QuantiFarm Toolkit –
Directions for using the “Cost & Benefit Calculator tool”

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Overview

With the Cost & Benefit Calculator tool, a user can:

1. Evaluate the financial implications of implementing Digital Agricultural Technologies (DATs),
2. Calculate potential returns on investment (ROI) for various DATs, and
3. Assess the cost-effectiveness of DATs for specific agricultural scenarios.

For example, a user operating a crop farm could select a crop-oriented DAT from the tool and enter information such as current yield, water usage, fertilizer costs, and crop market prices. The Cost & Benefit Calculator will then process this data to estimate the costs involved in adopting the DAT, as well as the potential financial gains from improvements in yield, resource efficiency, or product quality. Similarly, a livestock farmer can choose a livestock DAT and provide details on animal numbers, feed costs, veterinary expenses, and current production metrics. The tool will calculate the estimated costs of implementation and potential benefits, which may include enhanced animal health, increased milk or meat production, and better feed-to-growth ratios. Users can therefore leverage the Cost & Benefit Calculator tool to conduct a thorough financial analysis before committing to a new DAT. The tool's ability to customize calculations based on user-provided farm-specific data ensures that the insights are relevant and actionable.

The Cost & Benefit Calculator tool (**Figure 1**) is available here: [QuantiFarm Toolkit]

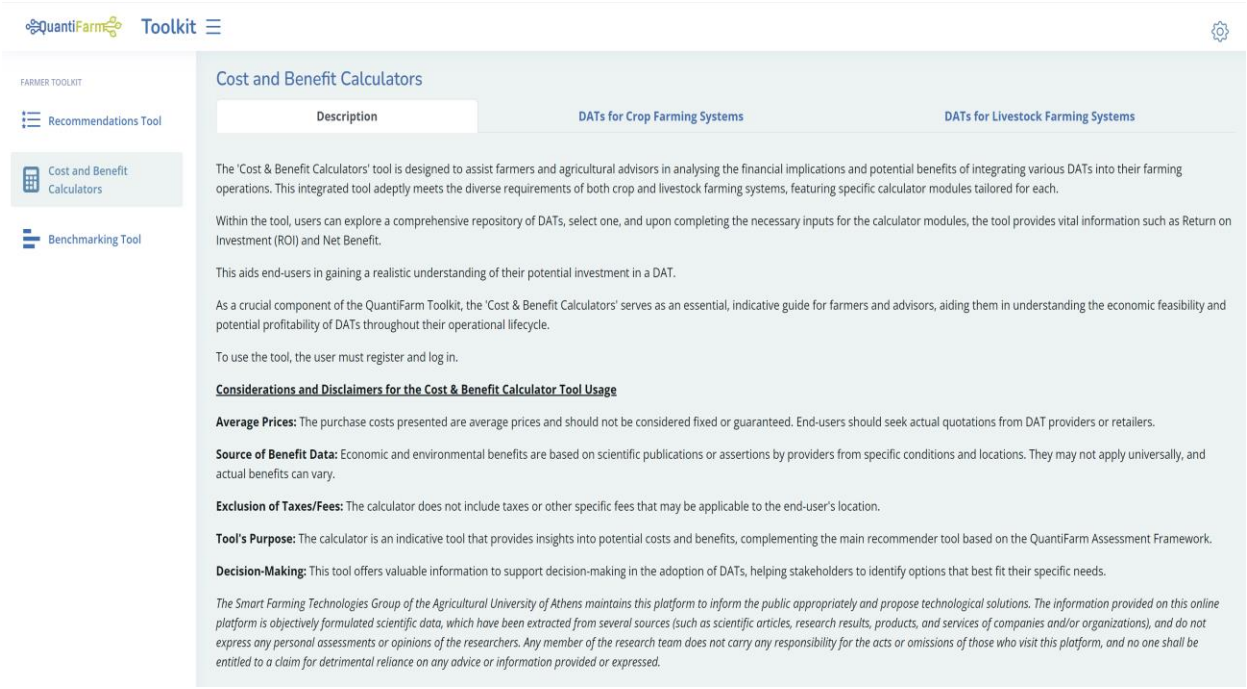

Figure 1 – Cost & Benefit Calculator Tool

Description

The description of the tool (**Figure 2**) can be found under the “Description” tab in the top navigation bar.

Figure 2 – Tool Description

The tool currently requires no registration and/or logins. Currently, the tool holds five main functionalities:

(1) **DAT Search and Selection Process**
(2) **DAT Evaluation process**
(3) **Entering DATA**
(4) **System Analysis** to perform the evaluation of the selected DAT through the calculator modules based on the end-user inputs
(5)**Presentation of the Results**

DAT Search and Selection Process

The "DAT Search and Selection Process" within the Cost & Benefit Calculator tool is designed to systematically guide users in identifying the DATs that best suit their farming needs. This process involves four key steps, each requiring specific inputs from the user to refine the search and evaluation of DATs.

1. Select Farming System: Users start by choosing their primary farming system type from a dropdown menu, with options for 'Crop' or 'Livestock'. This selection is crucial as it tailors the subsequent options to be relevant to the user's farming context.

- **Input Fields:** Dropdown: Crop, Livestock

2. Select Crop or Livestock Type: Depending on the farming system selected, users will specify the type of crop or livestock they manage. This step further narrows down the DATs to those that are specifically designed for the selected type of agriculture, whether it be arable farming, fruit cultivation, dairy cattle management, etc.

- **Input Fields:** For Crop: Dropdown (Arable, Fruits, Vineyards, Vegetables, Orchards); For Livestock: Dropdown (Cattle/Dairy Cattle, Pigs, Poultry, Small Ruminants)

3. Select DAT Category: After defining the farming system, users select a category of DAT that aligns with their operational goals or the challenges they aim to address. The dropdown provides a list of DAT categories to choose from.

- **Input Fields:** Dropdown: List of DAT Categories

4. Select Farming Practice (Purpose): After selecting the DAT category, users are prompted to choose the specific farming practice or purpose for which they are considering a DAT.

- **Input Fields:** Dropdown: List of Farming Practices

5. Select Specific DAT: In the final step of the selection process, users choose a specific DAT from a curated list that matches their farming system, DAT category, and crop or livestock type. This chosen DAT will then be the focus for in-depth cost-benefit analysis and evaluation.

- **Input Fields:** Dropdown: List of DATs

DAT Evaluation process

The "DAT Evaluation Process" is a streamlined component of the Cost & Benefit Calculator tool, enabling users to select and evaluate the suitability of DATs for their specific farming needs.

DAT Evaluation Process: This function allows users to choose the most relevant DATs for further analysis. After users have navigated the selection process by specifying their farming system (crop or livestock), DAT category, and the type of crop or livestock they manage, they can then pick a specific DAT from the list. Each DAT in the list comes with essential details such as the DAT name, provider, web links, purpose, and a description, aiding users in making an informed selection.

Once a DAT is selected, users are prepared to move to the next functionality of entering data into the system, which will utilize the provided information to conduct a thorough cost-benefit analysis.

Entering DATA

The "Entering Data" functionality is a crucial step in the Cost & Benefit Calculator tool that involves the detailed input of farming operation data by the end-user. This data is essential to perform a tailored evaluation of the selected DATs for either crop or livestock farming. Below is a description suitable for inclusion in the manual:

For Crop Farming DATs: Users are required to enter specific information about their crop farming operations. This includes the expected duration of DAT utilization (Years of Usage of DAT), the quantity of DAT units needed (Number of Units), the size of the land area where the DAT will be deployed (Total Area in hectares), and the current agricultural yields and costs associated with production inputs such as fertilizer, water, pesticides, labor, and fuel. Each data point entered will help in determining the potential improvements and cost savings that could be achieved by implementing the DAT in question.

For Livestock Farming DATs: Livestock farmers will input data related to the number of animals, the expected duration of DAT usage, and the number of DAT units required. Additionally, they will provide financial figures such as the market price of milk, average milk production per animal, and annual costs for labor, energy, water, feed, antibiotics, and losses due to mortality. These inputs help calculate the expected changes in profitability and efficiency from using the DAT.

In both cases, the data entered must meet certain validation criteria to ensure accuracy in the subsequent analysis. For example, numerical inputs such as area, yields, and costs must be zero or positive, while the number of years and units must be greater than zero.

This data-gathering phase is pivotal, as it feeds directly into the system analysis component where the cost-benefit evaluation is performed. By carefully entering accurate and comprehensive data, users can expect to receive a detailed analysis of the potential financial and operational impacts of adopting the selected DATs.

System Analysis

The "System Analysis" functionality within the Cost and Benefit Calculator tool is designed to harness user-provided data alongside specialized calculation modules to deliver comprehensive financial evaluations of DATs for different farming systems. This dual approach ensures a tailored analysis that reflects the unique conditions and requirements of each user's agricultural operation. Here's how it works:

- **User Data Integration**: The tool begins by collecting specific data from the user regarding their current farming operations, including details on crop types, livestock, and existing costs and yields. This data serves as the foundation for all subsequent analyses.
- **Farming System-Specific Modules**: Based on the type of farming operation (crop or livestock), the tool selects from a set of predefined calculator modules designed to evaluate various aspects of the farming operation. Each module focuses on a particular area of cost or benefit, such as yield increases, input cost reductions (fertilizer, water, pesticide, feed, etc.), labor savings, and more.
- **Customized Calculations**: For each module, the tool applies user data to farming system-specific formulas to compute potential costs, savings, and revenue enhancements. This approach allows for a highly personalized analysis that reflects the potential impact of DATs on the user's unique operation.
- **Comprehensive Financial Evaluation**: By aggregating the outcomes from all relevant modules, the tool provides a holistic view of the financial implications of adopting DATs, including total investment costs, projected benefits, cost savings, and key financial indicators like Return on Investment (ROI) and Net Benefit.

This systematic use of user data and targeted calculation modules enables the "System Analysis" functionality to offer precise and actionable financial insights. It empowers users to make informed decisions about integrating DATs into their farming operations by providing a clear, customized evaluation of the economic outcomes.

Presentation of the Results

The "Presentation of Results" functionality in the Cost and Benefit Calculator tool is a critical component designed to synthesize and display the outcomes of the analysis conducted through various calculator modules. This feature ensures that users can easily understand the financial implications of adopting DATs for their specific farming operations.

- **Consolidated Results Dashboard**: Once the analysis through the System Analysis functionality is complete, the tool aggregates the results from all calculator modules into a user-friendly dashboard. This dashboard provides a comprehensive overview of the calculated financial metrics, such as initial and ongoing investment costs, yield increases, revenue enhancements, cost savings, and more.
- **ROI and Net Benefit Highlighting**: Central to the dashboard are the Return on Investment (ROI) and Net Benefit figures. These key indicators are prominently displayed to give users immediate insight into the financial feasibility and profitability of implementing DATs. ROI offers a percentage-based look at the returns compared to the investment, while Net Benefit provides a dollar figure representing the total financial gain after subtracting costs.

The "Presentation of Results" functionality is designed to demystify the complex financial calculations and present them in a clear, actionable manner. By doing so, it empowers users to make informed decisions about integrating technology into their farming practices, backed by a solid understanding of the expected financial outcomes.

Guiding steps for each functionality

DAT Search and Selection Process

At the top of the screen (**Figure 3**), the user can select the Farming System that he wants to explore and search for DATs (A) for Crop and (B) for Livestock.

Figure 3 – Farming System selection

Once the user selects the farming system then a drop down menu with a list of Crop or Livestock types appears at the Left side of the screen. **Figure 4** shows the list of Crop types included in the tool and **Figure 5** the Livestock types.

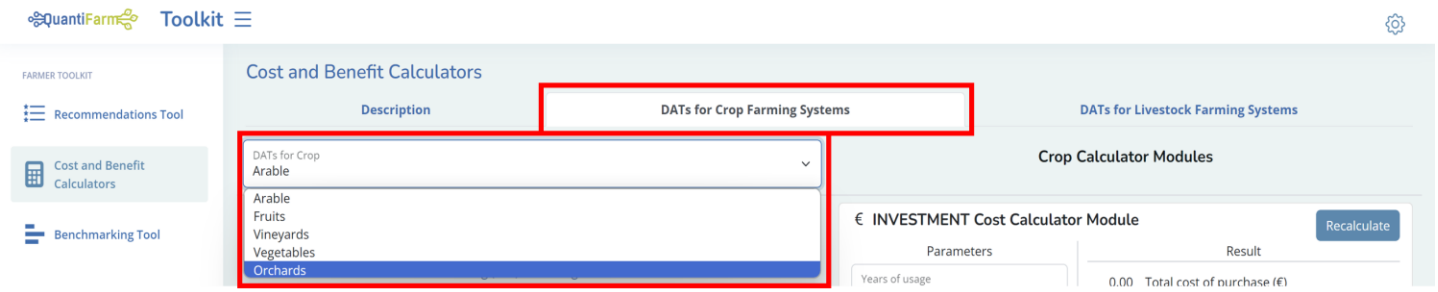

Figure 4 - List of Crop types included in the tool

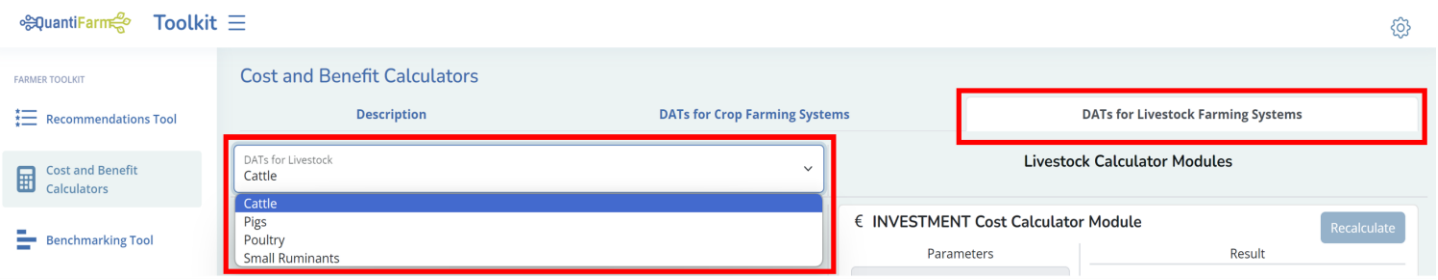

Figure 5 - List of Livestock types included in the tool

After the user selects the Crop or Livestock Type then a drop down menu with a list of DAT categories appears at the Left side of the screen. **Figure 6** shows the DAT categories for Crop and **Figure 7** the DAT categories for Livestock.

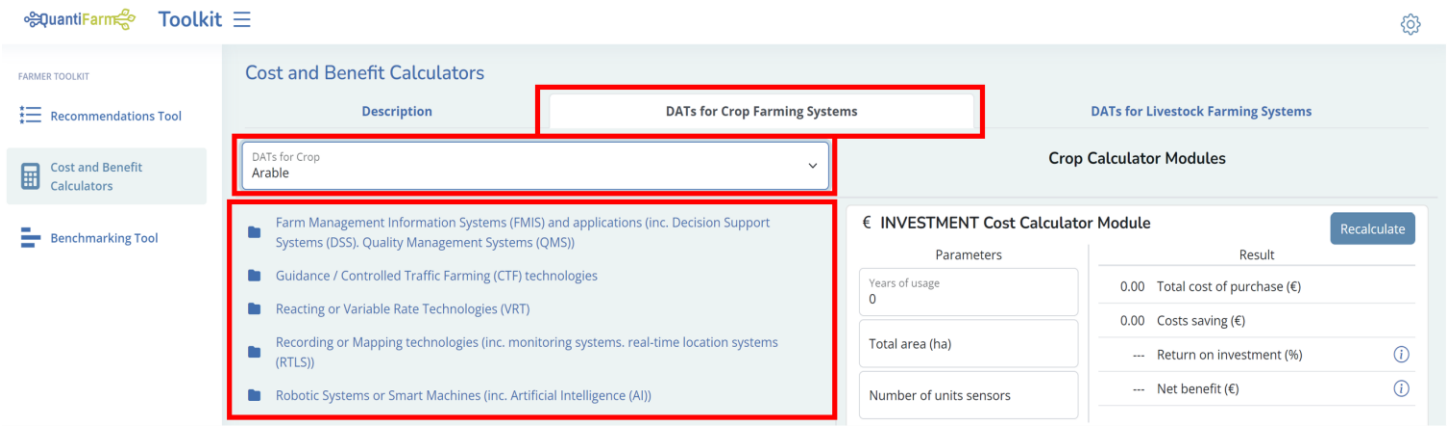

Figure 6 - DAT categories for Crop Farming Systems

Figure 7 - DAT categories for Livestock Farming Systems

In each DAT category there are specific sub categories regarding the Farming practices (purpose) that each DAT carries out. The user needs to select the Farming Practice he wants to execute with a DAT. Examples are shown in **Figure 8** for Crop Farming Practices under the 'FMIS' DAT category and in **Figure 9** for Livestock Farming Practices under the 'Automatic Oestrus Detection' DAT category.

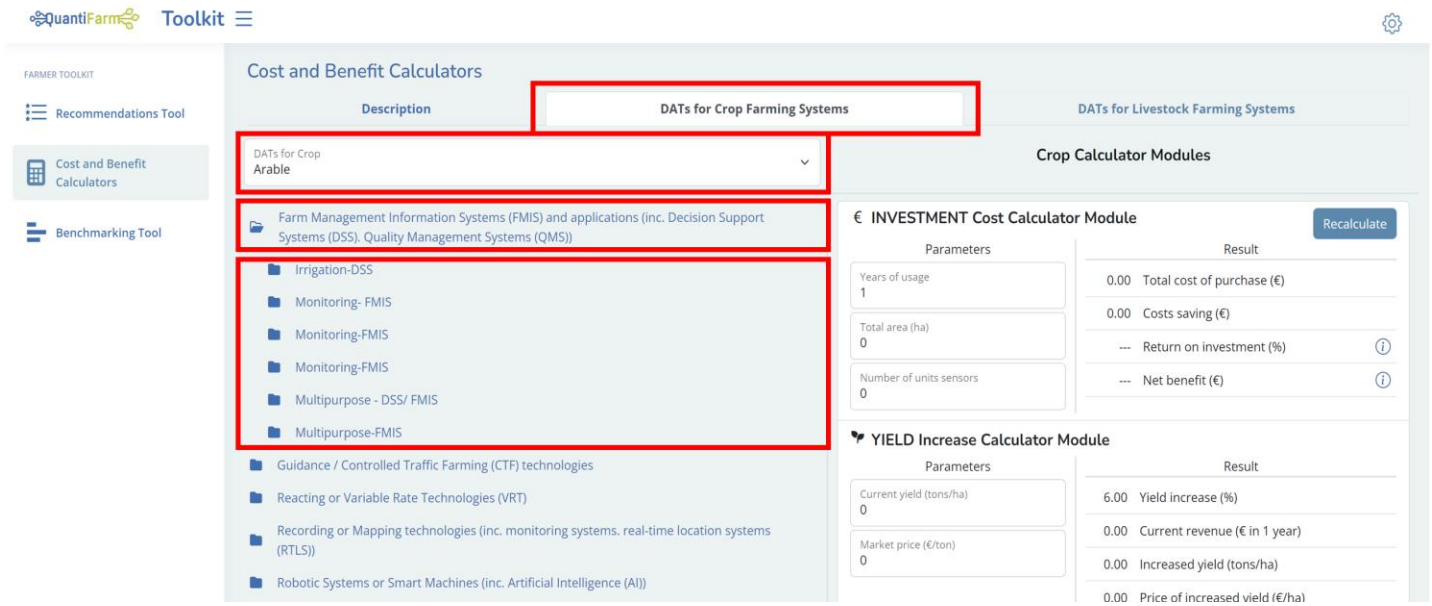

Figure 8 - Crop Farming Practices under the 'FMIS'

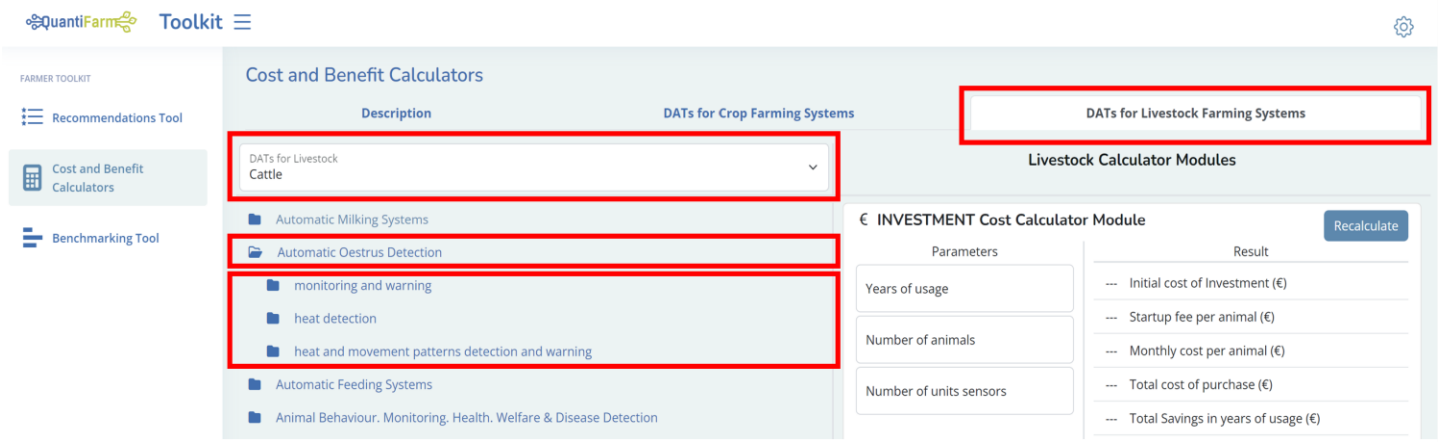

Figure 9 - Livestock Farming Practices under the 'Automatic Oestrus Detection'

After the user selects the Farming Practice then a list of DAT related to the selected Farming Practice appears. Examples are shown in **Figure 10** for Crop DATs under the 'Irrigation DSS' Crop Farming Practice in the 'FMIS' DAT category and in **Figure 11** for Livestock DATs under the 'Heat Detection' Livestock Farming Practice in the 'Automatic Oestrus Detection' DAT category.

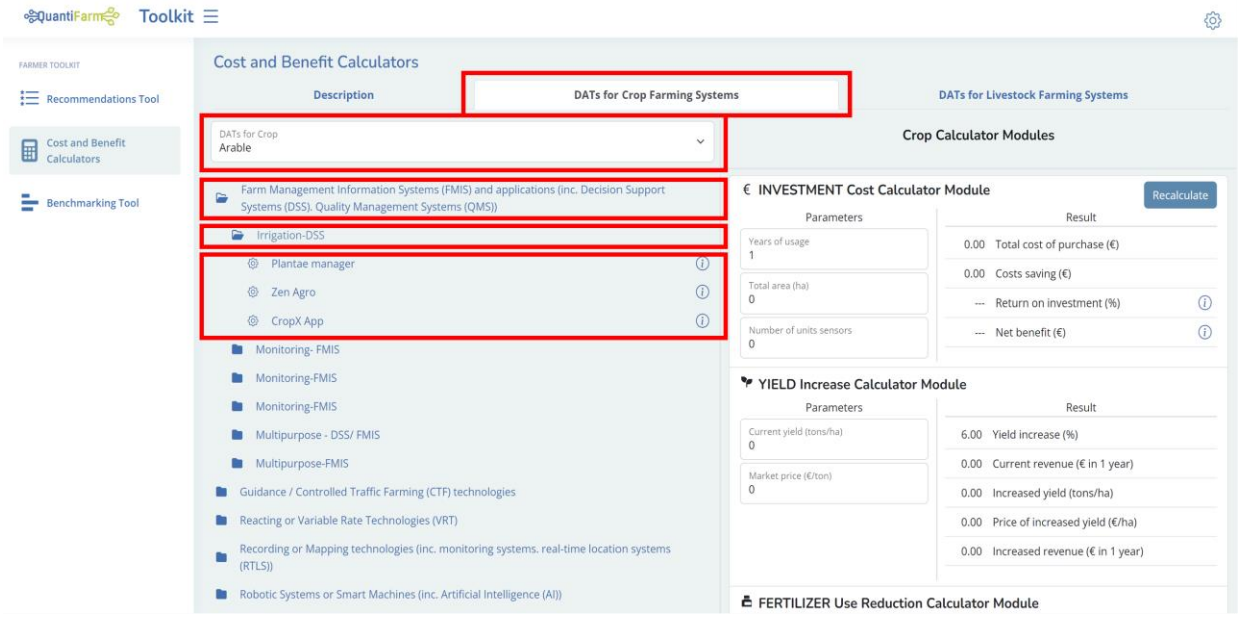

Figure 10 - Crop DATs under the 'Irrigation DSS' Crop Farming Practice in the 'FMIS' DAT category

Figure 11 - Livestock DATs under the 'Heat Detection' Livestock Farming Practice in the 'Automatic Oestrus Detection' DAT category

DAT Evaluation Process

At this stage the user will select one DAT (by clicking in on it) from the list that matches their farming system, DAT category, and crop or livestock type and the evaluation process will begin moving to the next functionality for user's data entering. Next to each DAT there is an (i) icon which includes specific information for the selected DAT. Examples can be found in **Figure 12** for 'Plantae Manager' in Crop DATs and in **Figure 13** for 'Ovalert' in Livestock DATs.

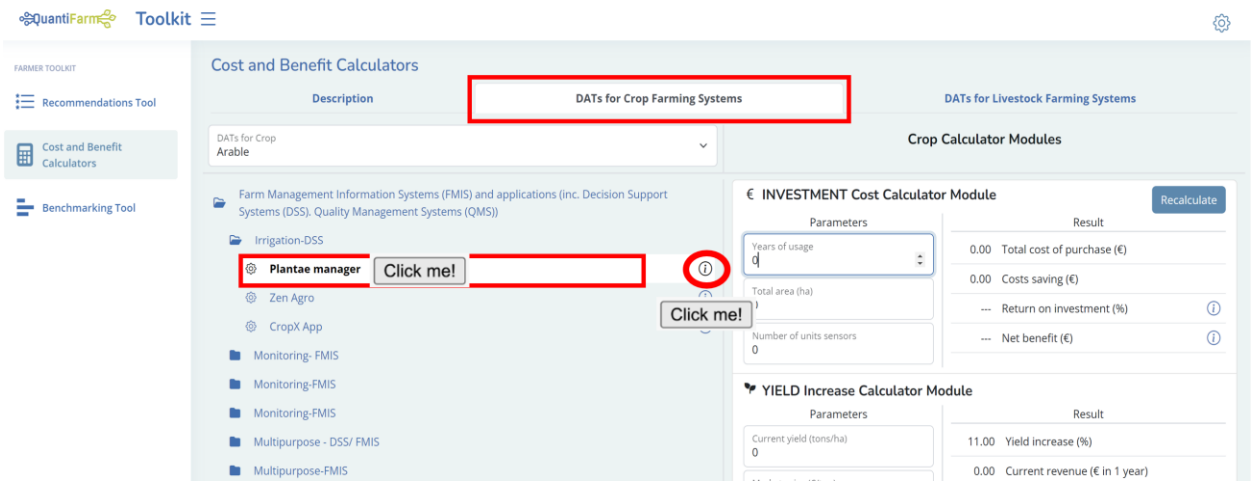

Figure 12 - 'Plantae Manager' in Crop DATs

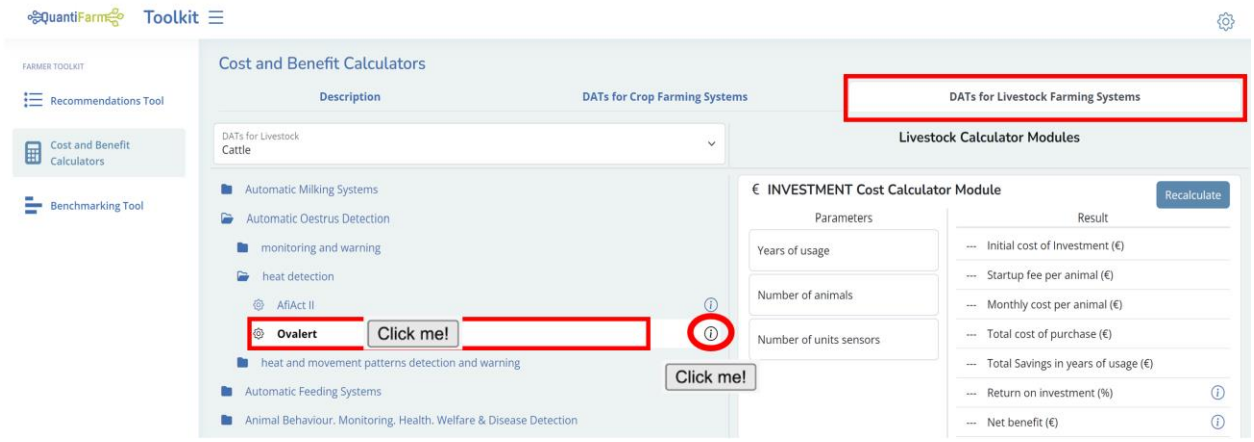

Figure 13 - 'Ovalert' in Livestock DATs

The following figures showing the information provided for 'Plantae Manager' in Crop DATs (**Figure 14**) and for 'Ovalert' in Livestock DATs (**Figure 15**) after the user click on the (i) icon.

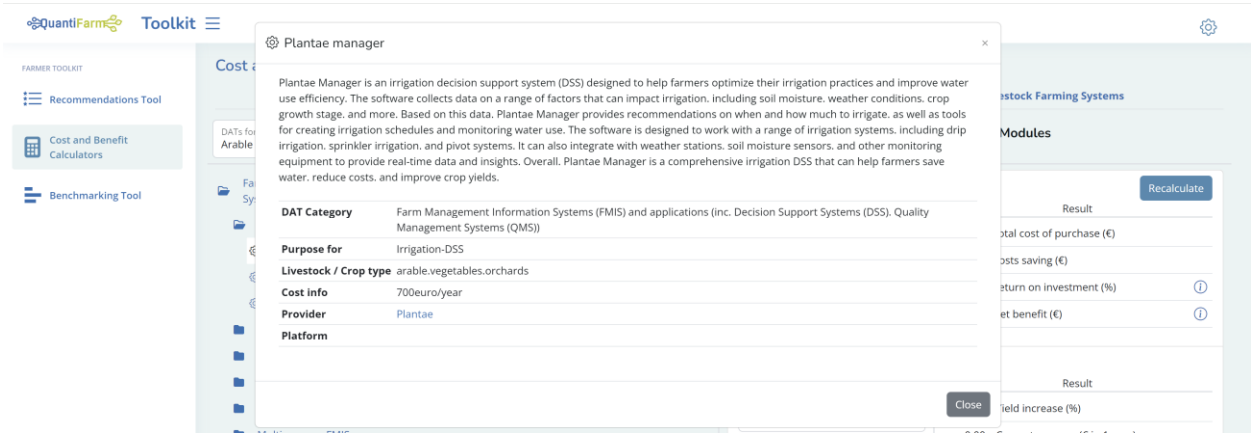

Figure 14 - Information provided for 'Plantae Manager' in Crop DATs

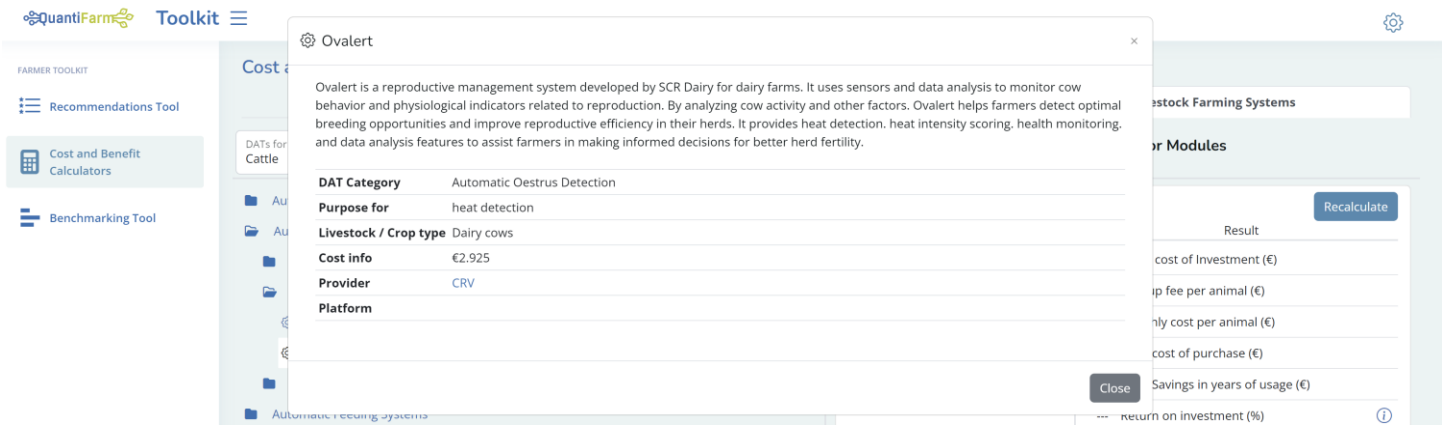

Figure 15 - Information provided for 'Ovalert' in Livestock DATs

Entering DATA & System Analysis.

After the user has select a DAT he can start using the calculator modules at the right side of the screen by entering the requested data in the 'Parameters' section in each module. When the user starts putting data then each calculator module starts the system analysis by calculating and providing results. Examples for Livestock and Crop calculator modules highlighting the 'Parameters' sections are shown in **Figure 16** and **Figure 17** respectively.

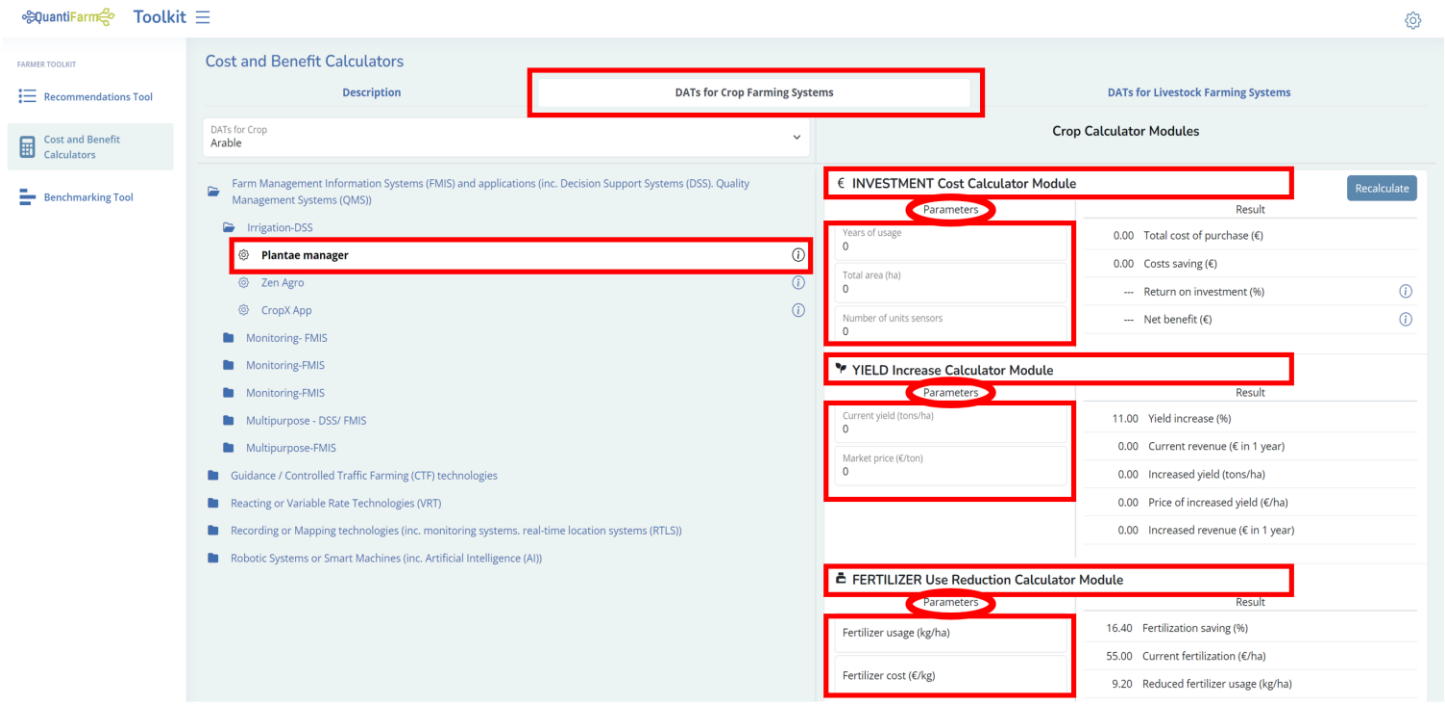

Figure 16 - Crop calculator modules Parameters' sections

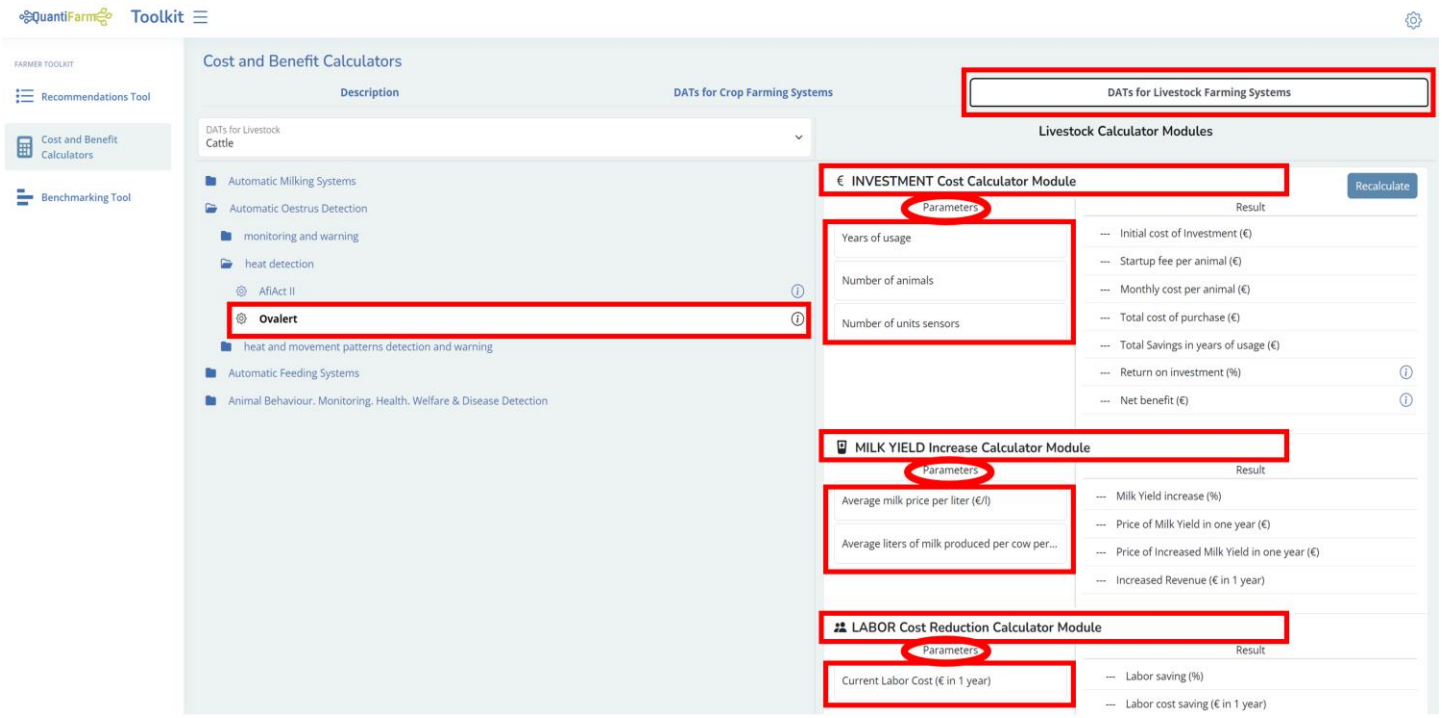

Figure 17 - Livestock calculator modules Parameters' sections

Presentation of the Results

When the user has completed the data entering process he needs to press the 'Recalculate' blue button (in Green circle) to see the results of all the calculator modules which is presented in the 'Results' section. Examples for Livestock and Crop calculator modules highlighting the 'Results' sections are shown in **Figure 18** and **Figure 19** respectively.

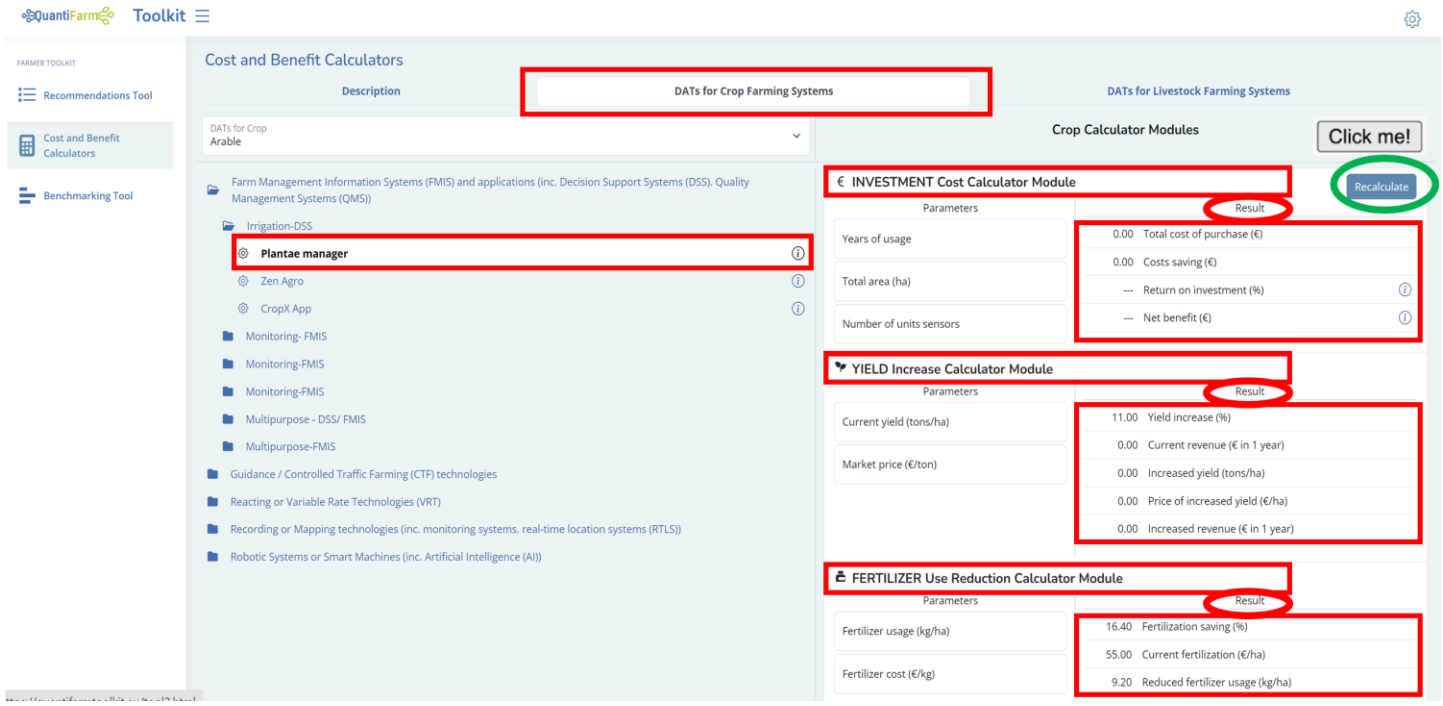

Figure 18 - Crop calculator modules 'Results' sections

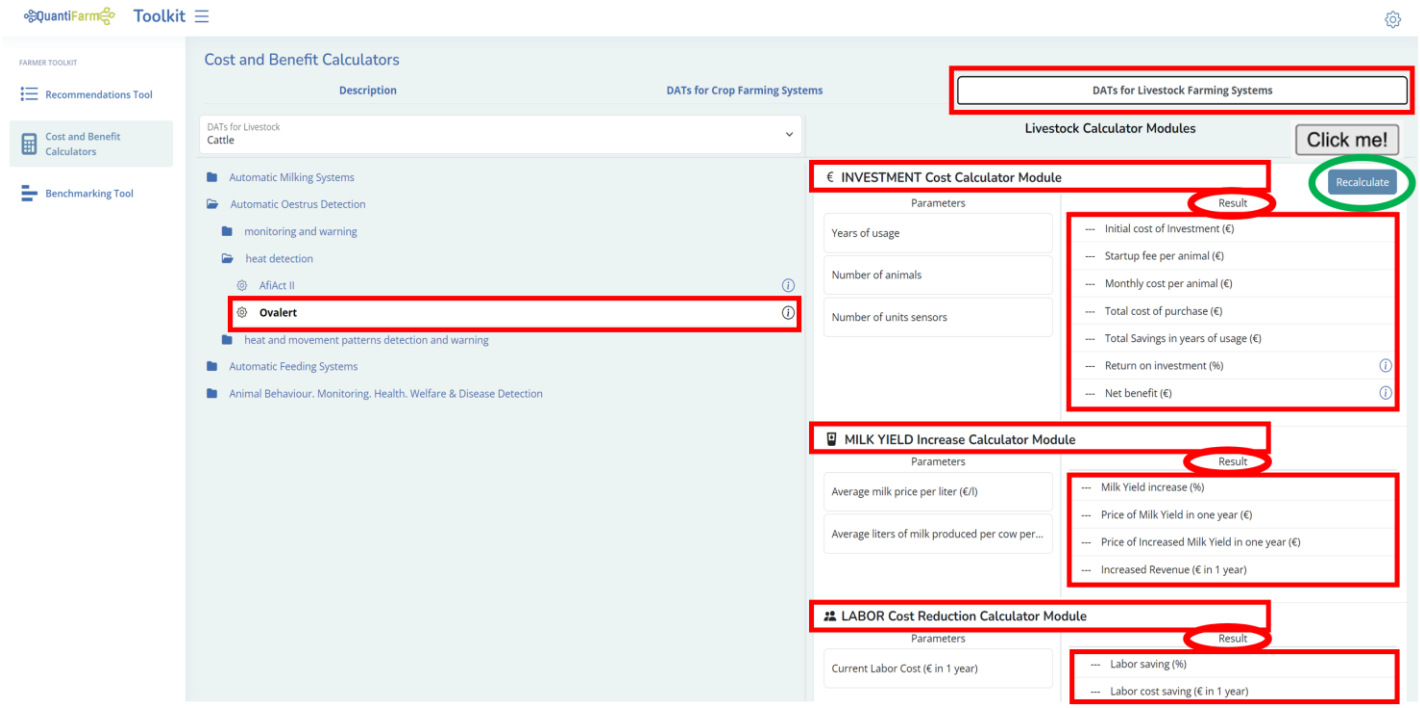

Figure 19 - Livestock calculator modules 'Results' sections

Specifically in the 'Investment Cost Calculator Module' regarding the 'Return on Investment (ROI)' and the 'Net benefit' result the user can press the (i) icons next to them to read some information for these values. Example for the ROI result information is shown in **Figure 20**.

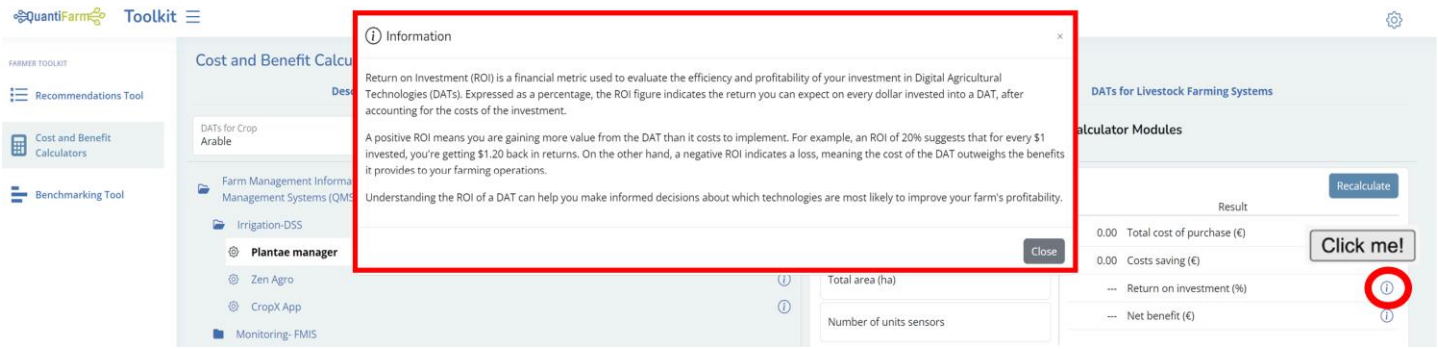

Figure 20 - Example for the ROI result information

Crop Farming Example

The following **Figure 21** provides an example with a cotton farmer and the data that needs to enter in the crop calculator modules to estimate the potential benefits of the DAT he/ she selected will provide specifically for his/ her farm.

Figure 21 - Example with a cotton farmer

The following **Figure 22** presents the results from the Crop Calculator modules after entering Yiannis' farm data.

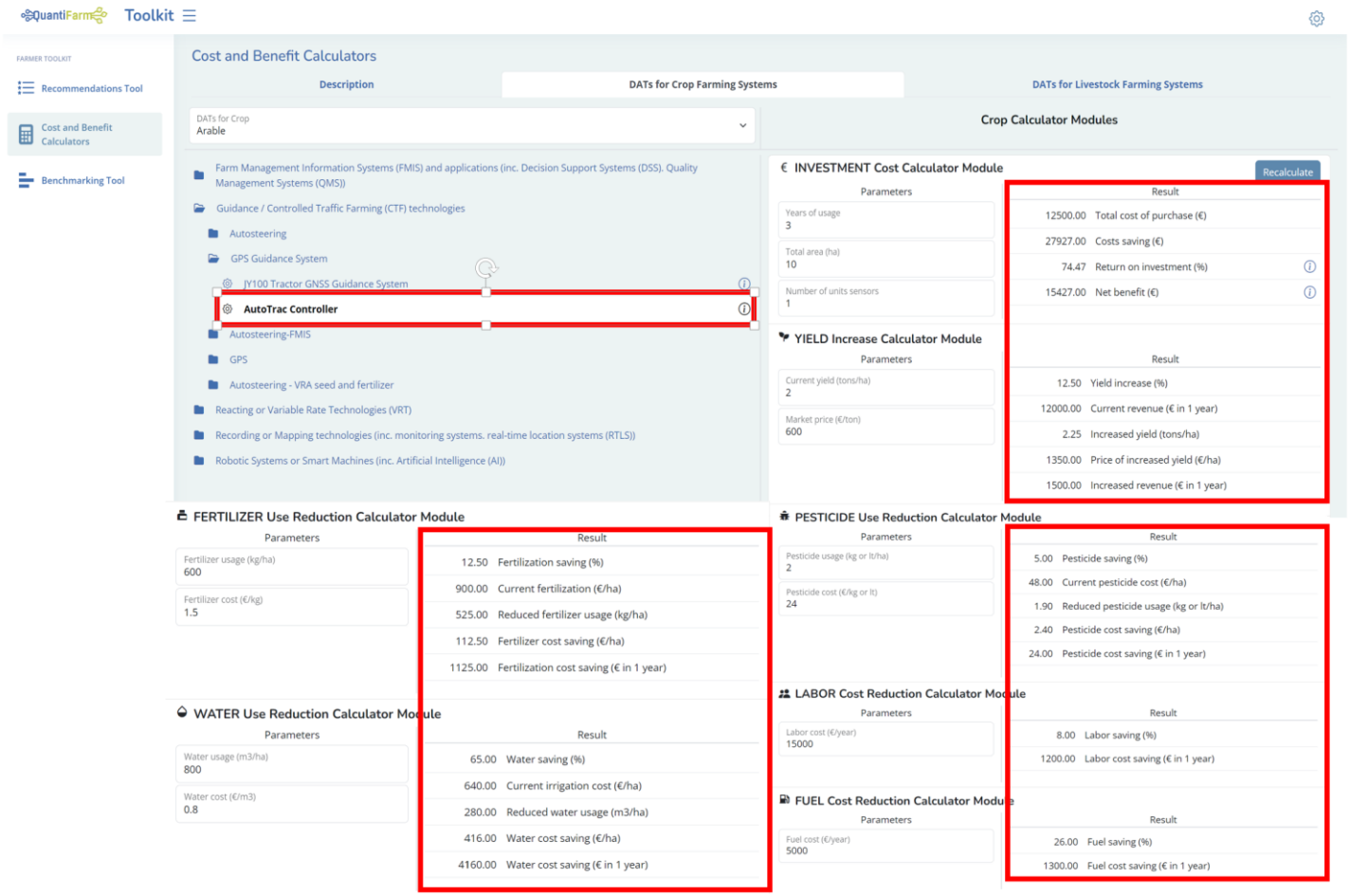

Figure 22 - Results from the Crop Calculator modules

Livestock Farming Example

The following **Figure 23** provides an example with a livestock farmer and the data that needs to enter in the livestock calculator modules to estimate the potential benefits of the DAT he/ she selected will provide specifically for his/ her farm.

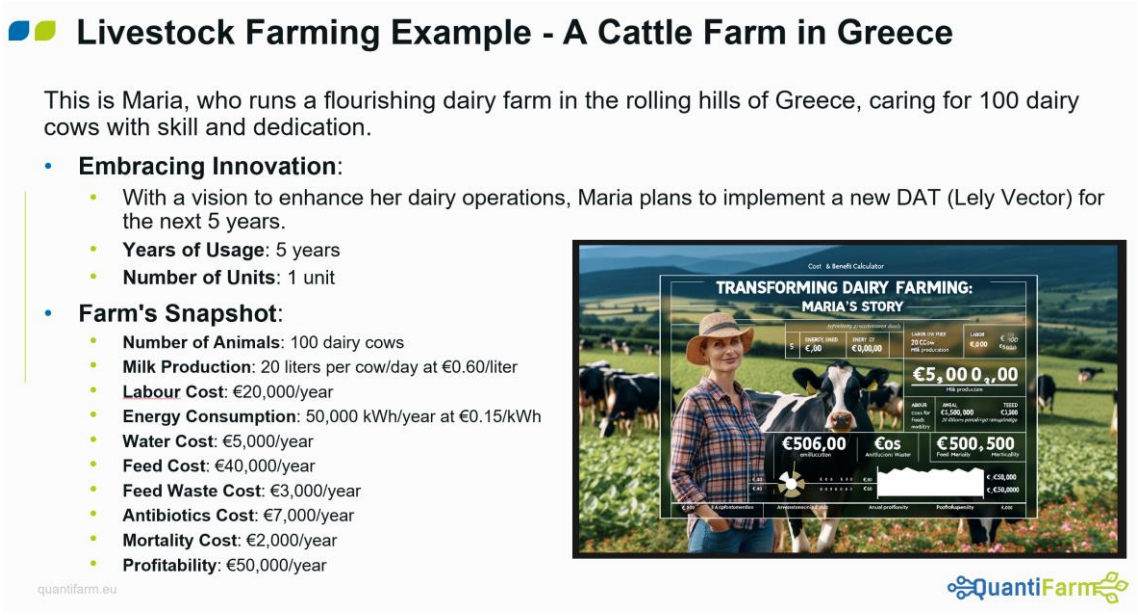

Figure 23 - Example with a cattle farmer

The following **Figure 24** presents the results from the Livestock Calculator modules after entering Maria's farm data.

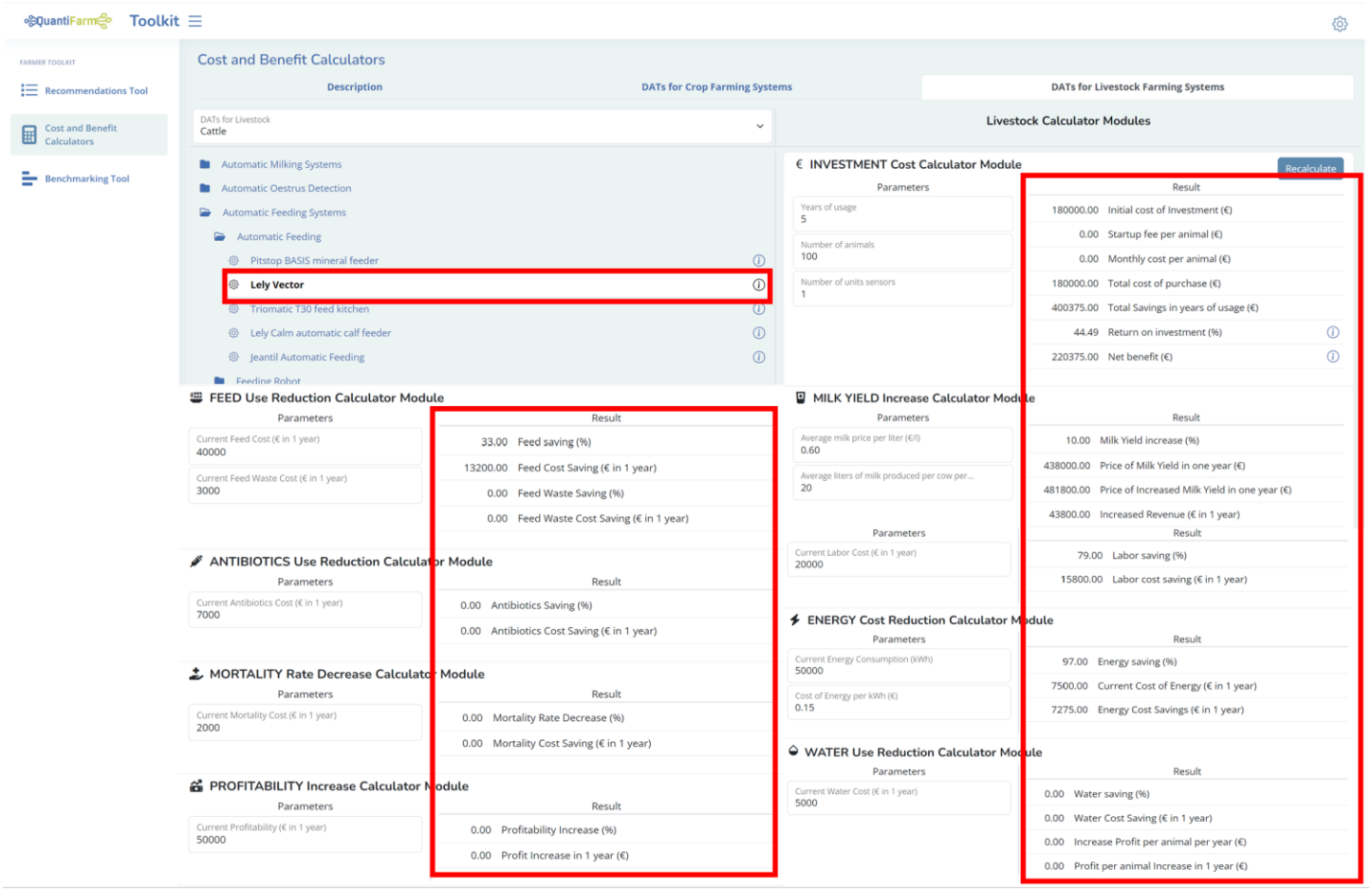

Figure 24 – Example with a Cattle Farmer

End of the

***'Cost & Benefit Calculators'* Tool**

Manual