European
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BioMA

Framework User Guide

Joint
Research
Centre

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

Contents

About this Guide

1

This Guide has been developed for users and advanced users of the BioMA Software Framework, an application designed and developed for analyzing, parameterizing and running modelling solutions based on biophysical models.

The application is based on independent components, for both the modelling solutions and the graphical user interface: as an application user, you can use it for running model solutions and, as an advanced user, to extend modeling solutions and/or adding new components.

This **Guide** has two main purposes:

- To provide an overview of the software architecture, its main components, and the Graphical User Interface (BioMA Spatial).
- To be a sort of repository for all existing documentation related to the BioMA Software Framework components. The documentation set, which is targeted to both end users and developers, covers the following:
  - Software Architecture
  - Graphical User Interfaces
  - Pluggable components
  - Application utilities
  - Reference documentation (code)

  For a descriptive list, see “Documentation set and Web resources” on page 5.

See also:

- “Contents of this Guidethis Help” on page 4

Contents of this Guide

The topics are organized as described in the following table:

Topic	Contents	See
Introduction to BioMA	Introduction to the software framework, its users, the available user interfaces, and the main components of BioMA.	page 9
BioMA Architecture	Introduction to the multilayered architecture of BioMA.	page 17
Graphical User Interface overview (BioMA Spatial) (Spatial)	An overview of the BioMA Spatial Graphical User Interface of the BioMA Framework, that allow configuring, running, analyzing, and viewing model simulations.	page 27
Pluggable components overview	An overview of all plugins of BioMA, including Model, Data, and Utility tools, with links to the relevant User Guides.	page 31

See also:

- “Documentation set and Web resources” on page 5
- “Credits and links” on page 6

Documentation set and Web resources

The following table describes the components' existing documentation and to whom is addressed.

Furthermore, it provides a link to the relevant guide.

Title	What you will learn	Mainly targeted to	See
BioMA Spatial	BioMA Graphical User Interface - How to use it to configure, run, or create models simulations.	Users/Advanced users	Visit [Agri4Cast Software Portal]()
MDV User Guide	Map Data Visualizer - How to use this component to inspect and visually analyze the outputs of simulations.	Users/Advanced users	
Optimizer User Guide	Optimizer Library - How to use the sample graphical user interface to manage the process of optimization.	Mainly Advanced users	
CLIC User Guide	Composition Layer Interactive Code - How to use this component for models composition.	Advanced users (Modellers/ Developers)	
MCE User Guide	Model Component Explorer - How to use this tool to visualize the interfaces and the ontology of components.	Advanced users	Visit the **CRA** Web site [www.biomamodelling.org]()
MPE User Guide	Model Parameter Editor - How to use this tool to edit the parameters for composite models.	Users/Advanced users	
GDD User Guide	Graphic Data Display - How to use this component to retrieve a set of output variables and to allow displaying values either by textual tables or by several kinds of graphs.	Users/Advanced users	
DCC User Guide	Domain Classes Coder - How to use this tool to generate C# and VB.NET (.NET 2.0 platform) code.	Advanced users (Developers)	

Tips:

For an overview of all components and what these can be used for, please refer to "Pluggable components overview" on page 31.

Credits and links

The BioMA framework is the result of a multi-team development led by the MARS Unit, Institute for Environment and Sustainability of the Directorate General Joint Research Centre, European Commission.

Single components may be developed by specific teams. Please refer to the relevant documentation (see “Documentation set and Web resources” on page 5).

New partners in the development of BioMA and of modelling solutions are welcome!

Partners

MARS AGRI4CAST, IES JRC

Stefan Niemeyer:

stefan.niemeyer@jrc.ec.europa.eu

CRA-CIN - Agriculture Research Council

Marcello Donatelli:

marcello.donatelli@entecra.it

Department of Crop Production, University of Milan

Roberto Confalonieri

roberto.confalonieri@unimi.it

IDSIA - Institute Dalle Molle for Artificial Intelligence, University of Lugano

Andrea Rizzoli

andrea@idsia.ch

BioMA components developers

- Simone Bregaglio
- Iacopo Cerrani
- Roberto Confalonieri

- Marcello Donatelli (project leader)
- Davide Fanchini
- Davide Fumagalli
- Andrea Rizzoli
- Antonio Zucchini

List servers contacts

news-bioma@jrc.ec.europa.eu

developers-bioma@jrc.ec.europa.eu (it requires approval by the administration to join)

Introduction to BioMA

2

In this section:

What BioMA is used for?

BioMA (Biophysical Model Applications) is an extensible platform for running biophysical models on generic spatial units. It is based on discrete conceptual units codified in software components (both for simulation engines and user’s interface).

Simulations are carried out via modelling solutions, which are discrete simulation engines where different models are selected and integrated in order to carry out simulations for a specific goal. Each modeling solution makes use of extensible components.

The framework is based on framework-independent components, both for the modelling solutions and the graphical user's interface.

The BioMA simulation environment includes a solver framework (Optimizer) to assist in parameter calibration, which can be used with each modelling solution made available in BioMA and it can be extended (see “Pluggable components overview” on page 31).

Related Topics:

- “About models and modelling solutions” on page 11
- “Who are the users of BioMA?” on page 13
- “About the multi-layer architecture” on page 20
- “BioMA macro-components” on page 25

About models and modelling solutions

What are biophysical models?

Models are simplified representations of the real system, and they must include the essential processes (as sources of variability of responses) with respect to the goal of the analysis planned.

In particular, biophysical models are algorithms to simulate a part of the biophysical system, typically biophysical systems. Such algorithms can be coded into discrete software components.

One possible definition of a model, relevant to the work of developing components for biophysical simulation, is a conceptualization of a process.

Typically, such models are composite models, that is, are built from models which represent single processes and which are implemented in different components, but this is not always the case.

For instance, a climatic index can be a very simple algorithm and yet a modelling solution, whereas, again as an example, a modelling solution to simulate cropping systems, with crop, soil, diseases, tillage simulation modules is a composite model of much higher complexity.

Composition of models is also be done within components, in this case implementing *composite strategies*, within the Model Layer. (See “Model layer applications” on page 41).

What are modelling solutions?

A modelling solution is a composition of models implemented for a specific purpose via one or more software components. (See “Composition layer overview” on page 23)

For instance, a crop model capable to simulate water limited production is a modelling solution composed of models for crop development and growth, and for soil water. These can be called "sub-models" and can be implemented in the same discrete software unit, or in separate software components.

Tip:

For a comprehensive description of how modelling solutions are built and how are composed, please refer to:

- **CropSyst Modelling Solution Documentation**
- **Wofost Modelling Solution Documentation**
- **WARM Modelling Solution Documentation**

You can find all these documents here: https://agri4cast.jrc.ec.europa.eu/DataPortal/Index.aspx?o=s

Static vs. Dynamic modelling solutions

The BioMA modelling solutions can be **static** or **dynamic** models which use spatially defined inputs. A static model does not account for the element of time, while a dynamic model does.

A static model takes a single snapshot of a situation. During this snapshot, everything occurs in a single interval.

Dynamic models are time dependent. Dynamic simulation, in contrast to steady-state simulation, represents what happens when conditions vary from the steady state over time.

In BioMA, the Spatial graphical user interface allows running both static and dynamic models. (See “Graphical User Interface overview (BioMA Spatial)” on page 27).

Related topics:

- “About the multi-layer architecture” on page 20

Who are the users of BioMA?

The following table summarizes who are and what typically do the users of the BioMA framework:

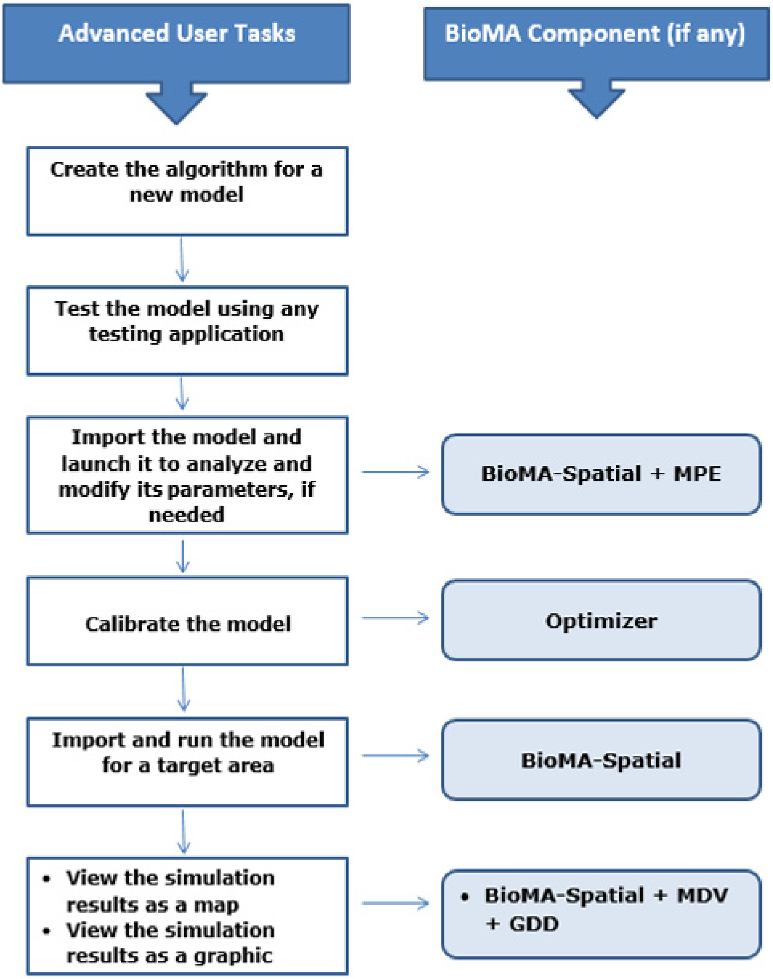
Type of users	What they do
Application users	Run and view the available model simulations, as well as produce a deliverable for monitoring purposes. Typically, they could be researchers.
Advanced users	Create and develop models, modeling solutions, and components. Typically, they could be scientists, such as agronomists, with code-development skills.

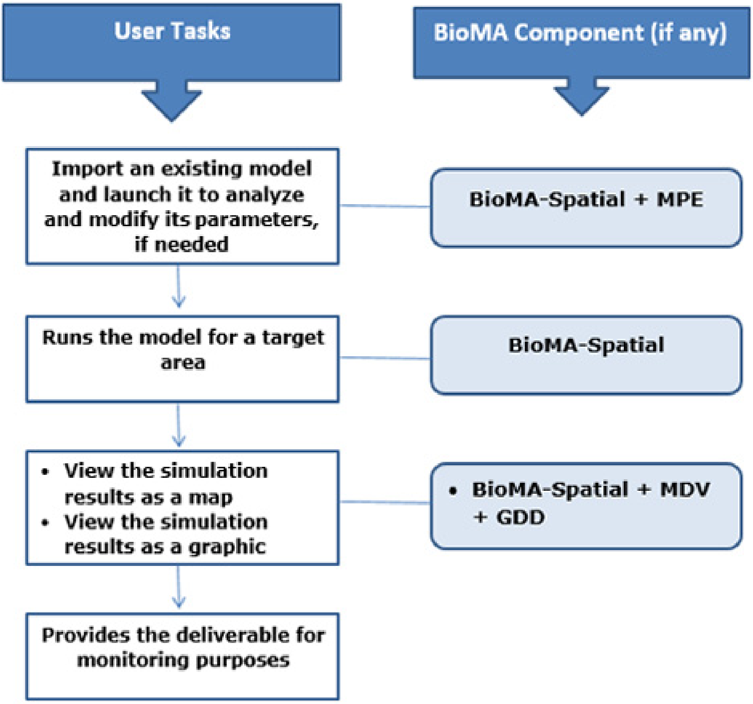
See also:

- "Examples of workflow" on page 14

Examples of workflow

The following shows an example of a workflow using BioMA for both types of users, as well as which tool is being used to perform the required task.


Advanced User Tasks
BioMA Component (if any)
Create the algorithm for a new model
Test the model using any testing application
Import the model and launch it to analyze and modify its parameters, if needed
BioMA-Spatial + MPE
Calibrate the model
Optimizer
Import and run the model for a target area
BioMA-Spatial
• View the simulation results as a map
• View the simulation results as a graphic
• BioMA-Spatial + MDV + GDD


User Tasks
BioMA Component (if any)
Import an existing model and launch it to analyze and modify its parameters, if needed
BioMA-Spatial + MPE
Runs the model for a target area
BioMA-Spatial
• View the simulation results as a map
• View the simulation results as a graphic
• BioMA-Spatial + MDV + GDD
Provides the deliverable for monitoring purposes

Related topics:

- "BioMA macro-components" on page 25
- "Graphical User Interface overview (BioMA Spatial)" on page 27

BioMA Architecture

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This section provides an overview of the BioMA software framework architecture.

In this section:

- “BioMA development guidelines” on page 18
- “About the multi-layer architecture” on page 20
- “BioMA macro-components” on page 25

Related topics:

- “Pluggable components overview” on page 31

BioMA development guidelines

The guidelines followed during the development of BioMA aim at maximizing:

- Extension with new modeling solutions and adaptation to different operation contexts
- Transparency of the modelling domain
- Ease of customizing in new environments
- Ease of deployment (at national and local research and academic facilities)
- Reusability and extensibility of single models

The reuse of existing models, besides their re-implementation to ensure the functionalities of the platform, was also chosen as a base of modeling options.

Related topics:

- “What you can do to extend BioMA” on page 19
- “What are component-centered modeling frameworks” on page 19
- “About the multi-layer architecture” on page 20

What you can do to extend BioMA

BioMA can be extended autonomously by adding new modeling solutions, making use of components already used by the application or using new ones.

Model components provided include documentation of the algorithms and of the code, and a software development kit. The component-based structure allows BioMA to implement diverse modelling solutions targeted to specific modelling goals, allowing for adding new modelling solutions. (For this purpose, you can use BioMA Spatial. See “BioMA Spatial overview” on page 280).

The framework allows for adding new tools, as well as for autonomous extension by third parties, which can add plug-ins to the graphical user interfaces, tools, and modelling solutions.

What are component-centered modeling frameworks

Model frameworks have represented a substantial step forward with respect to monolithic implementations of biophysical models. The main reasons are:

- The separation of algorithms from data.
- The reusability of services such as I/O procedures, data view utilities, and integration services.
- The isolation of a modeling solution in a discrete unit, targeting reuse.

Emphasis has been placed on the framework and even new implementations of models have been made targeting a specific framework.

> BioMA represents a shift of focus from the framework-centric to framework-independent components.

Related topics:

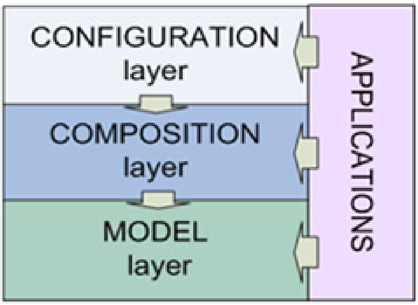
- “About the multi-layer architecture” on page 20

About the multi-layer architecture

To address the guidelines described in the previous section, the modelling framework simulation system has been discretized in layers, each with its own requirements.

If the design of a framework is based on layers, its building block units must avoid dependencies from the framework, and layers must be independent from each other.

The following diagram shows the framework layers:



(See “Example of a layer-based model creation” on page 21 for a practical use case).

Description

The table here below shortly describes the diagram shown above.

For further information on each layer, click the layer name in the table.

		Applications
Model layer	Where fine granularity models are implemented as discrete units.	• **Model Component Explorer (MCE)** - Window application that allows visualizing the interfaces and the ontology of components. (See “Introduction to Model Component Explorer (MCE)” on page 41)

		Applications
Composition layer	Where basic models from different components are composed to build a modelling solution.	- **Clic (Composition Layer Interactive Coder)** - Desktop application that helps modelers with development skills to create a ModelRunner C# project. (See “Introduction to Clic (Composition Layer Interactive Coder)” on page 42)
Configuration layer	Where information (configuration items) can be added to a modeling solution to make it usable in a specific context. For this purpose, the **Modeling solution configuration** editor can be used either at run-time via the BioMA GUIs, or as a re-usable component.	- **Model Parameters Editor (MPE)** - Application that allows generating a dedicated user interface for each parameter definition made available. (See “Introduction to Model Parameters Editor (MPE)” on page 43)

Layers implement no dependency among them, hence facilitating the independent reuse of tools, utilities, and model components in different applications and frameworks.

Example of a layer-based model creation

The following describes a purposely oversimplified example where a simple model is being created based on the use of the three layers, hence enabling the re-use of all components, inputs, and/or outputs for new models.

Purpose

Creating a model that simulates the daily plant growth based on the level of water within the soil.

Step 1

Model layer-based - Create the model

To ensure the independent reuse of the model’s elementary elements, we divide the model into two components:

- **Component 1** - It calculates the daily quantity of water within the soil based on both the rain and the watering (output).
- **Component 2** - Getting the result of Component 1 (water quantity within the soil) as the input, it calculates the daily plant growth.

  (**Note**: The timing must be the same for both components).

Each of these components includes several context-related equations.

Step 2

Composition layer-based - Compose the simulation components

At this level, we specify how to compose and execute components, that is:

- The execution order of the components.
- The links between components. In our example, the water quantity in the soil is the 1st component output and the 2nd component input.

BioMA provides a specific tool to assist the developer in model composition. See “Introduction to Clic (Composition Layer Interactive Coder)” on page 42.

Step 3

Configuration layer-based - Set the configuration items and run the simulation

At this level, we specify:

- The I/O sources and destinations
- The acceptable values for simulation

BioMA provides a specific Graphical User Interface to help you to complete this step, such as the Configuration editor used in BioMA Spatial. (See “Graphical User Interface overview (BioMA Spatial)” on page 27).

Model layer overview

The Model layer is where fine granularity models are implemented as discrete units.

One possible definition of a model, relevant to the work of developing components for biophysical simulation, is a conceptualization of a process. When developing code using the Object-Oriented Programming paradigm, a model can be implemented in a class, providing the estimation or generation of a variable (or a set of interrelated variables), obtaining a fine level of granularity.

Modular conceptualization of models

One of the BioMA framework main aim is thinking of models in modular terms, a needed shift of paradigm with respect to monolithic, unchangeable models.

This allows:

- An easier transfer of research results to operational tools
- The comparison of different approaches
- A greater transparency
- More rapid application development
- Re-use of models of known quality
- Independent extensibility by third parties
- Avoiding duplication

Related topics:

- “Model layer applications” on page 41

Composition layer overview

The Composition layer allows linking model components to build model solutions.

A model solution is developed and used for a specific purpose (e.g. a crop model in which we link crop, soil water and other sub-models to simulate water limited production of crops).

The composition layer must include:

- Time handling
- Provide events handling

The composition layer may include:

- Integration services.
- Data services (in principle excluding persistence).

Visual tools can be developed to assist creating code units to be compiled and used by applications.

Tip:

For a comprehensive description of the Composition Layer, including how it is coded, please refer to the **Composition Layer Documentation**, which you can find here: https://agri4cast.jrc.ec.europa.eu/DataPortal/Index.aspx?o=s

Related topics:

- "Composition layer applications" on page 42

Configuration layer overview

The Configuration layer allows adding information to a modeling solution to make it usable in a specific context.

The information consists of configuration items which specify the information needed, the information allowed, and possibly the tool to edit the information.

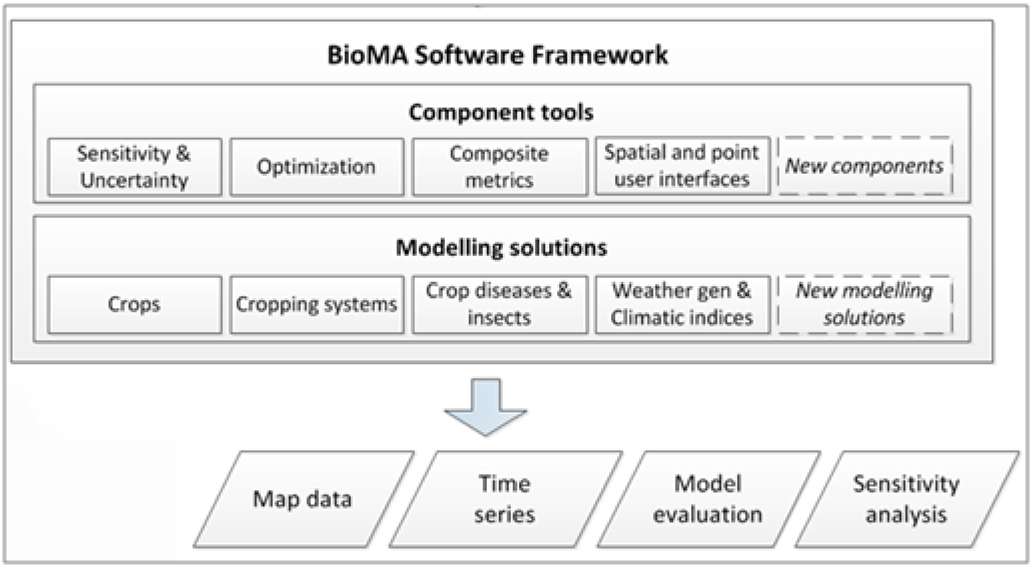
The Configuration layer also includes handles to run the model and to change model parameters.

Related topics:

- "Configuration layer applications" on page 43

BioMA macro-components

The macro-components of a BioMA deployment are represented in the diagram below:



Component tools description

Activity	Tool name	To learn more:
Optimization	Optimizer	page 33
User interface for point and spatial simulations runs	BioMA-Spatial	page 27
Map data	Map Data Visualizer (MDV)	page 39
Time series	Graphic Data Visualizer (GDD)	page 36

The tools are extensible and can also be used outside BioMA.

Graphical User Interface overview (BioMA Spatial)

4

This chapter provides a general overview of BioMA Spatial, the main Graphical User Interface of the BioMA framework.

BioMA Spatial allows running both dynamic and static models.

For further information, see:

- “BioMA Spatial overview” on page 28

BioMA Spatial overview

To access the Bioma Spatial Help:

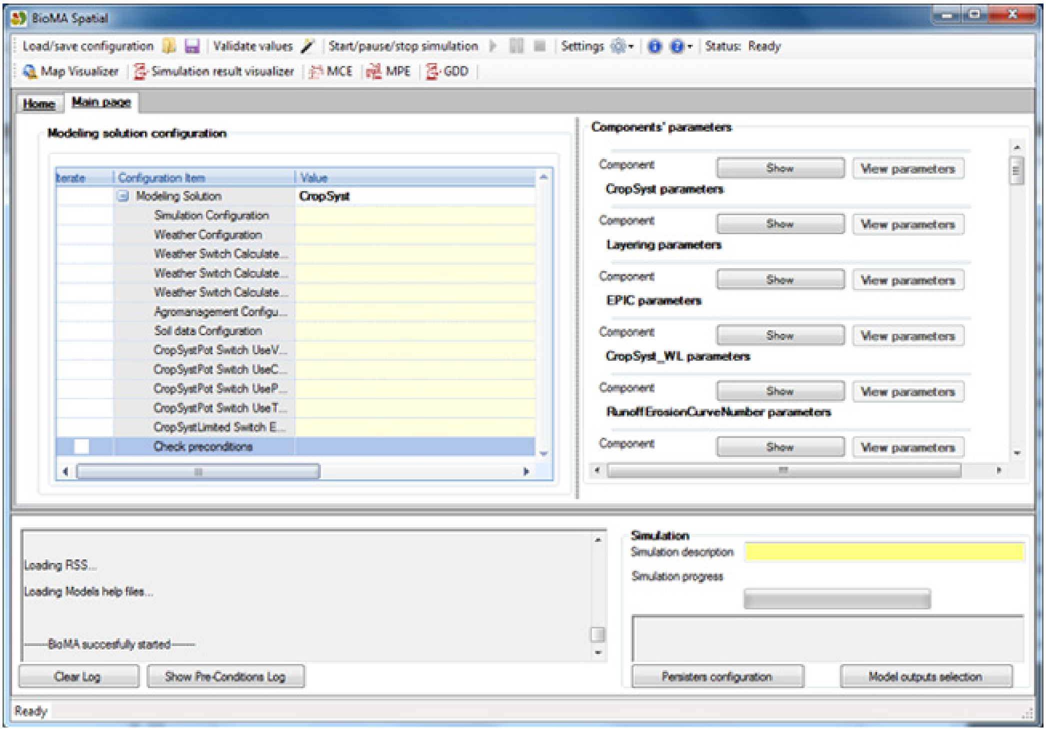
- Go to the **Agri4Cast Software Portal**: http://agri4cast.jrc.ec.europa.eu/DataPortal/Index.aspx

To access the offline Help:

- Select ❓▾ **(Help)** > **BioMA Spatial Help** from the application's menu bar

BioMA Spatial allows you to configure, run, and view tested models against spatial units, or run a model which requires coupling spatial units at each time step.

The following shows the **Main page** of BioMA Spatial where **CropSyst** has been selected as the **Modeling Solution** has been selected:



Iterate	Configuration Item	Value
	⊟ Modeling Solution	CropSyst
	Simulation Configuration	
	Weather Configuration	
	Weather Switch Calculate...	
	Weather Switch Calculate...	
	Weather Switch Calculate...	
	Agromanagement Configu...	
	Soil data Configuration	
	CropSystPot Switch UseV...	
	CropSystPot Switch UseC...	
	CropSystPot Switch UseP...	
	CropSystPot Switch UseT...	
	CropSystLimited Switch E...	
□	Check preconditions	

```
Loading RSS...
Loading Models help files...
-----BioMA succesfully started-----
```

Ready

What you can do

After selecting a modelling solution to run, you can:

- Configure the components' parameters by using the Model Parameters Editor plugin (see "Introduction to Model Parameters Editor (MPE)" on page 43.
- Visualize the interfaces and the ontology of components by using the Model Component Explorer plugin (see "Introduction to Model Component Explorer (MCE)" on page 41).
- Inspect and visually analyze the outputs of simulations by using the Map Data Visualizer plugin (see "Introduction to Map Data Visualizer (MDV)" on page 39).
- Display values either by textual tables or by several kinds of graphs by using the integrated Graphic Data Display (see "Introduction to Graphic Data Display (GDD)" on page 36).

Pluggable components overview

5

Note:

This chapter only provides an overview of all plug-ins for BioMA.

A more comprehensive documentation has been developed for each component a link to which is provided in the table “Documentation set and Web resources” on page 5.

The BioMA graphical user interface can be extended by loading plug-ins. A plug-in can be developed as discrete software unit recognizable by BioMA via the realization of an interface in one adapter.

The interface makes available a copy of an instance of the model being run, and the output data. Model tools are plug-ins which allow running the model (e.g. for optimization, for sensitivity analysis), whereas Data tools make use of the output data of a run.

Utility applications are discrete software units, often with a graphical user interface, which can be referred to the platform layers. These plug-ins are mainly targeted to advanced users.

For further information:

- “Model tools” on page 32
- “Data tools” on page 35
- “Utility applications” on page 40

Model tools

Model tools are plug-ins which allow running the model and that are integrated in the BioMA simulation environment. In particular, Optimizer, a solver framework to assist in parameter calibration

For an overview of what users and advanced users can do using this tool, see:

- "Introduction to Optimizer" on page 33

Introduction to Optimizer

Targeted to:

Both users and advanced users.

What it is used for	Parameter calibration extensible for objective functions and solvers. It is a solver framework that can be used with each modelling solution made available in BioMA.
What you can do	Use it as a BioMA plug-in or as a stand-alone application. Use a solver of choice, an objective function of choice (e.g. minimizing simple and composite metrics), against a modeling solution of choice. **As an advanced user**: Extend the tool for solvers and objective functions, which can be based on either simple or composite indices. Compose new metrics with the help of the IRENE component.

- For a comprehensive user guide, visit the Agri4Cast Software Portal

What is parameter calibration?

The Optimizer library models the process of optimization, that is, it allows finding the minimum of an objective function value depending on a model output by varying the value of the model parameters.

In this process, three main entities are involved:

- A Solver, abstracting the task of exploring the parameters' space.

- An Objective Function, abstracting the task of calculating a cost function depending on some reference data and some estimated data.
- A Model, estimating data for a particular point in the parameters' space

The Optimizer library is made available with sample Solvers, Objective Functions and Model to be optimized, but it can independently extended as solvers and objective functions. Models can be used by building a specific adapter.

Optimizer is distributed with a sample graphical user interface to manage the process of optimization. The implementation of the Model-View-Controller design pattern allows easily replacing the GUI with a custom developed one.

Optimizer uses the IRENE component which implements dedicated metrics for model evaluation and allows composing new metrics.

See also:

- “Data tools” on page 35
- “Utility applications” on page 40

Data tools

Data tools are plug-ins that make use of the output data of a run.

These include:

- Graphic Data Display (GDD), a tool for displaying values
- Map Data Visualizer (MDV), a tool for inspecting and analyzing outputs

For an overview of what users and advanced users can do using this tools, see:

- “Introduction to Graphic Data Display (GDD)” on page 36
- “Introduction to Map Data Visualizer (MDV)” on page 39

Introduction to Graphic Data Display (GDD)

Targeted to:

Both users and advanced users of BioMA.

What it is used for	Load/use a set of output variables and display values either via textual tables or via several kinds of graphs. To this purpose, several tabs are made available in which different types of data views are available. Currently GDD loads three data formats: XML with schema, a proprietary binary, and Excel workbooks. These can be extended.
What you can do	View data as time series based on your selections and save graphs as images files. Superimpose reference data (for example, data from experiments or surveys) to simulation results. Use it as a component within an application, e.g. BioMA-Spatial (by opening it inside a modelling framework and then directly loading the current dataset), or as a stand-alone tool (by selecting a file from a file dialog that is made available to the user). **As an advanced user**: Extend the available inputs readers.

- For a comprehensive user guide, visit the **CRA** Web site: www.biomamodelling.org.

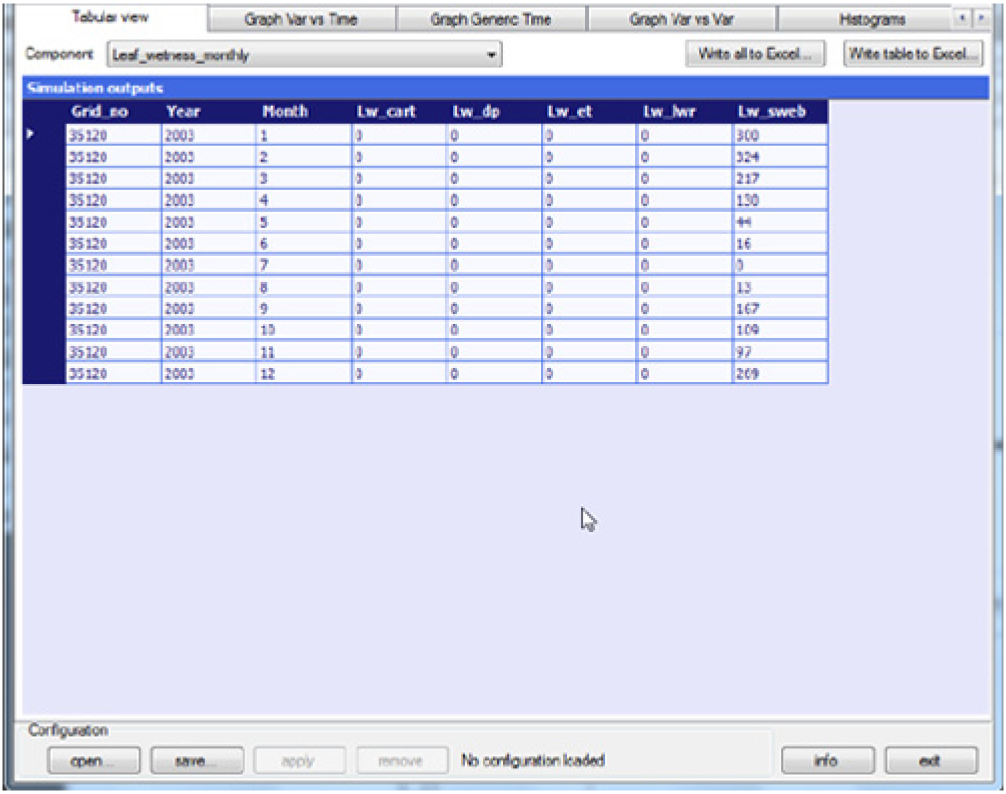
Examples of Data Views

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).

From this data view single tables (or all tables at once) can be saved in a Microsoft Excel format.

Figure 1 Example - Tabular view



Component: Leaf_wetness_monthly

Simulation outputs

Grid_no	Year	Month	Lw_cart	Lw_dp	Lw_et	Lw_hwr	Lw_sweb
35120	2003	1	0	0	0	0	300
35120	2003	2	0	0	0	0	324
35120	2003	3	0	0	0	0	217
35120	2003	4	0	0	0	0	130
35120	2003	5	0	0	0	0	44
35120	2003	6	0	0	0	0	16
35120	2003	7	0	0	0	0	0
35120	2003	8	0	0	0	0	13
35120	2003	9	0	0	0	0	167
35120	2003	10	0	0	0	0	109
35120	2003	11	0	0	0	0	97
35120	2003	12	0	0	0	0	209

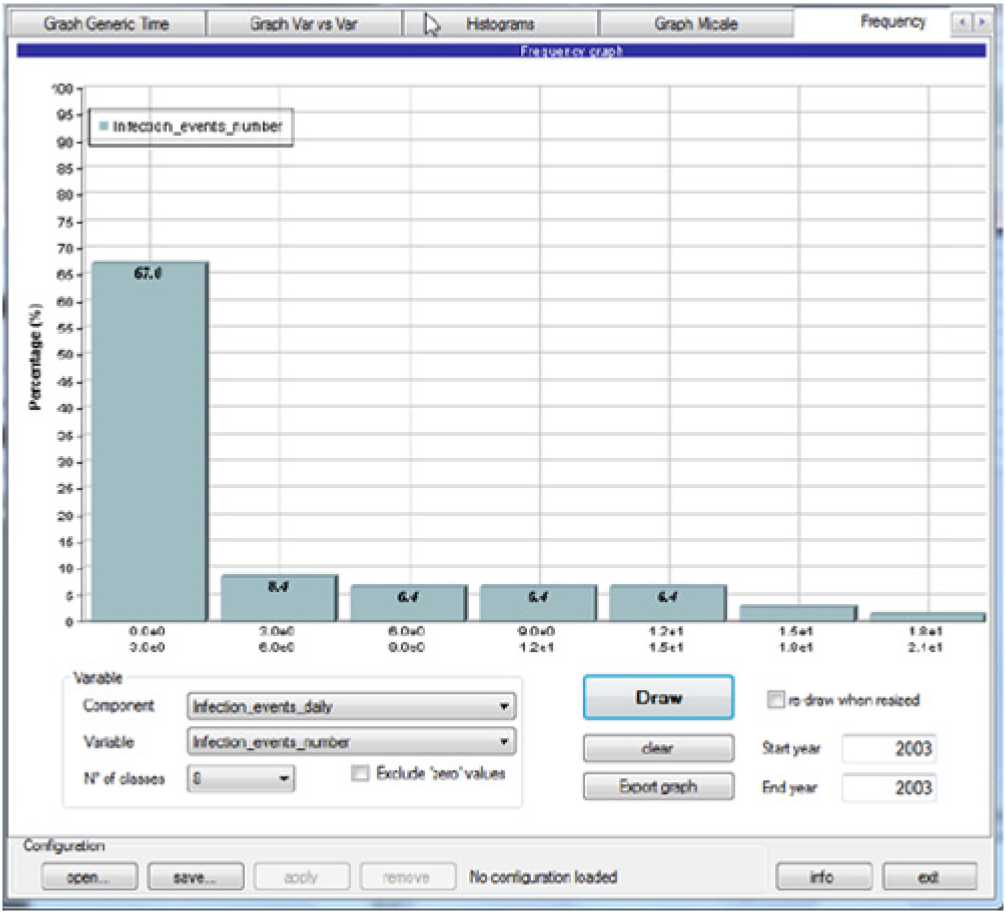
No configuration loaded

Graph view

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. Also, the auto-draw feature can be set so as to have the auto-draw feature starting automatically.

Figure 2 Example - Graph view



Variable

Component: Infection_events_daily

Variable: Infection_events_number

N° of classes: 8

☐ Exclude 'zero' values

☐ re-draw when resized

Start year: 2003

End year: 2003

Configuration

No configuration loaded

Related topics:

- “Introduction to Map Data Visualizer (MDV)” on page 39

Introduction to Map Data Visualizer (MDV)

Targeted to:

All BioMA users.

What it is used for	Inspect and visually analyze the outputs of simulations to help you to understand the model behavior. It is integrated in the BioMA-Spatial application.
What you can do	Use it as a map visualizer for: • Showing one indicator spatially. • Showing multiple custom made graphs of time series by selecting a cell at the time on a map. • Extensively customize both the layout and the legend of maps. You can use it as a stand-alone application.

For further information on how to use this tool:

- For step-by-step instructions on how to view the simulations results using the Map Visualizer plugin via BioMA-Spatial, see the relevant Help online, which you can access by selecting ? **(Help) > BioMA Spatial Help** from the application’s menu bar.
- For a comprehensive user guide, visit the Agri4Cast Software Portal.

Related topics:

- “Introduction to Graphic Data Display (GDD)” on page 36

Utility applications

Targeted to:

Developers and advanced users who use BioMA for deploying components or creating new modelling solutions.

Utility applications are discrete software units, often with a graphical user interface, which can be referred to the platform layers described.

The ones referred to the configuration layer have a graphical user interface and are used in the BioMA as support application (for example, the generic Model Parameter Editor).

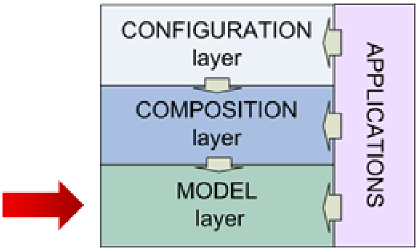
For further information:

- “Model layer applications” on page 41
- “Composition layer applications” on page 42
- “Configuration layer applications” on page 43

Related topics:

- “About the multi-layer architecture” on page 20

Model layer applications



Introduction to Model Component Explorer (MCE)

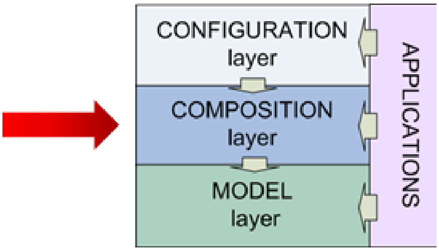
What it is used for?	Window application that allows visualizing the interfaces and the ontology of components.
What you can do	• Identify domain classes, the attributes of each variable, ant the signature of each interface model. • For each model implemented, you can identify inputs, parameters (if any), outputs, and associated models (if any). • See the dependencies of each component. • Export the information as XML files, which can be used to populate an ontology browser.

- For a comprehensive user guide, visit the **CRA** Web site: www.biomamodelling.org.

Related topics:

- “Model layer overview” on page 23
- “Composition layer applications” on page 42
- “Configuration layer applications” on page 43

Composition layer applications



Introduction to Clic (Composition Layer Interactive Coder)

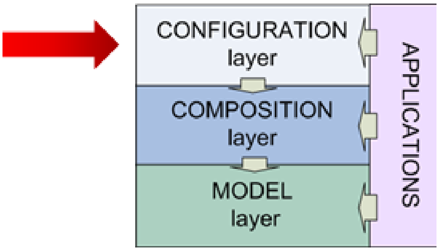
What it is used for?	As a desktop application, modelers with development skills can use it to create a ModelRunner C# project.
What you can do	• Create the simulation components and links them to each other. • Create the Model Runner class and the C# project structure. • Explore an already compiled project containing a model runner. • Draw a graph of project structure (i.e., the list of the components and how they are linked to each other). • Extract one or more components and use them to create a new Model Runner.

- For a comprehensive user guide, visit the Agri4Cast Software Portal.

Related topics:

- “Composition layer overview” on page 23
- “Model layer applications” on page 41
- “Configuration layer applications” on page 43

Configuration layer applications



Introduction to Model Parameters Editor (MPE)

What it is used for?	To change the model parameters via a dedicated graphical user interface.
What you can do	• Use it as a stand-alone application to import the parameters definition created via the DCC application. • Use it as an integrated plug-in of BioMA-Spatial to edit an existing XML file containing the model's parameters.

The Model Parameters Editor allows generating a dedicated user interface for each parameter definition made available. It can group interfaces in different tabs either according to a user criterion, or according to the different model components which originate the parameters definition.

The application allows either selecting parameters definitions, or loading automatically parameters definitions. A separate application (Domain Classes Coder - DCC) is provided to build parameters definitions as an XML file.

MPE allows ensuring that values are correctly set (within a range provided in their definition) by performing an automatic check on saving

For further information on how to use this tool:

- For step-by-step instructions on how to edit the parameter using the MPE plugin via BioMA-Spatial, see the relevant Help, which you can access either from within the application (? **(Help) > BioMA Spatial Help**).

- For a comprehensive Web-based user guide, visit the **CRA** Web site: www.biomamodelling.org.