European Commission

GDD

Graphic Data Display

User Guide

Joint Research Centre

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Feel free to contact us, in case you need additional explanations or information.

Contents

Help contents

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This Guide is targeted to advanced users of the BioMA Software Framework.

In particular, this Help describes how to use GDD (Graphic Data Display), a Microsoft .NET component, which allows displaying the simulation results either as textual tables or as graphs.

The topics are organized as follows:

Topic	Contents
“About GDD” on page 6	A general introduction to the application’s features
“Installing and launching GDD” on page 8	How to install and launch Graphic Data Display
“Workspace overview” on page 9	An overview of the application’s user interface and main functions
“Available data views” on page 12	Examples of the tabular and graphic data views
“Using the GDD auto-draw capabilities” on page 24	How to use the application to create and manage the graph data views

See also:

- BioMA Framework User Guide (https://agri4cast.jrc.ec.europa.eu/DataPortal/Index.aspx?o=s)
- “Credits” on page 4

Credits

The current version of **CRA.Core.GDD** was developed by **CRA-ISCI** (Agriculture Research Center) within the project SEAMLESS (EU - DG Research, contract no. 010036-2)

See http://www.seamless-ip.org

Development

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- Andrea Di Guardo

Programming

- Andrea Di Guardo
- Marcello Donatelli

References

Di Guardo A., M. Donatelli M., M. Botta, 2007. Two framework components to simulate biophysical systems. Proc. of Farming Systems Design 2007, Catania, Italy, 10-12 September, 2007.

Using GDD

2

This topic is organized into the following sections:

About GDD

Scope

Providing data views via graphical user interfaces is a common need for every application built to make use of models.

If model output is generated by a modular system in which model components are interchangeable, output variables may change; thus, maintaining such graphical user interfaces, can be challenging and resource demanding.

A tool which can load datasets with various schema and which helps the user to visualize data in various ways, it would speed up application development, allowing focusing on models, rather than on user interfaces. In such a tool, whether flexibility of use is a need, providing domain specific views of data would add value both in operational use and in model development.

What GDD can be used for

GDD (Graphic Data Display) is a Microsoft .NET component, which has the specific purpose to retrieve a set of output variables and to allow displaying values either by textual tables or by several kinds of graphs.

Also, reference data (e.g., data from experiments, or surveys) can be superimposed to simulation results. Graphs can be saved as image files. GDD can be used as a stand-alone tool or as a component inside an application (see “GDD as a BioMA plugin” on page 7).

In the former case it provides access to a file dialog to allow the user selecting a file, whereas in the latter case it can be opened inside a modeling framework directly loading the current dataset.

Data formats

At this development stage, GDD accepts inputs via three different formats: XML, Microsoft Excel, and a more compact/faster binary (another component, also available, allows I/O operations with the binary format). Readers can however be extended by third parties implementing the proper interface.

Each variable can be either a table column, or an entire table of the dataset, depending on the fact that it is either only time-variant or time and 1 dimension space-variant (the latter are variables that vary across soil profiles, such as soil temperature).

GDD as a BioMA plugin

Besides of being a stand-alone application, GDD can be used as a BioMA plug-in.

Users can access it from within the BioMA Graphical User Interfaces (Spatial and Point) to load the current dataset and visualize data both in tabular and graphical form.

Tip:

For further information on how to use GDD as a BioMA plugin, see the BioMA Spatial User Guide (https://agri4cast.jrc.ec.europa.eu/DataPortal/Index.aspx?o=s) .

Related topics:

- “Installing and launching GDD” on page 8
- “Workspace overview” on page 9
- “Available data views” on page 12
- “Using the GDD auto-draw capabilities” on page 24

Installing and launching GDD

Graphic Data Display (**GDD**) is only provided as a **BioMA Spatial** plugin (see BioMA Spatial User Guide).

Installation prerequisites

In order to install and run Graphic Data Display, the following prerequisites must be fulfilled:

Hardware prerequisites

- Operative system: Windows XP or later (32 or 64 bit)

Software prerequisites

The following software must be installed on your computer:

- **NET 4.5 Framework** - To install go to http://www.microsoft.com/net/. Follow the product's documentation, if needed.

Regional Settings of your PC

Ensure that the Regional Settings of your PC are properly set:

1. Access the Windows **Control Panel** and select **Clock, Language, and Region**.
2. In the **Region and Language** window, click **Additional settings**.
3. Be sure that the **Decimal symbol** is set to "point" (**.**).

Launching the application

As a BioMA Spatial plugin:

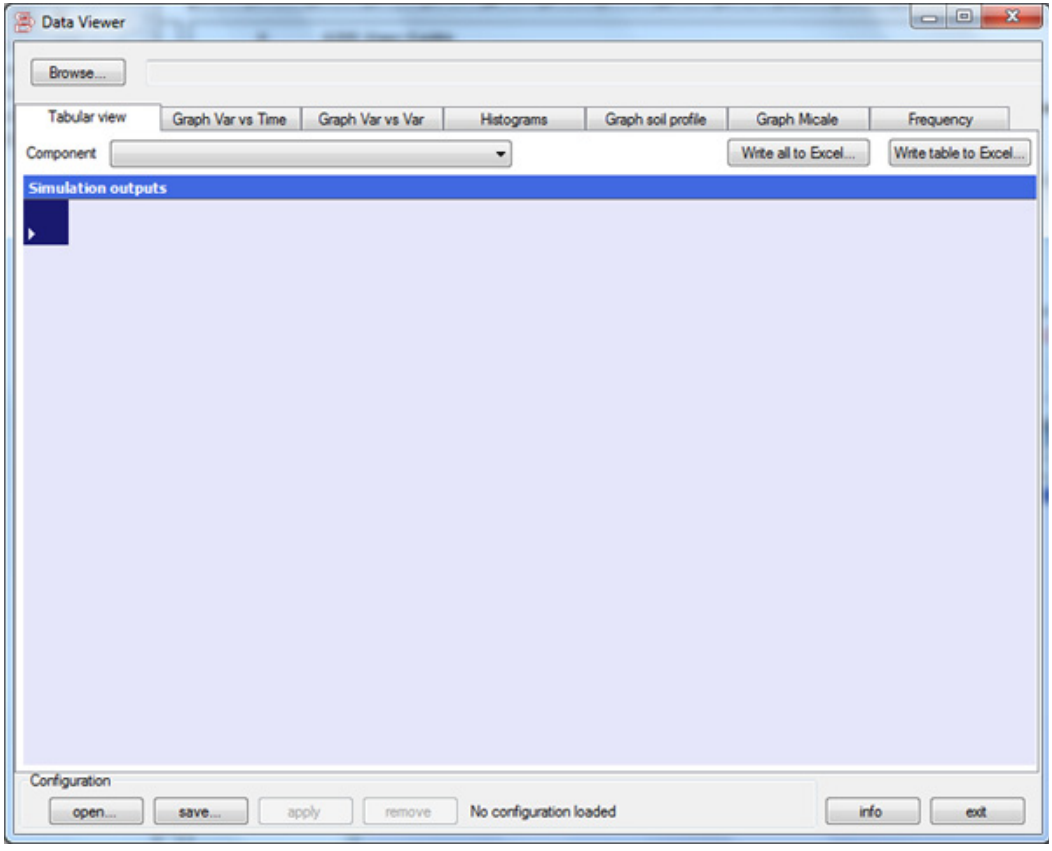
- After running a model simulation and launching the Simulation Result Visualizer, open it by clicking the **Open tables with GDD** button.
- Load the current dataset to visualize data.

Related topics:

- "Workspace overview" on page 9

Workspace overview

The following shows the GDD workspace overview when the user launches the application:



The following table describes the main workspace items:

Workspace item		Description
TABS	**Tabular view**	It allows selecting a single table from the dataset and visualizing its content on screen. From this data view, single tables (or all tables at once) can be saved in a Microsoft Excel format, using the ad-hoc buttons. See “Tabular view” on page 13.
	Graph Var vs Time	It provides the opportunity to plot up to seven variables vs. time allowing the user to set the time period and providing some graph options. See “Graph Var vs Time view” on page 15.
	Graph Var vs Var	It allows plotting a variables of choice vs. another variable. “Graph Var vs Var view” on page 17.
	Histograms	It allows plotting histograms on graphs which do not have time explicit. See “Histograms view” on page 18.
	Graph soil profile	This tab is only available if the model’s output includes the soil data and it allows plotting the variables that relate to soil. This is a domain specific graphical representation of a selection of variables generally available in a biophysical system simulation. See “Graph Soil Profile view” on page 19.
	Graph Micale	It is a graphic metaphor which allows plotting daily values of an output variable using a scale of colours. See “Graph Micale” on page 21.
	Frequency	It shows the distribution of values in a number of classes chosen by the user. See “Frequency view” on page 23.

Workspace item		Description
BUTTONS	**Browse**	It allows loading the XML(s) files that include the dataset(s).
	Component	It allows selecting the component to visualize.
	Write all to Excel	Only relevant for the **Tabular view** tab. It allows saving all tables in a Microsoft Excel format, in one single operation.
	Write table to Excel	Only relevant for the **Tabular view** tab. It allows saving a single table in a Microsoft Excel format.
	Configuration	• Open - It allows loading an existing configuration, that is, a graph that you have already created and saved. • Save - It allows saving a configuration, that is, variables and settings of a graph. Using this function you can reuse a graph configuration. • Apply - It allows viewing a saved graph. • Remove - It removes the loaded configuration. For further information on using these buttons, refer to “Using the GDD auto-draw capabilities” on page 24.
	Info	It shows information on the software release and allows accessing this Help.
	Exit	It closes the application.

Related topics:

- “Available data views” on page 12
- “Using the GDD auto-draw capabilities” on page 24

Available data views

Each tab of the GDD Graphical User Interface, provides a different type of data view.

This topic provides a general overview of each data view, as well as some examples of graphs.

Tabular view vs. Graph views

GDD allows displaying values either by textual tables or by several kinds of graphs.

On each of the graph types available, variables can be selected and plotted.

However, automatic plotting can be activated loading GDD files with the information needed to use the auto-draw feature. Such files can be built via GDD.

The use cases related to this feature of GDD are described in “Using the GDD auto-draw capabilities” on page 24.

Note:

The auto-draw configurations are specific to the input file content.

See also:

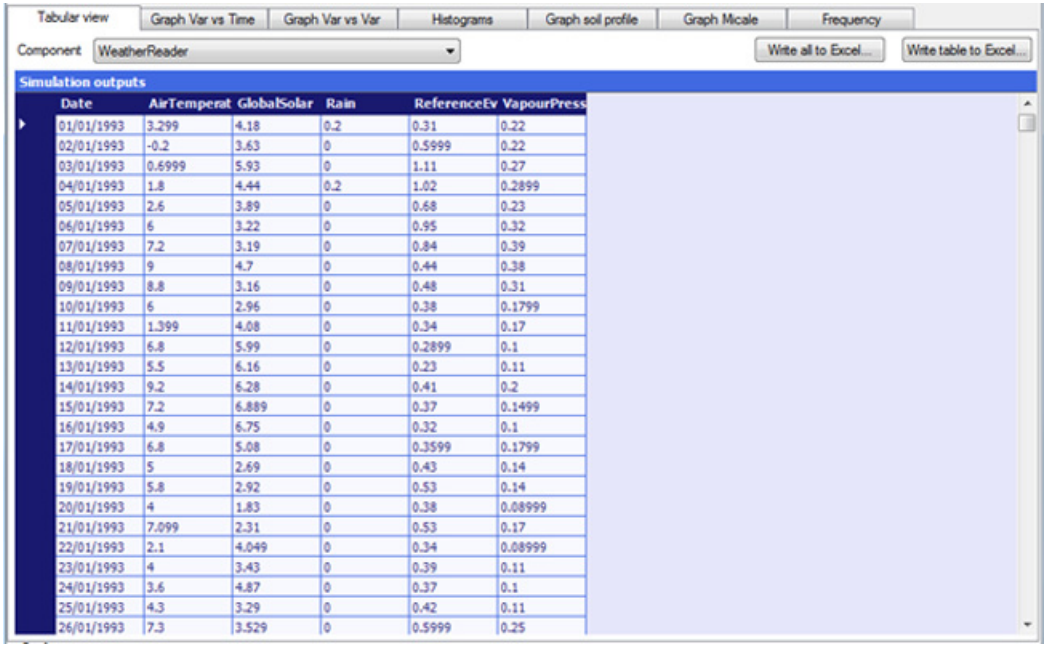
- “Tabular view” on page 13
- “Graph Var vs Time view” on page 15
- “Graph Var vs Var view” on page 17
- “Histograms view” on page 18
- “Graph Soil Profile view” on page 19
- “Graph Micale” on page 21
- “Frequency view” on page 23
- “Using the GDD auto-draw capabilities” on page 24

Tabular view

The **Tabular view** shows data, for each component, either as columns per variable (variable as time variant) or as tables per variable (variable as time and one dimension variant).

The latter refers to soil data profiles (water, nitrogen, temperature, pesticides).

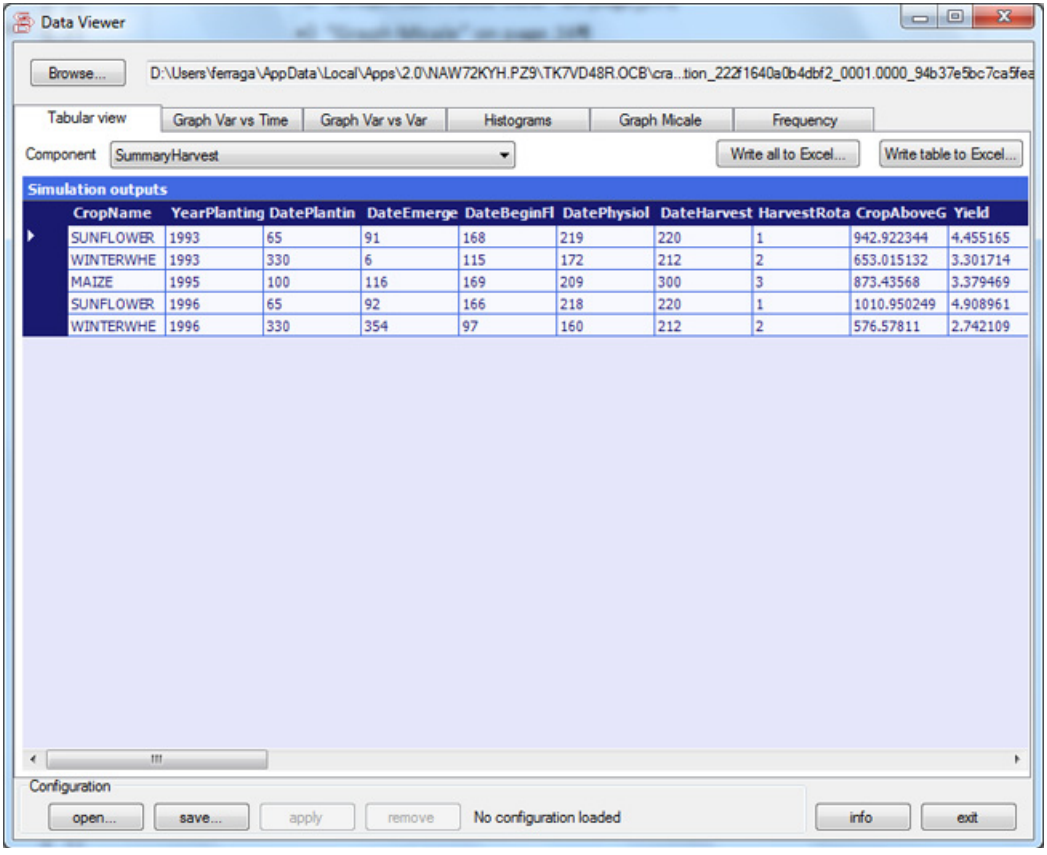
Each row is a day. A date is stored in the first column, as shown in the following example (**WeatherReader** table):



Date	AirTemperat	GlobalSolar	Rain	ReferenceEv	VapourPress
01/01/1993	3.299	4.18	0.2	0.31	0.22
02/01/1993	-0.2	3.63	0	0.5999	0.22
03/01/1993	0.6999	5.93	0	1.11	0.27
04/01/1993	1.8	4.44	0.2	1.02	0.2899
05/01/1993	2.6	3.89	0	0.68	0.23
06/01/1993	6	3.22	0	0.95	0.32
07/01/1993	7.2	3.19	0	0.84	0.39
08/01/1993	9	4.7	0	0.44	0.38
09/01/1993	8.8	3.16	0	0.48	0.31
10/01/1993	6	2.96	0	0.38	0.1799
11/01/1993	1.399	4.08	0	0.34	0.17
12/01/1993	6.8	5.99	0	0.2899	0.1
13/01/1993	5.5	6.16	0	0.23	0.11
14/01/1993	9.2	6.28	0	0.41	0.2
15/01/1993	7.2	6.889	0	0.37	0.1499
16/01/1993	4.9	6.75	0	0.32	0.1
17/01/1993	6.8	5.08	0	0.3599	0.1799
18/01/1993	5	2.69	0	0.43	0.14
19/01/1993	5.8	2.92	0	0.53	0.14
20/01/1993	4	1.83	0	0.38	0.08999
21/01/1993	7.099	2.31	0	0.53	0.17
22/01/1993	2.1	4.049	0	0.34	0.08999
23/01/1993	4	3.43	0	0.39	0.11
24/01/1993	3.6	4.87	0	0.37	0.1
25/01/1993	4.3	3.29	0	0.42	0.11
26/01/1993	7.3	3.529	0	0.5999	0.25

Other types of tables are like the **SummaryHarvest** table (each record refers to a crop harvested), and like the **YearSummary** table (each record refers to a year).

The following shows the **SummaryHarvest** table:



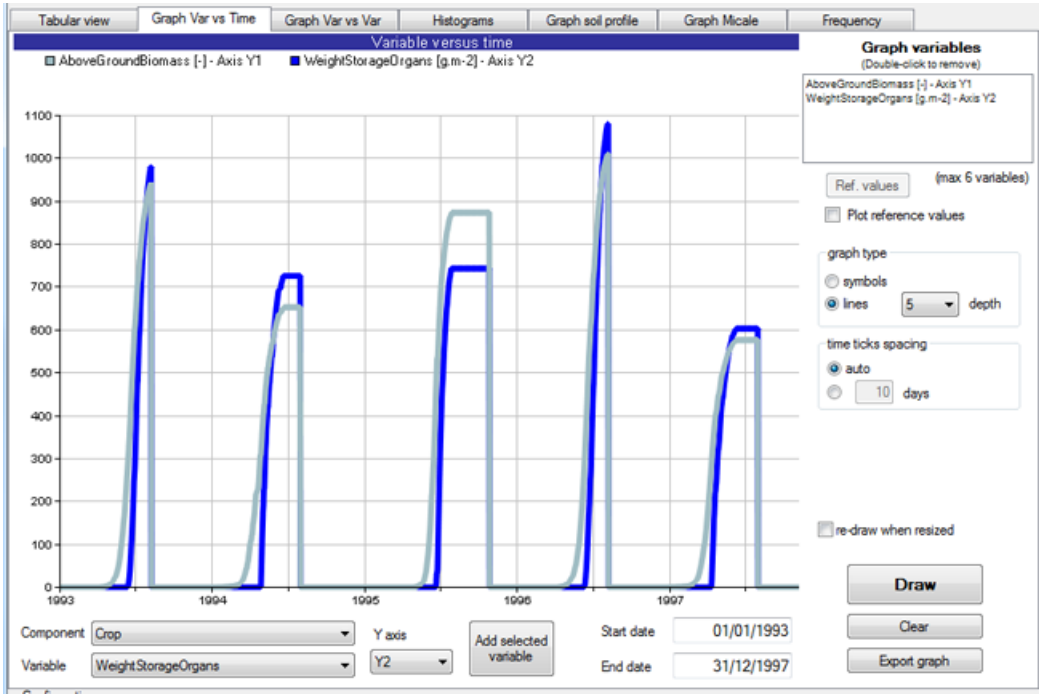
From this data view, you can save all tables at once, or single tables in a Microsoft Excel format by using the **Write all to Excel** or the **Write table to Excel** button, respectively.

Graph Var vs Time view

This data view allows plotting up to seven variables at once versus time.

Data can be plotted as both and symbols or lines (the latter can have a different depth, as in the example below.

A subset of data (as time) can be plotted. Graphs can be exported as JPG images.

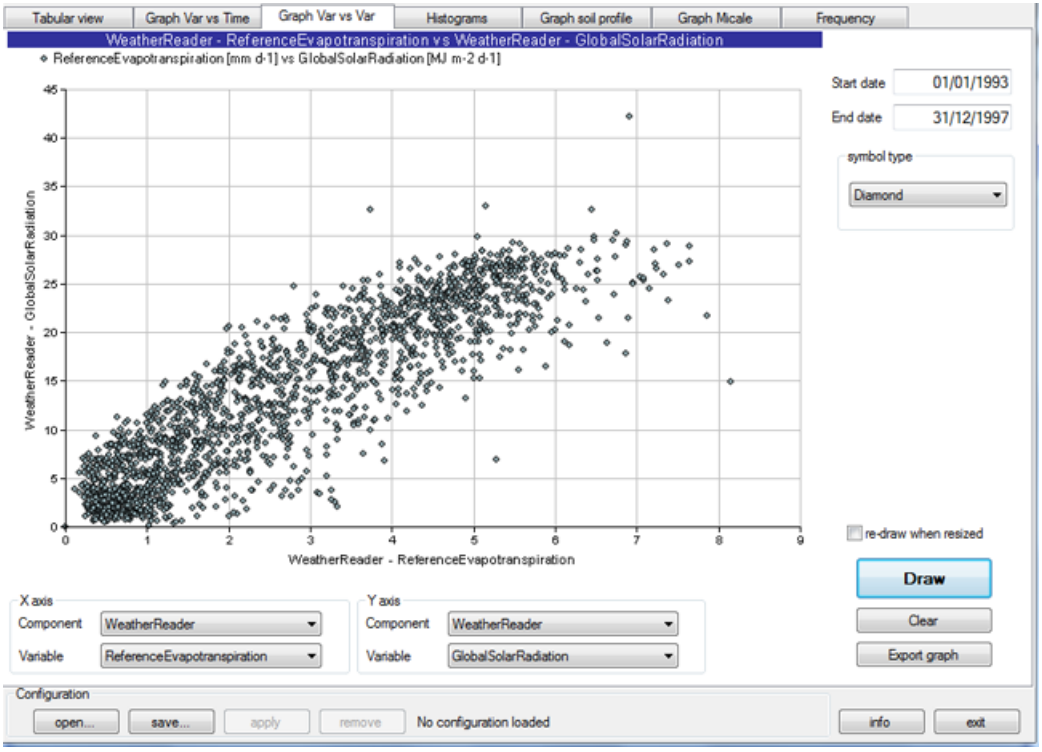


Tip:

For detailed instructions on how to create, load, and save a graph, refer to “Using the GDD auto-draw capabilities” on page 24.

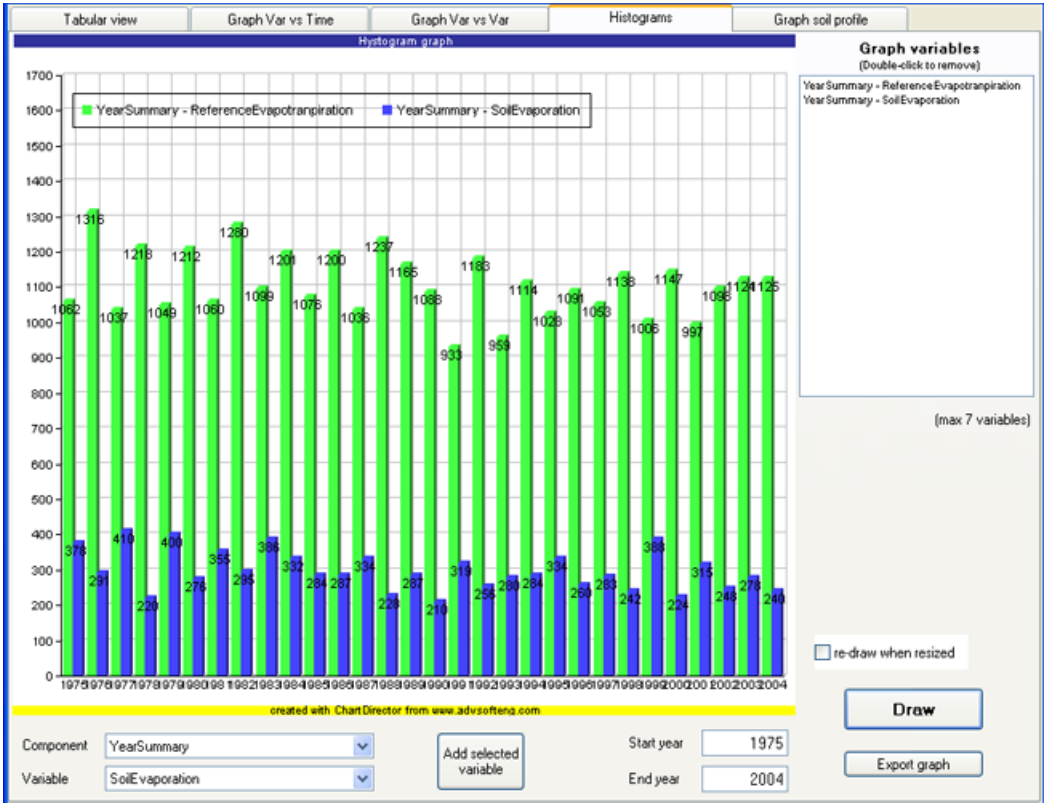
Graph Var vs Var view

This data view allows plotting a variables of choice vs. another variable.



Histograms view

Histograms can be plotted on graphs which do not have time explicit.



Graph Soil Profile view

This view allows plotting variables that relate to soil, such as:

- Volumetric water content
- Temperature
- Total nitrogen
- Pesticides (one graph for each pesticide)

This data view is domain specific and it requires some variables. A GDD mapping file allows matching the variable and table names used in GDD to the ones of the input file used. This allows using GDD in systems which use different name for variables.

In the following are shown some examples:

Figure 1 Profile data: SoilWaterContent

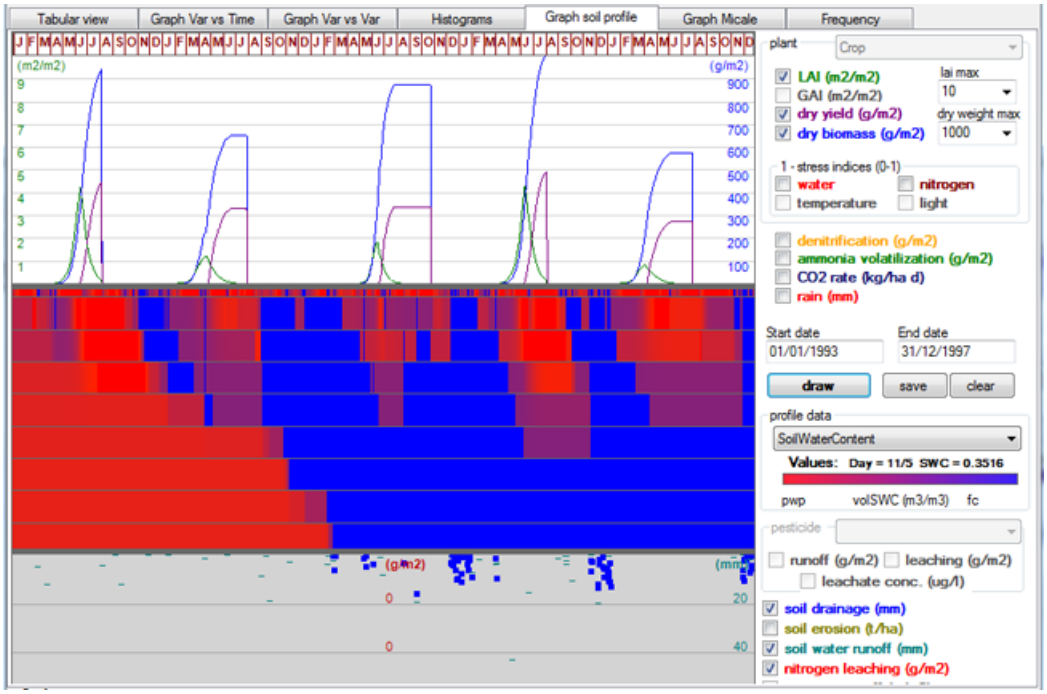
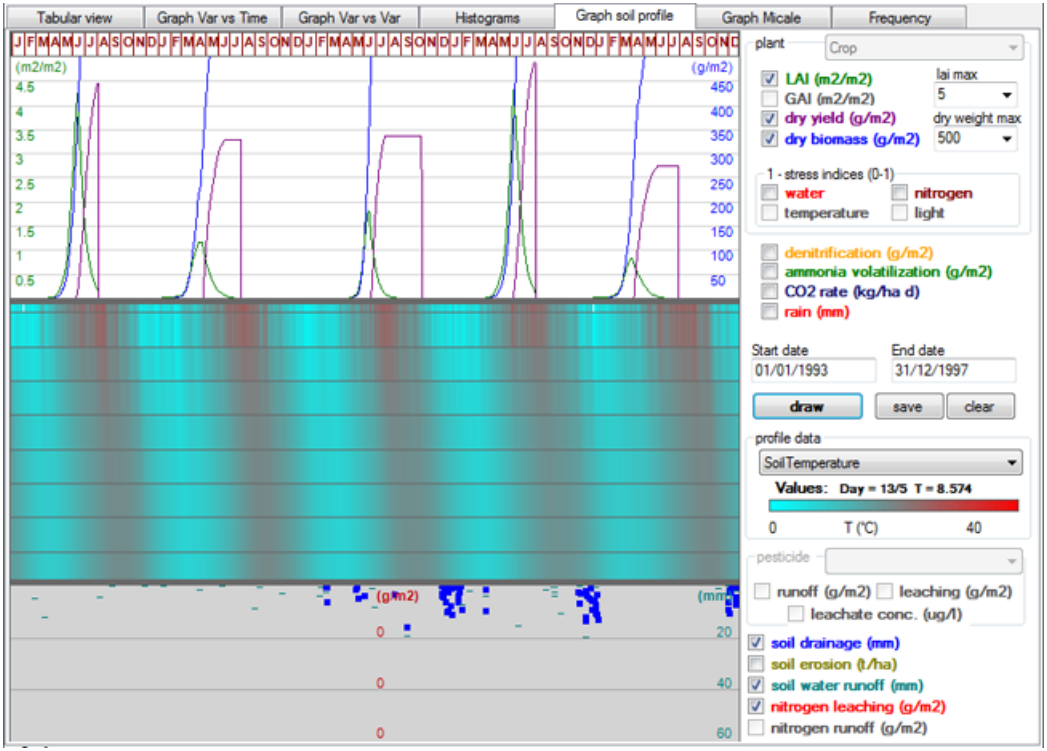


Figure 2 Profile data: SoilTemperature

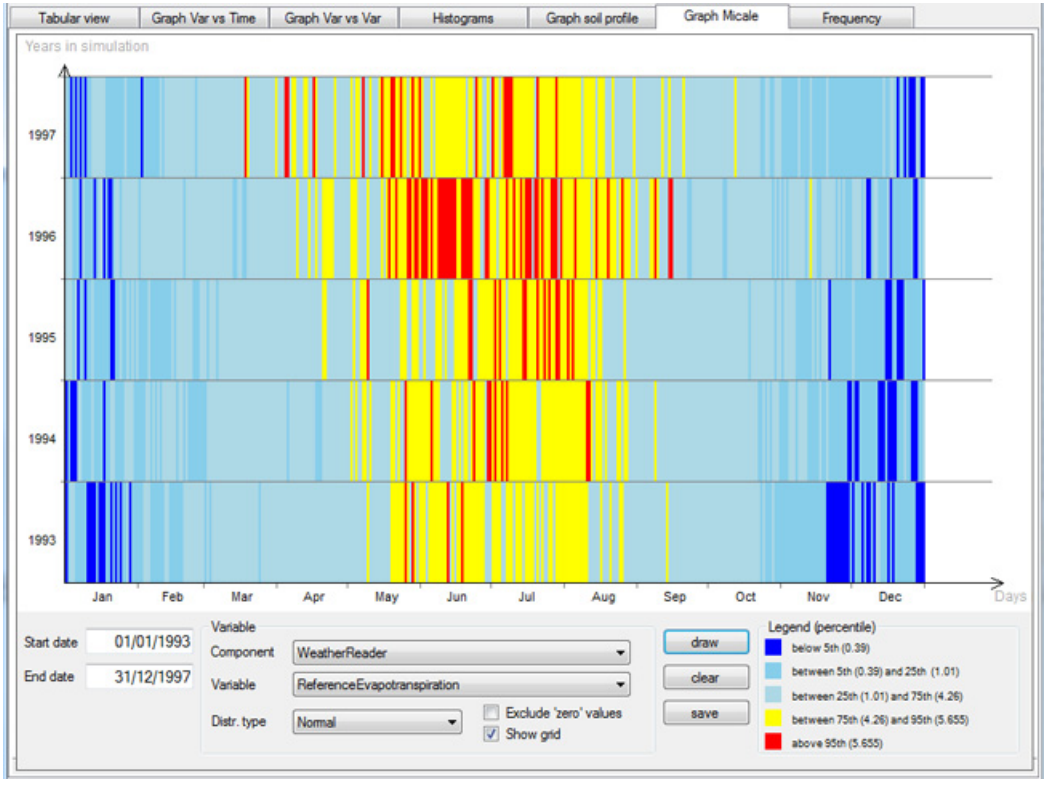


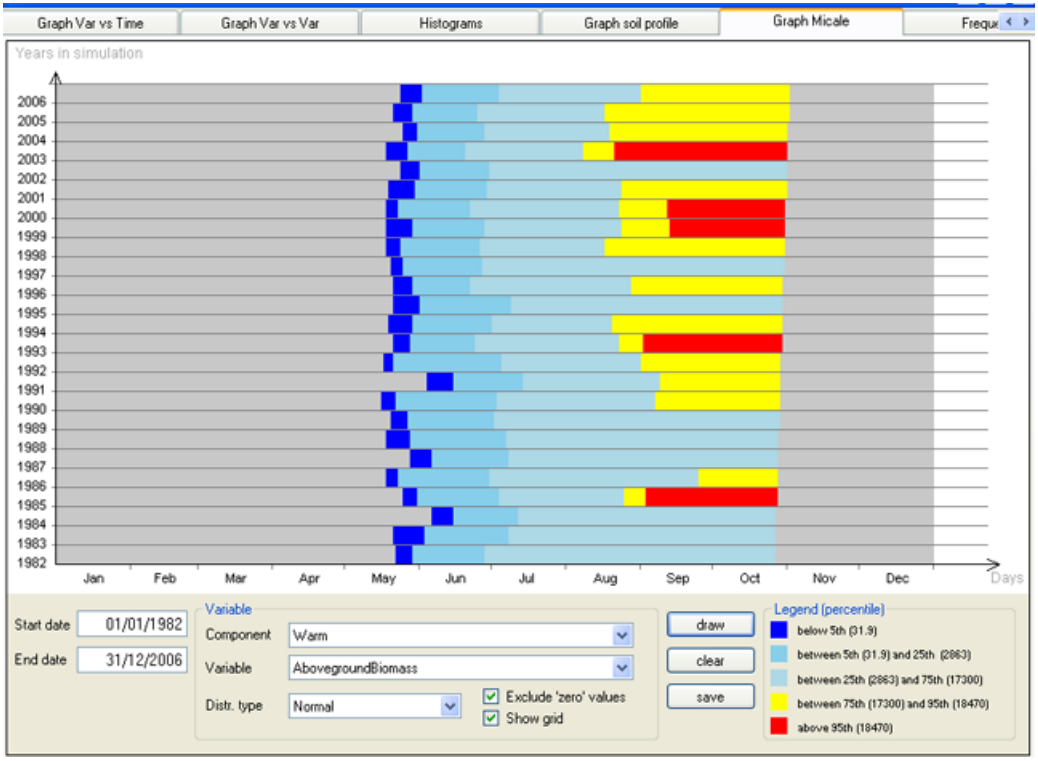
Graph Micale

The graph Micale is a graphic metaphor which allows plotting daily values of an output variable using a scale of colours.

Color settings are done according with a distribution of choice (normal as default).

Values equal to 0 can be excluded from the plot as shown in the second graph in this page.

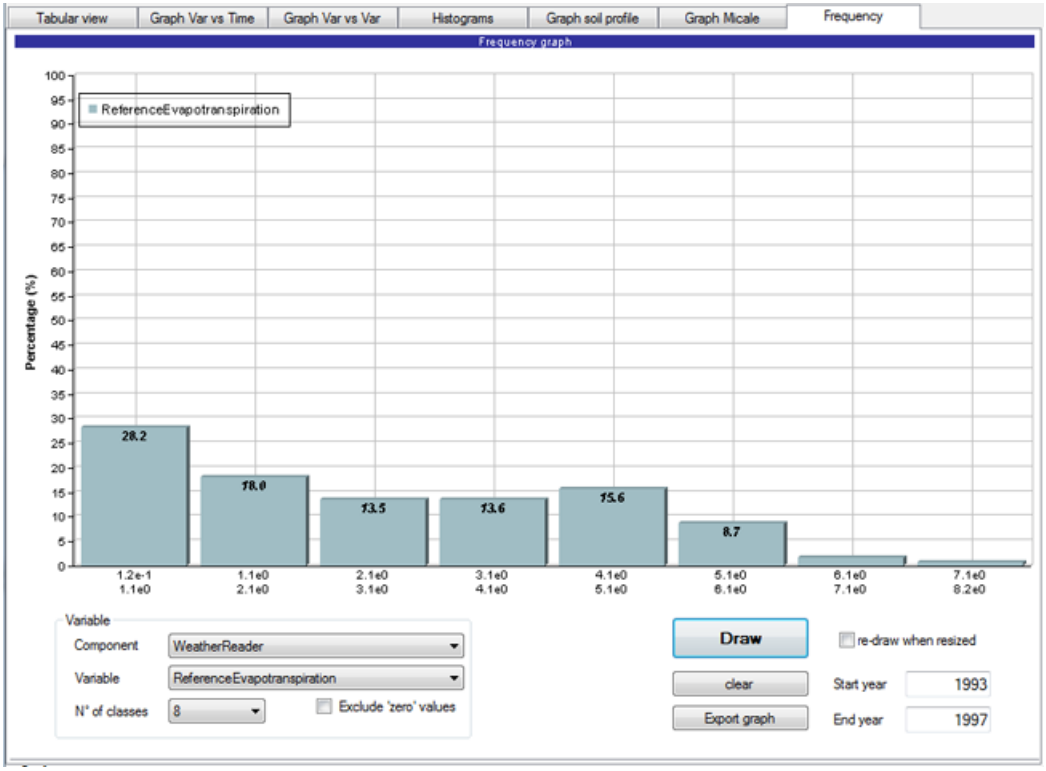



Graph Var vs Time
Graph Var vs Var
Histograms
Graph soil profile
Graph Micale
Years in simulation
2006
2005
2004
2003
2002
2001
2000
1999
1998
1997
1996
1995
1994
1993
1992
1991
1990
1989
1988
1987
1986
1985
1984
1983
1982
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Days
Start date
01/01/1982
End date
31/12/2006
Variable
Component
Warm
Variable
AbovegroundBiomass
Distr. type
Normal
Exclude 'zero' values
Show grid
draw
clear
save
Legend (percentile)
below 5th (31.9)
between 5th (31.9) and 25th (2863)
between 25th (2863) and 75th (17300)
between 75th (17300) and 95th (18470)
above 95th (18470)

Frequency view

The Frequency graphs show the distribution of values in a number of classes chosen by the user.

Here it is an example of this type of graph:



Related topics:

- “Tabular view vs. Graph views” on page 12
- “Using the GDD auto-draw capabilities” on page 24

Using the GDD auto-draw capabilities

This section describes how to use GDD to visualize, create, and edit variable configurations that are used to view data as graphs.

You can load a configuration from any of the available tabs.

To run operations related to auto-draw, specific buttons are provided at the bottom of the form.

In particular:

- "Creating a new configuration" on page 24
- "Loading a saved configuration" on page 26
- "Editing and saving a configuration" on page 28
- "Comparing the results with existing reference data" on page 29
- "Exporting the graph" on page 32

Creating a new configuration

Note:

If you are using GDD as a BioMA plugin, the **Browse** button is not available as, in this case, GDD is opened inside a modeling framework directly loading the current dataset.

To create a new configuration:

1. Click **Browse** at the top of the GDD window.
2. Select the XMLs that contains the dataset(s) and click **Open**.
3. Select the **Graph view** tab you want to configure and then select a **Component** from the dropdown list. In this example we select **Graph Var vs Time**.
4. Set the **Variable** you want to use from the dropdown list, and then set the graph's **Axis**.
5. Click **Add selected variable**. The variable is added in the **Graph variables** pane at the top-right.

   You can add as many variables as it is indicated. To remove a variable, double-click it.
6. Set the other parameters, as required:
   - **Start date** and **End date** -

- **Ref. Values** - This button becomes available after selecting a variable in the **Graph variables** list. If you have reference values, you can use this function to compare the simulation results with existing reference data. For further information, see “Comparing the results with existing reference data” on page 29.
- **Plot reference values** - Check to enable the capability.
- **Graph type** - Select the graph type you want to generate. If you select **Lines**, you can also set the depth.
- **Time ticks spaces** - Set the value (**Auto** or select a value from the dropdown list).
- **Re-draw when resized** - Select this checkbox to properly resize the graph when the graph area changes (e.g., the GDD window is resized).

7 Once finished, click **Draw** to display the graph. To clear the graph from the form click **Clear**.

8 Click the **Save** button.

9 In the text box that popups, specify the modelling solution/type of output file the configuration is made for. (Recommended).

10 Close the text box. The configuration has been saved and you can now reload for a future use/edit. (See “Loading a saved configuration” on page 26).

11 You can also save your graph as an image by clicking the **Export graph** button. Available formats are: JPG, PNG, GIF, and BMP.

Note:

The **Save** button allows saving the current choice of variables for each tab. All tabs are saved at once.

Related topics:

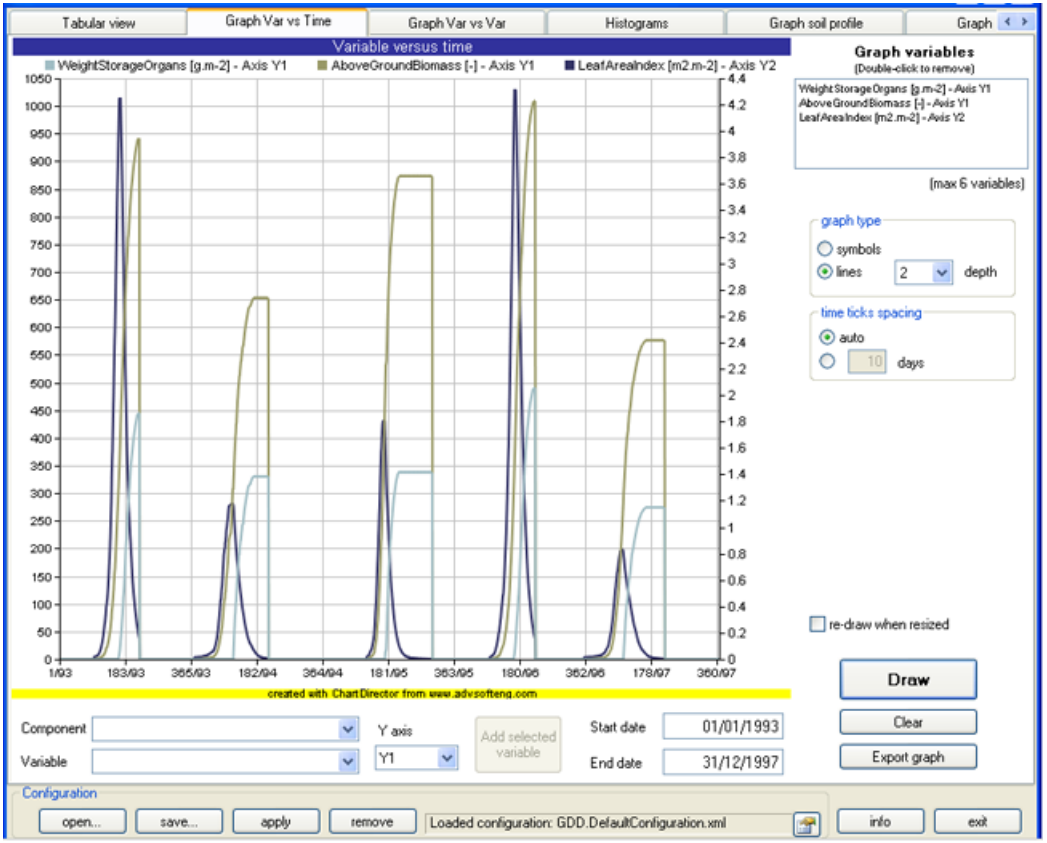
- “Loading a saved configuration” on page 26
- “Editing and saving a configuration” on page 28
- “Comparing the results with existing reference data” on page 29
- “Exporting the graph” on page 32

Loading a saved configuration

To upload an existing configuration:

1. If you did not yet open a dataset, click **Browse** at the top of window.
2. Select the XMLs that contains the dataset(s) and click **Open**.
3. Select the **Graph view** tab you want to configure and click the **Open** button. (In this example, we selected the **Graph Var vs Time** tab).
4. Browse to upload an existing configuration (XML) file.

   The screenshot below shows the **Graph Var vs. Time** tab where the **GDD.DefaultConfiguration.xml** has been loaded. (This file is provided with the installation package).



Related topics:

- “Creating a new configuration” on page 24
- “Editing and saving a configuration” on page 28
- “Comparing the results with existing reference data” on page 29
- “Exporting the graph” on page 32

Editing and saving a configuration

You can load an existing configuration and use it as a basis to create a new one:

1. Click the **Open** button and then load an existing configuration (see “Loading a saved configuration” on page 26).
2. There are two possible scenarios:
   a. If you already opened a dataset, the graph will be displayed after selecting the configuration.
   b. If you did not opened a dataset, click **Browse**, select it (see “Loading a saved configuration” on page 26) and then click **Apply** to view the graph.
3. Edit your settings as needed (add/remove variables, change the graph type, and so forth).
4. Click the **Save** button.
5. In the text box that popups, enter a meaningful description for the configuration, and then close it.
6. In the **Save as** dialog that is displayed, enter a new name for your configuration and click **Save**.

Related topics:

- “Creating a new configuration” on page 24
- “Loading a saved configuration” on page 26
- “Comparing the results with existing reference data” on page 29
- “Exporting the graph” on page 32

Comparing the results with existing reference data

Note:

This function is only available in the **Graph Var vs. Time** view.

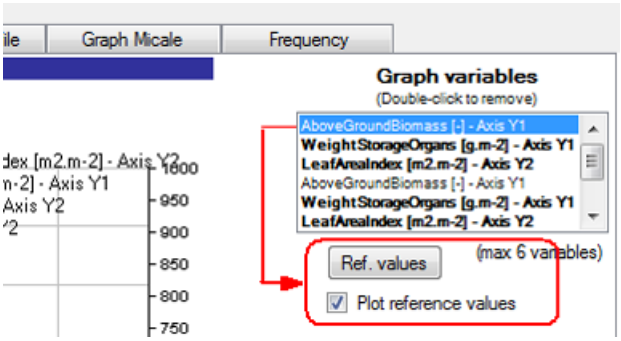
After running a simulation and viewing the results in graph format, you can compare the results with existing reference data, either in Microsoft Excel format, or in text format (tab/comma/semicolon separated).

In the following example, we will compare the simulation results with existing reference data related to the **AboveGroundBiomass** variable.

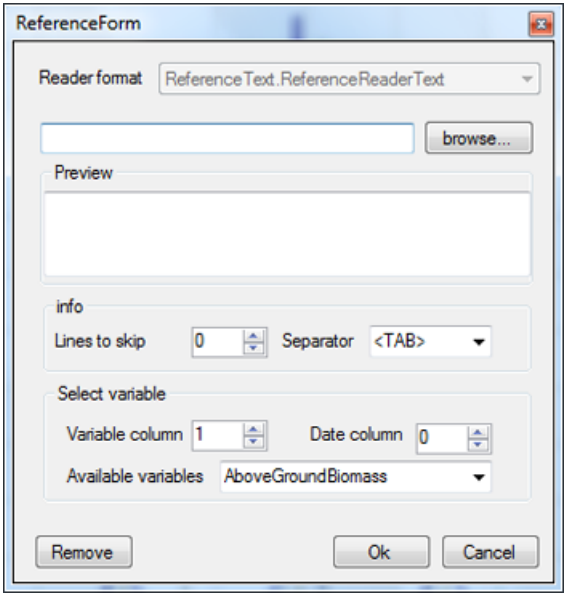
To extend the readers and compare the data:

1 Load or create a configuration.

2 Select a variable in the **Graph variables** list at the top-right of the form.



3 Click the **Ref. values** button. The following dialog popups:



4 From the **Reader format** dropdown list, select the format of your reference data file: Text files or Microsoft Excel files.

5 Click the **Browse** button and then select the file.

6 Depending on the **Reader format** you selected, do the following:

   a. If you selected Text (as the example above), specify the **Lines to skip**, if any, and the **Separator**.

   b. If you selected Microsoft Excel, select the **Worksheet**.

7 In the **Select variable** area:

   a. From the **Available variables** dropdown list, which lists the columns that are present in your file, select the same variable that you selected in **Step 1**.

   b. Set the other parameters as required.

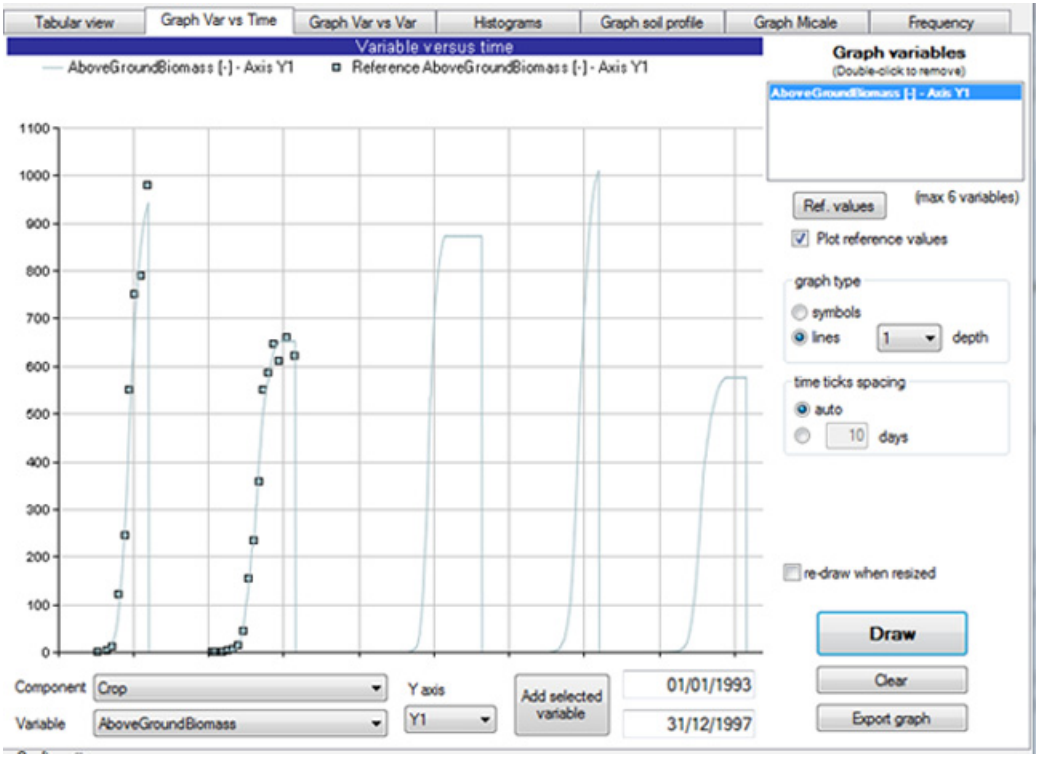
8 Click **Ok** to apply your selections and return to GDD.

   (To remove the selected file and set a new one, click **Remove**. To exit the form without selecting a file, click **Cancel**.)

9 In GDD, select the **Plot reference values** checkbox.

10 Click the **Draw** button to display the reference values in the graph.

The reference values will be displayed in the graph as dots, as it is shown in the example below:



11 You can then use the **Save** button to save your new graph configuration for a later re-use.

Related topics:

- “Creating a new configuration” on page 24
- “Loading a saved configuration” on page 26
- “Exporting the graph” on page 32

Exporting the graph

All graphs can be exported as an image by doing the following:

1. Once you are finished drawing your graph, click the **Export graph** button at the bottom of the window.
2. In the window that is displayed, select the image format (JPG, GIF, PNG, or BMP) from the **Save as type** dropdown list.
3. Specify a **File name** and then click **Save**.

Related topics:

- “Creating a new configuration” on page 24
- “Available data views” on page 12