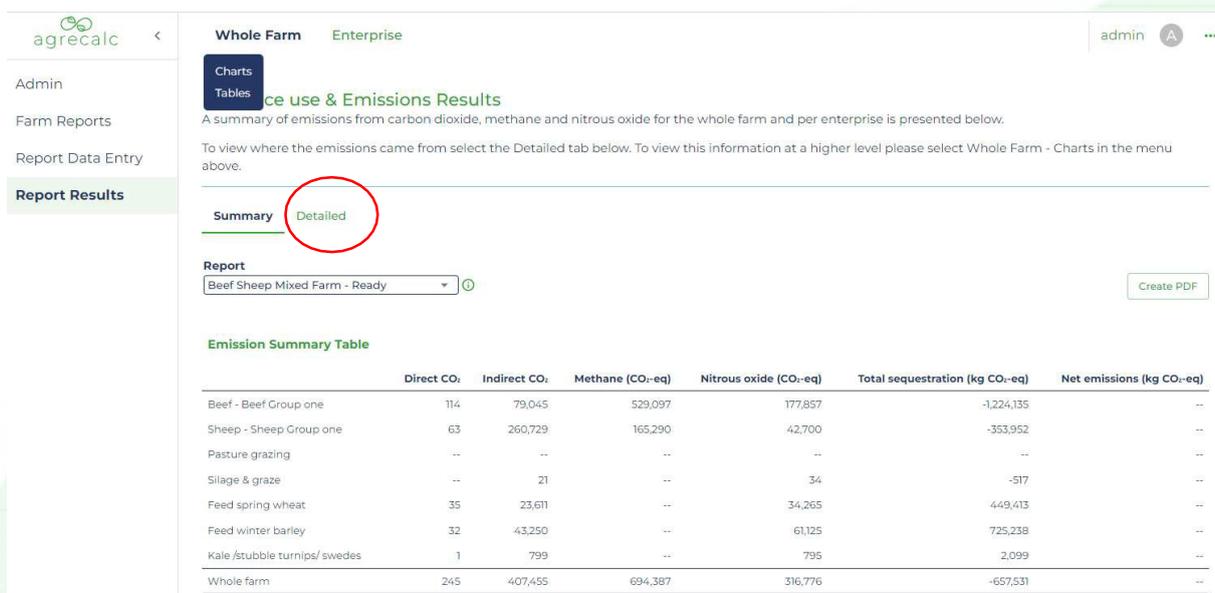
1. Whole farm results
 - a. Emission and sequestration tables
 - b. Charts
2. Enterprise-level results
 - a. Quick-glance emissions and KPI tables
 - b. Charts

Whole farm tables

Summary tables show emissions of carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O) for the whole farm and per enterprise. The tables separate CO₂ emissions into emissions from electricity use and burning fuel on the farm (scope 1 and 2), and emissions from the production of farm inputs and disposal of waste (scope 3). Whole farm results tables also include carbon sequestration from hedges, soils, and woodlands.

Emissions of all gases are expressed as CO₂ equivalent (CO₂-eq) emissions, calculated using conversion factors published with the IPCC AR4.

To view a detailed breakdown of emissions by source, select “View detailed results.”



The screenshot shows the Agrecalc interface with a sidebar on the left containing 'Admin', 'Farm Reports', 'Report Data Entry', and 'Report Results'. The main content area is titled 'Whole Farm Enterprise' and 'Electricity use & Emissions Results'. A 'Detailed' tab is circled in red. Below the tabs, there is a 'Report' dropdown menu set to 'Beef Sheep Mixed Farm - Ready' and a 'Create PDF' button. The 'Emission Summary Table' is displayed with the following data:

	Direct CO ₂	Indirect CO ₂	Methane (CO ₂ -eq)	Nitrous oxide (CO ₂ -eq)	Total sequestration (kg CO ₂ -eq)	Net emissions (kg CO ₂ -eq)
Beef - Beef Group one	114	79,045	529,097	177,857	-1,224,135	--
Sheep - Sheep Group one	63	260,729	165,290	42,700	-353,952	--
Pasture grazing	--	--	--	--	--	--
Silage & graze	--	21	--	34	-517	--
Feed spring wheat	35	23,611	--	34,265	449,413	--
Feed winter barley	32	43,250	--	61,125	725,238	--
Kale /stubble turnips/ swedes	1	799	--	795	2,099	--
Whole farm	245	407,455	694,387	316,776	-657,531	--

The tables below detail and explain each emissions source category.

Carbon Dioxide: Direct Emissions	
Diesel	Emissions from burning red and white diesel on-farm including contractors use
Electricity	Emissions linked to the production of electricity used on the farm
Other fuels	Emissions from burning fuels other than diesel on the farm
Renewable heat and electricity	Emissions from the production of renewable energy used on farm. Direct emissions from renewable electricity are zero. Direct emissions from renewable heat are related to burning.

Carbon Dioxide: Indirect Emissions	
Fertiliser	Emissions linked to the manufacture of artificial fertiliser
Lime	Emissions linked to the manufacture and application of lime
Pesticides	Emissions linked to the production of pesticides, herbicides, and fungicides
Bedding	Emissions from growing, processing and transport of purchased feeds before arrival at the farm
Feed	Emissions from growing, processing and transport of purchased bedding before arrival at the farm
Energy	Scope 3 emissions from fuel extraction, transport, infrastructure, and transmission
Carcass disposal	Emissions from deadstock disposal based on livestock mortality
Transport	Emissions from fuel used by external hauliers
Biochar	Emissions from the production of biochar from fresh organic material

Methane	
Feed digestion	Methane emitted during feed digestion in ruminants and pigs
Manure management	Methane emissions from manure storage and manure deposition on grazing land

Nitrous oxide	
Imported fertilisers and manures	Emissions from the application of fertilisers and imported manures, including indirect emissions from leaching and runoff
Grazing, manure spreading, manure management	Emissions from manure storage, manure deposition on grazing land, and application of home-produced manures, including indirect emissions from leaching and runoff
Crop residues	Nitrous oxide released during the decomposition of crop and grassland residues

Total Emissions	
Gross emissions from farming	All direct and indirect emissions produced by the farm
Net emissions from farming	All emissions produced by the farm, minus sequestration from hedges, biochar, and soils
Net emissions from land use	Net emissions from farming minus land use sequestration from woodlands

The product emissions table displays emissions intensities (emissions per unit of product) of all products sold from the farm.

The foot of the page includes practical measures to which may help improve efficiency and reduce emissions.

Enterprise tables

Enterprise tables include a breakdown of the product’s carbon footprint across major emission sources. In the “Comparison” column, average emissions from each source in the comparison data shows for reference.

The “Opportunity Level” column displays the potential for improvement based on emissions in the comparison data. If enterprise emissions are lower than the comparison, opportunity level will show as “Low.” If emissions are up to and including 25% higher, the opportunity level will be “Medium.” If emissions are over 25% higher than those of the comparison, opportunity level will show as “High”.



Enterprise Results
To see this information at a higher level please select Enterprise - Charts in the menu above.

Report: Beef Sheep Mixed Farm - Ready
Enterprise: Beef - Beef Group one
Compare To: Select report...
 Select report...
 Farms with same enterprise
 Farms in this sector
 Top 25 percent of farms with same enterprise
 Bottom 25 percent of farms with same enterprise

Enterprise Type: Spring calving lowland suckler cows **System**: Breeder/finisher

Quick glance emissions

Enterprise Source	kg CO ₂ -eq / kg product	Compared To	Opportunity Level
Enteric fermentation	13.15	--	--
Manure Management	3.7	--	--
Fertiliser	3.53	--	--
Purchased Feed	0.18	--	--
Purchased Bedding	0.03	--	--

The table below details and explains each emissions source category.

Quick Glance Emissions: Livestock	
Enteric fermentation	Methane emitted during feed digestion in ruminants and pigs
Manure management	Methane and nitrous oxide emissions from manure storage, manure deposition on grazing land, and application of home-produced manures
Fertiliser	Emissions from the production and application of fertilisers and imported manures
Purchased feed	Emissions from growing, processing and transport of purchased feeds before arrival at the farm
Purchased bedding	Emissions from growing, processing and transport of purchased bedding before arrival at the farm

Other	Emissions from the production and application of lime, decomposition of crop and grassland residues, deadstock and plastic disposal, and fuel use by external hauliers
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Quick Glance Emissions: Crops and Forages	
--	--

Crop residues	Nitrous oxide released during the decomposition of crop and grassland residues
Lime	Emissions from the manufacture and transport of lime and from its application to soils on the farm
Pesticides	Emissions from the manufacture of pesticides
Fertiliser and manure	Emissions from the production and application of fertilisers and imported or home-produced manures
Other	Emissions from plastic disposal and fuel use by external hauliers

Quick Glance Emissions: All Enterprises	
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Fuel	Emissions from on-farm burning of all fuels and emissions from fuel extraction, processing, and transport before arrival at the farm
Electricity	Emissions linked to the production of electricity used on farm

The “Physical Performance” table provides insight on enterprise resource efficiency. This table includes various performance indicators for the farm’s enterprise and the benchmark comparison. These sector-specific KPIs were developed in partnership with agricultural industry specialists at SAC Consulting. They provide useful information on the technical performance and efficiency of the enterprise and can also help to explain why emissions are higher or lower than benchmarking values.

Charts

Charts in the enterprise and whole farm results sections help visualise emissions results. Charts include breakdown of emissions by gas and by source for the whole farm and per enterprise. This visual representation of farm emissions can aid interpretation and mitigation planning.

Boxes at the top pull out key pieces of information from the report.

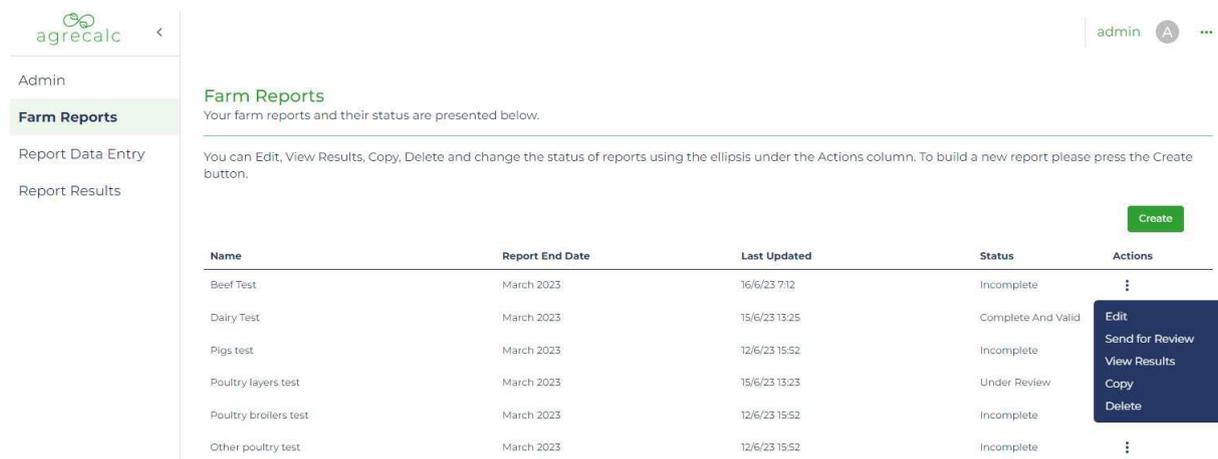
Drop down menus can be used to easily navigate between reports or change the enterprise or comparison data in the enterprise report.



Report management

From “Farm Reports” on the left-hand menu, report management actions available in Agrecalc include:

1. **Copy:** Copy will allow you to make a duplicate of a report for a new reporting year or scenario testing. To copy a report, select ‘Copy Scenario,’ rename the report, then select ‘Copy.’ The new scenario/copied report will be created in the farm home page. Select the report and edit as required.
2. **Delete report:** Reports can be deleted by selecting the relevant icon on the farm home page. Once a report has been deleted, it cannot be retrieved.
3. **Edit:** Link to report data entry
4. **View Results:** Link to whole farm charts page
5. **Send for Review:** See information below



The screenshot shows the 'Farm Reports' section of the Agrecalc interface. It includes a sidebar with navigation options like 'Admin', 'Farm Reports', 'Report Data Entry', and 'Report Results'. The main content area displays a table of reports with columns for Name, Report End Date, Last Updated, Status, and Actions. A 'Create' button is visible in the top right. A dropdown menu is open over the 'Actions' column, showing options: Edit, Send for Review, View Results, Copy, and Delete.

Name	Report End Date	Last Updated	Status	Actions
Beef Test	March 2023	16/6/23 7:12	Incomplete	⋮
Dairy Test	March 2023	15/6/23 13:25	Complete And Valid	Edit
Pigs test	March 2023	12/6/23 15:52	Incomplete	Send for Review
Poultry layers test	March 2023	15/6/23 13:23	Under Review	View Results
Poultry broilers test	March 2023	12/6/23 15:52	Incomplete	Copy
Other poultry test	March 2023	12/6/23 15:52	Incomplete	Delete
				⋮

Report completion and data validation

Once all data has been entered and results viewed, a report can be marked as complete. To complete the report, select ‘Send for Review’ on the farm home page. Once submitted, you will be unable to edit the input data. The data will be checked and validated, after which you can prepare your report. If you need to edit the data, use the ‘Contact Us’ facility and provide details of the farm name and report and why you require to edit the data.

Validated data is included in benchmarking and will contribute to the enterprise ‘Comparisons’ used in the enterprise reports.

Understanding your Results

Total emissions

Total emissions per source produced from a farm and its enterprises are useful to highlight what activities or inputs generate the highest emissions. For each enterprise, the expected main sources of emissions are:

- Beef, sheep, & dairy: enteric fermentation (CH₄).
- Pigs: manure management (CH₄) and purchased feed (CO₂).
- Poultry: purchased feed (CO₂).
- Arable crops: fertiliser (N₂O and CO₂).
- Potatoes: fertiliser (N₂O and CO₂) and electricity (CO₂).

Emissions from pesticides, external transport and waste represent a small percentage of total emissions from farming.

Larger farms tend to produce higher total emissions, but this does not mean large farms are inefficient. When assessing climate impacts, we must consider farm output in addition to total emissions. For this reason, we express emissions as carbon footprints (CO₂-eq per unit of output).

Emissions intensity (carbon footprint)

Emissions intensities (carbon footprints; kg CO₂-eq /kg output) help assess the production efficiency of farm enterprises.

Low carbon footprints for farm products tend to indicate efficient use of farm resources i.e., efficient process of turning inputs into saleable outputs.

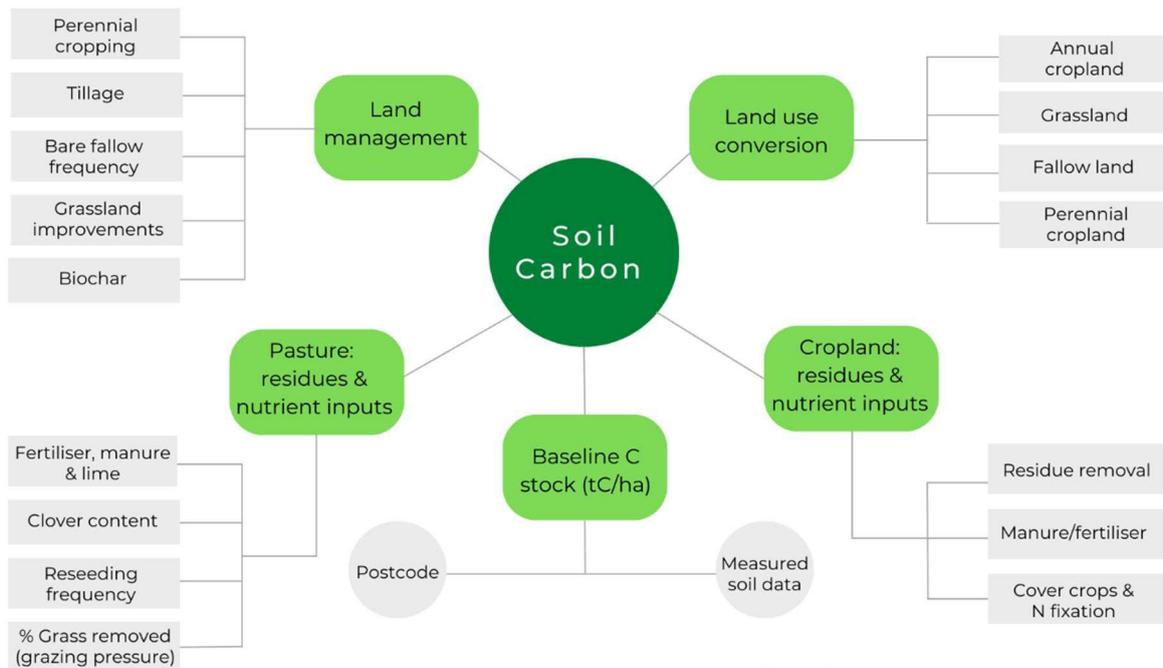
Enterprise comparisons

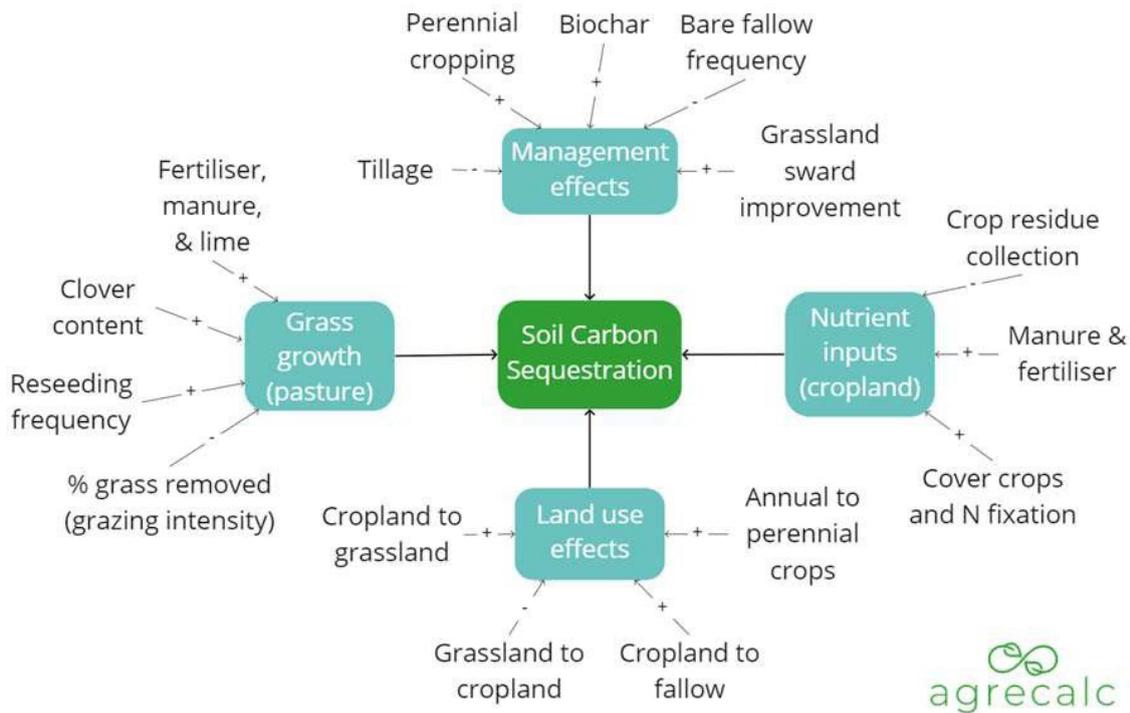
Comparing emission intensities to those of similar enterprises highlights areas of opportunity for climate action. If emissions are higher than average, improvement might be possible at a low cost. If emissions are lower than average, the enterprise is usually already efficient and further improvements might come at a cost to the business.

Soil carbon

The map below shows the different areas of input data in Agrecalc that impact soil carbon sequestration estimates. The model currently contains all parameters considered by the IPCC tier I model. This model ignores certain practices which may impact soil carbon due to limited scientific evidence.

Soil carbon will increase with higher inputs of crop residues, grassland residues, biochar, and manure. Perennial crops, cover crops, and nitrogen fixing crops are also beneficial for soil carbon sequestration. Land use conversion also impacts soil carbon. For example, conversion from grassland to annual cropland is associated with a considerable decrease in soil carbon storage.





Cropland: Cropland soils are often a net carbon source, releasing more carbon into the atmosphere than they store each year. This is often related to the high offtake of carbon due to crop harvests, as well as periods of bare soil between crops. Practices to increase cropland soil carbon include cover cropping, companion cropping, and residue incorporation. Whilst conservation tillage is useful for maintaining natural soil structure and processes, the impact of eliminating tillage on overall soil carbon stocks is low compared to other factors.

Grassland: For grassland, land management practices to increase grass growth can increase soil carbon. Grazing intensity is also central to determining grassland soil carbon stocks. Be sure to consider grazing intensity in your “Percentage crop removed” input in the “Crop production & use” input section, as described in the guidance for inputting data.

Interpreting your Results

Questions to guide interpretation

Focus on the enterprise tables and charts when interpreting the results from Agrecalc. The following questions can act as a starting point:

1. How do the total emissions per kg product and emissions per source compare to comparable enterprises or crops? If they are lower or higher, and why might this be?
2. If the results are for a follow up year, how do emissions per kg output and emissions per source compare to year 1?
3. How does the physical performance of the enterprise or crops compare? If they are lower or higher why might this be?
4. Is the farm using less inputs (such as kg fertiliser per ha, kWh electricity per ton, litres red diesel per ha, kg purchased feed per cow, etc.) than comparable enterprises?
5. If they are using less inputs, is this due to a particular management practice (such as soil analysis and nutrient budgeting, use of renewables, etc.)?
6. If emissions are high or performance is below average, is it potentially because they are not carrying out a particular action (such as poor grassland utilisation, not doing silage analysis and rations, calving at an older age, higher mortality, lower yields, etc.)?
7. Is the farm producing more output (higher crop yields, fewer mortalities, higher calving %, higher live-weight gains, etc.) than comparable enterprises or previous years?
8. Is the farm producing less output (lower crop yields, higher mortalities, lower calving %, lower live-weight gains, etc.) leading to lower sales than comparable enterprises or previous years?

Further interpretation guidance

In addition to improving technical performance by decreasing inputs or increasing output, other reasons why emissions might be higher or lower than comparable enterprises or previous years include:

1. **Enteric fermentation:** Average liveweight and herd/flock size significantly influence enteric emissions. Changing breeds to lighter cows will reduce total emissions from enteric fermentation, but the sale weight of calves will be lower so emissions per kg of output may not change. Better livestock performance is associated with lower emissions per kg output from this source. Note: changing feeds within Agrecalc will not change emissions from enteric fermentation unless data in the feed ration tab is also changed.
2. **Manure management:** Emissions from manure management will change depending on the farm manure management system and time spent at pasture, hill, and housing. Slurry, slats, and deep bedding systems result in higher emissions than FYM systems. If cattle spend lots of time on hill ground rather than in byre, manure management emissions will also be slightly higher.
3. **Livestock purchases & sales:** If many replacements have been recently purchased (expanding the herd or flock), these animals may not have yet produced saleable stock. The net weight sold will be lower and emissions per kg output will be higher than comparable enterprises or might even be negative (if purchases outweigh sales). In contrast, if the business had a dispersal, higher sales would lower emissions per kg output.
4. **Finished vs store animals:** If the farm changes policy from selling finished animals to store, animals sold will be lighter which will result in a higher carbon footprint (kg CO₂-eq/kg output) due to lower total output.
5. **Fertiliser:** Agrecalc livestock reports do not include fertiliser performance indicators. Check the inputs for how much N, P and K is applied per ha and compare to typical values for the farm type (see SAC Farm Management Handbook). Organic farms will have lower emissions from fertiliser than comparable non-organic farms.

6. **Purchased feed:** kg per cow, ewe or head may be lower than the average of comparable enterprises but emissions from purchased feed might show as being higher. This could be due to the actual feeds fed having higher emissions than the feeds fed to comparable enterprises (by-products tend to have lower emissions), or output sold is less. Note: the same embedded emission factor is used regardless of where the feed is transported to.
7. **Purchased bedding:** Bedding emissions can be higher if the farm does not produce any straw or produces limited straw compared to comparable enterprises. Note: Agrecalc uses the same embedded emission factor regardless of where imported bedding is from.
8. **Fuel and electricity:** Farms rarely monitor energy use at the enterprise level. Agrecalc makes assumptions to allocate whole farm energy use across enterprises, making it difficult to assess how efficient the farm is in using these inputs. Information about the farm set up and practices can help identify actions.
9. **Other emissions:** The category for other emissions in livestock reports includes crop residues, lime, external transport, and waste. High emissions in this category are often due to lime application.
10. **Pesticides:** emissions will lower if output is higher. Though emissions from pesticides may appear as a medium opportunity for improvement, they are typically low (less than 1% of the total emissions). Farmers using agronomist advice are unlikely to apply more than required. Mitigation efforts should focus on larger sources, such as fertiliser, fuel, and electricity. If it is known that the farm is applying more pesticides than required, reducing pesticide use will lead to financial savings.
11. **Crop residues:** straw incorporation can increase emissions from crop residues. However, the benefits of increasing soil organic matter can offset this increase and should deliver crop yield benefits as well.

Mitigation actions

Focus first on reducing emissions in areas of your farm business that contribute to the greatest proportion of your total emissions. Information and advice on practical mitigation measures that could be implemented on a farm can be found via the following websites:

[Farming for a Better Climate](#)

[Scottish Farm Advisory Service - Climate Change resources](#)

[Agricology website - Environment, Wildlife & Climate resources](#)

[SAC's Farm Management Handbook - Carbon chapter \(page 329\)](#)

For a more scientific evidence review of on-farm mitigation actions to meet climate targets, the Marginal Abatement Cost Curves produced by SRUC for Defra and the CCC can be found online. The [2008](#), [2010](#), [2015](#) and [2020](#) reports cover various mitigation options.

If you are interested in having a tailored mitigation plan prepared by an SAC consultant, please contact us at info@agrecalc.com