



# CAPRI Introduction

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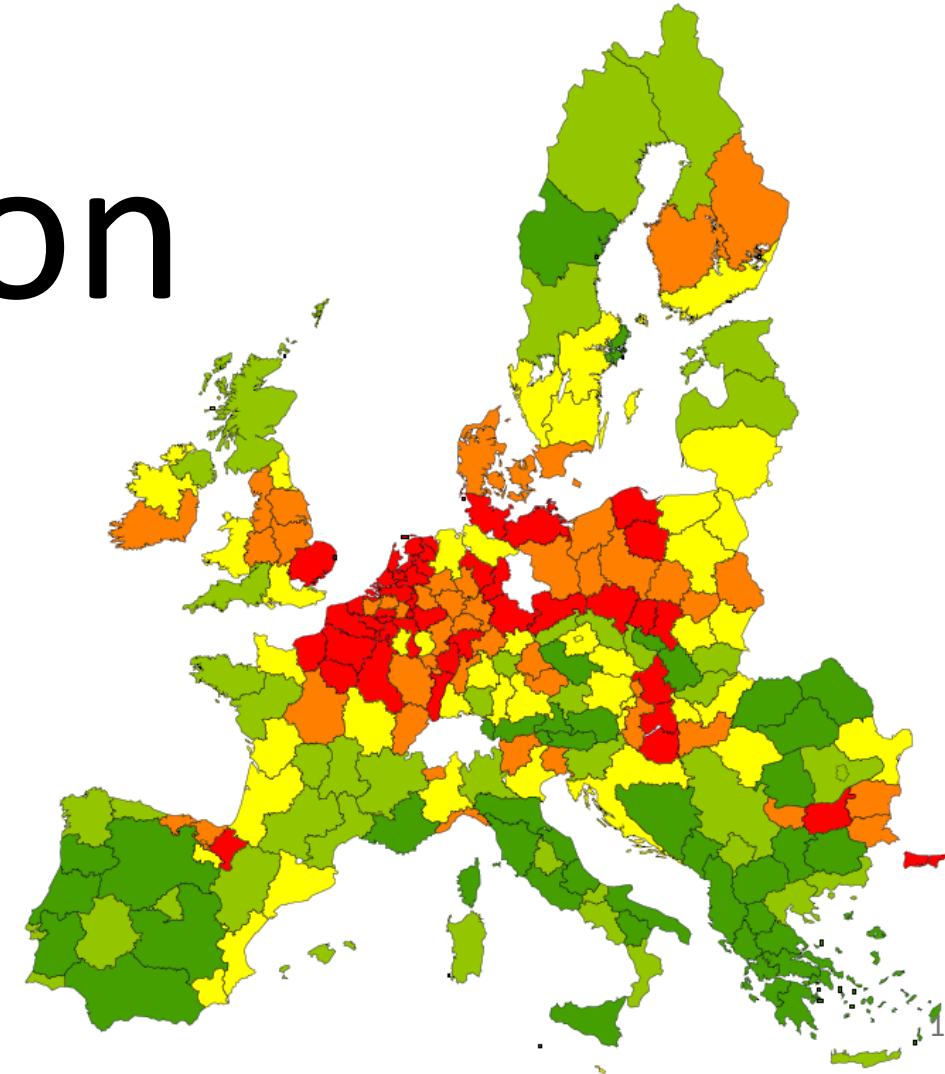
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Swedish University of Agricultural Sciences, Uppsala





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# 1. Setting up the System

More information in CAPRI Modelling System Documentation (Britz, 2014):  
<https://www.capri-model.org/lib/exe/fetch.php?media=docs:capri-documentation.pdf>



- **Setting up the System**
- **Structure of CAPRI**
- **CAPRI Graphical User Interface (GUI)**
  - Start the GUI
  - Adjust the settings
  - Tasks in the GUI
- **Running Your First Simulation**
  - Scenario Settings
  - Run a Policy Scenario
  - Run a Policy Reform Scenario
  - Run Scenarios Without the Market Model



## How to install CAPRI:

1. Create a CAPRI folder on your computer
2. Download the CAPRI *release Star 2.8.2* ([link](#))
3. Download the CAPRI results database ([link](#))

*\* Some users may have access to the CAPRI SVN6 repository. In that case, you do not have to download the model but can instead use check out the file through <https://svn1.agp.uni-bonn.de/svn/capri/tags/star/2.8.1>*

## Step 1: Create a CAPRI folder on your computer

All files belonging to CAPRI will be stored in subdirectories to a main installation directory. (we recommend local hard drive c:\ or d:\)

**It is generally not advisable to put the model on e.g., the desktop or in my documents.**

The path should not contain spaces, special characters. It should be **≤ 20 characters**, excluding the letter of the drive.

Examples:

- C:\capri
- D:\models\star\_2.8

*In the following, we assume that you will install CAPRI in the folder:  
C:\capri\star\_2.8 (e.g., 14 characters)*

## Step 2: Download the model

1) Download a zipped archive of a Stable Release of CAPRI (STAR) - contains model code and input data. [\(Link\)](#)

\*You could also find it on the [CAPRI Course Overview](#) page:

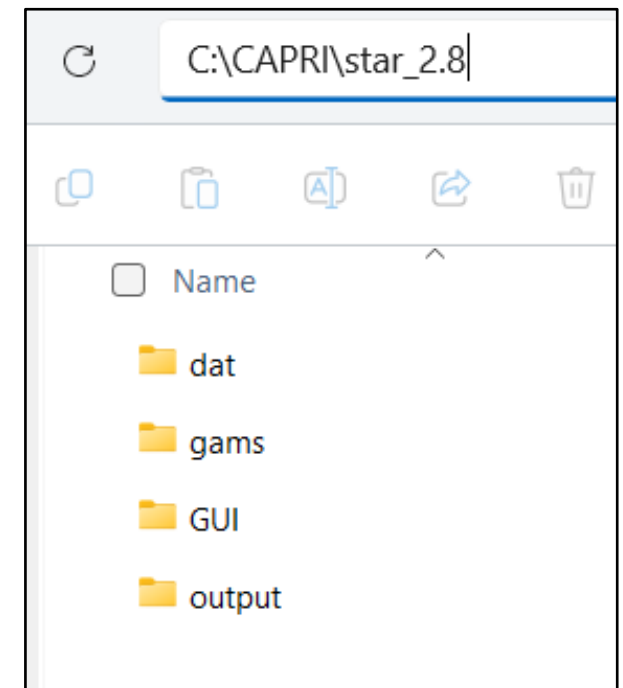
### Download Course Version

- Download Version: [TS2024\\_08\\_11](#)
- Download result data base: [results20240811\\_131647](#)

**1. Introduction to CAPRI and GAMS course – First day: 17 April 2025, 12:00–16:00.**

Time	Format	Trainers	Topic of
------	--------	----------	----------

2) Unzip the model zip file into your CAPRI folder, it should look like this: 



## Step 3: Download the database

*The CAPRI model comes with the raw data in the release version.*

*To create simulations, we need databases (built with GAMS programs from the raw data)*

*We provide a zipped archive of compiled CAPRI-databases and selected simulation results, which should be used in this course.*

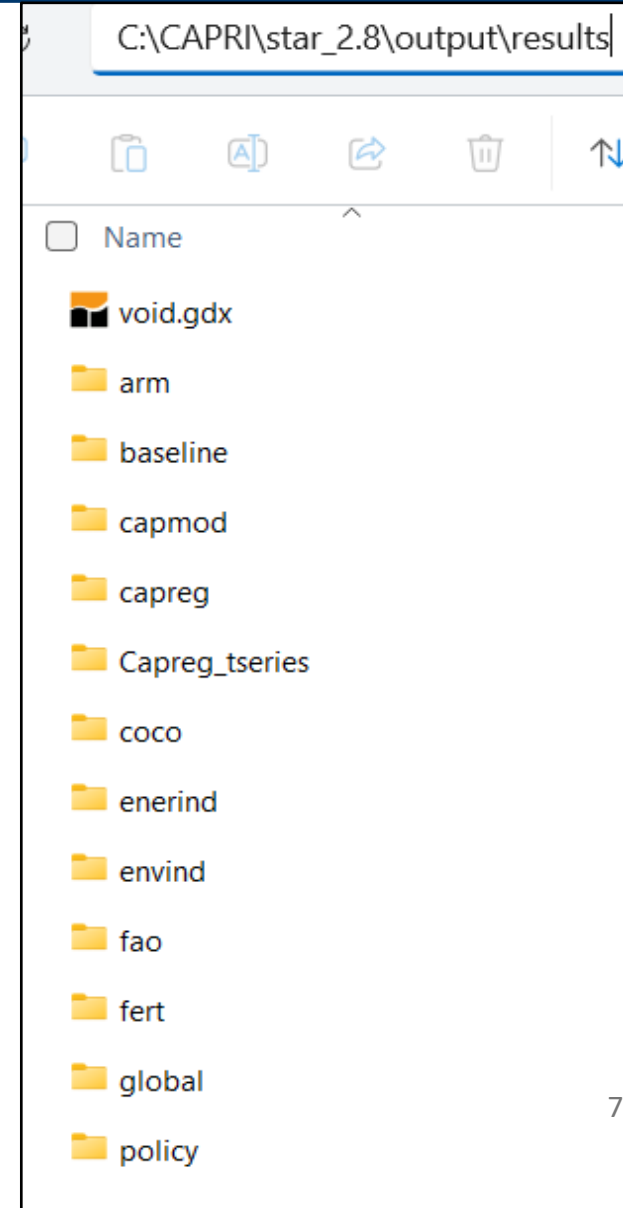
1) Download the CAPRI results database ([link](#))

*\*Could also be found on the [CAPRI Course overview page](#) (see previous slide)*

2) Unzip the files into the **results** folder within the **output** folder in the CAPRI folder you created (e.g. C:\capri\star\_2.8\output\results)

Replace the content of the results folder if there is any

It should look like this:





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## 2. Structure of CAPRI

More information in CAPRI Modelling System Documentation (Britz, 2014):  
<https://www.capri-model.org/lib/exe/fetch.php?media=docs:capri-documentation.pdf>

# Outline: Structure of CAPRI

**A. Technical implementation**

**B. Physical organization of files and folders**

**C. Logical organization of CAPMOD.gms**


**D. Exercises**

**(... and NOT how the economic model is structured in terms of equations and variables)**

- ### CAPRI worksteps
- Installation
  - Build database
  - Generate baseline
  - Run scenario
  - Disaggregate Results
  - Tests and Reporting

- ### CAPRI tasks
- Define scenario
  - Run scenario with market model
  - Run scenario without market model
  - Test alternative market model
  - Run scenario only with market model
  - Disagg\_Scenario

### GGIG



**GAMS Graphical User Interface Generator**  
Wolfgang Britz  
2013  
University Bonn

General settings | Modules and algorithm | Reporting | Debug options

### CAPRI General settings

Scenario description

Dir:    
Files:

Aggregation file:    
Scenario group:

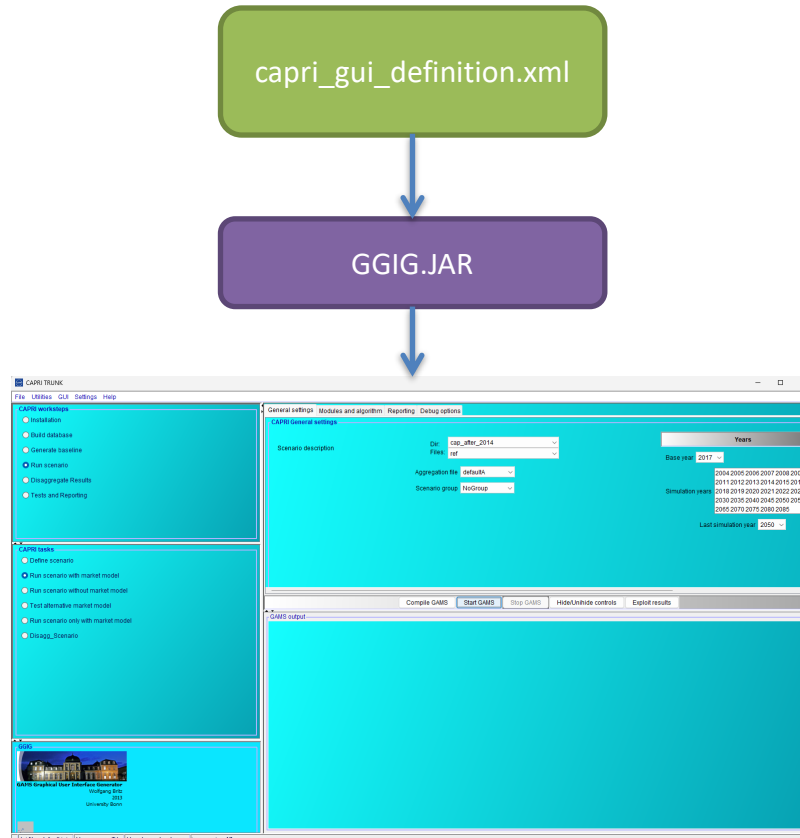
Base year:

Simulation years:

Last simulation year:

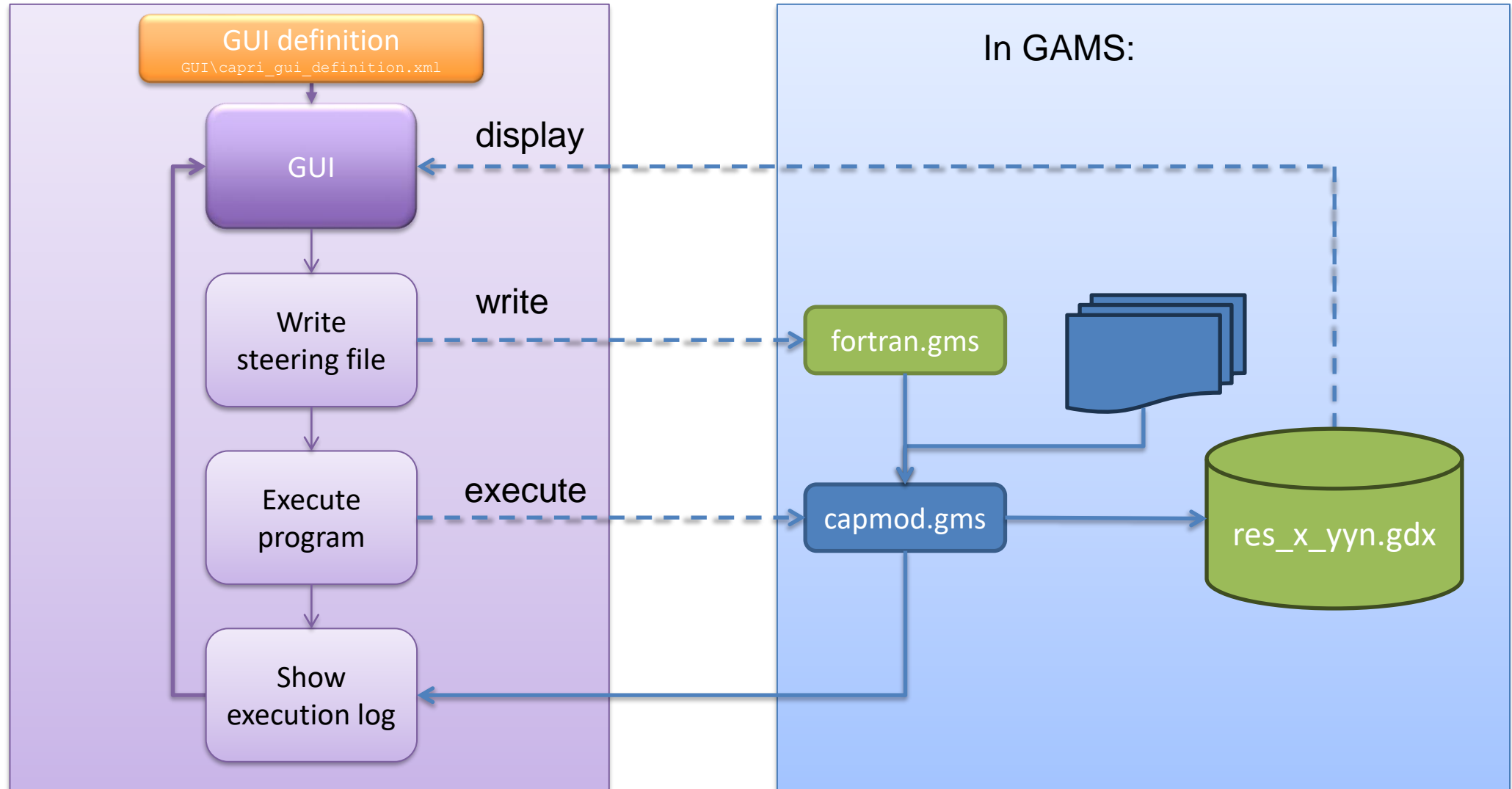
### GAMS output

# Generating a GUI

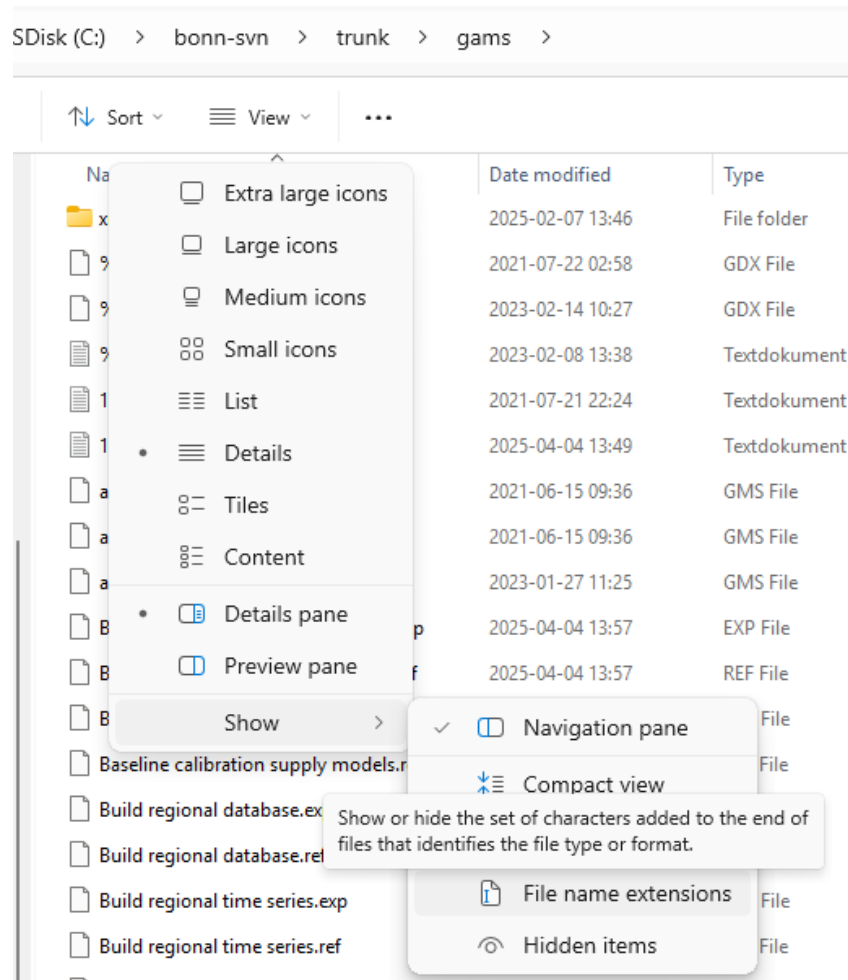


- The GUI is generic
- XML-files define
  - Controls to display
  - Programs to run
  - Reports (views)
- This “is” not CAPRI
- It is difficult to use CAPRI without it!
- The engine under the hood is a set of GAMS programs

# Executing GAMS from the GUI

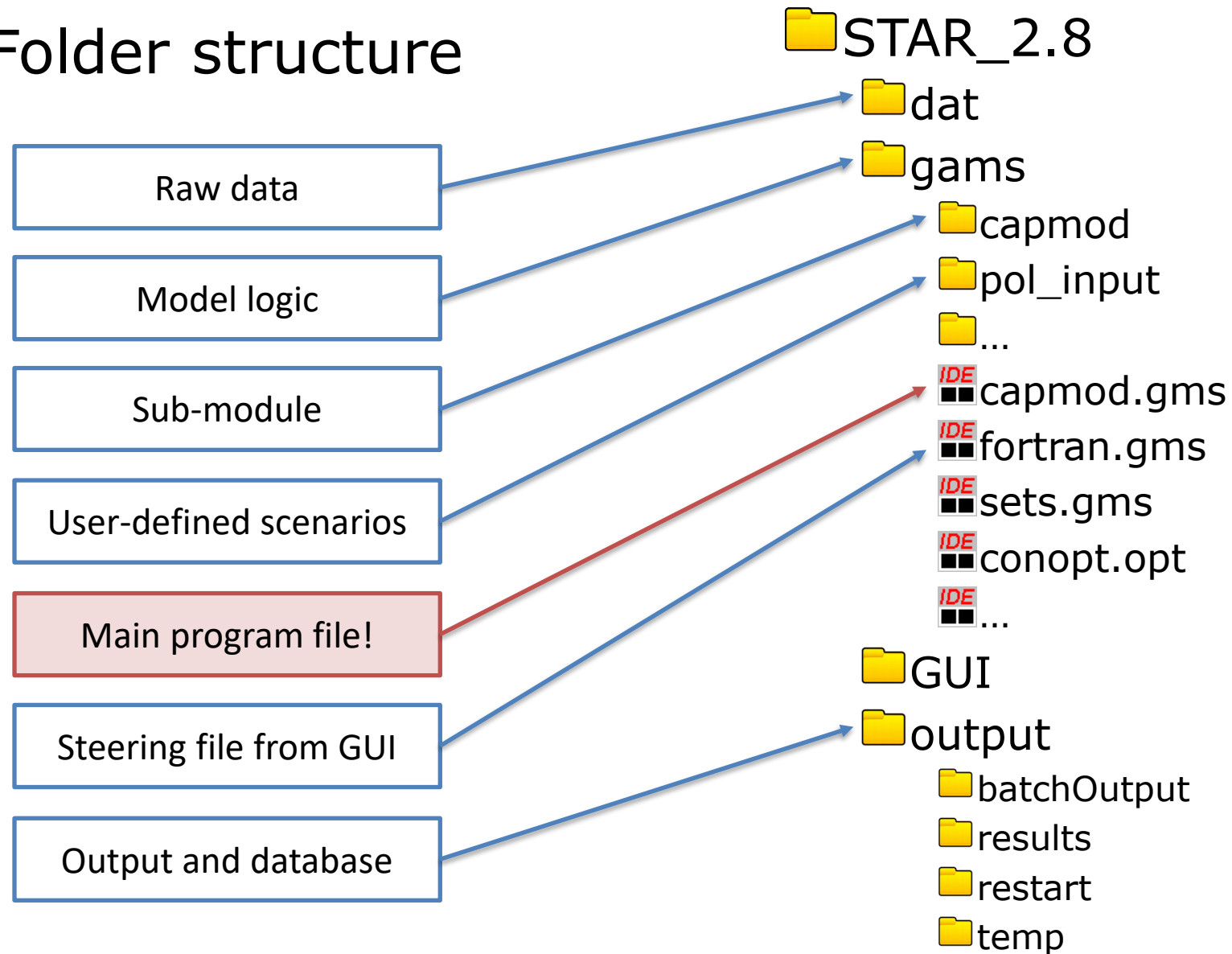


# File types

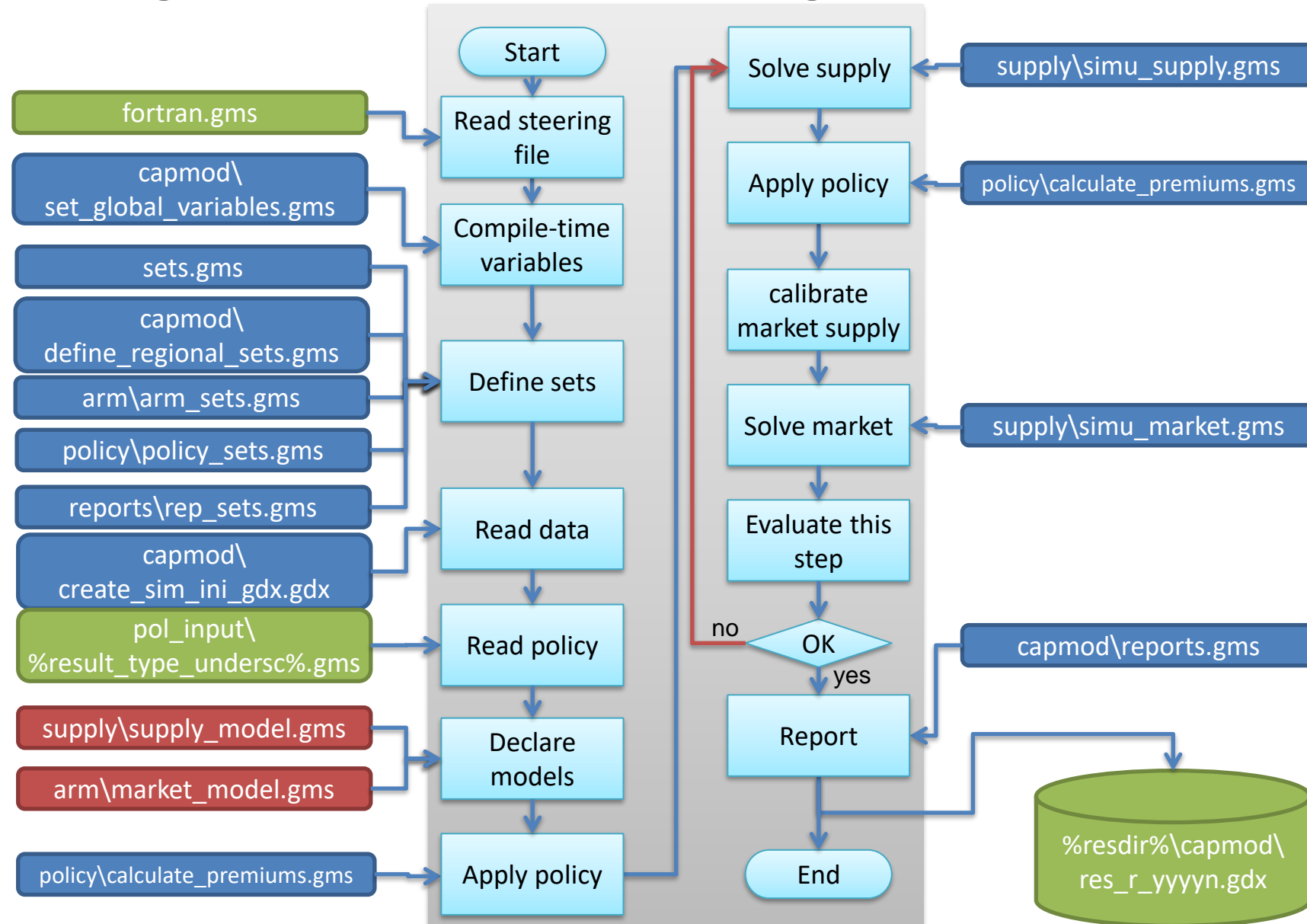


File suffix	Content type
.GMS	Model code in the language GAMS. Plain text file.
.GDY	Gams Data eXchange. Input or output data for GAMS. Binary file.
.LST	Program log from GAMS, containing compilation information and some program output.
.OPT	GAMS file that contains instructions (OPTions) for the model solver(s). Variations op1, op2, ...
.XML	Extended Markup language. Textfiles with instructions for the GUI.
.XLSX	Microsoft Excel files. Some raw data comes in this format.
.PDF	Portable Document Format. Mostly model documentation.
.BAT, .CMD	Windows command files, used to execute pre-defined windows commands
...	GAMS internal .ref, .exp, .lxi, .log, ...

## Folder structure



# Program flow of CAPMOD.gms



# Exercise 1: Open and inspect sets.gms

*sets.gms* contains the definitions of many set elements in CAPRI. It is a good place to look if you wonder what some abbreviation means.

a) Open "*sets.gms*" and find out what the set element "UVAG" means.

\_\_\_\_\_

b) Find at least three *sets* where this element is a member.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



# Exercise 2: Locating and inspecting the iteration loop in capmod.gms

- a) Find the places where the iteration loop starts and ends in **capmod.gms**
  - a) Start line nr: \_\_\_\_\_
  - b) End line nr: \_\_\_\_\_
  
- b) In which line is simu\_supply included?  
Answer: \_\_\_\_\_
  
- c) In which line is simu\_market included?  
Answer: \_\_\_\_\_

# Exercise 3: The GUI definition files

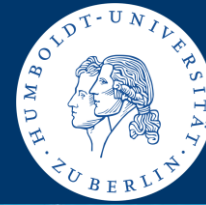
Check what GUI does when running a scenario:

- a) Open "**capri\_gui\_definition.xml**" (use a text editor)
- b) Search for "<name>Run scenario without market"
- c) Also check the value of "<gamsFile>" \_\_\_\_\_
- d) Also check the value of "<incfile>" \_\_\_\_\_
- e) Also check the value of "<resdir>" \_\_\_\_\_
- f) Look a few lines below at "<gdxSymbol>" \_\_\_\_\_





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# 3. CAPRI Graphical User Interface (GUI)

More information in CAPRI Modelling System Documentation (Britz, 2014):

<https://www.capri-model.org/lib/exe/fetch.php?media=docs:capri-documentation.pdf>

## Start the GUI

The GUI is used to run the CAPRI model and define the settings of the model run, with its different tasks. In the GUI, you can also view the results from simulations and databases.

 `start_capri.bat`

File to start the  
CAPRI GUI

Double-click on the “start\_capri.bat” file in the GUI subfolder (e.g., C:\CAPRI\star\_2.8\GUI).

*You can also make a shortcut to start\_capri.bat file on your desktop.*



```
start_capri - Shortcut
C:\CAPRI\GUI>SET PATH=C:\WINDOWS\system32;C:\WINDOWS;C:\WINDOWS\System32\Wbem;C:\WINDOWS\System32\WindowsPowerShell\v1.0\;C:\WINDOWS\System32\OpenSSH\;C:\Program Files\Intel\WiFi\bin\;C:\Program Files\Common Files\Intel\WirelessCommon\;C:\Users\iovl\AppData\Local\Microsoft\WindowsApps;.
C:\CAPRI\GUI>java\bin\java.exe -XX:+UseParallelGC -XX:MaxNewSize=32M -XX:NewSize=32M -Djava.library.path=jars -jar jars\gig.jar default.ini capri_gui_definition.xml
Apr 07, 2025 8:24:15 PM org.icepdf.core.pobjects.Document <clinit>
WARNING: PDF write support was not found on the class path
```

**The JAVA script for the GUI is starting**

The background processes running in CAPRI

When the process is done, the GUI will open

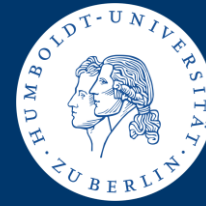
**Do not close this program!**



# CAPRI Graphical User Interface (GUI)



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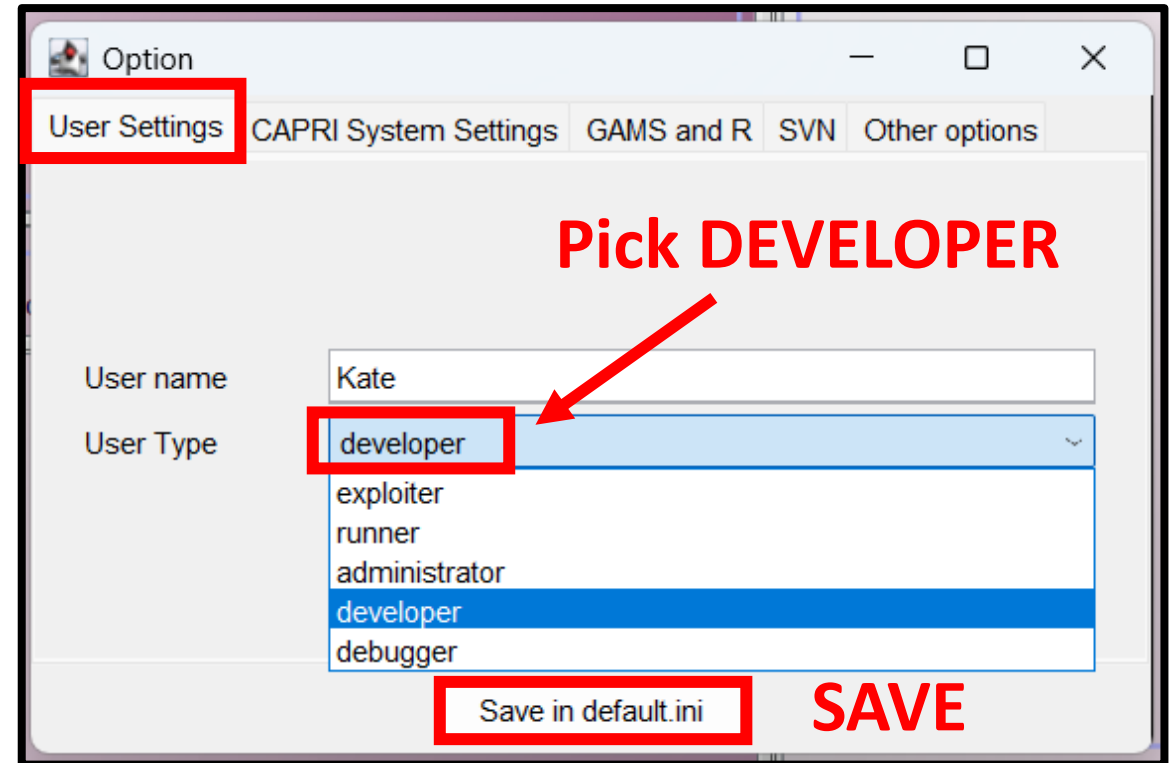
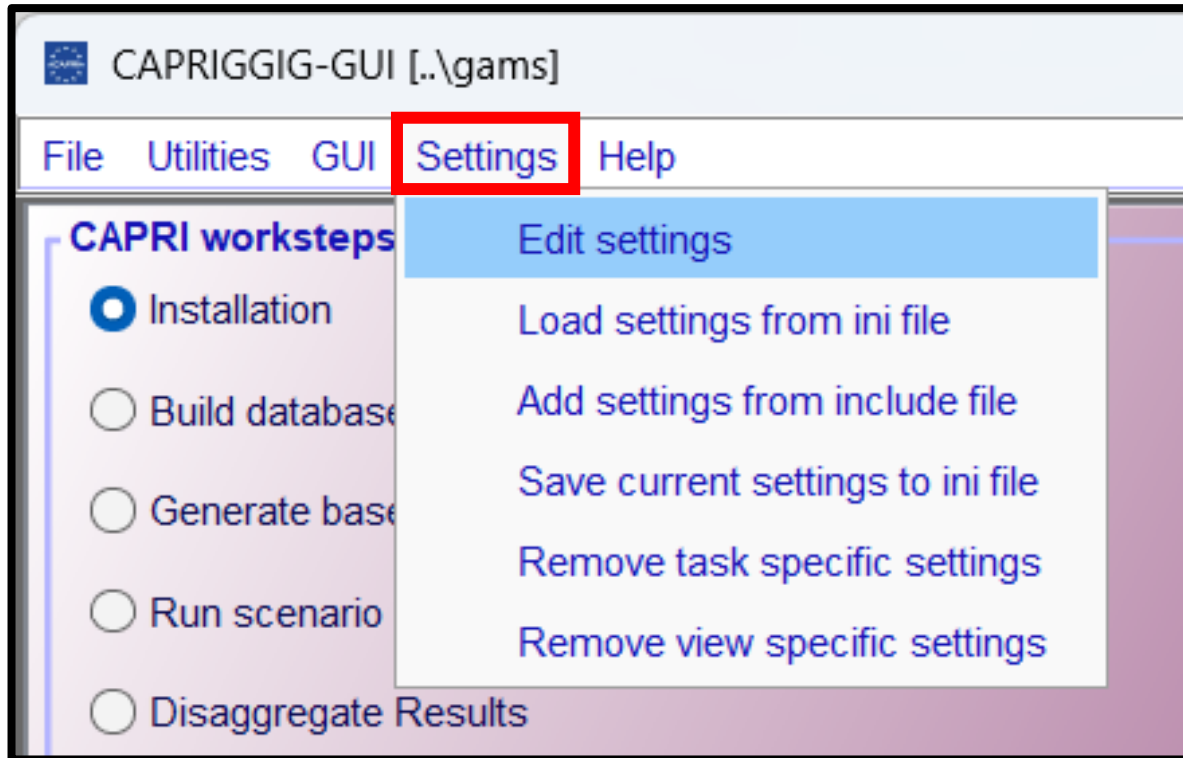
The screenshot displays the CAPRI TS 2024 GUI with the following components:

- Menu Bar:** File, Utilities, GUI, Settings, Help
- Left Panel:**
  - CAPRI worksteps:** Installation, Build database, Generate baseline, Run scenario (selected), Disaggregate Results, Tests and Reporting.
  - CAPRI tasks:** Define scenario, Run scenario with market model (selected), Run scenario without market model, Test alternative market model, Run scenario only with market model, Disagg\_Scenario.
- Main Panel (General settings):**
  - Scenario description:** Dir: .., Files: userScens\Higher\_input\_price\_myproject\_98
  - Aggregation file:** defaultA
  - Scenario group:** NoGroup
  - Years:** Base year: 2017; Simulation years: 2004-2010, 2011-2017, 2018-2025, 2030-2060, 2065-2085; Last simulation year: 2050
  - Regions:** BL000000, DK000000, DE000000, EL000000, ES000000, FR000000, IR000000, IT000000, NL000000, AT000000
  - Countries:** (List of country codes)
  - Regional breakdown:** NUTS2
  - FAOSTAT updated to 2021:**
  - Non-default FAO trade matrix vintage:** (Unselected)
- Buttons:** Compile GAMS, Start GAMS, Stop GAMS, Hide/Unhide controls, Exploit results
- GAMS output:** (Empty text area)
- Footer:** GGIG logo, GAMS Graphical User Interface Generator, Wolfgang Britz, 2013, University Bonn, Institute for Food and Resource Economics
- Status Bar:** Ini file: default.ini, User name: Ekaterina.Iovleva, User type: developer, Ijava version 17

## Adjusting the settings

Settings >>Edit Settings (upper left corner of GUI)

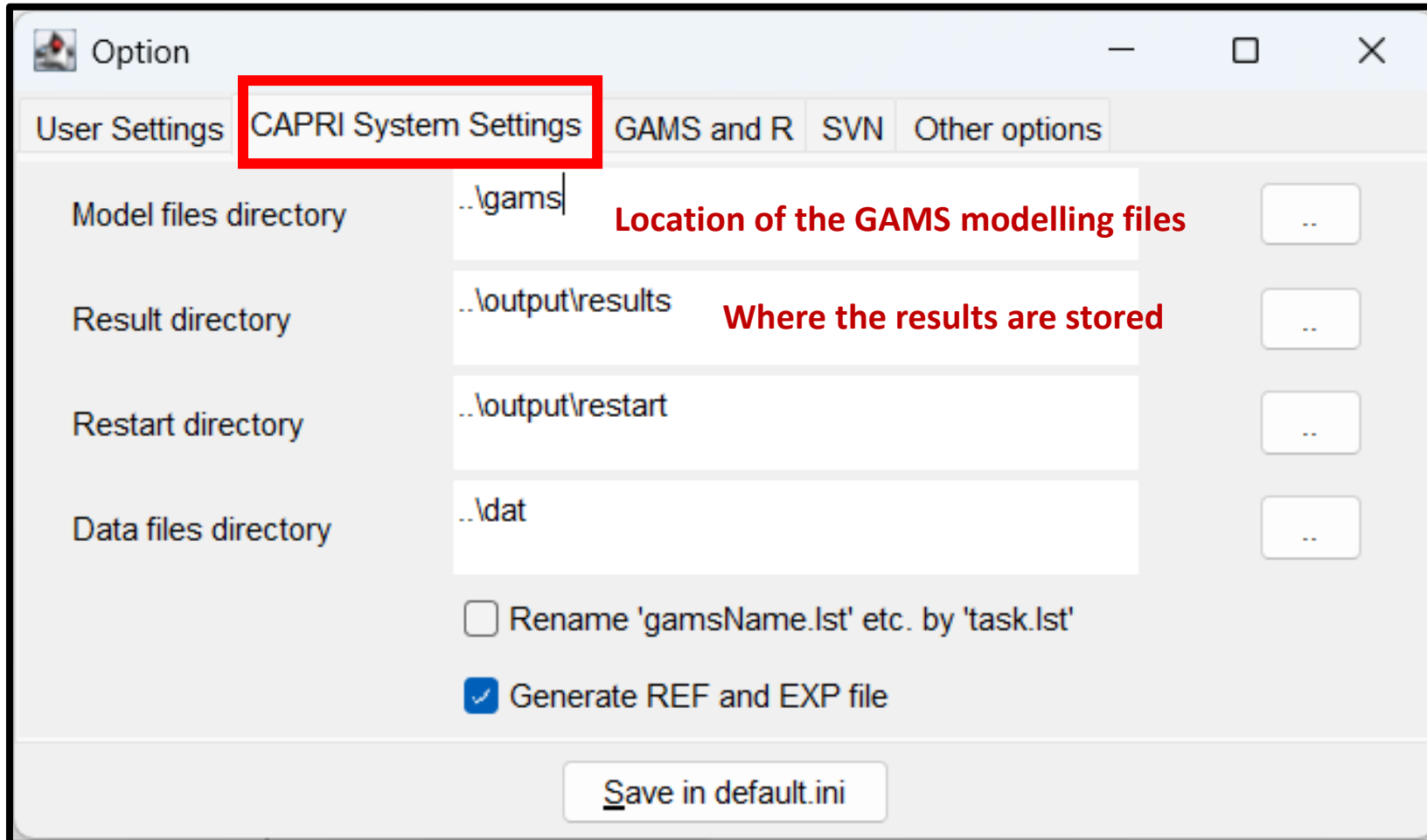
Save your settings when you have finished!



The name you enter will be stored with the result files generated by the model.

The user type determines which choices you can make in the CAPRI work steps and tasks.

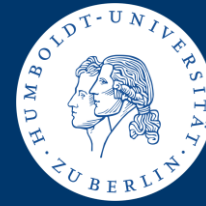
## CAPRI system settings



You can choose where to store results and data, and where the GAMS program files are located.

By default, your results are stored in a subdirectory to your CAPRI directory.

**You do not have to change these settings**



## GAMS and R settings

Option

User Settings CAPRI System Settings **GAMS and R** SVN Other options

path to where you have installed your GAMS program

Path to GAMS.exe ..\GUI\gams\_exe\42\gams.exe

Path to R.exe

Path to Troll.exe

determines where GAMS stores temporary files.  
keep this default setting!

GAMS scratch Directory ..\output\temp

GAMS Options threads 0

Number of processors used in GAMS **Get the number of processors ...** 8

Processor speed relative (100% ~ 2.4 GH Intel core 2) 100

Allow parallel processing of tasks in interactive mode

Save in default.ini

Defines the path for the GAMS program to use with R.

**Not necessary for this course**

You cannot use more processors than determined but might want to decrease the number if you are working with other programs or documents on your computer.

Using all available processors will typically slow down your computer.

## Other options

SVN settings are only needed if you are connected to the SVN repository for CAPRI. See Britz and Witzke (2014)

Option

User Settings CAPRI System Settings GAMS and R **SVN** **Other options**

Path to view definition file (tables.xml) ..

Path to Editor gams\_exe\42\studio\studio.exe ..

Title for interface **CAPRI TS 2024** **title will be shown on the top of the GUI tab**

Language to load from tables.xml English

Output batch statements to include file

Output ini statements to include file

Output set with meta information to include file

Sort code lists in predefined tables

Sort code lists in GDY viewer and equation/var viewer

Clean window with GAMS output with each new GAMS compile/start

Use task specific settings in interface

Debug XML table definition (output to OS prompt)

**SAVE your changes**

**Save in default.ini** = in the GUI directory with the default name



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# Work Steps and Tasks in GUI



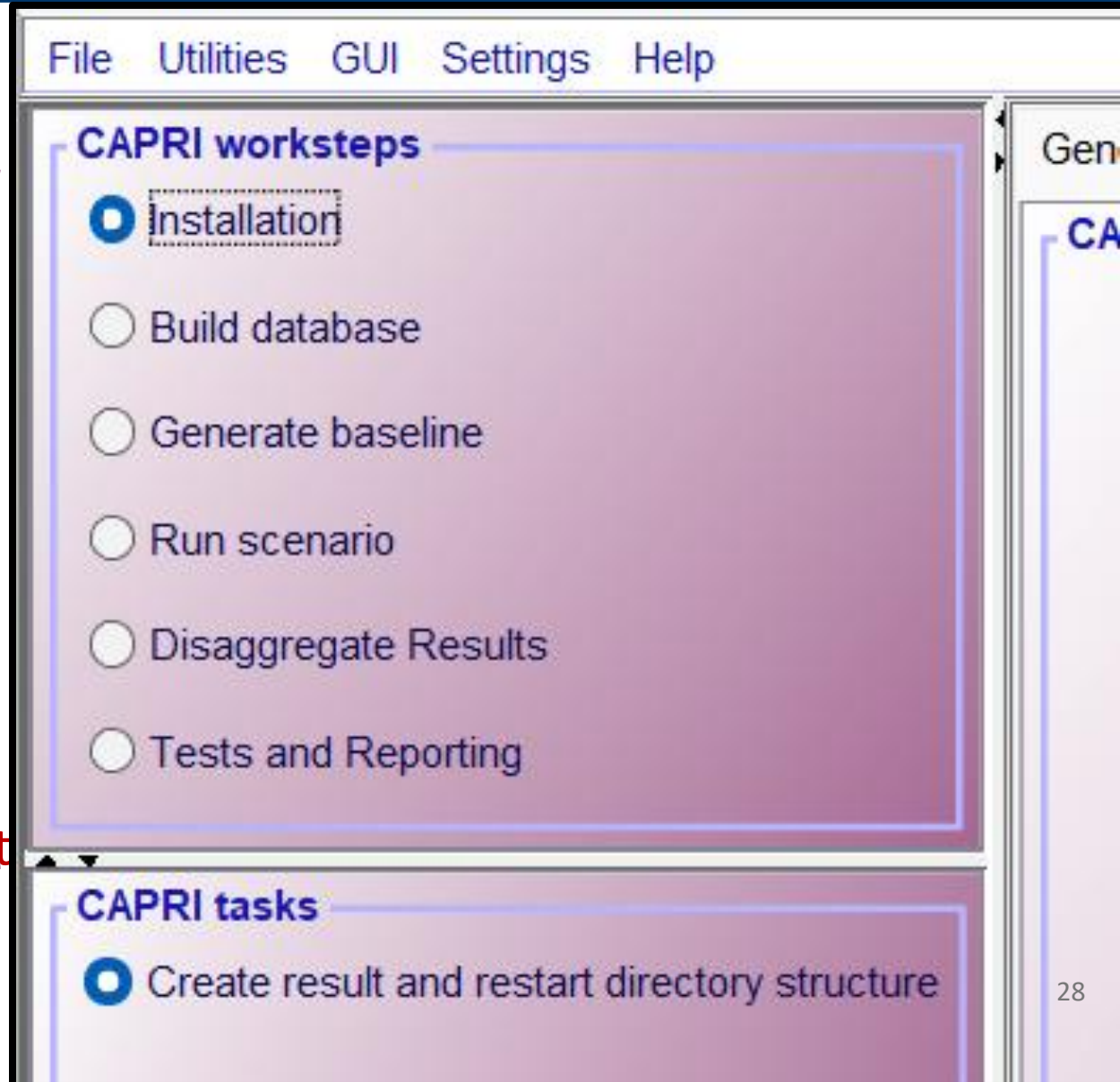
# Tasks in the GUI

- the work steps you will see in the GUI depends on your chosen user type

5 different Work steps,  
each with specific Tasks

(we will only focus on the Run Scenarios step)

- if you have not run Installation, and you start using CAPRI from scratch, you will only see this work step



## 1. Installation work step

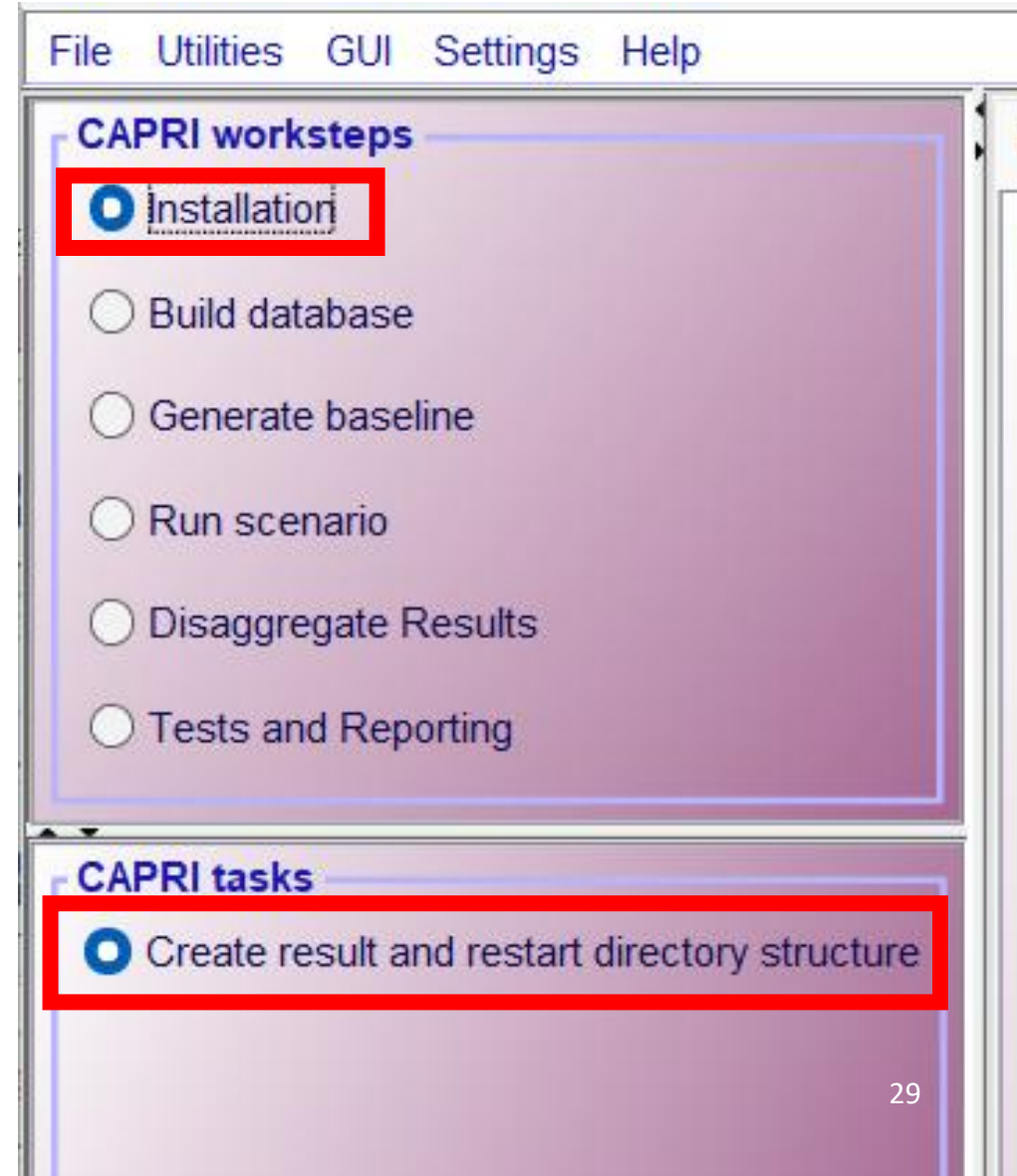
Only one task – **Create result and restart directory structure**

- The task generates the folder structure for your results
- Restart is generated for system testing purposes and is not of interest for this course
- This work step generates the CAPRI database

## 2. Build database work step

Harmonizes the data (on e.g., agricultural land use, production quantities and prices from FAOSTAT, EUROSTAT) to be a complete and consistent dataset

**There is no need to run those two tasks because you already have result files in your CAPRI folder for this course.**

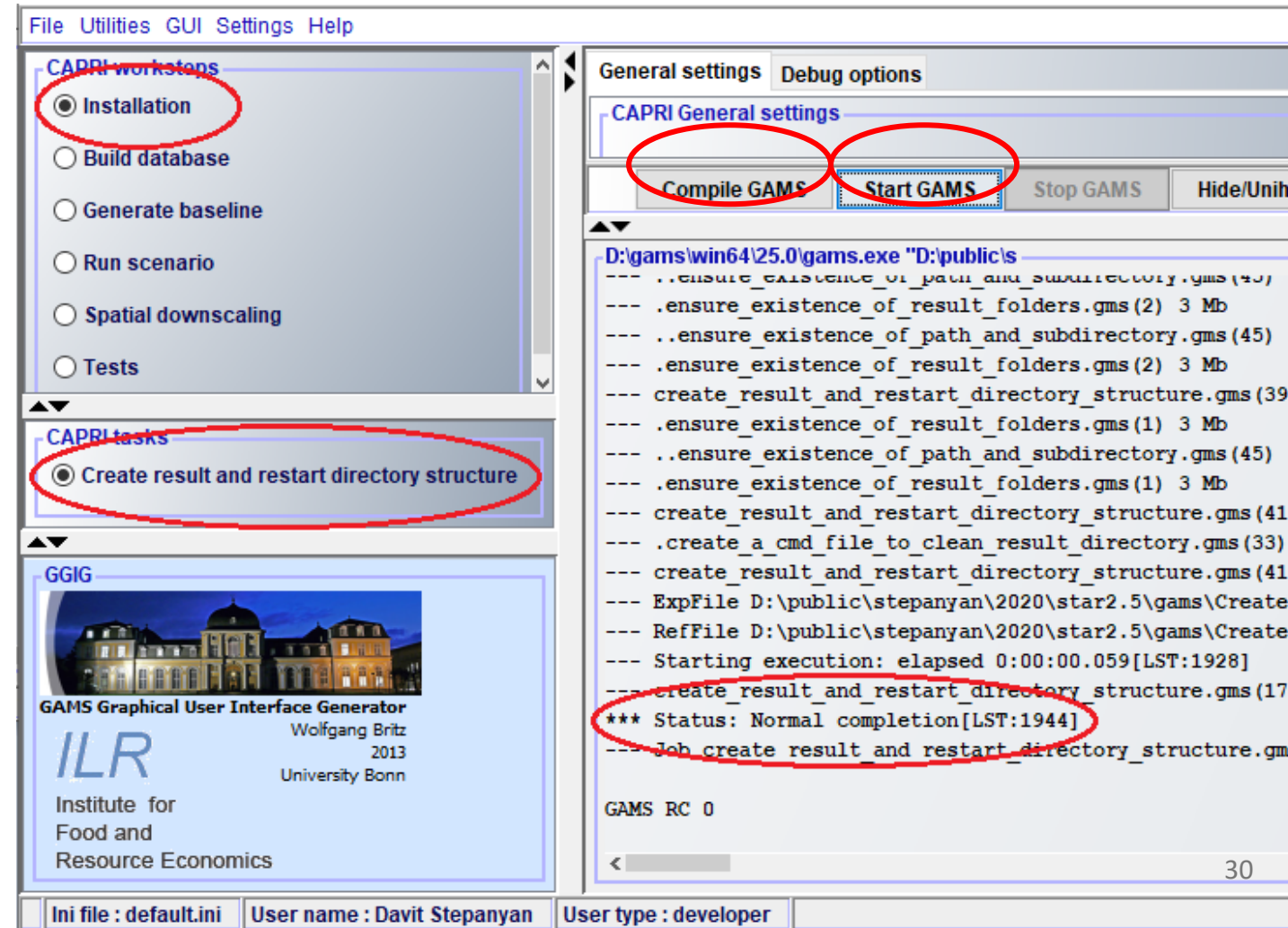


\* But if you want to run CAPRI from scratch here are the steps:

- 1) Select the task “Create result and restart directory structure” and click **Compile GAMS**. (Normally you will get the message “Normal Completion” in the output window)
- 2) Then click **Start GAMS**, and wait for a “Normal Completion” again

## Errors:

- If you can not see other work steps after Installation – restart GUI
- Check again that you have the correct JAVA and GAMS version
- Try to download CAPRI again and redo the installation process
- If it still doesn't work contact the course team.



## 3. Generate Baseline work step

- A baseline projection for the chosen simulation year is generated based on a mix of trends, expert knowledge and automated checks that assures logical consistency. It is updated continuously and serves as the point of reference in our ex-ante analysis.
- You will not need to perform this work step – the baseline files are already included in the CAPRI database

## 4. Run Scenario work step

- In this work step the scenarios are simulated.
- This step is the focus of this course and will be described later

## 5. Tests and Reporting work step

- Here the results of the CAPRI model can be tested with regards to for example stability when using different computers. This is used by developers in a process of improving and identifying development needs of the model.



## Exercise 6: Define a reference scenario, running the supply model

1. Make a copy of *"gams\pol\_input\cap\_after\_2014\ref"* and call it *"my\_supply\_simulation.gms"*.
2. Start the GUI. Go to the workstep *"Run scenario"*, task *"Run scenario without market model"*. Verify that you find your new scenario in the dropdown.
3. Make sure that on "Modules and algorithm" the "non-Default reference scenario for carbon accounting" is selected
4. Select only one country (any), *base year 2017*, *simulation year 2030*, run! (click on Start GAMS)
5. Verify that a new *fortran.gms* was written in the *gams* folder.
  - 4.1 Find your scenario name in that file!
  - 4.2 Find *"\$setglobal countries"* and check that your country appears there
5. Look at the *output\results\capmod* folder to find the *gdx* file.



```
$ ifi %CALC_MTR% = on $batinclude "parameters.def"
$|include definition of regional input data
$ onclude $BASELINE% == on $include "parameters.def"
for current levels for parameters modeling
behavior over iterations
$ --- set start level parameters for current run
* set start level
iterations
$ ifi %BASELINE% == on $include
* set start level
current run
over iterations
```

## 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.

## Aims:

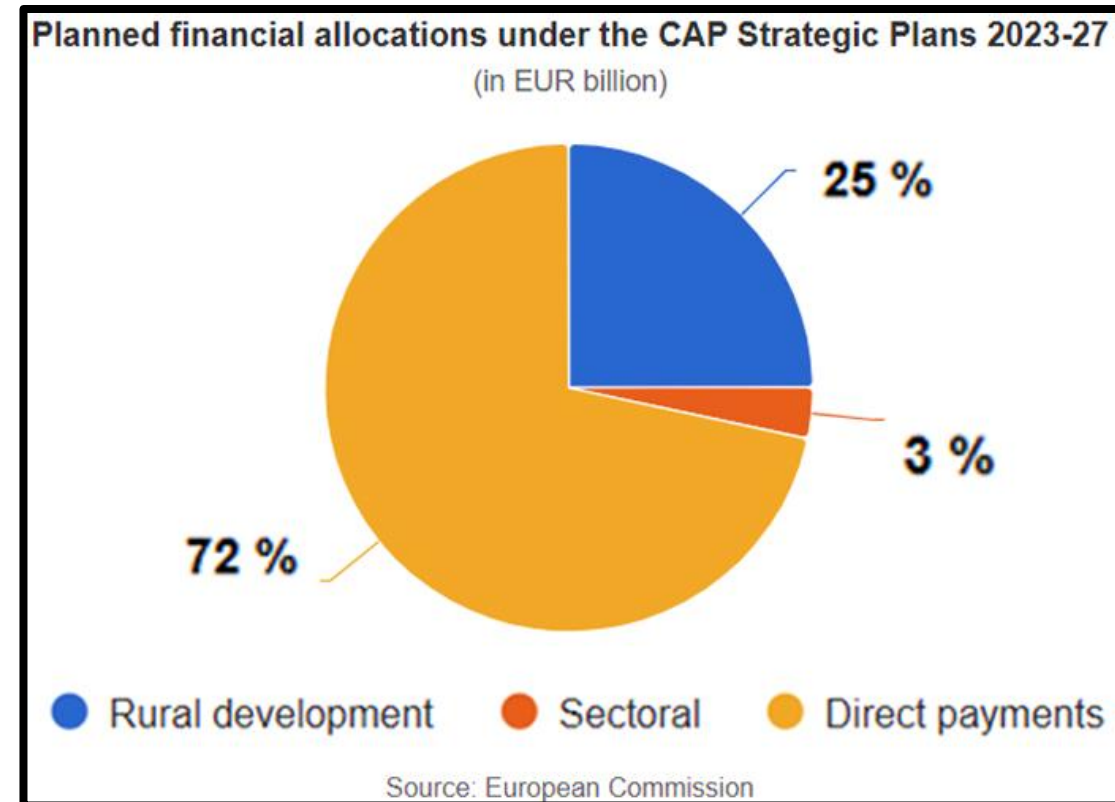
- Support farmers
- Food security
- Environmental protection
- Rural development

## CAP measures:

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

For more information on the CAP read:

Jansson et al. 2021 <https://doi.org/10.1002/aep.13092> ,  
European Commission 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 (2014-2020), which are located in folder “gams\pol\_input\cap\_after\_2014”

### Two scenarios will be selected:

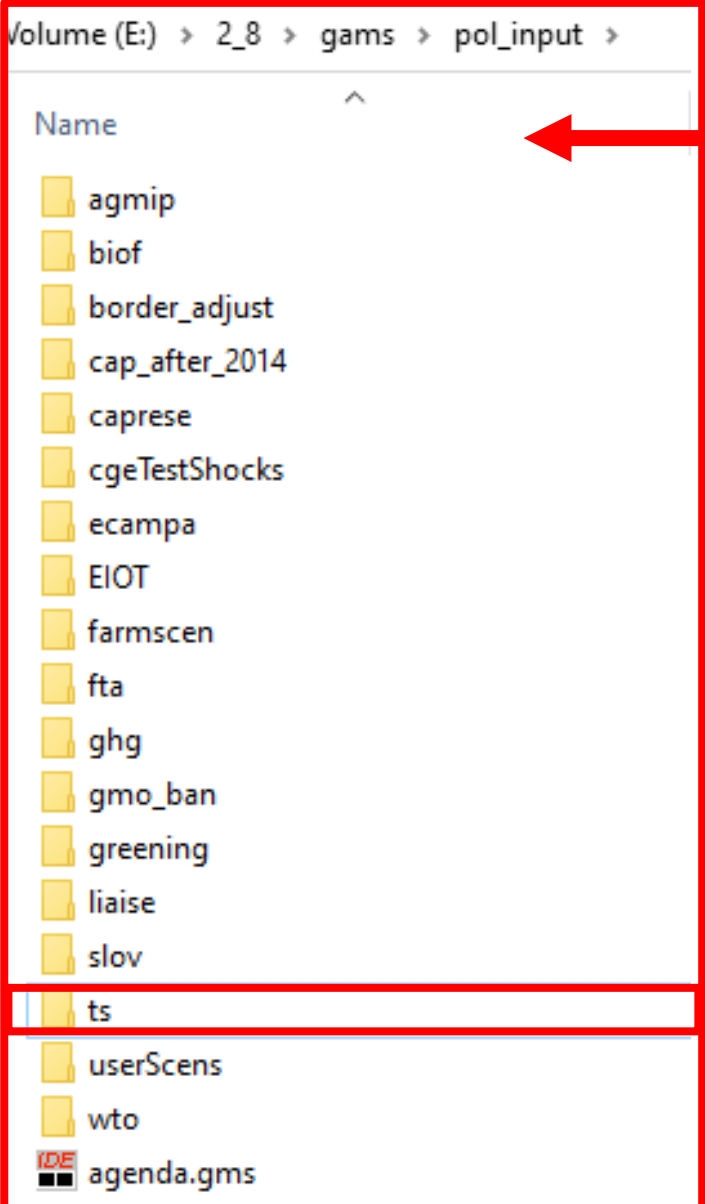
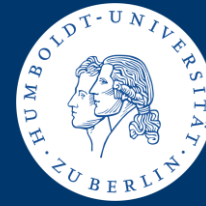
- **Reference scenario (CAPRI Baseline)**: with CAP framework (prevailing in 2014) in file “ref.gms”
- **NoVCS scenario**: same, but a change is introduced in file “without\_voluntary\_coupled\_support.gms”.

*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



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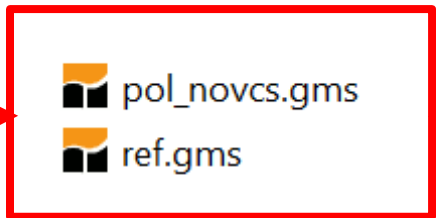
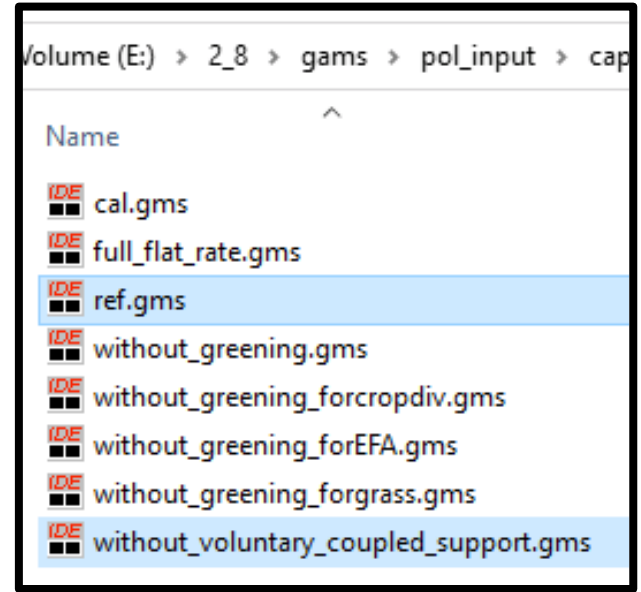


3) To avoid overwriting scenario results, we will work in a new folder where we will locate all scenarios used in this course. For this, you need to create a new folder **“gams\pol\_input\ts”**

4) Then copy the two scenario files

- ref.gms
- without\_voluntary\_coupled\_support.gms

from **“gams\pol\_input\cap\_after\_2014”** to your new folder **“gams\pol\_input\ts”**



5) Finally rename the policy file in your folder: **without\_voluntary\_coupled\_support.gms** >> **pol\_novcs.gms**

## 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



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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 2030
7. Regional breakdown: NUTS2

Important! Keep the same settings for both scenarios!

File Utilities GUI Settings Help

General settings Modules and algorithm Reporting Debug options

CAPRI worksteps

- Installation
- Build database
- Generate baseline
- Run scenario
- Tests and Reporting

CAPRI tasks

- Define scenario
- Run scenario with market model
- Run scenario without market model
- Test alternative market model
- Run scenario only with market model

Scenario description

Dir: ts

Files: ref

Aggregation file: defaultA

Scenario group: NoGroup

Base year: 2017

Simulation years: 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042 2043 2044 2045 2046 2047 2048 2049 2050 2051 2052 2053 2054 2055 2056 2057 2058 2059 2060 2061 2062 2063 2064 2065 2066 2067 2068 2069 2070 2071 2072 2073 2074 2075 2076 2077 2078 2079 2080

Regions

Countries

- BL000000
- DK000000
- DE000000
- EL000000
- ES000000
- FR000000
- IR000000
- IT000000
- NL000000
- AT000000

Regional breakdown: NUTS2

FAOSTAT updated to 2021

Non-default FAO trade matrix vintage

Compile GAMS Start GAMS Stop GAMS Hide/Unhide controls Exploit results

GAMS output

GGIG

GAMS Graphical User Interface Generator

Wolfgang Britz

# 2. Choose scenario settings 2



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File Utilities GUI Settings Help

**CAPRI worksteps**

- Installation
- Build database
- Generate baseline
- Run scenario
- Tests and Reporting

**CAPRI tasks**

- Define scenario
- Run scenario with market model
- Run scenario without market model
- Test alternative market model
- Run scenario only with market model

General settings Modules and algorithm **Reporting** Debug options

**CAPRI Reporting**

- Aggregates for activities and commodities
- Environmental Indicators
- Life-cycle assessment for energy**
- Multi-functionality indicators**
- Iteration tracking
- Sensitivity experiments with features in supply model

**Uncheck these boxes**

**Other settings should be left default**

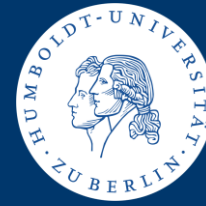
Compile GAMS Start GAMS **Stop GAMS** Hide/Unihide controls Exploit results

**GAMS output**

# Running the simulation



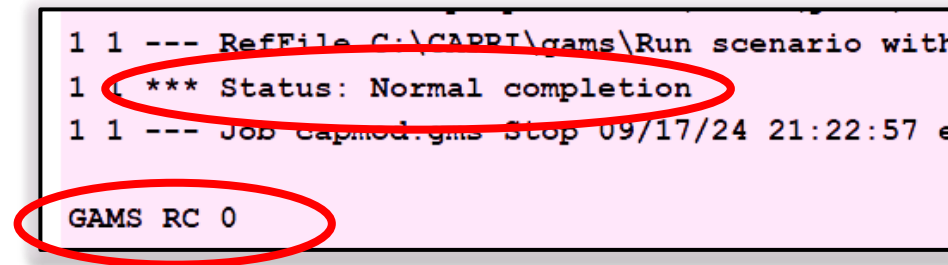
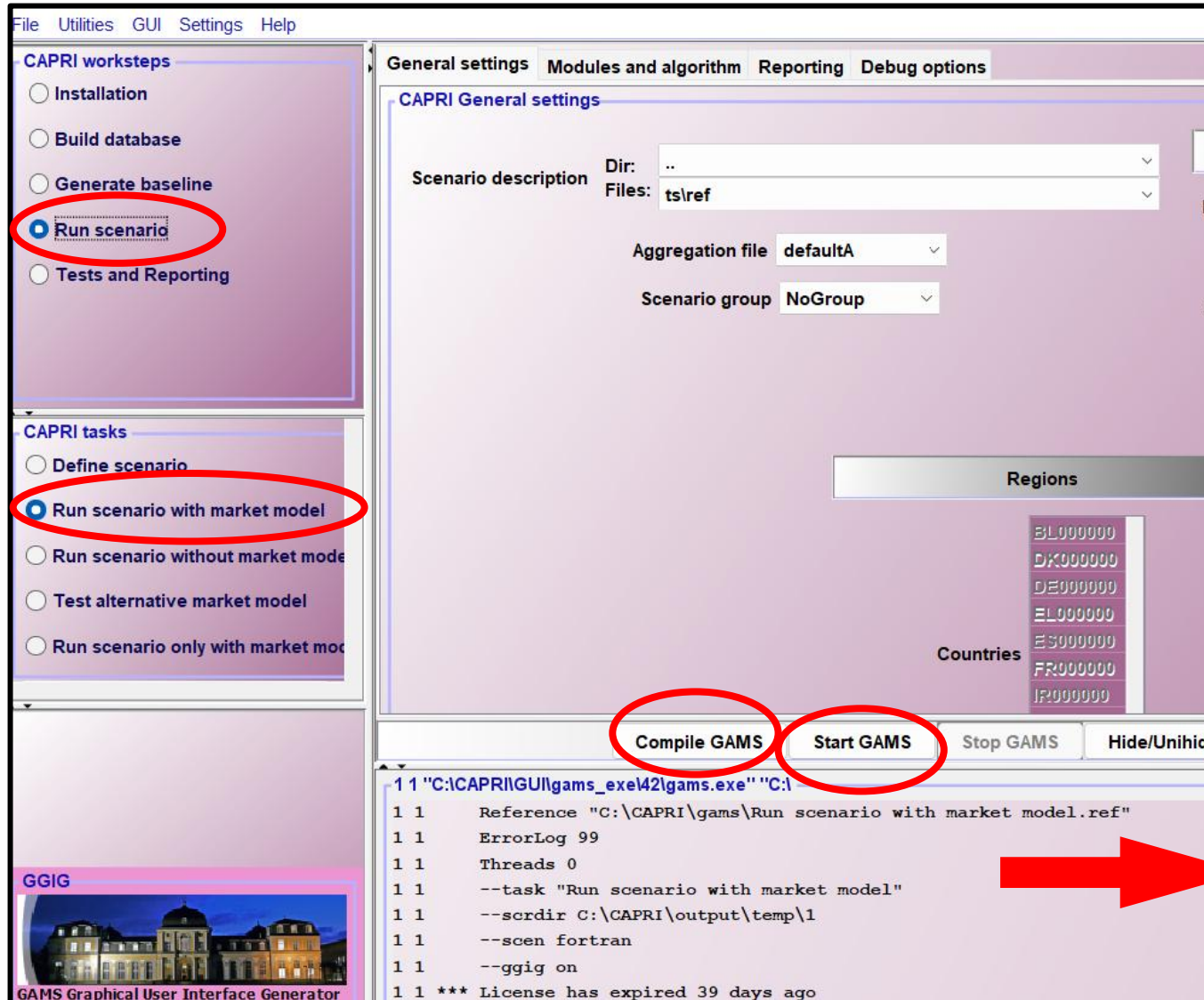
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## 3. Run a policy scenario

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

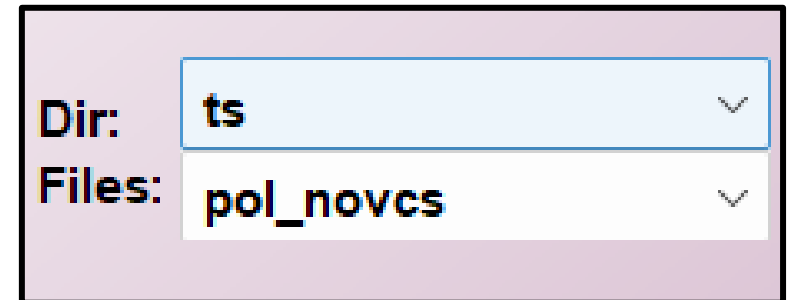
**“Status: Execution error”**

- 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 (**pol\_novcs.gms**) in the same way. You only must change the scenario file.



Dir:    
Files:

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 **pol\_novcs**)
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)

The screenshot shows the GAMS software interface with several key elements highlighted in red:

- Dir:** ts
- Files:** ref
- Default file:** defaultA
- Group:** NoGroup
- Regions list:** SE000000, FI000000, UK000000, CZ000000, HU000000, PL000000, SI000000, SK000000, EE000000, LT000000
- Debug options tab:** Contains 'Additional result type identifier' set to **\_SE**.
- Countries:** A label for the region list.
- Regional breakdown:** NUTS2

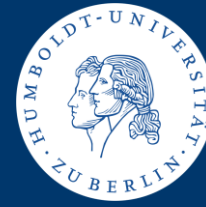
# Recap



THÜNEN



- ✓ You learned how to Set up the CAPRI system on your computer
- ✓ Got familiar with the structure of CAPRI
- ✓ Got familiar with the Graphical User Interface (GUI) and the settings
- ✓ Ran simulations with the provided policy files (for two scenarios)
  - With a market model for NUTS2 region
  - Without a market model for one country (Sweden)
- ✓ Got a successful completion of those simulations



# References

1. Britz, W., & Witzke, H. P. (2014). CAPRI Model Documentation 2014. University of Bonn. <https://www.capri-model.org/lib/exe/fetch.php?media=docs:capri-documentation.pdf>
2. CAPRI Course Overview page. <https://www.capri-model.org/ts/dokuwiki/doku.php?id=start>
3. European Commission. *Common Agricultural Policy (CAP) overview*. [https://agriculture.ec.europa.eu/common-agricultural-policy/cap-overview\\_en](https://agriculture.ec.europa.eu/common-agricultural-policy/cap-overview_en)
4. Jansson, T., Nordin, I., Wilhelmsson, F., Witzke, P., Manevska-Tasevska, G., & Weiss, F. (2021). *Coupled agricultural subsidies in the EU undermine climate efforts*. *Applied Economic Perspectives and Policy*, 43(4), 1503–1519. <https://doi.org/10.1002/aapp.13092>