Grid-based Polycultural Simulation

The Plant simulation Tool

This is the Tutorial. It shows screenshots of the application and introduces all features

This page allows to create and manage plants which will be used in the simulation.

Manage Plants ∧

Manage Plants

Available Plants

| lettuce |
| cabbage |
| spinach |
| weed |
| Buckweed |
| Lactuca Sativa L. |

A plant can be selected for edition.

New plants can be added by entering the needed parameters into the forms.

The entered parameters can be save with this button. It will appear in the Available plants.

Name:

Enter plant name

W max:

Max width

K:

Growth rate constant

N:

Exponent

B:

Parameter b

Max moves:

Max moves

Yield:

Yield

Planting cost:

Planting cost

Revenue:

Revenue

Save

This section allows to create and manage plants

Manage Plants

∧

Manage Plants

Available Plants

lettuce
cabbage
spinach
weed
Buckweed
Lactuca Sativa L.

The parameters of the selected plans will be displayed on the right.

Parameters can be edited here.

A selected plant can be deleted

The edited parameters can be saved.

Name:

Lactuca Sativa L. ⌒

W max:

35,0

K:

0,095

N:

1,477

B:

180,0

Max moves:

5

Yield:

0,8

Planting cost:

0,05

Revenue:

100,0

Save

Delete

This section allows to either plot or delete previous simulations

Previous Simulations

Simulations

Tutorial	Plot	Delete
Tutorial No.2	Plot	Delete
Tutorial No.3	Plot	Delete
Tutorial No.4	Plot	Delete

Previous simulations will be listed here.

The simulation results can be plotted below.

The simulation data can be deleted from database.

This section allows to create customize the simulation parameters and run the simulation.

Run Simulations ∧

Run Simulation

☐ Use Water Level
☐ Use Temperature
☐ Allow Weed Growth
☐ Iteration Mode

Here the features can be enabled.

Simulation Settings

A unique name must be entered.

Name
Enter Simulation Name

The length of the field can be configured.

Length
Length (cm)

The start date musst be between 30.11.2022 and 01.02.2024.

Startdate
TT.mm.jjjj 📅

This field defined the time steps of the simulation (6=6 h steps).

Stepsize
Step Size

The harvest type can be chosen.

Harvesttype
Max Yield ⌄

Plant Parameters

At least one row must be added to the field.

Add New Row   Run Simulation

The simulation can be started with this button.

Simulations environments can be created in this section.

Run Simulation

- ☐ Use Water Level
- ☐ Use Temperature
- ☐ Allow Weed Growth
- ☐ Iteration Mode

Simulation Settings

Name

Enter Simulation Name

Length

Length (cm)

Startdate

TT.mm.jjjj

Stepsize

Step Size

Harvesttype

This appears if a row is added. Multiple rows can be added.

Max Yield

Plant Parameters

Plant Type:

Lactuca Sativa L.

The plant can be chosen from the available plats in the section above.

Width of the row (cm):

Width in cm

The width of the row can be configured.

Planting Type:

Grid

The planting type can be chosen (grid, alternating, random, empty).

Space between plants (cm):

Row spacing in cm

The space between plants can be configured.

Number of Iterations:

Number of Iterations

The number of iterations can be set. (How often to replant after harvest).

Delete Row

This will delete the row.

Add New Row   Run Simulation

More rows can be added.

The iteration mode can be used to iterate over a parameter.

Run Simulation

- ☐ Use Water Level
- ☐ Use Temperature
- ☐ Allow Weed Growth
- ☑ Iteration Mode

In this mode, only one row is possible by default.

Iteration mode enables to iterate over certain parameters.

Simulation Settings

Name

Tutorial

☑

One parameter can be selected to iterate over.

Length

200

Length

210

☐

Startdate

30.09.202

This field defines the start value.

This field defines the end value.

☐

Stepsize

24

In this case the simulation will create ten iterations. Iterating for row length from 100 to 110.

Harvesttype

Max Yield

Plant Parameters

Plant Type:

Lactuca Sativa L.

☐

Width of the row (cm):

100

Planting Type:

Grid

☐

Space between plants (cm):
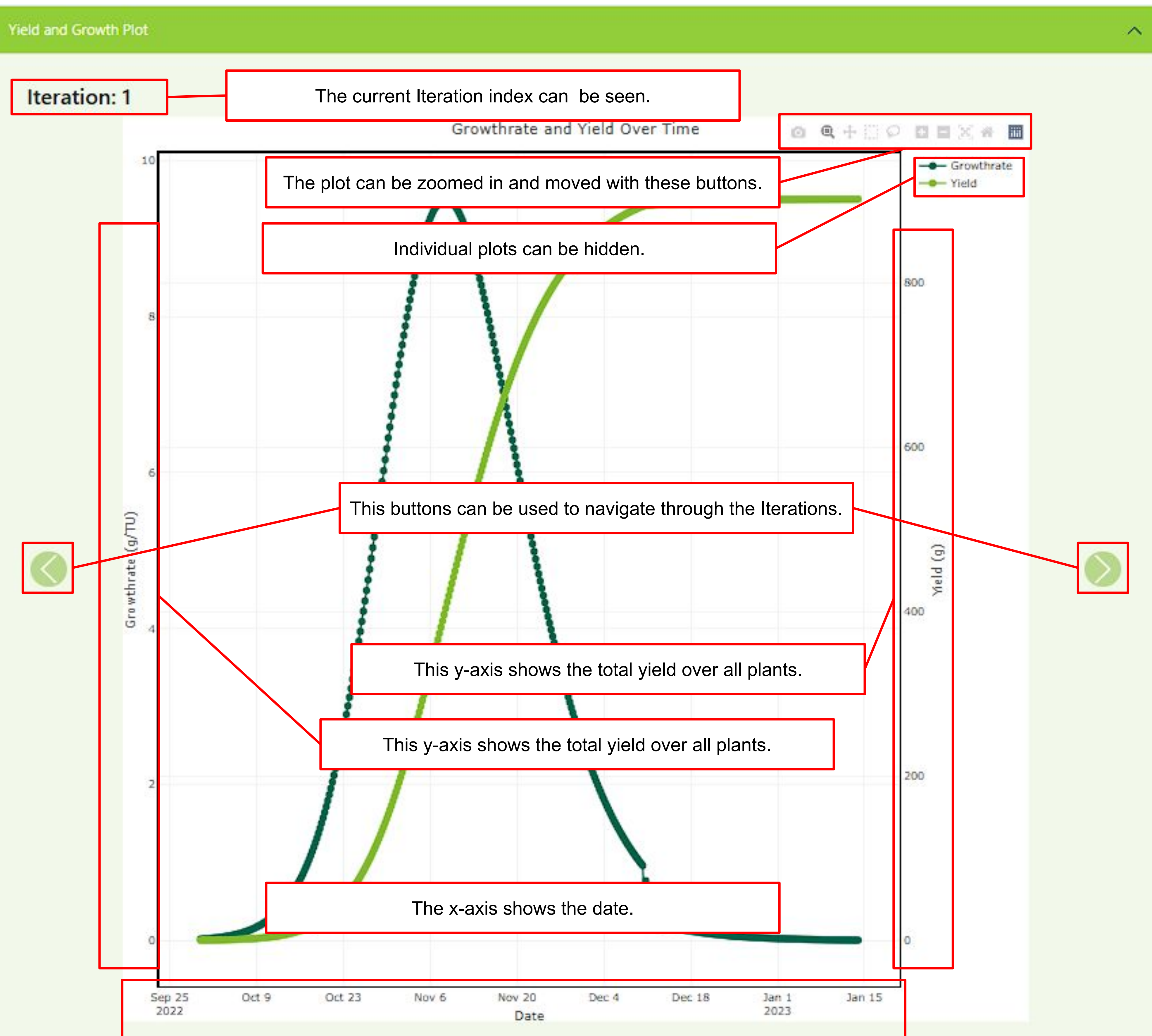
25

☐

Number of Iterations:

1

Delete Row

☐

Add New Row   Run Simulation

If the "Add New Row" button is selected multiple rows can be added. The simulation will iterate over the row definitions. This allows direct comparison of rows.

The First Plot gives an overview over growth and size.

Yield and Growth Plot ⌃

Iteration: 1

The current Iteration index can be seen.

Growthrate and Yield Over Time

The plot can be zoomed in and moved with these buttons.

— Growthrate
— Yield

Individual plots can be hidden.

This buttons can be used to navigate through the Iterations.

This y-axis shows the total yield over all plants.

This y-axis shows the total yield over all plants.

The x-axis shows the date.

Growthrate (g/TU)

Yield (g)

10

8

6

4

2

0

800

600

400

200

0

Sep 25
2022   Oct 9   Oct 23   Nov 6   Nov 20   Dec 4   Dec 18   Jan 1
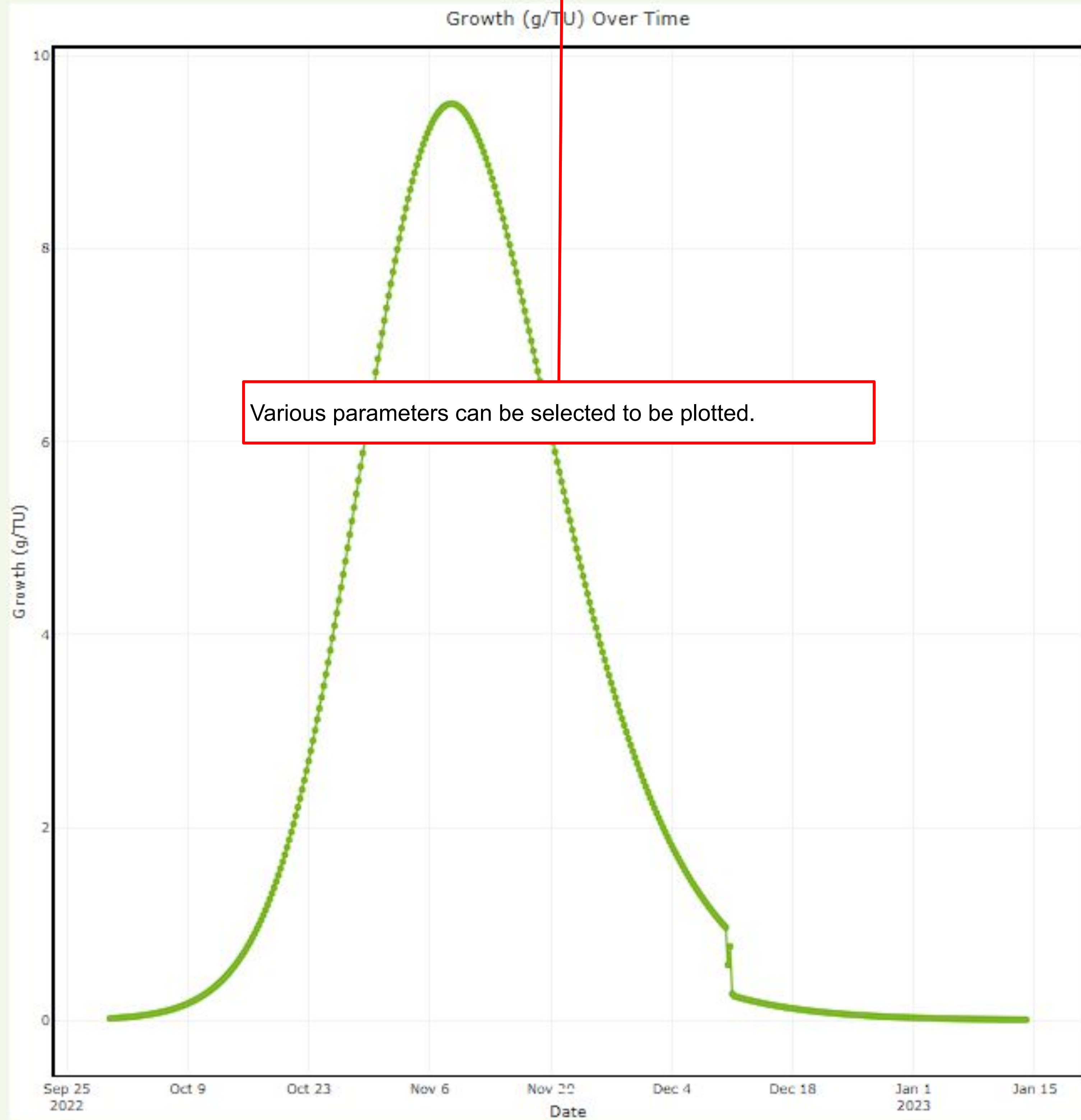2023   Jan 15

Date

The second plot can provide more detailed Informations
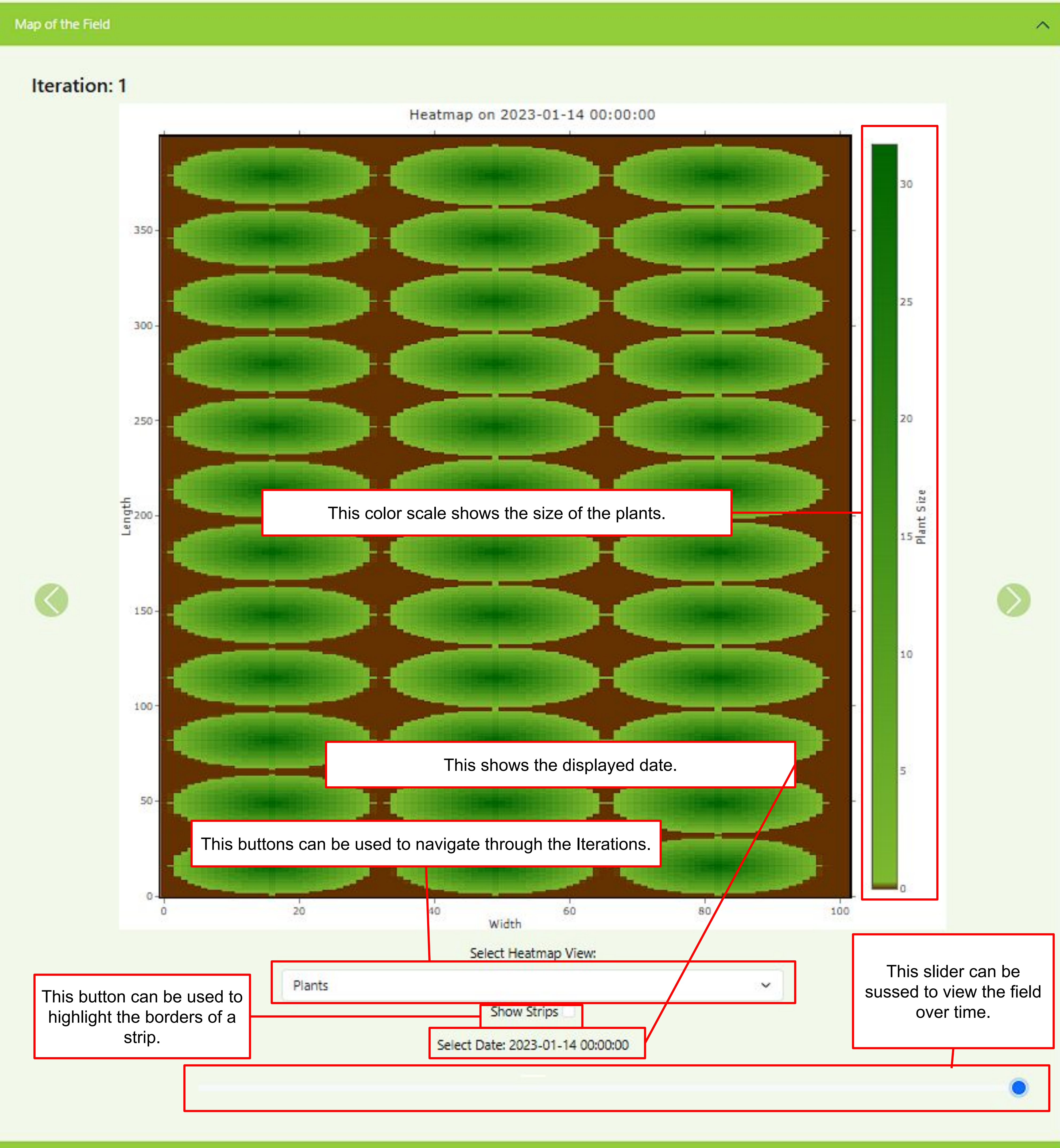
Detailed Plots

Iteration: 1

Growth

Various parameters can be selected to be plotted.

On this map of the field the spatial development over time can be investigated

Map of the Field

Iteration: 1

Heatmap on 2023-01-14 00:00:00

This color scale shows the size of the plants.

This shows the displayed date.

This buttons can be used to navigate through the Iterations.

Select Heatmap View:

Plants

Show Strips

This button can be used to highlight the borders of a strip.

Select Date: 2023-01-14 00:00:00

This slider can be sussed to view the field over time.

The last plot allows to compare different simulation iterations

Iteration Comparison

Select Y-Axis (Value to Compare):

Yield

Comparison of yield Across Iterations

A point represents the end result of a simulation run.

Various parameters can be selected.

This axis shows the iteration index. Means the value that was selected before to iterate over.

Total yield (g)

Iteration Index