



FACCE-MACSUR

WP2 C2.6 Online web tool for data visualization

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Abstract/Executive summary

This deliverable lays out the work as done as part of MACSUR CropM on data, with the focus on providing a web tool for visualization of model output. It was decided early on that not a specific MACSUR web tool would be developed as part of MACSUR for phase 1, and mostly results would be visualized in other available tools, such as the Global Yield Gap Atlas, which are recognised resources for visualizations. Only in relationship to the MACSUR Geonetwork data catalog hosted at Aarhus University some developments where started. Operationally speaking, most data was still being generated during phase 1, so there was not enough to visualize on specific websites and partners did not commit financial resources to their development, and only in kind was available.

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Visualization in MACSUR of CROP M outputs

Early on in the phase 1 of MACSUR it was concluded that it would not be feasible nor sensible to develop a special website for MACSUR results visualization:

1. As research data and outputs were still being generated and methods developed, so there was very little to work on.
2. As only two partners had committed in-kind resources to this task, with no option to steer these resources to developments of new websites
3. As already some visualization platforms (e.g. Yieldgap.org, WheatRust tools, AgMIP crop data base, AgTrials.org) are available that offer good functionality and possibilities to include MACSUR results.

This deliverable thus does not introduce a new platform for result visualization, but reports on the options of result visualization as part of MACSUR and introduces one example in some detail. The options available are:

1. Publish the data in the Open Data Journal of Agricultural Research, which is supported by MACSUR, after which the data can be exported and visualized in tools like R, Excel, and Tableau
2. Publish the data as part of Geonetwork data server hosted by Aarhus University, which will be extended in phase to include visualizations
3. Publish the data on another platform for targeted visualization of results, from the perspective of a certain theme or purpose.

Of this last category an example can be found in the link to the Global Yield Gap Atlas and the Benchmarking Atlas. The Global Yield Gap Atlas is focused on visualization of yield gaps across the globe and a product of a Bill and Melinda Gates foundation funded project lead by University of Nebraska, and Wageningen UR, with many partners. The partners contribute by doing country level analysis of yield gaps of major crops with local knowledge and data. The Benchmarking Atlas is a product of Wageningen UR, with contributions from partners, in which yields gaps are visualized and analysed as to their causes based on additional data. In the Benchmarking Atlas indicators can be visualized and auxiliary data can be explored.

For both the Yield Gap Atlas and the Benchmarking Atlas, yield gap simulations have been carried out as part of MACSUR, leading to a yield gap analysis for European Countries, lead by Wageningen UR PPS and with contributions of many European partners. These maps of yield gaps have been visualized as part of yield gap atlas, see: www.yieldgap.org, and can be accessed on the prototype of the benchmarking atlas, see: <http://realatlas-test.services.geodesk.nl/web/guest/home>.

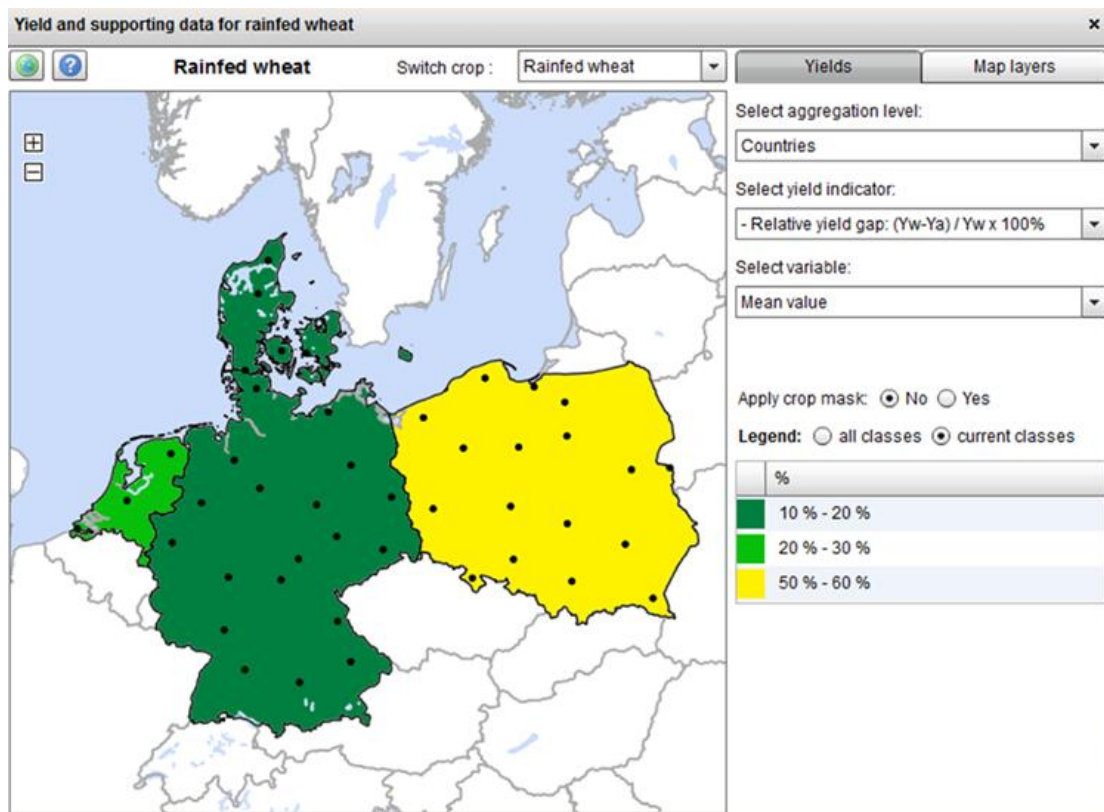


Figure 1 Visualization of yield gaps in Netherlands, Germany and Poland as part of www.yieldgap.org

www.yieldgap.org is an interactive atlas to browse the data on yield gaps across the globe and with different settings different maps can be generated by the user, see the example in figure 1. The explanation and further detailing on the yield gaps is given in the bench marking atlas, and this is displayed through a set-up of key-messages, importance of the result, methods to generate the results and auxiliary data useful to explain the yield gaps based on local conditions. Below is sample from the Bench Marking atlas, as a narrative:

What do these maps tell us?

Current wheat yields in Poland are around 50% of what is possible. Inefficient management practices, especially on the many small farms, contribute to the low yields. Stimulation of the land market could remove the fragmented farming structure and increase resource use efficiency and crop yields.

Why is it important?

Areas with relatively high yield gaps may indicate an untapped potential to increase crop yields. The average relative yield gaps are approximately 50% for Poland and 20% for Germany, Denmark and the Netherlands. For Poland, a yield gap reduction from 50% to 20% would result in an increased national wheat production of around 3,700 t.

How did we obtain the results?

The presented yield gaps are the difference between the simulated water-limited yield and the actual yields achieved by farmers. Water-limited crop yields were simulated with the WOFOST crop model, using more than 15 years of actual observed daily weather data. The simulations were carried out for selected dominant crop growing areas.

Additional information

SPAM <http://apps.harvestchoice.org/mappr/>

SEDAC <http://sedac.ciesin.columbia.edu/>

EUROSTAT <http://ec.europa.eu/eurostat/statistical-atlas/gis/viewer/>

GRZEBISZ, W., DIATTA, J., HARDTER, R., & CYNA, K. (2010). Fertilizer consumption patterns in Central European countries-effect on actual yield development trends in 1986-

2005 years-a comparative study of the Czech Republic and Poland. *Journal of Central European Agriculture*, 11(1), 73-82.
 Latruffe, L., Balcombe, K., Davidova, S., & Zawalinska, K. (2004). Determinants of technical efficiency of crop and livestock farms in Poland. *Applied economics*, 36(12), 1255-1263.

Overview

A Data sharing, Visualisation and Publishing System (DVP) was established at Aarhus University (Fig. 1)

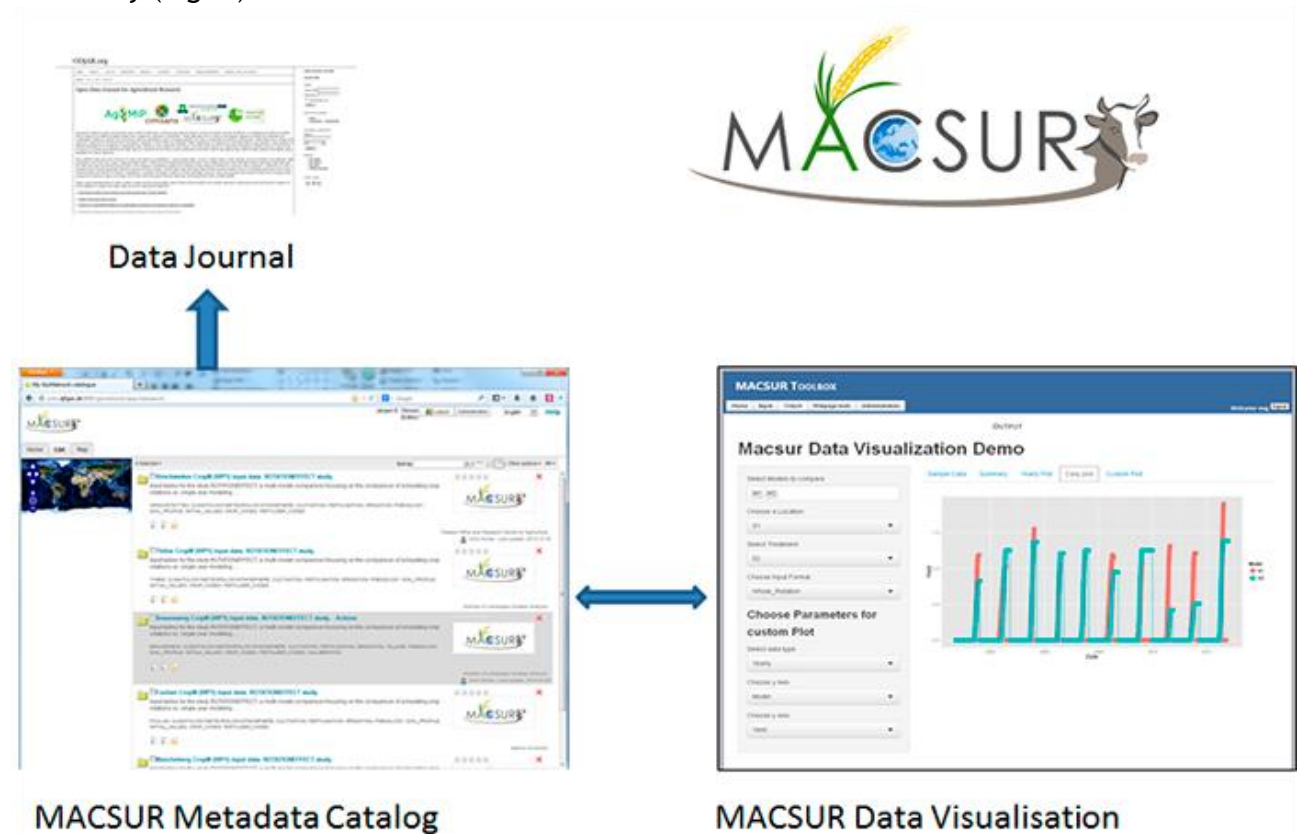


Figure 1. A Data sharing, Visualisation and Publishing System (DVP)

A toolbox was established to manage data and tools in the DSP framework (Fig. 2)



MACSUR Crop-M Metadata catalog

<http://agro.au.dk/macsur-catalog>

MACSUR Toolbox– Data management and Visualisation

<http://agro.au.dk/macsur-toolbox>

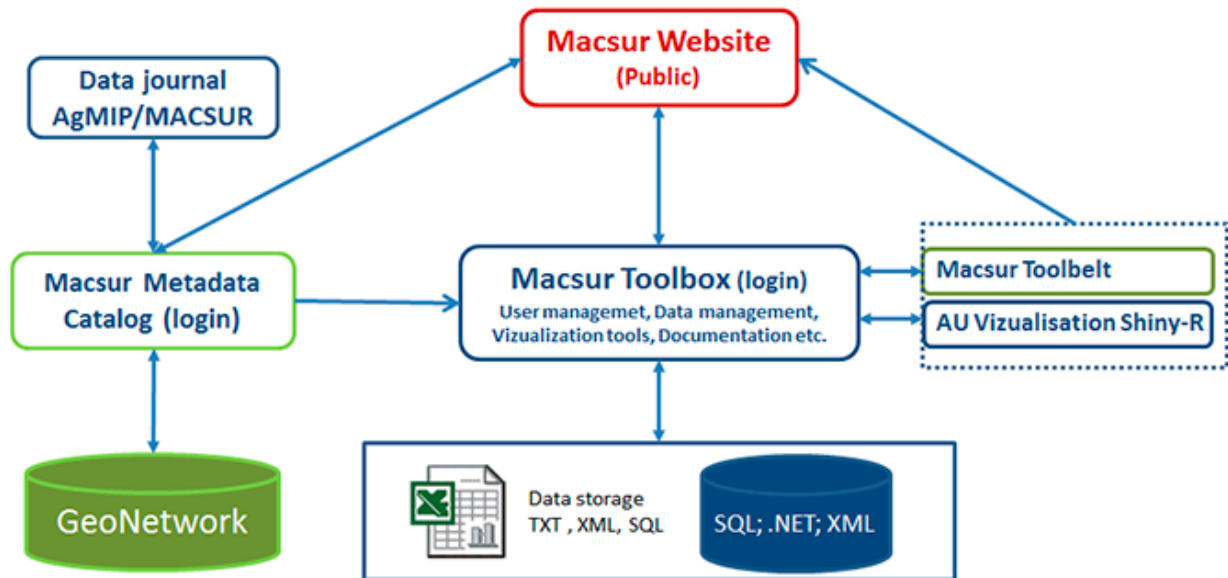
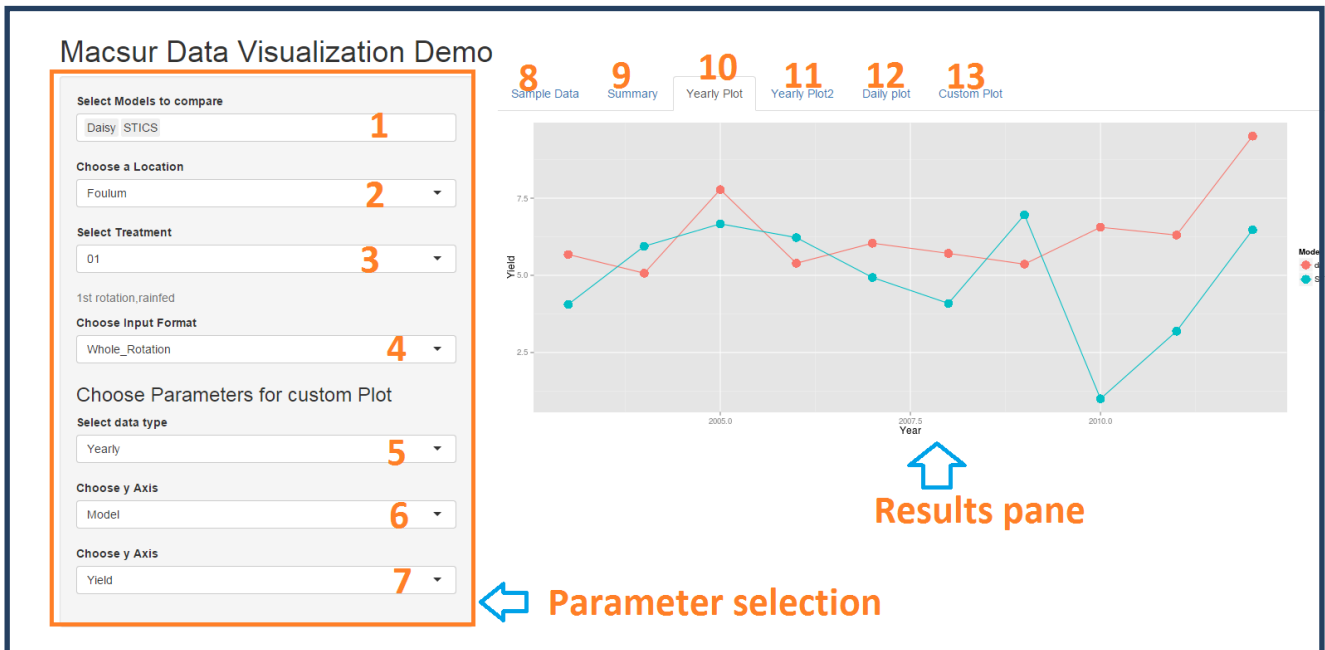


Figure 2. Data sharing, Visualisation and Publishing System framework

A server based visualization tool has been developed for the simulated model output data using R and shiny. The application is currently available at <http://gis.au.dk/macsur/>. The main components of the application are described using an annotated screenshot of the application. The application page is divided into two parts: Parameter selection pane and the results pane. We can subset the whole data using different parameters in the left pane and the resulting plot will appear on the right pane. Individual elements on these elements are described in the next section.

The tool was developed with test data from the initial modeling exercises. Final data from the modelling exercise at Aarhus University will be implemented and the tool will be further elaborated.



Parameter selection pane

1. We can select one or models to compare the simulation results.
2. Here we choose location of the data. Only one location can be selected.
3. Here we select the treatment to be plotted.
4. Select an input format. There are two formats available. Whole rotation or single year.
5. Parameters 5,6 and 7 apply only to custom plot (No 13 in the plot). Here we can choose to plot any variable against any other variable. First we choose the type of data to be plotted:Yearly or daily data.
6. Variable selection for x axis.
7. Variable selection for y axis.

Results selection pane

8. A few samples based on the selection will be shown here.
9. The summary tab gives a quick summary of all variables in the selected data. This is useful in checking the range of the data and if the variables are expressed in the correct format etc.
10. Here we plot yield against year. We get a quick comparison of yield simulation using different models.
11. This is same as no.10. Placing the mouse over different points in the plot will give more information about the points.
12. In the custom plot pane, we can plot any variable against any other variable. Since no prior information about the variables is used here, a most sensible plot is automatically produced. This plot can be used as a quality checking plot. For eg. we can easily verify if the variables from different models are in the same unit from the plot.