Analysing CAPRI results

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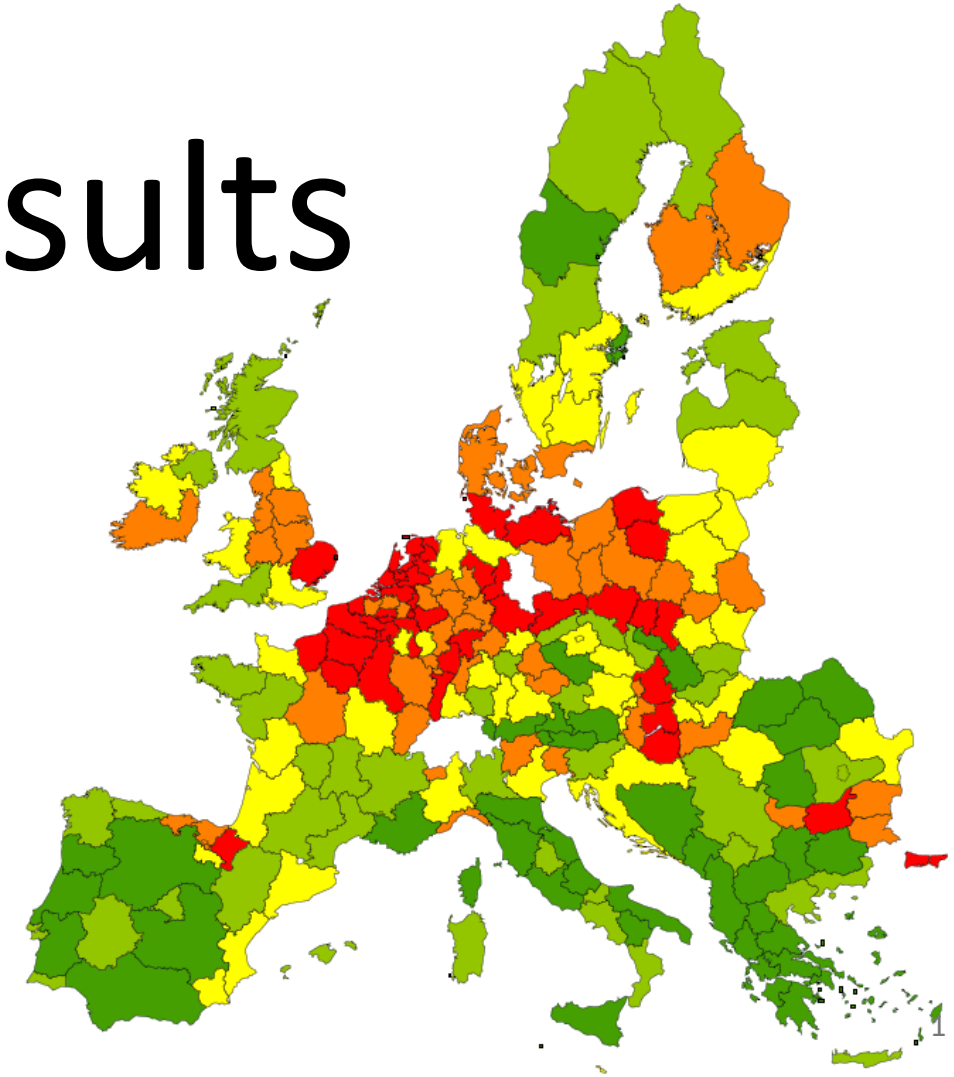


Outline

- **Running your first simulation**
- **Load the results**
- **Navigate the Result Viewer – choose data to view**
- **Customize Table Views - transpose table dimensions**
- **Compare Relative and Absolute Values**
- **Select Subsets of the Results**
- **Sort the Results**
- **Use Results Outside the GUI**
- **In-depth Exercises**
- **Problems you might encounter**

4. Running your first simulation

Common Agricultural Policy(CAP) overview

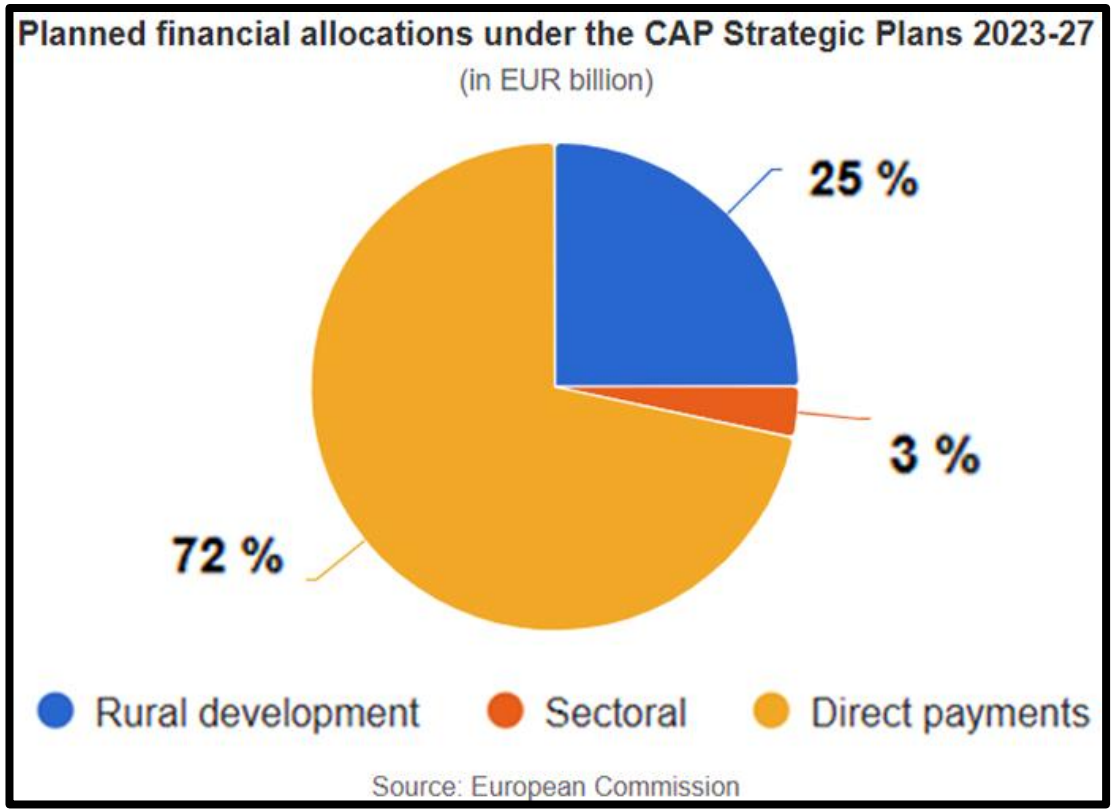
The CAP is a common policy for all EU countries. It is managed and funded at European level from the resources of the EU's budget.

<u>Aims:</u>

- Support farmers
- Food security
- Environmental protection
- Rural development

<u>CAP measures:</u>

- Income support (direct payments)
- Market measures
- Rural development



For more information on the CAP read:
Jansson et al. 2021 https://doi.org/10.1002/aepp.13092 ,
European Comission website (link)

1. Define the simulation scenarios

1) In GUI select the work step “Run scenario”

2) Select the task “Define scenario” (here we are specifying the data/conditions in a .gms file)

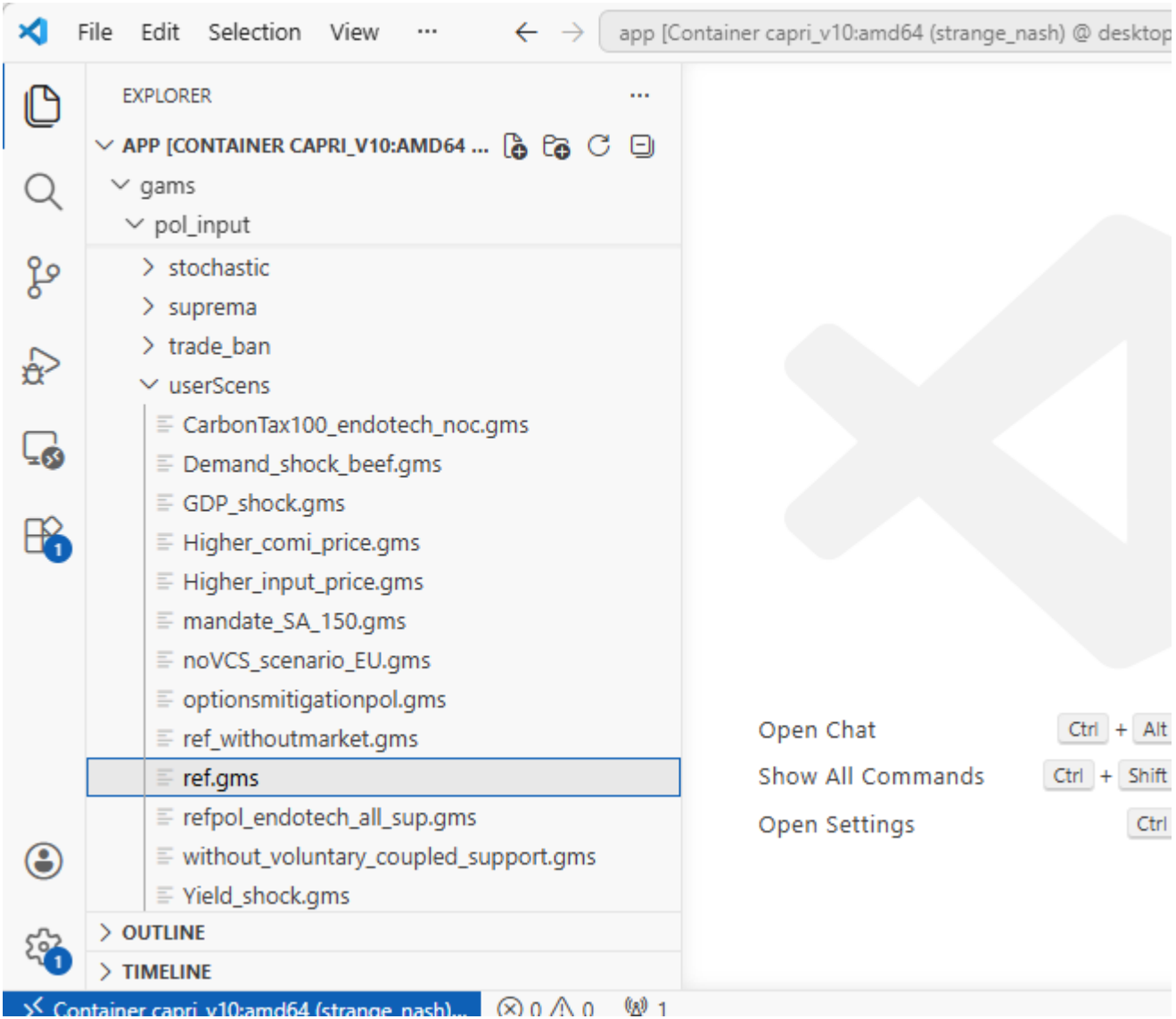
- All scenario files are located in a folder “gams/pol_input”
- Instead of defining new scenarios, we will use the existing policy scenarios related to the current CAP (2023-2027), which are located in folder “gams/pol_input/cap_after_2023”

Two scenarios will be selected:

- **Reference scenario (CAPRI Baseline):** with CAP framework (prevailing in 2023) in file “ref.gms”
- **noVCS_scenario_EU:** same, but a change is introduced in file “gams/pol_input/userScens/noVCS_scenario_EU.gms”.

In NoVCS scenario, the voluntary coupled support to specific production activities is removed. Instead, the budget is added to the basic payment scheme that is spread over all eligible ha of agricultural land.

Running the simulation



- All our course scenarios are stored in gams/pol_input/userScens

Run scenario work step overview

Once the scenarios have been defined, you have options to run them:

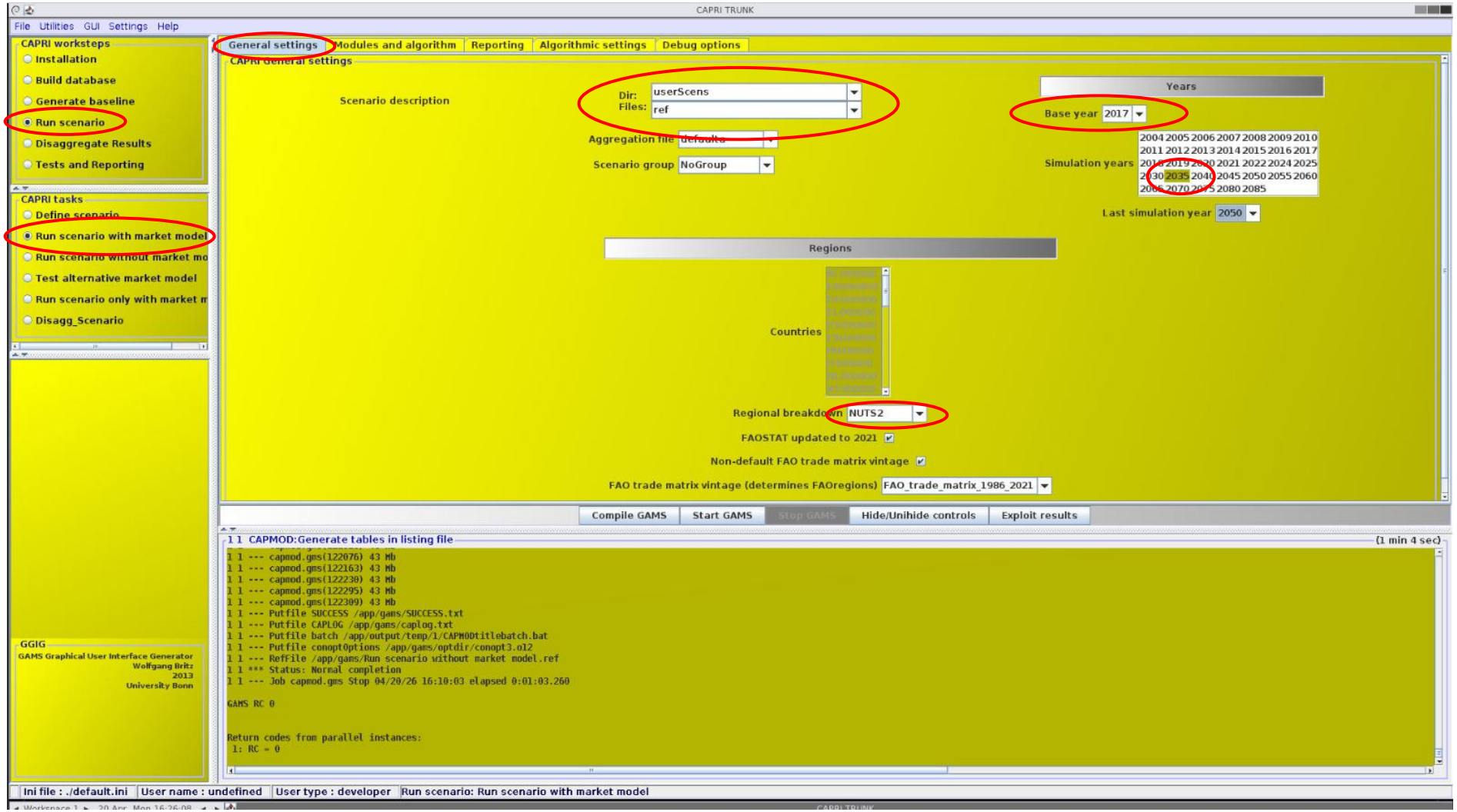
- **Run scenario with market model:** *both the supply and market modules are run, in an iterative way. The model accounts for market effects and provides results at the regional level for the EU.*
- **Run scenario without market model:** *only the supply module is run. The model provides detailed results at the regional level, but market effects are not considered.*
- **Run scenario with only market model:** *only the market module is run. The model accounts for market effects but does not provide regional results.*

Please note that for running a CAPRI scenario you need a valid GAMS licence.

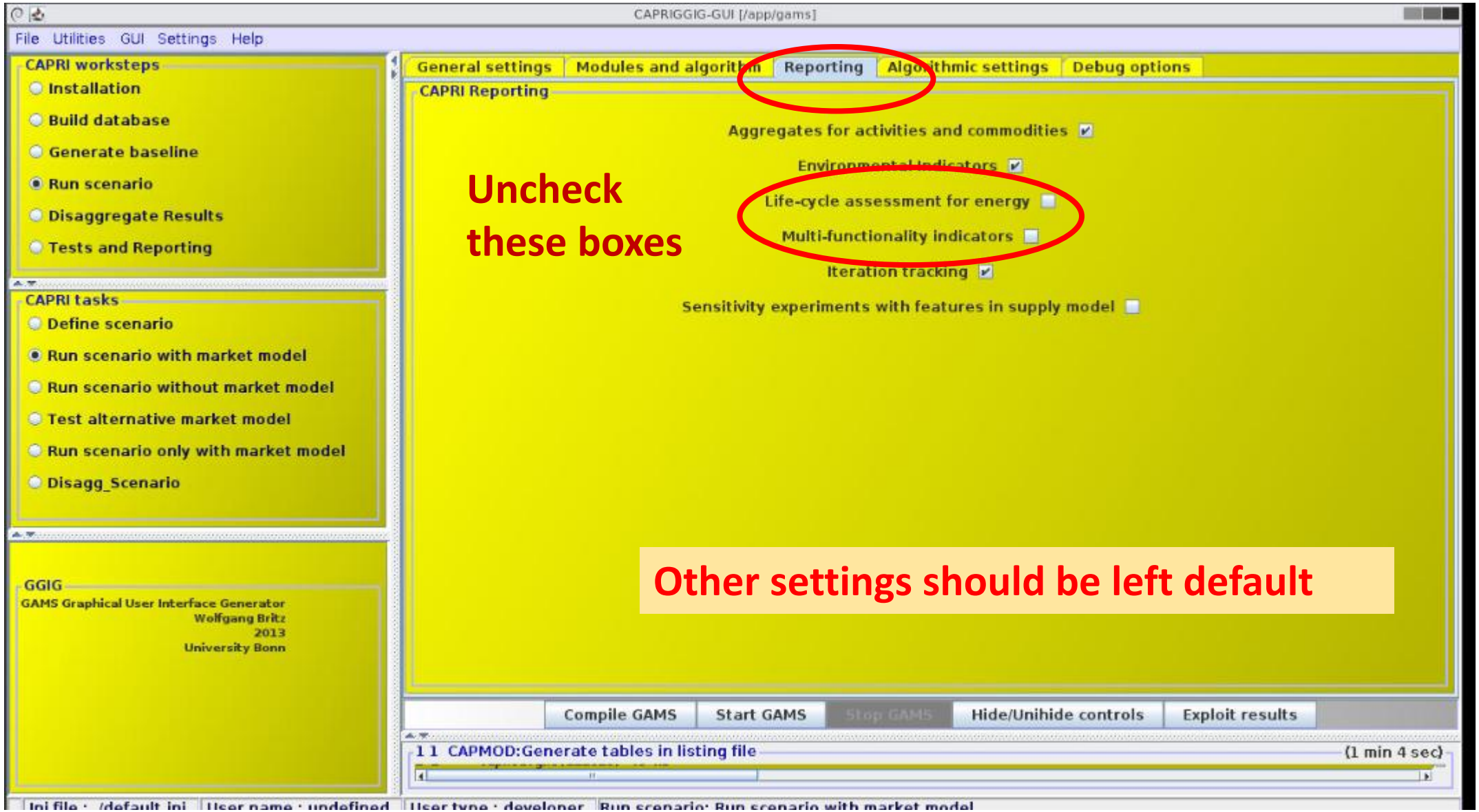
2. Choose scenario settings 1

1. Run scenario
2. Run scenario with market model
3. General settings
4. Pick a scenario
5. Choose base year 2017
6. Choose simulation year 2035
7. Regional breakdown: NUTS2

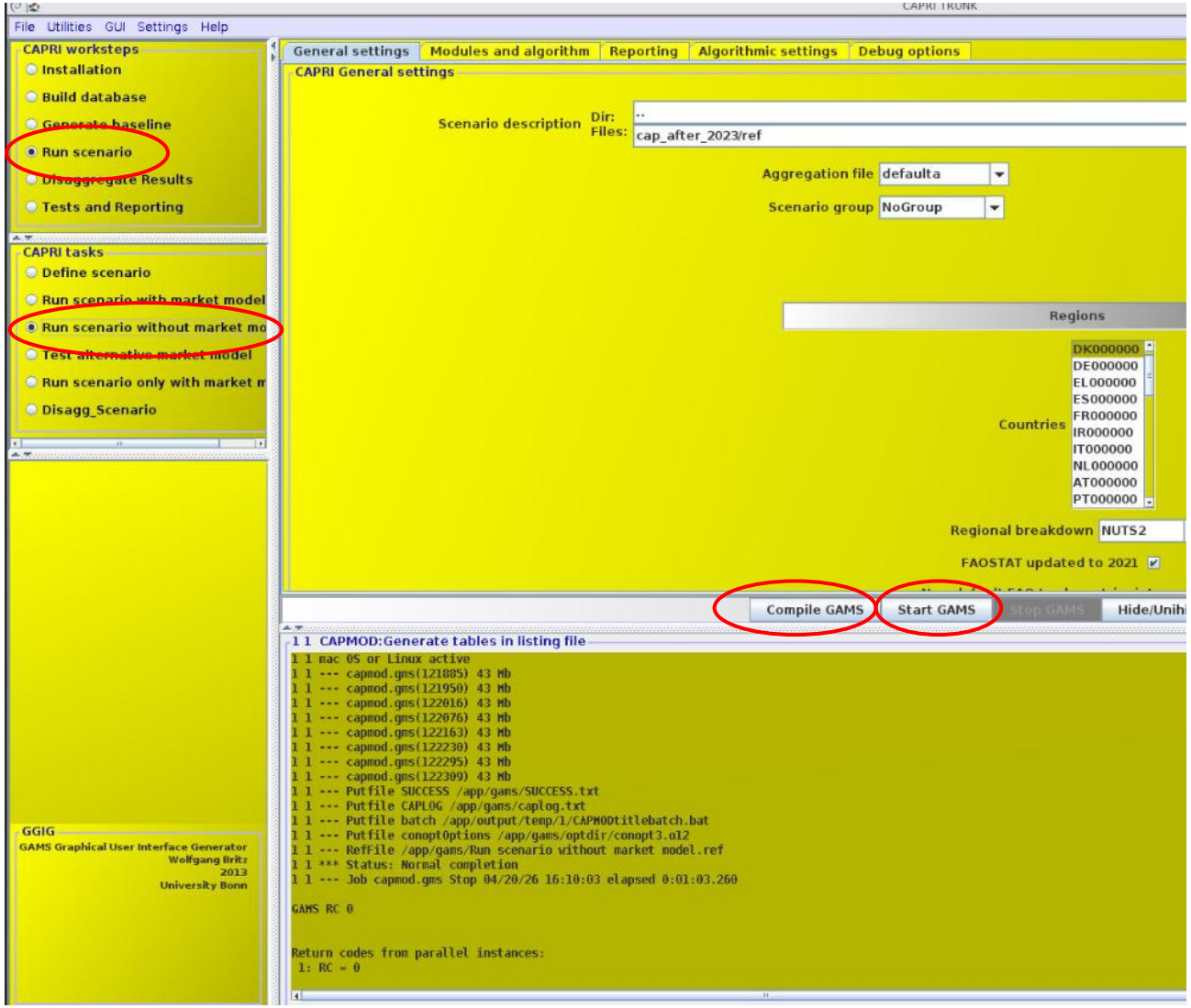
Important! Keep the same settings for both scenarios!



2. Choose scenario settings 2



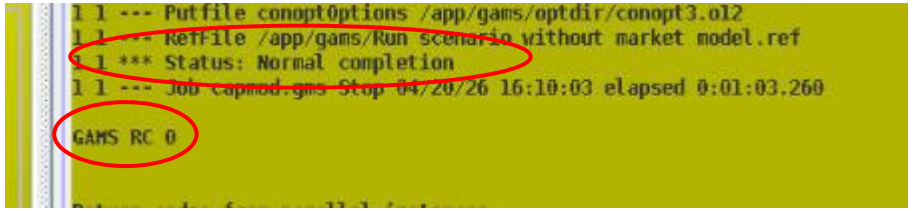
Running the simulation



3. Run a policy scenario

1. Run scenario
2. Run scenario with market model
3. Compile GAMS (checks for invalid statements in the code)
4. Start GAMS (takes ~30 minutes)

After completion of steps 3 and 4 you should get a message **“Status: Normal Completion”** and **“GAMS RC 0”** in the output window:



Possible Errors:

If something went wrong during the Compilation, the message will be "Status: Compilation Error".

- The type of error will be specified, but can be difficult to understand if you are not familiar with GAMS
- Check that you filled in all the GUI settings and all the scenario settings

If something went wrong during the Execution, the message will be "Status: Execution error"

- Can be due to missing data (when you downloaded the results)

If it still doesn't work, contact the course team

4. Run a policy reform scenario

Once the Reference scenario (ref.gms) was run successfully, run the Policy Reform scenario (noVCS_scenario_EU.gms) in the same way. You only must change the scenario file.

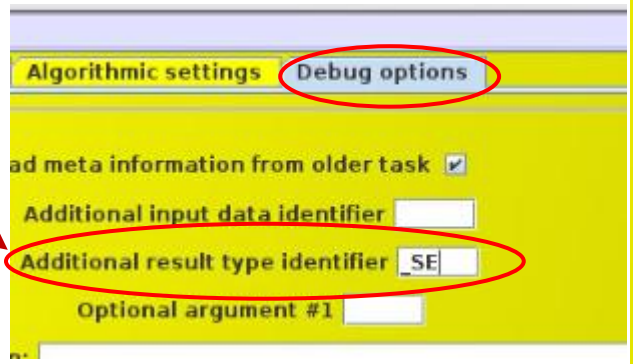
Run Scenario>>Run Scenario with market model

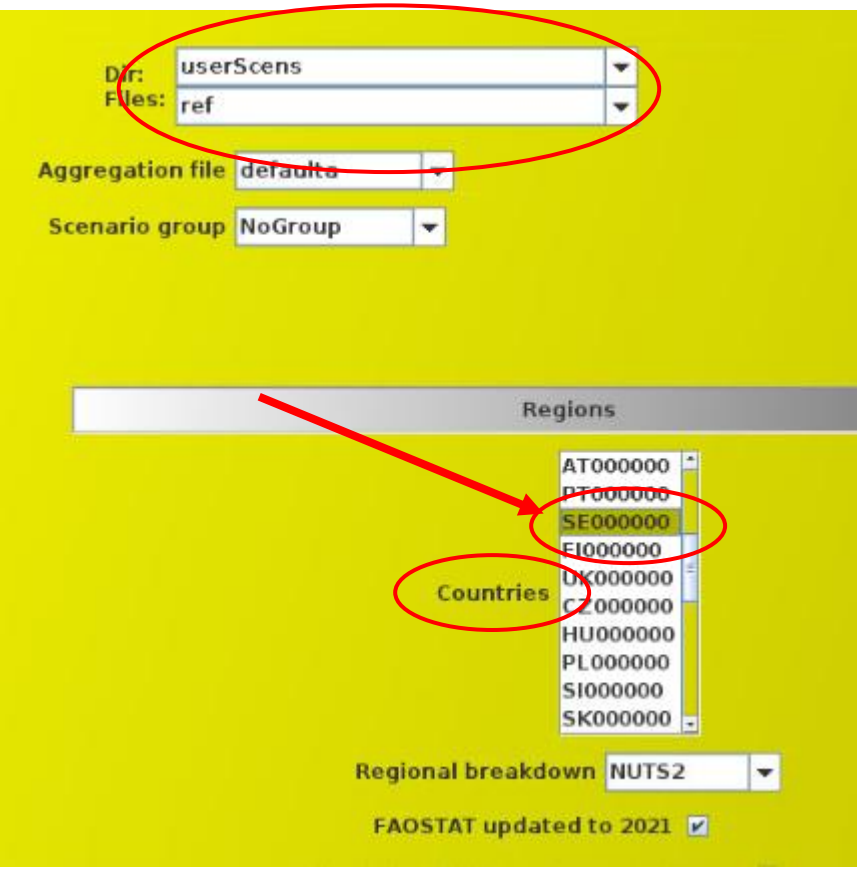
You should get a message **“Status: Normal Completion”**

5. Run scenarios without the market model (Sweden)

1. Run scenario (**ref**, then **noVCS_scenario_EU**)
2. Run scenario **without** market model (only supply module) faster
3. Pick **Sweden** in the list of countries (**SE000000)**
4. In ‘Debug options’ tab put an ‘Additional result type identifier’. Type: **“_SE”.**
5. Compile GAMS
6. Start GAMS

This will add an **“_SE”** identifier to your results file (protects from overwriting the existing result files)





Analysing CAPRI results

To analyse model results, we will use the scenarios you have already run in your first simulation.

Scenarios:

1. **“ref”**
2. **“noVCS_scenario_EU”**

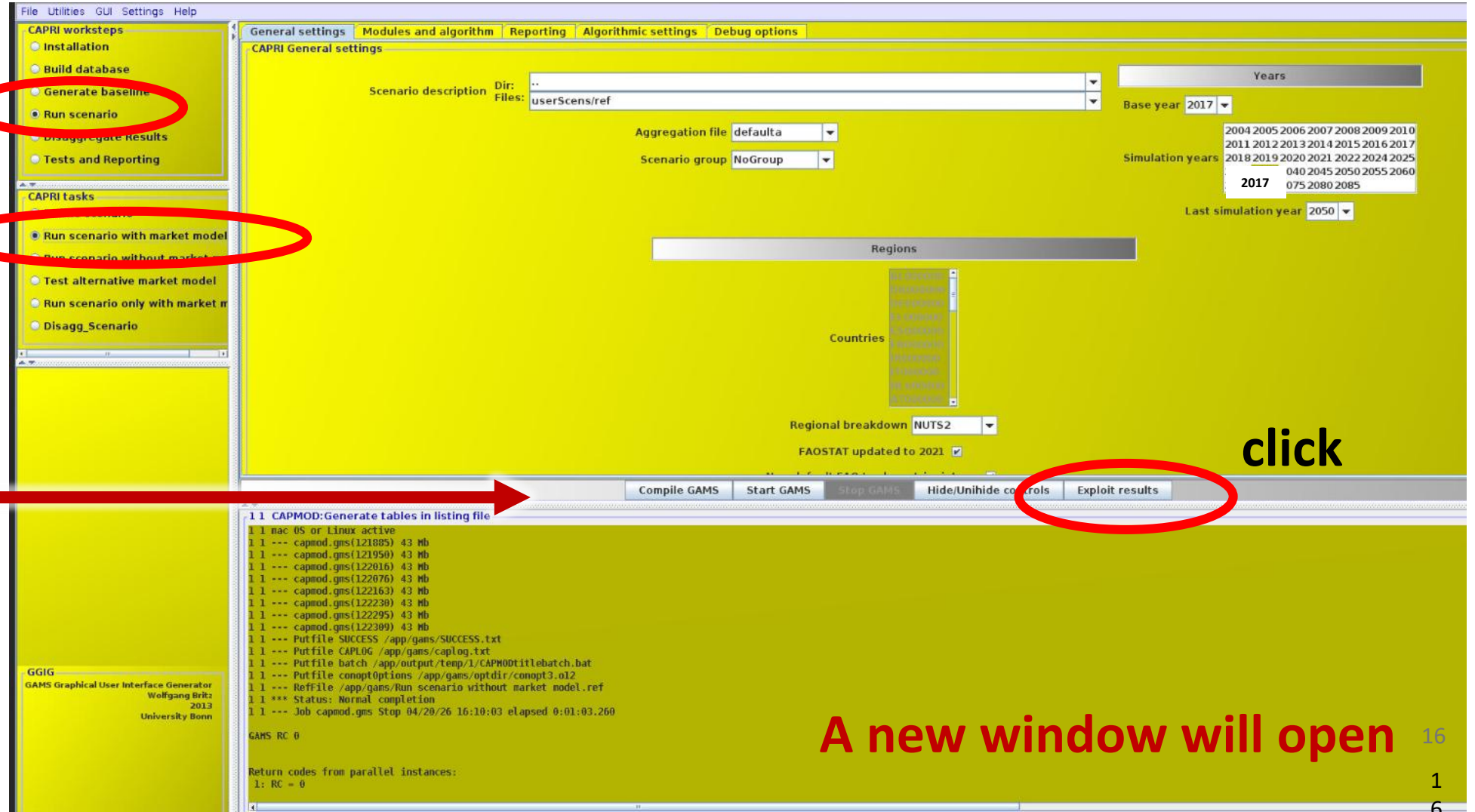
They were run **with market model** and, therefore, include all countries and market feedbacks from the CAPRI market module.

Load the Results

Load the Results

Run scenario>>Run scenario with market model>>Exploit results

All the results from the different tasks in CAPRI can be viewed in the GUI through the **general settings panel** for each task.



Load the Results

Choose results files

1

- Country selection: “All” (default).
- Regional level: “2”.
- Base year: “2017”.
- Simulation year: “2035”

2

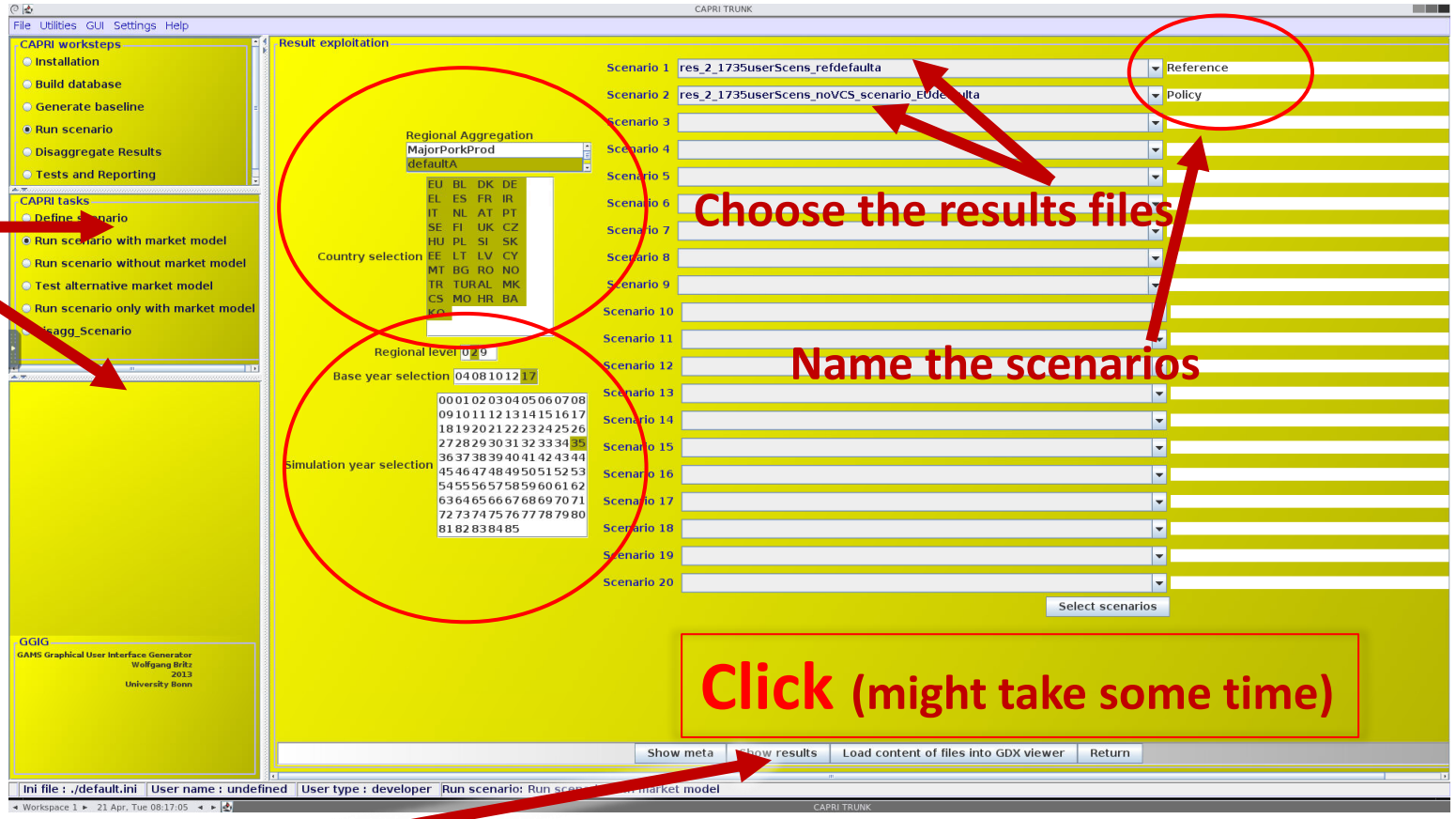
- Choose the corresponding simulation results files from the drop-down lists. (\output\results\capmod).

You can choose as many as you wish, but the Viewer may slow or stop if you choose too many.

- Good idea to name your scenarios.

3

- Click ‘Show Results’



Problems you might encounter

- It may take some time to load your results before the result viewer is opened.
- Sometimes the files are not loaded. It might be enough to press “Show results” again.
- It might also be necessary to restart the GUI. In this case, you do not need to re-run your simulation, only try to reload your results.

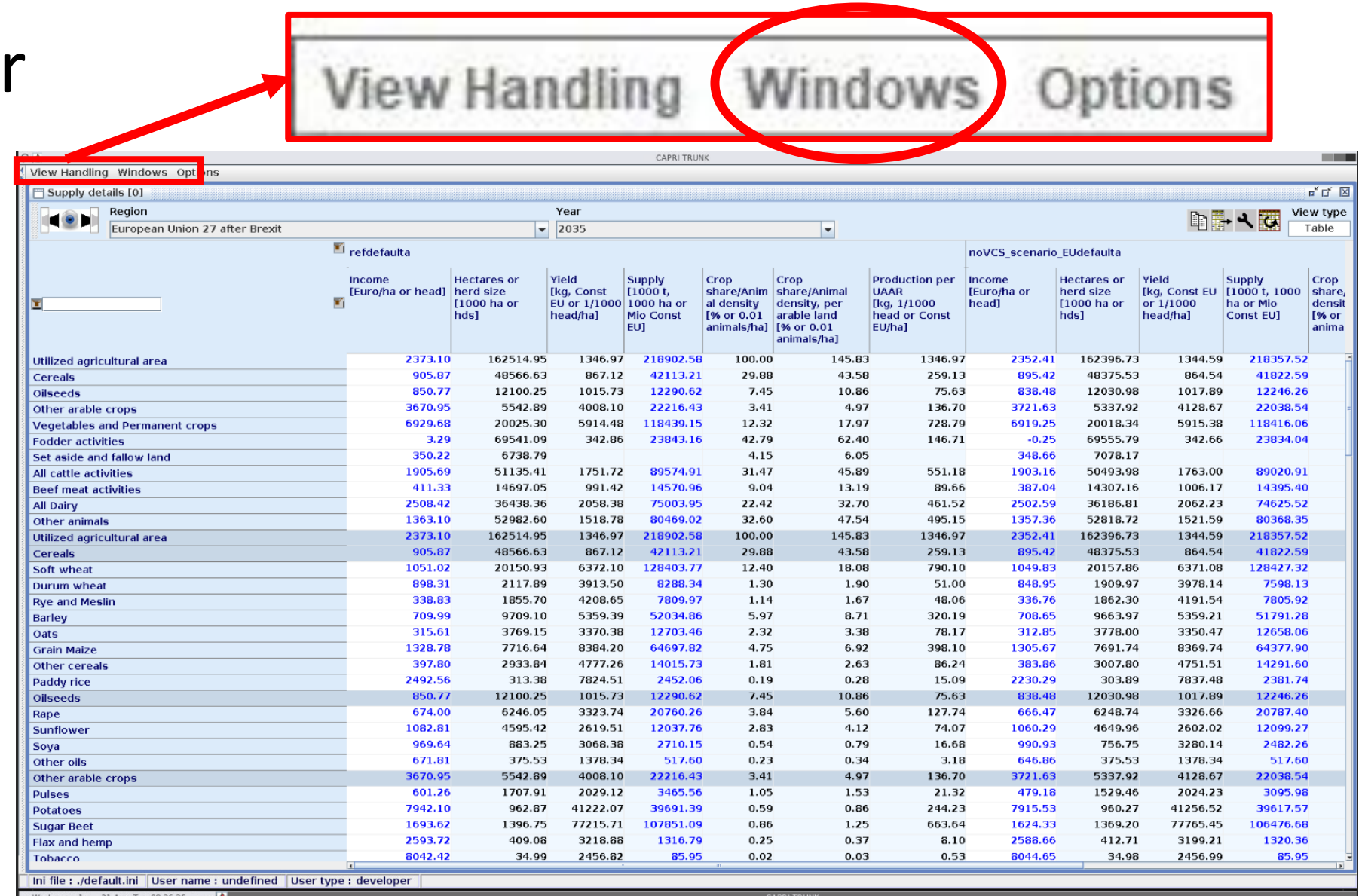
Navigate the Result Viewer

Navigate the Result Viewer

Result Viewer

- In the result viewer one or several data view windows can be seen.
- By clicking **Windows** in the list, you can choose which data view window to view among your open ones.
- If no data view windows are visible, click **View handling>> New data view.**
- To go back to the work steps and close result:

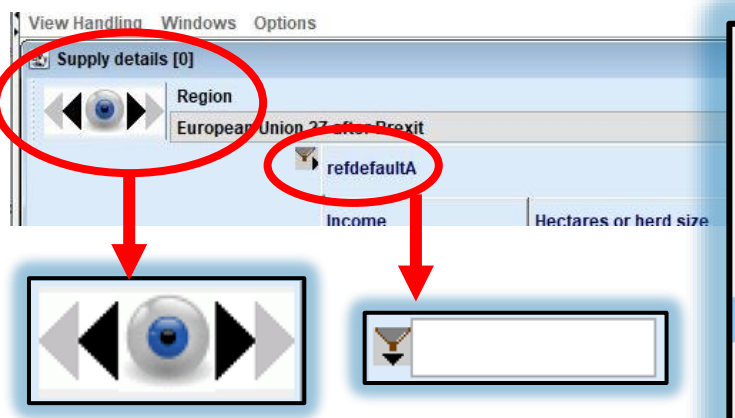
  View handling>>Exit.



Navigate the Result Viewer

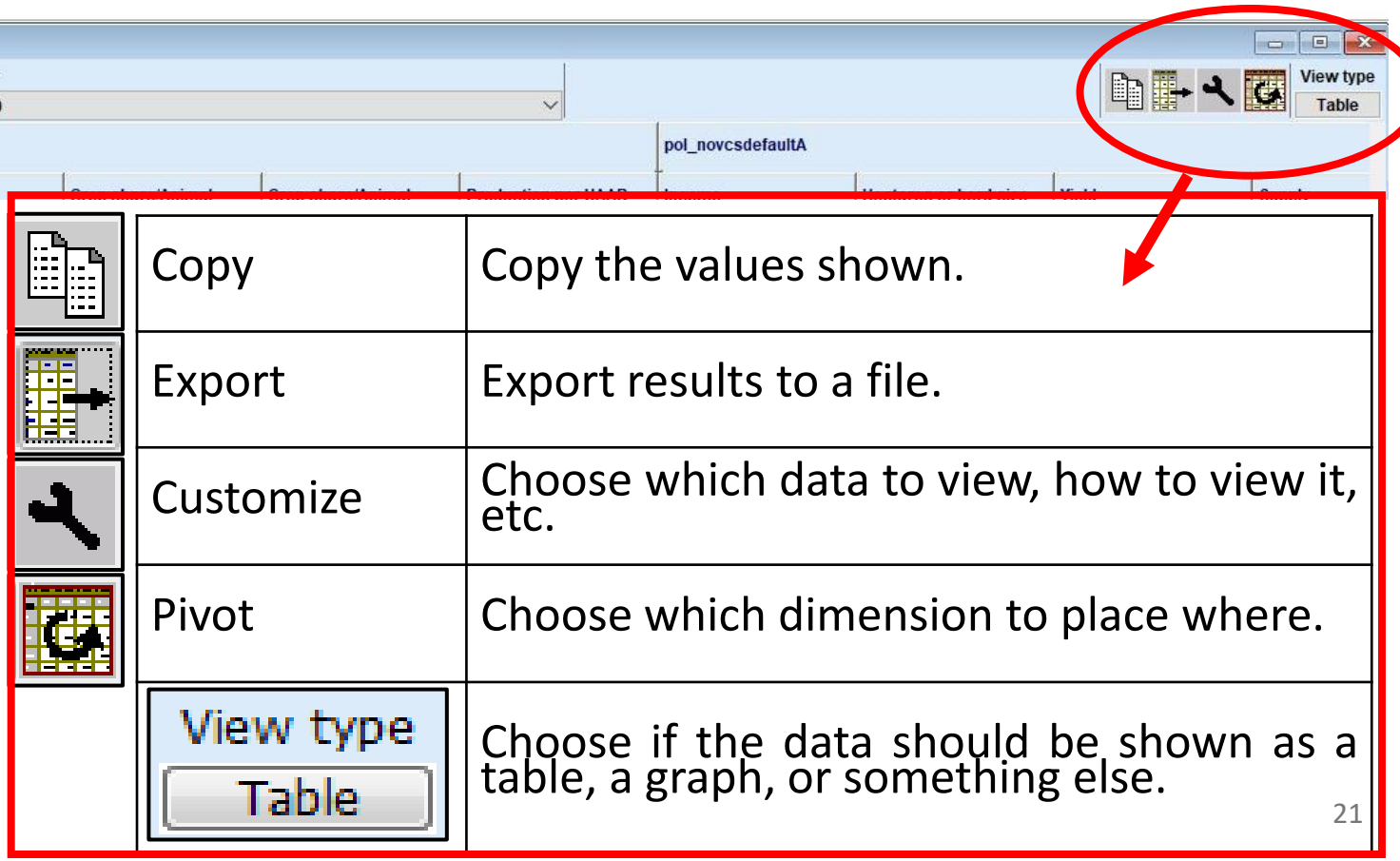
Options in the Result Viewer

You can choose which kind of data to view and which of the loaded scenarios to compare. **Symbols for the functions available for the data manipulation:**



Eye symbol:
Open menu to choose which data to view

Selection dialog:
Choose a subset of elements to show.



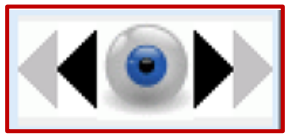
Copy	Copy the values shown.
Export	Export results to a file.
Customize	Choose which data to view, how to view it, etc.
Pivot	Choose which dimension to place where.
View type Table	Choose if the data should be shown as a table, a graph, or something else.

Navigate the Result Viewer

Farm theme>> Supply details

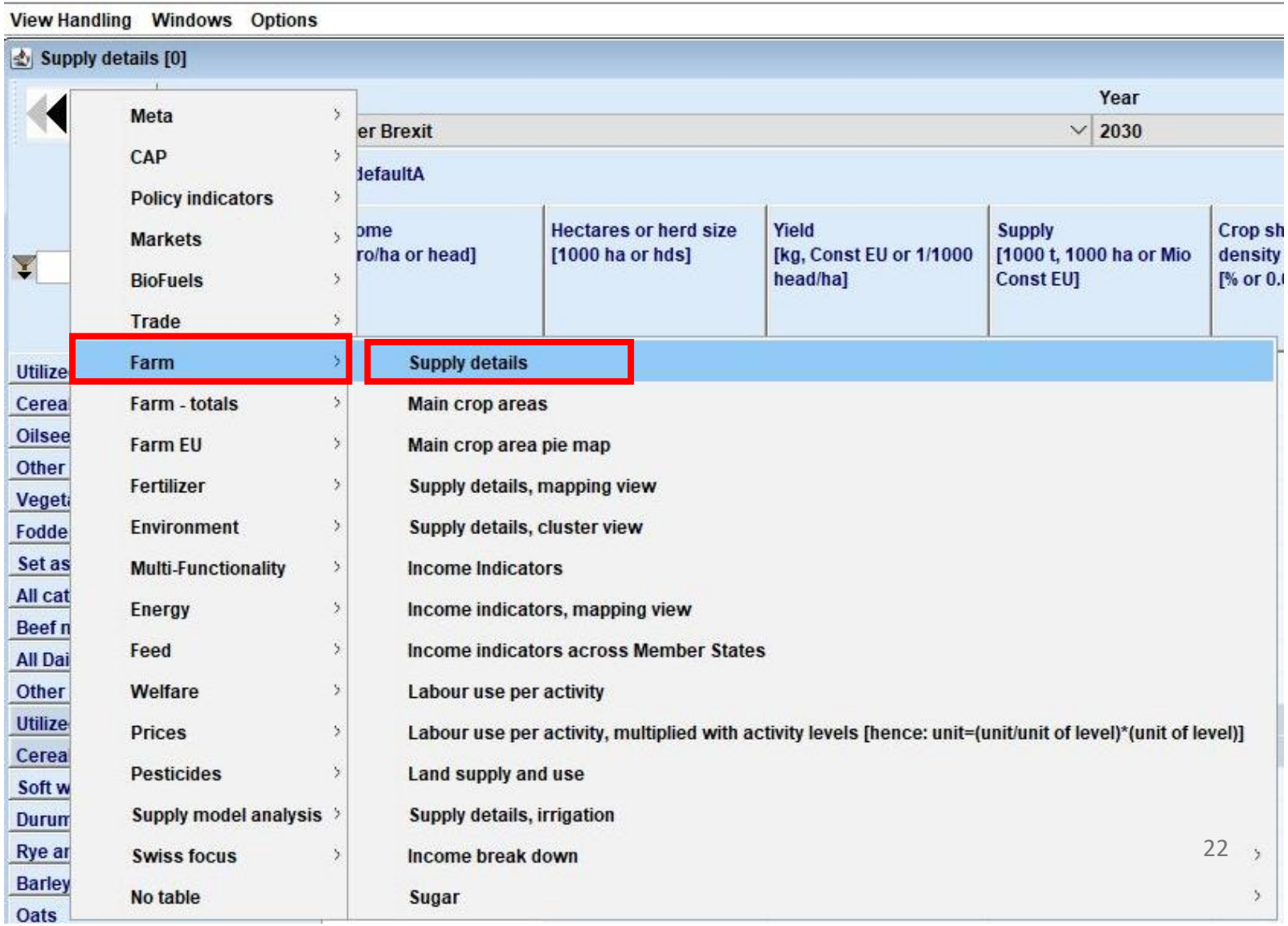
To start looking at results click at the

Eye symbol



Then choose:

Farm>> Supply details
you will see a table with the results for crop areas and production volumes, etc.



Data dimensions

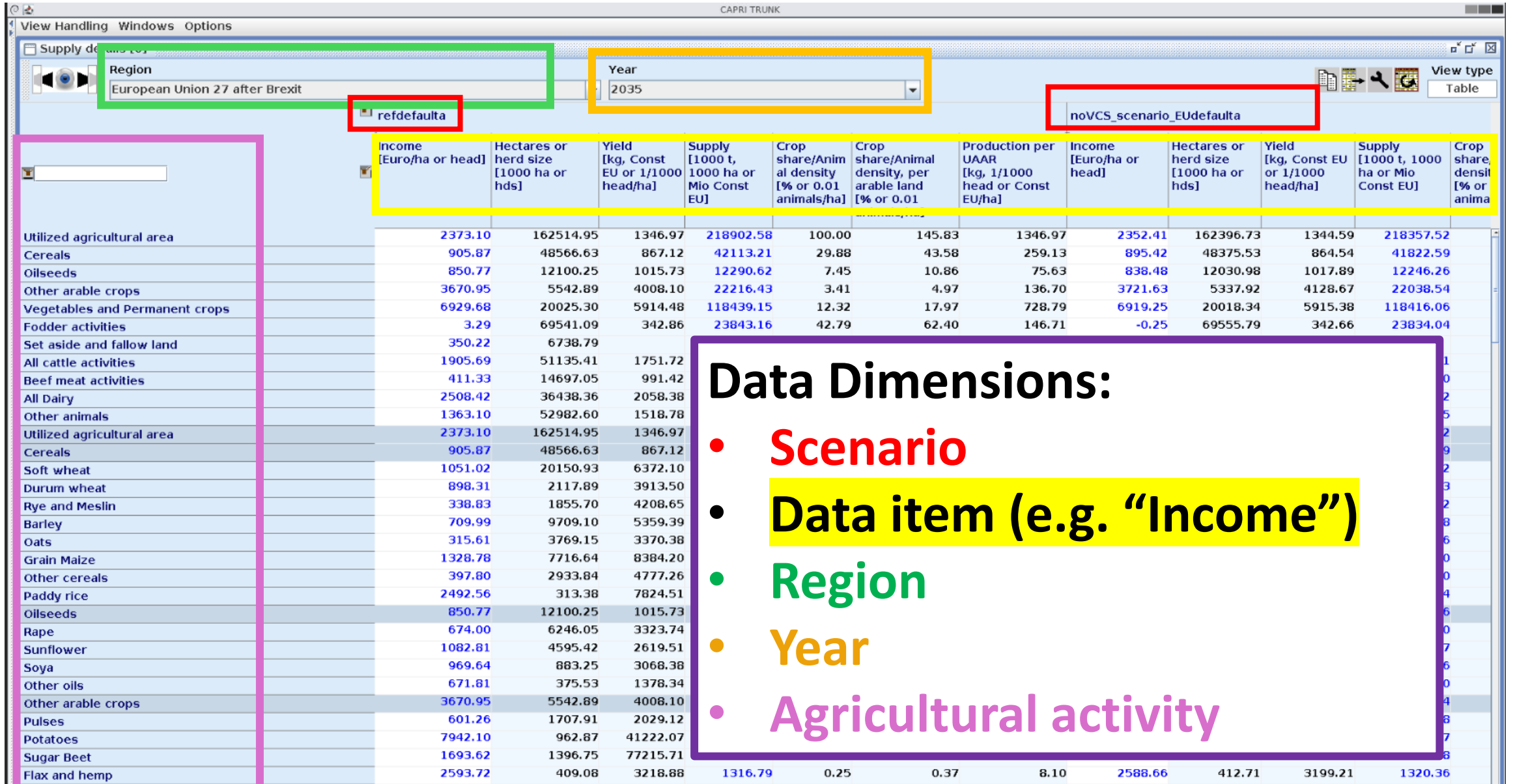
In CAPRI we can show data with many dimensions. Depending on which table you view (chosen data), the elements in the rows and columns might differ (some might be shown in drop-down lists at the top of the window).

Regions might not always cover the same set of regions:

- **NUTS2 regions** are shown when relevant (typically for results from the supply module),
- some views show **all world regions**, but not NUTS2 (typically for results from the market module).

Example on the next slide>>

Navigate the Result Viewer



Data Dimensions:

- **Scenario**
- **Data item (e.g. “Income”)**
- **Region**
- **Year**
- **Agricultural activity**

Navigate the Result Viewer

Try to find this yourself (example)

Dimensions:

- **Regions**: “Germany”
- **Year**: 2035
- **Scenario**: Reference
- **Data item**: Hectares
- **Agr. Activity**: Soft wheat

You can see that the area of soft wheat in Germany in 2035 is projected to be **2,896,430 hectares** in the Reference scenario.

	Income [Euro/ha or head]	Hectares or herd size [1000 ha or hds]	Yield [kg, Const EU or 1/1000 head/ha]	Supply [1000 t, 1000 ha o Const EU]
Utilized agricultural area	2896.69	16914.46	1582.05	267
Cereals	1024.93	5696.00	1010.58	57
Oilseeds	742.64	1733.92	1183.59	20
Other arable crops	5651.75	733.67	7424.13	54
Vegetables and Permanent crops	10041.60	1100.37	8292.09	91
Fodder activities	-115.04	7247.45	604.32	43
Set aside and fallow land	1087.82	403.06		
All cattle activities	2326.44	7675.37	2021.63	155
Beef meat activities	549.46	1392.64	1417.58	19
All Dairy	2720.33	6282.73	2155.52	135
Other animals	1300.81	7082.66	1716.05	121
Utilized agricultural area	2896.69	16914.46	1582.05	267
Cereals	1024.93	5696.00	1010.58	57
Soft wheat	1148.39	2896.43	7962.76	230
Durum wheat	564.39	23.12	6253.31	1
Rye and Meslin	637.37	533.82	5401.53	28
Barley	998.31	1300.53	7224.93	93
Oats	719.69	187.11	4746.44	8
Grain Maize	1163.60	406.65	10140.51	41
Other cereals	724.29	348.32	6113.07	21
Paddy rice				
Oilseeds	742.64	1733.92	1183.59	20
Rape	747.71	1696.80	3403.55	57

Exercise 9: Find these

a) Number of hectares of cereals in Sweden in 2035 for the Reference scenario.

b) Farm income (Euro/head) from all cattle activities in Ireland in 2035 for the Reference scenario.

c) Number of hectares of wine production in France in 2035 for the Reference scenario.

d) To find other themes, click the eye symbol and go through the menu.

Exercise 10: Find the table Product balances, detailed

Write the path (in the context menu) to where you find the table Product balances, detailed.

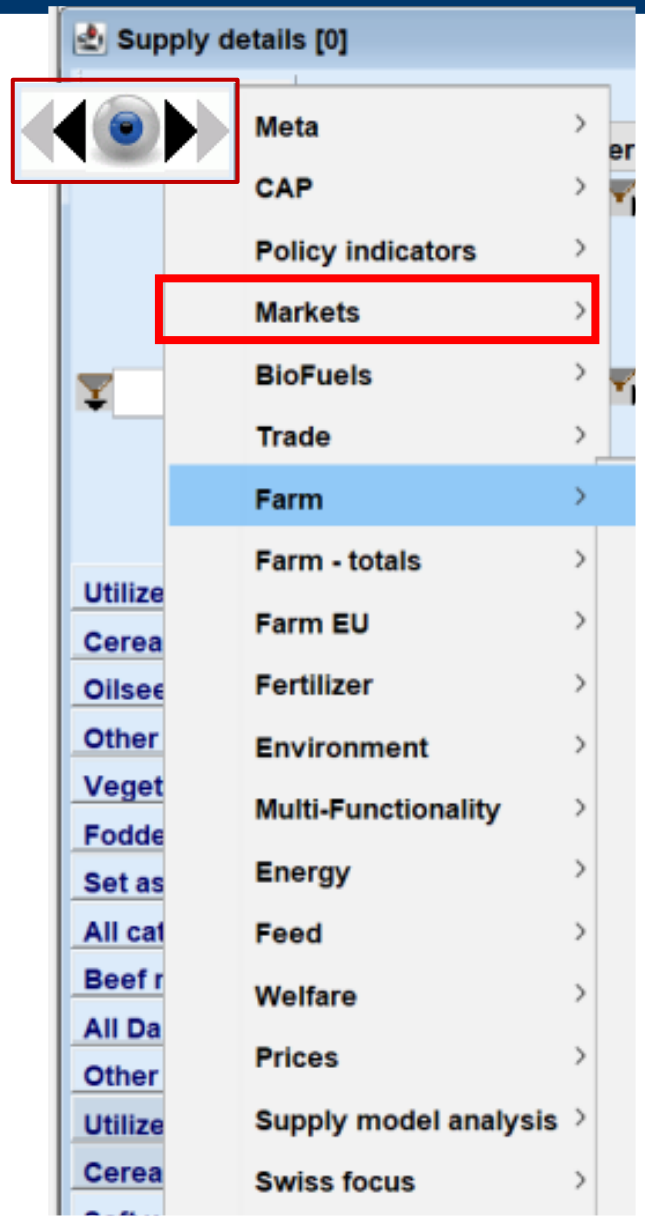
Markets theme

It shows data on **production**, **consumption** and **trade** among other things.

Go to **Markets>>Product Balances**, market model. Here you can see data like Net production and Human consumption plus losses.

If you compare the **regions**, you can find world regions such as “Brazil” in this table, but not NUTS2 regions such as “Sydsverige” as in the previous table.

Further, **agricultural activities** cannot be found, but instead you see products (for example “Beef” but not “Other Cows”).



Exercise 11

Find the quantity of human consumption plus losses of rice in China in 2035 for the Reference scenario.

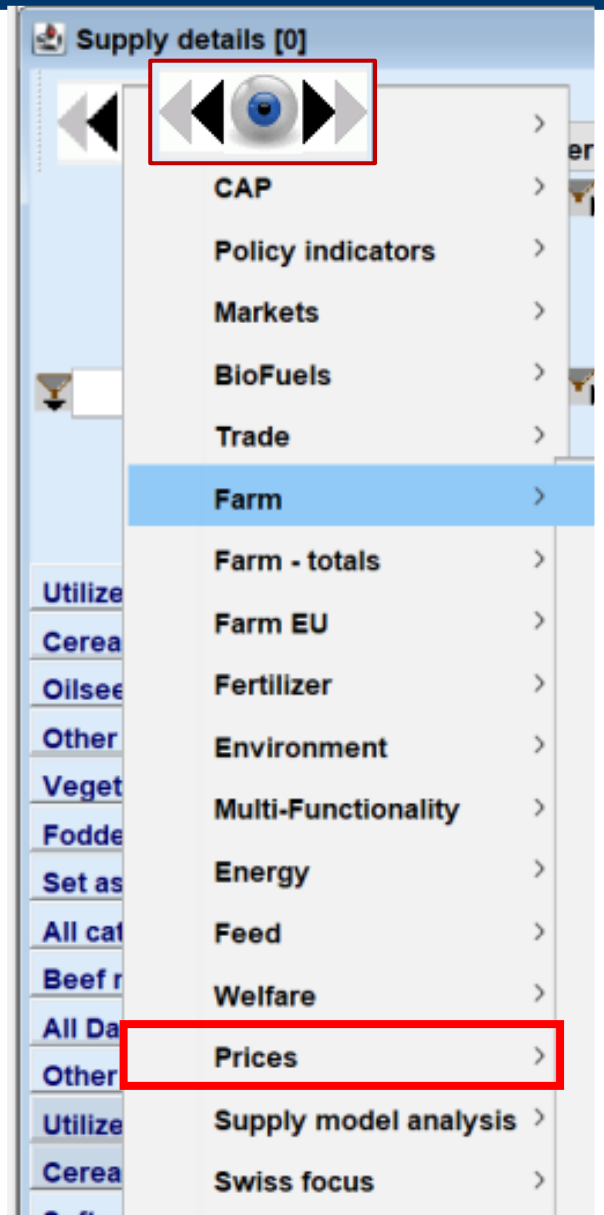
Navigate the Result Viewer

Prices theme

- Go to **Prices>> Prices market model**. This shows **prices in the market-model regions** for agricultural products.

The dimensions are similar to those in the Product balances market model.

- Go to **Prices>> Prices.** Here **prices for regions in the supply module** are shown. **Only prices for the NUTS2 regions are shown,** not for the regions outsude. Both prices for products and shadow prices for inputs such as fodder are shown.



Exercise 12: Find values in the GUI

a) The producer price of rapeseed in USA in 2035 for the Reference scenario.
b) The producer price of rapeseed in the aggregate for all regions in North America in 2035 for the Reference scenario.
c) The producer price of the aggregate for all oilseeds in USA in 2035 for the Reference scenario.

Exercise 13: Producer price of fodder maize

Find the Producer price of fodder maize in Mellersta Norrland (a Swedish NUTS2 region) and Sweden in 2035 for the Reference scenario.

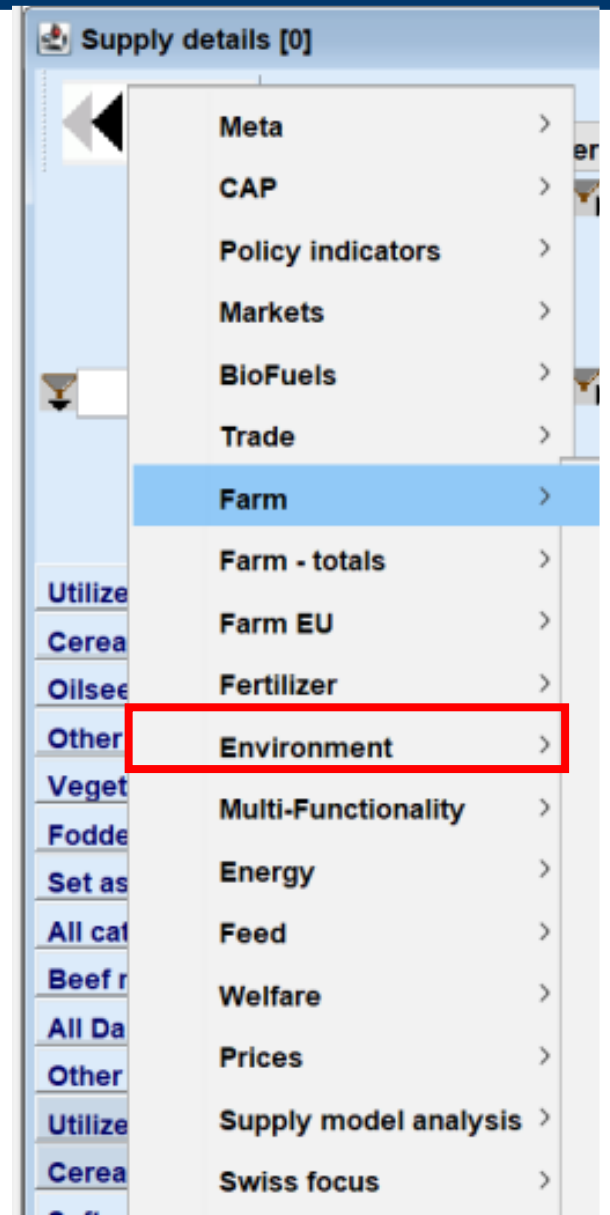
Environment theme

Includes results for various environmental indicators.

Go to **Environment>>Environmental indicators.** Here, total emissions of ammonium and greenhouse gases for each region in the supply module are shown.

You can also view the emissions per hectare of agricultural land.

“Global warming potential from agriculture” sums the emissions of the greenhouse gases methane and nitrous oxide using Global Warming Potential coefficients.



Exercise 14: Total GHG emissions

Find the total emissions of greenhouse gases in Global Warming Potential (in 1000t CO2 eq) for Sweden in 2035 for the Reference scenario

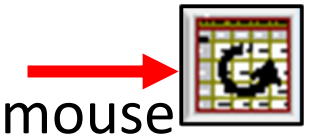
Customize Table Views

Transpose table dimensions

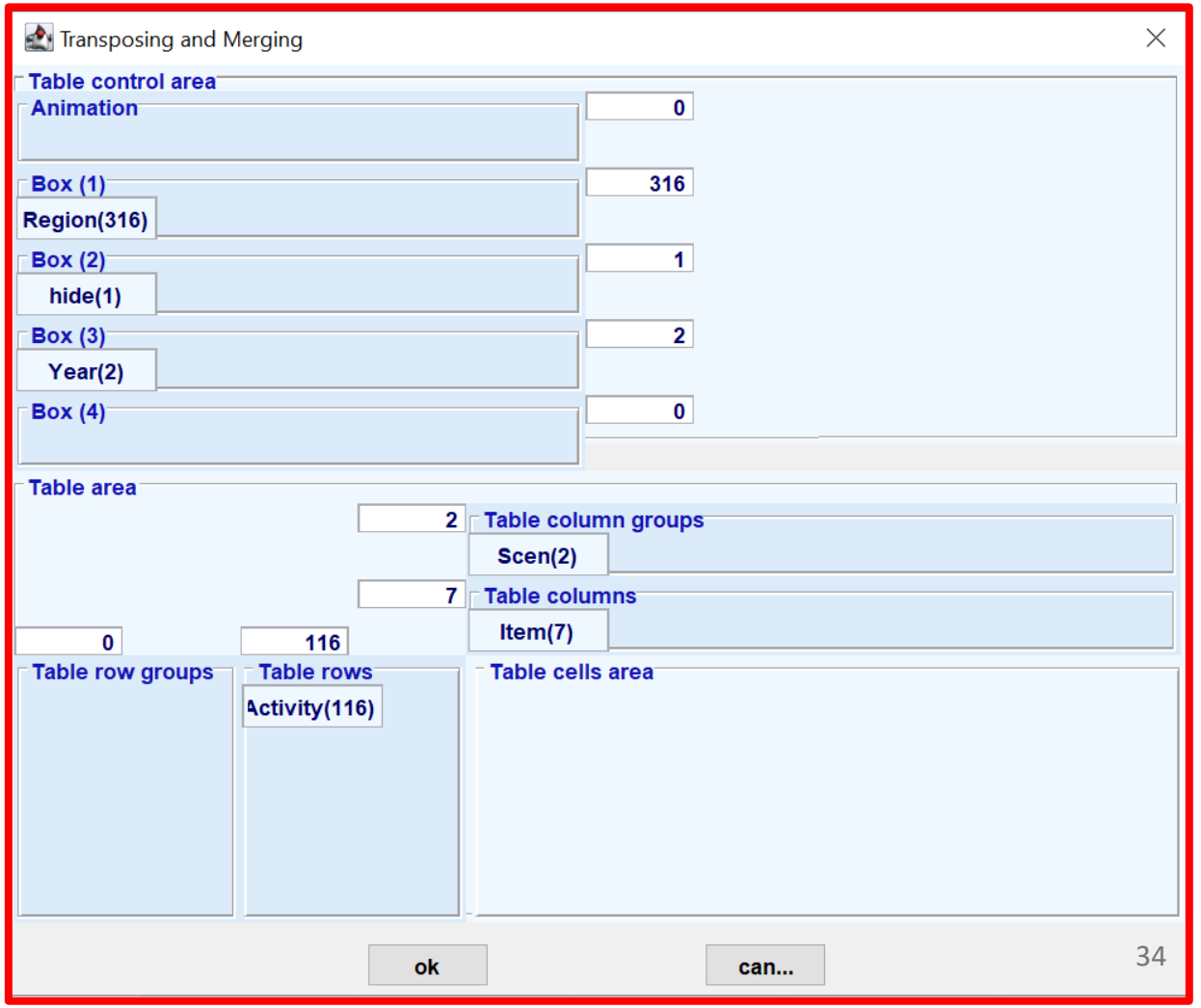
Changing the dimensions of the table can be helpful to get an overview of the results.

Go back to the table **Farm >> Supply details.**

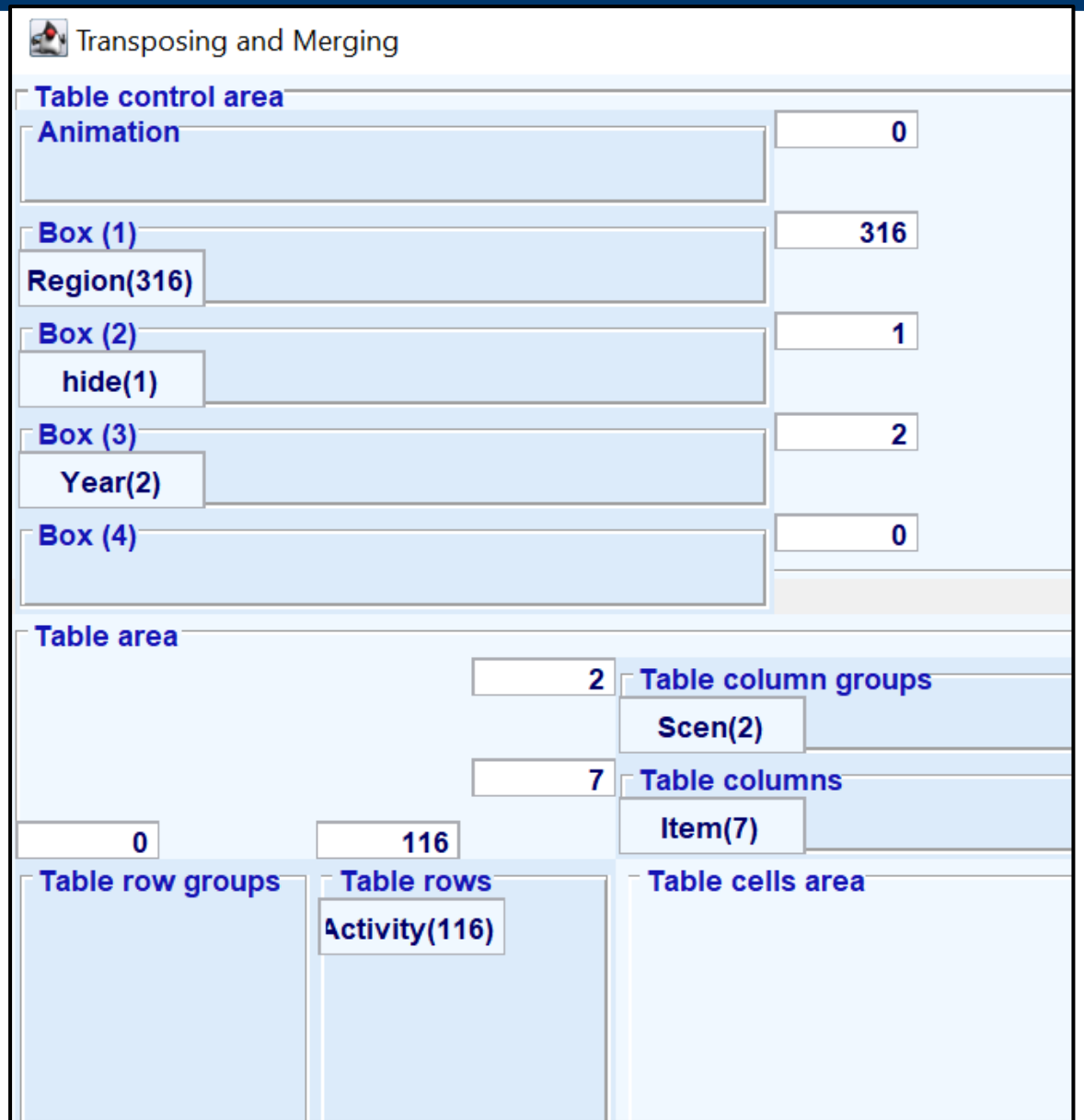
By clicking the **Pivot** up in the right corner, rows and columns will change places.



By clicking on Pivot with the right mouse button you will open a window called **Transposing and Merging.** Here, you can choose freely how to organize your data table by moving around the dimensions Region, Scen, Year, Item and Activity, and similarly for other themes.



Customize Table Views



- **Table control area** – defines how the table and the data are organized.
- **Animation** – can be used to play up items in one dimension, showing data for one item at a time.
- **Box (1-4)** – corresponds to the drop-down lists in the top row of your data view window.
- **Table columns and Table rows** – corresponds to columns and rows.
- **The Table rows, and Table columns groups** – make it possible to show data with e.g., regions (Table rows group), and for each region all products (Table rows), in the rows.
- **In Table area** – you can adjust the data dimension by dragging the dimensions to the different places, depending on what information you want to study. If you put two dimensions in the same place, it will be like putting one of them in the groups, but more difficult to rearrange.

Exercise 15: Change the table view

- Go back to the table **Farm >> Supply details.**
- Change the table view so that you have Activities in columns, Items in rows and Scen, Years and Regions in the drop-down lists.
- Chose the **Scen>>Policy scenario**, **Years>>2035** and **Regions>> Finland** in the drop-down list.

Compare Relative and Absolute Values

Compare Relative and Absolute Values

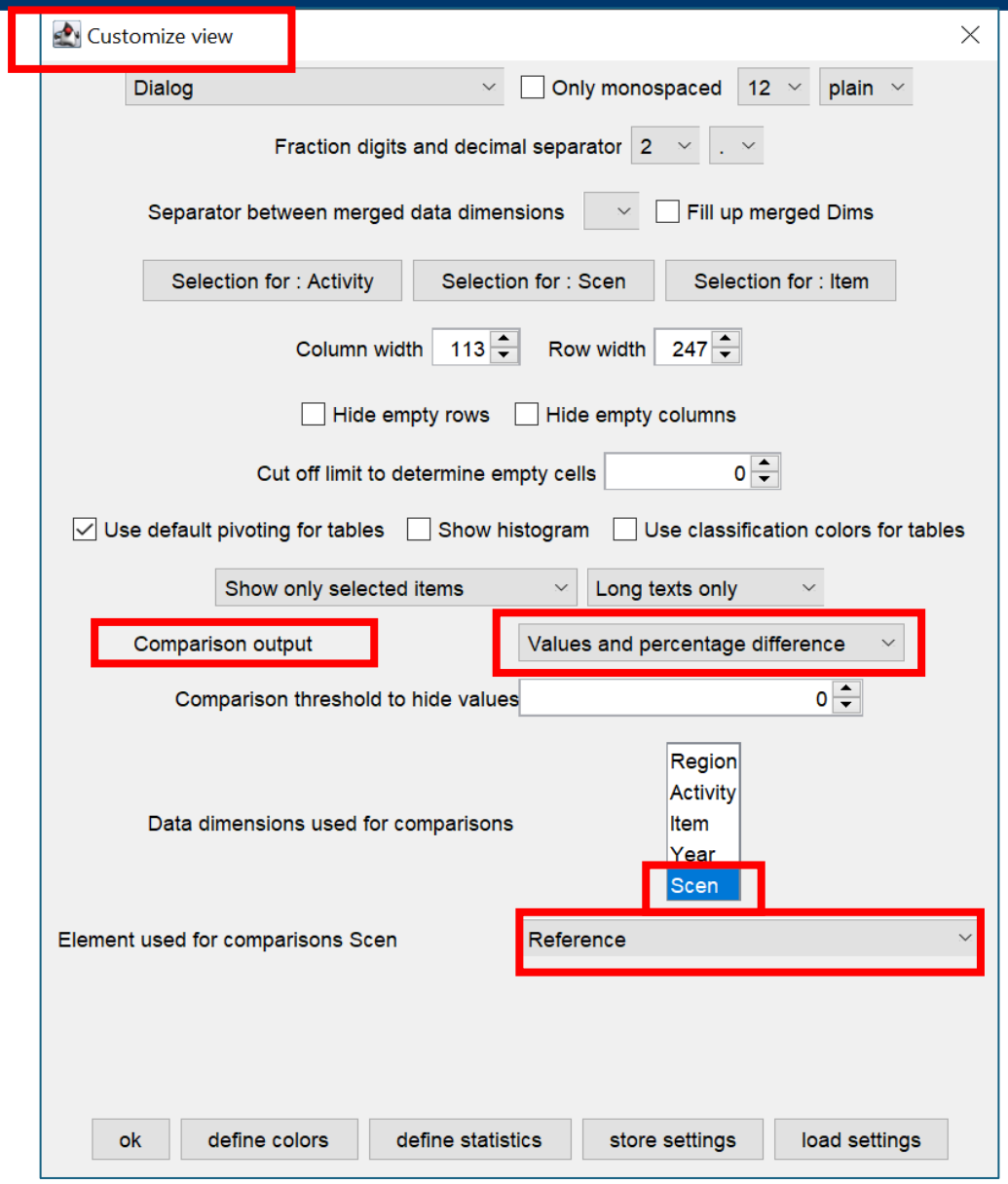
Clicking on "**Customize**" in the right upper corner, you can make several choices about what data to show and how.

Values format. Click on the Comparison output drop-down list to choose between absolute values, percentages, only values, or differences to the chosen scenario.

Choose:

- **Comparison output:** "Values and percentage difference".
- **Data dimension used for comparisons:** "Scen".
- **Element for comparison Scen:** "Reference".

Your results should now be shown for the Policy scenario in absolute values and percentage differences to the Reference scenario.



Exercise 16: Compare relative and absolute values

a) **Compare scenario results.** What is the percentage difference for farm income for Cereals in Spanish agriculture in the Policy scenario compared to the Reference?

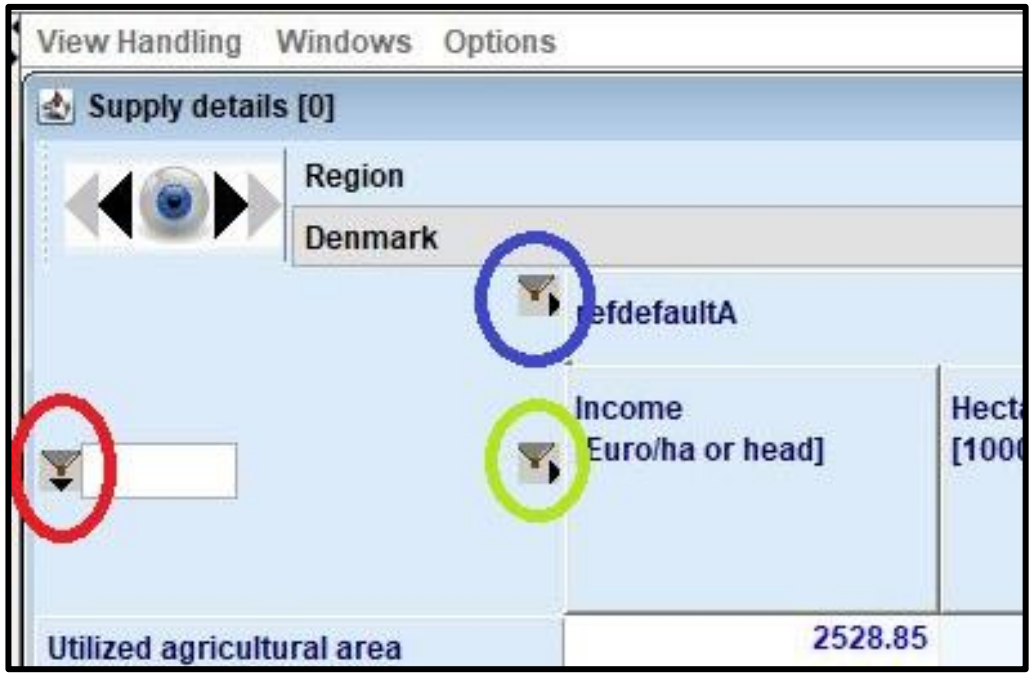
b) **Now compare results in different regions**. What is the absolute difference for prices of oats in USA compared to Sweden, in the Reference scenario?

Select Subsets of the Results

Select Subsets of the Results

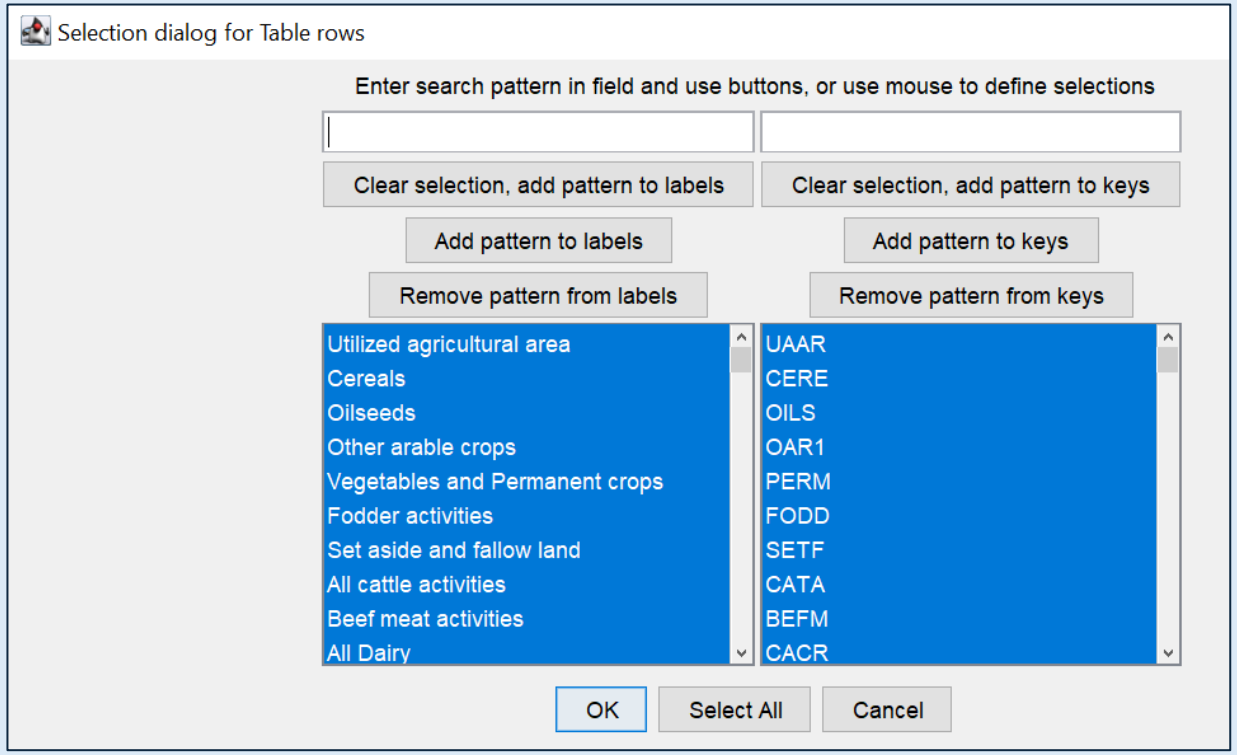
In a large data set, finding the results you need can be tedious and difficult. Choosing a subset of results can therefore be helpful.

Double clicking on the **funnel** above the column/rows heading, you can choose which activities you want to view.



A dialog window will open. Here, you choose what items you would like to view.
(hold down the **ctrl key** to choose several items).

- **The right box** in the dialog shows the CAPRI codes for the activities/items/scenarios etc.



Exercise 17: Select sub-sets of the results

a) Create a **subset** showing only values **Yield** and **Supply** for cereals (soft wheat, durum wheat, rye and meslin, barley, oats, grain maize, other cereals, and paddy rice) for Germany in the Reference scenario.

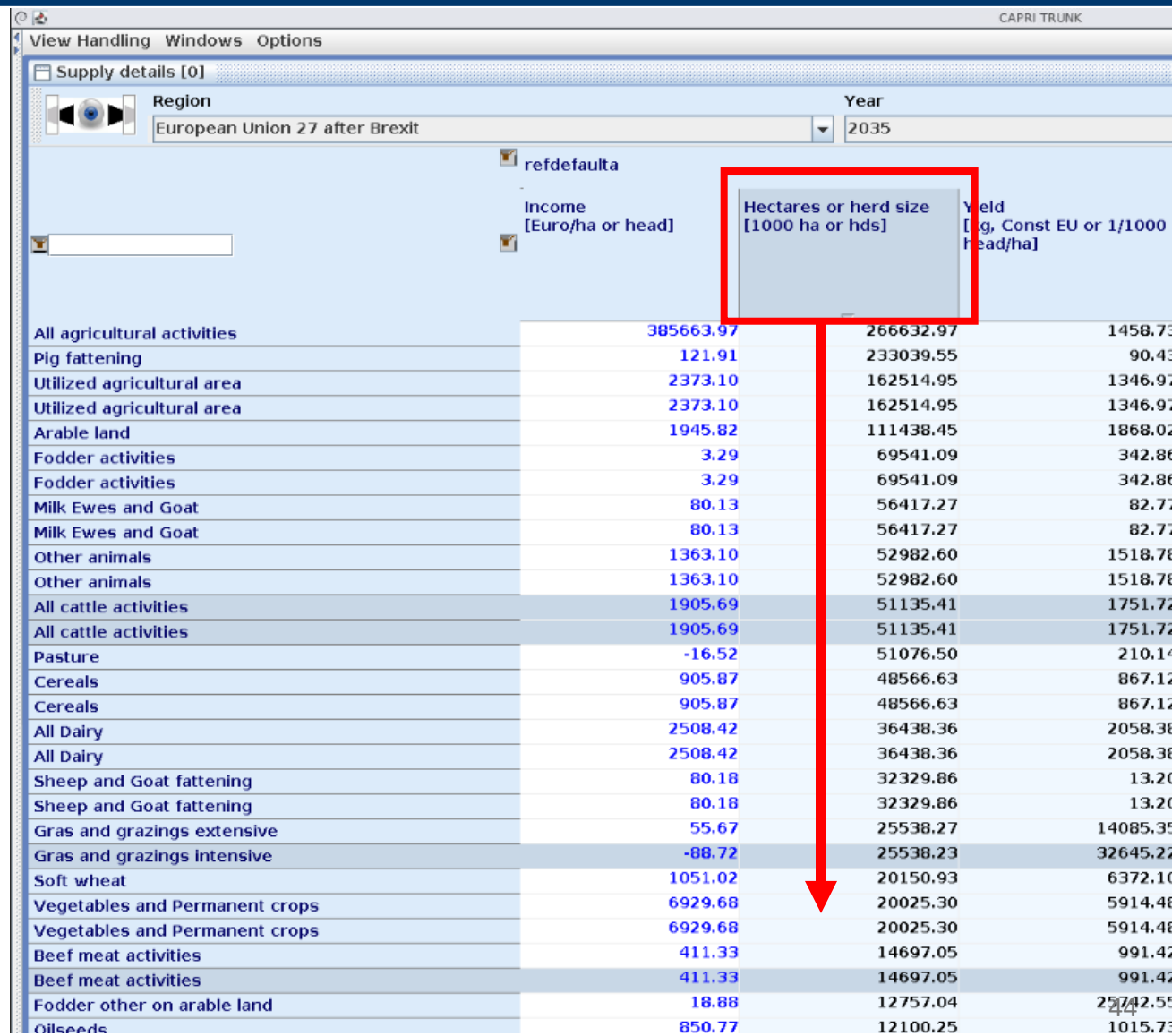
b) Create a subset showing only **Income** [Euro/ha or head] in Spain, Italy, and Germany, for oilseeds (rapeseed, sunflower, soya, and other oils) for both the Reference and the Policy scenarios. (Hint: You may need to use Pivot again to move countries from the drop-down menu.

Sort the Results

Sort the Results

- The rows are sorted according to a **predefined order** (e.g. first some larger crop groups, then the positions of each large group).

- You can **sort the data** by largest or smallest value, or the difference to the Reference scenario.
- By clicking on a **specific column header**, the values in the columns are sorted by either smallest or largest numbers. **Clicking again** reverses the order.
- If you have several columns, the data for all columns will be **sorted according** to the column of interest.
- If only **absolute values** are shown, the sorting will be based on this. But if you have chosen to e.g., compare by percentage difference, the sorting will be **based on these differences.**



Practice sorting

Go back to **Farm >> Supply details**.

- Place **Activities** in the rows and data items in the columns.
- Choose **EU27 after Brexit** in the drop-down menu.
- Click on the **Hectares** column.

The results should now be sorted in the order starting from the lowest (or highest) value. Try clicking on the other columns as well and see how the order of the data changes.

Exercise 18: Sort results

a) Sort the data so that the **largest values** for head/hectares for European Union West in the Policy scenario are **at the top**. Which aggregated land use activity (Cereals, Oilseeds, Other arable crops, Vegetables and permanent crops, Fodder activities, or Set aside and fallow land) uses the largest area? How large is it? Which individual land use activity (Barley, Maize,) uses the largest area?

b) Sort the data so that the **smallest percentage change** in area used for agricultural activities in Sweden is shown, i.e., between the Policy and the Reference scenario. Which aggregate land use activity (Cereals, Oilseeds, Other arable crops, Vegetables and permanent crops, Fodder activities, or Set aside and fallow land) has the smallest percentage change? How small?

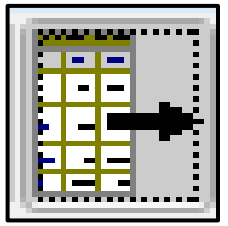
Use Results Outside the GUI

Use Results Outside the GUI

There are different ways to export your results so that you can use them outside the GUI

1) The first option is to copy the values in the table by using the **Copy symbol** or by right clicking on the table and choosing Copy to Clipboard. By using Copy selected cells to clipboard you can copy a selection. When you paste the data into a spreadsheet, labels and settings will also be shown.

2) The other option is to use **Export symbol**, by clicking the symbol or right-clicking. With this you can chose to export the table into an existing file, and you are given the possibility to choose which data to include.

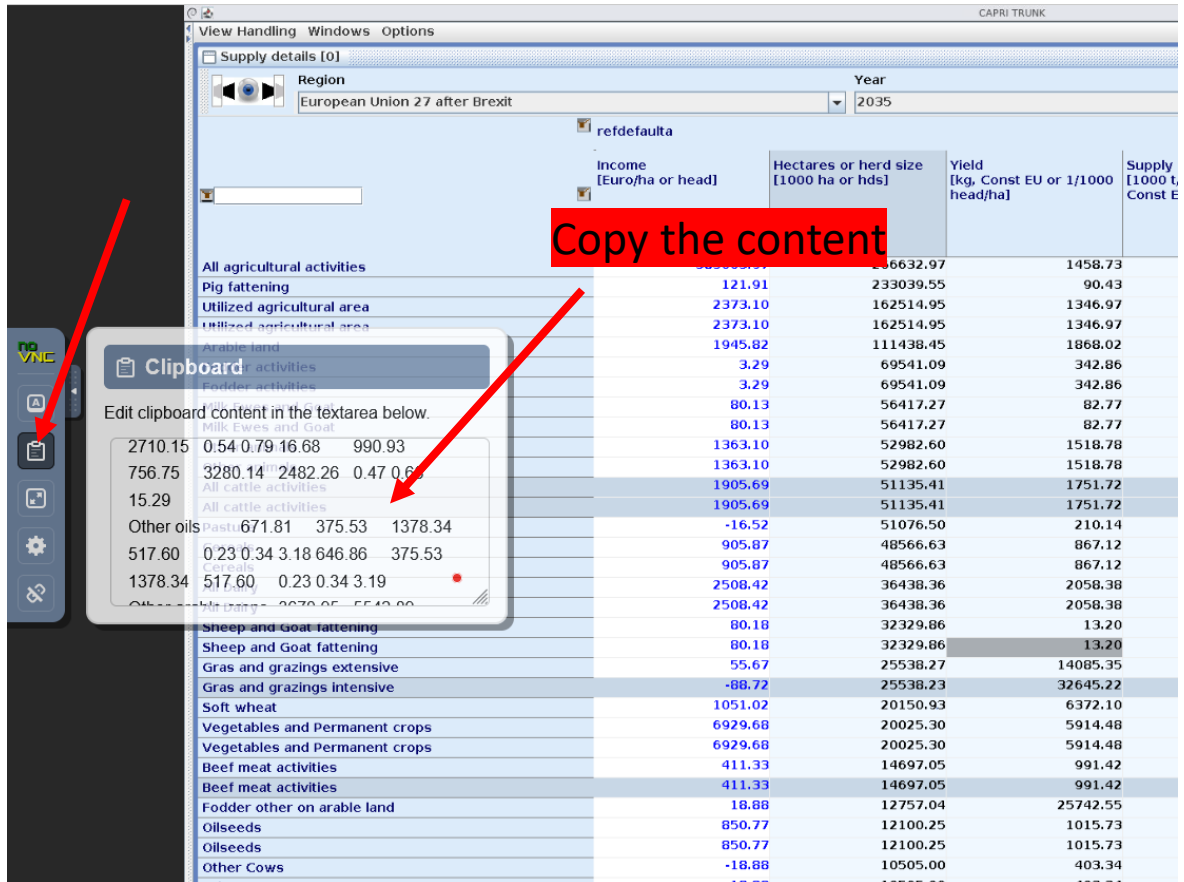


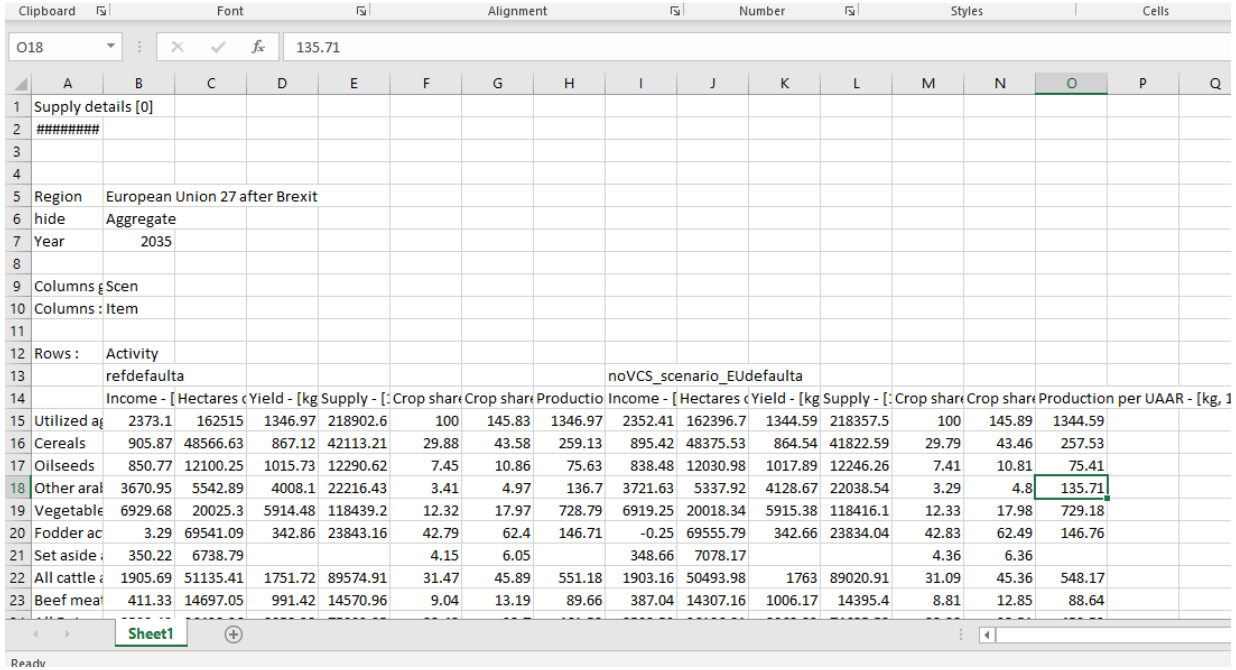
Use Results Outside the GUI

Exercise 19:

Try copying freely chosen results from the GUI into a datasheet.

It should look something like that:





In-depth Exercises

Exercise 20: Compare the Policy to the Reference scenario in Sweden in 2035

a) What is the relative change in number (heads) for the aggregate Beef meat activities?

b) For which “component” of Beef meat activities (Other cows, Heifers fattening low weight, Heifers fattening high weight, Male adult cattle low weight or Male adult cattle high weight) is the absolute change (in numbers of heads) largest? How large?

c) In which of the Swedish regions (Stockholm, Oestra mellansverige, Sydsverige, Norra mellansverige, Mellersta Norrland, Oevre Norrland, Smaland med Oearna or Vaestsverige) is the relative change smallest for Beef meat activities (in number of heads)? How large? For the absolute change?

d) What are the prices of Beef in Sweden in the Reference and in the Policy scenario? Attach a screenshot of a spreadsheet or a table showing these and only these prices.

Exercise 21: how results differ between using the market module and the supply module

In this exercise you will look at how results differ between using the market module and the supply module.

Step 1: First, go through the exercises looking at the result files that you already loaded (with market model). **Look at the Policy scenario for France.**

a) Find the activity with the largest absolute and the activity that has the largest percentage change in income (Except all agricultural activities and utilized agricultural area).

b) For both of these activities, in which of the French regions are the changes largest?

c) Which of the products show the highest price change (in producer prices)? In absolute values? And in percentage? How much?

d) How large are the changes in GHG emissions (in Global Warming Potentials) in all of France? In which of the French regions is the changes largest?

In-depth Exercises

Step 2: Now you will run a new scenario. Exit the result viewer: View handling>>Exit.

- Go back to **Run scenario>>Run scenario without market model.**
- Run the Reference scenario and the Policy scenario for **France (**with ending _FR in Additional result type identifier). **Remember to select Regional breakdown=NUTS2.*
- Load the result files. These will be in the same result directory, but the files will end by _FR (ref_FR and pol_novcs_FR).

Do the same exercises as in Step 1:

a) Find the activity with the largest absolute and the activity that has the largest percentage change in income (Except all agricultural activities and utilized agricultural area).

b) For both of these activities, in which of the French regions are the changes largest?

c) Which of the products show the highest price change (in producer prices)? In absolute values? And in percentage? How much?

d) How large are the changes in GHG emissions (in Global Warming Potentials) in all of France? In which of the French regions is the changes largest?

What differences can you see between the results? Why results differ?

Problems you might encounter

- Sometimes your sorting can disappear for no reason, you cannot see the tools etc. First just try again! Either try to change the rows and columns, expand the window to full screen, or open a new data view window.
- Sometimes it will be impossible to close a window. First try to close other windows, then close the GUI and restart.
- Be careful when clicking on the area above the drop-down menus before exporting results, to make sure that you have the data you wanted, and not, e.g., income instead of hectares.

Recap

You learned how to:

- ✓ Load the results into the viewer
- ✓ Find selected tables in the result viewer
- ✓ Customize result tables by transposing rows and columns
- ✓ Compare relative and absolute values
- ✓ Select sub-sets of the results
- ✓ Sort results