



# QuantiFarm Toolkit – Directions for using the “Recommendation tool” V2.0

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## Main functionality

The Recommendation Tool V2.0 is an interactive tool that allows farmers and farm advisors to search through a large set of available Digital Agricultural Technology Solutions (DATSs) using natural language text and filters for available DATS parameters and ask for a recommendation for one or more DATSs that match specific characteristics of the farm and farmer. The Recommendation Tool aims to be easy to use and the farmer shouldn't need special training or extended help from the advisor. Technically, the tool is based on a knowledge-based recommender system using a combination of reasoning and constraint satisfaction to provide a ranked list of the most suitable DATSs for any given farm/farmer profile.

The Recommendation Tool is available here: [QuantiFarm Toolkit](#)

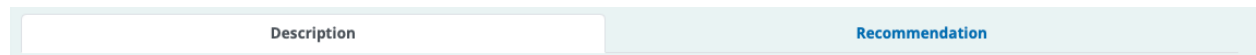
The screenshot displays the QuantiFarm Toolkit interface. On the left is a sidebar with the 'FARMER TOOLKIT' header and three menu items: 'Recommendations Tool' (active), 'Cost and Benefit Calculators', and 'Benchmarking Tool'. The main content area is titled 'Description' and 'Recommendation'. It features a row of 15 country flags for filtering. Below the flags, the text states: 'The Recommendation Tool is an interactive tool that allows farmers and advisors to gain insights on the available DATSs and request a recommendation of suitable DATSs, given:'. This is followed by a bulleted list: (1) A natural language search text, (2) DATS parameter filter values, (3) Farm and farmer profile characteristics values, and (4) A selected recommendation algorithm. The section then lists 'DATS parameter filters supported' with a description of filtering by parameter values and a bulleted list of supported filters: Agricultural Sector, Functionality, Benefits, Digital Form, Language and Country, and Cost Structure. Next, it lists 'Farm and farmer profile characteristics values supported' with a description of filtering by farm/farmer profile and a bulleted list of supported characteristics: Farm Type, Country, Language, Technologies, Functionality, and Benefits. The section then lists 'Recommendation algorithms supported' with a description of selecting an algorithm and a bulleted list of supported algorithms: Basic algorithm, Meta-path algorithm, and Natural language processing algorithm. Finally, it includes a 'Requesting a Recommendation' section with a description of the process: entering search text, selecting filters, choosing an algorithm, and clicking the 'Recommend DATSs' button to receive a ranked list of recommendations.

More specifically, with the Recommendation tool, a user can:

1. Get information about the available Digital Agricultural Technologies Solutions (DATSs),
2. Search and filter through the available DATSs,
3. Enter a profile with farm and farmer characteristics,
4. Select a recommendation algorithm to request a recommendation of suitable DATSs, and
5. Get insights into assessment information of DATSs that are being tested in testcases.

For example, a user could filter all DATSs when searching for “Greek arable farming DATSs for biodiversity preservation, in the form of computer software” and find a few corresponding available DATSs. Or, a user could have a Belgian Dairy farm, and find almost 30 recommended DATSs. To achieve this recommendation, the user must first supply the Tool with the appropriate data with information about

his/her farm to find the right match. The user can then select one of the recommended DATSs and gain insights about its information.

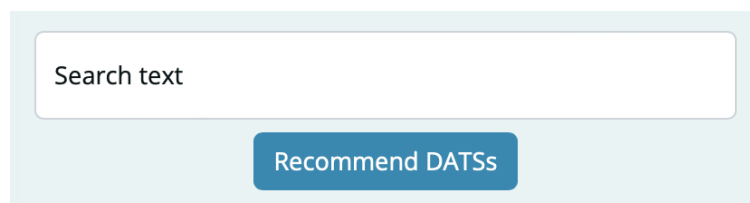


The description of the tool can be found under the “Description” tab in the top navigation bar. The tool currently requires no registration and/or logins. In the “Recommendation” tab, the tool can provide a recommendation given:

1. A natural language text in the “Search text” field,
2. The selected filters for DATS parameters in the left-hand column,
3. Entered farmer profile information in the top-part of the page, and/or
4. A selected recommendation algorithm also in the top part of the page.

### Search functionality

A free text search field is available to search for a text string in the title, description or keywords of the available DATSs. A natural language text can be entered into the “Search text” field depicted that is situated above the “Recommend DATSs” button. When pushing this button, the tool will look for any DATS that has this text in its title, description or keywords.



### DATS parameter filtering

A recommendation for DATSs can be given based on filters for DATS parameters. The possible parameters to filter the DATSs are:

1. **Agricultural Sector)** the sector the DATS is targeting
2. **Functionality)** the relevant functionality of the DATS
3. **Benefits)** the benefits that can be reached by using the DATS
4. **Digital Form)** the digital form of the DATS
5. **Language and Country)** the supported language and targeted country of the DATS
6. **Cost Structure)** the cost structure of the DATS

The values for these parameters are the union of all possible values for the DATS available in the Recommendation Tool. When the “Recommend DATSs” button is pushed, only DATSs will be shown that have all the selected values as parameter values.

The DATS parameters filters can be selected on the left side of the tool.

Recommend DATSs
Clear filters

Agricultural sector

- ☐ Vegetables (73)
- ☐ Fruits and vines (53)
- ☐ Herbs (24)
- ☐ Plant production in general (86)
- ☐ Arable farming (93)
- ▼ View more

Functionality

- ☐ Plant protection management (156)
- ☐ Nutrition/Fertilisation management (155)
- ☐ Water management (127)
- ☐ Digital pest control (1)
- ☐ Rotary Parlor (1)
- ▼ View more

Benefits

- ☐ Optimization of resources use (282)
- ☐ Effective operational management (174)
- ☐ Efficient strategy planning (154)
- ☐ Enhanced adaptation & resilience to climate change (87)
- ☐ Environmental protection (183)
- ▼ View more

Digital form

- ☐ Mobile app (162)
- ☐ Web app (2)
- ☐ Stand-alone software (56)
- ☐ Web app (296)
- ☐ Webapp (2)
- ▼ View more

Language

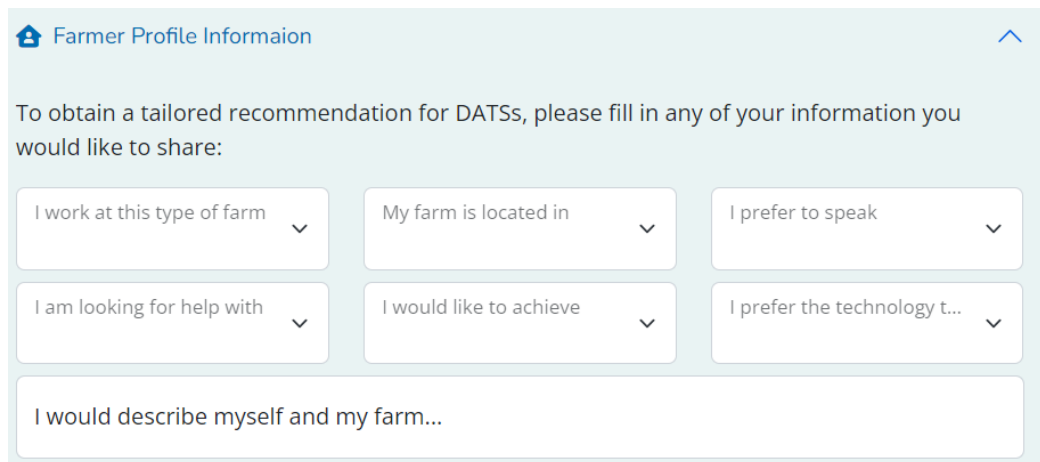
- ☐ French (72)
- ☐ Basque (15)

## Farm profile characteristics

A recommendation for DATSs can be further be finetuned based on an extended Farmer Profile. The V2.0 release of the tool includes seven farm/farmer characteristics:

1. **farm type)** arable, dairy, fruit, egg, arboriculture, meat, flower, other
2. **farm location)** ISO-3166 country code
3. **preferred language)** supported languages
4. **desired functionality type)** subgrouping of functionalities
5. **desired achievement)** preferred list of benefits
6. **technological proficiency)** computer software, mobile app, spreadsheet, paper
7. **additional farm description)** open text provided by the user for additional farm description.

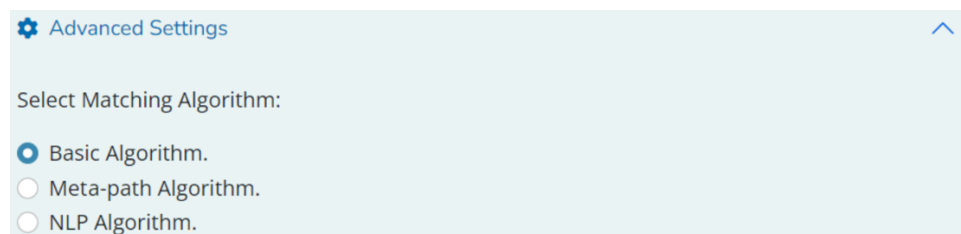
This farmer profile can be entered on the top of the “Recommendation” tab as depicted below. It allows the user to provide more information about themselves and their wishes and is supported by new and improved algorithms.



The screenshot shows a form titled "Farmer Profile Information" with a home icon and an upward arrow. Below the title, it says "To obtain a tailored recommendation for DATSs, please fill in any of your information you would like to share:". There are six dropdown menus arranged in two rows of three. The first row contains: "I work at this type of farm", "My farm is located in", and "I prefer to speak". The second row contains: "I am looking for help with", "I would like to achieve", and "I prefer the technology t...". Below these is a large text input field with the placeholder "I would describe myself and my farm...".

### Recommendation algorithms

The V2.0 release of the recommendation tool provides the inclusion of various recommendation algorithms. These recommendation algorithms can be chosen by the user through an ‘advanced settings’ menu, as shown below.



The screenshot shows a form titled "Advanced Settings" with a gear icon and an upward arrow. Below the title, it says "Select Matching Algorithm:". There are three radio button options: "Basic Algorithm." (which is selected), "Meta-path Algorithm.", and "NLP Algorithm.".

The supported algorithms are:

- **Basic algorithm)** this algorithm only recommends DATS that have *exact matches* with the selected DATS parameter values and farm/farmer characteristics.
- **Meta-path algorithm)** this algorithm recommends DATS also based on *nearly exact matches* of parameters and characteristics and prioritizes DATS according to the number of matching parameters and characteristics.
- **Natural language processing algorithm)** this algorithm uses natural language encoding techniques to encode the available and requested DATS characteristics values and calculate a similarity score to find matching DATSs to be recommended.

By default, the basic algorithm is selected.

## Requesting recommended DATSs

Once a search text has been entered, DATSs parameter filters are selected, farm characteristic values have been selected and/or a recommendation algorithm has been chosen, a recommendation for applicable DATSs can be requested by pushing the “Recommend DATSs” button. A columned list of recommended DATSs will be shown with a few parameters.

Farmer Profile Information

To obtain a tailored recommendation for DATSs, please fill in any of your information you would like to share:

I work at/have this type of farm Arable farm	I can work with these technologies Computer software
My farm is located in Netherlands	I speak this language
I am looking for help with	I would like to achieve

I would also describe myself and my farm like this

For instance, for the selection of Arable farm, Netherlands and Computer software as shown above, the following list of DATSs will be shown:

23 DATSs found		
<b>BodemDee</b>  ▶ <b>Agricultural Sector</b> Plant production in general; Arable farming; Vegetables  ▶ <b>Functionality</b> Plant protection management; Water management; Sustainable food production and healthy diets; Nutrition/Fertilisation management  ▶ <b>Cost structure</b> Free	<b>Advisors using microsoft teams</b>  ▶ <b>Agricultural Sector</b> All agricultural sectors  ▶ <b>Functionality</b> Work safety; Operational management focus; Strategic planning; Finance and budgeting  ▶ <b>Cost structure</b> Free Trial Period available	<b>EASE (Egnos sAvings in agriculturE)</b>  ▶ <b>Agricultural Sector</b> Arable farming  ▶ <b>Functionality</b> Sustainable food production and healthy diets; Nutrition/Fertilisation management; Operational management focus  ▶ <b>Cost structure</b> Free
<b>SMART Sustainability Monitoring and Assessment RouTine</b>  ▶ <b>Agricultural Sector</b> All agricultural sectors  ▶ <b>Functionality</b> Finance and budgeting; CAP management; Nutrition/Fertilisation management; Compliance with legislation and standards; Markets and sales; Post-harvest management; Sustainable food production and healthy diets; Plant protection management; Harvest prediction; Livestock stock management (movements/health/fertility/production); Operational management focus; Livestock Green House Gas (GHG) measurement and management; Logistics; Strategic planning; Water management; Improving animal care; Livestock feed and resource management; Work safety  ▶ <b>Cost structure</b> Annual service cost	<b>CROPIO</b>  ▶ <b>Agricultural Sector</b> Arable farming  ▶ <b>Functionality</b> Water management; Nutrition/Fertilisation management; Sustainable food production and healthy diets; Operational management focus; Plant protection management  ▶ <b>Cost structure</b> Annual service cost	<b>SmartShortChain</b>  ▶ <b>Agricultural Sector</b> Fruits and vines; Flowers; Plant production in general; Fishing/Aquaculture; Poultry egg production; Meat (cattle, pigs, sheep, goats, poultry, rabbits, snails); Vegetables; Communication/dissemination; Post-harvest  ▶ <b>Functionality</b> Sustainable food production and healthy diets; Compliance with legislation and standards; Markets and sales; Improving animal care; Post-harvest management  ▶ <b>Cost structure</b> Annual service cost
<b>SQAPP Soil Quality Assessment</b>  ▶ <b>Agricultural Sector</b> Plant production in general; Fruits and vines; Vegetables; Arable farming; Arboriculture; Herbs; Forestry; Flowers  ▶ <b>Functionality</b> Sustainable food production and healthy diets; Nutrition/Fertilisation management; Water management; Operational management focus  ▶ <b>Cost structure</b> Free	<b>Databank meststoffen</b>  ▶ <b>Agricultural Sector</b> All agricultural sectors  ▶ <b>Functionality</b> Compliance with legislation and standards; Nutrition/Fertilisation management  ▶ <b>Cost structure</b> Free basic version and premium fee-based version	<b>PinUp.com</b>  ▶ <b>Agricultural Sector</b> All agricultural sectors  ▶ <b>Functionality</b> Strategic planning  ▶ <b>Cost structure</b> Free
<b>Mural</b>	<b>BedrijfsBodemWaterPlan</b>	<b>Best4Soil</b>

## Detailed DATS information

When clicking on one of the DATS a pop-up window will appear that shows a longer list of DATS parameters and their values, including keywords, digital form, languages supported, countries of usage, launch year and a link to a website for even further information or possibilities to download or purchase the DATS. See below for a screenshot of this pop-up window for one of the DATS.

The screenshot shows a web interface with a sidebar on the left containing a search bar and a list of categories: Agricultural sector, Functionality, Benefits, Digital form, and Languages. The main area displays a pop-up window titled 'BodemlDee'. The pop-up contains a description of the tool, a list of parameters and their values, and a 'Close' button. The parameters listed are: Agricultural Sector, Functionality, Benefits, Keywords, Digital Form, Cost structure, Languages, Country, Launch year, Update year, and Link.

Parameter	Value
<b>Agricultural Sector</b>	Plant production in general; Arable farming; Vegetables
<b>Functionality</b>	Plant protection management; Water management; Sustainable food production and healthy diets; Nutrition/Fertilisation management
<b>Benefits</b>	Enhanced adaptation & resilience to climate change; Increase of profit/farm income; Increase of productivity; Optimization of resources use; Minimization of input costs; Improvement of yield quality; Biodiversity preservation; Environmental protection
<b>Keywords</b>	soil quality
<b>Digital Form</b>	Web app; Mobile app
<b>Cost structure</b>	Free
<b>Languages</b>	Dutch
<b>Country</b>	Netherlands; Belgium
<b>Launch year</b>	2019
<b>Update year</b>	2019
<b>Link</b>	<a href="https://levendebodem.eu/BodemlDee/BodemlDee">https://levendebodem.eu/BodemlDee/BodemlDee</a>


For instance, the detailed information for the DATS BodemlDee contains the following information:



The detailed information for the DATS BodemlDee is as follows:

Parameter	Value
<b>Agricultural Sector</b>	Plant production in general; Arable farming; Vegetables
<b>Functionality</b>	Plant protection management; Water management; Sustainable food production and healthy diets; Nutrition/Fertilisation management
<b>Benefits</b>	Enhanced adaptation & resilience to climate change; Increase of profit/farm income; Increase of productivity; Optimization of resources use; Minimization of input costs; Improvement of yield quality; Biodiversity preservation; Environmental protection
<b>Keywords</b>	soil quality
<b>Digital Form</b>	Web app; Mobile app
<b>Cost structure</b>	Free
<b>Languages</b>	Dutch
<b>Country</b>	Netherlands; Belgium
<b>Launch year</b>	2019
<b>Update year</b>	2019
<b>Link</b>	<a href="https://levendebodem.eu/BodemlDee/BodemlDee">https://levendebodem.eu/BodemlDee/BodemlDee</a>

Finally, a recommendation also indicates for a DATS whether it has been or is being tested in a QuantiFarm testcase. This is indicated by a **“TESTED”** icon in the top right corner of the DATS overview page. See below for the DATS Farm manager which is apparently tested in one of the testcases.

In the pop-up window, the fact that this DATS is tested is indicated by a text saying in which testcases the DATS is used including a button per testcase to click on that brings the user to a webpage with more details about the results of the testcase. See the screenshot below.


**Farm manager**


**This DATS was tested in the following Test cases, click on the number to see more details:**

**9**

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Farm manager - farm business planning/modelling and decision-making for agricultural advisors, farmers and education

Farm Manager is the e-service for business planning, business modelling and decision-making on farms, based on a technically advanced e-service. It is a modern upgrade of the catalogue of calculations, which has historically been provided in the printed version, and has been an indispensable tool for planning business operations on farms for various purposes within the framework of agricultural consulting since 1995. The service enables users to review existing calculations and create farm production plans while advanced users (advisors) can develop and prepare new calculations. The Farm manager is, in the next iteration going to be upgraded into a data-driven platform, aggregating data received from satellites (Earth Observation), drones, in-situ sensors (IoT), weather stations, soil and plant test databases and other third-party/open data sources.

<b>Agricultural Sector</b>	Farm-based added-value processes; Arable; Animal production in general; Plant production in general
<b>Functionality</b>	Harvest prediction; Finance and budgeting; Nutrition/Fertilisation management; Livestock feed and resource management; FMIS/ Financial Modelling; Strategic planning; Operational management focus; Post-harvest management; CAP management
<b>Benefits</b>	Better interaction between farmer and advisor; Biodiversity preservation; Efficient strategy planning; Environmental protection; Minimization of input costs; Financial assessment / Reporting; Effective operational management; Increase of profit/farm income; Increase of productivity; Task scheduling / Time management; Labour saving / Limit stress / Increase farmer's leisure time; Optimization of resources use
<b>Keywords</b>	business planning; animal production; crop production; farm production; business modelling; decision support; farm manager
<b>Digital Form</b>	Web app



When clicking on the testcase 9 icon, the user is guided towards the detailed testcase information of this testcase as shown in the screenshot below.

