



HOLOSIE SOFTWARE

A Model for Decision-making in Agri-environmental Systems (MODASYS)



A Quick User Guide

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1 INTRODUCTION

HOLOS-IE (V4.5) is a systems-based digital platform designed to support agricultural land use planning, decision-making for climate change mitigation and adaptation, as well as national inventory reporting. Developed through Research Ireland (Formerly Science Foundation Ireland)'s National Challenge Fund (Future Digital Challenge) in collaboration with ReLive project funded by Transnational ERA-NET (EU) through the Department of Agriculture, Food and the Marine, Ireland, HOLOS-IE addresses a critical gap as a sustainability tool for Irish agricultural system by providing an integrated approach at land parcel through farm to national scale carbon accounting and environmental impact assessment.

The model enables farmers, advisors, policymakers, and researchers to evaluate existing agricultural practices and explore alternative management strategies that sustain productivity while reducing agri-environmental footprint, leading to achieving net-zero emissions. By integrating multiple farm components (e.g., crops, grasses, livestock, agroforestry, and farm infrastructure) and their subcomponents/types, the model provides comprehensive assessments of greenhouse gas (GHG) emissions, carbon sequestration potential, changes in soil organic carbon density, soil health indices, and the overall total and net carbon balance.

The HOLOS-IE model is evolving into HOLOSEU, a European Union version of the digital platform. This development is supported through the ICT-AGRI-FOOD initiative, with national co-funding commencing on January 1, 2025. The HOLOSEU initiative aims to extend the capabilities of the Irish HOLOS-IE model to a broader European context, enabling harmonised assessment and comparison of agricultural GHG emissions and mitigation strategies across EU member states and beyond. In addition, the project will include modules on agrobiodiversity and the bioeconomy, integrating circularity concepts at a limited scale to explore resource efficiency, nutrient cycling, and sustainable production systems within European agriculture. The modelling work will continue, with sustained efforts dedicated to refinement and validation, until a fully functional software system integrating all essential components of an agricultural systems model is achieved.

N.B.: The HOLOS-IE platform is currently in its development phase, i.e. mainly considered as a research and educational tool. The estimates and projections provided by the platform are approximate and subject to refinement as new scientific findings emerge and the platform undergoes continued calibration and validation. At this stage, University College Dublin (UCD) and collaborating institutions make no warranty regarding the platform's reliability for operational farm management or policy compliance purposes beyond research exploration and educational applications. Users should consult with qualified agricultural advisors for farm-level decision-making.

2 GETTING STARTED

2.1 Software

HOLOS-IE Software can be downloaded from www.ucd.ie/holos-ie and the HOLOSEU project website (www.holoseu.net), or receive the link by contacting the Team Lead and using it for free.

2.2 Installation

- Run the **setup** installer (Figure 1.1)
- Launch **HOLOSIE** from the Windows start menu (search "HOLOSIE")



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- Once the installation is complete, HOLOSIE should begin immediately, greeting you with a disclaimer shown below.

Installer (Note: Temporarily turn off Anti-Virus before installation):

https://drive.google.com/file/d/11ysrVtnC3etat1M4jkeEYOL9wCjemG5V/view?usp=drive_lin

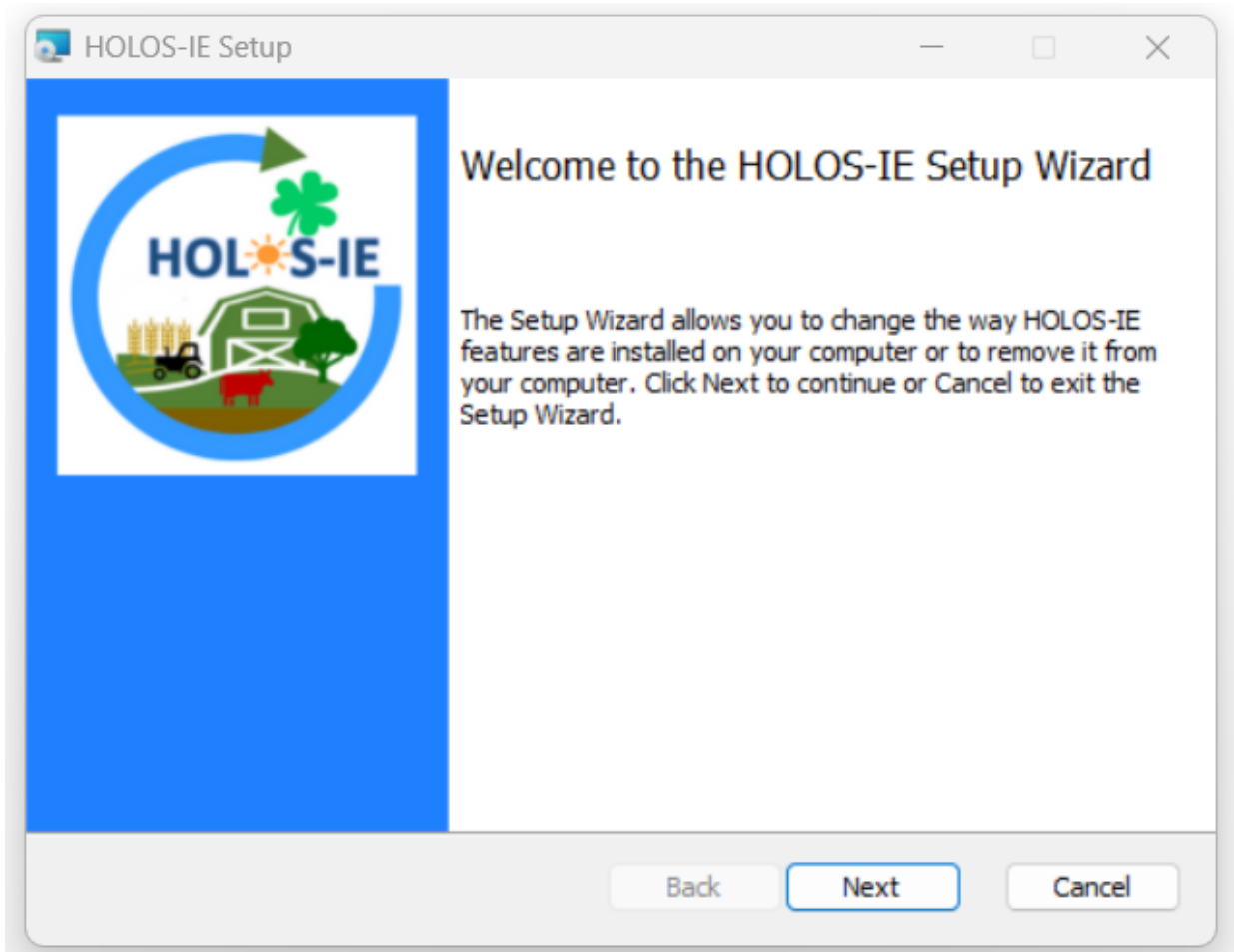


Figure 1.1: The install screen for HOLOSIE 4.5



HOLOS-IE

Select your language

English/Anglais

Version 4.5 (September 18 2025)

HOLOS-IE - a tool to estimate and reduce greenhouse gas emissions from farms

To be kept informed about future versions, please send your contact information (including email address) to ibrahim.khalil1@ucd.ie

Disclaimer

Important Notices

This software (HOLOS-IE, V4.5, leading to HOLOSEU) has been primarily designed to encourage various stakeholders, including farmers, to explore existing and alternative methods for improving production, mitigating greenhouse gas emissions, and addressing environmental pollution. Additionally, it facilitates the accounting of carbon balance and cost-benefit analysis at a farm-to-national level. The provided estimates are approximate and may change significantly as new scientific findings emerge. University College Dublin (UCD) and the collaborative institutes do not warrant the reliability of this tool for uses at this stage other than research and education, specifically for exploring practices related to farm configuration.

Copyright/Permission to Reproduce

The content in the HOLOS-IE software was adapted from Holos V 4.0, originally developed by Agriculture and Agri-Food Canada. This adaptation was undertaken with the aim of creating an Irish version, leading to EU application, for use in European agricultural farms, including agroforestry.

OK





Figure 1.2: HOLOSIE 4.5

3 CREATING YOUR FIRST FARM

3.1 Create a new farm or open or import an existing farm from the selection screen.

Would you like to open an existing farm or create a new one?

A

New

Open

Import

Figure 1.2: Create a new farm or open an existing farm selection screen or import from a file.
A: Click “New” to create a new farm.

3.2 Please enter a name for the farm you would like to create and add any additional comments in the “Comments” section and click “OK” button to proceed.

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For further information and collaboration, please contact Dr. Ibrahim Khalil, School of Agriculture and Food Science, University College Dublin, Dublin 04, Ireland. Email: ibrahim.khalil1@ucd.ie



Enter a name for this new farm

Name

Comments

OK

Figure 1.3: Enter a name for your farm and any comments.

3.3 Currently, we have only one Unit option to select i.e. “Metric” from the drop-down list in the next screen, and we have a plan to add "Imperial" measurement in the future. After choosing the unit of measurement, click “Next” button to proceed (Figure 2.3).

HOLOSIE Farm

Select units of measurement

Metric

Next



 

Figure 1.4: Unit of Measurement Selection Screen.



- 3.4 Select your county (mainly applicable for Irish users but not restricted to others) from the drop-down list and click “Next” on the bottom of the screen.

Select a county

Carlow▼

Figure 1.5: County Selection Screen.

4. SELECTING FARM LOCATION FOR SOIL AND CLIMATE DATA

4.1. Use of Default Soil and Climate Data:

On your screen, you will now see many polygon-shaped regions on the map for the County you selected. Each specific region is shaded in red. You can adjust the magnification (i.e. zoom in/out) of the map by using your mouse wheel or by selecting the magnifying sign near the bottom of the screen. Please select the location of your land parcel/farm by right-clicking on one of the regions (see Figure 2.1). The model framework will automatically download the soil data integrated with the map and climate data directly from NASA for your selected location/area. A progress bar will display the progress in downloading the data, and after a few seconds, the location, soil, and climate details will appear on the right, and this data will be auto-transferred (API) to the main platform for use and running the model. However, the platform has a provision to use its own soil and climate data, illustrated below. In addition to the Irish users, this approach should commonly be used by users outside of Ireland.

4.2 Using Your Own Soil and Climate Data

If you intend to run the model using inputs and activity data outside of Ireland, you are advised to use your own soil and climate data to better represent your site characteristics. To begin with, simply select any county in Ireland and let the system load the default data. Once this is done, go to the farm location page where you can upload or enter your own climate data (see Figure 2.1). How to prepare the soil and climate data is stated below:

- After completing that step, proceed to the component page and replace the default soil data with your own (see **Figure 3.7.1**).



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- Users from any country can fully customize their farm setup using their local soil and climate information.

Farm Location

Select the location of your farm by right-clicking on a region (use mouse wheel to zoom in or out)

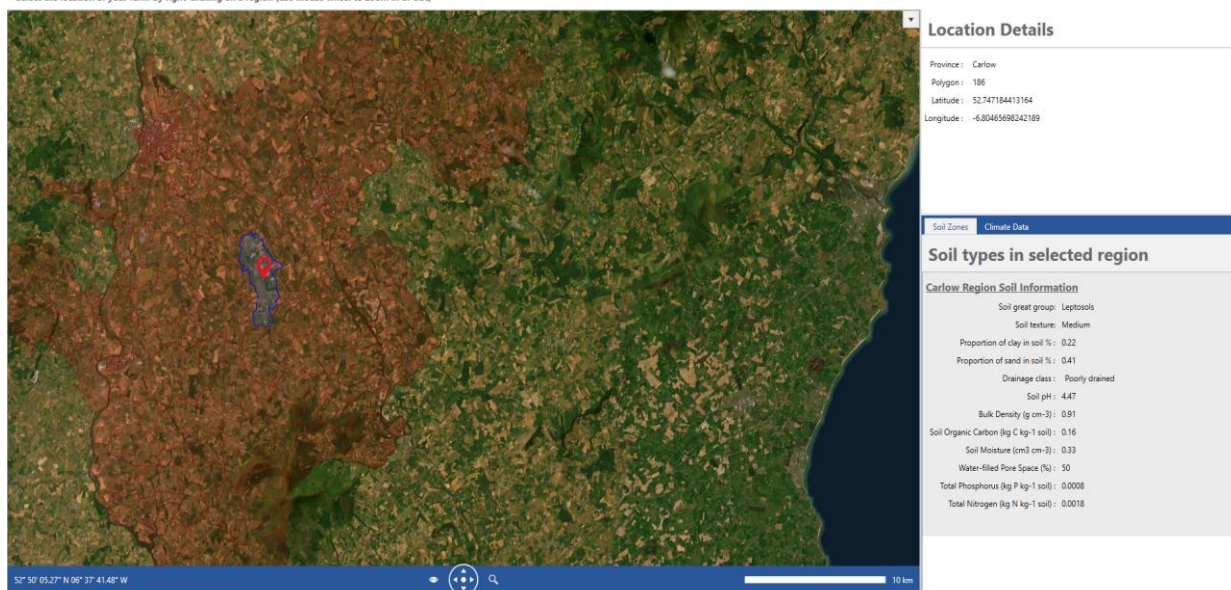


Figure 2.1: Hovering the mouse cursor over the regions on the map will display a tool tip near your mouse pointer. The details of the soil and climate details for your chosen location will be shown on the right.

The polygon shape region you selected has access to climate data. HOLOSIE will load the location-specific climate data by default should you choose to ignore this tab. If you would like to load custom data, you can load your own data from a file with “.csv” extension. The platform will confirm your custom data is loaded.

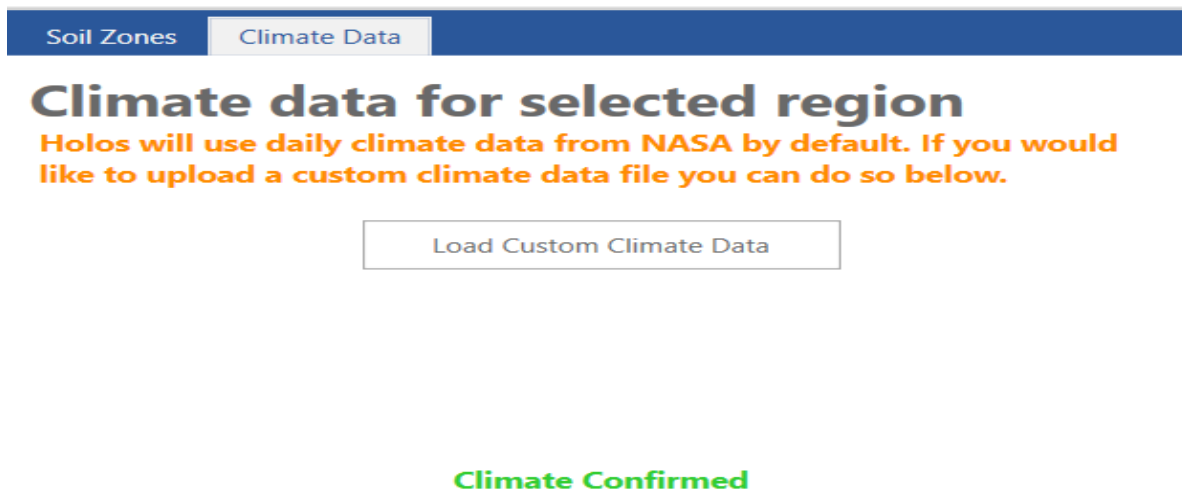


Figure 2.2: Climate Data Tab. (A) Load your custom climate data file by clicking the button. (B) A loading bar will show up while the data is being loaded, and (C) If successful, you'll see a confirmation message.



When you are finished selecting your desired location, click “Next”.

4.3 Formatting the Custom Climate Data File

To import your own climate data into HOLOSIE, the file must be a Comma Separated Values (CSV) and have the “.csv” file extension. The file must also contain the following columns:

- Year – The year the climate data is from.
- Julian day – The day based on the Julian Calendar.
- Mean daily air temperature – The mean temperature of that day.
- Mean daily precipitation – The mean precipitation of that day.
- Mean daily potential evapotranspiration (PET) – The mean PET of that day.

	A	B	C	D	E
1	Year	Julian day	Mean Daily Air Temperature	Mean Daily Precipitation	Mean Daily PET
2	1912	1	-15.6	0	0
3	1912	2	-17.5	2	0
4	1912	3	-17.2	0	0

Figure 2.3: custom climate data file format.

5. Component Selection Procedures

5.1 Component Selection

With HOLOSIE, you can accommodate mono to mixed farming systems, from land parcel to landscape (and even national) scale through the selection of each component separately that is available under the “All Components” section. Each component is categorized by its type and includes the following: site characteristics, land use and management (crops, grasses, livestock, agroforestry, and infrastructure, which is under further improvement).

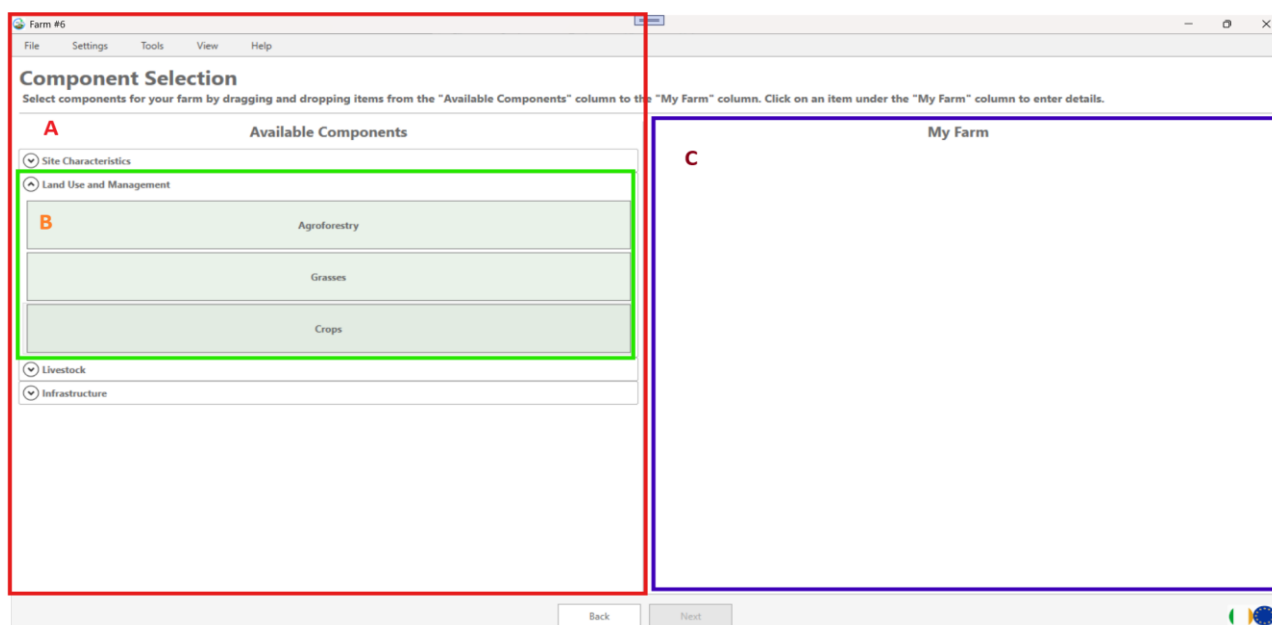


Figure 3.1 - Component Selection, (A) All the possible Components, separated by component categories, that can be added to the Farm; (B) A single component category and (C) All the components that have been added to the Farm.



5.2 Adding a Component to Your Farm

- To add a component to your farm, you must double-click or drag a component from the **“Available Components”** list into **“My Farm.”**
- As a result, the component will appear under the **“My Farm”** tab, and the inputs required for the selected component/subcomponent will be displayed in the section to the right of **“My Components.”** The components are grouped into four main categories: **Site Characteristics** (e.g. Farm component), **Land Use and Management** (e.g. Crops, and Grass components), **Livestock** (e.g., Dairy, Beef, Sheep, and other animal components), **Agroforestry** (trees within a farm) and **Infrastructure** (e.g. Anaerobic Digestion).
- To switch between selected farm components, simply click on the component you want to view, and the programme will automatically display that component’s information.
- For a farm moving from **mono-systems to mixed systems**, inputs can be added across multiple categories and subcomponents, allowing flexibility to represent more complex farm structures and run the model once to get results for both individual and mixed systems. See **Figure 3.2** below for a visual representation.

The screenshot shows the 'Component Selection' window in the HOLOSIE software. It has a menu bar (File, Settings, Tools, View, Help) and a title bar (Farm #6). The main area is titled 'Component Selection' and contains instructions: 'Select components for your farm by dragging and dropping items from the "Available Components" column to the "My Farm" column. Click on an item under the "My Farm" column to enter details.'

The interface is divided into three columns:

- Column A (Available Components):** A list of components grouped by category. The categories are Site Characteristics, Land Use and Management, Livestock, and Infrastructure. Under Land Use and Management, there are sub-categories: Agroforestry, Grasses, and Crops.
- Column B (My Farm):** A list of components that have been added to the farm. In this case, 'Crop #1' is listed under the 'Land Use and Management' category.
- Column C (Crop #1 details):** A form for entering details for the selected component. It includes fields for 'Start year' (1985), 'End year' (2025), and 'Total area of this field' (1 ha). Below these are tabs for 'General', 'Fertilizer', 'Manure', 'Winter & Cover Crops', 'Soil', 'Residue', and 'Economics'. The 'General' tab is active, showing 'General Properties' such as 'Yield (wet weight)', 'Yield (dry weight)', 'Moisture content of crop', 'Tillage', 'Harvest method', 'Amount of irrigation', and 'Number of pesticide passes'.

Figure 3.2: Adding a Component; (A) A list of all available components that can be added to the farm, separated by component category. (B) A list of components that have been added to the farm, and (C) the data associated with the selected component.

5.3 Crops/Grasses Component

- A crops component contains details like the crop sown, land area, and tillage regime (see figure 6.4). Crops are categorized by their growth type (i.e. Annual, Perennial, etc.)
- To enter specific details about the field, you need to access the Tab View containing: General, Manure, and Residue properties for the field/farm.
- To view additional information, Tab View, click “Yes” beside “Show Additional Information”.



Crop #1

Step 1: Starting with one field in the rotation, enter the start and end year of this rotation and the size of the field

Start year :	1985	▲▼
End year :	2025	▲▼
Total area of this field :	100	▲▼ (ha)

Step 2: Click the 'Add Crop' button to add crops to this rotation. Keep adding crops until the first phase of this rotation has been listed.

Add Crop

	Year ▼	Crop ▼	Winter/Cover/Undersown Crop ▼
>	2025	Wheat/Winter Wheat	Winter Wheat

Figure 3.3: Crop Step 1. Define name, area, crop, and tillage type for your field component.

The crop component contains different tabs for each aspect of the component.

Tab View

General Properties

Contains information like yield, harvest method, fertilizer application rate etc.

General	Fertilizer	Manure	Residue	Economics
<h3>General Properties</h3> <p>Amount of irrigation, pesticide usage, and yield for the selected crop can be entered on this tab. Harvested yield can be entered as either wet weight or dry weight. Additional information can be entered by clicking on the 'Show Additional Information' button.</p> <div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%;"> <p>Yield (wet weight) : 2,672.7 ▲▼ (kg ha⁻¹)</p> <p>Yield (dry weight) : 2,352.0 ▲▼ (kg DM ha⁻¹)</p> <p>Moisture content of crop : 12 ▲▼ (%)</p> </div> <div style="width: 50%;"> <p>Harvest method : Cash crop ▼</p> <p>Amount of irrigation : 0 ▲▼ (mm)</p> <p>Number of pesticide passes : 0 ▲▼</p> </div> </div>				

Figure 3.4: General tab for a field component.



Fertilizer

Allows the user to enter fertilizer applications including information like Season of Application, Blend Type and Application Rate to the field.

General

Fertilizer

Manure

Residue

Economics

Wheat - Fertilizer Management

Multiple fertilizer applications can be made to this field throughout the year. To add a fertilizer application, click 'Add Fertilizer Application' to specify the details.

Add Fertilizer Application

	Season of application	Blend	Application rate (kg ha ⁻¹)	
>	Spring	Urea	184.5	X

Figure 3.5: Fertilizer tab for a field component. This shows the fertilizer application table for a field

Manure

Allows the user to add a manure application to the field. This application includes information like Date of Application, Manure Type used, Origin of Manure and Amount of Manure applied.

General

Fertilizer

Manure

Residue

Economics

Wheat - Manure Management

Multiple applications of manure can be made to this field throughout the year. To add a new manure application, click 'Add Manure Application' to specify the details.

Add Manure Application

	Date	Manure type	Origin of manure	Manure handling system	Application method	Amount of manure (kg ha ⁻¹)	
>	01-27-2022	Dairy cattle	Not selected	Pasture	Solid spread (untilled land)	0.00	X

Figure 3.6: Manure tab for a field component. This shows the manure application table for a field.

Soil

The soil tab allows the user to change the soil type for the specific field. The table shows the list of all soil types available for the selected polygon. If a soil type is to be set on the specific field, select one from the list. To customize the soil, click "Custom Mode" and edit the individual soil properties for the field only.



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Step 3: Adjust the details of wheat/winter wheat. These adjustments will be copied to the other fields in the rotation when wheat/winter wheat was grown. Additional Information :

GeneralFertilizerManureWinter & Cover CropsSoilResidueEconomics

Soil Management

The soil tab can be used to change the soil type for the specific field. The table shows the list of all soil types available for the selected polygon. If a soil type is to be set on the specific field, select one from the list. To customize the soil, click 'Custom Mode' and edit individual soil properties for the field only.

Full Text Search

	Proportion of clay in soil	Proportion of sand in soil	Soil pH	Drainage class
>	0.17	0.48	6.26	Poorly

Basic ModeCustom Mode

Soil Properties

Soil texture :	Medium	
Top layer thickness :	300	(mm)
Bulk density :	1.04	
Proportion of clay in soil :	0.17	
Proportion of sand in soil :	0.48	
Percentage of soil organic carbon :	0.1	
Soil pH :	6.3	
Soil cation exchange capacity :	6.5	(mEq 100g ⁻¹)
Soil Greater Group :	Lixisols	
Drainage class :	Poorly drained	
Total phosphorus :	0.0014	
Total nitrogen :	0.0009	
Soil Moisture :	0.31	(cm ³ cm ⁻³)

Figure 3.7.1: Soil tab for a crops component.

Residue

This section lets the user specify how much carbon and nitrogen are in your crops. They can also specify how much of the crop remains above or below the ground after harvest.

GeneralFertilizerManureResidueEconomics

Wheat - Residue

The residue tab can be used to change the default carbon allocation coefficients for the main crop. Additional details such as nitrogen concentrations and percentages of the plant returned to soil can be entered here. Default values have been provided that the model will use unless custom values are entered here

Carbon coefficient of product :	0.219		Nitrogen content in product :	0.0279	(kg N kg ⁻¹)
Carbon coefficient of straw :	0.551		Nitrogen content in straw :	0.0086	(kg N kg ⁻¹)
Carbon coefficient of roots :	0.136		Nitrogen content in roots :	0.0134	(kg N kg ⁻¹)
Carbon coefficient of extra-roots :	0.095		Nitrogen content in extra-roots :	0.0134	(kg N kg ⁻¹)
Lignin content :	0.053				
Product returned to soil :	2	(%)			
Straw returned to soil :	100	(%)			
Roots returned to soil :	100	(%)			

Figure 3.8: Residue tab for a field component.

Economics

The economics section shows various economic data related to the component including crop price, direct costs and total fixed and variable costs.



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Step 3: Adjust the details of wheat/winter wheat. These adjustments will be copied to the other fields in the rotation when wheat/winter wheat was grown. Additional Information:

General	Fertilizer	Manure	Winter & Cover Crops	Soil	Residue	Economics
Crop price						
Regional average price : 0.27 (€ kg ⁻¹)						
Totals						
Total fixed cost : 154.98 (€ ha ⁻¹)						
Total variable cost : 387.82 (€ ha ⁻¹)						
Direct Costs						
Seed, cleaning and treatment : 128 (€ ha ⁻¹)						
Fertilizer : 728 (€ ha ⁻¹)						
Chemical : 349 (€ ha ⁻¹)						
Trucking and marketing : 22.87 (€ ha ⁻¹)						
Fuel, oil, and lube : 106 (€ ha ⁻¹)						
Machinery repairs : 151.5 (€ ha ⁻¹)						
Crop insurance : 92 (€ ha ⁻¹)						
Building repairs : 70 (€ ha ⁻¹)						
Custom work : 1.17 (€ ha ⁻¹)						
Labour (paid and unpaid) : 354.24 (€ ha ⁻¹)						
Utilities : 10.34 (€ ha ⁻¹)						
Operating interest : 7 (€ ha ⁻¹)						
Original economic data found here.						
If HOLOSIE can't find economic data for the crop in your province, it will search a neighbouring province and return that data if possible.						

Figure 3.9: Economic tab for a field component showing various costs related to the field.

6. Detailed Results

6.1 Soil Organic Carbon

The submodule of the HOMOSIE simulates SOC density changes (kg/ha) during a specified time, allowing users to compare how different management practices affect SOC density. Users can toggle between graph and grid views, and when analyzing farms with multiple fields or crop types, separate trend lines appear color-coded by component (e.g. wheat crops vs. mixed grass/legume pastures). The interface includes an option to compare multiple farm scenarios simultaneously, enabling side-by-side analysis of alternative management strategies.



Figure 4.1: SOC Results Tab



6.2 Estimates of Production

The source model has limitations in simulating farm production, which is based on the national average derived from .CSV file (monthly or yearly format). If the component has multiple products like beef cattle (manure and beef), there will be buttons that appear above the graph portion of the report to display the appropriate graph. However, the team has been progressing with dynamic growth modules to be integrated by 2026.

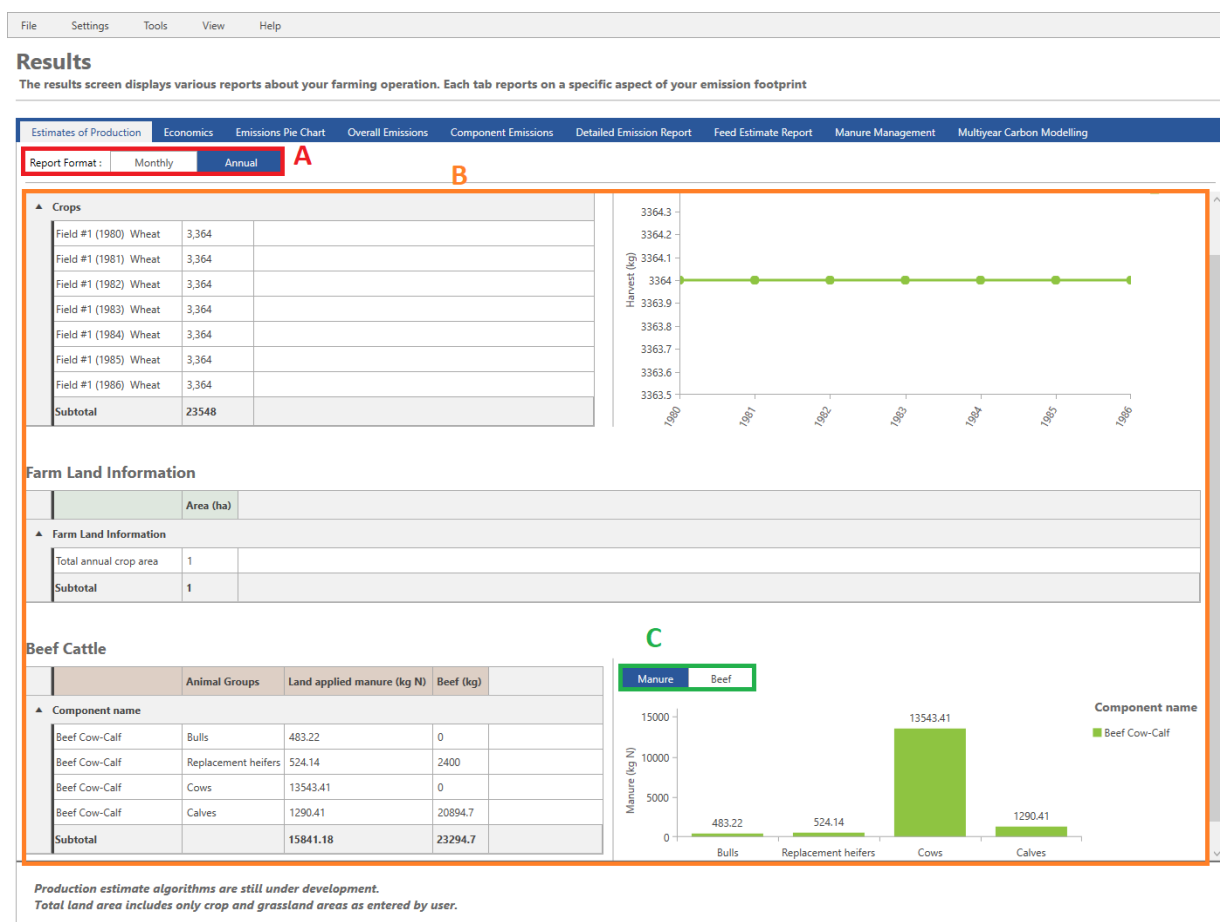


Figure 4.2: Estimates of Production Results Tab: (A) Toggle that helps switch the reporting format to Monthly or Annual, (B) Production Estimates, and (C) Toggle that helps switch between different component items.

Emissions Pie Chart

A proportional representation of all farm emissions. You can view how each farm component contributes by clicking “Yes” beside “Show Details”. You can also change the units of measurement; click on the drop-down box beside “Units of Measurement”. The chart will highlight whichever slice your mouse over for easy identification.



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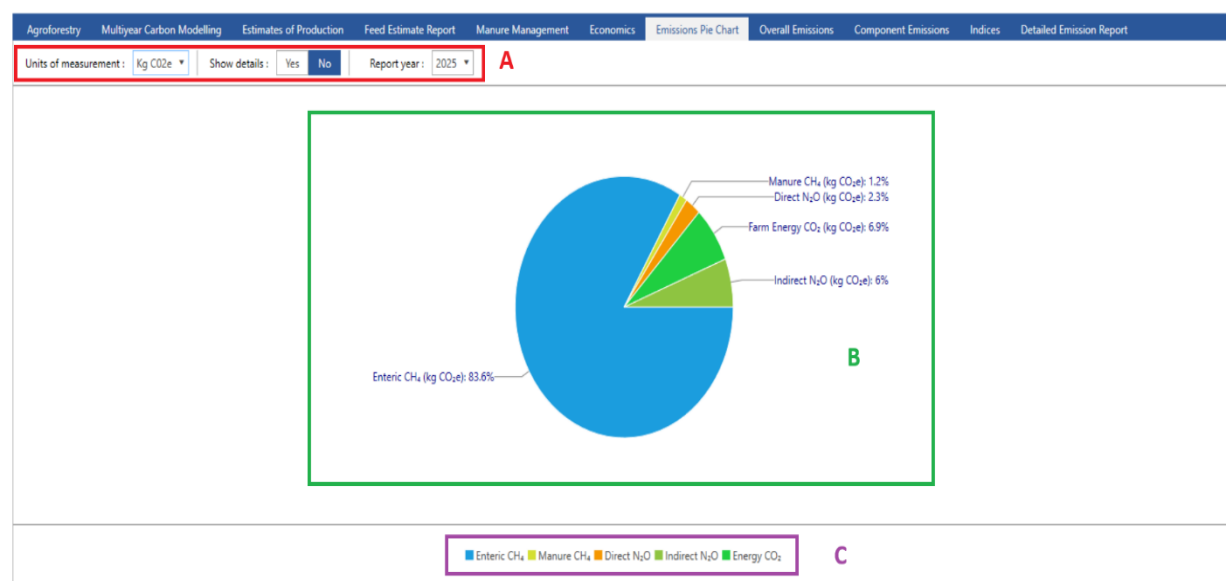


Figure 4.3: Emission Pie Chart Results Tab: (A) Various options related to display of chart. (B) The pie chart and data, and (C): The various emissions from the farm.

Component Emissions

Shows a breakdown of all emissions from a farm on a monthly basis.



Figure 4.4: Component Emissions Results Tab.



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Overall Emissions

Display the overall amount of each greenhouse gas produced by the farm.

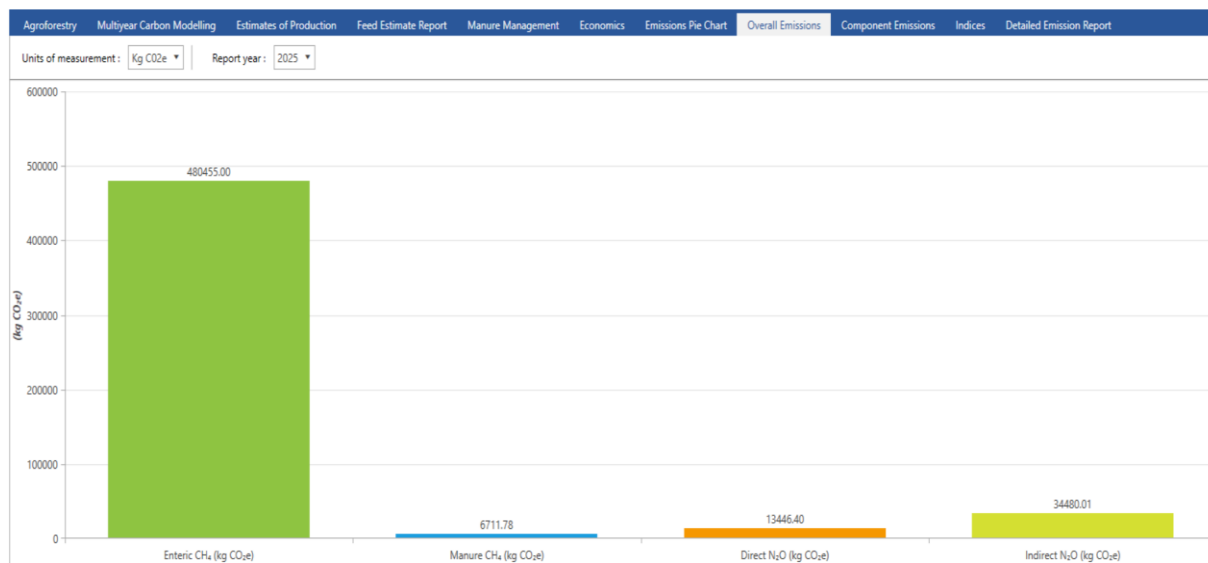


Figure 4.5: Overall Emissions Results Tab.

Detailed Emissions Report

A detailed summary of each component in the farm, showing emission breakdown for each component in the farm (i.e. total Direct/Indirect N₂O, Enteric CH₄, and Manure CH₄ produced by the given component). You can export this data to a CSV file of your choosing. You can also compare multiple farms and see the comparison in the table.

Results

The results screen displays various reports about your farming operation. Each tab reports on a specific aspect of your emission footprint

Agroforestry Multiyear Carbon Modelling Estimates of Production Feed Estimate Report Manure Management Economics Emissions Pie Chart Overall Emissions Component Emissions Indices Detailed Emission Report															
Report Format :		<div>Monthly</div> <div>Annual</div>		Report year : 2025 ▾		Units of measurement : Kg CO2e ▾		<div>Export to Excel</div>		<div>Show Additional Columns :</div> <div>Yes</div> <div>No</div>		Compare Multiple Farms : <div>Yes</div> <div>No</div>		A	
Farm	Component name	Emission source	Enteric CH ₄ (kg CO ₂ e) ▾	Manure CH ₄ (kg CO ₂ e) ▾	Direct N ₂ O (kg CO ₂ e) ▾	Indirect N ₂ O (kg CO ₂ e) ▾	Farm Energy CO ₂ (kg CO ₂ e) ▾								
▲ Crops										B					
	W3M24N(2)DA3_Imported_2025-01-28	Crop #1 [Field #1] - Wheat	Wheat/Winter Wheat, 3 (ha)	N/A	N/A	2237.50	588.89	842.13							
	W3M24N(2)DA3_Imported_2025-01-28	Grass #1 [Field #1] - Tame mixed (grass/legume)	Ryegrass + Clover Mix, 24 (ha)	N/A	N/A	6916.35	1566.47	2234.40							
			0.00	0.00	9153.85	2155.36	3076.53								
▲ Dairy Farming															
▸	W3M24N(2)DA3_Imported_2025-01-28	Dairy cattle	Dairy heifers	2978.97	333.38	619.16	116.08	N/A							
	W3M24N(2)DA3_Imported_2025-01-28	Dairy cattle	Dairy lactating	477476.03	6278.66	3542.89	32151.78	31603.87							
			Totals	480455.00	6711.78	13446.40	34480.01	34680.40							
◀										▶					

Negative values indicate carbon storage. Positive values indicate greenhouse gas emissions.

Uncertainty

Enteric CH₄: 20 % (+/-)

Manure CH₄: 20 % (+/-)

Direct N₂O: 40 % (+/-)

Indirect N₂O: 60 % (+/-)

Energy CO₂: 40 % (+/-)

C

Emissions are reported on a monthly basis. In some cases, prorating of yearly emissions occurs.

Pro-rating occurs with soil/cropping N₂O emissions - direct and indirect - as per user entered breakdown.

Soil carbon, tree planting carbon, energy CO₂ emissions to crop and spread manure, and poultry and other animals emissions are allocated equally throughout the year.

Figure 4.6: Detailed Emissions Results Tab: (A) Command bar capable of exporting the chart data, comparing multiple farms, along with other options previously mentioned. (B) Legend depicting each type of emission, and (C) Uncertainty associated with each type of emission



Agroforestry

The platform specifically models agroforestry (trees within a farm) as a carbon offsetting strategy. By predicting the atmospheric carbon sequestered by trees (biomass-C, like Silvopastoral, hedgerows) alongside emissions from crops and livestock, the model can assess the total and net carbon balance of a land parcel/farm.

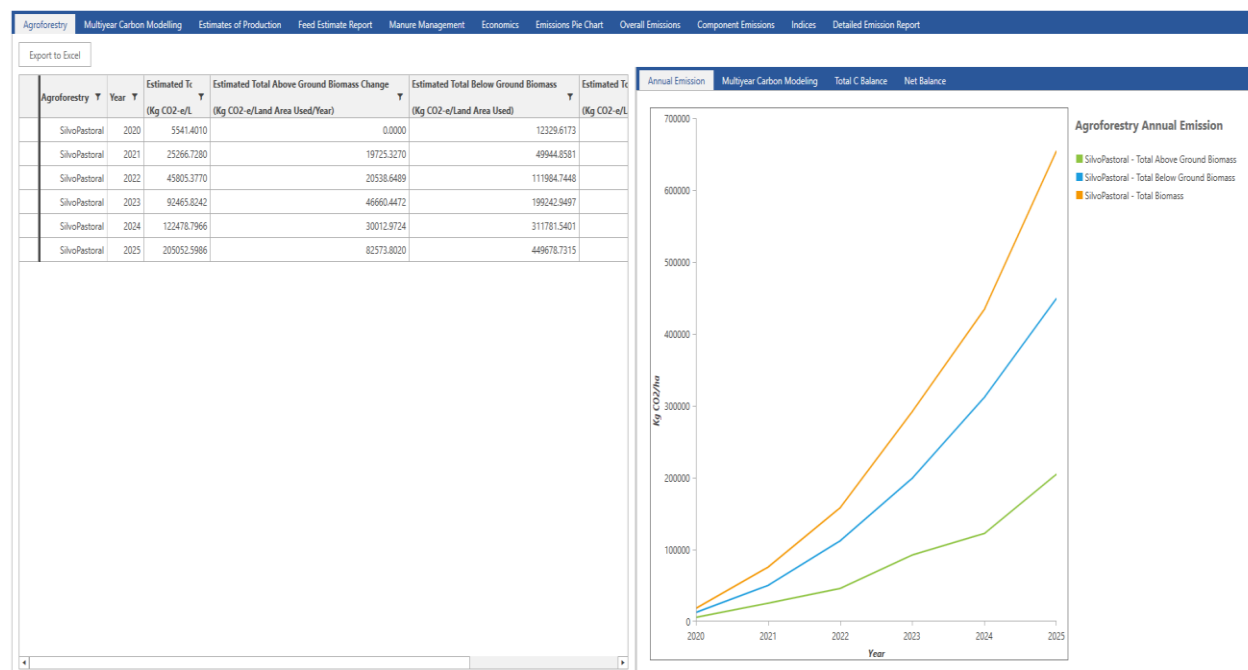


Figure 4.7: Agroforestry Annual Emission, Results Tab.

Soil Organic Carbon (SOC) trends for Silvo-Pastoral system.

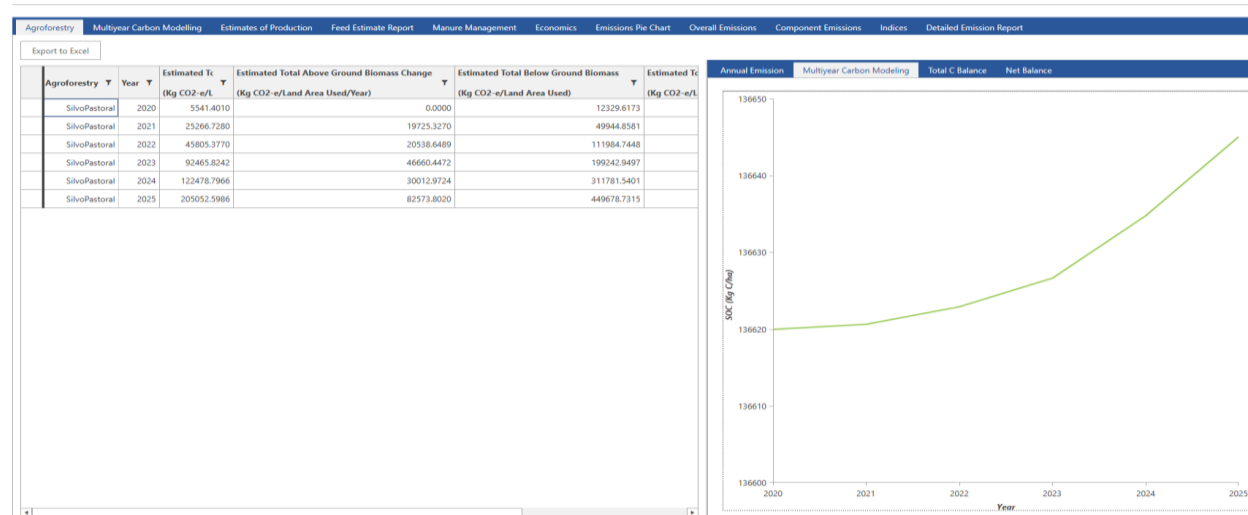


Figure 4.7: Agroforestry Soil Organic carbon (SOC), Results Tab



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Total carbon balance for the selected farm, including the Agroforestry system, and Farm energy.

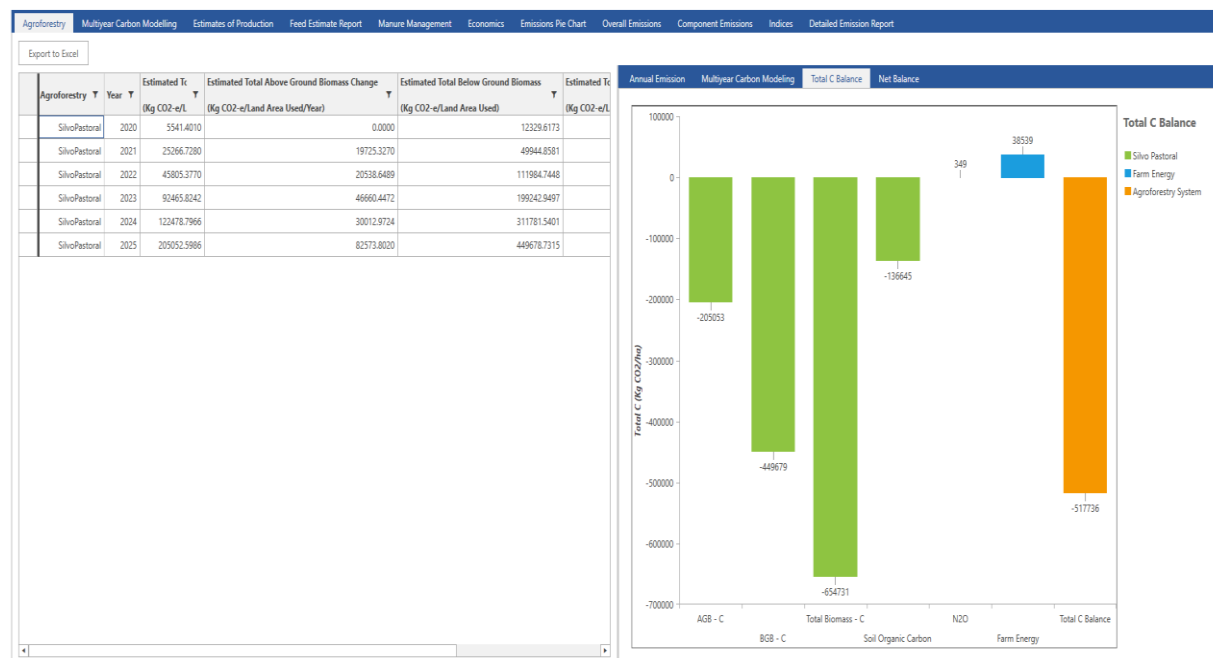


Figure 4.7: Agroforestry Total Carbon Balance, Results Tab

Net balance for the selected farm, Crops/grasses, livestock, agroforestry emissions and net balance.

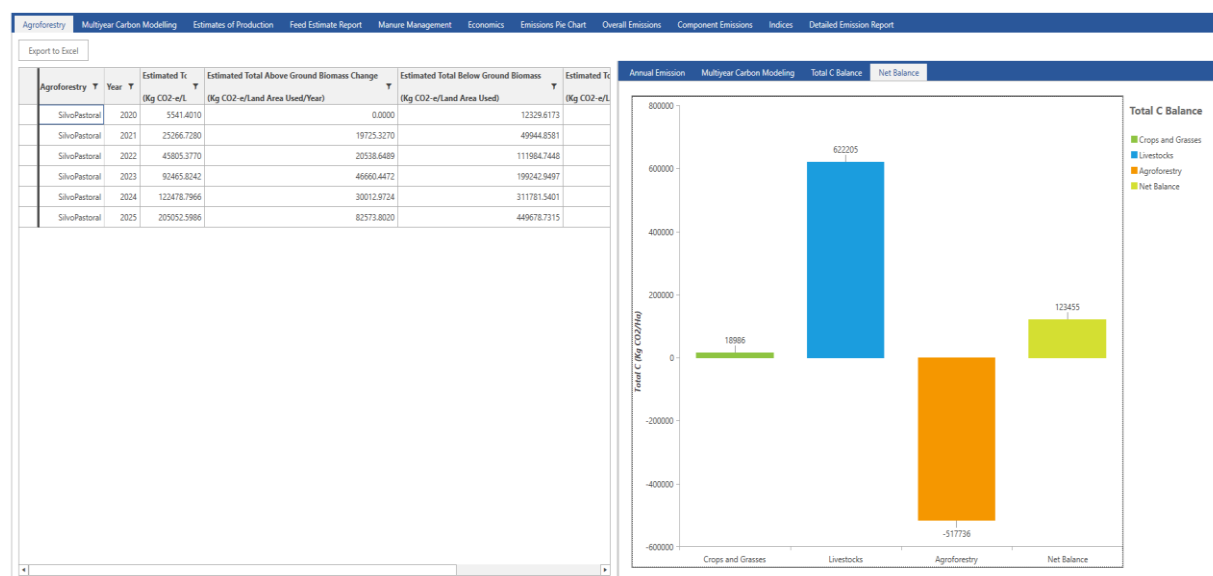


Figure 4.7: Net Balance for Selected Farm, Results Tab



Economics

Shows the market price and total revenue for crops on your farm. Economic data is provided by various data sources and might be incorrect. This tab offers a rough estimate of the revenue of crops, grassland, livestock, and agroforestry.

Agroforestry Multiyear Carbon Modelling Estimates of Production Feed Estimate Report Manure Management Economics Emissions Pie Chart Overall Emissions Component Emissions Indices Detailed Emission Report								
Export to Excel								
Crops								
Show Additional Columns: <input type="button" value="Yes"/> <input type="button" value="No"/>								
	Harvest (kg ha ⁻¹)	Production Price (€ kg ⁻¹)	Revenue (€)	Total fixed cost (€)	Total variable cost (€)	Grand Total Cost (€)	Profit (€)	
▲								
Crop #1 [Field #1] - Wheat (Wheat)	7,500	0.27	9,157.35	464.94	5,584.87	6,049.81	3,107.54	
Subtotal	7,500.00		€9,157.35	€464.94	€5,584.87	€6,049.81	€3,107.54	
Grasslands								
Show Additional Columns: <input type="button" value="Yes"/> <input type="button" value="No"/>								
	Harvest (kg ha ⁻¹)	Production Price (€ kg ⁻¹)	Revenue (€)	Total fixed cost (€)	Total variable cost (€)	Grand Total Cost (€)	Profit (€)	
▲								
Grass #1 [Field #1] - Tame mixed (grass/legume) (Tame mixed (grass/legume))	9,000	0.27	0.00	3,719.52	44,678.95	48,398.47	-48,398.47	
Subtotal	9,000.00		€0.00	€3,719.52	€44,678.95	€48,398.47	€-48,398.47	
Livestocks								
Show Additional Columns: <input type="button" value="Yes"/> <input type="button" value="No"/>								
	Name	Number of Replacement Heifers Sold	Total Fixed Cost (€)	Total Variable Cost (€)	Grand Total Cost (€)	Total Revenue (€)	Profit (€)	
<p><i>Costs and prices are based on values gathered from 2020 data sources and results may be unrepresentative for specific situations. As such, results should be used with caution. Economic results are not intended to give a detailed analysis of the farm, but rather a basic estimate of how potential changes in management that impact greenhouse gas emissions may influence the economic outcome of the farm operation.</i></p>								

Figure 4.8: Economics Results Tab

7 CONCLUSIONS

Version 4.5 of HOLOS-IE represents a mature and promising iteration of the platform, now poised to expand beyond its Irish roots toward a more pan-European ambition. With the HOLOSEU initiative under development (open-source initiative), backed by 8 European partners with funding from ERA-NET Co-Fund ICT-AGRI-FOOD, the foundation is being laid for a broader application across EU nations and beyond. However, the true unlocking of that potential will depend on rigorous user feedback and comprehensive, country-level validation and recalibration, tasks that the UCD team is already preparing for. In effect, HOLOS-IE v4.5 acts as a springboard: robust enough now for national-scale deployment yet architected to adapt and evolve into HOLOS-EU, once localised calibration, stakeholder consultation, and model refinement have been systematically applied. To achieve improved vision and wider use, active national and international collaboration will be vital in ensuring the model's accuracy, credibility, and relevance across diverse agricultural contexts.