The Graphical User Interface for CAPRI version 2013

Wolfgang Britz
Institute for Food and Resource Economics
Chair of Economic and Agricultural Policy
University of Bonn

Bonn, February 2013

Acknowledgments

Many people have over the years contributed to the development, maintenance and application of the CAPRI modelling system. After more than ten years since a first prototype was constructed, it is almost impossible to list them all and name their specific contributions. The author opted for this rather technical paper to refrain from citing the different (working) papers which shed more light on methodological questions, but rather refers in general to the CAPRI documentation.

Nevertheless, it is only fair to mention Hans-Josef Greuel and Andrea Zintl, who both long before CAPRI was born have already developed software concepts and code which underlined to a large extent until 2006 the DBMS of CAPRI, and in parts, its Graphical User Interface. Finally, Alexander Gocht contributed over the last years to the Java code underlying the GUI. Eriona Dashja, a student assistance, checked in 2011 the user manual against the actual interface, changed the text where necessary and corrected typos. The work described in here would have been impossible without the funds by different donors, mainly the EU Commission, with regards to changes in 2009 until 2013 especially under the FP 7 project CAPRI-RD

All errors in text and code remain with the author.

The author

Dr. Wolfgang Britz is a senior researcher and lecturer with the Institute for Food and Resource Economics at the University of Bonn, and has co-ordinated since several years the activities based on the CAPRI modelling system. His responsibilities further on include the methodological concept of CAPRI and, to a larger extent, its software implementation.

Contact:

Dr. Wolfgang Britz
Institute for Food and Resource Economics, University Bonn
Nussallee 21
D-53115 Bonn

Tel.: ++49-(0)-228-732502

Wolfgang.Britz@ilr.uni-bonn.de

Content

Background 9

Initialization........ 10

Logging in 10

Choosing a initialization file 10

Linking the GUI to the local CAPRI installation 11

GAMS settings 11

SVN settings........ 12

Case one: Exploiter and runner 13

Usage for installation purposes 16

Getting help 18

Basic layout of the GUI........ 19

The different work steps........ 21

Build database 21

The work step “Generate baseline” 24

The task run scenario........ 26

Define scenario task 26

Run scenario tasks........ 27

Exploiting results........ 31

The task: Collect meta information 32

Interaction with GAMS 34

Utilities........ 35

Batch execution 36

Generate GAMS documentation 38

Exploitation of gdx-files........ 40

An example: loading data from the spatial downscaling 41
Generating co-ordinate files for the exploitations tools from shapefiles 44
Editing the table definitions underlying the exploitation tools 45
Views as the basic concept for exploitation in CAPRI 45
Why a XML definition files for views? 46
Defining and changing the view definition via the GUI interface 47
Defining a table 48
Defining the list of activities, products, regions or dim5s 49
Exploitation tools 50
The structure of the GAMS generated gdx files 50
Loading the data from gdx files 50
Multi-dimensional viewer with pivoting and exporting possibilities 51
Pre-defined views 51
View selection 51
Navigating in the outer dimensions of the viewport 52
Column and row selection 52
Predefined selection groups 54
Selection of the view type 54
Manually changing the pivot 54
Changing view options 55
Showing a histogram window 57
Working with tables 59
The toolbar 59
Tooltips for column and row headers 59
Drill-down 59
Clipboard export 60

Export to file 60

Sorting 60

Numerical filtering based on cell content 60

Changing the row height and column width with the mouse 61

Adding statistics 61

Outlier detection algorithms implemented 64

Working with graphics 66

General handling of graphs 66

“Walking” through the data 68

Exporting the graphic to file 69

Exporting the graphic to clipboard 69

Bar charts 69

Line and point charts 71

Pie charts 72

Spider plots 73

Box and Whisker charts 74

Histograms 75

Markov charts 76

Flow maps 77

Pie chart maps 79

Colored thematic maps 79

Changing the classification and the legend 80

Adding a histogram window to a map 81

Shrinking polygons according to UAA share 82

Area weighted classification 83

Excluding zeros from classification and removing small and large values 83

Classification method 83

Integration distribution information in the map window 86

Color table 86

Changing the way the legend is drawn 90

Copying the map to the clipboard or saving to disk 92

Changing the title of the map 93

Zooming in and out and navigating in the map 93

Getting data for specific polygons 94

Highlighting specific regions in the map 95

Updating the map 99

Adding region label to the map 99

Showing river and cities 100

Storing and re-loading your settings 101

Exporting the data underlying the map 102

What are the HSMUs and what information is available? 114

How to visualize the HSMU information 114

Loading data based on the GUI presets 114

Working with several views 118

Examples 120

Drawing a map showing the nitrate surplus for EU27 at regional level in the base year 120

Drawing a map of the High Nature Value Farmland indicator for Belgium & Luxembourg for the base year 122

Drawing a map showing changes between the base year and the ex-ante results from the baseline. 126

Drawing a map with the base year results next to one showing changes from the base year to the baseline results 129

The software behind the mapping viewer and the CAPRI exploitation tools 132

CAPRI tasks as business model 133

Execution of tasks via a GamsStarter and GamsThread 133
Refactoring the mapping part 134
Views as the basic concept 135
Data model 136
Client based solution 137
The geometry model 137
The structure of the XML definition files for the views 139
General comments 139
Necessary tags for tables 139
Defining the items of the table 140
Additional tags 141
<defpivot> 141
<defview> 142
<COO> 142
Alternative texts for the dimensions 142
Filters for the elements in the different dimensions 143
Attaching long texts and filters to elements 143
Index 145

Background

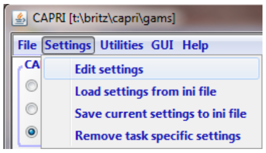
The use of the CAPRI modelling system is increasing, and the user group becomes more diversified. Whereas in the first years, almost all users had directly contributed to model development and were familiar with the underlying GAMS code, more and more users now get to know about the system during training sessions, and have only a limited knowledge of GAMS and the CAPRI GAMS code. Already a few years back, a Graphical User Interface (GUI) was developed in order to supports users to apply CAPRI for simulations and exploit results. For reasons laid down further in a short chapter, this GUI needs was now revised in major parts. The paper both explains the usage of the new GUI as well the underlying software concept. It is structured as follows. The first chapter gives a short overview over the different work steps necessary to finally allow simulations with CAPRI.

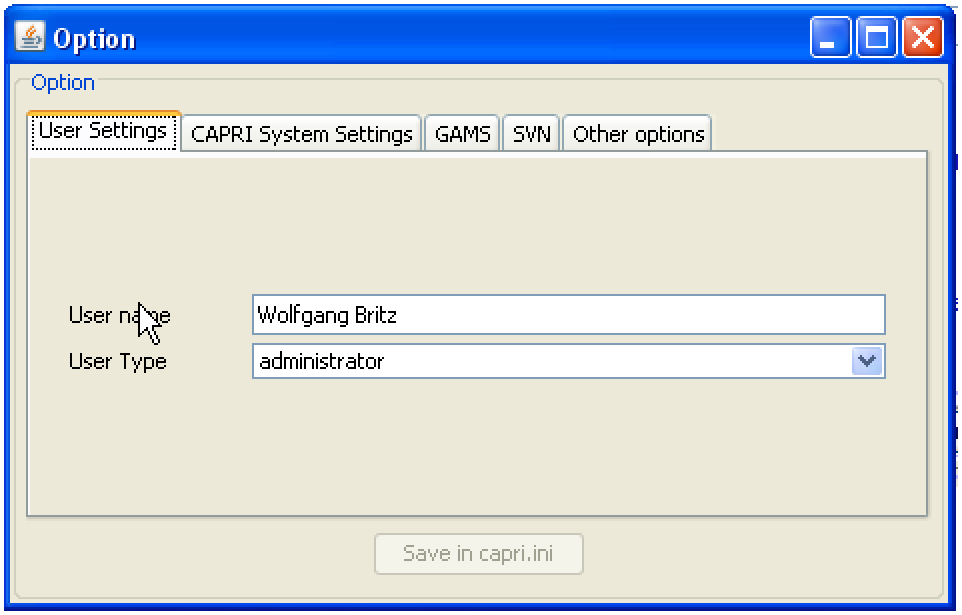
The new GUI is as the old one realized in Java. However, it builds now a toolkit developed by Wolfgang Britz called GGIG (GAMS Graphical Interface Generator, http://www.ilr.uni-bonn.de/agpo/staff/britz/ggig_e.htm) which allows designing the GUI via a XML file rather than by direct Java programming. That might mean that developers will add, change or remove controls from the interface more frequently than in the past. The GUI user guide will therefore possibly not document all detailed settings, especially quite specialized settings for debugging purposes. It is generally documented to use the defaults for any non-documented features.

Initialization

Logging in

The first step when the CAPRI GUI is opened for the first time is to set the user name and level. This is done by selecting the “settings” menu from the menu bar. As long as no user name is entered, the user cannot change its type and will only have exploitation rights. The user type “runner” has additionally the right to run scenarios. A user of type “administrator” can perform all operations, including generation of a new data base and calibration of the modelling system. In order to access the user settings, choose from the menu bar.

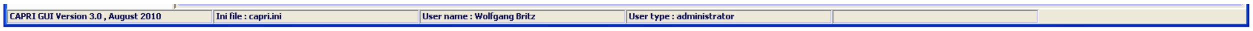

CAPRI [t:\britz\capri\gams]
File
Settings
Utilities
GUI
Help
CA
Edit settings
Load settings from ini file
Save current settings to ini file
Remove task specific settings



User name: Wolfgang Britz

User Type: administrator

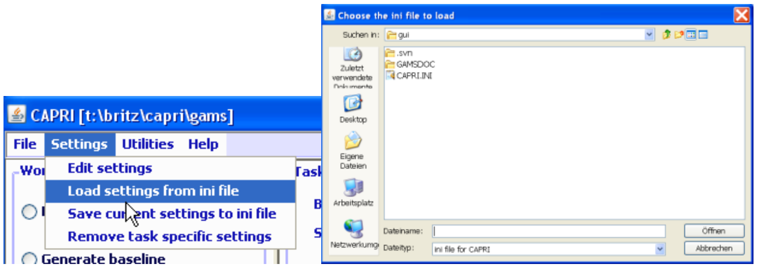
The user and user types can also be seen in the bottom panel of the GUI:



CAPRI GUI Version 3.0 , August 2010 | Ini file : capri.ini | User name : Wolfgang Britz | User type : administrator

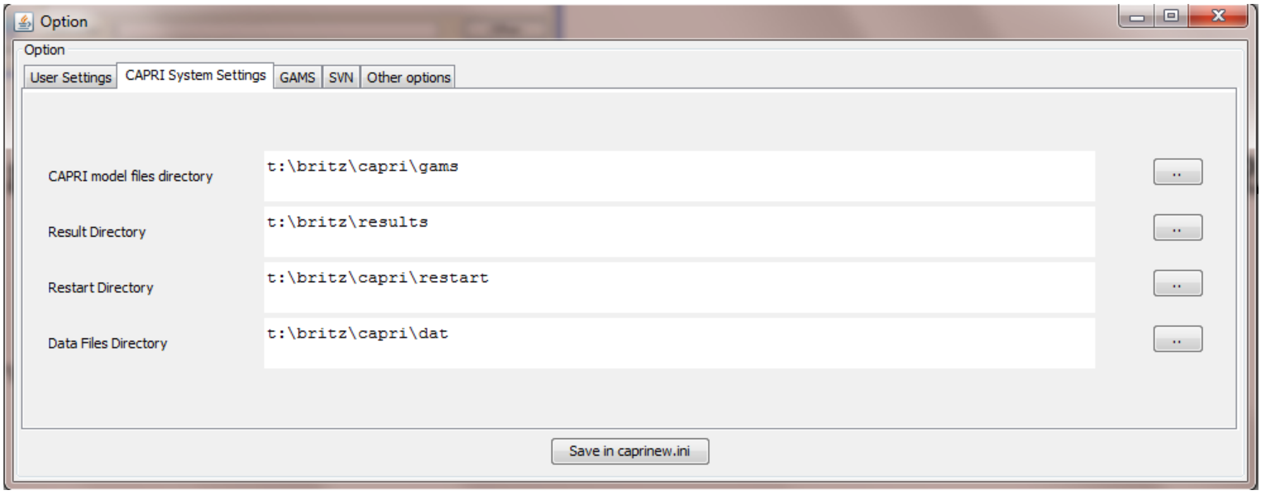
Choosing a initialization file

Some users require several CAPRI versions installed in parallel. In order to ease the task, the user can call the GUI with a specific ini-file by defining the ini-file in the batch command file calling the GUI. Alternatively, the ini file can be changed via the options menu. Each ini-file may then point to different directories, according to the settings discussed in the following.



Linking the GUI to the local CAPRI installation

Next, the GUI needs to know where your CAPRI system is installed.



CAPRI model files directory: t:\britz\capri\gams

Result Directory: t:\britz\results

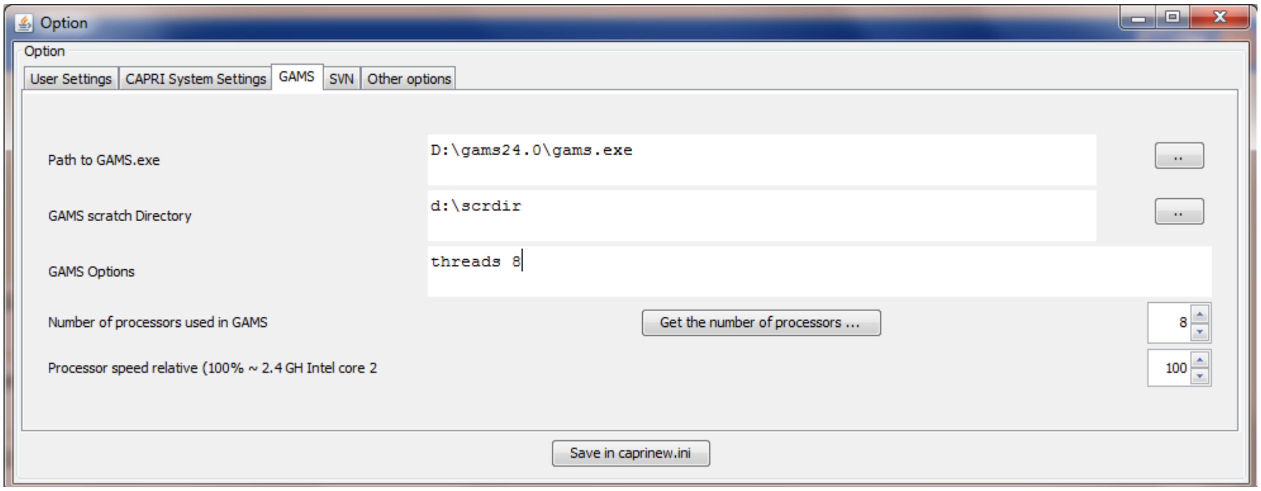
Restart Directory: t:\britz\capri\restart

Data Files Directory: t:\britz\capri\dat

The “CAPRI model files directory” points to the location of the GAMS sources for CAPRI whereas the “Result directory” points to the location where results from CAPRI tasks will be read from and written from; and accordingly for “Restart” and “Data Files” directories. Changing these settings allows switching between different installations for advanced users, e.g. when different branches from the CAPRI software versioning system are installed.

GAMS settings

In order to generate results, a GAMS installation and license are required. The relevant settings are found on the “GAMS” tab:



Path to GAMS.exe: D:\gams24.0\gams.exe

GAMS scratch Directory: d:\scrdir

GAMS Options: threads 8

Number of processors used in GAMS: 8

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

The "Path to Gams.exe" points to the actual GAMS engine to use. Currently, versions 22.8 and higher are supported. It is recommended to use GAMS 23.3 and above to benefit from calling CONOPT in memory. The button "get the number of processors …" will retrieve the number of available processors in the computer.

The "Scratch Directory" will be passed to GAMS and determines where GAMS stores temporary files. A directory on a local disk (not one on a file server) should be chosen.

The "GAMS options" field allows the user to send its own settings to GAMS, e.g. as shown above, the page width used in GAMS listings and the number of maximal process dirs generates by GAMs.

The number of processors used in GAMS will determine how many parallel GAMS processes will be started with threads are in use. The relative processor speed is used in the pre-steps of the market model to determine from the solution time of the sub-model when the next more complex sub-model or the full model will be solved. Going above 100% might speed up solving the market model.

SVN settings

CAPRI is hosted on the SVN software versioning system (see e.g. http://en.wikipedia.org/wiki/Apache_Subversion) which ensures that CAPRI users and developers can operate smoothly in a distributed network. For developers who need to upload changes made to CAPRI code to the server (a process called "commit"), TortoiseSVN (http://tortoisesvn.tigris.org/) is the recommended tool. TortoiseSVN is integrated nicely into windows, but it might take a while until the logic behind the SVN operations is fully understood by a novice user.

For users which do not contribute to the code basis of CAPRI or use TortoiseSVN in other contexts, installing and learning to master TortoiseSVN as an additional tool is an unnecessary burden. Therefore, the client based SVN basic operations which allow a user to keep its local copy synchronized with the server are now embedded in the java code of the GUI. For those who only need read-only access to the CAPRI server repository, an installation of TortoiseSVN is no longer necessary.

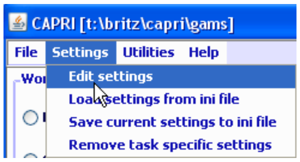
The changes necessary in the GUI can be summarized as follows. Firstly, new SVN related entries in the initialisation file can be edited by the user. And secondly, a new dialogue allows starting an update. The following sections give a quick overview over the new functionalities.

Case one: Exploiter and runner

Entering the necessary information to link to the SVN server

An exploiter by definition only accesses GDX files from the result directory. He is not allowed to run GAMS programs, and thus does not need access to the GAMS source code, data and restart files read in by the different GAMS based working steps of CAPRI.

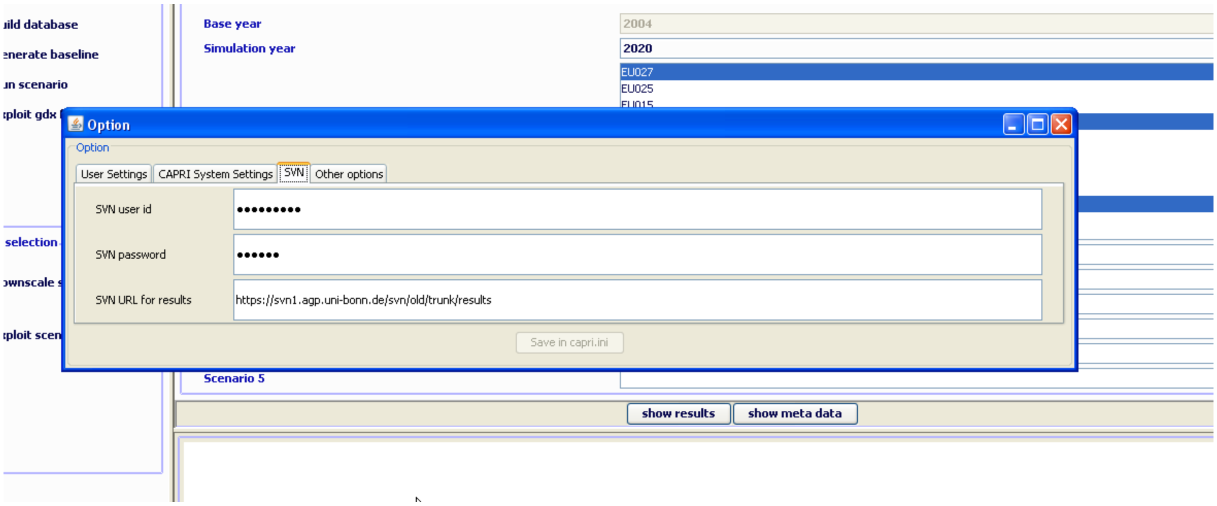
Accordingly, in order to work with SVN, only three pieces of information have to be entered under “Settings / Edit Settings” in the SVN tab:


CAPRI [t:\britz\capri\gams]
File
Settings
Utilities
Help
Edit settings
Load settings from ini file
Save current settings to ini file
Remove task specific settings

- The SVN user id
- The SVN password
- The url of the result directory

The first two fields are not visible, and the related entries in the ini file are encrypted. The last entry can be set to a specific branch relating e.g. to a training session. That allows for CAPRI “mini installations”. These mini installations do not need to be distributed as SVN installations as the SVN interface in the GUI will also allow to “checkout” over existing sub-directories and files. That ensures some additional safety regarding access information to sensible branches of the server – a bystander cannot read the user id and password. But users should always place local copies of such branches including the directory from which the GUI is started on secured parts of their file system.

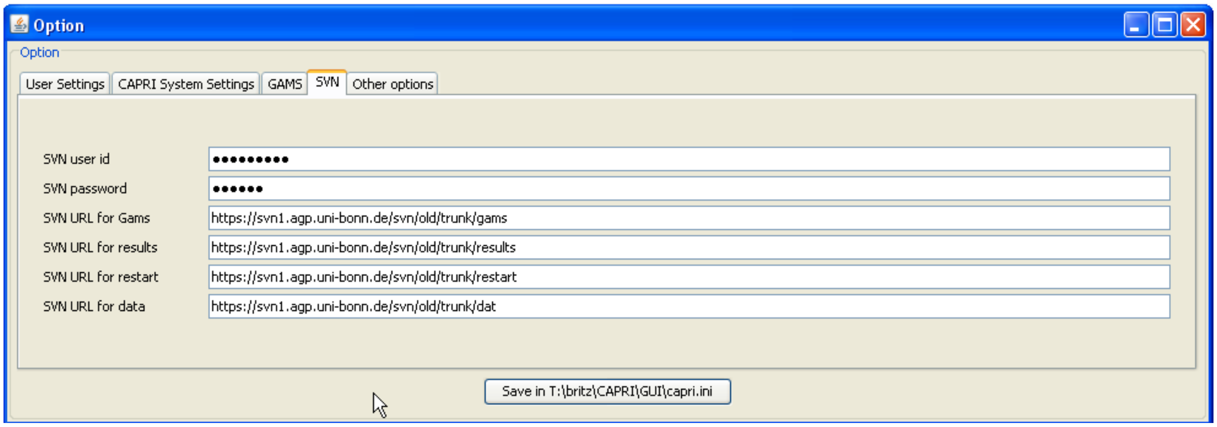
The local directory for the GUI is simply taken from the start directory of the GUI; whereas the SVN address for the GUI is stored in the “default.ini” file.



Base year: 2004
Simulation year: 2020
EU027
EU025
EU015

SVN user id: •••••••••
SVN password: ••••••
SVN URL for results: https://svn1.agp.uni-bonn.de/svn/old/trunk/results

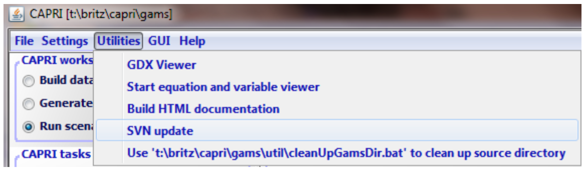
The runner can enter the additional SVN urls relating to the different sub-directories of a CAPRI installation. That should give some flexibility when working with branches on the server:



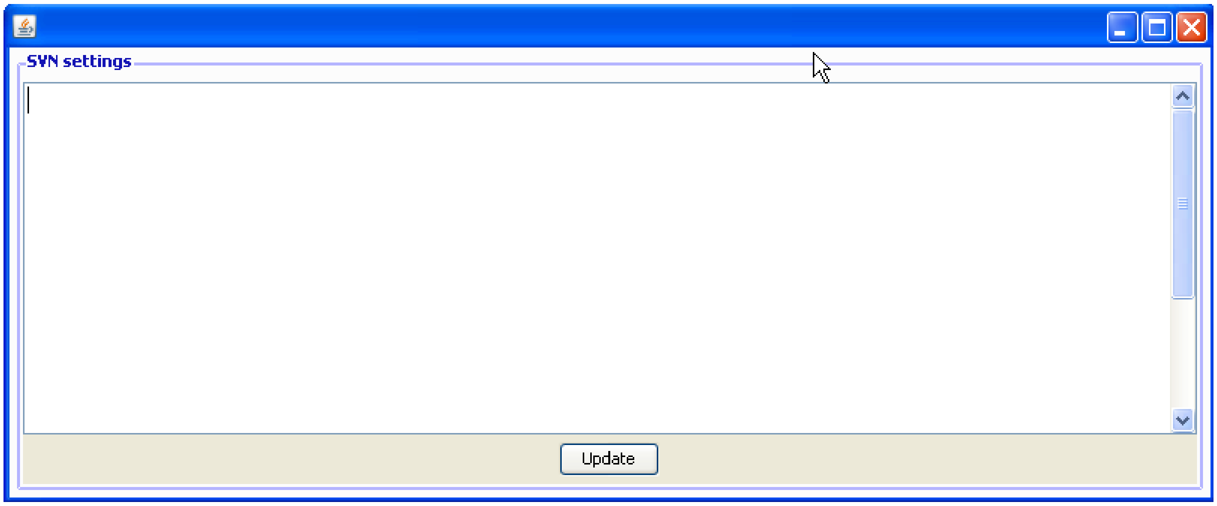
SVN user id: ••••••••••
SVN password: ••••••
SVN URL for Gams: https://svn1.agp.uni-bonn.de/svn/old/trunk/gams
SVN URL for results: https://svn1.agp.uni-bonn.de/svn/old/trunk/results
SVN URL for restart: https://svn1.agp.uni-bonn.de/svn/old/trunk/restart
SVN URL for data: https://svn1.agp.uni-bonn.de/svn/old/trunk/dat

Performing an update

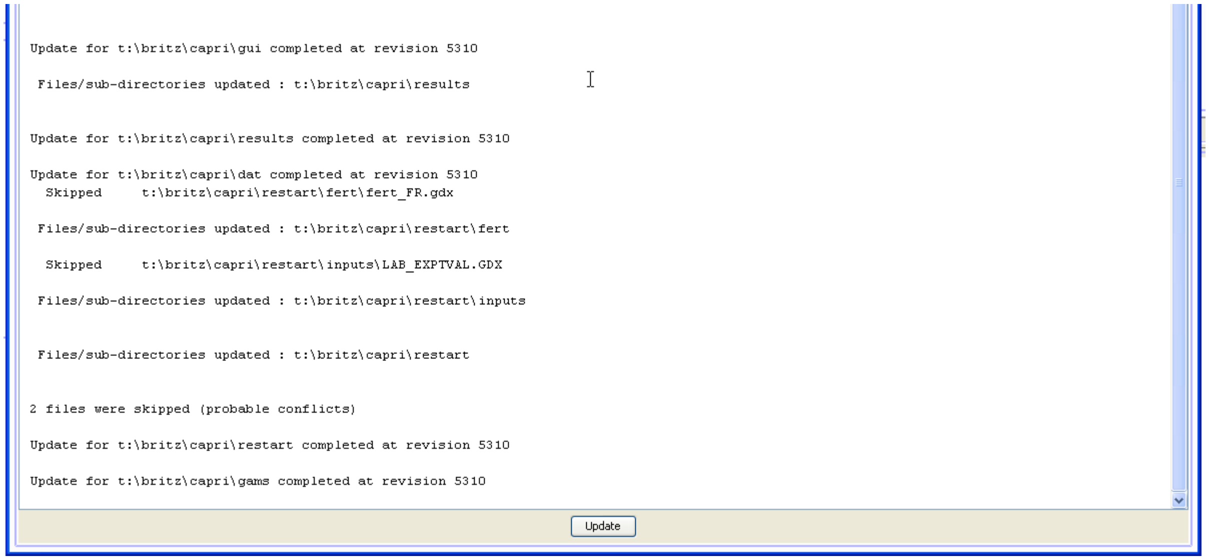
The second functionality for an exploiter (and runner) is to update all directories with the menu item "Utilities / SVN update" . An update will download updated versions of files into hidden directories, and, if the related files in the local working copy have not been modified, will also replace the local files.


CAPRI [t:\britz\capri\gams]
File
Settings
Utilities
GUI
Help
CAPRI works
Build data
Generate
Run scena
CAPRI tasks
GDX Viewer
Start equation and variable viewer
Build HTML documentation
SVN update
Use 't:\britz\capri\gams\util\cleanUpGamsDir.bat' to clean up source directory

Choosing that menu item will open a dialogue with just one button termed "update" and an area into which messages from the SVN updates / checkouts are reported:



Pressing the “update” bottom will trigger an unpdate. Possible conflicts, merges etc. are shown in the reporting area:

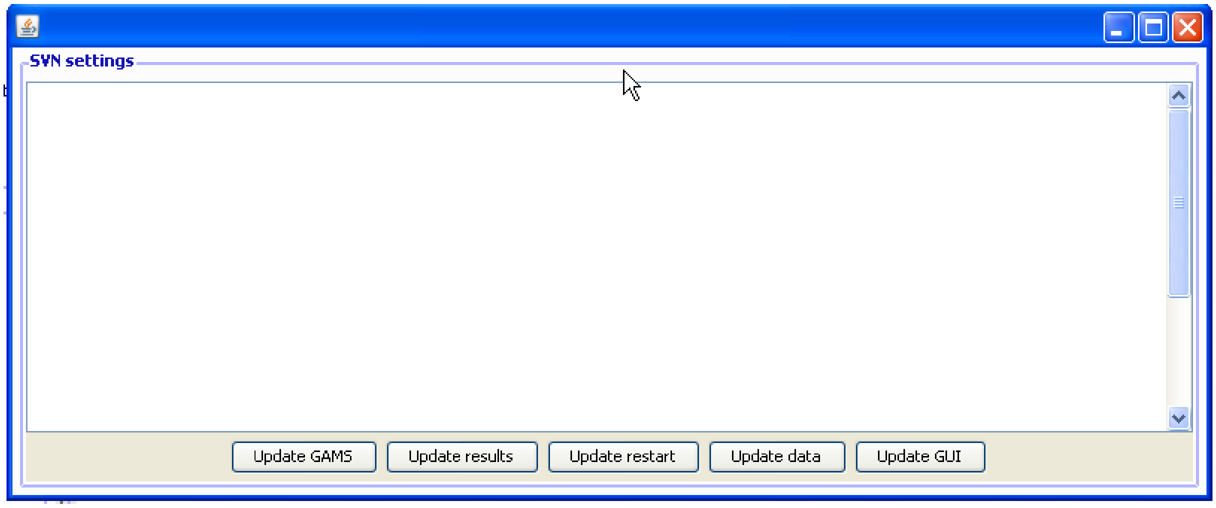


```
Update for t:\britz\capri\gui completed at revision 5310

 Files/sub-directories updated : t:\britz\capri\results


Update for t:\britz\capri\results completed at revision 5310

Update for t:\britz\capri\dat completed at revision 5310
  Skipped     t:\britz\capri\restart\fert\fert_FR.gdx

 Files/sub-directories updated : t:\britz\capri\restart\fert

  Skipped     t:\britz\capri\restart\inputs\LAB_EXPTVAL.GDX

 Files/sub-directories updated : t:\britz\capri\restart\inputs


 Files/sub-directories updated : t:\britz\capri\restart


2 files were skipped (probable conflicts)

Update for t:\britz\capri\restart completed at revision 5310

Update for t:\britz\capri\gams completed at revision 5310
```

If the directory is not yet under version control, the GUI will perform a checkout instead, i.e. setting up the first installation of the hidden copies from the server. Before an update, a “clean-up” operation will remove any possible local locks related to earlier unsuccessful SVN operations. As long as an internet connection is available, that should ensure smooth updates in most cases and avoid some of the more tricky problems TortoiseSVN users might face.

Case two: Administrator

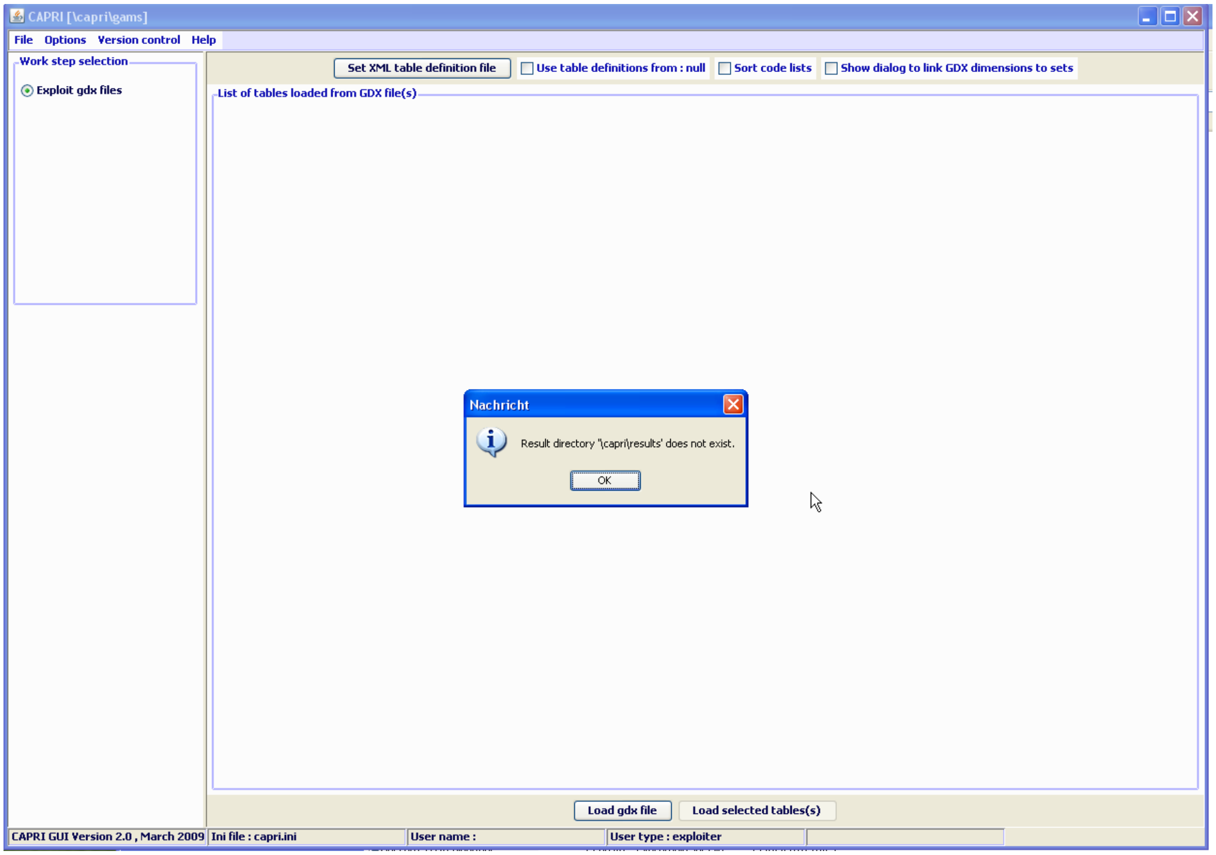
An administrator can enter the same SVN directories as a runner, but can trigger updates for the different parts separately:



Usage for installation purposes

Since quite a while the CAPRI network discusses how installations specifically for training sessions can be organized more easily. The newly embedded SVN functionalities in the GUI should ease that task somewhat, specifically in cases where only exploitation functionalities are asked for.

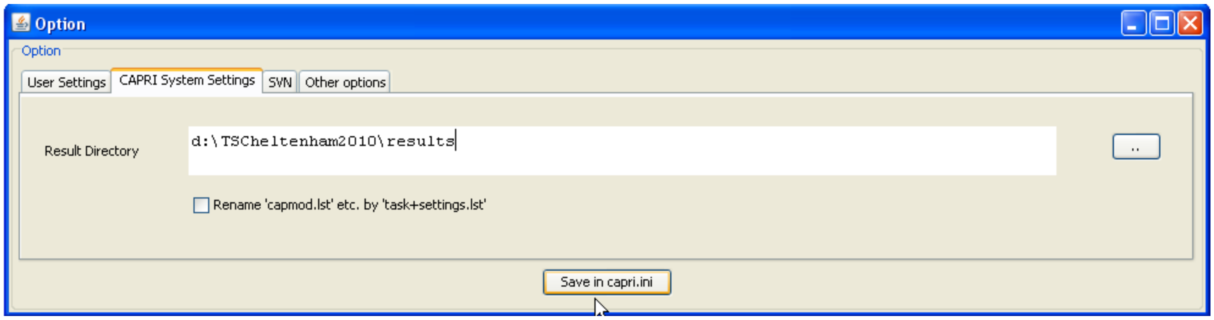
The installation of CAPRI based on the new functionality is relatively straightforward. As before, a JAVA run time engine must be installed for the GUI to run. For an exploiter, only a minimum GUI installation (e.g. without the large geometries for the 1x 1 km layer) and the necessary results files to view can then be copied to a local directory. At first start, the user must then only enter where the results had been copied to (if the result files are not parallel to the GUI) and save the information to his new *CAPRI.INI* file.


CAPRI [\capri\gams]
File Options Version control Help
Work step selection
○ Exploit gdx files
Set XML table definition file
□ Use table definitions from : null
□ Sort code lists
□ Show dialog to link GDX dimensions to sets
List of tables loaded from GDX file(s)
Nachricht
OK
Load gdx file
Load selected tables(s)

Result directory '\capri\results' does not exist.

CAPRI GUI Version 2.0 , March 2009 | Ini file : capri.ini | User name : | User type : exploiter

The interface is set-up such that only the results of those work steps are visible where result files are found. For a training session concentrating on analysing scenarios, only those result files can be distributed. An installation with four scenarios at NUTS2 level plus all the necessary GUI files will require under 100 MByte disk space.

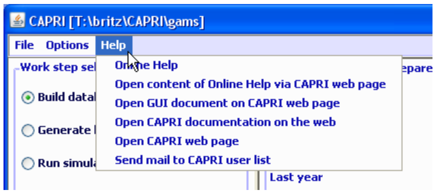


Result Directory d:\TSCheltenham2010\results

□ Rename 'capmod.lst' etc. by 'task+settings.lst'

Once the user has optionally entered the results directory, and stored it to the ini file, the user will face a rather clean interface which only allows to exploit existing scenarios and to exploit GDX files (also that option could be removed for exploiters).

Getting help


CAPRI [T:\britz\CAPRI\gams]
File
Options
Help
Work step sel
Build datal
Generate l
Run simula
Online Help
Open content of Online Help via CAPRI web page
Open GUI document on CAPRI web page
Open CAPRI documentation on the web
Open CAPRI web page
Send mail to CAPRI user list
epare
Last year

The “Help menu” allows opening the online help system, which can be invoked by pressing “F1”. A copy of the content is also stored on the CAPRI web page and can be accessed via the second menu item. “Open GUI document on CAPRI web page” will open the current document.

Basic layout of the GUI

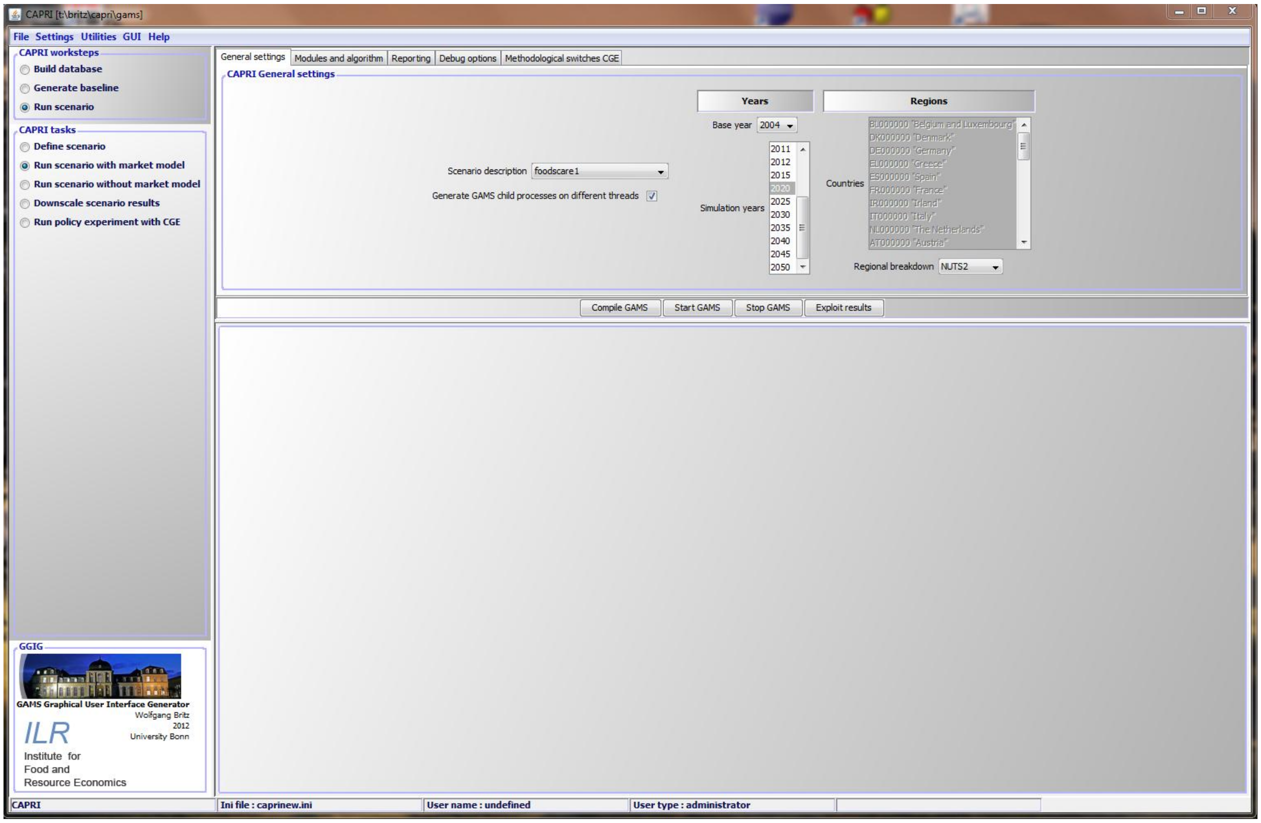
The GUI is generally structured as seen below. The left upper hand panel allows the selection of the different CAPRI work steps. The left lower hand panel lists the tasks belonging to the work steps. In both cases, only one button will be active. The right hand side offers controls depending on the properties of the task, grouped on different panes. There are buttons allowing starting the task, and a window which collects information at runtime. The footer lists the user name and type, and comprises a progress bar.

For tasks linked to a GAMS program, the buttons as shown below will be active:

- "**compile GAMS**": starts the GAMS compiler, but does not execute the program. A listing file will be generated. Used to test if a program compiles without errors.
- "**run GAMS**": tries to execute the GAMS program. A listing file will be generated where possible compilation or run-time errors are reported.
- "**stop GAMS**": sends a "signal interrupt" to the GAMS engine. It may take a while until GAMS reacts and stops with an error message after running its finalization routines.
- "**show results**": open the scenario exploiter

Note: for exploiters, the three buttons referring to GAMS will not be visible. The same holds for runners and the work steps "Build data base" and "Generate baseline".

Graph: Basic layout of the GUI



CAPRI worksteps

○ Build database
○ Generate baseline
● Run scenario

CAPRI tasks

○ Define scenario
● Run scenario with market model
○ Run scenario without market model
○ Downscale scenario results
○ Run policy experiment with CGE

CAPRI General settings

Scenario description: foodscare1

Generate GAMS child processes on different threads ☑

Years

Base year: 2004

Simulation years: 2011, 2012, 2015, 2020, 2025, 2030, 2035, 2040, 2045, 2050

Regions

Countries:
BL000000 "Belgium and Luxembourg"
DK000000 "Denmark"
DE000000 "Germany"
EL000000 "Greece"
ES000000 "Spain"
FR000000 "France"
IR000000 "Irland"
IT000000 "Italy"
NL000000 "The Netherlands"
AT000000 "Austria"

Regional breakdown: NUTS2

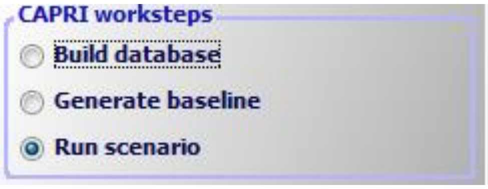
CAPRI | Ini file : caprinew.ini | User name : undefined | User type : administrator

The different work steps

Each work step may comprise different tasks. No task will require starting more than one GAMS program, but some tasks will start the very same GAMS program with different settings. Some tasks will not start GAMS, but other tools inside the GUI.

The different work steps are shown in a panel in the lower left corner of the GUI, and are presented by so-called radio-buttons, which means, that only one button can be selected at any time.

Graph: the work step panel



CAPRI worksteps

○ Build database

○ Generate baseline

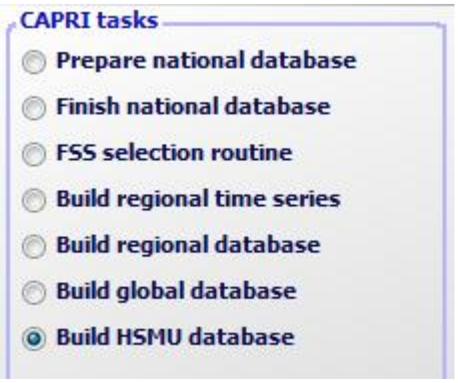
● Run scenario

Each work step may comprise several tasks, which are shown in the second panel, below the work step panel. The content of the panel hence changes when the user selects a different work step. Again, the different task panels comprise radio buttons for selections purposes.

Note: Some utilities which were in older version of the GUI listed as “work steps” can now found under “Utilities” in the menu bar such as the GDX Viewer.

Build database

Graph: the task panel for “build database”



CAPRI tasks

○ Prepare national database

○ Finish national database

○ FSS selection routine

○ Build regional time series

○ Build regional database

○ Build global database

● Build HSMU database

Building up the data base is the logical starting point in sequences of work steps. A new data base for the model needs to be constructed either after updates of the underlying statistical raw data, or after methodological changes in the code affecting content and structure of the data base. Controlling if updating the model yielded satisfactory results, possibly for the different tasks, is a time demanding task which requires in-depth knowledge about the quality of the different in-going data and the logical relations between the different elements of the data base. Users interested in ex-ante policy analysis are usually better off by taking the data base as given, and consequently, the work step is disabled for users which have no “administrator” status.

The work step consists of six different tasks:

1. ***Prepare national data base**: Generation of complete and consistent time series at national level, mainly based on Eurostat data (CoCO, from Complete & Consistent)*. CoCo runs per Member State simultaneously for all years, if data from other Member States are used to derive fallbacks as an? EU average, only the raw statistical data are used. The user can only choose which countries to run, and which years to cover.

2. ***Finish national data base:** Completion of the CoCo data by time series on consumer prices and certain feeding stuffs*. In both cases, it turned out that only the complete and consistent time series for all Member States from 1. provide a good basis for that step. The step is hence run simultaneously for all Member States and years, based on the results of the CoCo task. Here, only the years to cover can be chosen by the user.

3. ***FSS selection routine:** Determines the definition of farm type groups*.

4. ***Build regional data base, time series**, Generation of time series at regional level (CAPREG)*. The treatment of years in CAPREG is not identical. For all years, activity levels, output coefficients and input coefficients (excluding feed inputs) are generated. However, only for the base period, a three year weighted average around the chosen base year, feed input coefficients are estimated and the supply models are calibrated based on techniques borrowed from Positive Mathematical Programming. The user can hence choose for which Member States to run CAPREG, for which years and for which base year. Equally, the farm type module may be switched on or off.

5. ***Build regional data base** (CAPREG)*. Currently the same as three, only that the base year data will be loaded instead of time series.

6. ***Build global data base** (GLOBAL): Building up the international data base*. The step includes aggregation of Supply Utilization Accounts and bilateral trade flow matrices from FAO to the product and country definitions of CAPRI, aggregation of the supply and demand elasticities from the World Food Model to the product and country, estimation of bi-lateral transport costs and conversion of the FAPRI baseline to the product and regional aggregation of CAPRI.

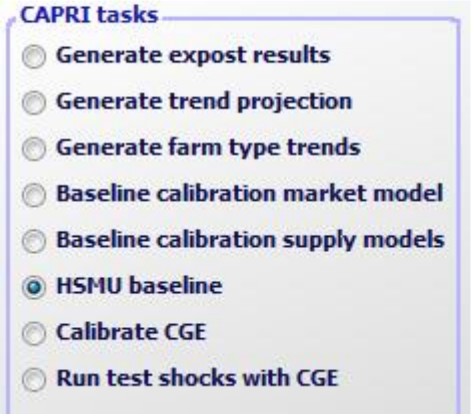
7. ***Build HSMU data base (CAPDIS_GRID):*** spatial downscaling of regional results for the base year to 1x1 km grid cells.

The underlying methodology for the different work steps is described in detail in the CAPRI model documentation. The sequence of the tasks as described above follows the work flows. It should be mentioned that certain preparatory steps, as downloading updated data from EuroStat, and converting these data into GAMS tables read by CoCo and CAPREG are no yet integrated in the GUI.

The actual controls available will depend on task. Please use the “F1” button to open the online help to get detailed information on settings for the tasks.

The work step “Generate baseline”

Graph: the task panel for “Generate baseline”



CAPRI tasks

○ Generate expost results
○ Generate trend projection
○ Generate farm type trends
○ Baseline calibration market model
○ Baseline calibration supply models
● HSMU baseline
○ Calibrate CGE
○ Run test shocks with CGE

For manifold reasons discussed in methodological papers, economic models as CAPRI are not suited for projections, but as tools for counterfactual analysis against an existing comparison point or an existing set of ex-ante time series. The point in time or these time series are called “base line” or “reference run”. CAPRI “runners” which use the model for ex-ante policy simulation do not need to construct their own baseline, but are typically better off by sticking to the baseline provided on a yearly basis along with the latest version of the GAMS code, data base and software. Accordingly, the step and the included tasks are only for user type “administrator”. According to current planning, the baseline will be updated in close co-operation with DG-AGRI twice a year in early summer and early winter, following the release of a new “medium term market outlook” by DG-AGRI.

The CAPRI baseline is a mix of trends, expert knowledge and automated checks for logical consistency, and is constructed by a sequences of tasks:

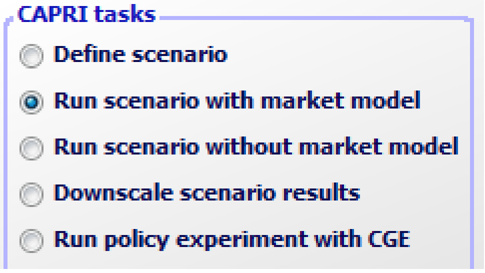
1. *Generation of ex-post results*. Albeit not strictly necessary for the base line, the ex –post results often prove quite helpful when analysing the reference run. The ex-post results are model run for the base at base year policy and other exogenous parameters, inflated to the chosen simulation year.
2. *Generation of the trend projection*. The trend projection task is rather time consuming, and may run several days when the farm types are included. It consists of several sub-tasks. Firstly, independent trend lines for many different variables and all regions are estimated, and for each of these trends lines, statistics as R^2, variance of the error terms etc. are calculated. These results, together with the base period data and the policy shifts, are used to define so-called supports, i.e. the most probable values for the final projection. These sub-tasks are relatively fast. The final

consistency sub-task is broken down in two iterations. In the first iteration, only the Member States consistency problems are solved. For the different projection years, the problem will look for minimal deviation from the supports – which may be interpreted as a priori information in a Bayesian interpretation – such that different necessary logical relations between the data are not violated – the data information in a Bayesian estimator. These relations define e.g. production as the product of yield and activity level or force close market balances. The details can be found in the methodological documentation. Once that step is done, the Member states are added up to the EU level, and new support are defined which take given expert projection into account, currently mainly a baseline provided by DG-AGRI. In the second round, the Member State problems are solved again, and then, problems for all NUTS II regions in each Member State, and, for all farm types inside of each NUTS II region.

3. *Baseline calibration market model*. In that task, the results from the trend projection as Member State level serve as the major input to generate the baseline, along with input from GLOBAL and CAPREG.
4. *Baseline calibration supply model*. In that task, the prices from the calibration of the market model are taken as given and the regional or farm type supply models are calibrated. That step can be performed independently for the different countries.
5. *HSMU Baseline*. Downscales the regional or farm type results from the baseline to clusters of 1x1 km grid cells and calculates indicators at that level. These are up-scaled again to NUTS 2.
6. *Calibrate CGE*. Calibrates the regional CGEs to the baseline calibration results of the supply models at NUTS2 level.
7. *Run test shocks with CGE*. Allows to test the CGEs on selected predefined shocks.

The task run scenario

Graph: the task panel for “Run Scenario”



CAPRI tasks

○ Define scenario

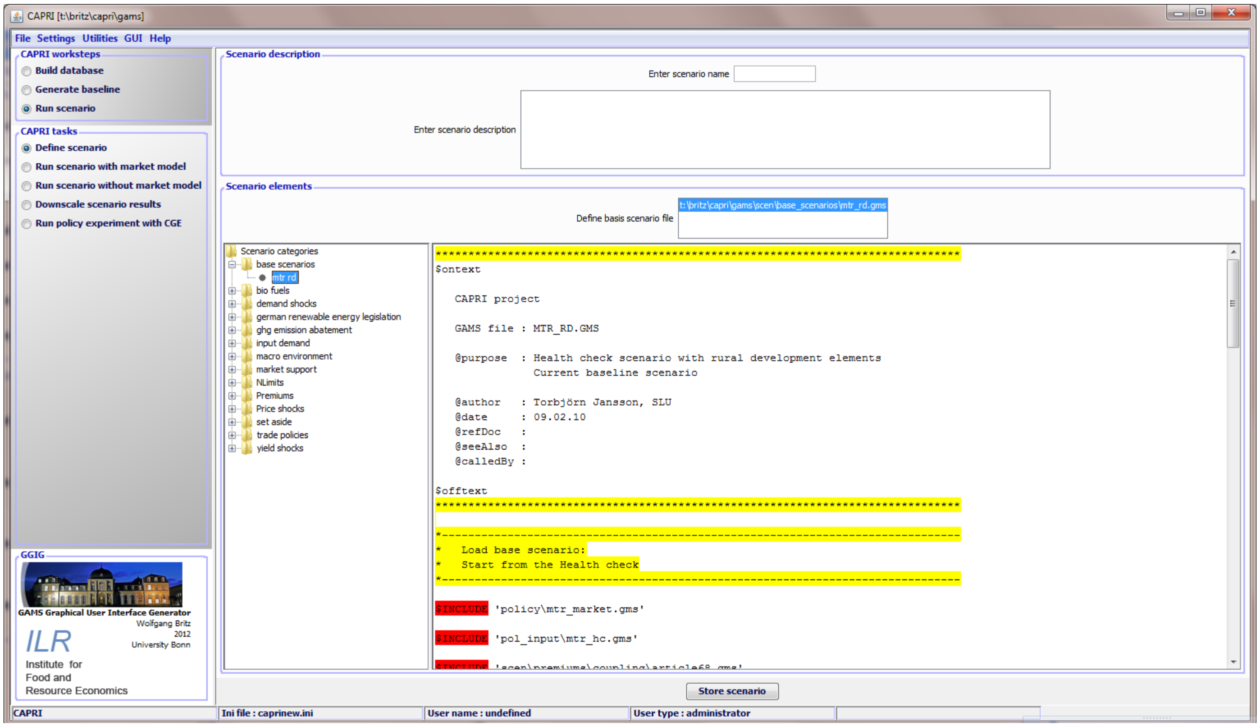
● Run scenario with market model

○ Run scenario without market model

○ Downscale scenario results

○ Run policy experiment with CGE

Define scenario task



CAPRI [t:\britz\capri\gams]
File Settings Utilities GUI Help
GGIG
GAMS Graphical User Interface Generator
Wolfgang Britz
2012
University Bonn
ILR
Institute for
Food and
Resource Economics
Store scenario

CAPRI worksteps

○ Build database

○ Generate baseline

● Run scenario

CAPRI tasks

● Define scenario

○ Run scenario with market model

○ Run scenario without market model

○ Downscale scenario results

○ Run policy experiment with CGE

Scenario description

Enter scenario name

Enter scenario description

Scenario elements

Define basis scenario file: t:\britz\capri\gams\scen\base_scenarios\mtr_rd.gms

Scenario categories
- base scenarios
  - mtr rd
- bio fuels
- demand shocks
- german renewable energy legislation
- ghg emission abatement
- input demand
- macro environment
- market support
- NLimits
- Premiums
- Price shocks
- set aside
- trade policies
- yield shocks

```
********************************************************************************
$ontext

   CAPRI project

   GAMS file : MTR_RD.GMS

   @purpose  : Health check scenario with rural development elements
               Current baseline scenario

   @author   : Torbjörn Jansson, SLU
   @date     : 09.02.10
   @refDoc   :
   @seeAlso  :
   @calledBy :

$offtext
********************************************************************************

*-------------------------------------------------------------------------------
*   Load base scenario:
*   Start from the Health check
*-------------------------------------------------------------------------------

$INCLUDE 'policy\mtr_market.gms'

$INCLUDE 'pol_input\mtr_hc.gms'

$INCLUDE 'scen\premiums\coupling\article68.gms'
```

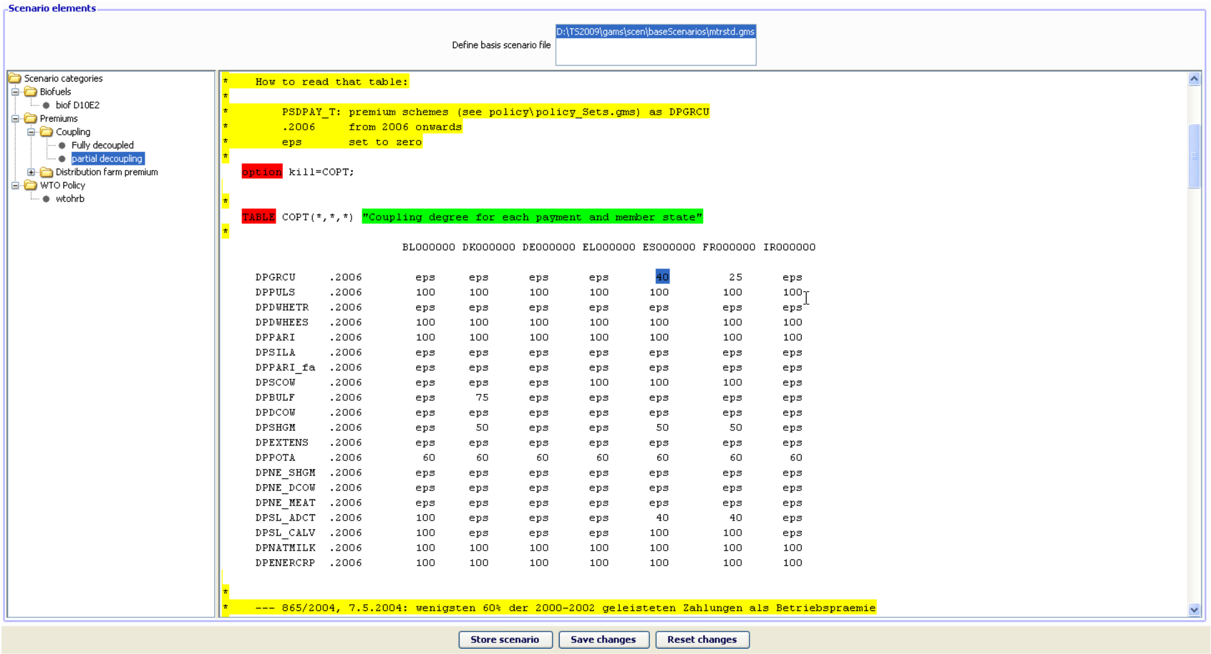
CAPRI | Ini file : caprinew.ini | User name : undefined | User type : administrator

Choosing the task adds the panel with GUI elements shown above. The panel consist of two major panes:

1. A top pane where the user can enter a name for his new scenario, and a description text.

2. A bottom pane where the user can define the base scenario to start with (currently in the trunk “MTR_RD.gms”) and the snippet to add. The available snippets and their structure are shown on the left hand side in an expandable tree which shows the sub-directories found under “gams\scen”, with the exclusion of a sub-directory called “baseScenarios” and the “.svn” directories. Empty directories are not shown. The user may select any number of snippets, even several from the same sub-directory. Double-clicking on one of the snippets shows the content of the file on the

right hand side, so that the user can inspect the code as seen below in more detail. GAMS keywords are shown in red, comments in yellow and strings in green. He can also edit the file – changes are shown in blue. Once changes had been saved, the tree shows a (user modified) behind the category. The user can also remove the changes from snippets.



Define basis scenario file D:\TS2009\gams\scen\baseScenarios\mtrstd.gms

```
*    How to read that table:
*
*        PSDPAY_T: premium schemes (see policy\policy_Sets.gms) as DPGRCU
*        .2006     from 2006 onwards
*        eps       set to zero
*
  option kill=COPT;

*
  TABLE COPT(*,*,*) "Coupling degree for each payment and member state"
*
                          BL000000 DK000000 DE000000 EL000000 ES000000 FR000000 IR000000

     DPGRCU     .2006        eps      eps      eps      eps       40       25      eps
     DPPULS     .2006        100      100      100      100      100      100      100
     DPDWHETR   .2006        eps      eps      eps      eps      eps      eps      eps
     DPDWHEES   .2006        100      100      100      100      100      100      100
     DPPARI     .2006        100      100      100      100      100      100      100
     DPSILA     .2006        eps      eps      eps      eps      eps      eps      eps
     DPPARI_fa  .2006        eps      eps      eps      eps      eps      eps      eps
     DPSCOW     .2006        eps      eps      eps      100      100      100      eps
     DPBULF     .2006        eps       75      eps      eps      eps      eps      eps
     DPDCOW     .2006        eps      eps      eps      eps      eps      eps      eps
     DPSHGM     .2006        eps       50      eps      eps       50       50      eps
     DPEXTENS   .2006        eps      eps      eps      eps      eps      eps      eps
     DPPOTA     .2006         60       60       60       60       60       60       60
     DPNE_SHGM  .2006        eps      eps      eps      eps      eps      eps      eps
     DPNE_DCOW  .2006        eps      eps      eps      eps      eps      eps      eps
     DPNE_MEAT  .2006        eps      eps      eps      eps      eps      eps      eps
     DPSL_ADCT  .2006        100      eps      eps      eps       40       40      eps
     DPSL_CALV  .2006        100      eps      eps      eps      100      100      eps
     DPNATMILK  .2006        100      100      100      100      100      100      100
     DPENERCRP  .2006        100      100      100      100      100      100      100

*
*    --- 865/2004, 7.5.2004: wenigsten 60% der 2000-2002 geleisteten Zahlungen als Betriebspraemie
```

Storing the scenario then generates a file as shown below, user name, the reference to CAPMOD.GMS and the date and time are automatically added by the GUI. The files will be added to the files stored in “gams\pol_input”.

Run scenario tasks

At the core of CAPRI stands its simulation engine, which iteratively links different types of economic models: aggregate programming models at regional or farm type level, with an explicit representation of agricultural production technology, aggregated versions of these models at Member States model linked together to derive market clearing prices for young animals, and finally, a global spatial multi-commodity model for main agricultural products and selected secondary processed products.

Differences in results between simulations may be rooted in three different blocks:

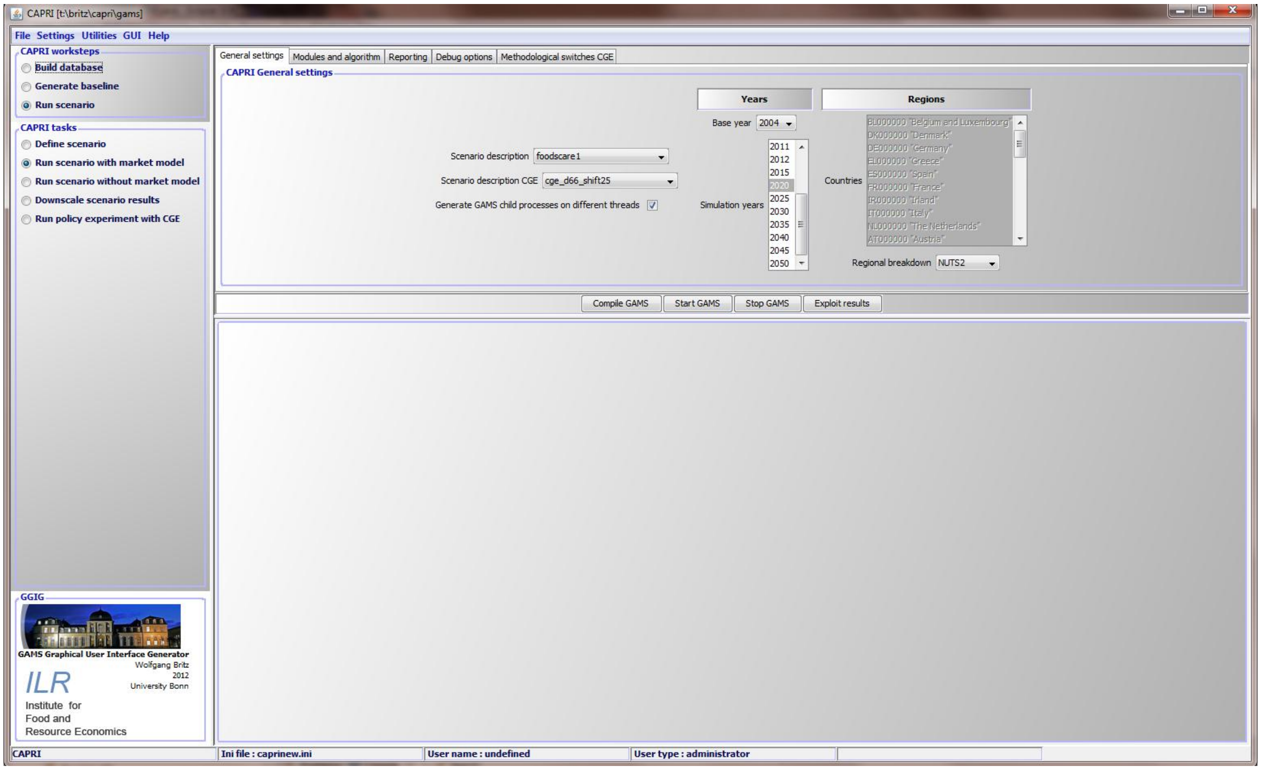
1. Differences in the in-going base year data and baseline. CAPRI allows several base years and calibration points to co-exist, and users may choose the base and baseline year.

2. Difference in what economic models are linked together and in the regionalisation level as the user may switch the market modules on or off, may run the model at Member State NUTS II and

farm type level or with the regional CGEs switch on or off. The CGE can also used in stand-alone mode.

3. And finally, the most common, differences in the exogenous assumptions including the policy definition.

Graph: The interface for the tasks “Run scenario”



Scenario description: foodscare1

Scenario description CGE: cge_d66_shift25

Generate GAMS child processes on different threads ☑

Base year: 2004

Simulation years: 2011, 2012, 2015, 2020, 2025, 2030, 2035, 2040, 2045, 2050

Countries: BL000000 "Belgium and Luxembourg", DK000000 "Denmark", DE000000 "Germany", EL000000 "Greece", ES000000 "Spain", FR000000 "France", IR000000 "Irland", IT000000 "Italy", NL000000 "The Netherlands", AT000000 "Austria"

Regional breakdown: NUTS2

CAPRI | Ini file : caprinew.ini | User name : undefined | User type : administrator

The following discussed the settings:

General Settings

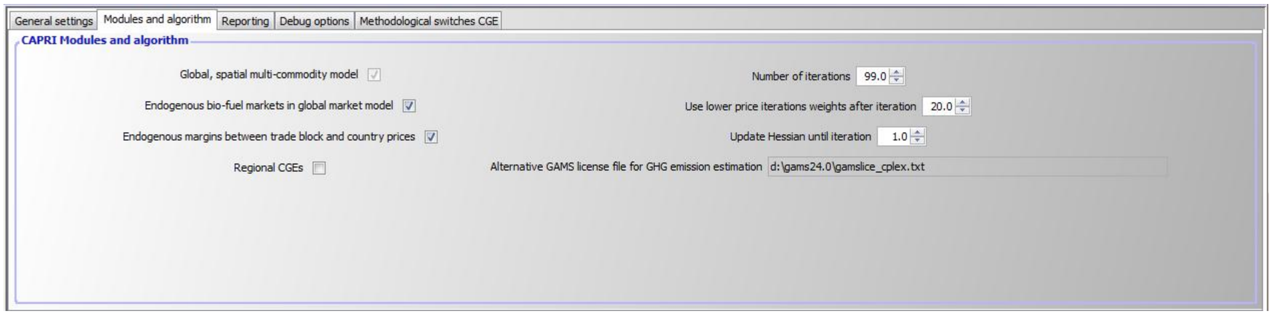
- ***Scenario description***: the GAMS file which comprises the settings for policy and further exogenous variables for a simulation. The files are stored in “gams\pol_input” and must be valid GAMS code. Use a text editor as e.g. the GAMS GUI to manipulate the files and generate new ones.

- ***Generate GAMS child processes on different threads:*** uses parallel GAMS processor to exploit multi-processor machines.

- ***Base year***: determines the three year average underlying the regional (see ***Build regional data base***) and global data base (see ***Build regional data base***) and the trends (see ***Generate trend projection***).

- ***Simulation years***: the years for which results are generated and trends are loaded.
- ***Countries***: if the global market model is switched off (run scenario without market model), the user may run a simulation for selected Member States, only.
- ***Regional break down***: the level of regional dis-aggregation in the supply part. It is not longer recommended to use the "Member State" level for production runs.

Modules and algorithm



CAPRI Modules and algorithm

Global, spatial multi-commodity model ☑

Endogenous bio-fuel markets in global market model ☑

Endogenous margins between trade block and country prices ☑

Regional CGEs □

Number of iterations 99.0

Use lower price iterations weights after iteration 20.0

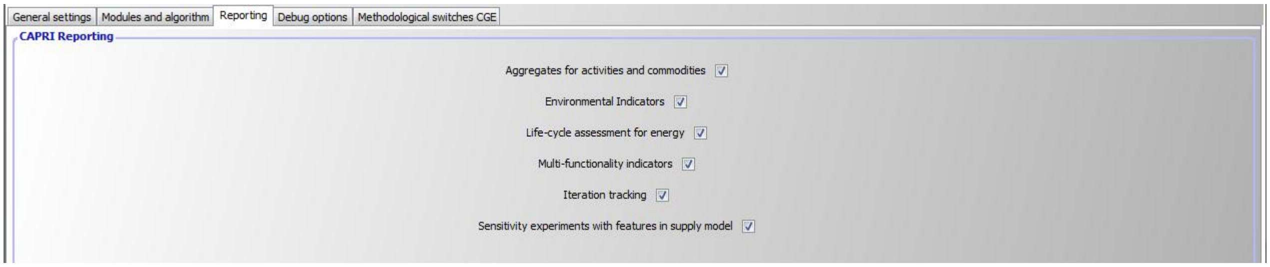
Update Hessian until iteration 1.0

Alternative GAMS license file for GHG emission estimation d:\gams24.0\gamslice_cplex.txt

- ***Global market model***: Switch the spatial global market model for agricultural products on and off. If switched off, output prices will be fixed to the baseline results. If switched on, the supply model will work with prices provided by the global market model, and the global market model will be iteratively calibrated to the results of the supply models aggregated to Member State level.
- ***Endogenous bio-fuel markets in global market model***: Renders supply, demand and trade for bio-ethanol and bio-diesel endogenous.
- ***Endogenous margins between trade blocks and country prices:*** Renders the difference the average producer prices for a trade block (e.g. EU15) and the countries in that trade block, and the margin between the Armington aggregator prices and the consumer price endogenous depending on the countries net trade position.
- ***Regional CGEs:*** Switches the regional CGEs on and off.
- ***Number of iterations***: with market models switched on, CAPRI sequentially calibrates the market models to supply model results which are solved at prices from the market models. Usually, the model will automatically converge in between 5 and 20 iterations. It is best to use 99 iterations as the default setting.
- ***User lower price iterations weights after iteration:*** That setting allows fine tuning the convergence process. Normally, a 50:50 weights between current and last iterations prices is used. The lower weights give less weight to the current iteration and more to past ones which might help in some cases with convergence.

- ***Update Hessian until iteration:*** The price elasticities for supply and feed demand for countries with supply models are iteratively updated until the given number of iteration is reached.

Reporting



CAPRI Reporting

Aggregates for activities and commodities ☑

Environmental Indicators ☑

Life-cycle assessment for energy ☑

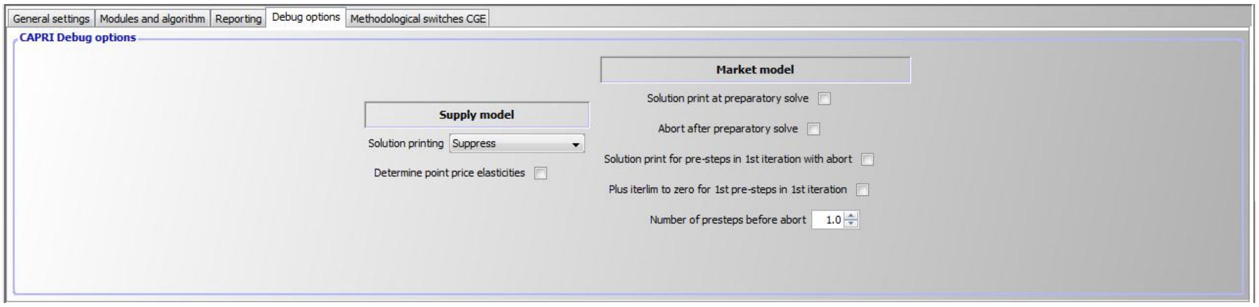
Multi-functionality indicators ☑

Iteration tracking ☑

Sensitivity experiments with features in supply model ☑

The panel allows switching certain part of the post-model reporting on and off. It is usually recommended to use all reports as the reporting part cannot (yet) used independently. If only core results are needed and computing time matters, these reports can be switched off.

Debug options



CAPRI Debug options

Supply model

Solution printing: Suppress

Determine point price elasticities □

Market model

Solution print at preparatory solve □

Abort after preparatory solve □

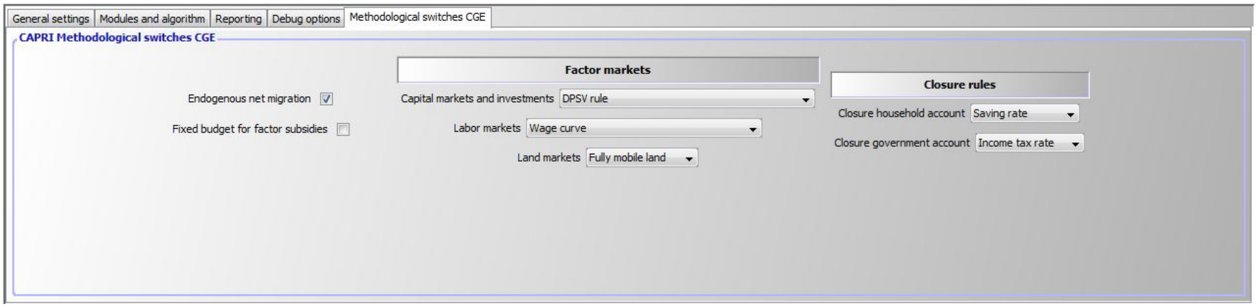
Solution print for pre-steps in 1st iteration with abort □

Plus iterlim to zero for 1st pre-steps in 1st iteration □

Number of presteps before abort: 1.0

Those are options useful when debugging the model which switch either model listings on/off or stop execution at certain points.

Methodological switches CGEs



CAPRI Methodological switches CGE

Endogenous net migration ☑

Fixed budget for factor subsidies □

Factor markets

Capital markets and investments: DPSV rule

Labor markets: Wage curve

Land markets: Fully mobile land

Closure rules

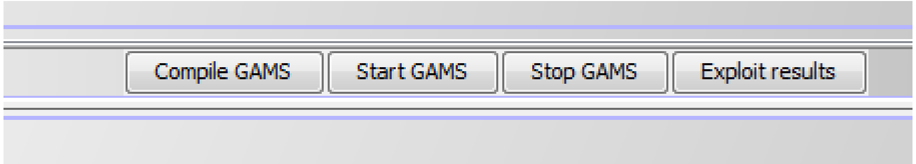
Closure household account: Saving rate

Closure government account: Income tax rate

Please consult the methodological documentation of the regional CGEs for a detailed discussion of these options.

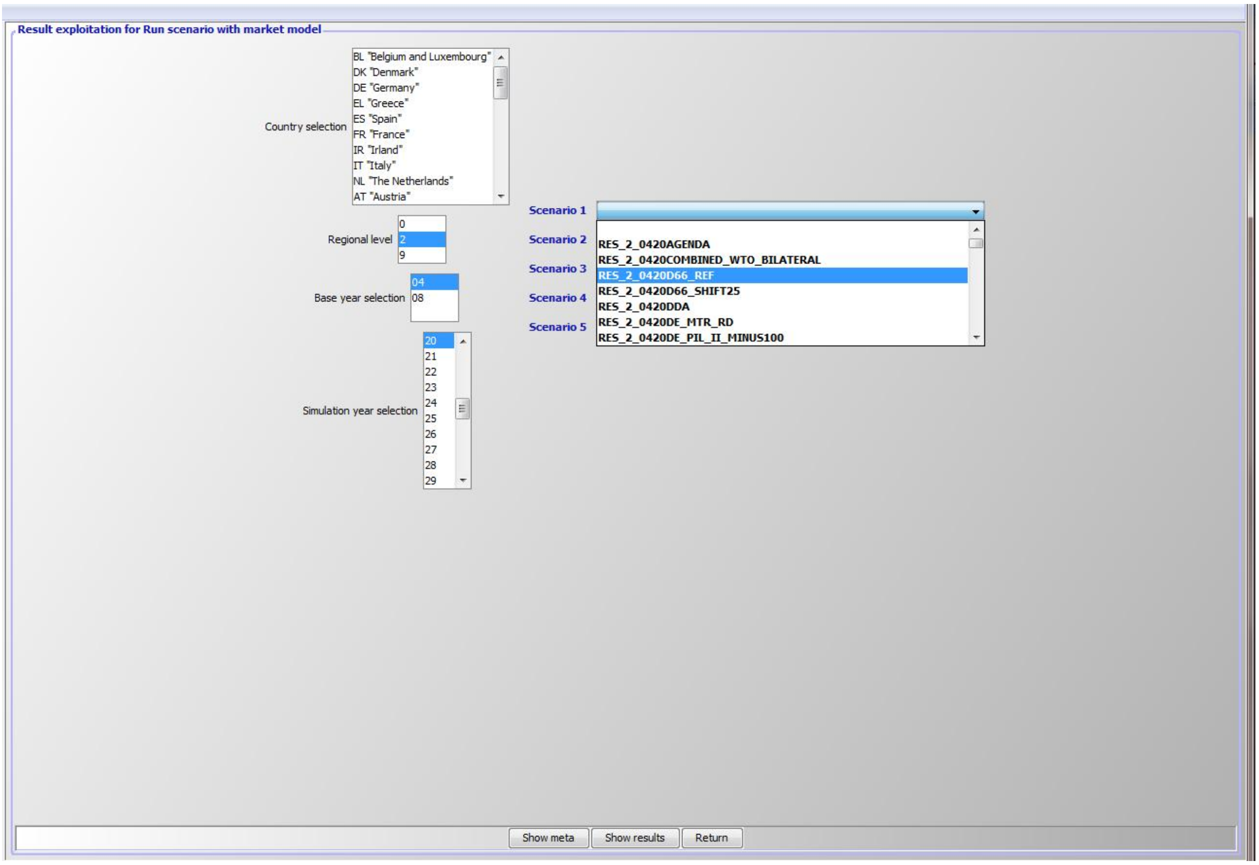
Exploiting results

For each work step, pressing the “Exploit results” button:



Will load the exploit result exploitation panel.

Graph: The interface in ”exploitation” mode



The right hand side comprises a set of drop-down boxes from which up to five different scenarios (or result files) can be selected. The first element in each box is empty.

The left hand side shows, depending on the work step, selection control for countries, the regional level, base year and simulation year. Operating these control filters out files from the disk shown in the drop-down boxes. In the example above, only results files for the base “04”, simulation year “20” and the regional level 2 (= NUTS2) can be selected.

The task: Collect meta information

The task scans the GDX files from the different tasks and collects Meta information (user, date of execution etc.) from there and shows it in a table. Besides the result directory stored in the settings, the task performs a “passive crawl” such that it will collect information on all files in the result directory which could technically be generated by the tasks. Settings as base year or simulation year in the interface are not taken into account. The processing depends on availability of the META symbol in the GDX file. Using the new GUI with files based on older version of CAPRI could lead to situations where files are not included in the reporting system.

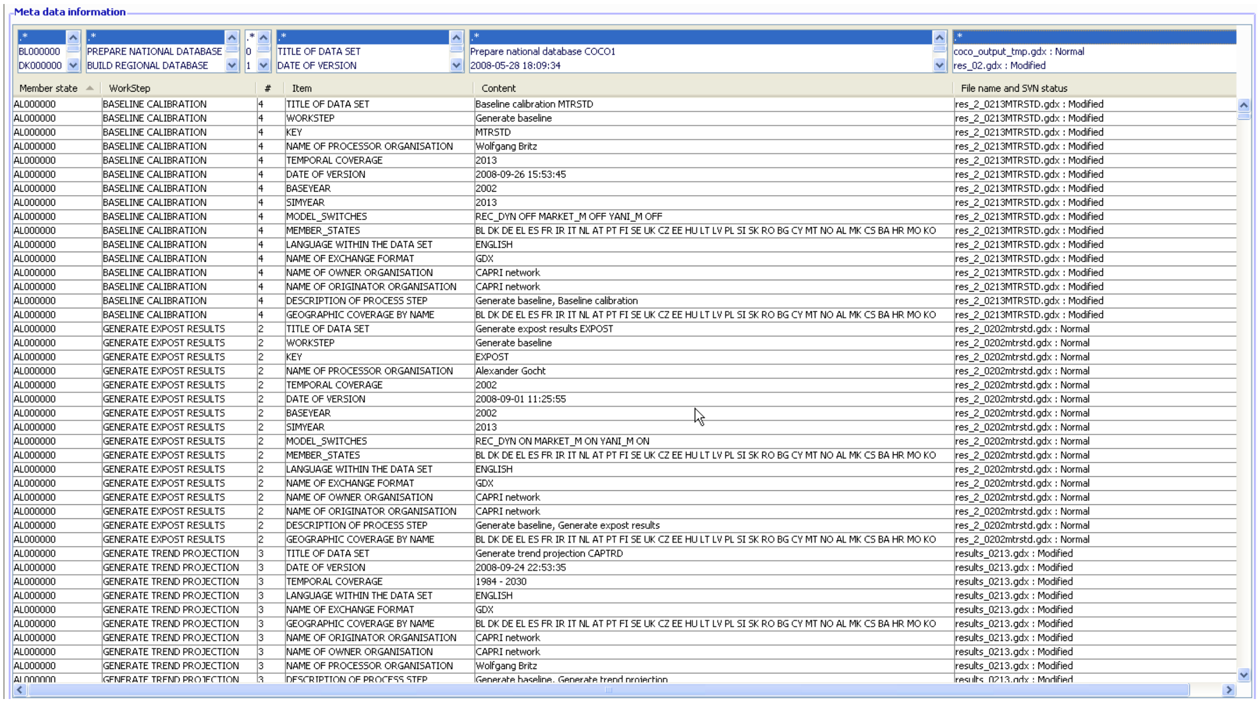
The following information is provided:

- **Member State**: the Member State for which Meta information is provided. Depending on the task, the program may have run for that Member State separately (e.g. CAPREG) or along with other Member States (e.g. CAPMOD)
- **Work step**: the task run as reported in the GDX file.
- **#**: logical order of the work steps. Steps with a higher order build on results of steps with a lower one. Consequently, results from steps with a higher order should be younger then those from steps with a lower order.
- **Item**: the different types of Meta data provided.
- **Content**: actual Meta data for the item.
- **File name and SVN status**: the GDX file from which the meta information is loaded, plus information about its status in the SVN versioning system. “Modified” means that the file in the local copy was modified since the last update and was not committed afterward. “Out of date” means that a newer version is available on the server. “Conflicting” means that an updated version of the file is available to the local copy, but that the file was modified. “Not under version control” means that the file is not handled by the version system.

It allows checking the internal consistency, i.e. if results entering certain work steps are outdated. In that case, the line with the date stamp is shown in red.

The scroll down boxes above the table can be used to select in the table. The first entry (.*) selects all items. Clicking on the table columns allows sorting.

Graph: Table with meta information



Meta data information

Member state	WorkStep	#	Item	Content	File name and SVN status
.* BL000000 DK000000	.* PREPARE NATIONAL DATABASE BUILD REGIONAL DATABASE	.* 0 1	.* TITLE OF DATA SET DATE OF VERSION	.* Prepare national database COCO1 2008-05-28 18:09:34	.* coco_output_tmp.gdx : Normal res_02.gdx : Modified
AL000000	BASELINE CALIBRATION	4	TITLE OF DATA SET	Baseline calibration MTRSTD	res_2_0213MTRSTD.gdx : Modified
AL000000	BASELINE CALIBRATION	4	WORKSTEP	Generate baseline	res_2_0213MTRSTD.gdx : Modified
AL000000	BASELINE CALIBRATION	4	KEY	MTRSTD	res_2_0213MTRSTD.gdx : Modified
AL000000	BASELINE CALIBRATION	4	NAME OF PROCESSOR ORGANISATION	Wolfgang Britz	res_2_0213MTRSTD.gdx : Modified
AL000000	BASELINE CALIBRATION	4	TEMPORAL COVERAGE	2013	res_2_0213MTRSTD.gdx : Modified
AL000000	BASELINE CALIBRATION	4	DATE OF VERSION	2008-09-26 15:53:45	res_2_0213MTRSTD.gdx : Modified
AL000000	BASELINE CALIBRATION	4	BASEYEAR	2002	res_2_0213MTRSTD.gdx : Modified
AL000000	BASELINE CALIBRATION	4	SIMYEAR	2013	res_2_0213MTRSTD.gdx : Modified
AL000000	BASELINE CALIBRATION	4	MODEL_SWITCHES	REC_DYN OFF MARKET_M OFF YANI_M OFF	res_2_0213MTRSTD.gdx : Modified
AL000000	BASELINE CALIBRATION	4	MEMBER_STATES	BL DK DE EL ES FR IR IT NL AT PT FI SE UK CZ EE HU LT LV PL SI SK RO BG CY MT NO AL MK CS BA HR MO KO	res_2_0213MTRSTD.gdx : Modified
AL000000	BASELINE CALIBRATION	4	LANGUAGE WITHIN THE DATA SET	ENGLISH	res_2_0213MTRSTD.gdx : Modified
AL000000	BASELINE CALIBRATION	4	NAME OF EXCHANGE FORMAT	GDX	res_2_0213MTRSTD.gdx : Modified
AL000000	BASELINE CALIBRATION	4	NAME OF OWNER ORGANISATION	CAPRI network	res_2_0213MTRSTD.gdx : Modified
AL000000	BASELINE CALIBRATION	4	NAME OF ORIGINATOR ORGANISATION	CAPRI network	res_2_0213MTRSTD.gdx : Modified
AL000000	BASELINE CALIBRATION	4	DESCRIPTION OF PROCESS STEP	Generate baseline, Baseline calibration	res_2_0213MTRSTD.gdx : Modified
AL000000	BASELINE CALIBRATION	4	GEOGRAPHIC COVERAGE BY NAME	BL DK DE EL ES FR IR IT NL AT PT FI SE UK CZ EE HU LT LV PL SI SK RO BG CY MT NO AL MK CS BA HR MO KO	res_2_0213MTRSTD.gdx : Modified
AL000000	GENERATE EXPOST RESULTS	2	TITLE OF DATA SET	Generate expost results EXPOST	res_2_0202mtrstd.gdx : Normal
AL000000	GENERATE EXPOST RESULTS	2	WORKSTEP	Generate baseline	res_2_0202mtrstd.gdx : Normal
AL000000	GENERATE EXPOST RESULTS	2	KEY	EXPOST	res_2_0202mtrstd.gdx : Normal
AL000000	GENERATE EXPOST RESULTS	2	NAME OF PROCESSOR ORGANISATION	Alexander Gocht	res_2_0202mtrstd.gdx : Normal
AL000000	GENERATE EXPOST RESULTS	2	TEMPORAL COVERAGE	2002	res_2_0202mtrstd.gdx : Normal
AL000000	GENERATE EXPOST RESULTS	2	DATE OF VERSION	2008-09-01 11:25:55	res_2_0202mtrstd.gdx : Normal
AL000000	GENERATE EXPOST RESULTS	2	BASEYEAR	2002	res_2_0202mtrstd.gdx : Normal
AL000000	GENERATE EXPOST RESULTS	2	SIMYEAR	2013	res_2_0202mtrstd.gdx : Normal
AL000000	GENERATE EXPOST RESULTS	2	MODEL_SWITCHES	REC_DYN ON MARKET_M ON YANI_M ON	res_2_0202mtrstd.gdx : Normal
AL000000	GENERATE EXPOST RESULTS	2	MEMBER_STATES	BL DK DE EL ES FR IR IT NL AT PT FI SE UK CZ EE HU LT LV PL SI SK RO BG CY MT NO AL MK CS BA HR MO KO	res_2_0202mtrstd.gdx : Normal
AL000000	GENERATE EXPOST RESULTS	2	LANGUAGE WITHIN THE DATA SET	ENGLISH	res_2_0202mtrstd.gdx : Normal
AL000000	GENERATE EXPOST RESULTS	2	NAME OF EXCHANGE FORMAT	GDX	res_2_0202mtrstd.gdx : Normal
AL000000	GENERATE EXPOST RESULTS	2	NAME OF OWNER ORGANISATION	CAPRI network	res_2_0202mtrstd.gdx : Normal
AL000000	GENERATE EXPOST RESULTS	2	NAME OF ORIGINATOR ORGANISATION	CAPRI network	res_2_0202mtrstd.gdx : Normal
AL000000	GENERATE EXPOST RESULTS	2	DESCRIPTION OF PROCESS STEP	Generate baseline, Generate expost results	res_2_0202mtrstd.gdx : Normal
AL000000	GENERATE EXPOST RESULTS	2	GEOGRAPHIC COVERAGE BY NAME	BL DK DE EL ES FR IR IT NL AT PT FI SE UK CZ EE HU LT LV PL SI SK RO BG CY MT NO AL MK CS BA HR MO KO	res_2_0202mtrstd.gdx : Normal
AL000000	GENERATE TREND PROJECTION	3	TITLE OF DATA SET	Generate trend projection CAPTRD	results_0213.gdx : Modified
AL000000	GENERATE TREND PROJECTION	3	DATE OF VERSION	2008-09-24 22:53:35	results_0213.gdx : Modified
AL000000	GENERATE TREND PROJECTION	3	TEMPORAL COVERAGE	1984 - 2030	results_0213.gdx : Modified
AL000000	GENERATE TREND PROJECTION	3	LANGUAGE WITHIN THE DATA SET	ENGLISH	results_0213.gdx : Modified
AL000000	GENERATE TREND PROJECTION	3	NAME OF EXCHANGE FORMAT	GDX	results_0213.gdx : Modified
AL000000	GENERATE TREND PROJECTION	3	GEOGRAPHIC COVERAGE BY NAME	BL DK DE EL ES FR IR IT NL AT PT FI SE UK CZ EE HU LT LV PL SI SK RO BG CY MT NO AL MK CS BA HR MO KO	results_0213.gdx : Modified
AL000000	GENERATE TREND PROJECTION	3	NAME OF ORIGINATOR ORGANISATION	CAPRI network	results_0213.gdx : Modified
AL000000	GENERATE TREND PROJECTION	3	NAME OF OWNER ORGANISATION	CAPRI network	results_0213.gdx : Modified
AL000000	GENERATE TREND PROJECTION	3	NAME OF PROCESSOR ORGANISATION	Wolfgang Britz	results_0213.gdx : Modified
AL000000	GENERATE TREND PROJECTION	3	DESCRIPTION OF PROCESS STEP	Generate baseline, Generate trend projection	results_0213.gdx : Modified

Interaction with GAMS

The interaction with GAMS consists of three parts:

- Generating GAMS code based on user input
- Starting GAMS
- Controlling the GAMS run

There are two types of input files generated based on user input. The first one are so-called scenario files and define the exogenous drivers for a CAPRI run as population growth, macro-economic environment or policy definitions. Here, the final aim is to integrate the scenario editor from SEAMLESS into the CAPRI user interface. The scenario files are typically stored for longer period on disk, both to provide templates for other scenarios as well as for documentation purposes. The name of the file to load is passed to GAMS either as an argument or stored in an input file with a fixed name. The second types are rather small files with a fixed name which typically comprise the information for which years and regions to run the GAMS program along with a small number of methodological switches. These files are overwritten with each start of the related GAMS code.

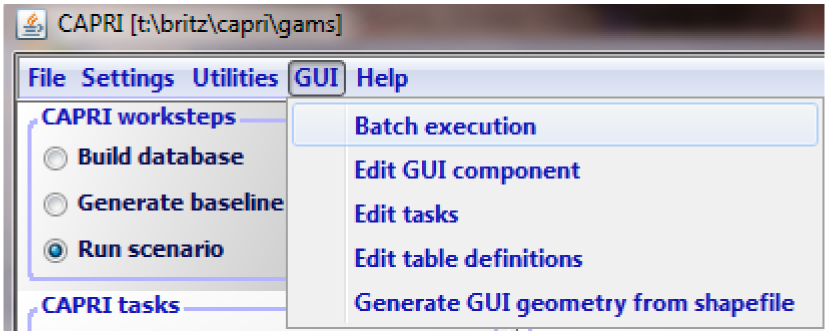
GAMS is started as a sub-process in an own thread. The output from GAMS which is typically shown in command processor window is redirected into a pipe and its content read from there and shown in a window on the CAPRI user interface, so that the user can check GAMS execution at run time. The code allows filtering out specific statements generated by GAMS to be shown in the windows title bar to give an indication about program progress.

There are two final control mechanisms. Firstly, the return code by GAMS which indicates if the GAMS program was correctly compiled and then executed. Typical execution time errors are math errors as division by zeros or read/write errors on external files. Secondly, the user can apply different type of exploitation tools to check the logical content of the results.

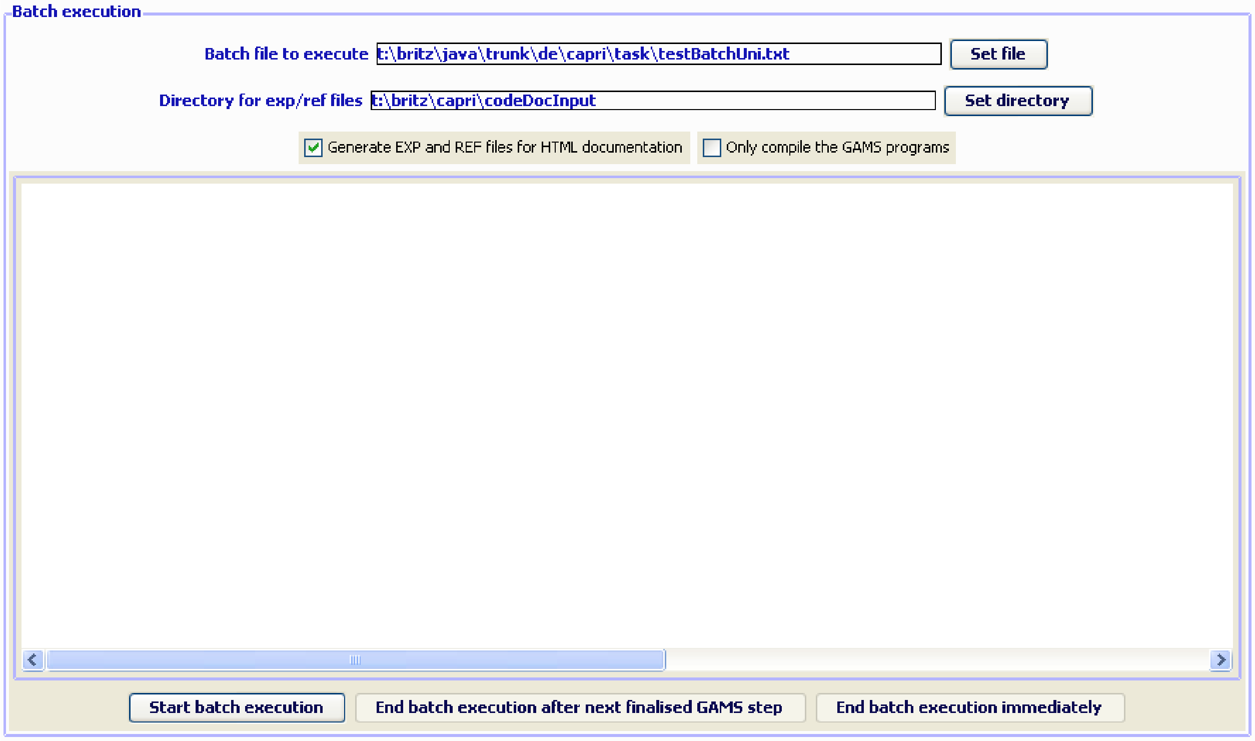
Utilities

Batch execution

The batch execution utility can now be opened from the menu bar under “GUI”.



Graph: Batch execution panel



Batch file to execute t:\britz\java\trunk\de\capri\task\testBatchUni.txt

Directory for exp/ref files t:\britz\capri\codeDocInput

☑ Generate EXP and REF files for HTML documentation ☐ Only compile the GAMS programs

Set file
Set directory
Start batch execution
End batch execution after next finalised GAMS step
End batch execution immediately

The batch execution allows starting a file, defining settings and tasks from the different CAPRI work steps and executing them without user intervention. Once started, the batch processor may be stopped so that the currently running GAMS program ends on its own (“end batch execution after next finalised GAMS step”) or by sending a “CTRL-C” to the GAMS program. It will continue to run until the GAMS processor notices the CTRL-C – which may take a while – and then end with an error code. However, the GAMS processor will run some finalisation tasks as removing temporary files and directories.

The batch execution facility is a tool which:

- Allows executing many different CAPRI tasks after each other without requiring user input.
- Reports the settings used, any errors and GAMS result codes in a HTML page from which they may queried at a later time.
- Ensures that each new run generates its own listing file, which can be opened from the HTML page.
- Allows storing the output of the different runs in a separate directory, while reading input from unchanged result directories.

The purpose of the batch execution facility is therefore at least twofold. On the one hand, it allows to set up test suits for the CAPRI GAMS code such as checking for compilation without errors for all tasks and different settings such as with and without market parts etc. Secondly, production runs of e.g. different scenarios can be started automatically. It is planned to add timer facilities to the batch execution so that the GUI will start a suite of runs at a pre-scheduled time. Along with the planned functionalities to compare in a more or less automated way differences in results between versions, the batch facility is one important step towards quality control.

For details on the batch execution facility see the technical document “Batch execution of CAPRI tasks” to be found on the Capri web page under technical documents.

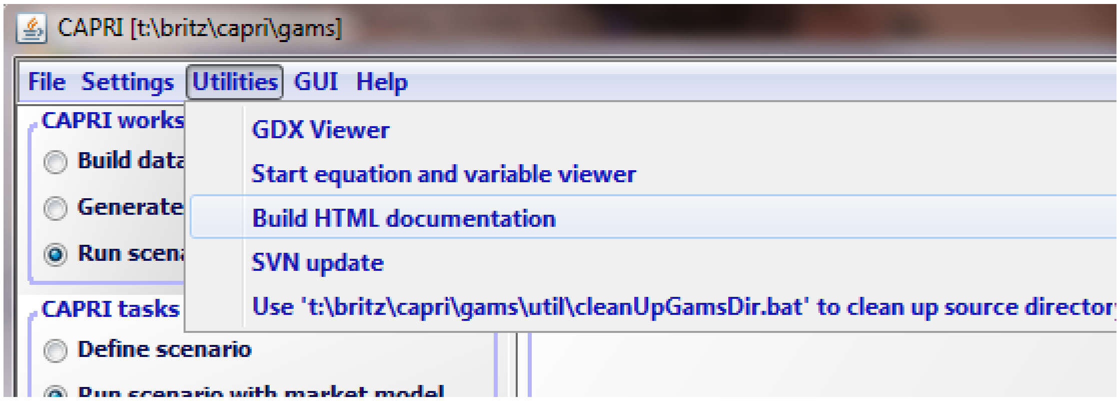
If the suite of tasks comprises “execute” statements, those can be downgraded to “compile” with “Only compile GAMS programs” check box.

The check box “Generate EXP/REF files for HTML documentation” adds settings to the GAMS calls which generate two specific reference files by the GAMS compiler which comprise information of files and symbols used by GAMS. For details on the code documentation facility see the technical document “Javadoc like technical documentation for CAPRI” to be found on the Capri web page under technical documents. The “directory for exp/ref files” defines where those files will be stored.

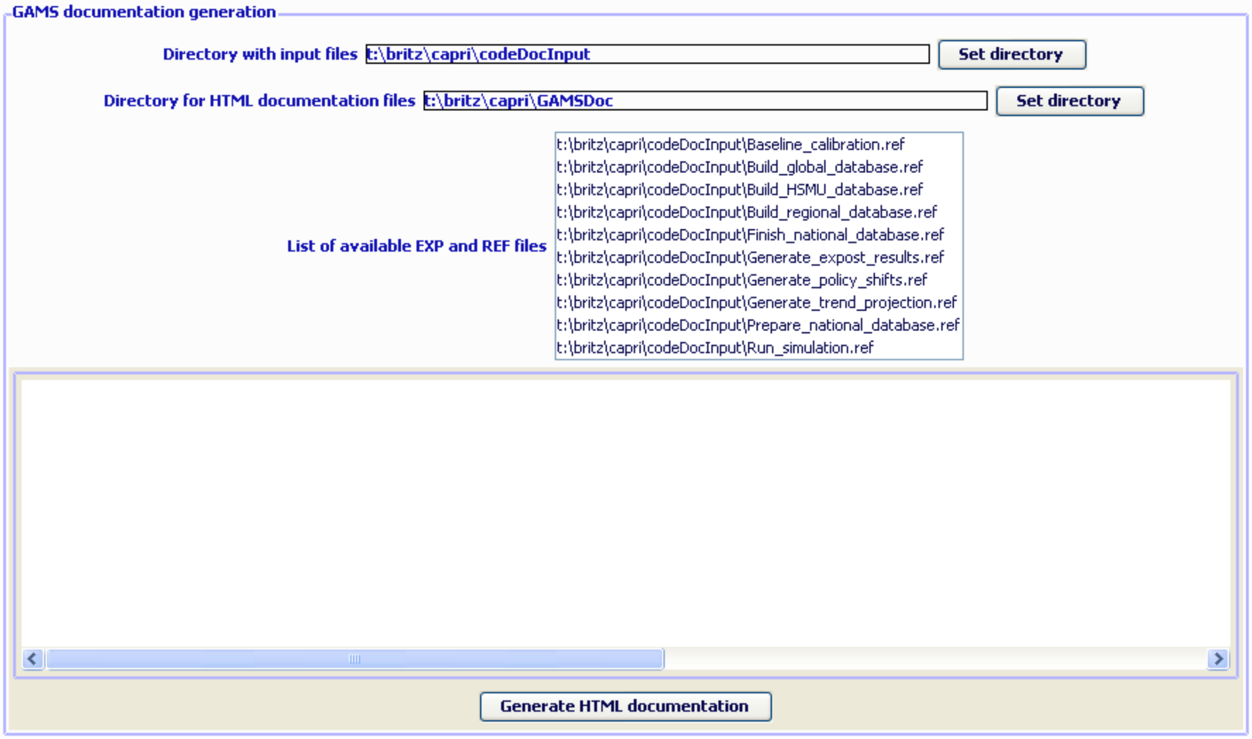
The batch language allows definition of a timer, i.e. to start the execution at a specified time.

Generate GAMS documentation

The batch execution utility can now be opened from the menu bar under “Utilities”:


CAPRI [t:\britz\capri\gams]
File Settings Utilities GUI Help
CAPRI works
Build data
Generate
Run scena
CAPRI tasks
Define scenario
Run scenario with market model
GDX Viewer
Start equation and variable viewer
Build HTML documentation
SVN update
Use 't:\britz\capri\gams\util\cleanUpGamsDir.bat' to clean up source director

Graph: Panel to steer GAMS documentation generation



Directory with input files: t:\britz\capri\codeDocInput

Directory for HTML documentation files: t:\britz\capri\GAMSDoc

List of available EXP and REF files:

```
t:\britz\capri\codeDocInput\Baseline_calibration.ref
t:\britz\capri\codeDocInput\Build_global_database.ref
t:\britz\capri\codeDocInput\Build_HSMU_database.ref
t:\britz\capri\codeDocInput\Build_regional_database.ref
t:\britz\capri\codeDocInput\Finish_national_database.ref
t:\britz\capri\codeDocInput\Generate_expost_results.ref
t:\britz\capri\codeDocInput\Generate_policy_shifts.ref
t:\britz\capri\codeDocInput\Generate_trend_projection.ref
t:\britz\capri\codeDocInput\Prepare_national_database.ref
t:\britz\capri\codeDocInput\Run_simulation.ref
```

The GUI comprises a tool to generate for each GAMS file and each symbol used HTML pages which are interlinked. For details on the code documentation facility see the technical document “Javadoc like technical documentation for CAPRI” to be found on the Capri web page under technical documents.

The controls on top allow the user:

- To define in which directory the “EXP”, “REF” and “GDX” files are stored which serve as input into the documentation generator.

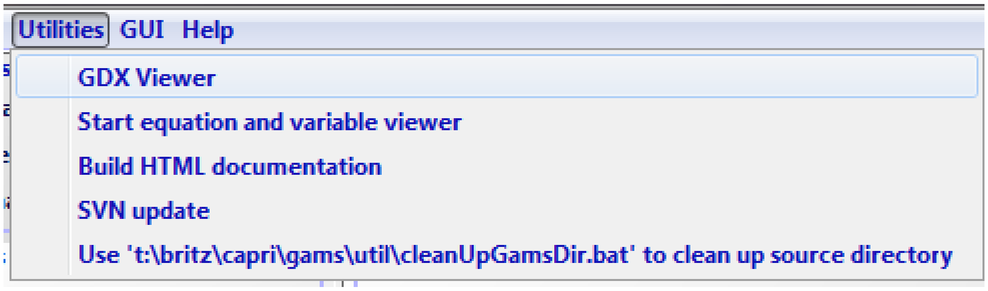
- To choose the directory where the HTML files will be generated.
- To select the tasks covered by the documentation generator.

Exploitation of gdx-files

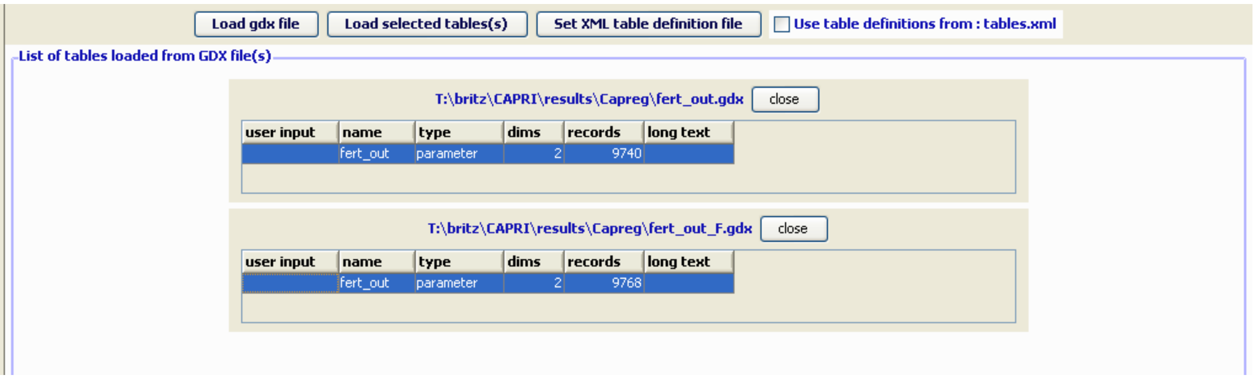
GDX-files are generated by GAMS and typically serve either an exchange format between different GAMS applications, or for exploitation purposes as the GAMS-IDE comprises a view for GDX-files. Further tools for GDX-files are available from GAMS company and are described in different documents. In opposite to listings generated by GAMS programs, the GDX files store the data in full numerical precision in an internal format.

The new CAPRI version passes information from one task to the next with the help of GDX files, so generates CoCo a gdx files with the time series at national level, which is read by CAPREG. And the regional time series generated by CAPREG are inputted by the trend projection tool CAPTRD. These gdx files are accessed when the different tasks of “Data base exploitation” are chosen. The user has on top the possibility to load one or several tables from one or several freely chosen gdx files.

The GDX exploitation utility can be reached via the menu bar:


Utilities
GUI
Help
GDX Viewer
Start equation and variable viewer
Build HTML documentation
SVN update
Use 't:\britz\capri\gams\util\cleanUpGamsDir.bat' to clean up source directory

Graph: Panel to GDX file exploitation


Load gdx file
Load selected tables(s)
Set XML table definition file
□ Use table definitions from : tables.xml
List of tables loaded from GDX file(s)
close
close

T:\britz\CAPRI\results\Capreg\fert_out.gdx

user input	name	type	dims	records	long text
	fert_out	parameter	2	9740	

T:\britz\CAPRI\results\Capreg\fert_out_F.gdx

user input	name	type	dims	records	long text
	fert_out	parameter	2	9768	

When the task “exploit gdx files” is selected by pressing the related button, four buttons are shown in the task panel. The first one, labelled “load gdx files” will open a file selection menu when pressed. When the ok button of the dialogue is operated, the content of the gdx file is partially loaded, and a table is added to the right upper window of the application showing the parameters and sets comprised in the gdx files, along with their number of dimensions and records. When the close button next to the table is pressed, the table is deleted. Pressing the “load gdx file” again will add more tables.

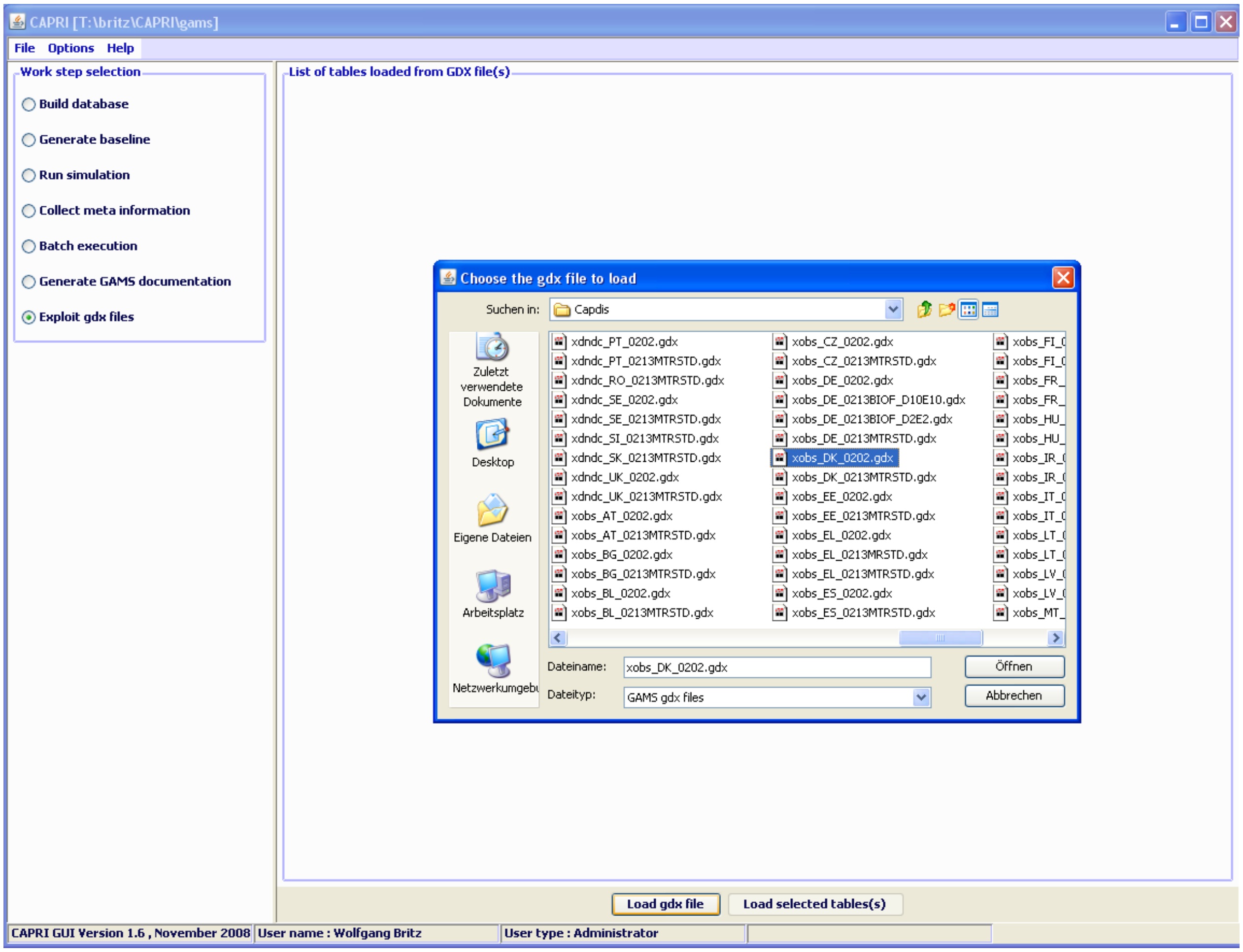
One parameter from each table may be selected (pressing the “crtl” key when clicking with the mouse de-selects). If several parameters from one file need to be loaded, the user may open the same file several time.

The content of the different parameters is merged together, and the parameters themselves span an additional data dimension. If the user does not provide input in the first column of the tables labelled “user input”, the program will generate names automatically. The data loaded are shown in the table tool described above.

The user can use view definitions stored in a XML file to the tables by pressing the enabling the ”Use table definitions from …” tick box, and may use the “Set XML table definition file” button to change the file to use.

An example: loading data from the spatial downscaling

The option described here is introduced for completeness. The names of the file generated by the dis-aggregation programs start with “XOBS_” followed with the two character code of the Member state, then an underscore followed by the base year and the simulation year, and if applicable, the code for the simulation which is identical to the name of the GAMS files used from “pol_input” which was used to run the scenario.



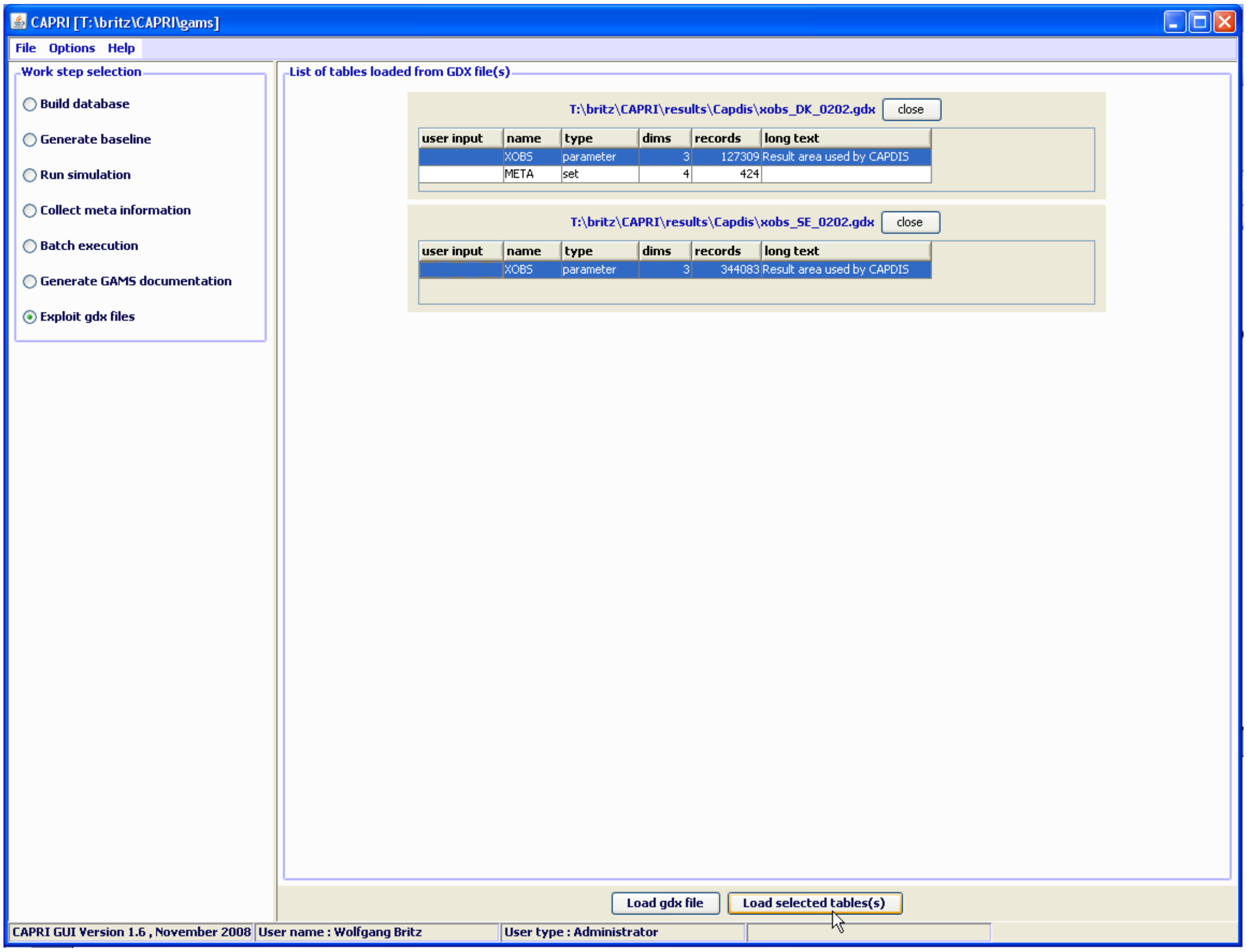
Suchen in: Capdis

Dateiname: xobs_DK_0202.gdx

Dateityp: GAMS gdx files

CAPRI GUI Version 1.6 , November 2008 | User name : Wolfgang Britz | User type : Administrator

If one wishes to see the information for several Member States simultaneously, one may click on “Load gdx file” again and add additional files. Afterwards, the lines with the parameters “XOBS” should be selected.



CAPRI [T:\britz\CAPRI\gams]

Work step selection

- ○ Build database
- ○ Generate baseline
- ○ Run simulation
- ○ Collect meta information
- ○ Batch execution
- ○ Generate GAMS documentation
- ● Exploit gdx files

List of tables loaded from GDX file(s)

T:\britz\CAPRI\results\Capdis\xobs_DK_0202.gdx

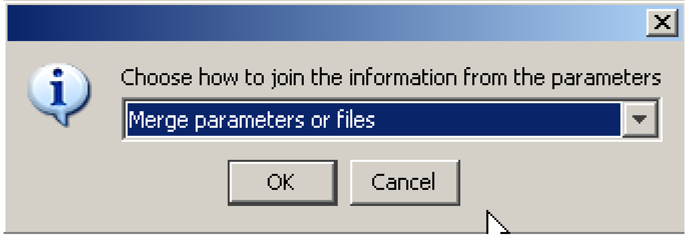
user input	name	type	dims	records	long text
	XOBS	parameter	3	127309	Result area used by CAPDIS
	META	set	4	424	

T:\britz\CAPRI\results\Capdis\xobs_SE_0202.gdx

user input	name	type	dims	records	long text
	XOBS	parameter	3	344083	Result area used by CAPDIS

CAPRI GUI Version 1.6 , November 2008 | User name : Wolfgang Britz | User type : Administrator

Pressing load selected tables will open the following dialogue, choose



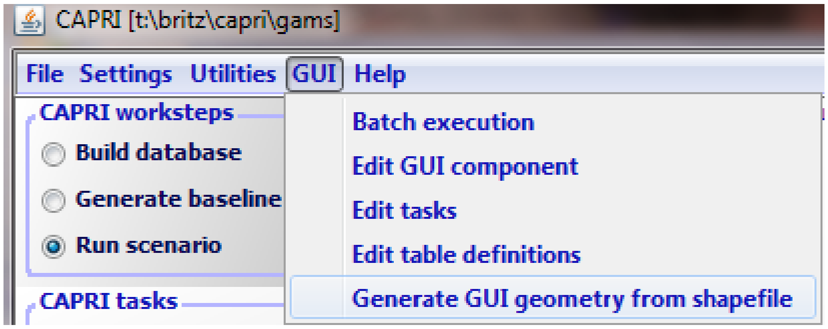
Choose how to join the information from the parameters

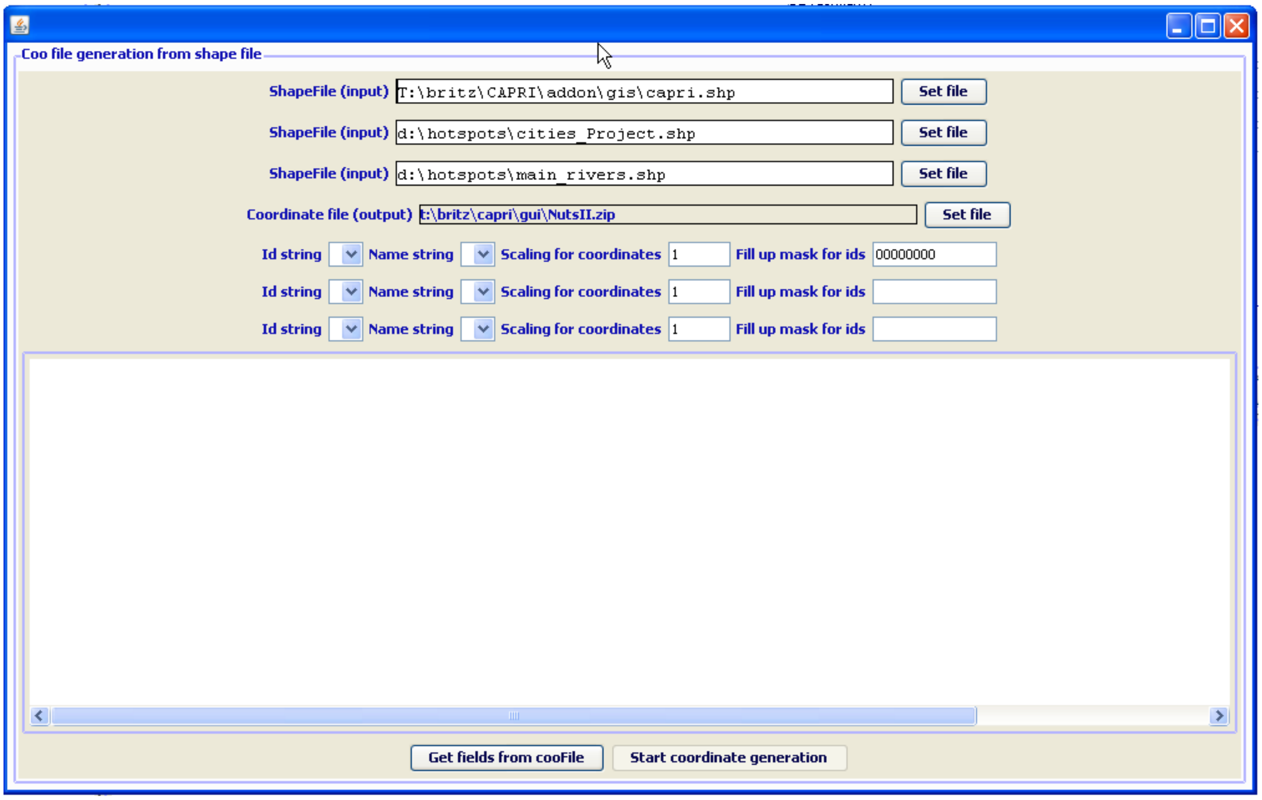
Merge parameters or files

As otherwise, the program will introduce a new dimension for the data loaded from the different files, and you will not be able to see the information for "DK" and "SE" together in one map. Afterwards, the selected records will be loaded from the files.

Depending on the amounts of records, that may take several seconds. Before turning to the mapping view, only one column should be selected. Press on the button left of "SWHE" in the table headers ("Open selection dialog for table column"), and select with the mouse one of the codes, then press o.k. The table should now comprise only one column. Afterwards use the drop-down list with the viewing options and choose map as shown below. Choose “HSMU.” to select the geometry for the HSMUs. The program will now load the geometry for the HSMU and draw the map which takes several seconds.

Generating co-ordinate files for the exploitations tools from shapefiles





ShapeFile (input) T:\britz\CAPRI\addon\gis\capri.shp Set file

ShapeFile (input) d:\hotspots\cities_Project.shp Set file

ShapeFile (input) d:\hotspots\main_rivers.shp Set file

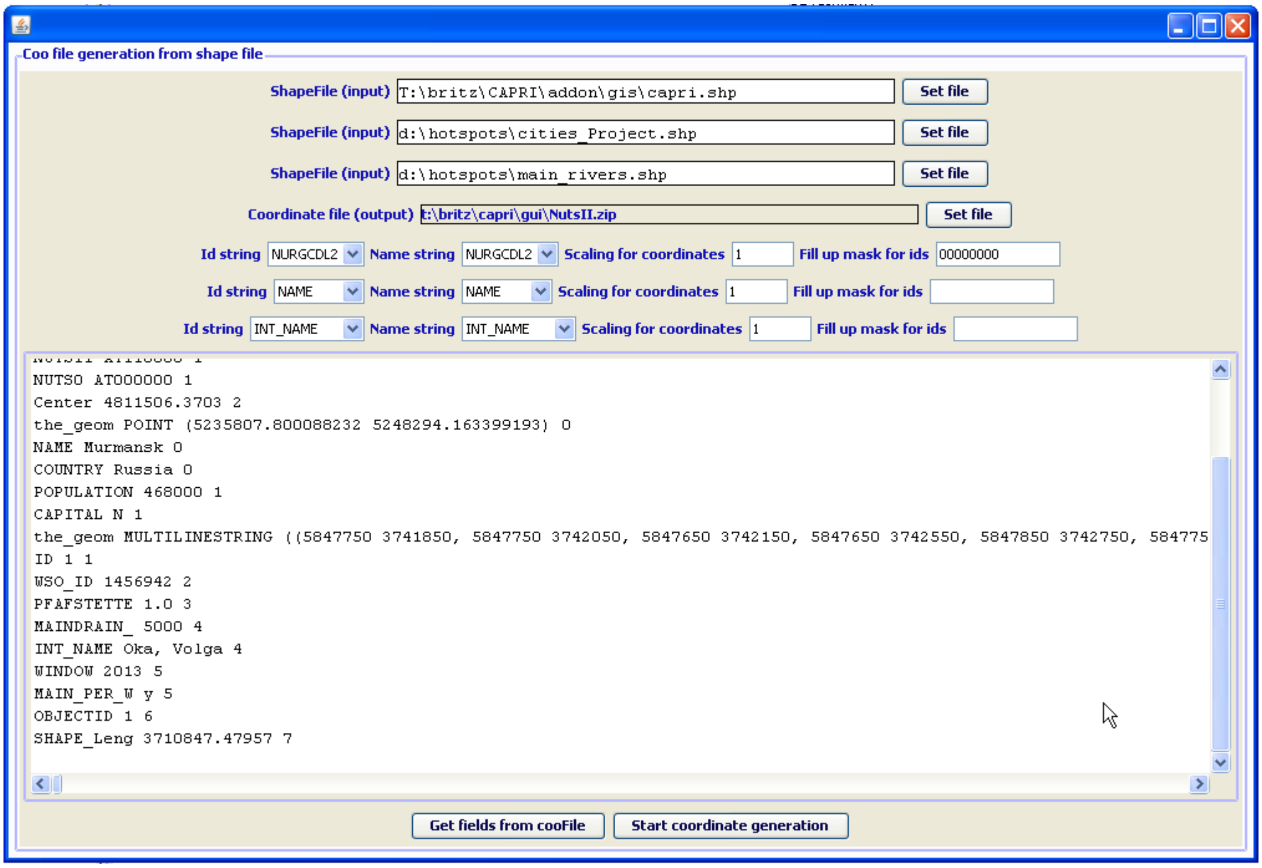
Coordinate file (output) t:\britz\capri\gui\NutsII.zip Set file

Id string Name string Scaling for coordinates 1 Fill up mask for ids 00000000

Id string Name string Scaling for coordinates 1 Fill up mask for ids

Id string Name string Scaling for coordinates 1 Fill up mask for ids

As a first step, the shapefiles must be analyzed by using the “Get field from coofile” button:



Coo file generation from shape file

ShapeFile (input) T:\britz\CAPRI\addon\gis\capri.shp

ShapeFile (input) d:\hotspots\cities_Project.shp

ShapeFile (input) d:\hotspots\main_rivers.shp

Coordinate file (output) t:\britz\capri\gui\NutsII.zip

Id string NURGCDL2 Name string NURGCDL2 Scaling for coordinates 1 Fill up mask for ids 00000000

Id string NAME Name string NAME Scaling for coordinates 1 Fill up mask for ids

Id string INT_NAME Name string INT_NAME Scaling for coordinates 1 Fill up mask for ids

```
NUTS0 AT000000 1
Center 4811506.3703 2
the_geom POINT (5235807.800088232 5248294.163399193) 0
NAME Murmansk 0
COUNTRY Russia 0
POPULATION 468000 1
CAPITAL N 1
the_geom MULTILINESTRING ((5847750 3741850, 5847750 3742050, 5847650 3742150, 5847650 3742550, 5847850 3742750, 584775
ID 1 1
WSO_ID 1456942 2
PFAFSTETTE 1.0 3
MAINDRAIN_ 5000 4
INT_NAME Oka, Volga 4
WINDOW 2013 5
MAIN_PER_W y 5
OBJECTID 1 6
SHAPE_Leng 3710847.47957 7
```

Once, that is done, the fields from the shapefiles used for keys and the long texts can be chosen, and some other settings. The interface will assume treat line strings as river, points as cities and polygons as regions.

Editing the table definitions underlying the exploitation tools

Views as the basic concept for exploitation in CAPRI

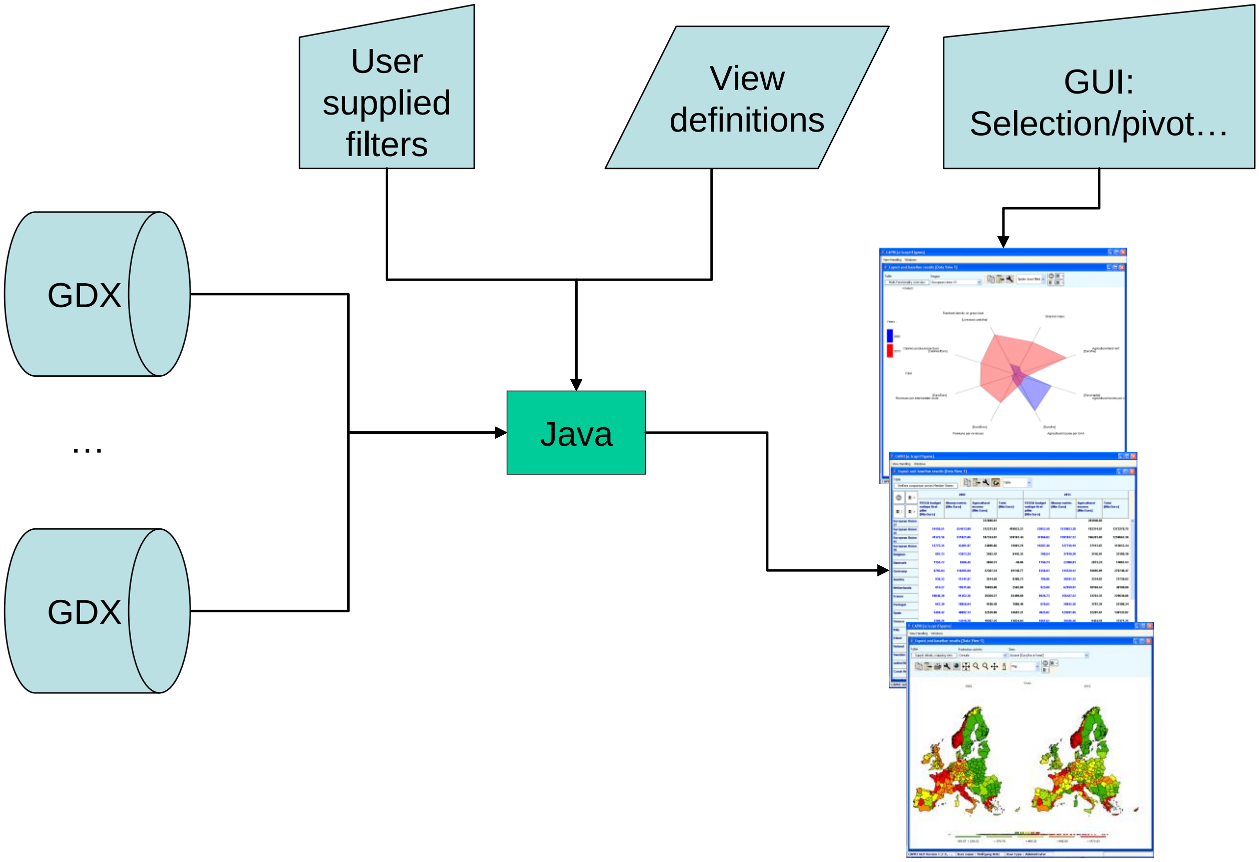
The concept of the CAPRI exploitation tools is centred on the idea of a view. Content wise, each view may be understood as showing one or several indicators relating to results of CAPRI working steps, e.g. environmental effects of farming, prices or market balances. Each view thus

- extracts a certain collection of numerical values
- labels them so that they carry information to the user (long texts, units)
- chooses a matching presentation – as a table, map or graphic
- and arranges them in a suitable way on screen.

The views can be linked to each others, allowing a WEB like navigation through the data cube. Views can be grouped to themes. The user may open several views in parallel, and he may change the views interactively according to its needs, e.g. switch from a map to a tabular presentation, or change the pivot of the table, sort the rows etc.

Internally, each view is stored in a XML schema. Technically, a view can be understood as a combination of a pre-defined selection query, along with reporting information. The XML schema allows to attach long texts, units and tooltips to the items of a table, and thus to show meta-data information to the user. The XML schema does hence replace look up tables in a DBMS. It may equally store information regarding the pivoting, the view type (table, map, different graphic types), and for maps, classification, colour ramp and number of classes. The views can be grouped into logical entities, and are shown as a popup menu to the user.

Tabular views may feature column and row groups. Empty columns and rows can be hidden; tables can be sorted by column, with multiple sort columns supported. Numerical filter can be applied to columns.

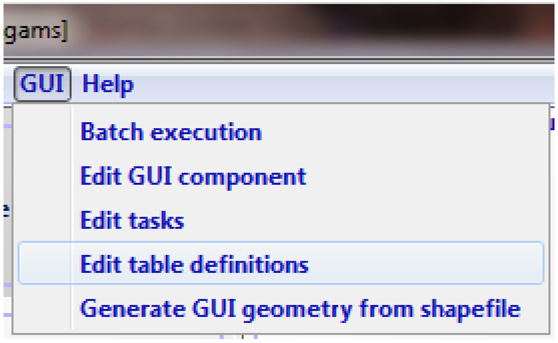


Why a XML definition files for views?

The exploitation tools of CAPRI build on a rather simple structure. Each CAPRI work step stores its results as GAMS parameter representing a multi-dimensional sparse cube which is stored as a GDX file. The exploitation loads the non-zeros from one or several GDX files into memory. However, given the length of the different dimensions and the use of short codes, the user would be typically lost on his own in the large tables, which can comprise several million non-zero data and basically an unlimited amount of zero cells. The XML definition file defines the views explained above, and allows a structured and user-friendly way to exploit the results of the different work steps. It also separates raw data from the views and from the GUI code itself, which requires relatively little information about the underlying data and their structure besides what is provided by the definition files. XML is an industry standard to store structured information in non-binary text files, which explains why that format was chosen. The user may change the information in two ways: (1) by using a tool built in the GUI and (2) by editing the XML files directly with an editor. The latter is only recommended for advanced users.

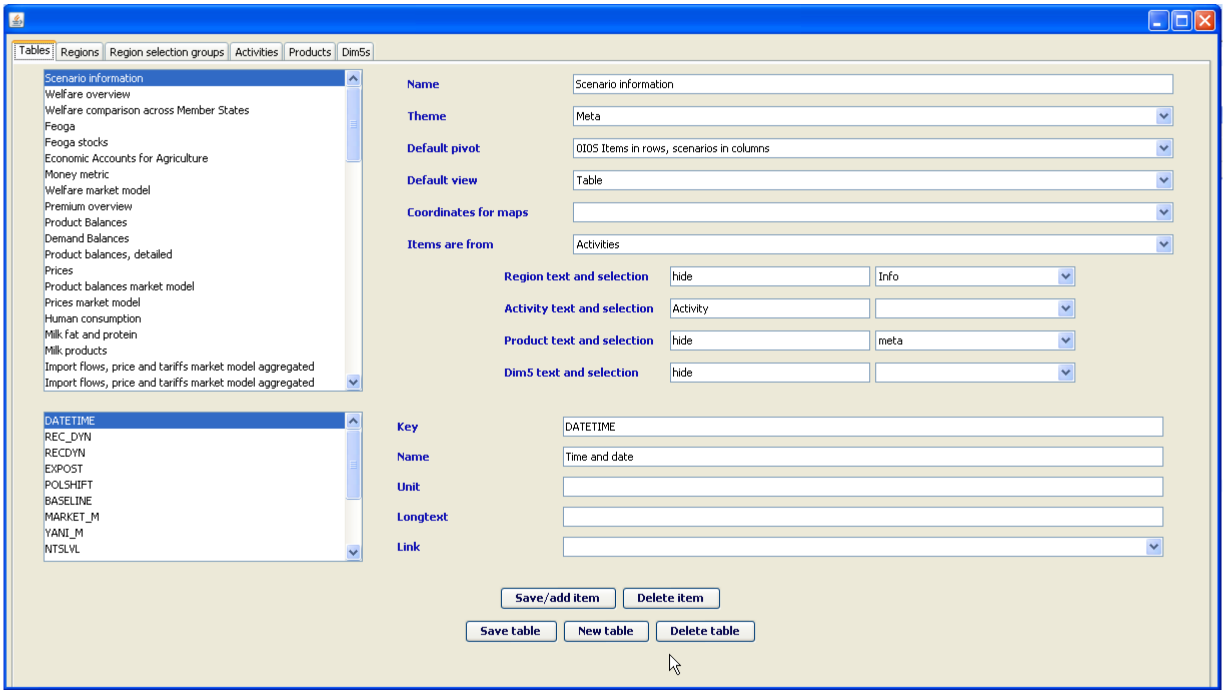
Defining and changing the view definition via the GUI interface

As a new add-on to the CAPRI GUI, the user can now edit the view interactively. In order to do so, chose "Utilities, Edit table definitions" from the toolbar.



Note: The utilities to define GUI components or tasks should not be used in the context of CAPRI.

A new window will open as shown below. It may stay open while the GUI is operated, allowing to check the effect of changes directly in the exploitation tools. The changes are only stored to the disk at the end of the session. Experimenting will hence do no immediate harm, a restart without saving to the disk will recover the original views.



Scenario information
Welfare overview
Welfare comparison across Member States
Feoga
Feoga stocks
Economic Accounts for Agriculture
Money metric
Welfare market model
Premium overview
Product Balances
Demand Balances
Product balances, detailed
Prices
Product balances market model
Prices market model
Human consumption
Milk fat and protein
Milk products
Import flows, price and tariffs market model aggregated
Import flows, price and tariffs market model aggregated

Name	Scenario information	
Theme	Meta	
Default pivot	0I0S Items in rows, scenarios in columns	
Default view	Table	
Coordinates for maps		
Items are from	Activities	
Region text and selection	hide	Info
Activity text and selection	Activity	
Product text and selection	hide	meta
Dim5 text and selection	hide	

DATETIME
REC_DYN
RECDYN
EXPOST
POLSHIFT
BASELINE
MARKET_M
YANI_M
NTSLVL

Key	DATETIME
Name	Time and date
Unit	
Longtext	
Link	

The new tool is structured according to the underlying logic and file. Tabs in the bottom line let the user select tables, or the different collections of items for regions, activities, products or dim5 (such as premium schemes or trading partners).

Defining a table

The pane for the table definition shows four sections. The upper left section allows selecting the table to edit. To the right, the basic attributes for the table are shown: its name, to which theme it belongs, the pivot and the view selected when the view is shown, and the coordinate file to use when a map is generated from the data. Below are the descriptions for the logical dimensions for the table and selection strings. Entering a new name allows generation of a new table.

The lower part relates the items of the tables. They can be selected on the left hand side according to their key under which they are stored in the GDX file. The right hand side shows the key again. Entering a new key allows adding new items. The link allows placing a hyperlink for that item to another table.

Probably, at some later stage, the editor tool and Java code will be changed in a way that allows for more properties of the view (hide empty columns/rows, specificities for the views)to be edited.

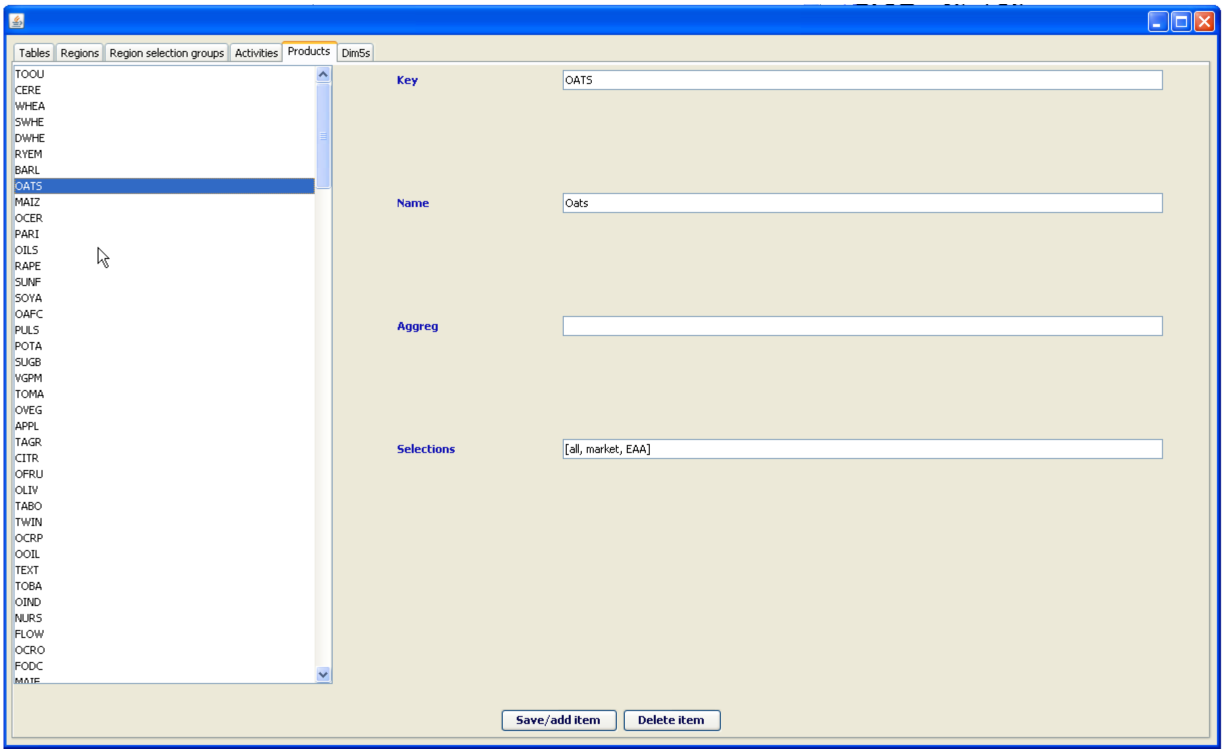
Beware: before editing a new item, save your last changes!

Once all items and properties of a table had been entered, save your changes.

Defining the list of activities, products, regions or dim5s

The screen shot below shows as an example the list for the products. Their keys under which they are loaded from the GDX file(s) are shown in a selection list on the left hand side. The right hand side shows the properties for each item. Changing the key allows to add a new item to the list. The name is the one shown to the user in the views, setting “Aggreg” to yes will let the item be shown twice: once in a block on top, showing only aggregates, and a second time in the list of all items. Components of aggregates should be placed underneath an aggregate in the list.

The selection should be entered comma separated in brackets.



Key: OATS

Name: Oats

Aggreg:

Selections: [all, market, EAA]

The buttons should be self explaining.

Exploitation tools

The structure of the GAMS generated gdx files

The exploitation tools load directly the gdx-files generated by the GAMS processes linked to the tasks described above. The gdx-files only store non-zero numerical values. The main content of a gdx file are two types of records. The first type provides a list of all labels used to identify the numerical data in the gdx file as GAMS does not support numerical indices, but requires character labels. The list does not distinguish for which data dimensions the labels are used. They are hence typically a mix of product, activity, region and further labels. The second type of records belongs to GAMS parameters (scalars, vectors, or multi-dimensional tables). Each non-zero numerical item in each parameter has its own record. Each of these records provides the numerical data in double precision (depending on the parameter type there may be different data stored in one record, as for variables its upper and lower bound, current level and marginal value etc.), and a vector of indices pointing in the list of codes described above.

Loading the data from gdx files

The data matrices generated by the different tasks as described above and stored in gdx-files are typically rather sparse, so that it seemed appropriate to load the data from the gdx-file into hash tables for exploitation purposes. That is done in a two step procedure. In the first step, all records from the gdx file are read and vectors of all found indices are stored. The length of each data dimension is only known when all data records are read, and is equal to the number of unique indices for each dimension. Once all records are read, the final length of these index vectors then defines a linear index room for the multi-dimensional table. In a second step, the records are read again, and the index vectors for each record now allow to define a linear index in the total table. A hash code is derived from that linear index to store the numerical values into a hash table. As the number of items to store in the hash table is known beforehand, a rather simple hash table implementation can be used. If necessary, step one can be run over several parameters which may be hosted in several gdx files, so that results from different runs can be merged into one hash table.

As the gdx-files provide lists of all labels used in any parameters stored in that gdx-file, the index vectors allows to build lists of labels linked for each index in a data dimension. There exists an additional storage type in the gdx-files to retrieve long-texts to the labels as defined in GAMS set definitions. However, one label may occur in different sets with different long texts, and the gdx-file does not store a possibly user defined relation between a data dimension of a parameter and a specific set, an option termed domain checking in GAMS. In order to link hence long-texts to the labels used for a specific data dimension, two options are possible. Firstly, at run time the user may interactively re-establish the link between data dimensions and specific sets, and thus add long-texts to the labels used on that data dimension based on his knowledge. Or the relation may be hard coded in the JAVA code.

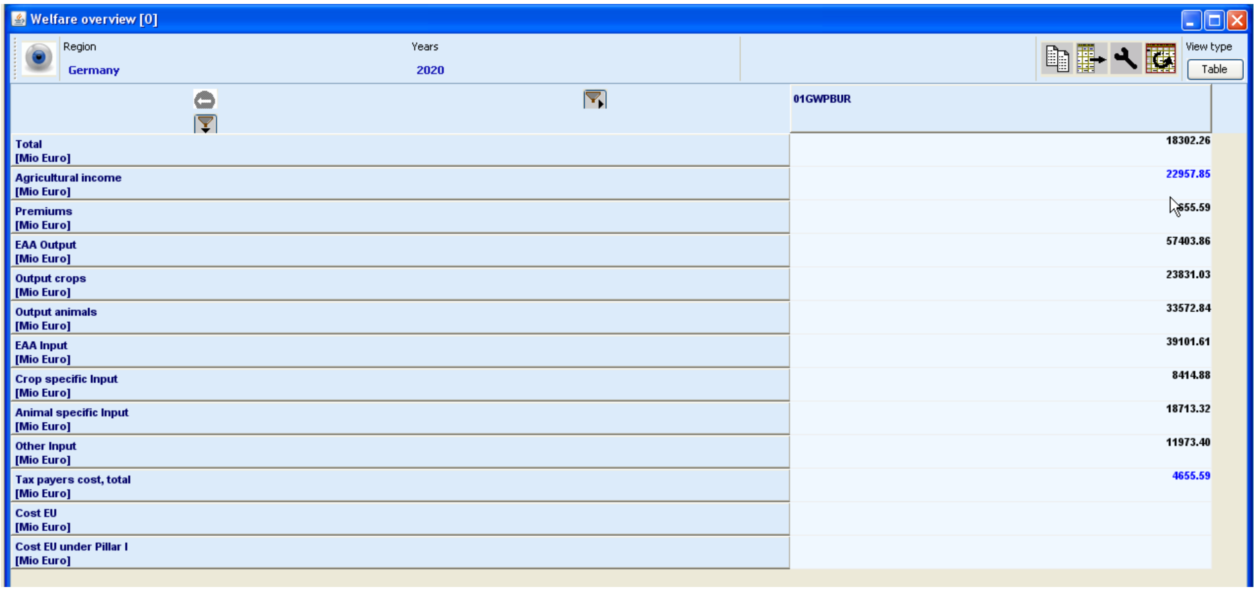
Multi-dimensional viewer with pivoting and exporting possibilities

The multi-dimensional table is then loaded in a spreadsheet like viewer with pivot-possibilities. The user may switch between a tabular view of the data, or different types of graphs (line, bar, pie, spider) or maps. Scroll-down boxes allow the user to rotate through data dimension not shown in the view port columns and rows. Several data dimensions may be merged into one view port dimension. The user can use column and rows groups, and may apply selection to columns and rows as well as to columns and column groups. Rows carrying zero values may only be hidden. Rows may be sorted by size of the numerical values in one or several columns. The current table may be loaded into the clipboard. Alternatively, all or a selection of tables may be exported to an external file, in different formats (HTML, CSV, tab-separated, GAMS, fixed width tables). There are further possibilities as changing fonts or the number of decimals.

Pre-defined views

An XML file links pre-defined views to the result content of the tasks. Each view defines selections in the different data dimensions, the view type (table, graph or map) and the pivot, plus some other information.

Graph: A pre-defined view



Welfare overview [0]

Region: Germany

Years: 2020

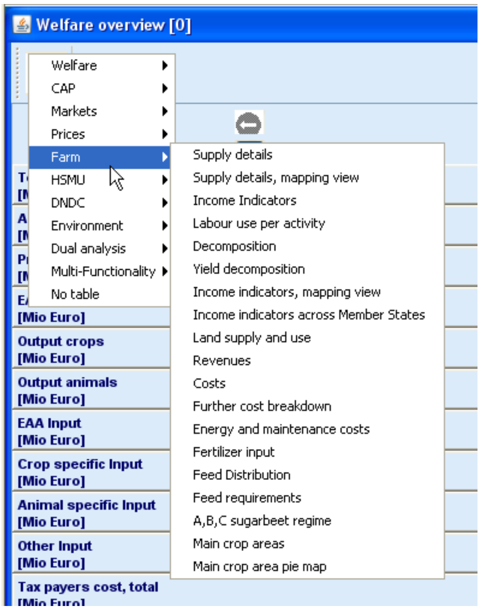
View type: Table

	01GWPBUR
Total [Mio Euro]	18302.26
Agricultural income [Mio Euro]	22957.85
Premiums [Mio Euro]	655.59
EAA Output [Mio Euro]	57403.86
Output crops [Mio Euro]	23831.03
Output animals [Mio Euro]	33572.84
EAA Input [Mio Euro]	39101.61
Crop specific Input [Mio Euro]	8414.88
Animal specific Input [Mio Euro]	18713.32
Other Input [Mio Euro]	11973.40
Tax payers cost, total [Mio Euro]	4655.59
Cost EU [Mio Euro]	
Cost EU under Pillar I [Mio Euro]	

View selection

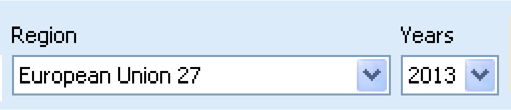
The *currently selected view* is shown as a description of the window title

It can be changed by pressing the view button. Pressing the button opens a pop-up menu to *select another view*. The available views will depend on the results you have loaded. The views are logically grouped under heading, and moving the cursor on the heading will show the single views. Some views will be opened as graphics (see chapter) or maps (see chapter).



Navigating in the outer dimensions of the viewport

In many views, some data dimensions will not be shown in the columns and rows, but as drop-down boxes in the toolbar. Use the mouse to select within the boxes. You can also use the keyboard to search items by typing. An example for these controls is shown here. .



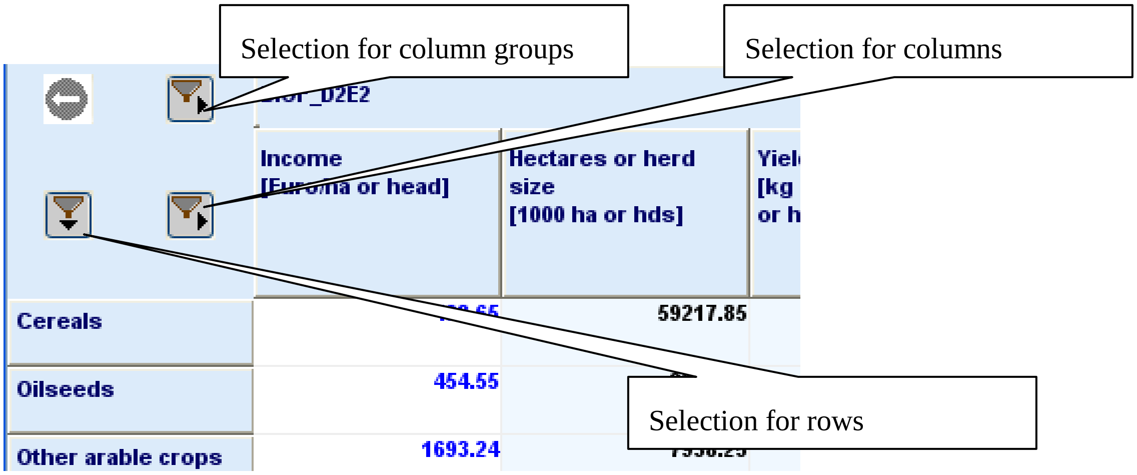
Region: European Union 27

Years: 2013

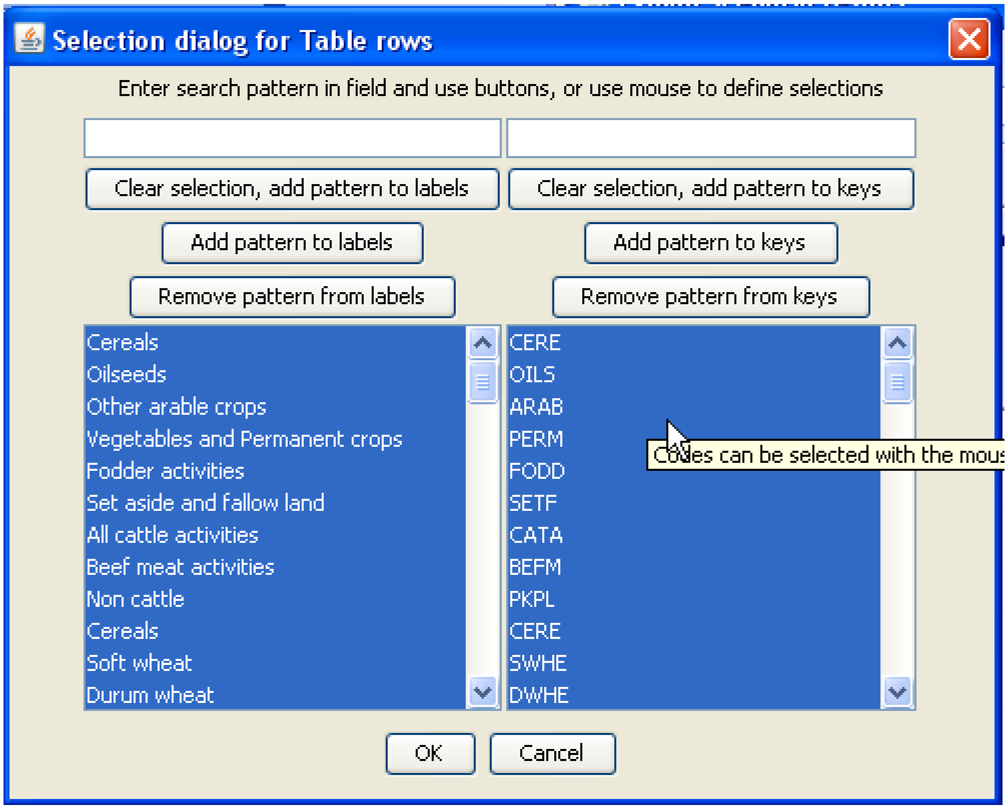
Note: If an outer dimension does only comprise one element, no drop-box list is shown

Column and row selection

Columns and rows can be hidden and included in the current view by using the buttons shown below.



Double-clicking the button will open a selection dialogue:


Selection dialog for Table rows

Enter search pattern in field and use buttons, or use mouse to define selections

Clear selection, add pattern to labels
Clear selection, add pattern to keys
Add pattern to labels
Add pattern to keys
Remove pattern from labels
Remove pattern from keys
OK
Cancel

Cereals	CERE
Oilseeds	OILS
Other arable crops	ARAB
Vegetables and Permanent crops	PERM
Fodder activities	FODD
Set aside and fallow land	SETF
All cattle activities	CATA
Beef meat activities	BEFM
Non cattle	PKPL
Cereals	CERE
Soft wheat	SWHE
Durum wheat	DWHE

Codes can be selected with the mous

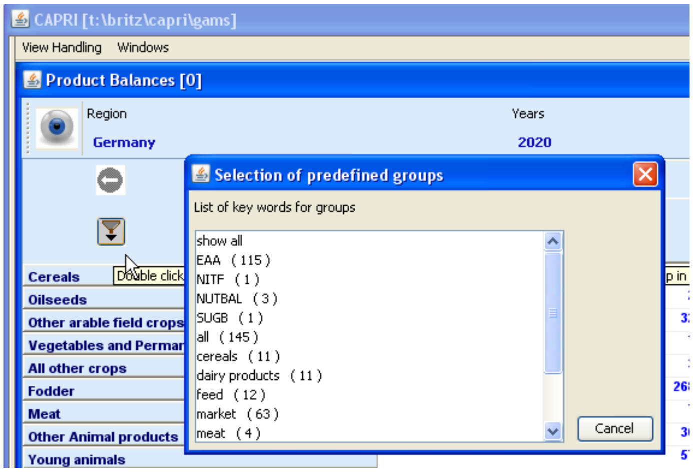
The selections can be done by mouse, following the convention of the operation systems. Additionally, a selection string can be entered in the field above, with the following possibilities:

- “*” select all
- “C*” select all items starting with “C”, “C???” will select a string starting with C followed by any 3 characters.

After entering the selection string in the text field, one of the three buttons must be right-clicked. The Clear selection, add pattern to labels button will remove any selection and select only those items which match the pattern entered in the text field. Add pattern to labels will keep the selection and add the matching items, whereas Remove pattern from labels will remove matching items from the selection.

Predefined selection groups

For some tables, pre-defined selection groups for columns or rows are stored. When the mouse is moved over the selection button and rests there for some time and such groups exists, a dialogue will show as below where the groups can be selected.



CAPRI [t:\britz\capri\gams]

View Handling Windows

Product Balances [0]

Region: Germany

Years: 2020

Cereals
Oilseeds
Other arable field crops
Vegetables and Permar
All other crops
Fodder
Meat
Other Animal products
Young animals

Double click

Selection of predefined groups

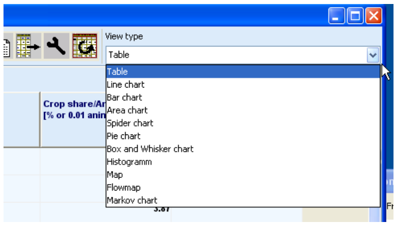
List of key words for groups

show all
EAA (115)
NITF (1)
NUTBAL (3)
SUGB (1)
all (145)
cereals (11)
dairy products (11)
feed (12)
market (63)
meat (4)

Cancel

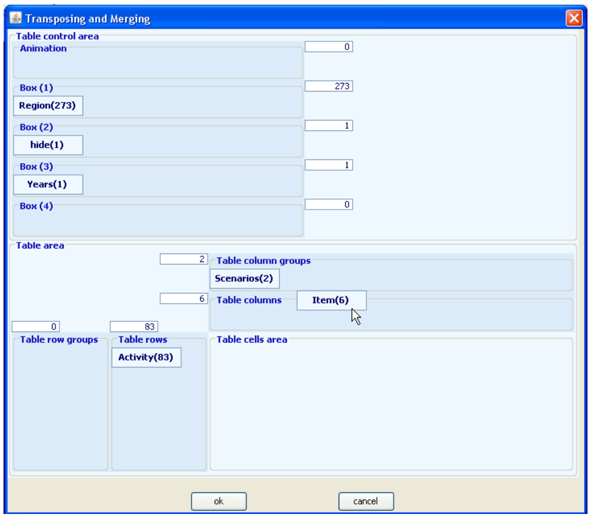
Selection of the view type

As discussed below, the data can be shown as tables, graphics or maps, to do so use the view selection drop-down box:



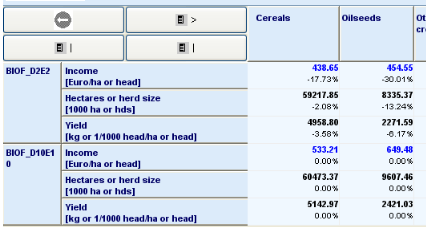
Manually changing the pivot

Normally, the predefined views will link the data dimension in an appropriate way to columns and rows. However, the user is free to change the pivot, to e.g. generate a cross-sectional series. A dialog opens when double-clicking the button to pivot the currently shown or selected part of the view:



The boxes Scenarios(2) show the data dimension and their lengths. They can be dragged to the different viewport dimensions as shown in the screen shot above. Assigning several dimensions to the columns Table columns Scenarios(2) Item(6) leads to "spanned" dimensions BIOF_D2E2 Income [Euro/ha or head].

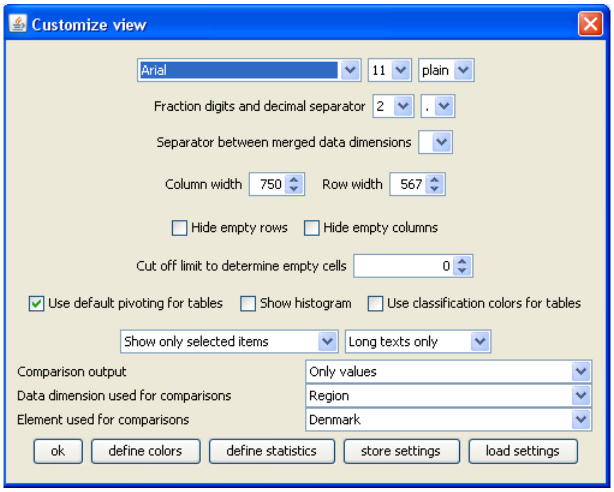
Alternatively, columns and rows can have row block: In combination with the selections for columns and rows, and column and row blocks, the view can be adjusted to the need of the user, e.g. to export the data in a specific ordering to an external file.



		Cereals	Oilseeds	Ot cr
BIOF_D2E2	Income [Euro/ha or head]	438.65 -17.73%	454.55 -30.01%	
	Hectares or herd size [1000 ha or hds]	59217.85 -2.08%	8335.37 -13.24%	
	Yield [kg or 1/1000 head/ha or head]	4958.80 -3.58%	2271.59 -6.17%	
BIOF_D10E10	Income [Euro/ha or head]	533.21 0.00%	649.48 0.00%	
	Hectares or herd size [1000 ha or hds]	60473.37 0.00%	9607.46 0.00%	
	Yield [kg or 1/1000 head/ha or head]	5142.97 0.00%	2421.03 0.00%	

Changing view options

A dialog opens when pressing the 🔧 button to change various options of the current view:



Customize view

Arial | 11 | plain

Fraction digits and decimal separator 2 .

Separator between merged data dimensions

Column width 750 Row width 567

□ Hide empty rows □ Hide empty columns

Cut off limit to determine empty cells 0

☑ Use default pivoting for tables □ Show histogram □ Use classification colors for tables

Show only selected items | Long texts only

Comparison output: Only values

Data dimension used for comparisons: Region

Element used for comparisons: Denmark

- *Fonts*: set font family, size and style - affects tabular views.

- *Number formatting*: chose the number of digits and define the decimal separator. The tool supports rounding numbers before the decimal point by allowing for negative fraction digits. Choosing e.g. -1 will round all numbers to tens. . The numbers shown in graphics or tables are based on the rounded results is applied.

- *Hide empty rows and hide empty columns* will suppress in the currently seen view, any columns and rows which would show only blank cells.

- *Cut off limit to determine empty cells* . In standard mode, the interface will treat zeros as missing values, and items will be shown as blanks. But the user might also enter a different value (any value, in absolute terms, below the threshold will be treated as if it was zero).

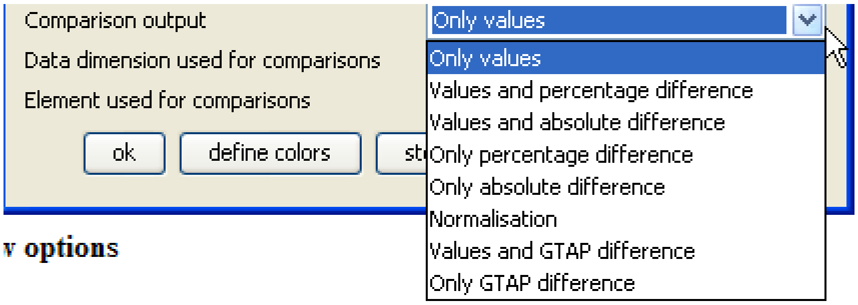
- *Use default pivoting for table*: That is the normal mode, where the pivot is defined by the table views. By clicking that off, the currently chosen pivot (from the current table or manually defined) will be kept even if a different table is chosen.

- *Show histogram*: A histogram is shown additionally to the current view as a separate window. The current window might however hide the histogram window, so that minimizing other windows might be required.

- *Use classification colors for tables*: Use the colours which would be used to colour the regions in a thematic map to colour the numbers shown in tables.

- *Use of short code and/or long texts*

- *Comparison output*: the exploitation tools can add different types of comparison output. They also affect what is shown in maps and graphics.



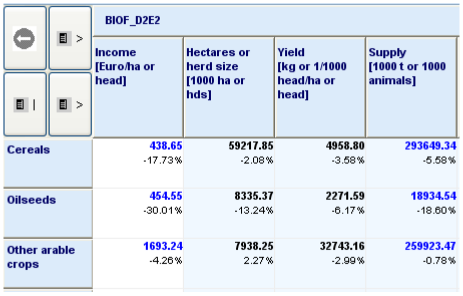
Comparison output	Only values
Data dimension used for comparisons	
Element used for comparisons	

Only values
Values and percentage difference
Values and absolute difference
Only percentage difference
Only absolute difference
Normalisation
Values and GTAP difference
Only GTAP difference
ok
define colors
st

v options

"Normalisation" means that the value is divided by the comparison points, allowing e.g. also to calculate shares. The "GTAP" difference is a compromise between a percentage and an absolute difference: it multiplies the difference in the logs with the difference (thanks to Rob McDougall from the GTAP team in Purdue for the proposal).

In tables, the "and" options will show two lines in each data cell, one with the observations, and one with the comparison output, as seen below. The "Data dimension used for comparisons" offers a drop-down list" to select the "Element used for comparisons" defined the comparison point.



BIOF_D2E2

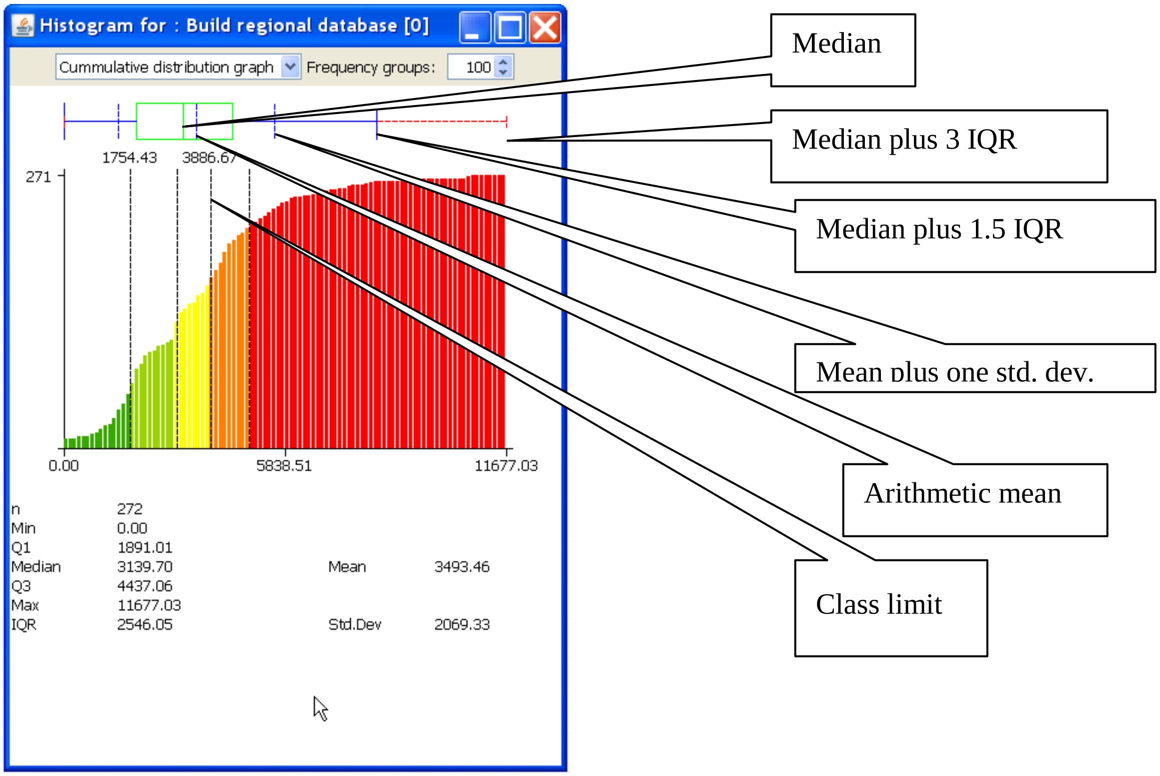
	Income [Euro/ha or head]	Hectares or herd size [1000 ha or hds]	Yield [kg or 1/1000 head/ha or head]	Supply [1000 t or 1000 animals]
Cereals	438.65 -17.73%	59217.85 -2.08%	4958.80 -3.58%	293649.34 -5.58%
Oilseeds	454.55 -30.01%	8335.37 -13.24%	2271.59 -6.17%	18934.54 -18.60%
Other arable crops	1693.24 -4.26%	7938.25 2.27%	32743.16 -2.99%	259923.47 -0.78%

Showing a histogram window

The system offers different ways to retrieve information about the distribution. For maps and tables, the user can show an additional window with a box and whisker diagram, histogram and some descriptive statistics as shown below. The box and whisker diagram is defined as follows: the green box shows the first (Q1) to third quartile (Q3), so that the width of the box is equal to the so-called inner quartile range (IRQ). The blue "whiskers" are defined by Q1 minus 1.5 times IQR and Q3 plus 1.5 times IQR, but bounded by the minimum and maximum of the observations. In many applications, any value falling outside that range is classified as a mild outlier. The red dotted whiskers are at Q1 minus 3 times IQR and Q3 plus 3 times IQR, but bounded by the minimum and maximum of the observations. In many applications, any value falling outside that range is classified as a stronger outlier.

The user can restrict the plotted range as to exclude stronger outliers. If outliers are present, the red dotted whiskers at the tail with strong outliers are removed.

The blue dotted lines show the mean, and +/- one standard deviation around the mean. For a normal distribution, that would cover around 2/3 of the observations. The black dotted lines in the histogram show the class limits used for the colour model. The bottom reports some descriptive statistics. The technical implementation is set up according to the way maps are drawn: the population consists of all values in the rows and the columns of the table, and thus differs from the outlier control, which treats each column as a separate set of observations.

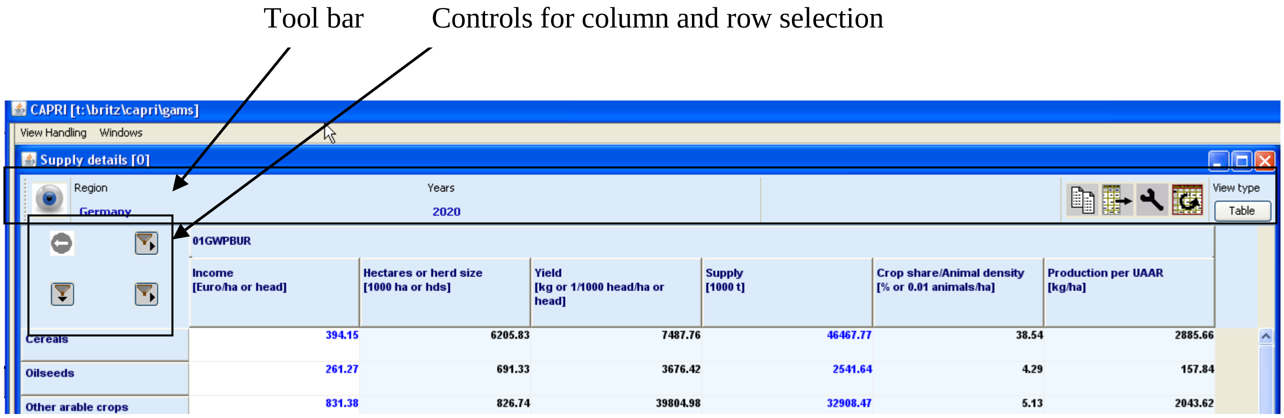


Cummulative distribution graph Frequency groups: 100

```
n        272
Min      0.00
Q1       1891.01
Median   3139.70              Mean       3493.46
Q3       4437.06
Max      11677.03
IQR      2546.05              Std.Dev    2069.33
```

The colours are typically used to visualize the distribution in maps, but, as a second option, they can also be applied to the numerical values in tables. Alternatively, histograms and box and whisker diagrams can be drawn via the graphics.

Working with tables



Tool bar

Controls for column and row selection

CAPRI [t:\britz\capri\gams]

Supply details [0]

Region: Germany

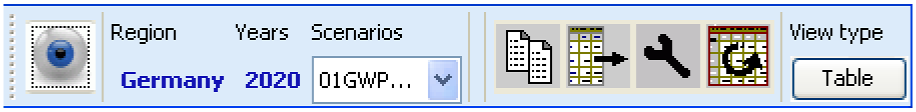
Years: 2020

View type: Table

01GWPBUR

	Income [Euro/ha or head]	Hectares or herd size [1000 ha or hds]	Yield [kg or 1/1000 head/ha or head]	Supply [1000 t]	Crop share/Animal density [% or 0.01 animals/ha]	Production per UAAR [kg/ha]
Cereals	394.15	6205.83	7487.76	46467.77	38.54	2885.66
Oilseeds	261.27	691.33	3676.42	2541.64	4.29	157.84
Other arable crops	831.38	826.74	39804.98	32908.47	5.13	2043.62

The toolbar



Region: Germany

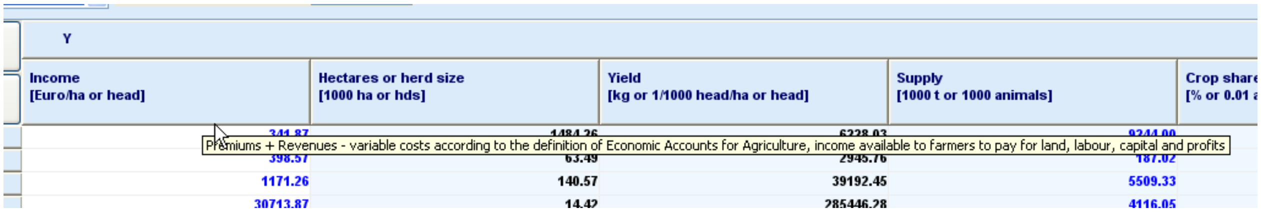
Years: 2020

Scenarios: 01GWP...

View type: Table

Tooltips for column and row headers

For predefined tables, tooltips may be stored which give additional information on the columns and rows. They will appear when the mouse is moved over the respective column or row header.



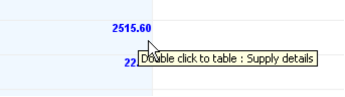
Y

Income [Euro/ha or head]	Hectares or herd size [1000 ha or hds]	Yield [kg or 1/1000 head/ha or head]	Supply [1000 t or 1000 animals]	Crop share [% or 0.01 a
341.87	1484.26	6228.03	9244.00	
398.57	63.49	2945.76	187.02	
1171.26	140.57	39192.45	5509.33	
30713.87	14.42	285446.28	4116.05	

Premiums + Revenues - variable costs according to the definition of Economic Accounts for Agriculture, income available to farmers to pay for land, labour, capital and profits

Drill-down

Some views comprise hyper-links to other tables. Numbers with hyperlinks are shown in blue, and a tooltip will appear when the mouse is moved over them. Double-clicking in the cell will jump to the connected table.



2515.60

22

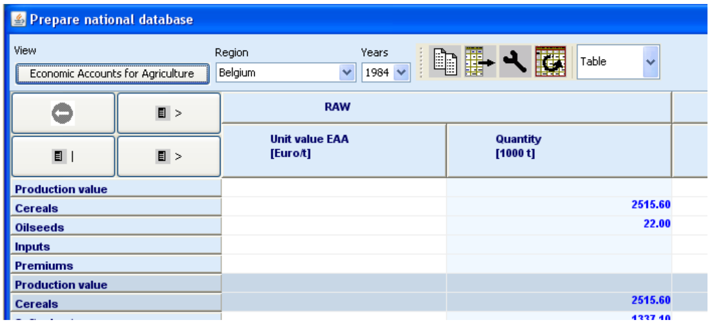
Double click to table : Supply details

Clipboard export

The content of the currently shown view can be copied to the clipboard by pressing the button. Tables are placed as tab delimited text in the clipboard, so that they can be pasted into spreadsheets. Graphics and maps are placed as graphics in the clipboard and can be copied e.g. into word processing.

Export to file

A dialog opens when pressing the button to export the full dataset of the view to a file. The action provoked by the button depends on the view type. In tabular view, in opposite to the clipboard export, the export file will scroll through the outer dimensions and will copy all stacked tables after each other into a file. Take the table below as an example. Clipboard export will export the data for Belgium and 1984. File export fill export data for *all* regions and for *all* years, if the user does not apply filters in the export dialog. An example is discussed on page 102.



Prepare national database

View: Economic Accounts for Agriculture

Region: Belgium

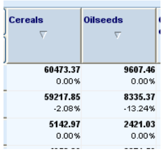
Years: 1984

Table

	RAW	
	Unit value EAA [Euro/t]	Quantity [1000 t]
Production value		
Cereals		2515.60
Oilseeds		22.00
Inputs		
Premiums		
Production value		
Cereals		2515.60

Sorting

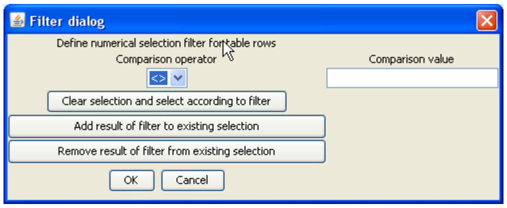
The rows can be sorted by one or several columns by clicking with the left mouse button in the column headers. Adding additional sorting columns is achieved by pressing the "shift"-key and then using the mouse as explained before. A sorting symbol will show sort direction, and its size will show the sorting order.



Cereals ▽	Oilseeds ▽
60473.37 0.00%	9607.46 0.00%
59217.85 -2.08%	8335.37 -13.24%
5142.97 0.00%	2421.03 0.00%

Numerical filtering based on cell content

Clicking with the right mouse button on one of the column headers will open the "filter dialog" which can be used to apply numerical filters to remove rows not matching the filter from the view.



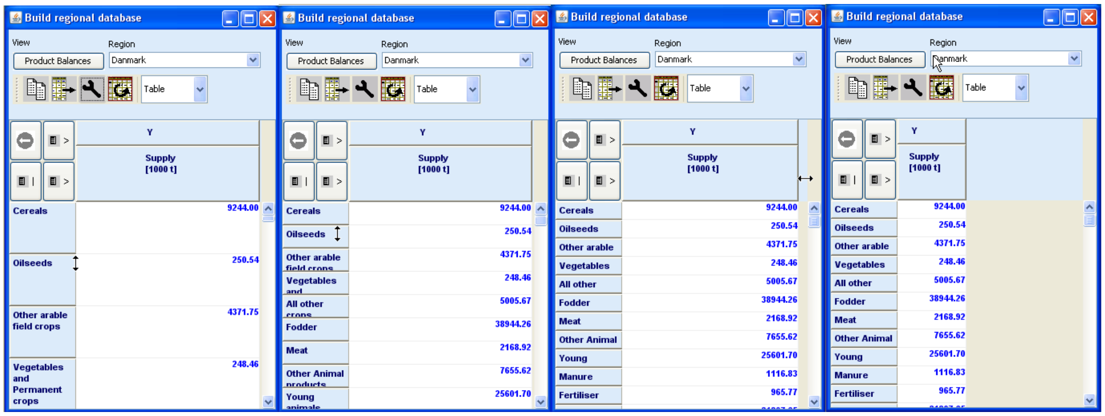
Define numerical selection filter for table rows

Comparison operator: <>

Comparison value:
Clear selection and select according to filter
Add result of filter to existing selection
Remove result of filter from existing selection
OK
Cancel

Changing the row height and column width with the mouse

While dragging with the mouse the bottom of the first row header, the cell height of each row (the height of each row) is changed at the same time. But, the column width can be changed selectively per each desired column (if you change the width on one column, the widths of the other columns do not change).The column width can be changed in a similar way by dragging the right border of the column header. Alternatively, the size can set in the “Changing view options” dialogue.



View: Product Balances

Region: Danmark

Table

	Y Supply [1000 t]
Cereals	9244.00
Oilseeds	250.54
Other arable	4371.75
Vegetables	248.46
All other	5005.67
Fodder	38944.26
Meat	2168.92
Other Animal	7655.62
Young	25601.70
Manure	1116.83
Fertiliser	965.77

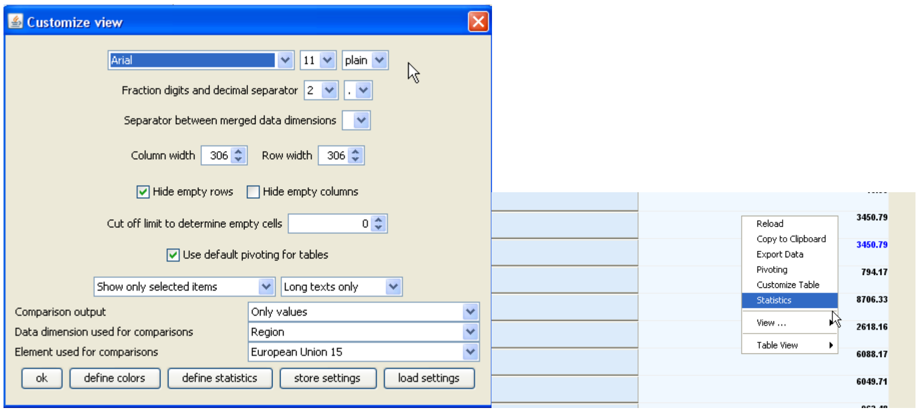
Adding statistics

The user may add different statistics as rows to the table as reported in the following table. The observations are assumed to be mapped into the rows of the current views. Zeros can be treated as missing values. The statistics summarize the observation separately for each column.

Statistics	**Shortcut**
Number of observations	nObs
Arithmetic mean	Mean
Median	Median
Standard Deviation	StdDev

End value in first quartile	q1
First value in fourth quartile	q4
Minimum of the values	min
Maximum of the values	max
Minimum limit for outlier detection as defined from user settings	minOutlier
Maximum limit for outlier detection as defined from user settings	maxOutlier

The above related options can be either found in the “customize dialogue” box, which opens by clicking the button on the toolbar, using the “define statistics” button, or by right clicking on any cell inside the table to open the popup menu, and choosing “Statistics”.



Customize view

Arial | 11 | plain

Fraction digits and decimal separator 2 .

Separator between merged data dimensions

Column width 306 Row width 306

☑ Hide empty rows ☐ Hide empty columns

Cut off limit to determine empty cells 0

☑ Use default pivoting for tables

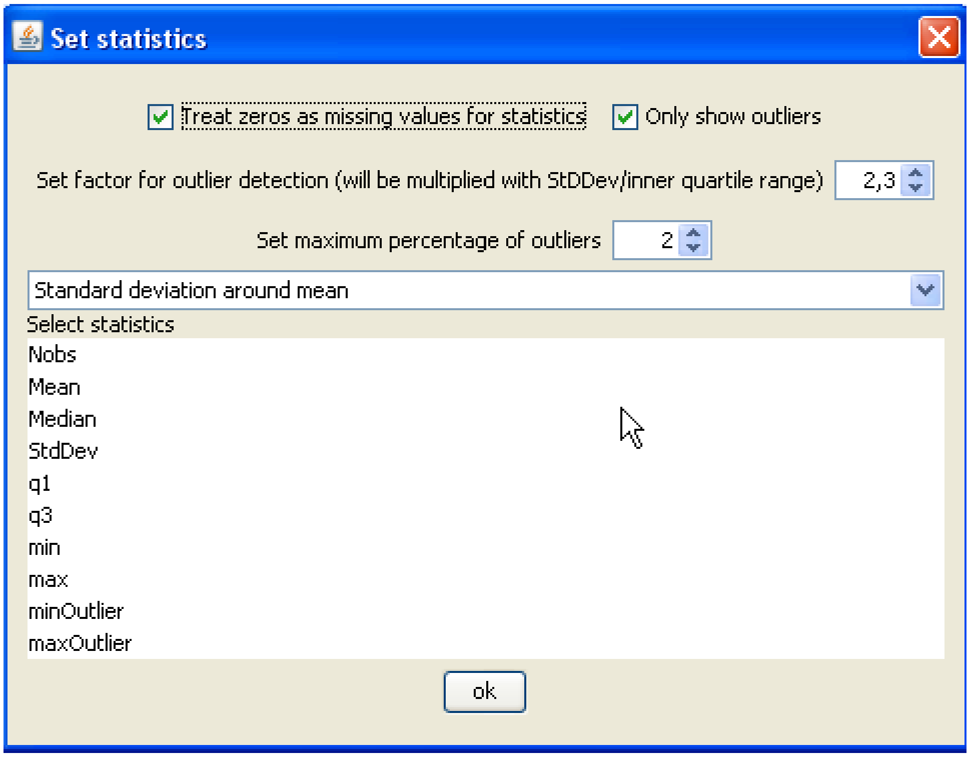
Show only selected items | Long texts only

Comparison output: Only values

Data dimension used for comparisons: Region

Element used for comparisons: European Union 15

The dialog has the options as shown below, which in parts are dynamically changing depending on the detection algorithm.



Set statistics

☑ Treat zeros as missing values for statistics ☑ Only show outliers

Set factor for outlier detection (will be multiplied with StDDev/inner quartile range) 2,3

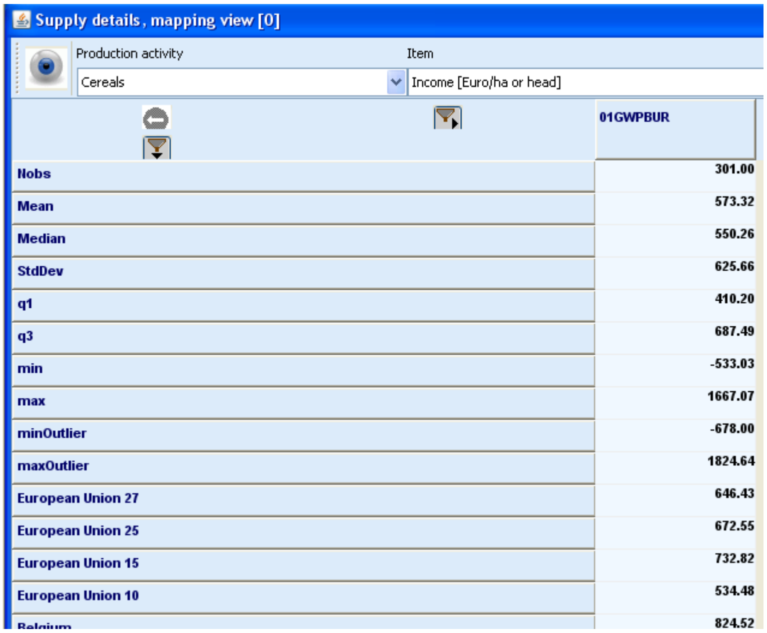
Set maximum percentage of outliers 2

Standard deviation around mean

Select statistics

Nobs
Mean
Median
StdDev
q1
q3
min
max
minOutlier
maxOutlier

The selected statistic options will appear as first rows of the table:



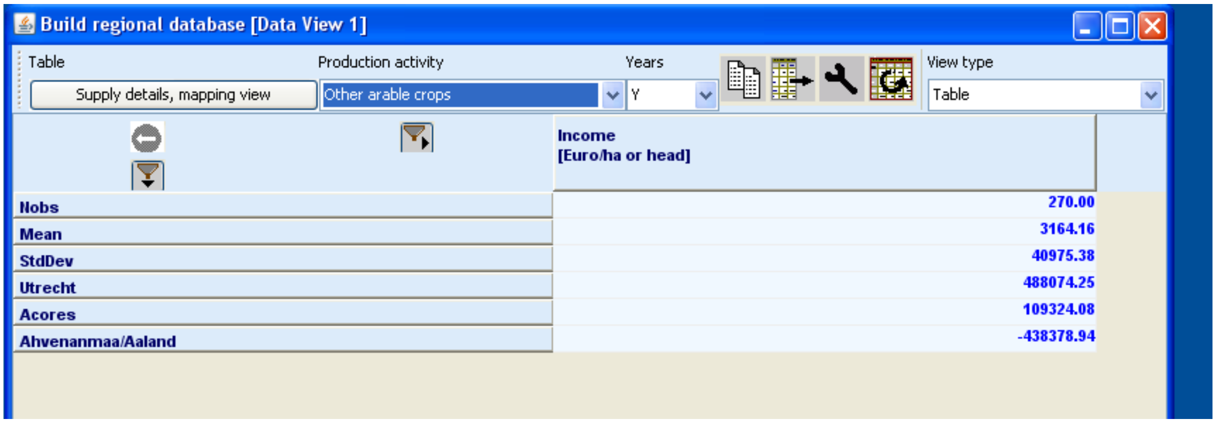
Supply details, mapping view [0]

Production activity: Cereals

Item: Income [Euro/ha or head]

	01GWPBUR
Nobs	301.00
Mean	573.32
Median	550.26
StdDev	625.66
q1	410.20
q3	687.49
min	-533.03
max	1667.07
minOutlier	-678.00
maxOutlier	1824.64
European Union 27	646.43
European Union 25	672.55
European Union 15	732.82
European Union 10	534.48
Belgium	824.52

Perhaps the most interesting option is to show only the outlier rows besides the statistics in the table, as illustrated below:



Build regional database [Data View 1]

Table: Supply details, mapping view

Production activity: Other arable crops

Years: Y

View type: Table

	Income [Euro/ha or head]
Nobs	270.00
Mean	3164.16
StdDev	40975.38
Utrecht	488074.25
Acores	109324.08
Ahvenanmaa/Aaland	-438378.94

Outlier detection algorithms implemented

The GUI offers currently the following ways to look up possible outliers. For all the methods, the user may additionally define a maximum percentage of observations show in which case only the largest or smallest outliers according to the outlier detection algorithm shown will be selected.

Standard deviation around the mean

The user can define the factor β before the standard deviation. Observations are marked as outliers when their distance to the arithmetic mean exceeds the value defined by the multiplication of the standard deviation σ and a user defined factor β:

$$\neg\left(\bar{x}+\beta_{\sigma}\cdot\sigma > x_{i} > \bar{x}-\beta_{\sigma}\cdot\sigma\right).$$

Large outliers can easily bias the result as they will change both the mean and the standard deviation of the observation sample. Further on, many time series in the CAPRI data base have by definition a lower limit of zero, so that the assumption of normally distributed data sets cannot hold. Therefore, other outlier detection methods are also implemented as discussed below. The dialog allows changing the factor β from its default of 2 which covers 95% of the values for normally distributed data.

Standard deviation of values normalized by median

The values are all divided by the median and the new series is classified as under the option discussed above. The main advantage of that method is the shift to a mid point which is less vulnerable to large outliers in the observations.

Standard deviation of trend line error

A regression is estimated by using the index position in the unsorted values as explanatory values. The resulting errors are then classified according to the first option discussed above. The typical application would be a table where consecutive time points – e.g. years – are shown along the rows.

Median and inner quartile range

Box-and-whisker charts, which are also supported by the graphics view, are using the median and quartile to visualize the distribution. They are also an easy and robust way to detect possible outliers. First, the so-called "inner quartile range (IQR)" is calculated as the difference in values between the beginning value of the first and the ending value of the third quartile. The IQR then consists of the 50% range of values around the median. The IQR is multiplied with a user defined factor β added to Q3 respectively subtracted from Q1 to define the lower and upper bound for regular values. The factor β default value is 1.5. The quartiles and the median are not affected by outliers at the tails of the distribution, allowing for a rather robust way to filter outliers:

$$\neg\left(Q3+\beta_{IQR}\cdot IQR > x_i > Q1-\beta_{IQR}\cdot IQR\right)$$

Conformity based on relation of distances

Here, the following formulae are used, taken from Last & Kandel (2001):

$$\mu_{i,l} = 2\Big/\left(1+\exp\left(\frac{\beta\cdot n\cdot m\cdot\left(x_{i+1}-x_i\right)}{x_{i+m}-x_{i+1}}\right)\right)$$

$$\mu_{i,h} = 2\Big/\left(1+\exp\left(\frac{\beta\cdot n\cdot m\cdot\left(x_i-x_{i-1}\right)}{x_{i-1}-x_{i-m-1}}\right)\right)$$

They define "conformity" from below and above by comparing the distance from the current value to its neighbour in relation to the average distance for a predefined group size *m*. Before the formulae are applied, the values are sorted. In opposite to the outliers based on first and second moment, the method is also able to detect outliers in between "clusters" of values. Inside such a cluster, differences in distances between values are small, so that the relation between the distance to the next neighbour, and the average distance between the neighbour and its m-th neighbour is around unity. The big advantage of the approach is that it does neither assume a certain functional form for the distribution (as in the case of the mean/standard deviation approach), nor a uni-modal distribution as in the case of the IQR method, and it is rather easy to compute. It may be worth to continue with a literature research in the direction of similar outlier detection methods.

The factor β describes how distances between succeeding values are assessed. Outliers are defined when the maximum of the above and below conformity is above a predefined threshold α.

$$\neg\left(\max\left(u_{i,l},u_{i,h}\right)>\alpha\right)$$

Last & Kandel have tested their algorithm for β=0.001, α=0.05 and m=10. There seems to be a rich literature on that kind of "neighbourhood distance", where outlier control based with different algorithms is analyzed in detail. The different parameter can be set by the user interface.

Reference: Last M. & Kandel M. (2001), Automated Detection of Outliers in Real-World Data, Proc. of the Second International Conference on Intelligent Technologies

Working with graphics

The exploitation tools allow showing the current content of a tabular view as a graphic. Most of the graphic types are based on the JFreeChart library (see http://www.jfree.org/jfreechart/).

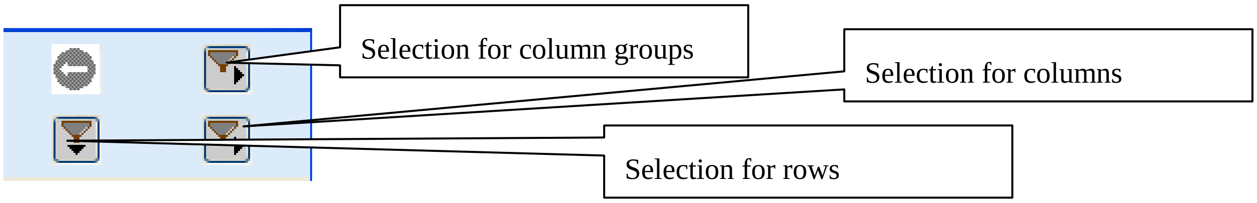
General handling of graphs

In the system, the selection of graphs is based under the Table bottom in the tool bar and the following *graphic types* are currently supported:

- Bar charts
- Line charts
- Area chart
- Spider chart
- Pie chart
- Box and Whisker chart
- Histogram
- Markov chart

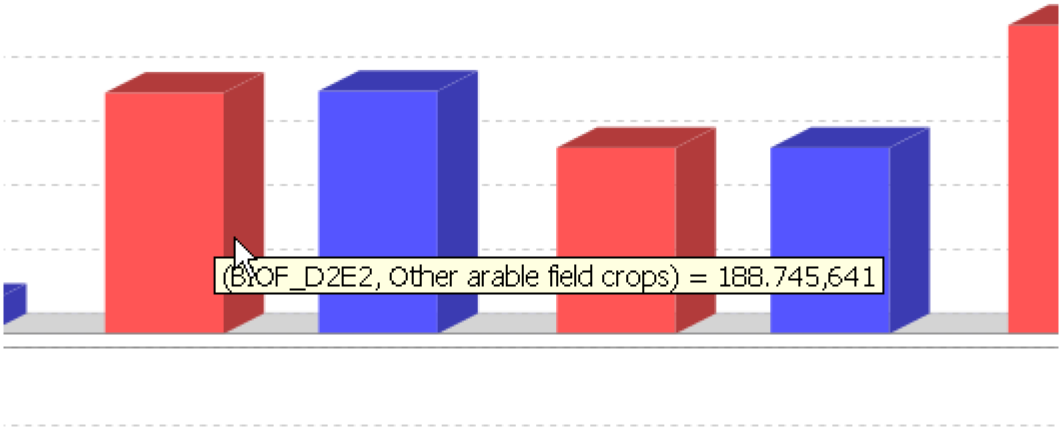
The *selection* of rows and columns shown in the graph can be set in three different ways, for all types of graphics:

- Using the selection dialog (upper left corner of the table, or the buttons next to the graphic type selection drop down box: double click)

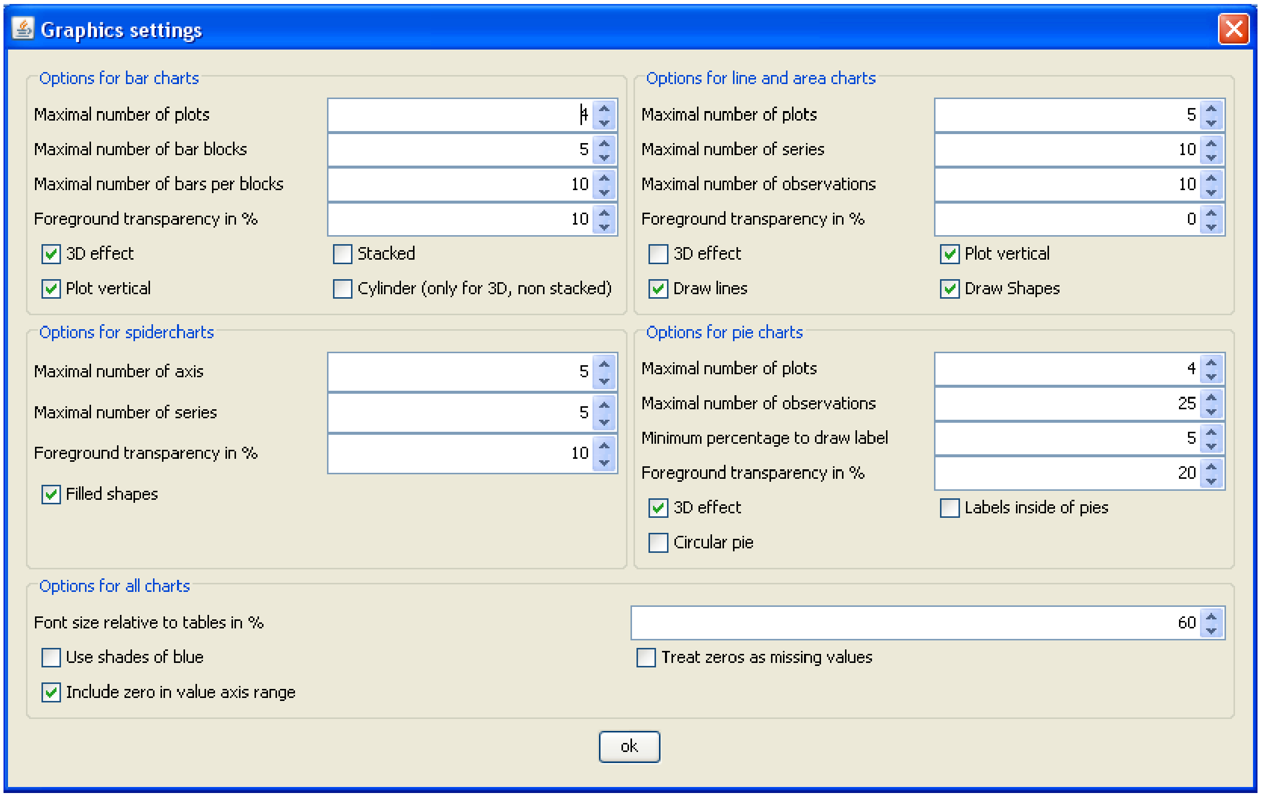


- Using those buttons in graphic mode: single clicks with the left mouse button will scroll down in the list, right mouse, single clicks will scroll up.
- Scrolling the table with the scroll bar to a specific position. The column/row in the upper left corner of the table will define the starting point for the graphic.

All types of graphics support *tooltips* to query the numerical values underlying the graphic. The tooltips appear when moving the mouse on a graphic element linked to the value as e.g. a bar.



Perhaps an unexpected feature is the zooming in and out with the mouse. The graphs support, *saving* to the disk via a popup menu and *printing*. The popup menu also allows changing certain properties for the current graph temporarily. Some settings which will pertain can be edited by opening the graphics option dialogue, press:



Graphics settings

Options for bar charts

Maximal number of plots 4

Maximal number of bar blocks 5

Maximal number of bars per blocks 10

Foreground transparency in % 10

☑ 3D effect

☐ Stacked

☑ Plot vertical

☐ Cylinder (only for 3D, non stacked)

Options for line and area charts

Maximal number of plots 5

Maximal number of series 10

Maximal number of observations 10

Foreground transparency in % 0

☐ 3D effect

☑ Plot vertical

☑ Draw lines

☑ Draw Shapes

Options for spidercharts

Maximal number of axis 5

Maximal number of series 5

Foreground transparency in % 10

☑ Filled shapes

Options for pie charts

Maximal number of plots 4

Maximal number of observations 25

Minimum percentage to draw label 5

Foreground transparency in % 20

☑ 3D effect

☐ Labels inside of pies

☐ Circular pie

Options for all charts

Font size relative to tables in % 60

☐ Use shades of blue

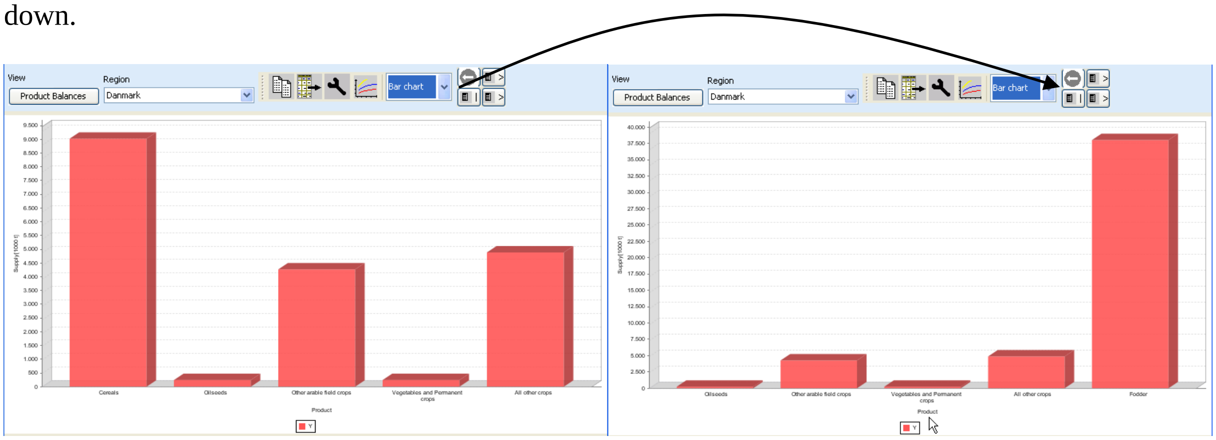
☐ Treat zeros as missing values

☑ Include zero in value axis range

The chart type’s specific settings are discussed in more detail below. The general options should be self-explanatory, it is best to try them out interactively.

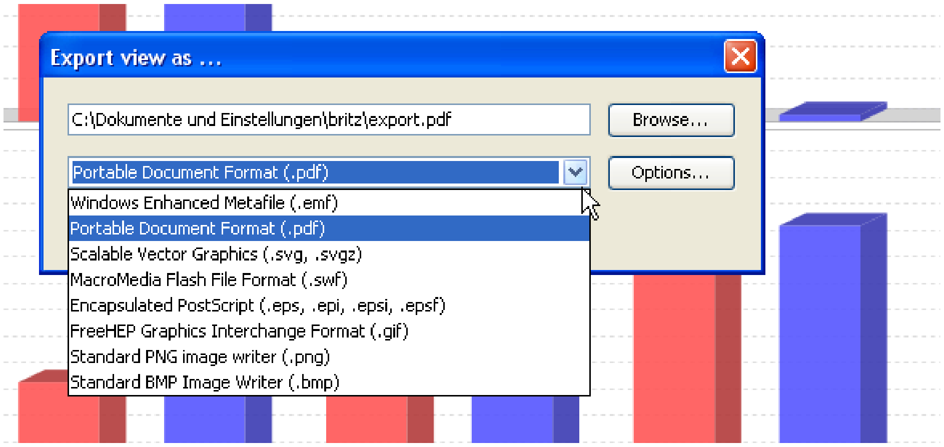
“Walking” through the data

As the maximal numbers of elements shown is restricted (see above), typically not all columns and/or rows will be shown in a graph. The user basically has two possibilities to change the visible columns or rows. Firstly, columns and rows can be selected by the selection dialogues. Secondly, the user can click with the right or left mouse button on the buttons for table dimensions to mode one row or column up or down.



Exporting the graphic to file

The graphics can be saved to file in different formats by pressing the export button. The following dialogue will appear which allows the user to define the file, and a range of different file formats. For MS Office users, the "Windows Enhanced Metafile" format is interesting, as it allows changing later the graphics manually, e.g. by adding new text.



Export view as ...

C:\Dokumente und Einstellungen\britz\export.pdf

Portable Document Format (.pdf)

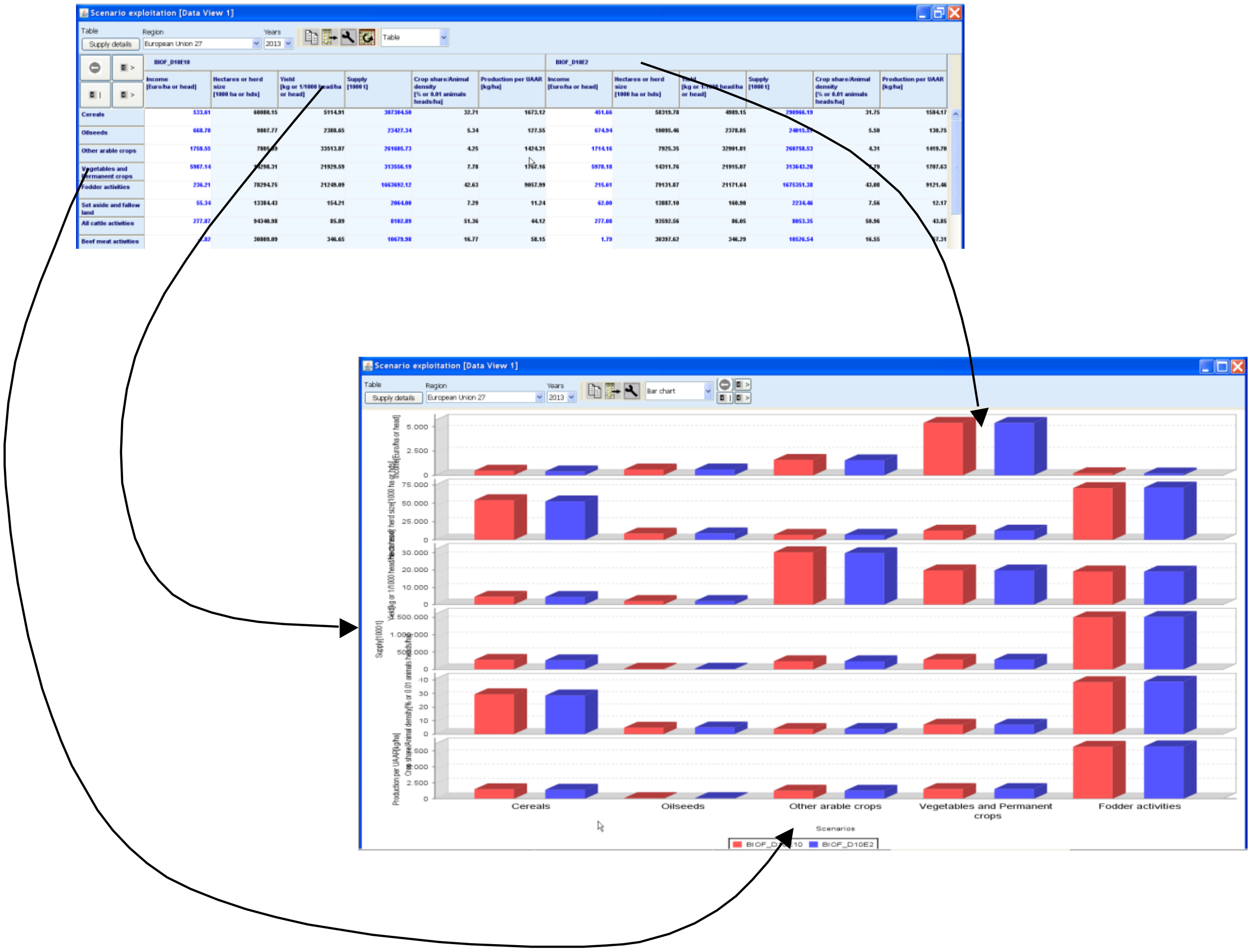
Browse...
Options...
Windows Enhanced Metafile (.emf)
Portable Document Format (.pdf)
Scalable Vector Graphics (.svg, .svgz)
MacroMedia Flash File Format (.swf)
Encapsulated PostScript (.eps, .epi, .epsi, .epsf)
FreeHEP Graphics Interchange Format (.gif)
Standard PNG image writer (.png)
Standard BMP Image Writer (.bmp)

Exporting the graphic to clipboard

Alternatively, the graphic can be placed into the clipboard where it is stored as a bitmap or as jpeg by double-clicking the "copy to clipboard" button.

Bar charts

Bar charts treat the columns – typically the table items – as having different units and consequently assign an own plot with a value axis to each of them. The observations are taken from the table rows and define the domain, the horizontal axis. Each groups of bar columns present – typically the scenarios –receives its own colour. An example is given below.



Scenario exploitation [Data View 1]

Table: Supply details

Region: European Union 27

Years: 2013

Table

	BIOF_D10E10						BIOF_D10E2					
	Income [Euro/ha or head]	Hectares or herd size [1000 ha or hds]	Yield [kg or 1/1000 head/ha or head]	Supply [1000 t]	Crop share/Animal density [% or 0.01 animals heads/ha]	Production per UAAR [kg/ha]	Income [Euro/ha or head]	Hectares or herd size [1000 ha or hds]	Yield [kg or 1/1000 head/ha or head]	Supply [1000 t]	Crop share/Animal density [% or 0.01 animals heads/ha]	Production per UAAR [kg/ha]
Cereals	533.61	60080.15	5114.91	307304.50	32.71	1673.12	451.66	58319.78	4989.15	290966.19	31.75	1584.17
Oilseeds	668.78	9807.77	2388.65	23427.34	5.34	127.55	674.94	10095.46	2378.85	24015.57	5.50	130.75
Other arable crops	1758.55	7805.69	33513.87	261606.73	4.25	1424.31	1714.16	7925.35	32901.81	260758.53	4.31	1419.70
Vegetables and permanent crops	5987.14	14298.31	21929.59	313556.19	7.78	1707.16	5978.18	14311.76	21915.07	313643.28	7.79	1707.63
Fodder activities	236.21	78294.75	21249.09	1663692.12	42.63	9057.99	215.61	79131.87	21171.64	1675351.38	43.08	9121.46
Set aside and fallow land	55.34	13384.43	154.21	2064.00	7.29	11.24	62.00	13887.10	160.90	2234.46	7.56	12.17
All cattle activities	277.87	94340.98	85.89	8102.89	51.36	44.12	277.08	93592.56	86.05	8053.35	50.96	43.85
Beef meat activities	1.82	30809.09	346.65	10679.98	16.77	58.15	1.79	30397.62	346.29	10526.54	16.55	57.31

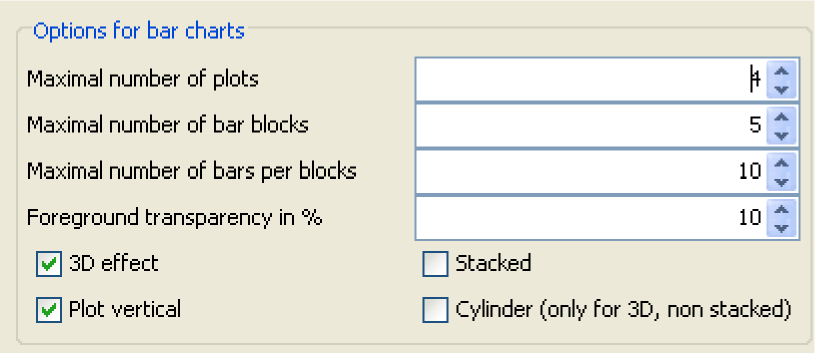
Scenario exploitation [Data View 1]

Table: Supply details

Region: European Union 27

Years: 2013

Bar chart



Options for bar charts

Maximal number of plots	4
Maximal number of bar blocks	5
Maximal number of bars per blocks	10
Foreground transparency in %	10

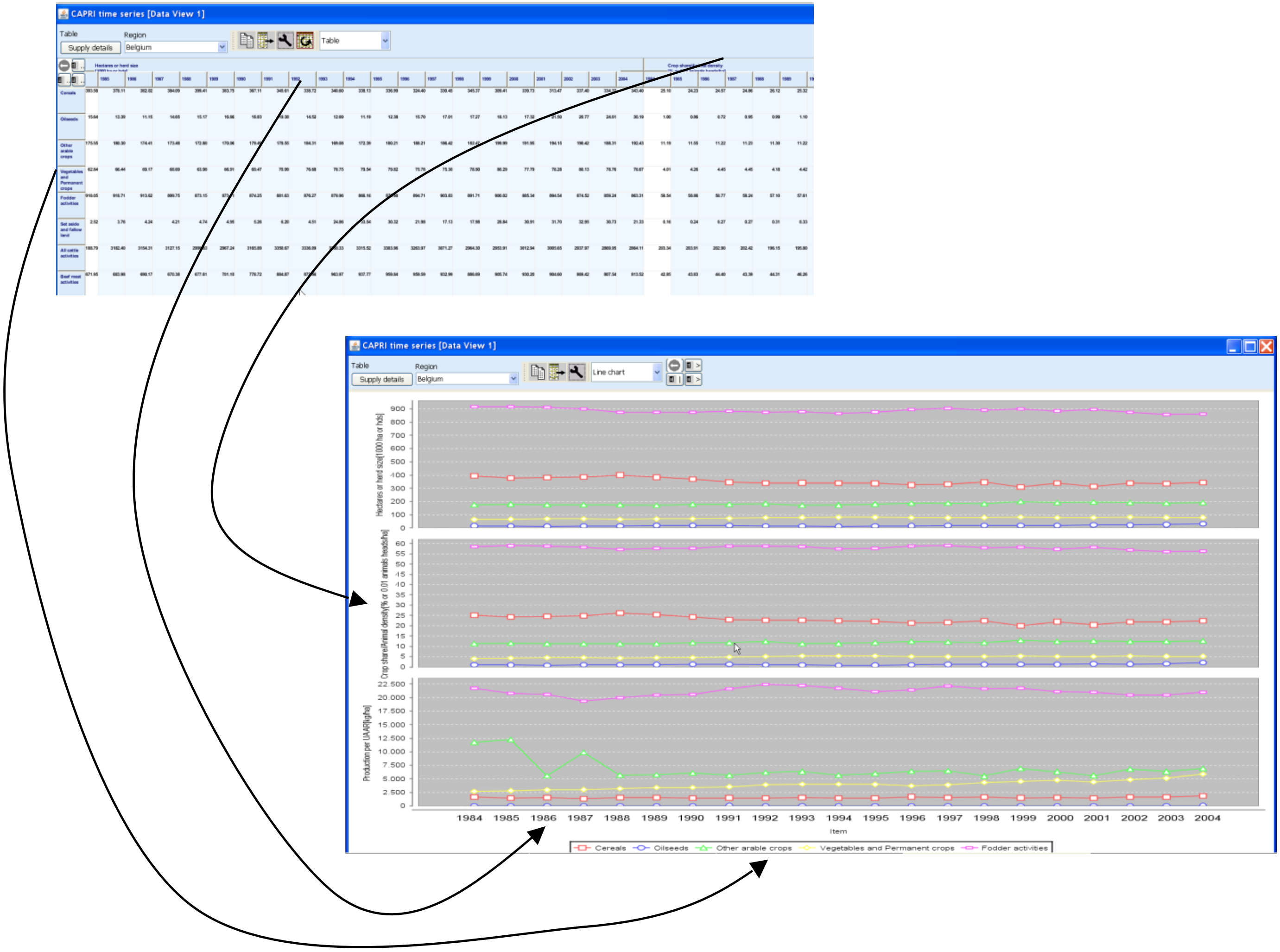
☑ 3D effect   □ Stacked

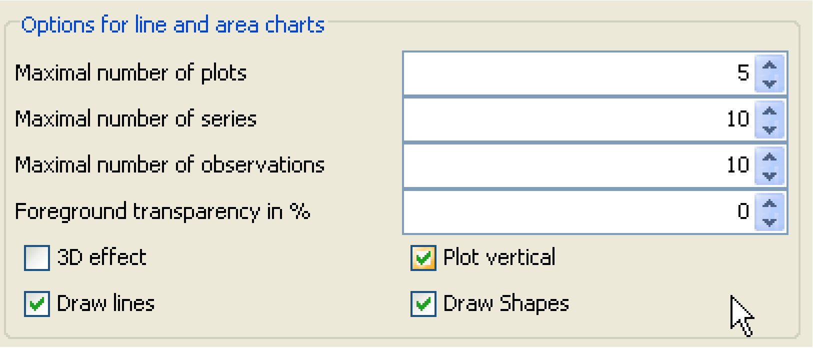
☑ Plot vertical   □ Cylinder (only for 3D, non stacked)

The user has a number of options for the bar charts. By pressing the button in the toolbar, a dialog box including the section of “Options for bar charts” opens. The number of plots refers to the number of columns in the underlying tables, each column will receive an own plot with a matching value axis. The bar blocks refer to the rows, each bar block may comprise several bars taken from the column groups (typically scenarios). As seen above, it is also possible to generate stacked bars from the column groups, or to generate cylinders instead of cubes.

Line and point charts

Line and point charts assume that the columns of the table present some ordered sets e.g. years or iterations. There is currently a default of 25 such observations which can be increased by the user. The different series to plot are taken from the table rows. If different column groups are present, those receive their own plot with an own value axis.





Options for line and area charts

Maximal number of plots: 5

Maximal number of series: 10

Maximal number of observations: 10

Foreground transparency in %: 0

☐ 3D effect

☑ Plot vertical

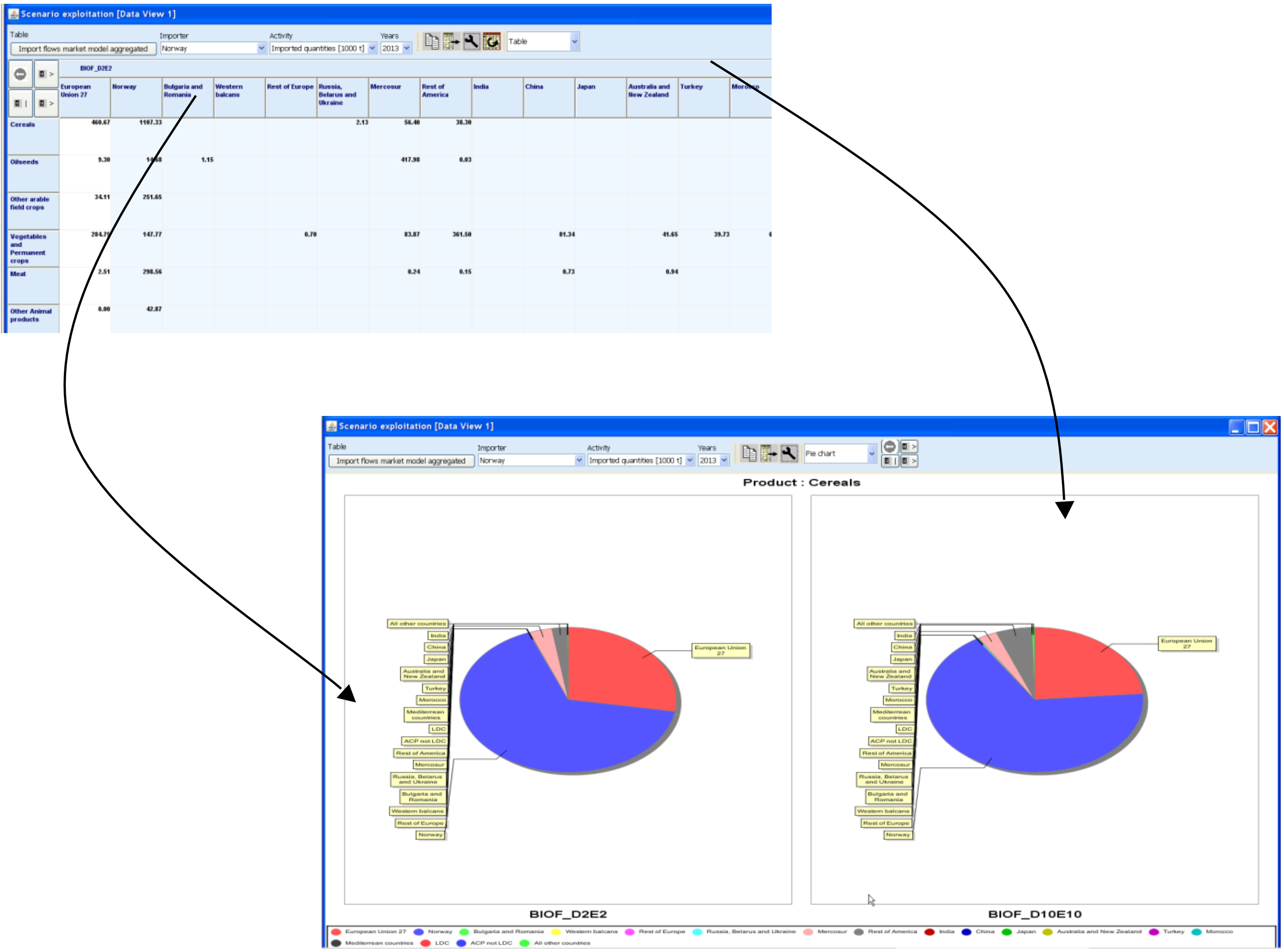
☑ Draw lines

☑ Draw Shapes

The options for line and area charts are similar to the ones for bar charts. The number of plots refers to the column groups, the number of series to the rows of the table. Area charts are equivalent to stacked bars, i.e. the observations are added. The number of observations is linked to the columns.

Pie charts

Pie charts are useful to show shares on total as e.g. trade flows. The shares are calculated from the columns, whereas each column group – typically scenarios – receives its own pie. Only one row is allowed.



Scenario exploitation [Data View 1]

Table: Import flows market model aggregated
Importer: Norway
Activity: Imported quantities [1000 t]
Years: 2013
Table

BIOF_D2E2

	European Union 27	Norway	Bulgaria and Romania	Western balcans	Rest of Europe	Russia, Belarus and Ukraine	Mercosur	Rest of America	India	China	Japan	Australia and New Zealand	Turkey	Morocco
Cereals	460.67	1107.33				2.13	56.40	38.30						
Oilseeds	9.30	14[illegible]8	1.15				417.98	0.03						
Other arable field crops	34.11	251.65												
Vegetables and Permanent crops	284.7[illegible]	147.77			0.70		83.87	361.50		81.34		41.65	39.73	6
Meat	2.51	298.56					0.24	0.15		0.73		0.94		
Other Animal products	0.00	42.87												

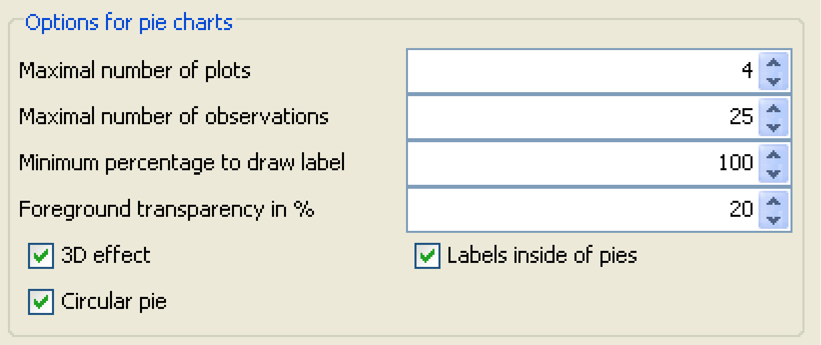
Scenario exploitation [Data View 1]

Table: Import flows market model aggregated
Importer: Norway
Activity: Imported quantities [1000 t]
Years: 2013
Pie chart

Product : Cereals

All other countries
India
China
Japan
Australia and New Zealand
Turkey
Morocco
Mediterrean countries
LDC
ACP not LDC
Rest of America
Mercosur
Russia, Belarus and Ukraine
Bulgaria and Romania
Western balcans
Rest of Europe
Norway
European Union 27
BIOF_D2E2
All other countries
India
China
Japan
Australia and New Zealand
Turkey
Morocco
Mediterrean countries
LDC
ACP not LDC
Rest of America
Mercosur
Russia, Belarus and Ukraine
Bulgaria and Romania
Western balcans
Rest of Europe
Norway
European Union 27
BIOF_D10E10
● European Union 27 ● Norway ● Bulgaria and Romania ● Western balcans ● Rest of Europe ● Russia, Belarus and Ukraine ● Mercosur ● Rest of America ● India ● China ● Japan ● Australia and New Zealand ● Turkey ● Morocco
● Mediterrean countries ● LDC ● ACP not LDC ● All other countries

The user has the following options to modify the presentation of pie charts:



Options for pie charts

Maximal number of plots: 4

Maximal number of observations: 25

Minimum percentage to draw label: 100

Foreground transparency in %: 20

☑ 3D effect ☑ Labels inside of pies

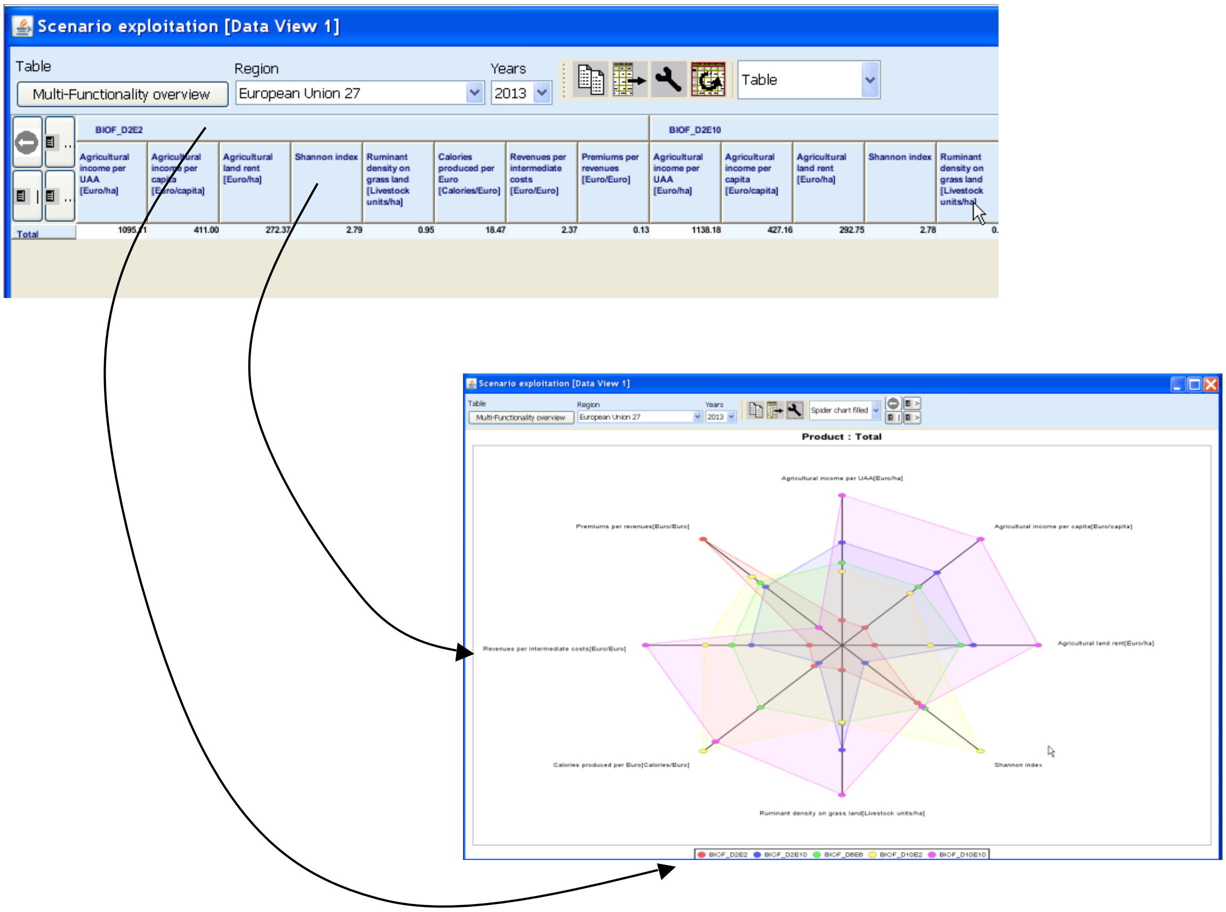
☑ Circular pie

The maximum number of plots refers to the number of elements in the dimensions of the column group., The example above shows two plots. The number of observations defines the numbers of pies – if more columns are available, the cake will eventually give a wrong impression if not all values are used to define the sum and the shares.

The “minimum percentage to draw label” defines a lower cut-off limit, if a cake’s size is below the threshold, no label will be drawn. As shown in the example above, setting the threshold to 100% will erase the labels (see Pie chart maps for an example). It is also possible to place the labels in the pies, and not outside of the cake as shown in the example above.

Spider plots

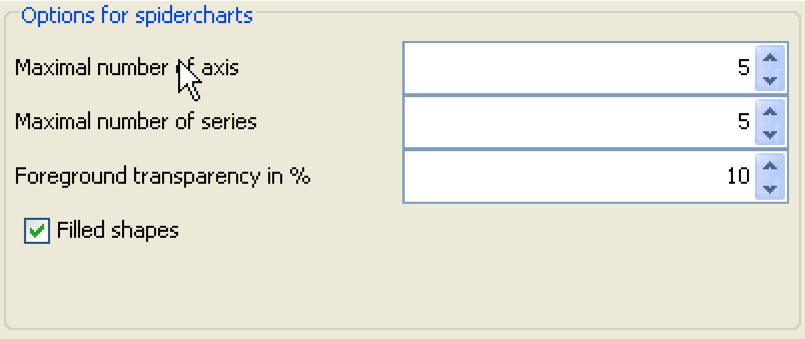
Spider charts are useful to compare several dimensions simultaneously across a range of alternatives. It is assumed that the columns show the items of which each receives its own axis, whereas the column groups are the alternatives to compare. The axis are not ticked with numerical values, instead they are always scaled to cover the minimum and maximum found in any alternative.



Scenario exploitation [Data View 1]
Table
Multi-Functionality overview
Region
European Union 27
Years
2013
Table

	BIOF_D2E2								BIOF_D2E10				
	Agricultural income per UAA [Euro/ha]	Agricultural income per capita [Euro/capita]	Agricultural land rent [Euro/ha]	Shannon index	Ruminant density on grass land [Livestock units/ha]	Calories produced per Euro [Calories/Euro]	Revenues per intermediate costs [Euro/Euro]	Premiums per revenues [Euro/Euro]	Agricultural income per UAA [Euro/ha]	Agricultural income per capita [Euro/capita]	Agricultural land rent [Euro/ha]	Shannon index	Ruminant density on grass land [Livestock units/ha]
Total	1095.11	411.00	272.37	2.79	0.95	18.47	2.37	0.13	1138.18	427.16	292.75	2.78	0.

Scenario exploitation [Data View 1]
Table
Multi-Functionality overview
Region
European Union 27
Years
2013
Spider chart filled
Product : Total
Agricultural income per UAA[Euro/ha]
Agricultural income per capita[Euro/capita]
Agricultural land rent[Euro/ha]
Shannon index
Ruminant density on grass land[Livestock units/ha]
Calories produced per Euro[Calories/Euro]
Revenues per intermediate costs[Euro/Euro]
Premiums per revenues[Euro/Euro]
● BIOF_D2E2 ● BIOF_D2E10 ● BIOF_D6E6 ● BIOF_D10E2 ● BIOF_D10E10



Options for spidercharts

Maximal number of axis	5
Maximal number of series	5
Foreground transparency in %	10

☑ Filled shapes

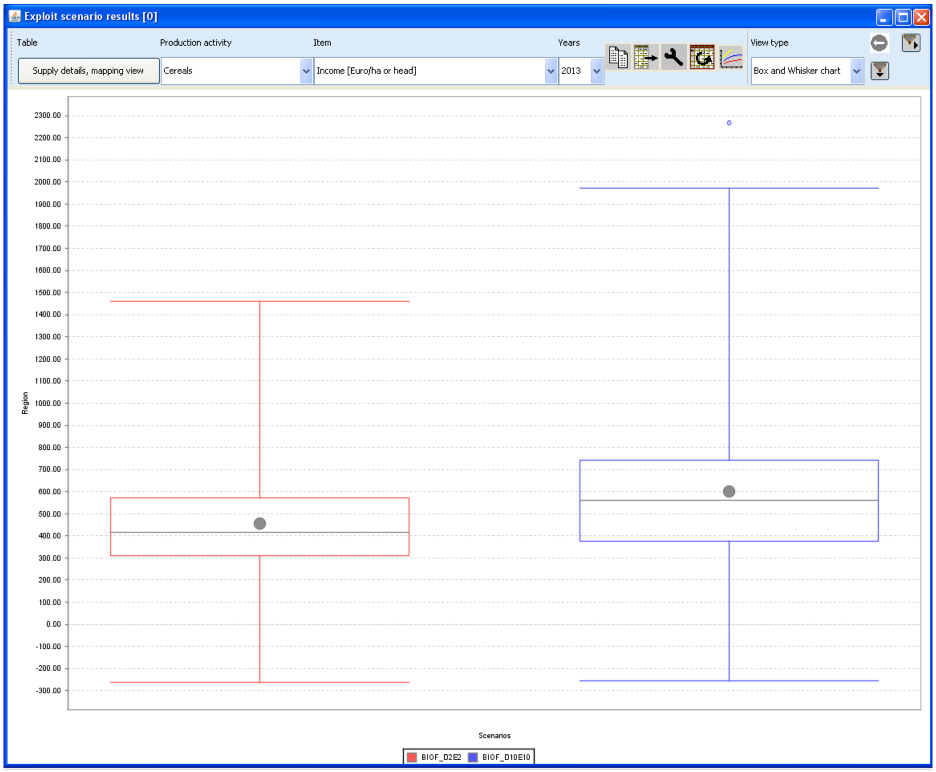
The options for spider charts which are found under the button in the toolbar are rather limited. The user can determine how many axes – taken from the columns – are included in the diagram and the maximum number of series, which typically consist of scenarios.

Box and Whisker charts

In descriptive statistics, a box plot or boxplot (also known as a box-and-whisker diagram or plot) is a convenient way of graphically depicting groups of numerical data through their five-number summaries (the smallest observation (sample minimum), lower quartile (Q1), median (Q2), upper quartile (Q3), and largest observation (sample maximum). A boxplot may also indicate which observations, if any, might be considered outliers.

Boxplots can be useful to display differences between populations without making any assumptions of the underlying statistical distribution: they are non-parametric. The spacings between the different parts of the box help indicate the degree of dispersion (spread) and skewness in the data, and identify outliers. Boxplots can be drawn either horizontally or vertically (text so far from Wikipedia).

The box and whisker chart uses the rows as the observations, and generates an own graph per column. The box shows +/-25% of the observations around the median which is shown as a grey line, whereas the arithmetic mean is shown as a grey circle. The whiskers show the median +/- three times the inner quartile range. Mild outliers are drawn as dots and strong outliers are indicated by arrows. So far there are no specific options for that type of diagram.



Exploit scenario results [0]

Table: Supply details, mapping view

Production activity: Cereals

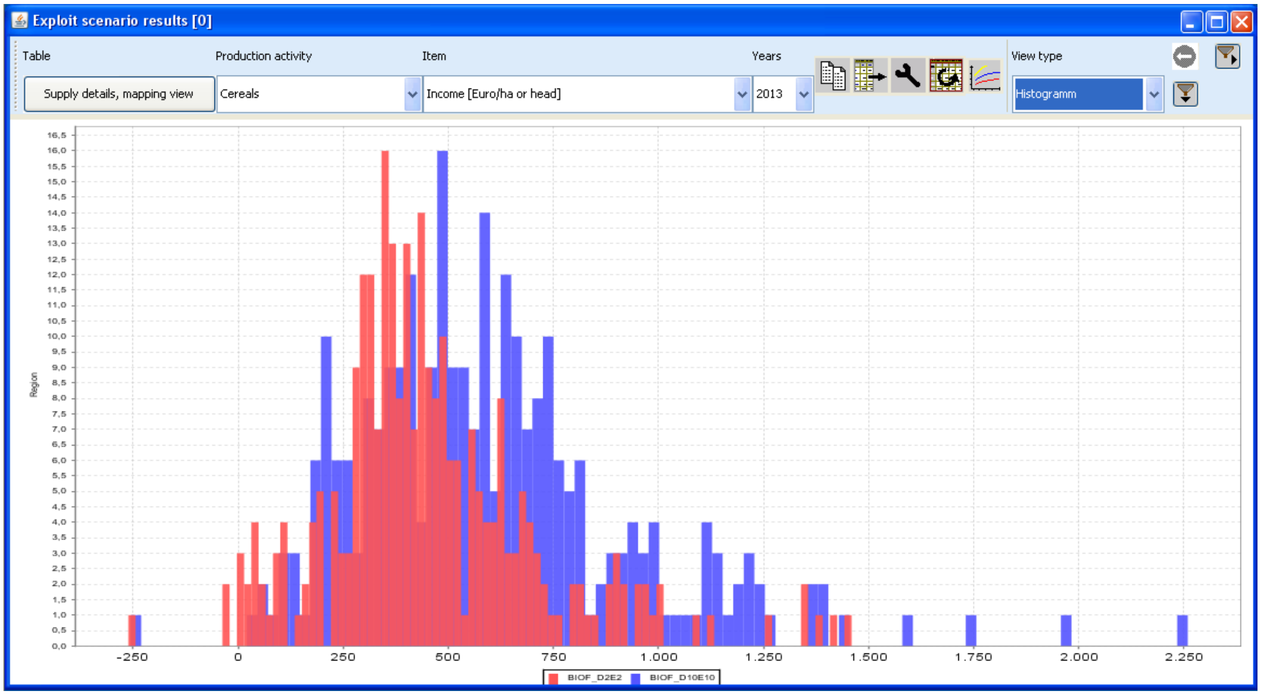
Item: Income [Euro/ha or head]

Years: 2013

View type: Box and Whisker chart

Histograms

As for whisker charts and statistics shown in tables, the observations are taken from rows, and different columns are charted individually. So far there no specific options for that type of diagram. Please note that it is also possible to generate a separate Histogram window, but then, the observations refer to all columns simultaneously.



Exploit scenario results [0]

Table: Supply details, mapping view

Production activity: Cereals

Item: Income [Euro/ha or head]

Years: 2013

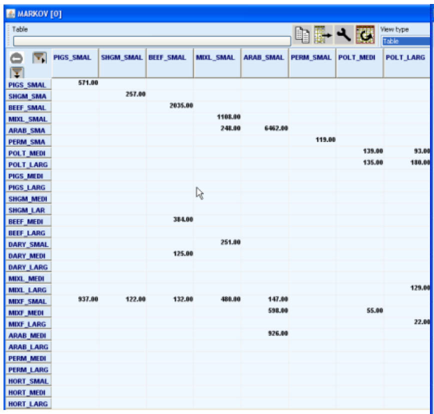
View type: Histogramm

Markov charts

A still explorative type of graphics visualizes flows between entities which are placed in a two dimensional co-ordinate system. It is currently not yet used in CAPRI itself, but applied to show flows between farm groups classified by economic size and specialization. As with the flow maps below, the major code based for the graphics is based on work of Doantam Phan[1].

The positions on the x and y co-ordinate are deducted from the codes, taken from a specific section of the underlying XML-definitions which refers to a matching of sub-strings of the codes and x respectively y positions. The size of the dots is taken from the diagonal elements.

[1] Flow Map Layout, Doantam Phan, Ling Xiao1, Ron Yeh1, Pat Hanrahan, and Terry Winograd, Stanford University, see http://graphics.stanford.edu/papers/flow_map_layout/flow_map_layout.pdf. I would like to thank Doantam Phan for letting the CAPRI team use and modify his source code.

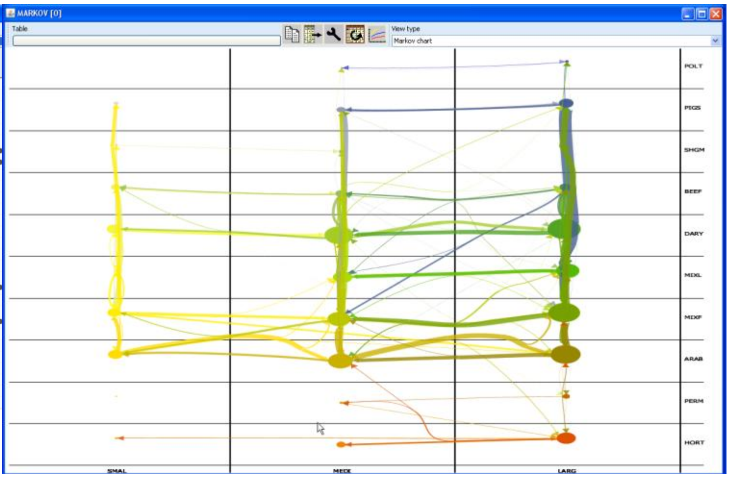


MARKOV [0]

Table

View type: Table

	PIGS_SMAL	SHGM_SMAL	BEEF_SMAL	MIXL_SMAL	ARAB_SMAL	PERM_SMAL	POLT_MEDI	POLT_LARG
PIGS_SMAL	571.00							
SHGM_SMA		257.00						
BEEF_SMAL			2035.00					
MIXL_SMAL				1108.00				
ARAB_SMA				248.00	6462.00			
PERM_SMA						119.00		
POLT_MEDI							139.00	93.00
POLT_LARG							135.00	180.00
PIGS_MEDI								
PIGS_LARG								
SHGM_MEDI								
SHGM_LAR								
BEEF_MEDI			384.00					
BEEF_LARG								
DARY_SMAL				251.00				
DARY_MEDI			125.00					
DARY_LARG								
MIXL_MEDI								
MIXL_LARG								129.00
MIXF_SMAL	937.00	122.00	132.00	480.00	147.00			
MIXF_MEDI					598.00		55.00	
MIXF_LARG								22.00
ARAB_MEDI					926.00			
ARAB_LARG								
PERM_MEDI								
PERM_LARG								
HORT_SMAL								
HORT_MEDI								
HORT_LARG								



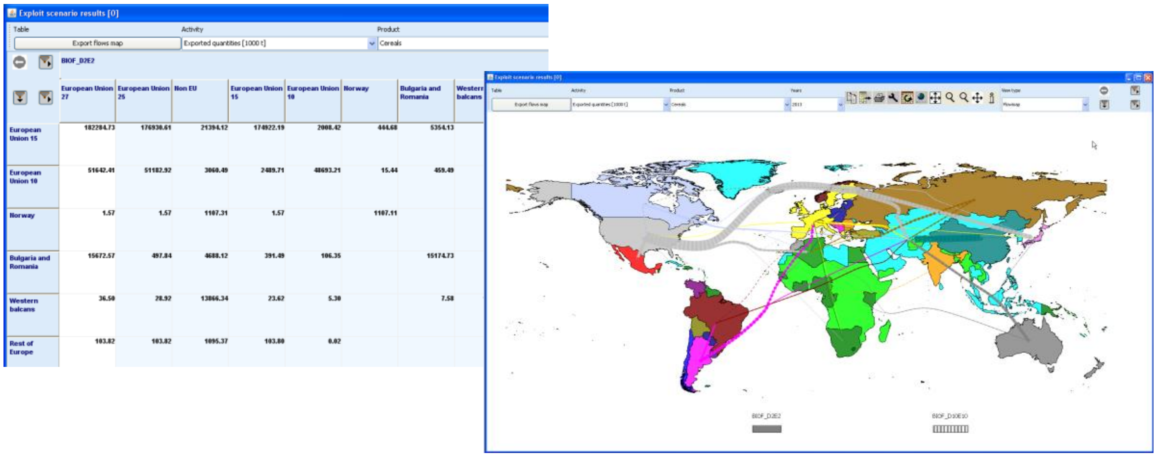
MARKOV [0]

Table

View type: Markov chart

Flow maps

Flow maps visualize flows between regions - The maps are constructed by taken the elements in the rows as the origins of the flows, and the elements in the columns as the destinations. Flows from the same origin are drawn in the same color, the width of the flows relates to their size. Counterfactuals are taken from the column groups and receive a specific "dash". The picture below shows a screen shot of a flow map for two scenarios.



Exploit scenario results [0]

Table: Export flows map

Activity: Exported quantities [1000 t]

Product: Cereals

BIOF_D2E2

	European Union 27	European Union 25	Non EU	European Union 15	European Union 10	Norway	Bulgaria and Romania	Western balcans
European Union 15	182284.73	176930.61	21394.12	174922.19	2008.42	444.68	5354.13	
European Union 10	51642.41	51182.92	3060.49	2489.71	48693.21	15.44	459.49	
Norway	1.57	1.57	1107.31	1.57		1107.11		
Bulgaria and Romania	15672.57	497.84	4688.12	391.49	106.35		15174.73	
Western balcans	36.50	28.92	13866.34	23.62	5.30		7.58	
Rest of Europe	103.82	103.82	1095.37	103.80	0.02			

Exploit scenario results [0]

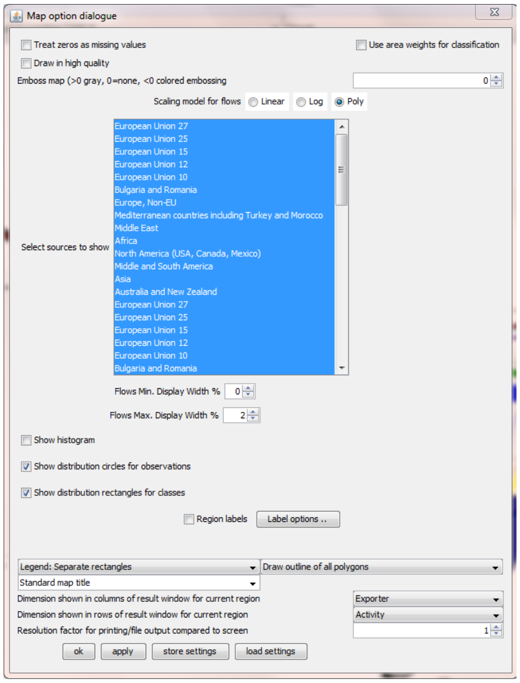
Table: Export flows map

Activity: Exported quantities [1000 t]

Product: Cereals

View type: Flowmap

When pressing the map option button 🌐, the following dialogue is opened:



Map option dialogue

□ Treat zeros as missing values

□ Use area weights for classification

□ Draw in high quality

Emboss map (>0 gray, 0=none, <0 colored embossing: 0

Scaling model for flows ○ Linear ○ Log ● Poly

Select sources to show:
European Union 27
European Union 25
European Union 15
European Union 12
European Union 10
Bulgaria and Romania
Europe, Non-EU
Mediterranean countries including Turkey and Morocco
Middle East
Africa
North America (USA, Canada, Mexico)
Middle and South America
Asia
Australia and New Zealand
European Union 27
European Union 25
European Union 15
European Union 12
European Union 10
Bulgaria and Romania

Flows Min. Display Width %: 0

Flows Max. Display Width %: 2

□ Show histogram

☑ Show distribution circles for observations

☑ Show distribution rectangles for classes

□ Region labels

Legend: Separate rectangles

Draw outline of all polygons

Standard map title

Dimension shown in columns of result window for current region: Exporter

Dimension shown in rows of result window for current region: Activity

Resolution factor for printing/file output compared to screen: 1

The main options of interest for flow maps are the scaling model and the display width. The following ***scaling models*** are available:

- *Linear*: the width is determined by relating the flow quantity to the sum of all flows for the same scenario.
- *Log*: the width is determined by multiplying the log of the relation between the flow quantity and the minimal flow with the log of the relation of the maximal and minimal flows for the same scenario.
- *Polynomial*: the relation between the current flow and the maximal flow is raised to a power determined by taking the log of the relation between the maximal and minimal display width divided by the log of the regional between the maximal and minimal flow.

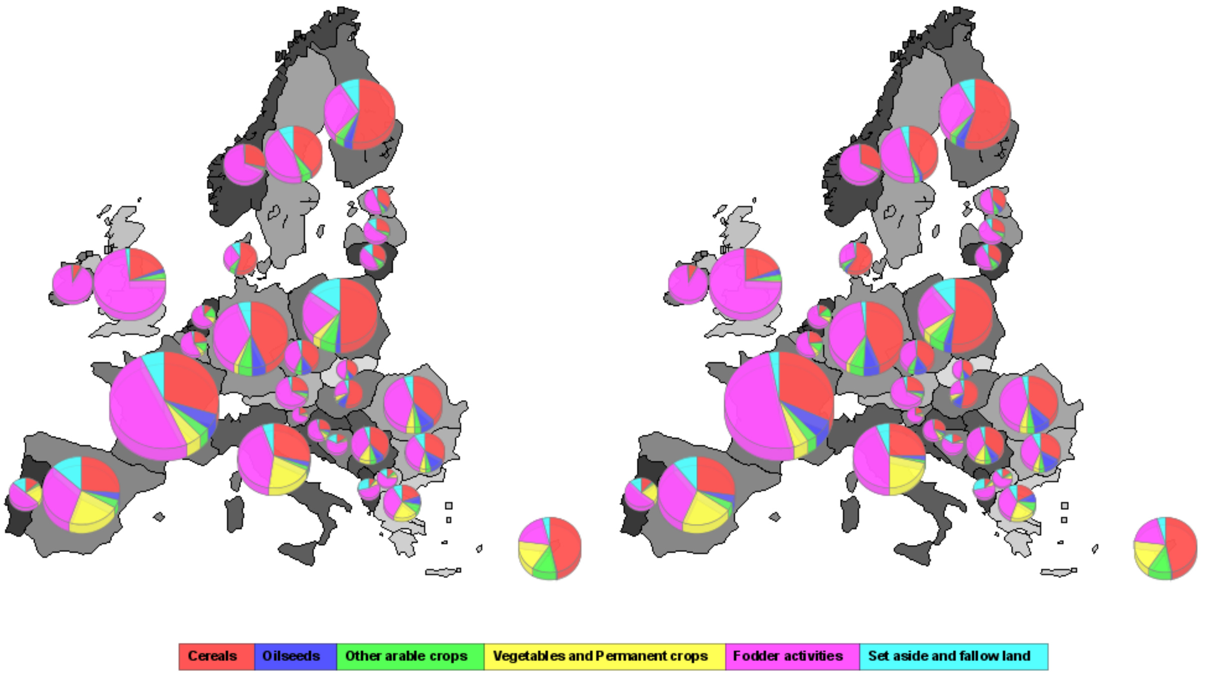
The user can prevent that small flows are drawn by setting a minimal width relative to the size of the window; equally, the maximal possible size of a flow relative to the size of the window can be determined.

In order to show only a selection of the flows, the selection buttons can be used. The lower left one relates to the rows of the underlying tables, and thus allows excluding origins from the maps. The lower right one opens a dialogue to exclude destinations, whereas the upper right one allows exclusion of scenarios.

Most options described below for thematic maps such as zooming and dragging are also available for flow maps. However, classifications and color models cannot be supported.

Pie chart maps

Another rarely used application of maps is the possibility to place pie charts above the geometry. The regions must – as always with maps – be placed in the rows of the underlying tables, and the cakes are calculated from the data in the columns. It is possible to produce maps for different scenarios when those are placed in the column groups as shown below. The size of the charts depends mainly on the bounds of the underlying polygon, so that smaller countries have smaller pies. The settings for pie chart diagrams (see Pie charts) can be applied to that view.

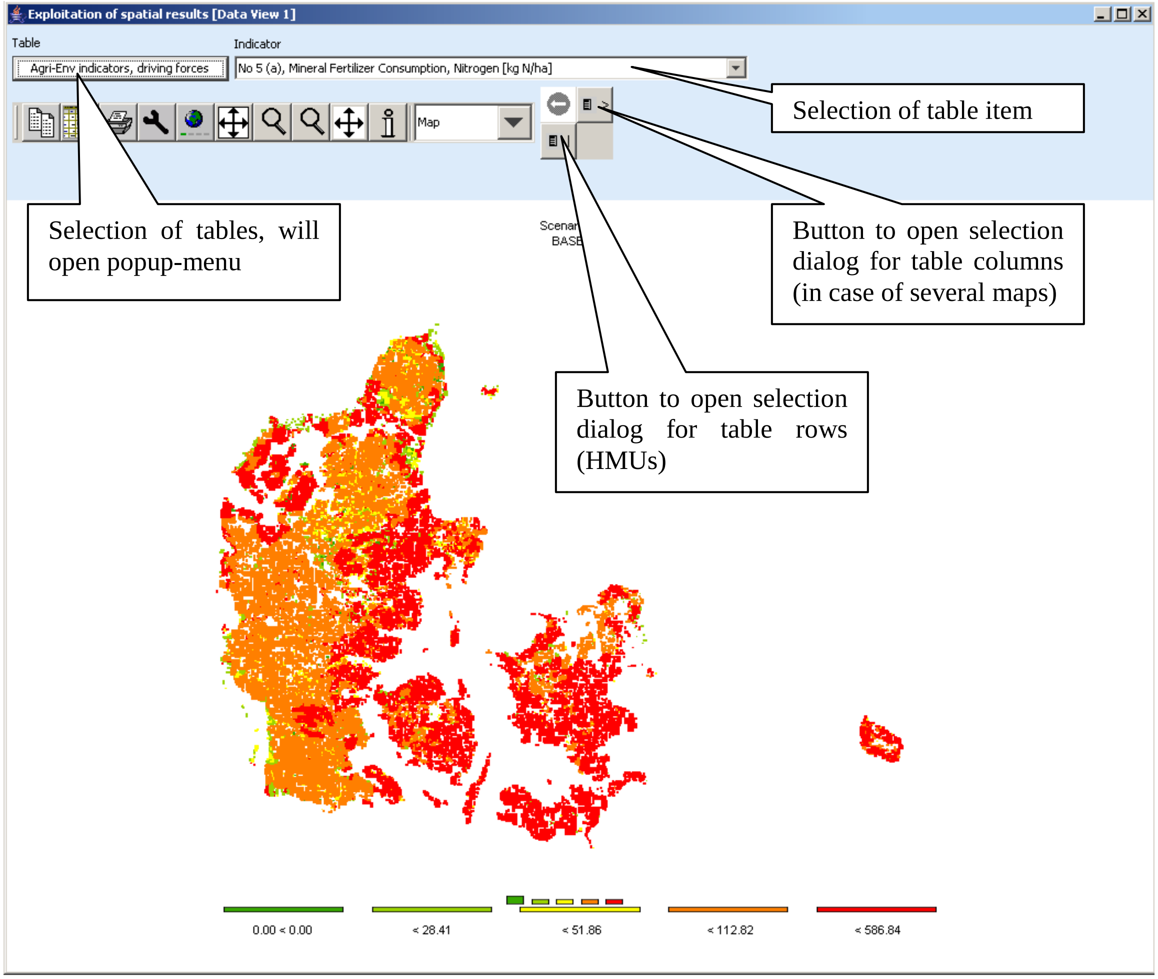


Colored thematic maps

The GUI currently provides geometries for NUTS 2 regions, Member States, the regions with behavioral functions in the market model, trade blocks in the market model and finally, the Homogenous Soil Mapping Units (1x1 km resolution) underlying the spatial down-scaling component. The geometries are always linked to the rows of the underlying table.

The most obvious way to visualize results is the use of thematic maps. This holds true for NUTS2 results, but even more so for the results at the HSMU level, When starting the GUI, the mapping view uses some pre-sets which can be interactively changed as described below. The following screen-shot shows the result of first loading the base year results from the spatial dis-aggregation for Denmark and then switching from the tabular to the mapping view.

As with other views, the content of the map can be changed by working with the drop-down boxes, or by (de)selecting columns and rows. There are specific possibilities to change class limits, colors and further features for maps which are discussed in the following.



Exploitation of spatial results [Data View 1]

Table: Agri-Env indicators, driving forces

Indicator: No 5 (a), Mineral Fertilizer Consumption, Nitrogen [kg N/ha]

Map

Selection of table item

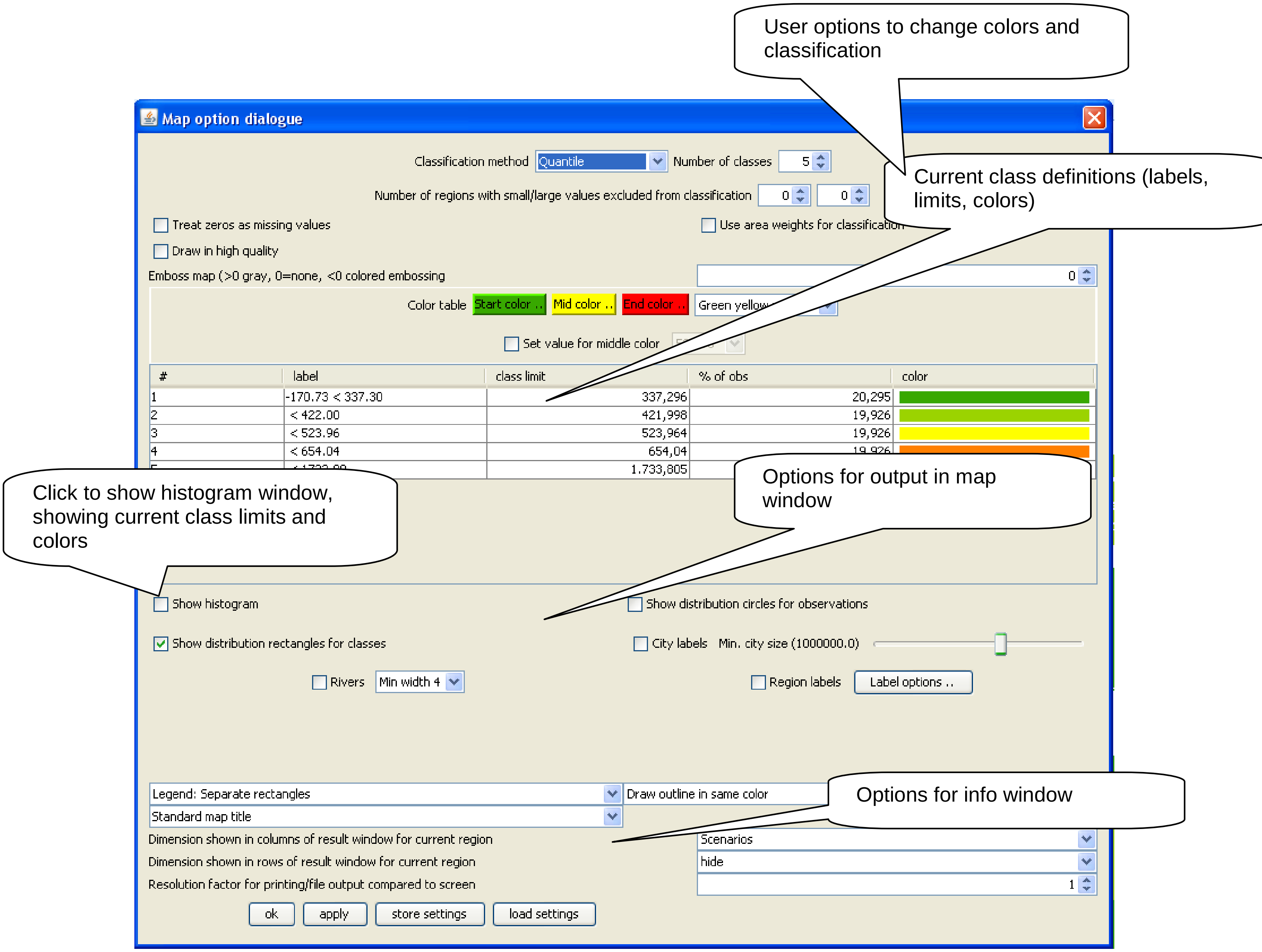
Selection of tables, will open popup-menu

Button to open selection dialog for table columns (in case of several maps)

Button to open selection dialog for table rows (HMUs)

Changing the classification and the legend

In order to change the layout of the map, click the mouse in the area of the legend or double-click the map option button 🌐. The following dialogue will open.



User options to change colors and classification

Current class definitions (labels, limits, colors)

Click to show histogram window, showing current class limits and colors

Options for output in map window

Options for info window

Map option dialogue

Classification method: Quantile — Number of classes: 5

Number of regions with small/large values excluded from classification: 0 / 0

□ Treat zeros as missing values — □ Use area weights for classification

□ Draw in high quality

Emboss map (>0 gray, 0=none, <0 colored embossing: 0

Color table: Start color .. / Mid color .. / End color .. — Green yellow

□ Set value for middle color

#	label	class limit	% of obs	color
1	-170.73 < 337.30	337,296	20,295	🟩
2	< 422.00	421,998	19,926	🟩
3	< 523.96	523,964	19,926	🟨
4	< 654.04	654,04	19,926	🟧
5	< 1733.80	1.733,805		

□ Show histogram — □ Show distribution circles for observations

☑ Show distribution rectangles for classes — □ City labels — Min. city size (1000000.0)

□ Rivers: Min width 4 — □ Region labels — Label options ..

Legend: Separate rectangles — Draw outline in same color

Standard map title

Dimension shown in columns of result window for current region: Scenarios

Dimension shown in rows of result window for current region: hide

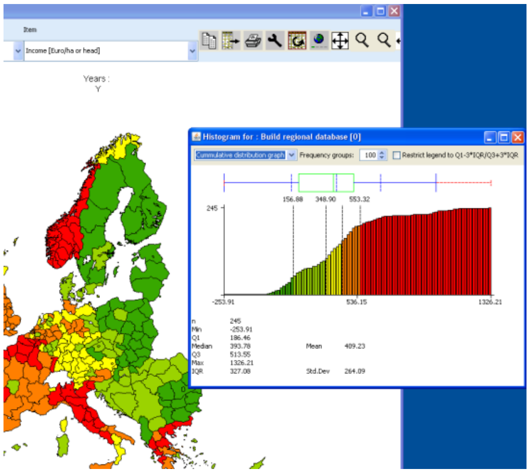
Resolution factor for printing/file output compared to screen: 1

ok — apply — store settings — load settings

It offers different options to change the way the map is drawn on screen and information supporting the classification.

Adding a histogram window to a map

In the map option dialogue, tick “Show histogram” and a separate window with a Histogram will be shown. It will use the current classification and color model to visualize the distribution of the values, reports some basic statistics and shows a box and whisker diagram.



Item: Income [Euro/ha or head]

Years :
Y

Histogram for : Build regional database [0]

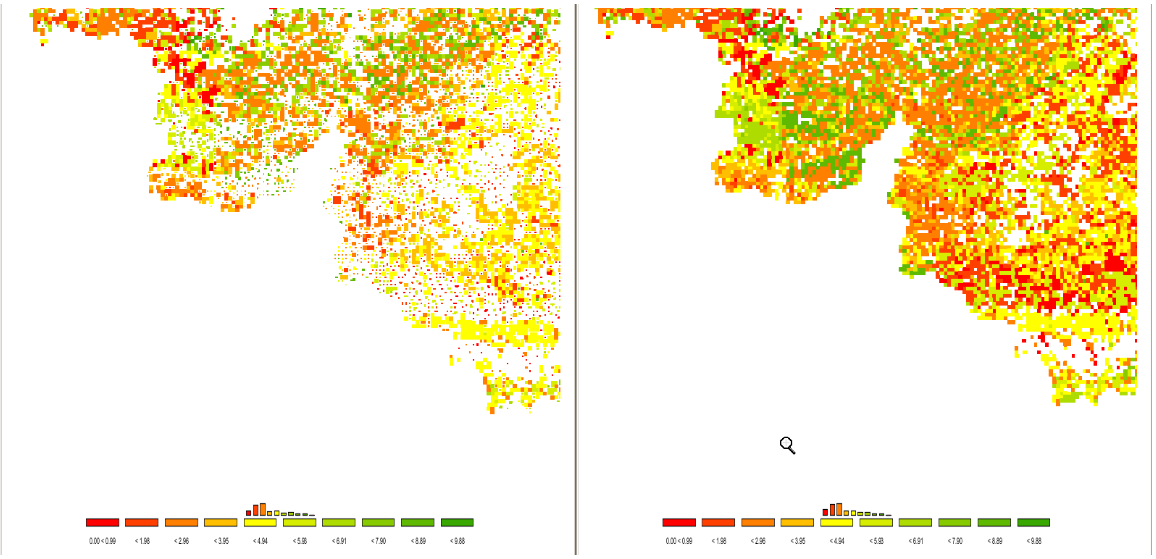
Cummulative distribution graph   Frequency groups: 100   □ Restrict legend to Q1-3*IQR/Q3+3*IQR

```
n         245
Min       -253.91
Q1        186.46
Median    393.78        Mean      409.23
Q3        513.55
Max       1326.21
IQR       327.08        Std.Dev   264.09
```

Shrinking polygons according to UAA share

The optical impression received of a map where colors are used to distinguish between values, depends to large extent on the area covered by a certain color. If the majority of the pixels is drawn in red, that will send a warning message to the user. In the case of the HSMUs and information relating to agriculture that message can be strongly biased as almost all HSMU comprise some other land cover then agriculture, and some of the HSMU comprise only very little agriculture, but e.g. forest, shrub lands, water bodies or artificial land cover. The HSMU geometry therefore comprises the information about the share of UAA assigned in the base year to each HSMU. That information can be used to shrink the area of the polygons when drawn on screen accordingly. That is done by drawing all points of the polygons towards the centroid of the polygon and then multiplying the distance between the point and the centroid with the square root of the share of the UAA. In the original HSMU geometry, such polygons had been broken down to simpler ones where the connection between a point and a centroid would cut through a segment of the polygon. In such cases, shrinking could let the new polygon hide other ones.

The graphs below show the very same map (same input data, classification and coloring) for the High Nature Value indicator for a part of Belgium. The right hand side map draws the HSMUs into their full size, the one on the left hand side one uses shrinking. The message perceived is probably very different. In the unshrinked right map, one may conclude that there is a lot of highly intensive agriculture (low HNV indicator drawn in red) in the lower diagonal triangle and some important areas of high nature farmland in the protruding area. This optical impression differs strongly from the polygons drawn with corrected shares for agricultural cover. It turns out that in the lower diagonal triangle, the density of agriculture is often low, and especially low in the intensively managed HSMUs. Equally, it turns out, that the area covered by High Natural Farmland in the protruding part is relatively small.



Area weighted classification

The classification can be generally applied treating each “region” (a NUTS II or a HSMU) as an observation with equal weight or using the areas of the underlying polygons as weights. Those weights are multiplied with the share of UAA if shrinking is used as explained above.

Excluding zeros from classification and removing small and large values

In GAMS, zeros and missing values cannot be distinguished. For certain results, zero results are therefore coded as very small numbers to allow for that distinction. Zero observation can be excluded from classification and the polygons with zero observations will not be filled. Equally, a number of regions with small and large values can be excluded from classification.

Classification method

A first important feature is called “classification method” and defines how internally the class limits are set. For all types of automatic classification methods a clean-up procedure is used which removes classes with identical limits. It is generally recommended to use a number of classes which can be easily identified by the user, and to consult the frequency or cumulative distribution graphs present in the map option dialogue to check to what extent the class limits chosen represent the data well.

The following classification methods are currently supported:

Natural breaks

Natural breaks classification is a method to cluster the data into classes so that differences between the means of the classes become high while the standard deviation inside the classes becomes low (FISHER, W. D. (1958). "ON GROUPING FOR MAXIMAL HOMOGENEITY," JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION 53, 789-798. Code based on: HARTIGAN, J. A. (1975). CLUSTERING ALGORITHMS, JOHN WILEY & SONS, INC., NEW YORK. PAGES 130-142.). The algorithm does not only find the approximate best solution, but often gives rather appealing class limit definitions.

It works rather well if no extreme outliers are present in the distribution. In the latter case, classes solely comprising the outliers will be generated, and the vast majority of the values will be put in one or two classes.

The clustering algorithm is rather expensive to calculate, so that in cases in which the population exceeds 500 observations a somewhat simplified version is implemented in the CAPRI GUI. From the original observations, a “condensed” population is generated whose members represented means of consecutive observations of the original one. The members are set so that the number of observations from which the mean is calculated is not bigger then 1/500 of the original population size and that the spread of those observations is smaller than the minimum of 1/500 of the spread of the total population and 10% of the standard deviation. The actual calculations are then done taking the size of the resulting classes into account.

Quantile

The observations of the regions are split in a way so that approximately the same number of observations fall into each class . Quantiles are cheap to calculate and are therefore the default setting, and often appealing as colors occupy similar areas in the maps as long as the polygons have approximately the same size.

If unique values are found at the end of a quantile, the algorithm will either exclude all observation with that unique value from the class or include all of them. The decision will be based on the fact if with or without inclusion the size of the class comes closer to the desired size. If the user has e.g. chosen five classes, the desired class size should cover 20% of the observations or area weights.

Equal interval

The differences between the current minimum and maximum value is divided into classes of equal spread. This may lead to rather curious class limits when outliers are present. In those cases, it may be appropriate to exclude some regions from the classification. See below for details how to exclude regions from the classification.

Mean standard dev

The class limits are defined according to the mean and the portions of the standard deviation of the data. It works best with normally distributed data, but may result in very small classes if the distribution is skewed, e.g. long tailed. The algorithm will always introduce at least four classes, then six, eight, ten and twelve. More than twelve classes are neglected.

The algorithm takes into account the spread of the data, and sets the class limits accordingly. If all observations fall into +/-25% of a standard deviation, class limits are introduced at 25% and 10% for four classes. If the number of classes is higher, new limits are introduced at 5%, 2.5%, 1% and 0.5%. In case of +/-50%, the smallest class is dropped and +/-50% added, and so forth up to +/- 3 standard deviations.

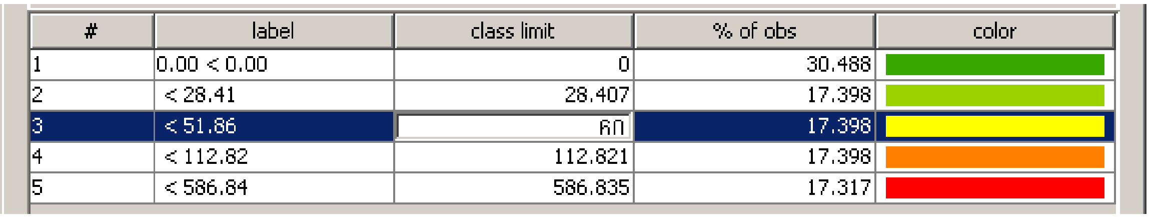
Nested mean

The nested mean classification will only work with 2, 4 or 8 classes. The classes will be defined such that one break is found at the mean of the sample. The resulting two halves of population are then again divided by their mean to get four classes, and the resulting quarters divided by their means to define eight classes. This works well with rather skewed distributions.

Manual classification

Finally, the user may set the class limits by hand. In order to do so, double click the mouse on the appropriate row in the table with the classification results in the column "class limit". The value can now be changed with the keyboard. When this is done, click into another cell. The labels will be adjusted accordingly. Afterwards, when all class limits are defined, the user may also overwrite the label (e.g. using words as "low" or "high").

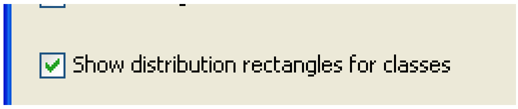
Please keep in mind that currently the values will be lost if you load other data or change the classification, number of classes etc..



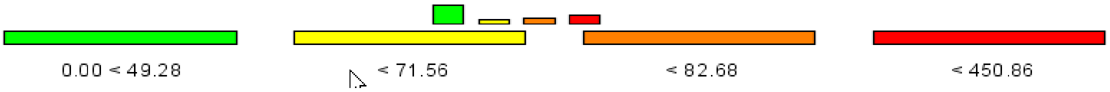
#	label	class limit	% of obs	color
1	0.00 < 0.00	0	30.488	🟩
2	< 28.41	28.407	17.398	🟩
3	< 51.86	60	17.398	🟨
4	< 112.82	112.821	17.398	🟧
5	< 586.84	586.835	17.317	🟥

Integration distribution information in the map window

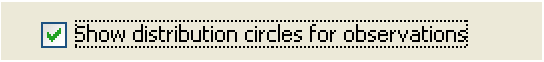
The GUI allows the user to enter distribution information in the map in different ways. The first possibility is to print a simple frequency diagram above the legend.

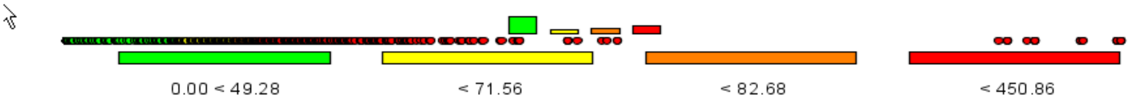

☑ Show distribution rectangles for classes

That gives a rather intuitive feel on how well the class limits represent the data distribution. In our example below, it is obvious, that the majority of the values lie in the first class.

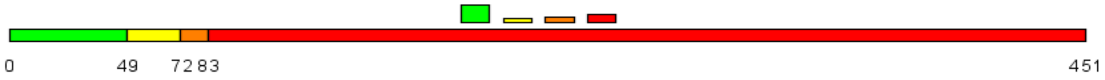


Less suitable for final out, but useful while playing around with classification methods and class definition are the distribution dots which can be added. They carry additional information on the locationof values in different classes.


☑ Show distribution circles for observations



Finally, switching to linear or logarithmic may be a way to help reading the map.



Color table

The color table defines the colors used for the classes. When choosing the color model, keep in mind that colors carry a meaning; red e.g. is generally interpreted as dangerous. Equally, it is important to think about the final medium with which the map will be published. Exporting colored maps to a black-white device will render it almost impossible to read the map. It is best to try different color tables and different classification methods on your data. The following color models are currently available, named according to the data order from minimal to maximal value:

- *Green – Yellow – Red (standard)*: Normally, the middle class is drawn in yellow, smaller values in shades between yellow and green, and larger ones from green to red. This should be applied e.g. to environmental indicators where the damage increases with the value of the indicator.

- *Red – Yellow – Green:* as above, only that high values are shown in green. Should be used e.g. for income indicators or environmental benefits.

- *Red – Gray - Green / Green – Gray – Red:* more available for historic reasons as they mimic the color tables of the original JAVA applet.

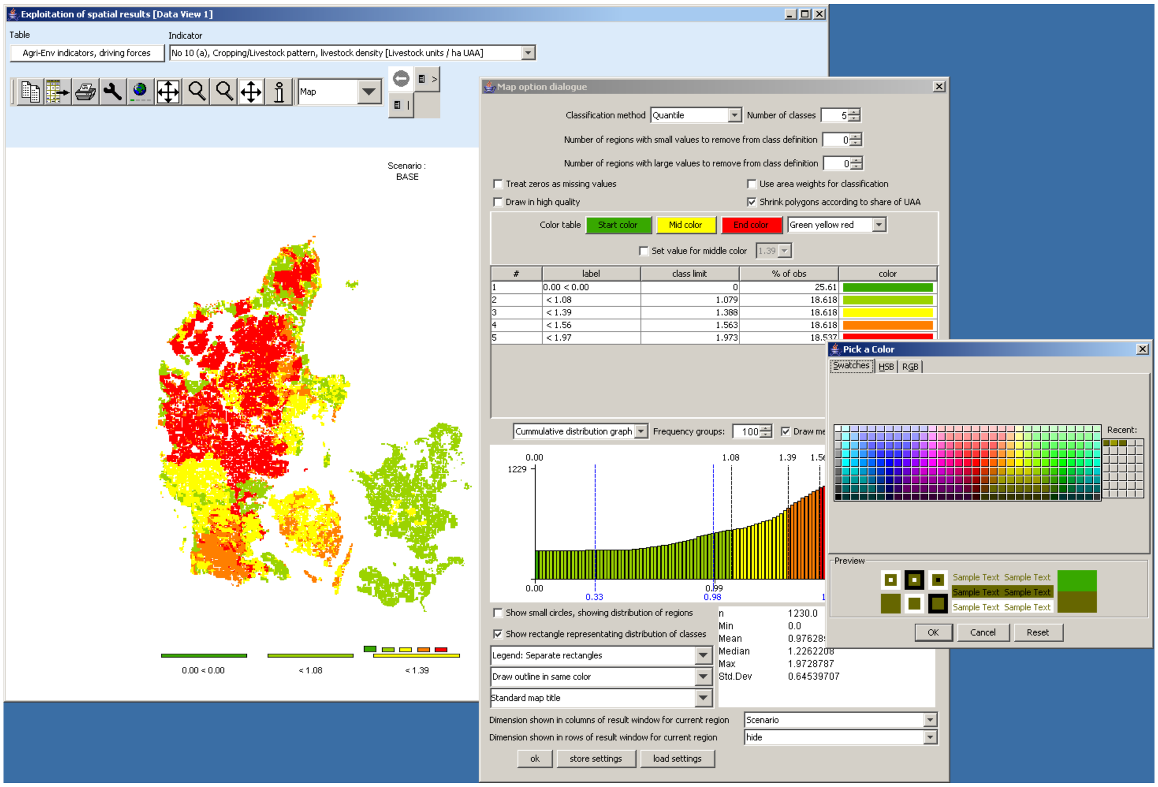
- *Blue – Gray - Green / Green – Gray – Blue:* introduced on demand of DG-AGRI. A good choice if the “good”/”bad” interpretation of the distribution is to be avoided.

- *Shades of grey:* sometimes needed for publications when color printing is not available in the final hardcopy. Beware to use a limited number of classes.

- *Shades of blue:* useful where the notion of “bad” or “good” inheritably comprised in greenish and reddish colors is to be avoided.

Defining an self-created color model

Once a color model is chosen, the user can re-define the start, middle and end color using the three buttons on the color table selection row, as shown below, given a lot of freedom to generate color ramps.



Exploitation of spatial results [Data View 1]

Table: Agri-Env indicators, driving forces

Indicator: No 10 (a), Cropping/Livestock pattern, livestock density [Livestock units / ha UAA]

Map

Scenario : BASE

Map option dialogue

Classification method: Quantile — Number of classes: 5

Number of regions with small values to remove from class definition: 0

Number of regions with large values to remove from class definition: 0

☐ Treat zeros as missing values ☐ Use area weights for classification

☐ Draw in high quality ☑ Shrink polygons according to share of UAA

Color table: Start color — Mid color — End color — Green yellow red

☐ Set value for middle color: 1.39

#	label	class limit	% of obs	color
1	0.00 < 0.00	0	25.61	🟩
2	< 1.08	1.079	18.618	🟩
3	< 1.39	1.388	18.618	🟨
4	< 1.56	1.563	18.618	🟧
5	< 1.97	1.973	18.537	🟥

Cummulative distribution graph — Frequency groups: 100 — ☑ Draw me

☐ Show small circles, showing distribution of regions

☑ Show rectangle representating distribution of classes

Legend: Separate rectangles

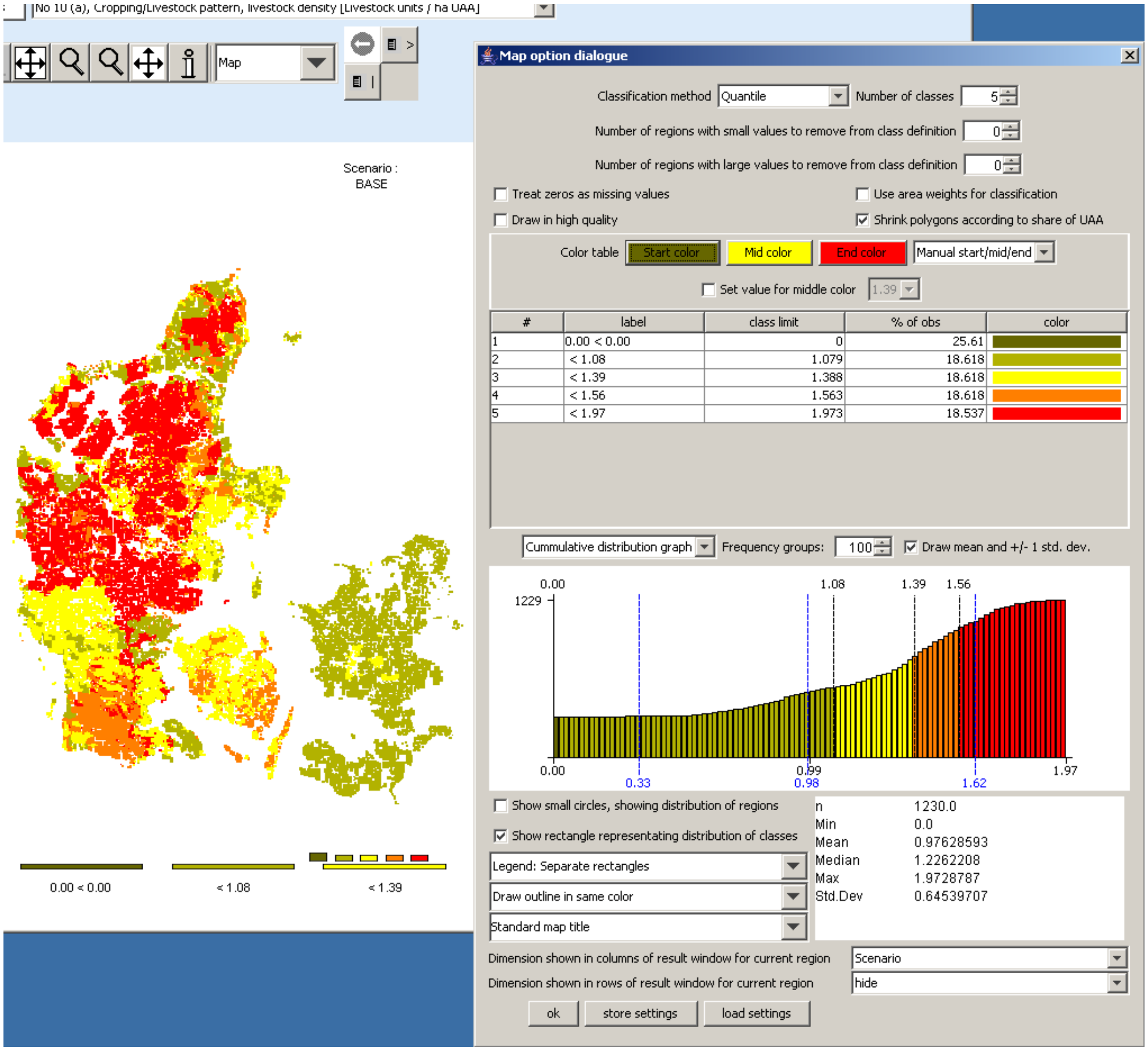
Draw outline in same color

Standard map title

n	1230.0
Min	0.0
Mean	0.97628
Median	1.2262208
Max	1.9728787
Std.Dev	0.64539707

Dimension shown in columns of result window for current region: Scenario

Dimension shown in rows of result window for current region: hide



Map option dialogue

Classification method: Quantile Number of classes: 5

Number of regions with small values to remove from class definition: 0

Number of regions with large values to remove from class definition: 0

□ Treat zeros as missing values □ Use area weights for classification

□ Draw in high quality ☑ Shrink polygons according to share of UAA

Color table: Start color | Mid color | End color | Manual start/mid/end

□ Set value for middle color 1.39

#	label	class limit	% of obs	color
1	0.00 < 0.00	0	25.61	🟫
2	< 1.08	1.079	18.618	🟨
3	< 1.39	1.388	18.618	🟨
4	< 1.56	1.563	18.618	🟧
5	< 1.97	1.973	18.537	🟥

Cummulative distribution graph Frequency groups: 100 ☑ Draw mean and +/- 1 std. dev.

□ Show small circles, showing distribution of regions

☑ Show rectangle representing distribution of classes

Legend: Separate rectangles

Draw outline in same color

Standard map title

n	1230.0
Min	0.0
Mean	0.97628593
Median	1.2262208
Max	1.9728787
Std.Dev	0.64539707

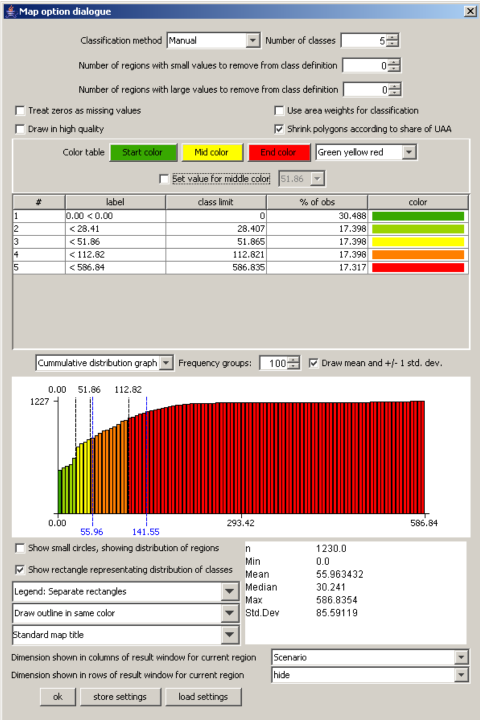
Dimension shown in columns of result window for current region: Scenario

Dimension shown in rows of result window for current region: hide

ok | store settings | load settings

Changing the value for the medium color

Normally, the medium color (yellow or gray) is assigned to the middle class. Sometimes, the user may wish to change the class where the color switches. First, the “Set value for color change” must be ticked. Next, in the now enabled drop-down box, choose the class limit for which the middle color should be used. The effect is shown below. Before, values in the class below “392.70” – the middle class – were drawn in yellow. When the user now selects another class limit, the colors assigned to the classes change. Here one of the shades of green is dropped and shades of red are added.



Map option dialogue

Classification method: Manual; Number of classes: 5

Number of regions with small values to remove from class definition: 0

Number of regions with large values to remove from class definition: 0

☐ Treat zeros as missing values ☐ Use area weights for classification

☐ Draw in high quality ☑ Shrink polygons according to share of UAA

Color table: Start color | Mid color | End color | Green yellow red

☐ Set value for middle color: 51.86

#	label	class limit	% of obs	color
1	0.00 < 0.00	0	30.488	🟩
2	< 28.41	28.407	17.398	🟩
3	< 51.86	51.865	17.398	🟨
4	< 112.82	112.821	17.398	🟧
5	< 586.84	586.835	17.317	🟥

Cummulative distribution graph; Frequency groups: 100; ☑ Draw mean and +/- 1 std. dev.

☐ Show small circles, showing distribution of regions

☑ Show rectangle representating distribution of classes

Legend: Separate rectangles

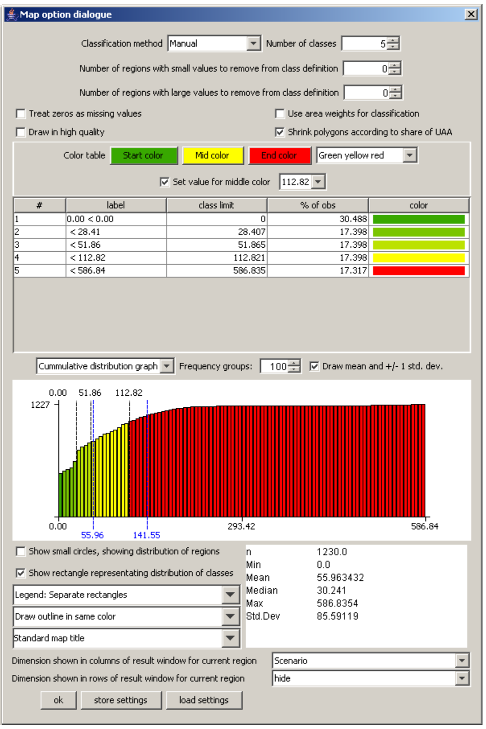
Draw outline in same color

Standard map title

n	1230.0
Min	0.0
Mean	55.963432
Median	30.241
Max	586.8354
Std.Dev	85.59119

Dimension shown in columns of result window for current region: Scenario

Dimension shown in rows of result window for current region: hide



Map option dialogue

Classification method: Manual; Number of classes: 5

Number of regions with small values to remove from class definition: 0

Number of regions with large values to remove from class definition: 0

☐ Treat zeros as missing values ☐ Use area weights for classification

☐ Draw in high quality ☑ Shrink polygons according to share of UAA

Color table: Start color | Mid color | End color | Green yellow red

☑ Set value for middle color: 112.82

#	label	class limit	% of obs	color
1	0.00 < 0.00	0	30.488	🟩
2	< 28.41	28.407	17.398	🟩
3	< 51.86	51.865	17.398	🟩
4	< 112.82	112.821	17.398	🟨
5	< 586.84	586.835	17.317	🟥

Cummulative distribution graph; Frequency groups: 100; ☑ Draw mean and +/- 1 std. dev.

☐ Show small circles, showing distribution of regions

☑ Show rectangle representating distribution of classes

Legend: Separate rectangles

Draw outline in same color

Standard map title

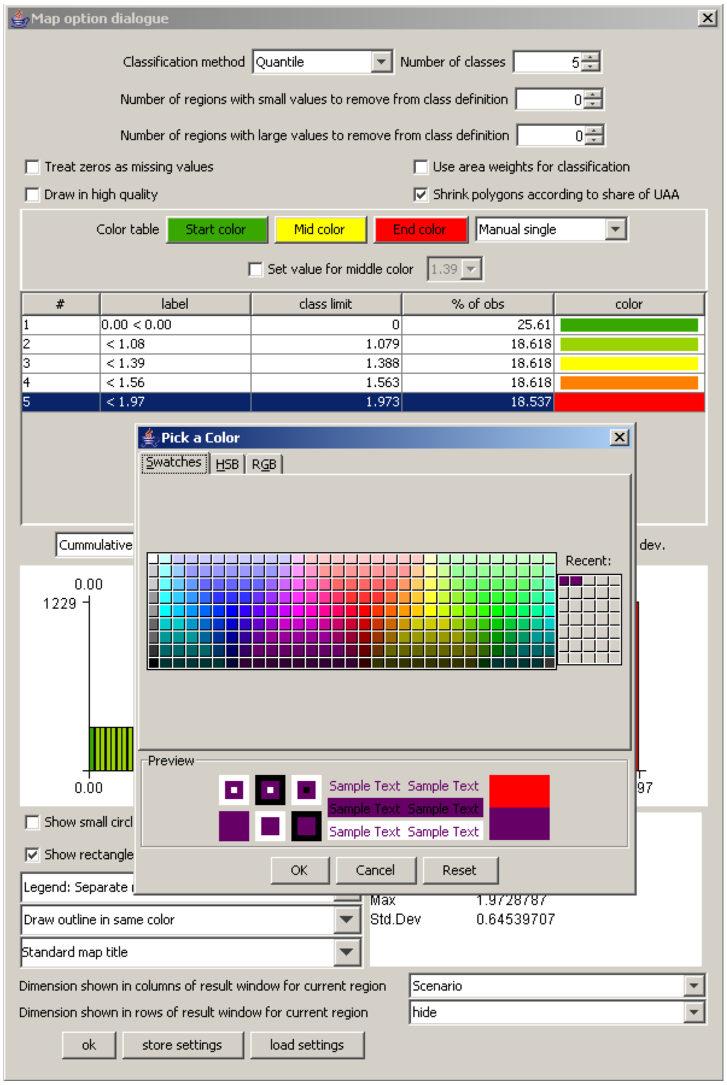
n	1230.0
Min	0.0
Mean	55.963432
Median	30.241
Max	586.8354
Std.Dev	85.59119

Dimension shown in columns of result window for current region: Scenario

Dimension shown in rows of result window for current region: hide

Manual set colors

Finally, the user can choose its own colors by double clicking in a color field in the legend table. That should only be done after the final definition of the class limits is set as otherwise, the manually set color will be lost.



Map option dialogue

Classification method: Quantile. Number of classes: 5

Number of regions with small values to remove from class definition: 0

Number of regions with large values to remove from class definition: 0

☐ Treat zeros as missing values ☐ Use area weights for classification

☐ Draw in high quality ☑ Shrink polygons according to share of UAA

Color table: Start color, Mid color, End color; Manual single

☐ Set value for middle color: 1.39

#	label	class limit	% of obs	color
1	0.00 < 0.00	0	25.61	🟩
2	< 1.08	1.079	18.618	🟩
3	< 1.39	1.388	18.618	🟨
4	< 1.56	1.563	18.618	🟧
5	< 1.97	1.973	18.537	🟥

☐ Show small circl

☑ Show rectangle

Legend: Separate r

Max 1.9728787

Std.Dev 0.64539707

Draw outline in same color

Standard map title

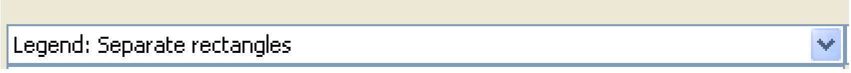
Dimension shown in columns of result window for current region: Scenario

Dimension shown in rows of result window for current region: hide

Changing the way the legend is drawn

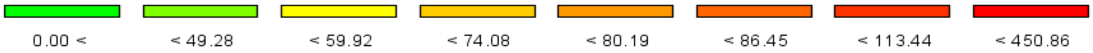
The map viewer always puts the legend below the map. Currently it offers three options how legends are drawn:

1. **Separate, equally sized rectangles** which show the upper class limit with the exemption of the lowest class, which shows the lower limit.

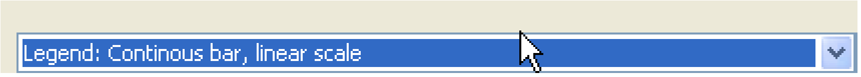


Legend: Separate rectangles

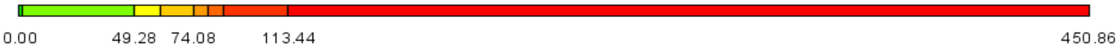
:



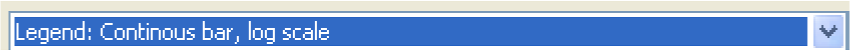
2. **A continuous linear scaling** bar. That gives an optical idea about the distribution of the class limits. Overlapping of the number is avoided by skipping class limits close to each other



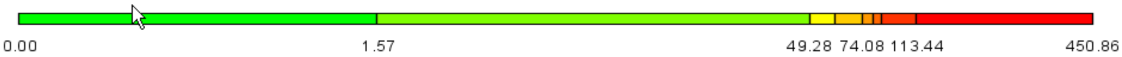
Legend: Continous bar, linear scale



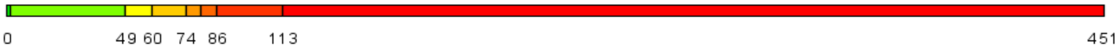
3. A continuous logarithmic scaling bar



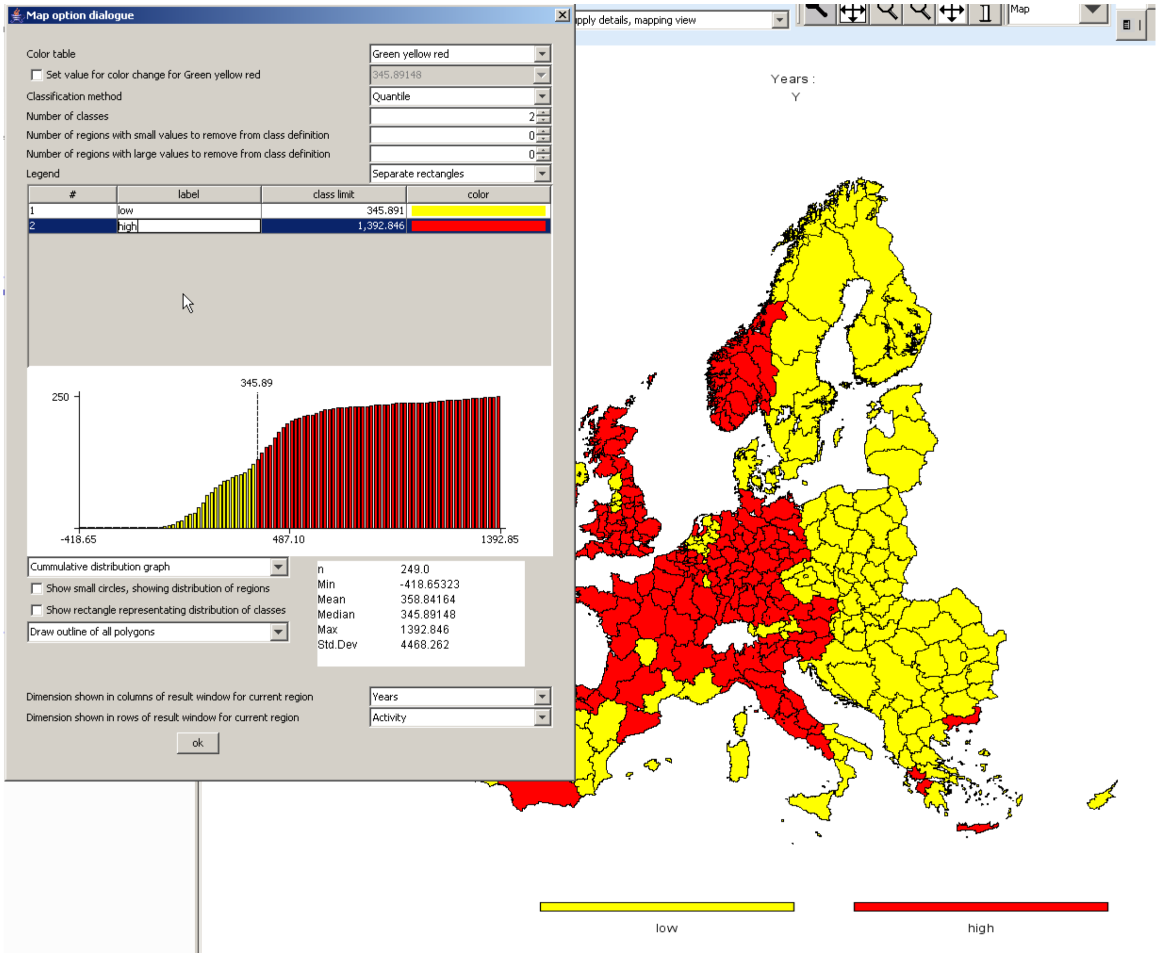
Legend: Continous bar, log scale



In all the cases, the tool dialogue can be used to set number of digits shown, e.g. reducing the number of digits to zero leads to a linear bar as shown below:



The reader is reminded that the label can be changed manually as shown below.


Map option dialogue

Color table: Green yellow red

□ Set value for color change for Green yellow red: 345.89148

Classification method: Quantile

Number of classes: 2

Number of regions with small values to remove from class definition: 0

Number of regions with large values to remove from class definition: 0

Legend: Separate rectangles

#	label	class limit	color
1	low	345.891	🟨
2	high	1,392.846	🟥

Cummulative distribution graph

□ Show small circles, showing distribution of regions

□ Show rectangle representating distribution of classes

Draw outline of all polygons

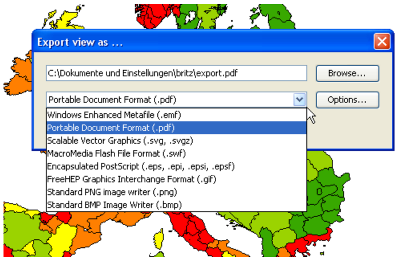
n	249.0
Min	-418.65323
Mean	358.84164
Median	345.89148
Max	1392.846
Std.Dev	4468.262

Dimension shown in columns of result window for current region: Years

Dimension shown in rows of result window for current region: Activity

Copying the map to the clipboard or saving to disk

In order to export the map to other applications, the easiest way is to use the clipboard, in order to do so, press the “copy to clipboard” 📋 button. Afterwards, the current map can be imported into other applications as e.g. MS Word. Another possibility is to store the current map in jpeg format on disk, to do so, use the “export” ▦ button which will open a file dialog to choose the name of the file and select between different graphic formats. For MS Office users, the “Windows Enhanced Metafile (.emf)” format is especially interesting as it allows to change the graphic afterwards, e.g. by moving the legend or changing the text.


Export view as ...

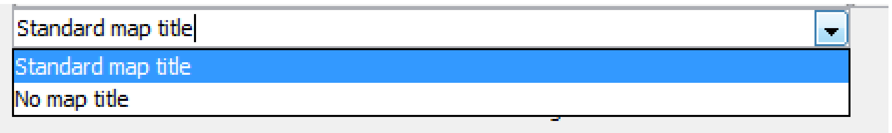
C:\Dokumente und Einstellungen\britz\export.pdf

Portable Document Format (.pdf)

Browse...
Options...
Windows Enhanced Metafile (.emf)
Portable Document Format (.pdf)
Scalable Vector Graphics (.svg, .svgz)
MacroMedia Flash File Format (.swf)
Encapsulated PostScript (.eps, .epi, .epsi, .epsf)
FreeHEP Graphics Interchange Format (.gif)
Standard PNG image writer (.png)
Standard BMP Image Writer (.bmp)

Changing the title of the map

When using output to clipboard or disk, the user may often prefer to choose his own title or no title at all on top of the map. This will be helpful when producing a caption for the map in another application. In order to refrain from drawing a title on top of the map, click into the legend part of the map, and in the dialog at the bottom, choose “none” in the row labeled “Title on top of map”. Alternatively, the user can simply write something in the box.



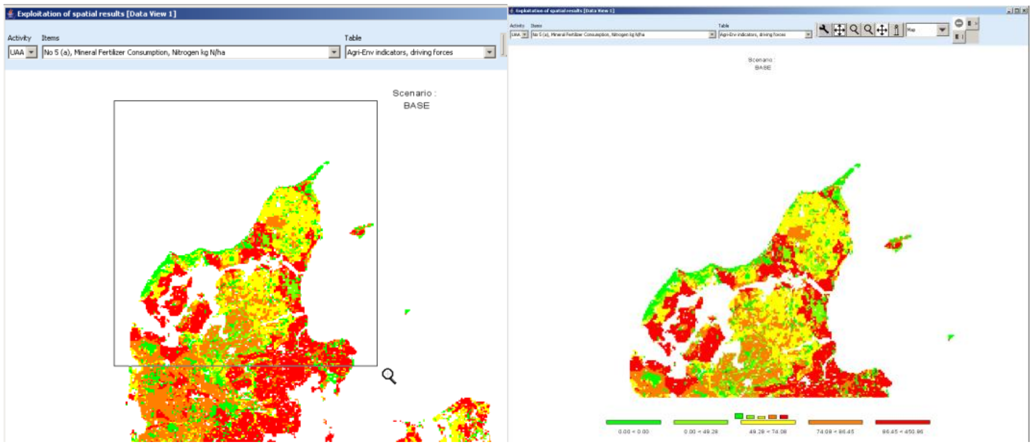
Standard map title

Standard map title

No map title

Zooming in and out and navigating in the map

In order to zoom in part of the map, press the 🔍 button. The mouse pointer will change to a magnifying glass with a cross in it. You can then mark an area on the map by pressing the mouse button, dragging and then releasing the mouse. After the mouse is released, solely the selected zone of the map will be drawn, without changing the class limits or any other setting. Clicking with the mouse while being in zoom in mode will increase the map resolution step-wise by 25% and center the map at the current mouse position.



Exploitation of spatial results [Data View 1]

Activity: UAA

Items: No 5 (a), Mineral Fertilizer Consumption, Nitrogen kg N/ha

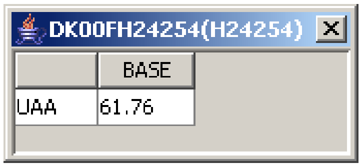
Table: Agri-Env indicators, driving forces

Scenario : BASE

By clicking with the zoom out pointer 🔍 on a point of the map, the point becomes the new center point of the map and the map resolution is reduced stepwise by 25%. Equally, you may drag the map while keeping the current resolution by choosing the drag pointer ✥. Finally, in order to return to the original full-sized map, use the “full extent” button ⊞. The reader should note that the “full extent” button shows a rectangle around the arrows.

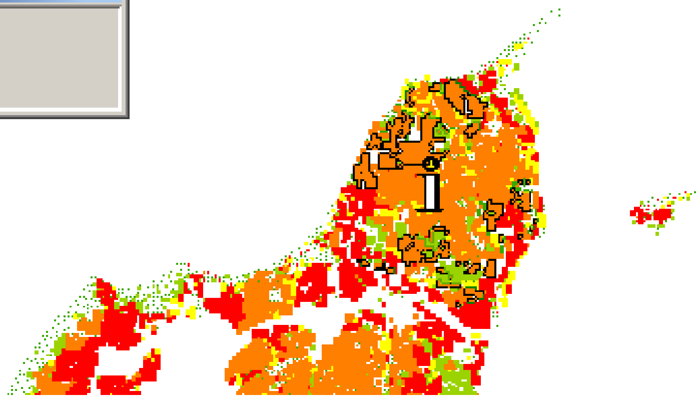
Getting data for specific polygons

The info pointer ℹ will open an additional window, as shown below, which displays information on the current polygon – the circle above the “i” being the focus point. The title bar of the new window shows the code and, if available, the long text of the polygon currently pointed to with the info pointer. The content of the info window is continuously updated when the mouse is moved over the map, and all polygons belonging to the same region as the one pointed on with the mouse is highlighted.

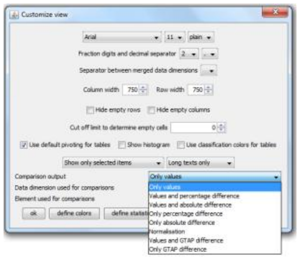


DK00FH24254(H24254)

	BASE
UAA	61.76



If the user opts to use one of the comparison options to be shown (percentages, differences, normalization) by clicking on the “customize” 🔧 button, an additional column is automatically added to the info window showing the comparison value used. That is especially helpful when the map shows only differences.



Customize view

Arial ▾ 11 ▾ plain ▾

Fraction digits and decimal separator 2 ▾ . ▾

Separator between merged data dimensions ▾

Column width 750 Row width 750

□ Hide empty rows □ Hide empty columns

Cut off limit to determine empty cells 0

☑ Use default pivoting for tables □ Show histogram □ Use classification colors for tables

Show only selected items ▾ Long texts only ▾

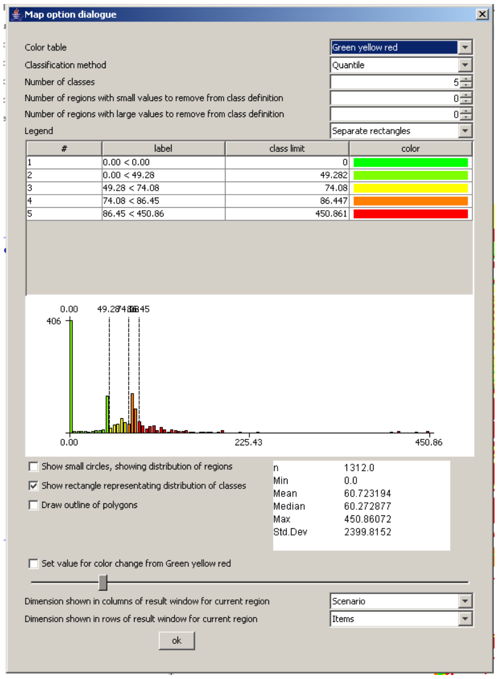
Comparison output: Only values ▾

Data dimension used for comparisons

Element used for comparisons

Only values
Values and percentage difference
Values and absolute difference
Only percentage difference
Only absolute difference
Normalisation
Values and GTAP difference
Only GTAP difference
ok
define colors
define statisti

The content shown in the info window is not fixed, rather, the user can decide which data dimensions to use for the columns and rows by using the "map option dialogue" by clicking on the legend of the map. If the user e.g. switches to "items" instead of "activity", the "info" window will look like shown below. An alternative is to use a second tabular view in addition to the map.



Map option dialogue

Color table: Green yellow red
Classification method: Quantile
Number of classes: 5
Number of regions with small values to remove from class definition: 0
Number of regions with large values to remove from class definition: 0
Legend: Separate rectangles

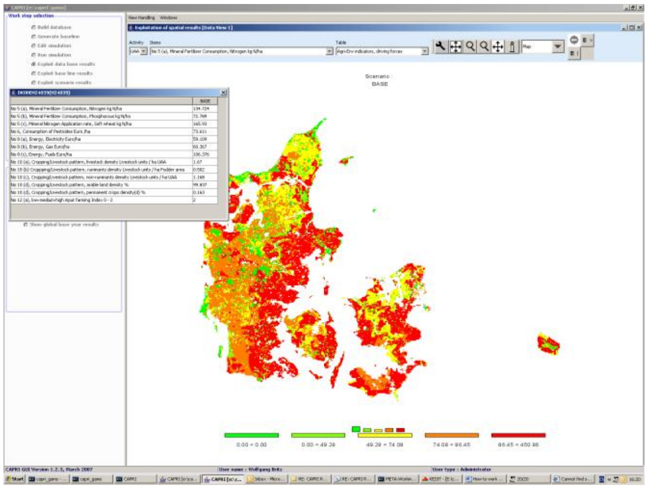
#	label	class limit	color
1	0.00 < 0.00	0	🟩
2	0.00 < 49.28	49.282	🟩
3	49.28 < 74.08	74.08	🟨
4	74.08 < 86.45	86.447	🟧
5	86.45 < 450.86	450.861	🟥

☐ Show small circles, showing distribution of regions
☑ Show rectangle representating distribution of classes
☐ Draw outline of polygons

n	1312.0
Min	0.0
Mean	60.723194
Median	60.272877
Max	450.86072
Std.Dev	2399.8152

☐ Set value for color change from Green yellow red

Dimension shown in columns of result window for current region: Scenario
Dimension shown in rows of result window for current region: Items



Exploitation of spatial results [Data View 1]

Activity: UAA
Items: No 5 (a), Mineral Fertilizer Consumption, Nitrogen kg N/ha
Table: Agri-Env indicators, driving forces
Map

Scenario : BASE

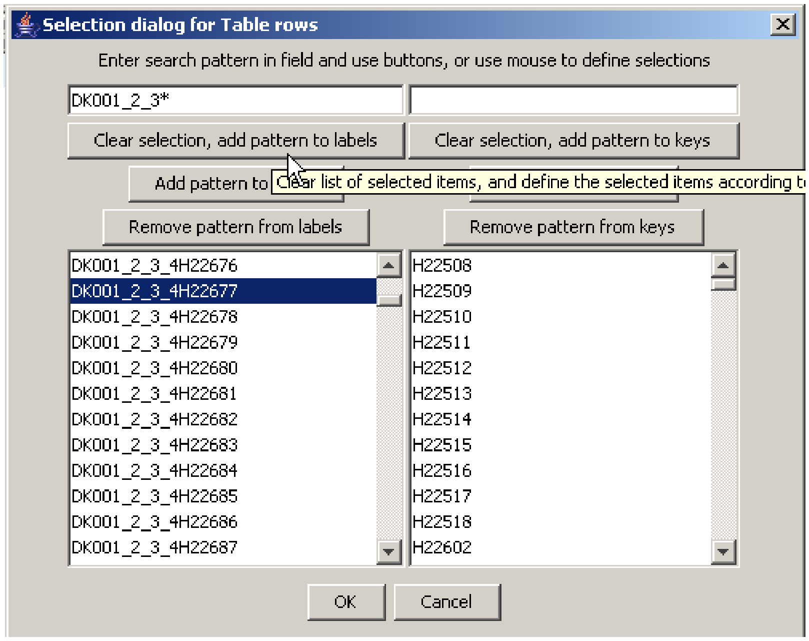
DK000H24039(H24039)

	BASE
No 5 (a), Mineral Fertilizer Consumption, Nitrogen kg N/ha	134.724
No 5 (b), Mineral Fertilizer Consumption, Phosphorous kg N/ha	72.769
No 5 (c), Mineral Nitrogen Application rate, Soft wheat kg N/ha	165.93
No 6, Consumption of Pesticides Euro /ha	73.611
No 8 (a), Energy, Electricity Euro/ha	59.109
No 8 (b), Energy, Gas Euro/ha	60.367
No 8 (c), Energy, Fuels Euro/ha	106.376
No 10 (a), Cropping/Livestock pattern, livestock density Livestock units / ha UAA	1.67
No 10 (b) Cropping/Livestock pattern, ruminants density Livestock units / ha Fodder area	0.582
No 10 (c), Cropping/Livestock pattern, non-ruminants density Livestock units / ha UAA	1.169
No 10 (d), Cropping/Livestock pattern, arable land density %	99.837
No 10 (d), Cropping/Livestock pattern, permanent crops density(d) %	0.163
No 12 (a), low-medium-high input Farming Index 0 - 2	2

0.00 < 0.00
0.00 < 49.28
49.28 < 74.08
74.08 < 86.45
86.45 < 450.86
CAPRI GUI Version 1.2.3, March 2007
User name : Wolfgang Britz
User type : Administrator
Start

Highlighting specific regions in the map

Sometimes it may be interesting to see the spatial distribution of specific data or data constellations. All views open the possibility to (de)select columns and rows, allowing e.g. to use the NUTS code in front of the numerical HSMU code to select only the HSMU belonging to specific administrative regions. That possibility is explained in short. First, double-click the row selection button ▮| ("Open selection dialog for table rows") which will open the following dialogue.



Selection dialog for Table rows

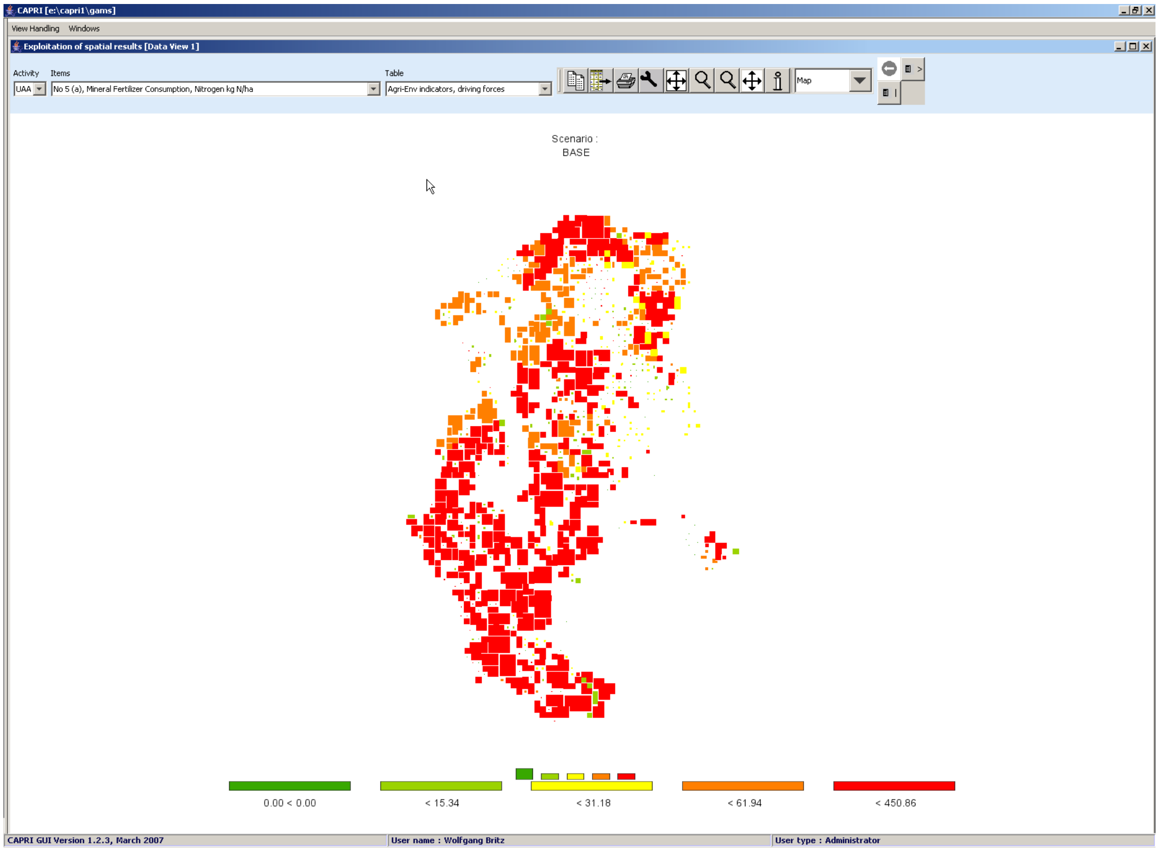
Enter search pattern in field and use buttons, or use mouse to define selections

DK001_2_3*

Clear selection, add pattern to labels
Clear selection, add pattern to keys
Add pattern to
Clear list of selected items, and define the selected items according t
Remove pattern from labels
Remove pattern from keys
OK
Cancel

DK001_2_3_4H22676	H22508
DK001_2_3_4H22677	H22509
DK001_2_3_4H22678	H22510
DK001_2_3_4H22679	H22511
DK001_2_3_4H22680	H22512
DK001_2_3_4H22681	H22513
DK001_2_3_4H22682	H22514
DK001_2_3_4H22683	H22515
DK001_2_3_4H22684	H22516
DK001_2_3_4H22685	H22517
DK001_2_3_4H22686	H22518
DK001_2_3_4H22687	H22602

Now, we may e.g. select only the HSMU belonging to the FSS region DK000_1_2_3 by typing “”DK001_2_3” in the left input box, and then choosing “Clear selection, add pattern to labels”. Afterwards, the map will look as shown below.



Activity: UAA

Items: No 5 (a), Mineral Fertilizer Consumption, Nitrogen kg N/ha

Table: Agri-Env indicators, driving forces

Map

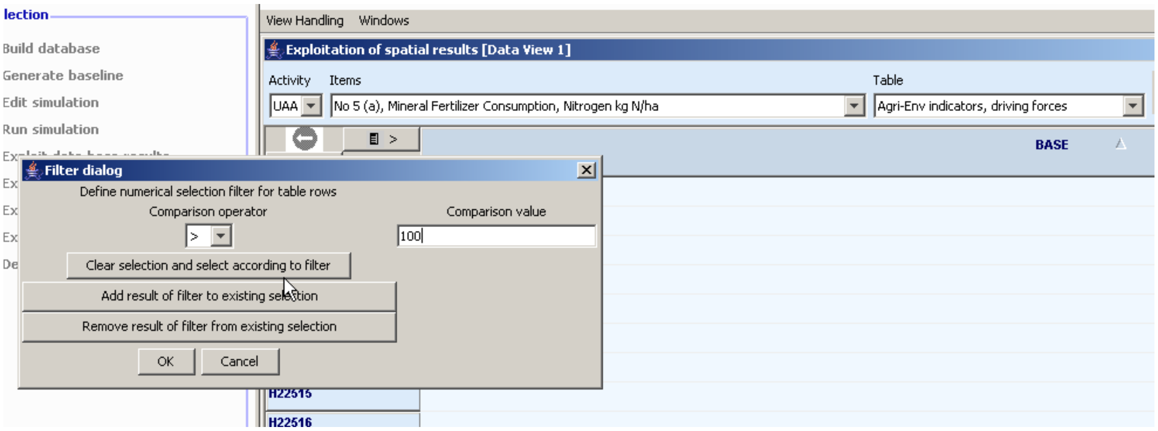
Scenario : BASE

CAPRI GUI Version 1.2.3, March 2007

User name : Wolfgang Britz

User type : Administrator

The tabular view opens up the possibility of using numeric filters, an option discussed in the following. Take for example the task to select all regions where the Nitrogen Fertilizer Consumption is between 100 and 150 kg/ha. First, switch from map to tabular view. In the table click with the right mouse button in the column header of that column holding the values to which the filter should be applied, as shown below. We will need to apply the filter step-wise, first e.g. selecting all values greater than 100 and then removing those which are above 150.


lection
Build database
Generate baseline
Edit simulation
Run simulation
View Handling
Windows
Exploitation of spatial results [Data View 1]
BASE
Filter dialog
Clear selection and select according to filter
Add result of filter to existing selection
Remove result of filter from existing selection
OK
Cancel
H22515
H22516

Activity: UAA

Items: No 5 (a), Mineral Fertilizer Consumption, Nitrogen kg N/ha

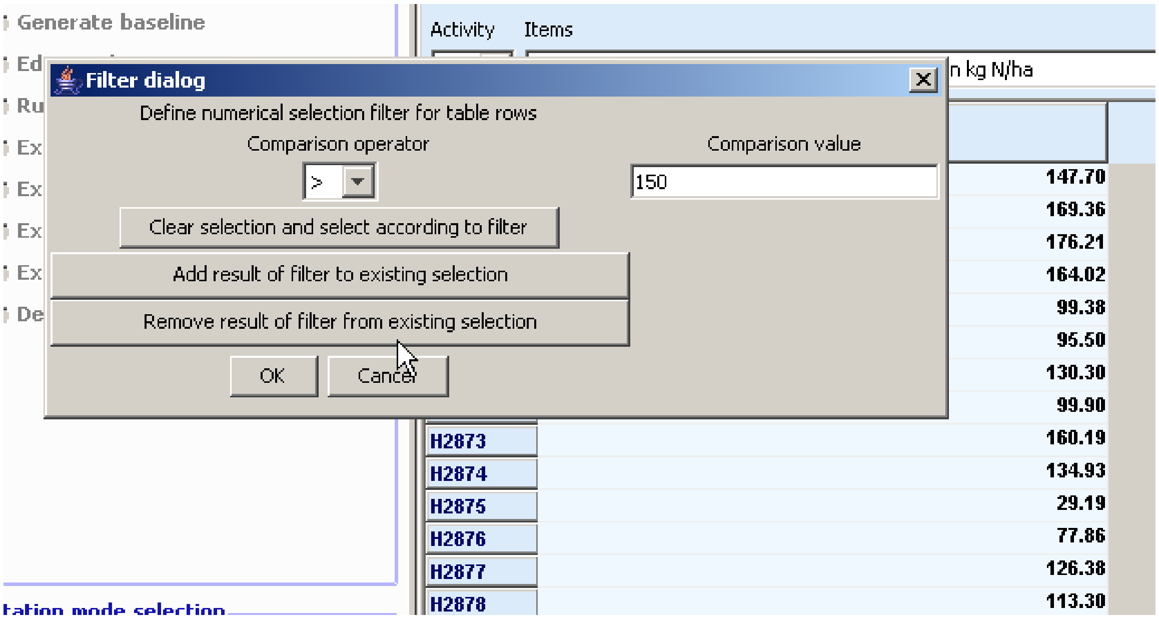
Table: Agri-Env indicators, driving forces

Define numerical selection filter for table rows

Comparison operator: >

Comparison value: 100

After clicking on “clear selection and select according to filter”, and then on “ok”, the table will only show such regions where the value in the column “BASE” is above 100, as shown below. Next, we must exclude the regions above 150 kg/ha. To do so, set the filter to “>” “150”m and then press “remove result of filter from existing selection”.


Generate baseline
Filter dialog
Clear selection and select according to filter
Add result of filter to existing selection
Remove result of filter from existing selection
OK
Cancel
tation mode selection

Activity

Items: n kg N/ha

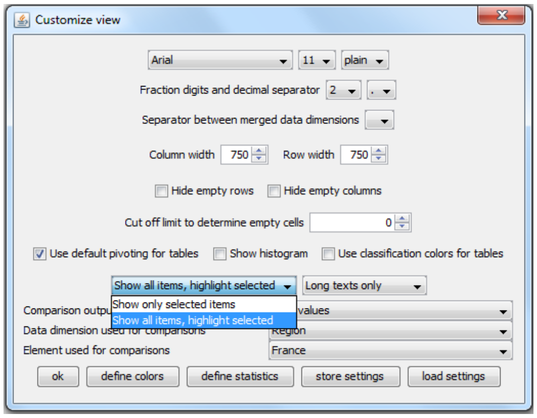
Define numerical selection filter for table rows

Comparison operator: >

Comparison value: 150

	147.70
	169.36
	176.21
	164.02
	99.38
	95.50
	130.30
	99.90
H2873	160.19
H2874	134.93
H2875	29.19
H2876	77.86
H2877	126.38
H2878	113.30

Now, drawing a map with just those regions is not so interesting. However, with the tool dialogue, we can highlight the selected value instead of hiding all others. The selected rows are now shown in red in the tabular view.



Customize view

Arial | 11 | plain

Fraction digits and decimal separator: 2 | .

Separator between merged data dimensions:

Column width: 750 — Row width: 750

□ Hide empty rows □ Hide empty columns

Cut off limit to determine empty cells: 0

☑ Use default pivoting for tables □ Show histogram □ Use classification colors for tables

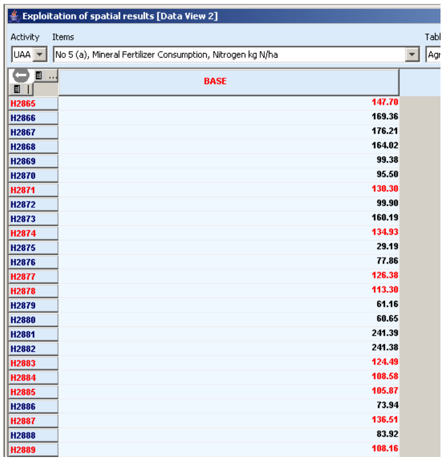
Show all items, highlight selected | Long texts only

Show only selected items
Show all items, highlight selected

Comparison outpu… : values

Data dimension used for comparisons: Region

Element used for comparisons: France

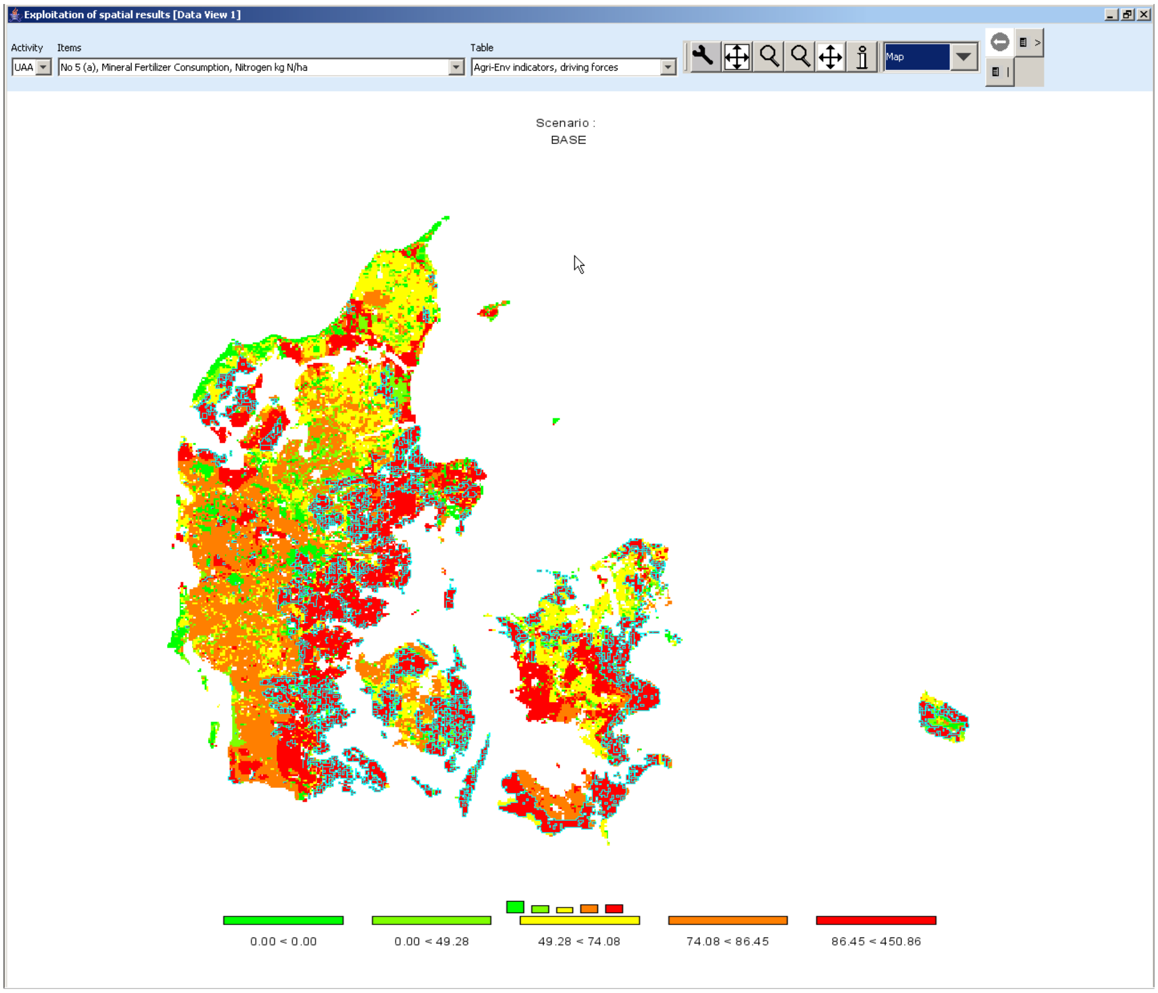


Exploitation of spatial results [Data View 2]

Activity: UAA — Items: No 5 (a), Mineral Fertilizer Consumption, Nitrogen kg N/ha — Tabl: Agr

	BASE
H2865	147.70
H2866	169.36
H2867	176.21
H2868	164.02
H2869	99.38
H2870	95.50
H2871	130.30
H2872	99.90
H2873	160.19
H2874	134.93
H2875	29.19
H2876	77.86
H2877	126.38
H2878	113.30
H2879	61.16
H2880	60.65
H2881	241.39
H2882	241.38
H2883	124.49
H2884	108.58
H2885	105.87
H2886	73.94
H2887	136.51
H2888	83.92
H2889	108.16

When we now draw the outlines of the selected polygons only (see map option dialogue), the map will draw the outline of the selected regions in cyan and thus highlight them. The row selection will be maintained when the pivot or the table is changed, as long as one of the selected items can be found in the rows of the new table. The example map shown below is certainly not so interesting, as changed class limits could have done basically the same job. However, we could switch e.g. to grass land shares to see if fertilizer input is more often found on arable or on grass land.



Exploitation of spatial results [Data View 1]

Activity: UAA

Items: No 5 (a), Mineral Fertilizer Consumption, Nitrogen kg N/ha

Table: Agri-Env indicators, driving forces

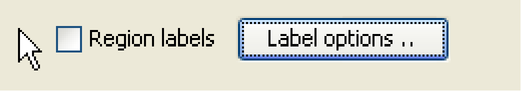
Scenario : BASE

Updating the map

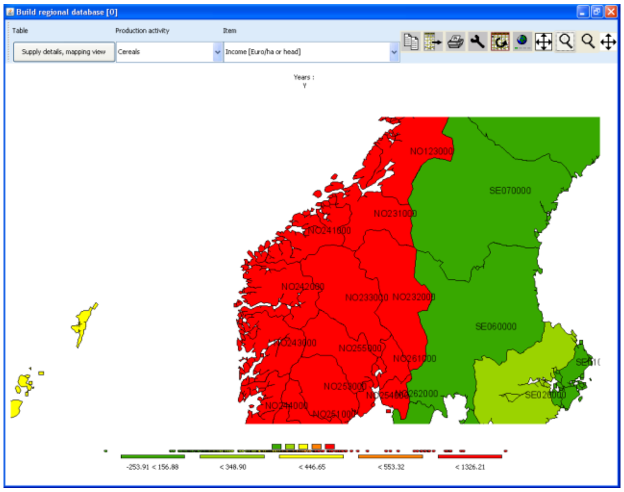
Generally, the map is updated automatically when the user changes an option with an impact on its layout, as long as the number of visible polygons is below 20.000. If that amount is exceeded, the classification dialogue is updated immediately, but not the underlying map. In order to apply the changes, the “apply” button must be clicked on. The user is informed that the “ok” button will also update the map, so that an “apply” immediately before an “ok” is not necessary.

Adding region label to the map

In the map option dialogue, tick the box “Show regions labels in map”



to add labels to the largest polygon for each region as shown below.



Build regional database [0]

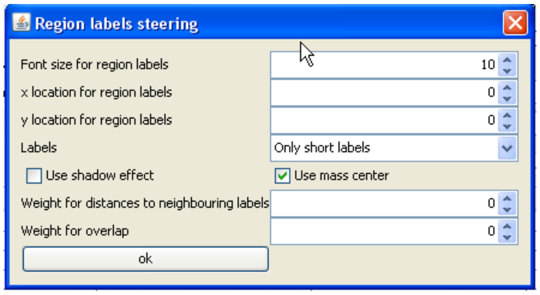
Table: Supply details, mapping view

Production activity: Cereals

Item: Income [Euro/ha or head]

Years :
Y

By clicking on the Label options .. button, the "Region label steering" dialogue box opens which allows changing some settings. For maps with just a few regions (or when zooming), it might be worthwhile trying to play around with the action to improve labeling.

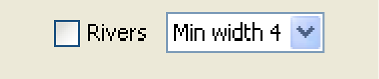


Region labels steering

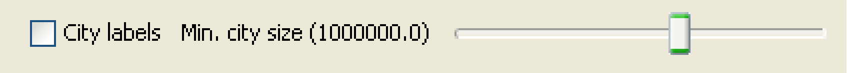
Font size for region labels	10
x location for region labels	0
y location for region labels	0
Labels	Only short labels
☐ Use shadow effect	☑ Use mass center
Weight for distances to neighbouring labels	0
Weight for overlap	0

Showing river and cities

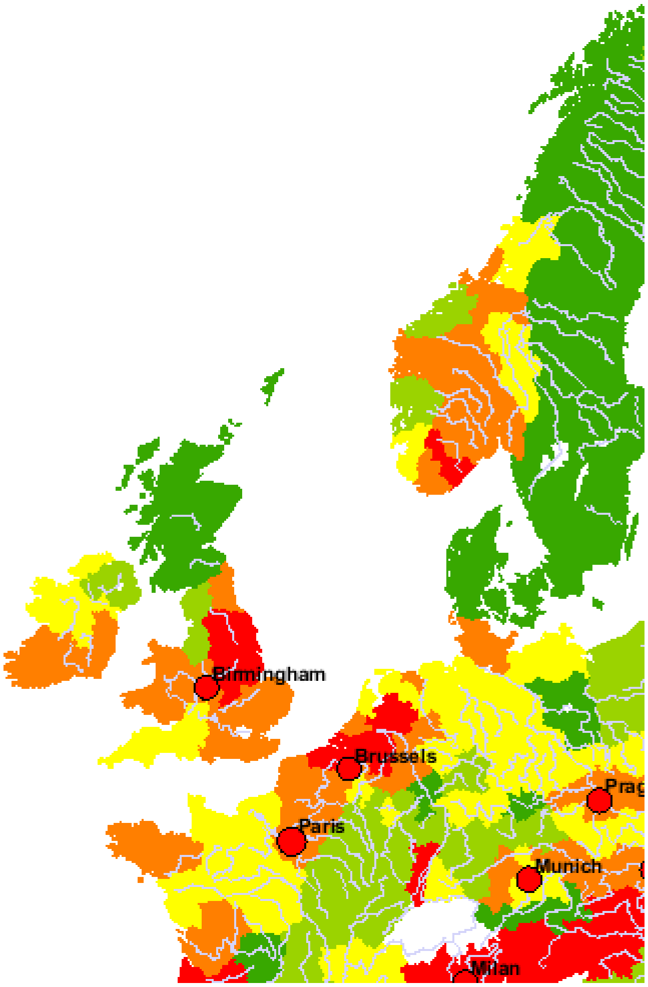
The NUTS2 map comprises geometry information about major rivers and cities above around 75.5000 inhabitants, which can be added to the map:



☐ Rivers Min width 4

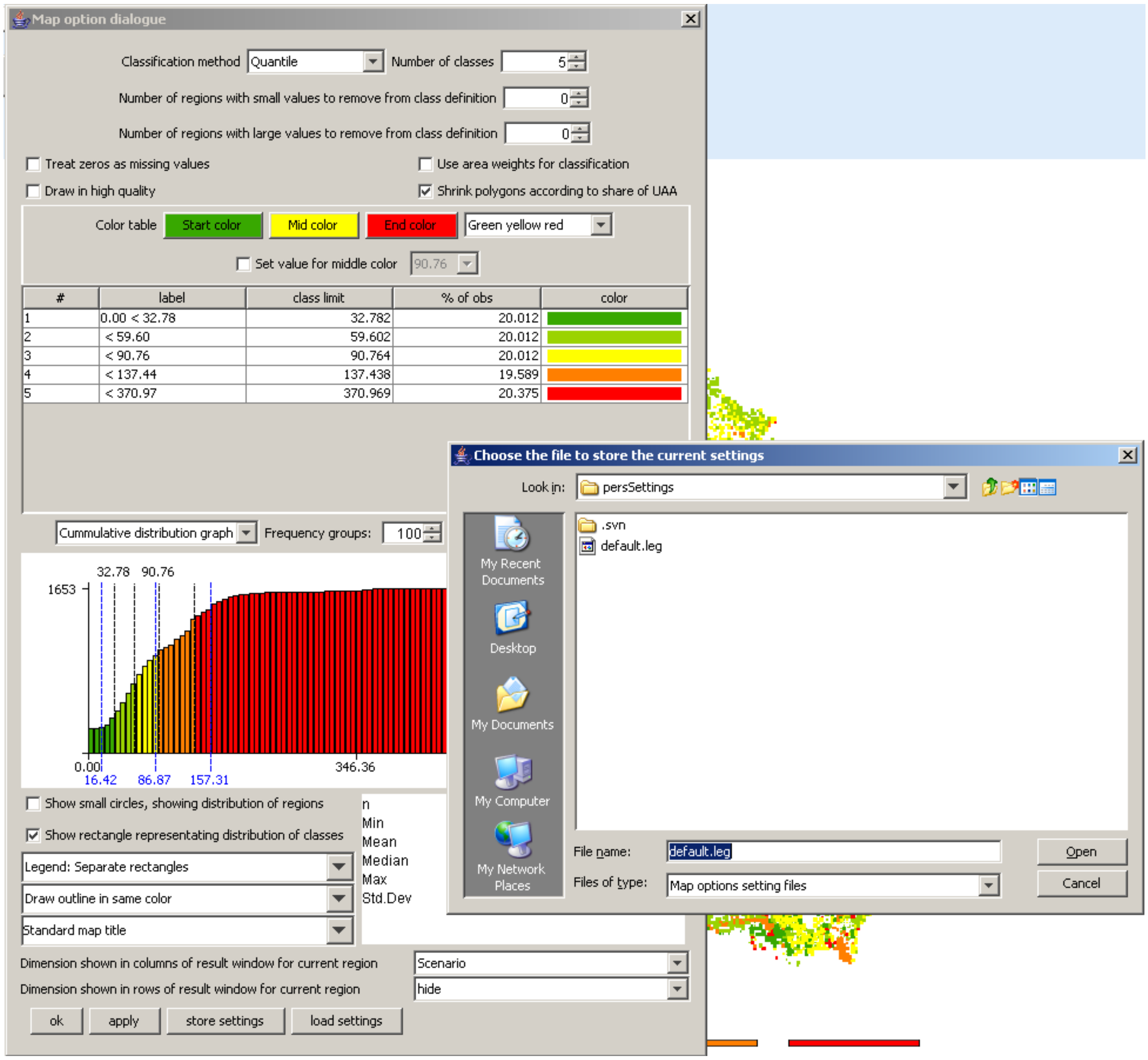


☐ City labels Min. city size (1000000.0)



Storing and re-loading your settings

Open the map option dialogue by pressing the map option button “🌐”. Change the settings according to your needs and then press the “store settings” button in the lower part of the dialogue. Choose a file name and a location. You may later use “load settings” to retrieve them again and apply them to another map.



Map option dialogue

Classification method: Quantile — Number of classes: 5

Number of regions with small values to remove from class definition: 0

Number of regions with large values to remove from class definition: 0

□ Treat zeros as missing values — □ Use area weights for classification

□ Draw in high quality — ☑ Shrink polygons according to share of UAA

Color table: Start color, Mid color, End color — Green yellow red

□ Set value for middle color 90.76

#	label	class limit	% of obs	color
1	0.00 < 32.78	32.782	20.012	🟩
2	< 59.60	59.602	20.012	🟩
3	< 90.76	90.764	20.012	🟨
4	< 137.44	137.438	19.589	🟧
5	< 370.97	370.969	20.375	🟥

Cummulative distribution graph — Frequency groups: 100

□ Show small circles, showing distribution of regions

☑ Show rectangle representating distribution of classes

Legend: Separate rectangles

Draw outline in same color

Standard map title

Dimension shown in columns of result window for current region: Scenario

Dimension shown in rows of result window for current region: hide

Choose the file to store the current settings

Look in: persSettings

.svn

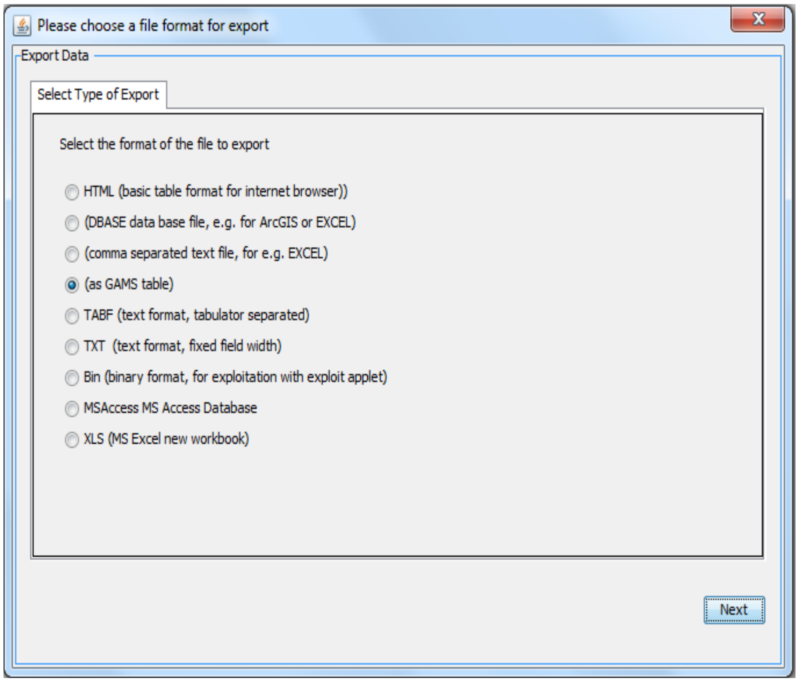
default.leg

File name: default.leg

Files of type: Map options setting files

Exporting the data underlying the map

As mentioned above, the mapping viewer is part of the CAPRI exploitation tools which is in its core based on pivot tables. In order to export the data, e.g. to GIS system, the view must first be changed to tables. Afterwards, the ▦ button will open a file dialog as shown below. For GIS-export, e.g. to ArcGIS, DBF is the recommended format.



Please choose a file format for export

Export Data

Select Type of Export

Select the format of the file to export

○ HTML (basic table format for internet browser))
○ (DBASE data base file, e.g. for ArcGIS or EXCEL)
○ (comma separated text file, for e.g. EXCEL)
● (as GAMS table)
○ TABF (text format, tabulator separated)
○ TXT (text format, fixed field width)
○ Bin (binary format, for exploitation with exploit applet)
○ MSAccess MS Access Database
○ XLS (MS Excel new workbook)

Once next is pressed, the next pane will open a file dialog to choose a file. In the case of export to a Microsoft Access Data Base, the file must exist.

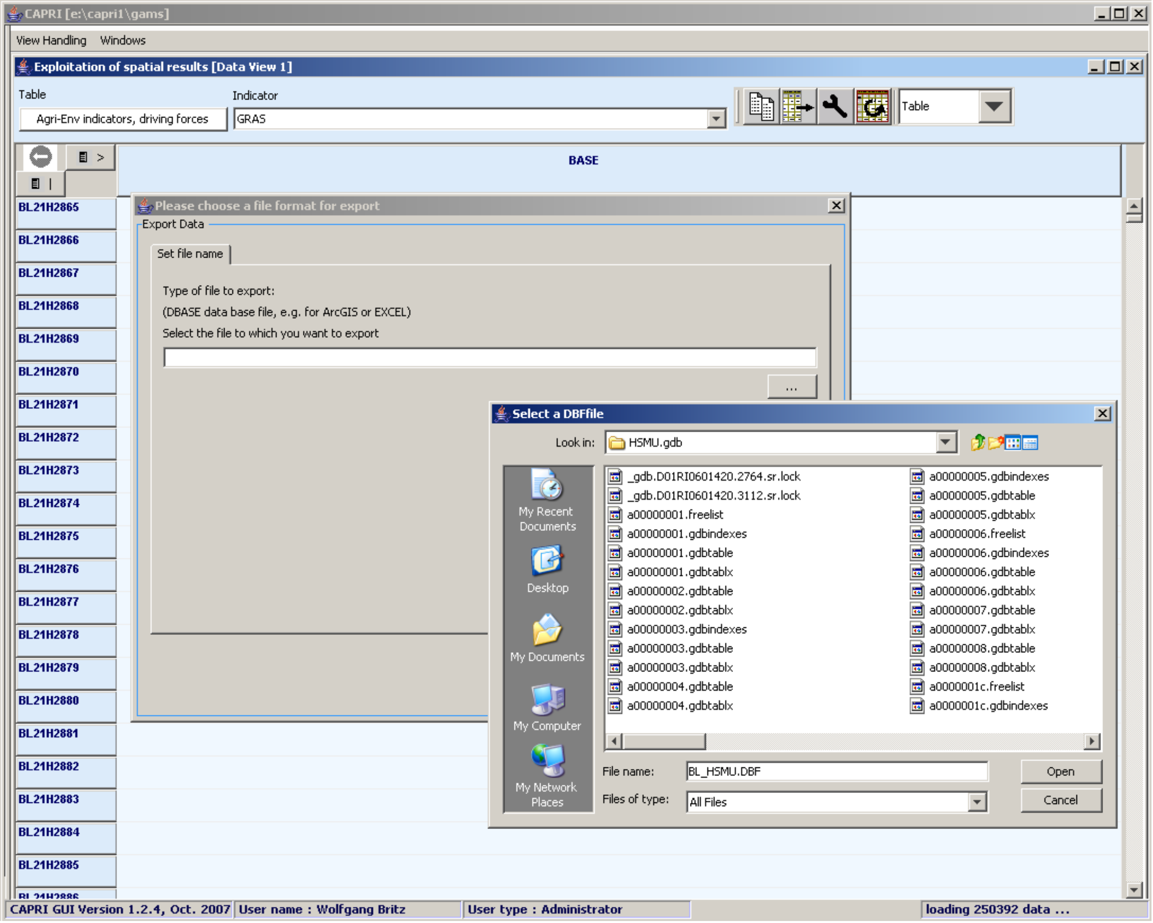


Table: Agri-Env indicators, driving forces

Indicator: GRAS

Please choose a file format for export

Export Data

Set file name

Type of file to export:
(DBASE data base file, e.g. for ArcGIS or EXCEL)
Select the file to which you want to export

Select a DBFfile

Look in: HSMU.gdb

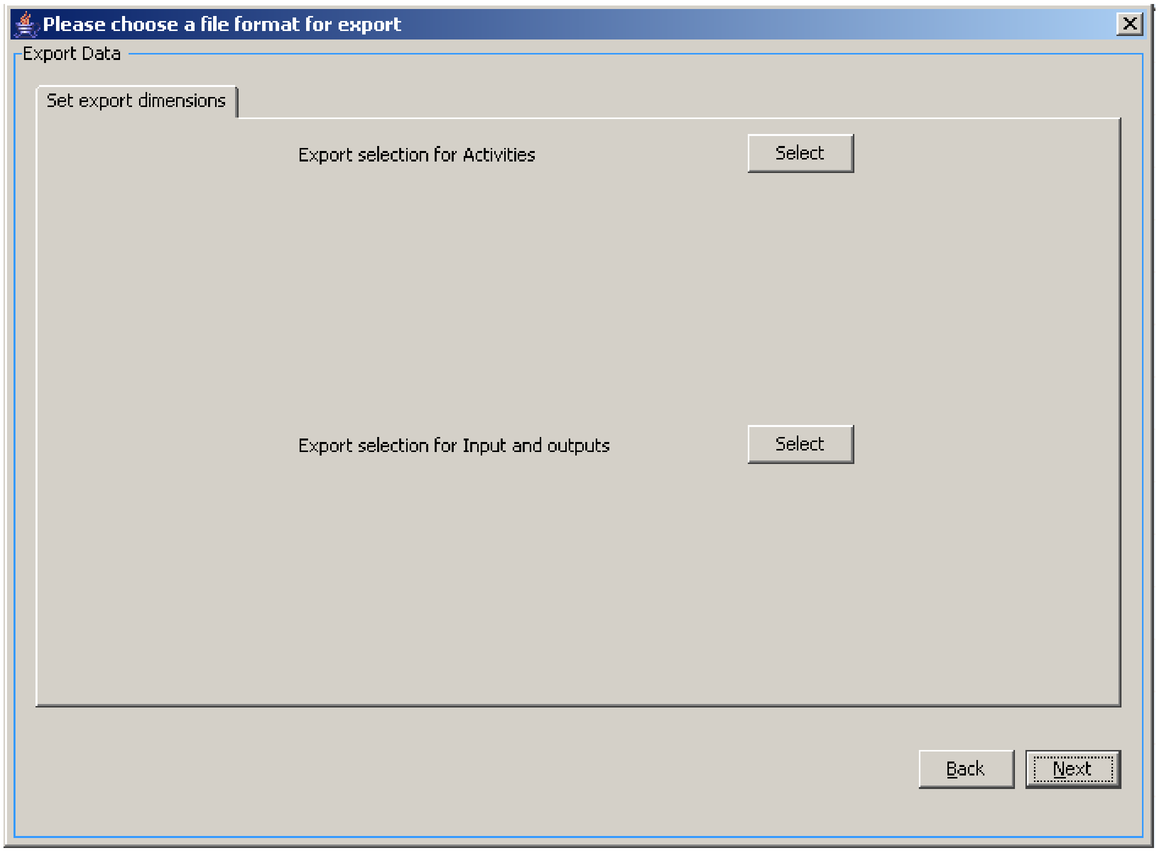
_gdb.D01RI0601420.2764.sr.lock	a00000005.gdbindexes
_gdb.D01RI0601420.3112.sr.lock	a00000005.gdbtable
a00000001.freelist	a00000005.gdbtablx
a00000001.gdbindexes	a00000006.freelist
a00000001.gdbtable	a00000006.gdbindexes
a00000001.gdbtablx	a00000006.gdbtable
a00000002.gdbtable	a00000006.gdbtablx
a00000002.gdbtablx	a00000007.gdbtable
a00000003.gdbindexes	a00000007.gdbtablx
a00000003.gdbtable	a00000008.gdbtable
a00000003.gdbtablx	a00000008.gdbtablx
a00000004.gdbtable	a0000001c.freelist
a00000004.gdbtablx	a0000001c.gdbindexes

File name: BL_HSMU.DBF

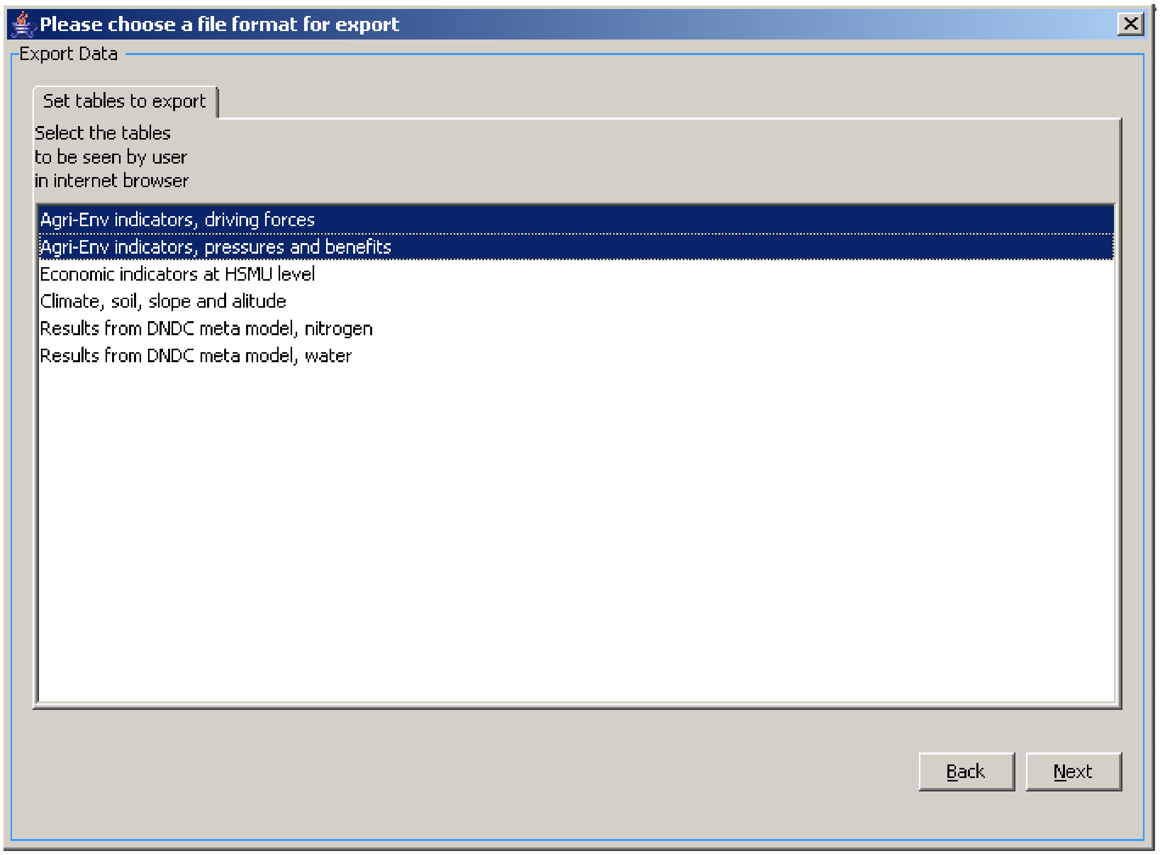
Files of type: All Files

CAPRI GUI Version 1.2.4, Oct. 2007 | User name : Wolfgang Britz | User type : Administrator | loading 250392 data ...

If desired, the Next pane allows openening selection lists for the different data dimensions.


Please choose a file format for export
Export Data
Set export dimensions
Export selection for Activities
Select
Export selection for Input and outputs
Select
Back
Next

You can Select next the tables for export.



Please choose a file format for export

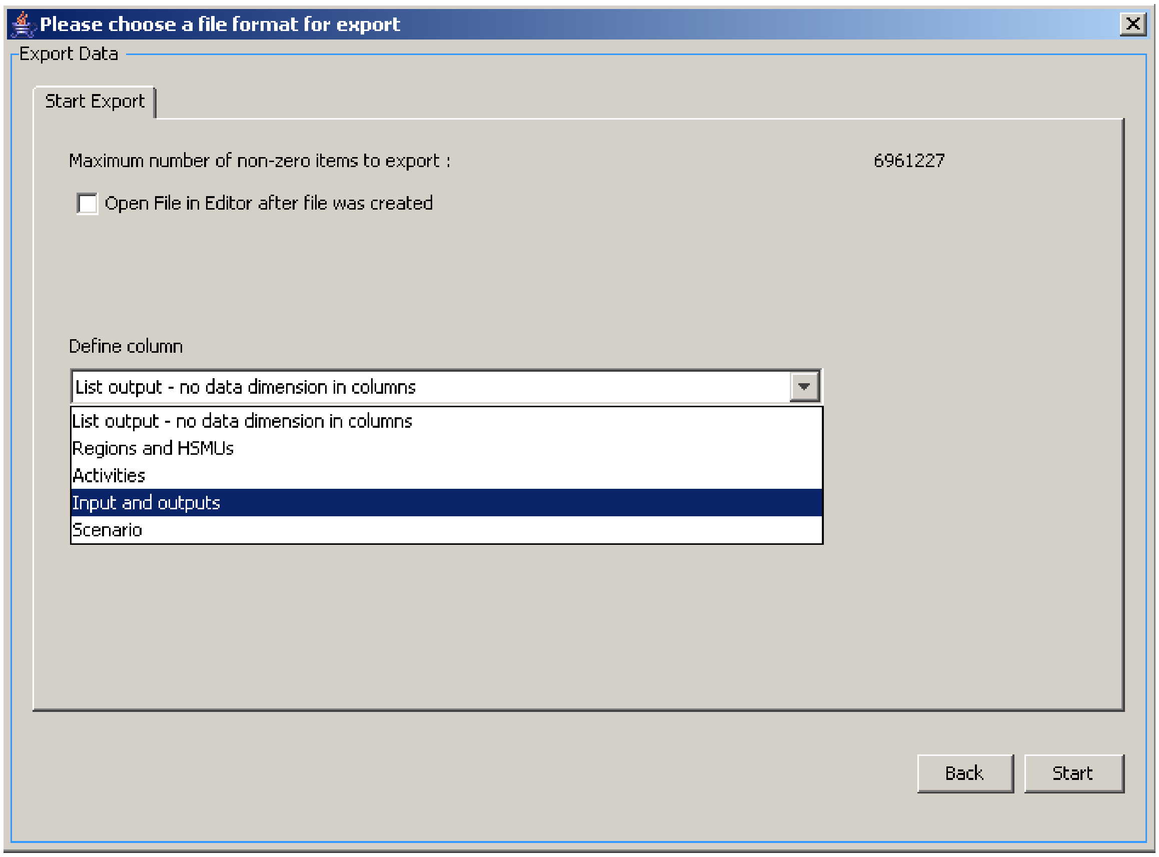
Export Data

Set tables to export

Select the tables
to be seen by user
in internet browser

- Agri-Env indicators, driving forces
- Agri-Env indicators, pressures and benefits
- Economic indicators at HSMU level
- Climate, soil, slope and altitude
- Results from DNDC meta model, nitrogen
- Results from DNDC meta model, water

Beware: the pre-defined table structure will be lost, as will the long-texts and units attached to the tables. However, in the case of DBF-export, a second file with that information will be automatically created. If you solely want to export the table you have currently up front, use the “copy to clipboard” 📋 button. The clipboard export will retain the pivoting and further information.



Please choose a file format for export

Export Data

Start Export

Maximum number of non-zero items to export : 6961227

□ Open File in Editor after file was created

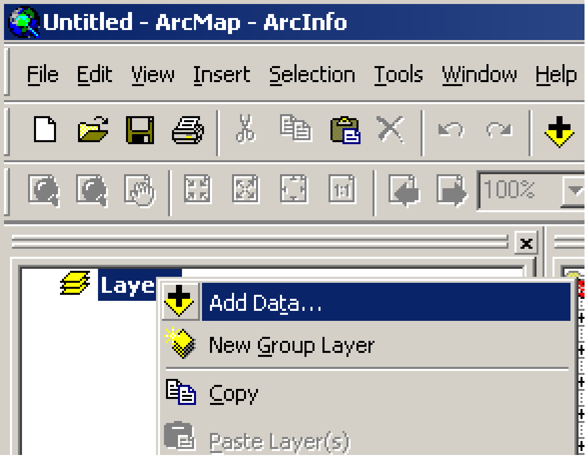
Define column

List output - no data dimension in columns

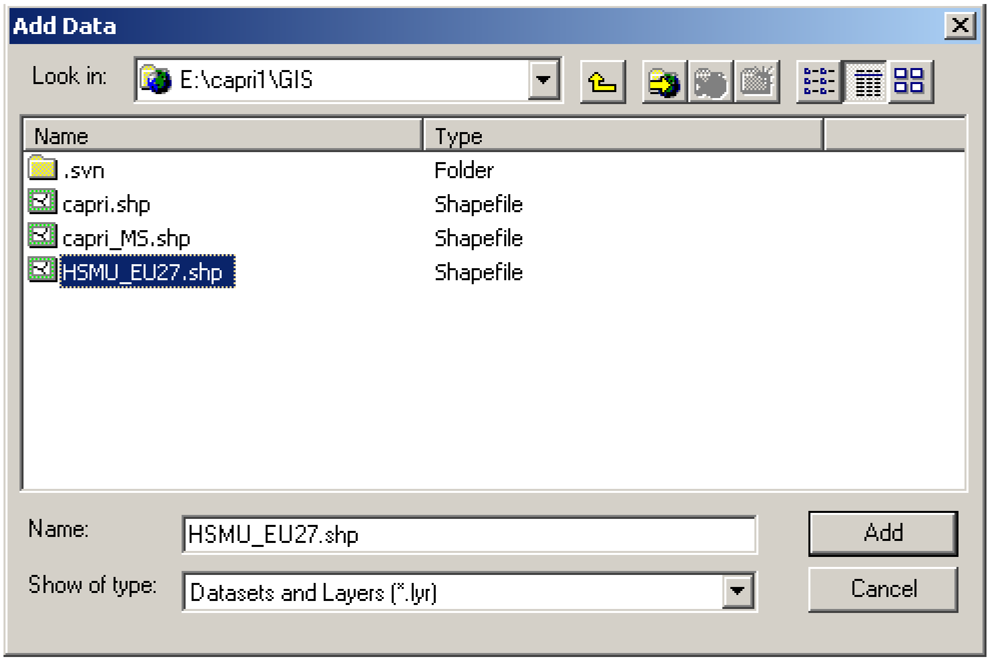
The last pane let you decide for DBF-export if you want a list, or if you want the data dimension spanned across the columns. For exporting the HSMU tables, it is recommended to put “Inputs and outputs” in the columns.

If everything has worked well, we should now find two files: one with the data, named as chosen in the file dialog, and a second one with “_meta” introduced before the file extension.

The following section will briefly explain how to work with the data in ArcGIS. Under Layers, choose add Data



and in the case of the HSMUs, add the “HSMU_EU27.shp” shapefile.



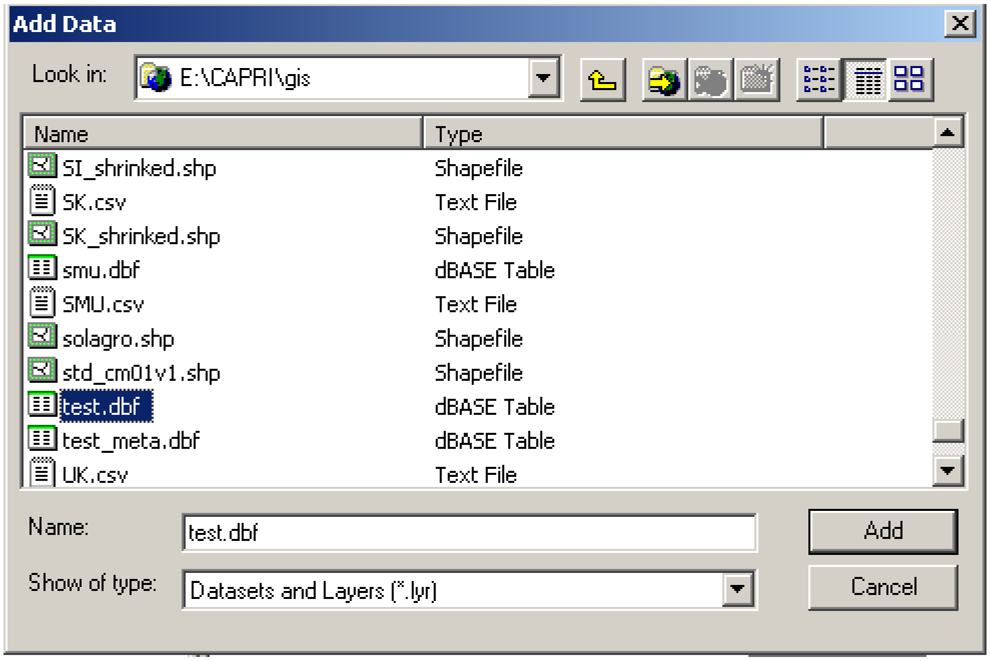
Look in: E:\capri1\GIS

Name	Type
.svn	Folder
capri.shp	Shapefile
capri_MS.shp	Shapefile
HSMU_EU27.shp	Shapefile

Name: HSMU_EU27.shp

Show of type: Datasets and Layers (*.lyr)

Then, choose add layers again, and add the dfb-file you have generated in the step explained above. You may also add the file with the meta data.



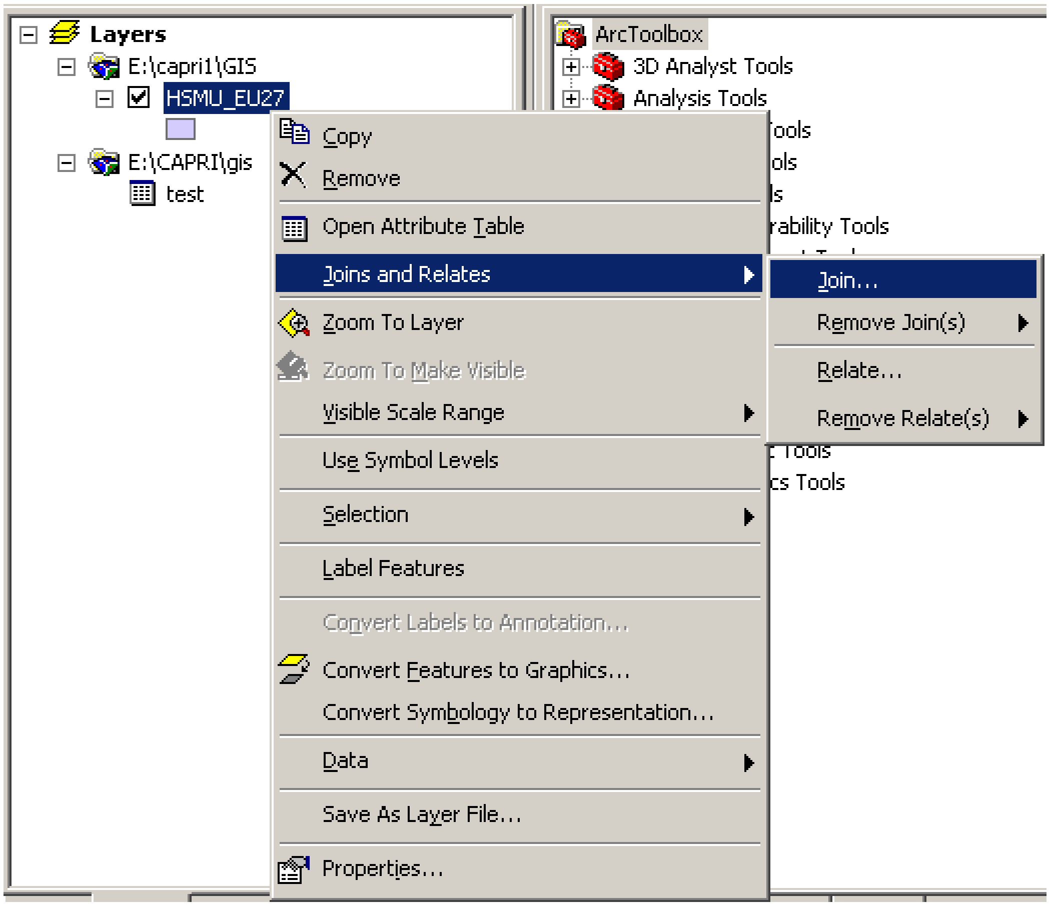
Look in: E:\CAPRI\gis

Name	Type
SI_shrinked.shp	Shapefile
SK.csv	Text File
SK_shrinked.shp	Shapefile
smu.dbf	dBASE Table
SMU.csv	Text File
solagro.shp	Shapefile
std_cm01v1.shp	Shapefile
test.dbf	dBASE Table
test_meta.dbf	dBASE Table
UK.csv	Text File

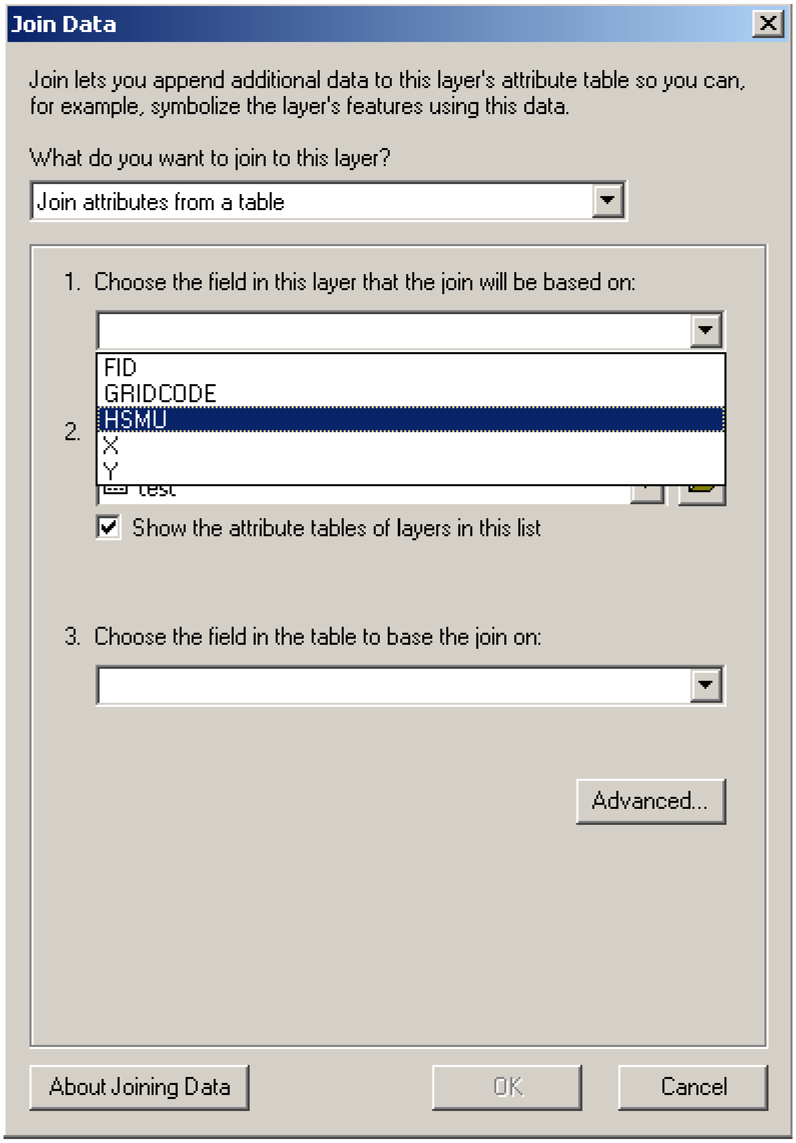
Name: test.dbf

Show of type: Datasets and Layers (*.lyr)

Next, we need to connect the HSMU geometry with the newly loaded data, a process called “joining” in ArcGis. In the context of “HSMU_EU27”, choose “Join and Relates”, then “Join …”.



That will open the join dialogue as shown below.



Join Data

Join lets you append additional data to this layer's attribute table so you can, for example, symbolize the layer's features using this data.

What do you want to join to this layer?

Join attributes from a table

1. Choose the field in this layer that the join will be based on:

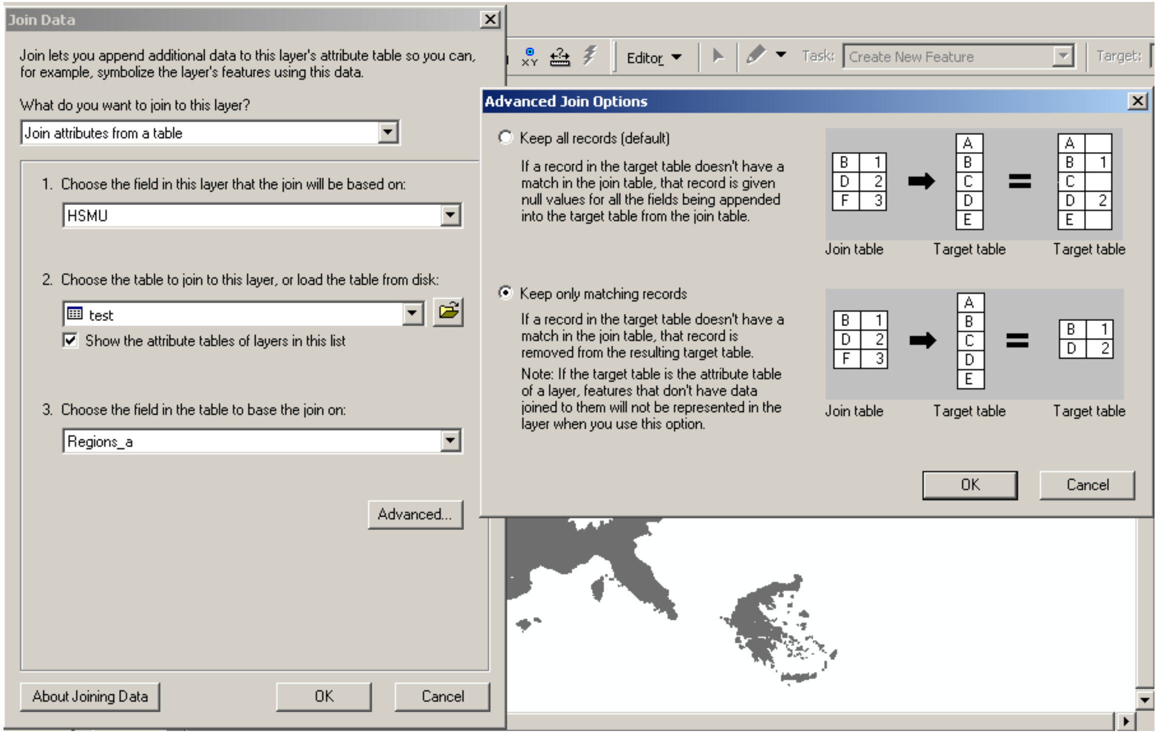
FID
GRIDCODE
HSMU
X
Y

2. test

☑ Show the attribute tables of layers in this list

3. Choose the field in the table to base the join on:

Make sure that “Join attributes from a table” is set in the first drop down box, and under 1., select HSMU, i.e. the filed in the HSMU_27 geometry where the codes for the HSMU polygons are stored. Use the name of the exported dbf-table under 2., and select the field “Regions_a” (the field name are restriced to 10 chars) under 3. Then press the button labeled “advanced”, and chose the radiobutton “keep only matching records”. If you are asked to build index, confirm.



Join Data

Join lets you append additional data to this layer's attribute table so you can, for example, symbolize the layer's features using this data.

What do you want to join to this layer?

Join attributes from a table

1. Choose the field in this layer that the join will be based on:

   HSMU

2. Choose the table to join to this layer, or load the table from disk:

   test

   ☑ Show the attribute tables of layers in this list

3. Choose the field in the table to base the join on:

   Regions_a

Advanced Join Options

○ Keep all records (default)

If a record in the target table doesn't have a match in the join table, that record is given null values for all the fields being appended into the target table from the join table.

● Keep only matching records

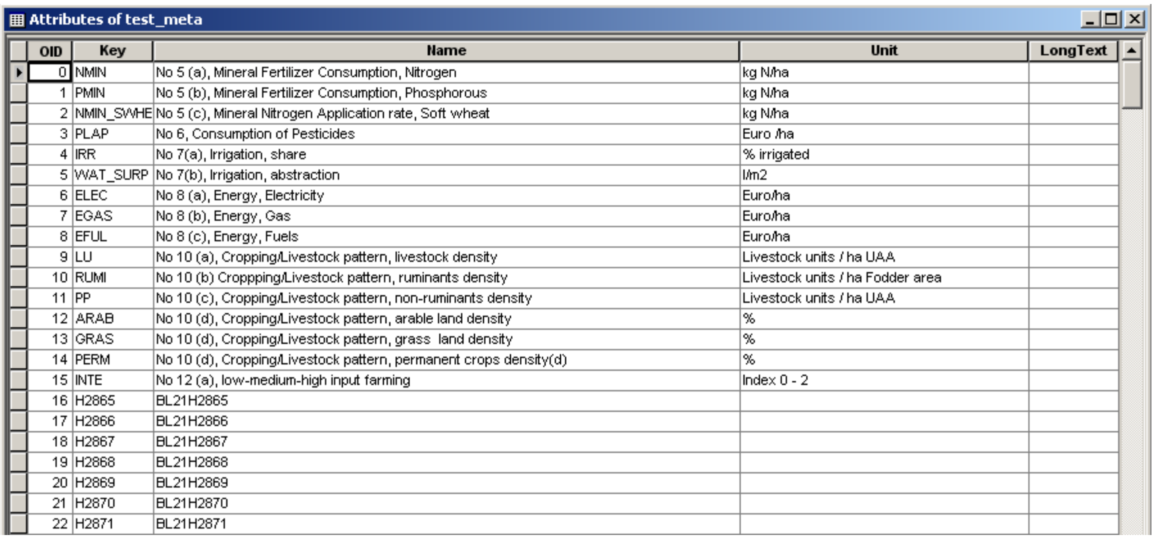
If a record in the target table doesn't have a match in the join table, that record is removed from the resulting target table.

Note: If the target table is the attribute table of a layer, features that don't have data joined to them will not be represented in the layer when you use this option.

If anything has worked well, you should now see the country or countries you had in the original map.

There is a trap, though. If you export several tables, or results for several scenarios, your table will normally have several fields used as a row header (e.g. year, scenario, activity). If that is the case, the join will not work properly as several rows for the same regions will be joined to the very same polygon. Unfortunately, ArcGIS will not warn you about that. *First* you have to execute a definition query in the table, while selecting the rows which you are later going to draw a map from.

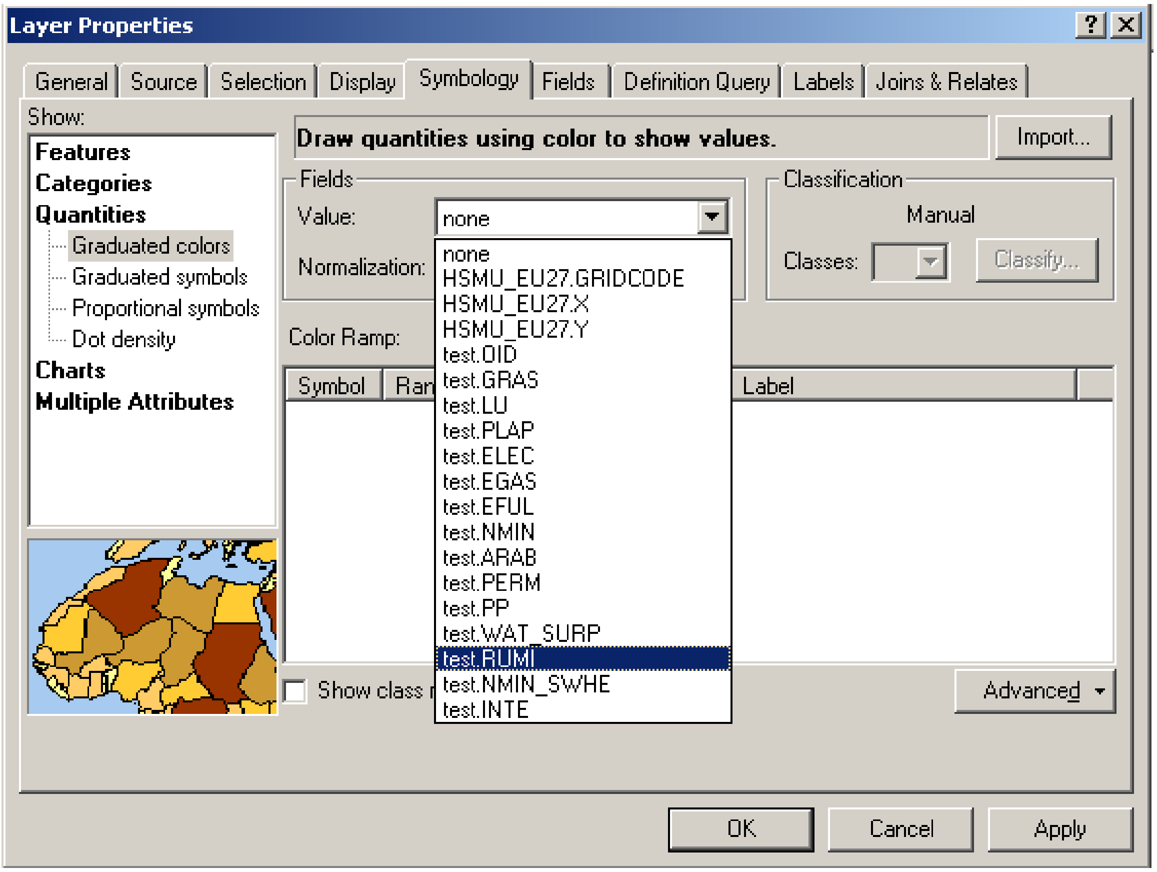
In order to draw a thematic map now, it may be helpful to add the file with the meta data to the map, and to open the meta-data table with the help of its context menu. It will give us the long description and units belonging to the data fields in the exported data table.



Attributes of test_meta

OID	Key	Name	Unit	LongText
0	NMIN	No 5 (a), Mineral Fertilizer Consumption, Nitrogen	kg N/ha	
1	PMIN	No 5 (b), Mineral Fertilizer Consumption, Phosphorous	kg N/ha	
2	NMIN_SWHE	No 5 (c), Mineral Nitrogen Application rate, Soft wheat	kg N/ha	
3	PLAP	No 6, Consumption of Pesticides	Euro /ha	
4	IRR	No 7(a), Irrigation, share	% irrigated	
5	WAT_SURP	No 7(b), Irrigation, abstraction	l/m2	
6	ELEC	No 8 (a), Energy, Electricity	Euro/ha	
7	EGAS	No 8 (b), Energy, Gas	Euro/ha	
8	EFUL	No 8 (c), Energy, Fuels	Euro/ha	
9	LU	No 10 (a), Cropping/Livestock pattern, livestock density	Livestock units / ha UAA	
10	RUMI	No 10 (b) Croppping/Livestock pattern, ruminants density	Livestock units / ha Fodder area	
11	PP	No 10 (c), Cropping/Livestock pattern, non-ruminants density	Livestock units / ha UAA	
12	ARAB	No 10 (d), Cropping/Livestock pattern, arable land density	%	
13	GRAS	No 10 (d), Cropping/Livestock pattern, grass land density	%	
14	PERM	No 10 (d), Cropping/Livestock pattern, permanent crops density(d)	%	
15	INTE	No 12 (a), low-medium-high input farming	Index 0 - 2	
16	H2865	BL21H2865		
17	H2866	BL21H2866		
18	H2867	BL21H2867		
19	H2868	BL21H2868		
20	H2869	BL21H2869		
21	H2870	BL21H2870		
22	H2871	BL21H2871		

Assuming we want to draw a map now with the ruminant stocking density, we find it in row 10 under the key “RUMI”. In order to produce a map now, we have to open the context menu of “HSMU_EU27”, and choose properties, symbology, and choose “Quantities”. Under values, choose “RUMI”, the name before is the name of the DBF-file.



Layer Properties

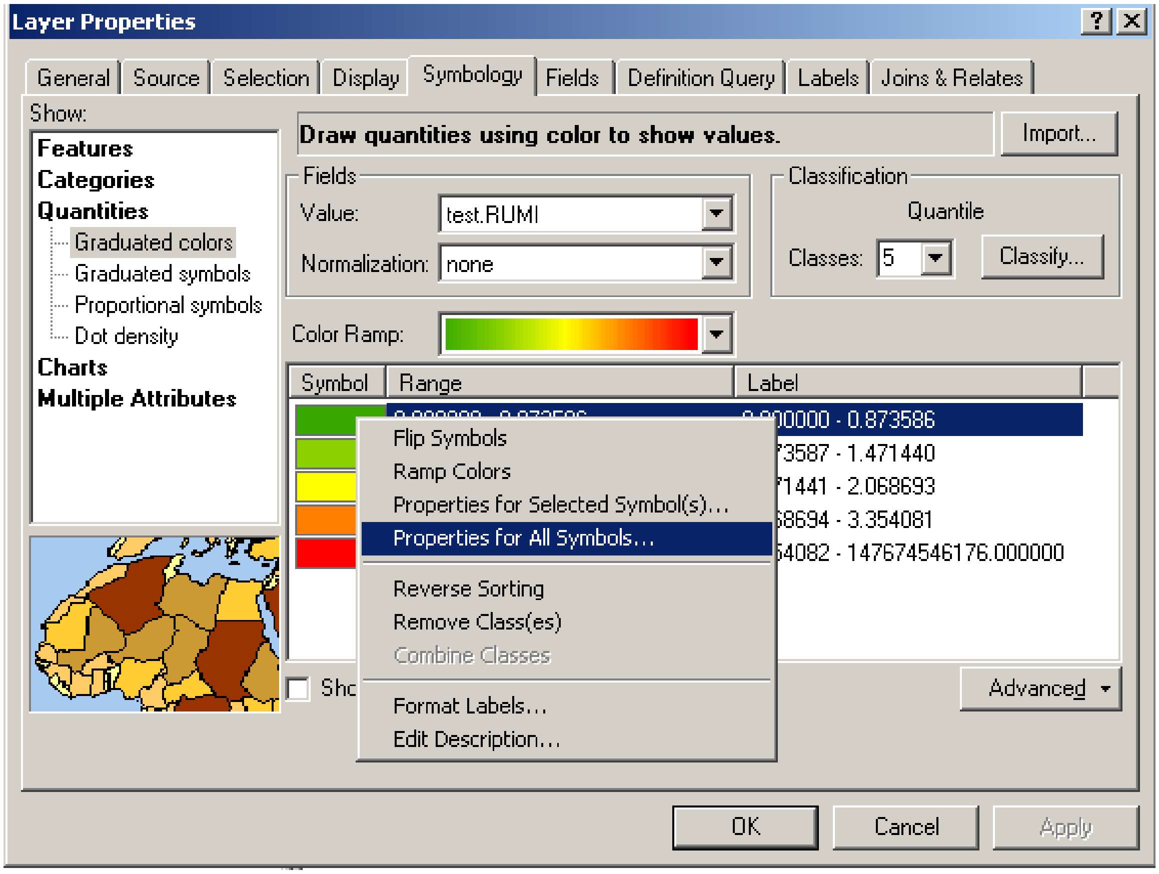
Draw quantities using color to show values.

Value: none

none
HSMU_EU27.GRIDCODE
HSMU_EU27.X
HSMU_EU27.Y
test.OID
test.GRAS
test.LU
test.PLAP
test.ELEC
test.EGAS
test.EFUL
test.NMIN
test.ARAB
test.PERM
test.PP
test.WAT_SURP
test.RUMI
test.NMIN_SWHE
test.INTE

Classification: Manual

Afterwards, under classification, choose your preferred one. As there are many small polygons, the outline of the polygons should not be drawn. Therefore click on one of the colors, choose “Properties for all symbols …” and under “Outline color” chose “No Color”.



Fields

Value: test.RUMI

Normalization: none

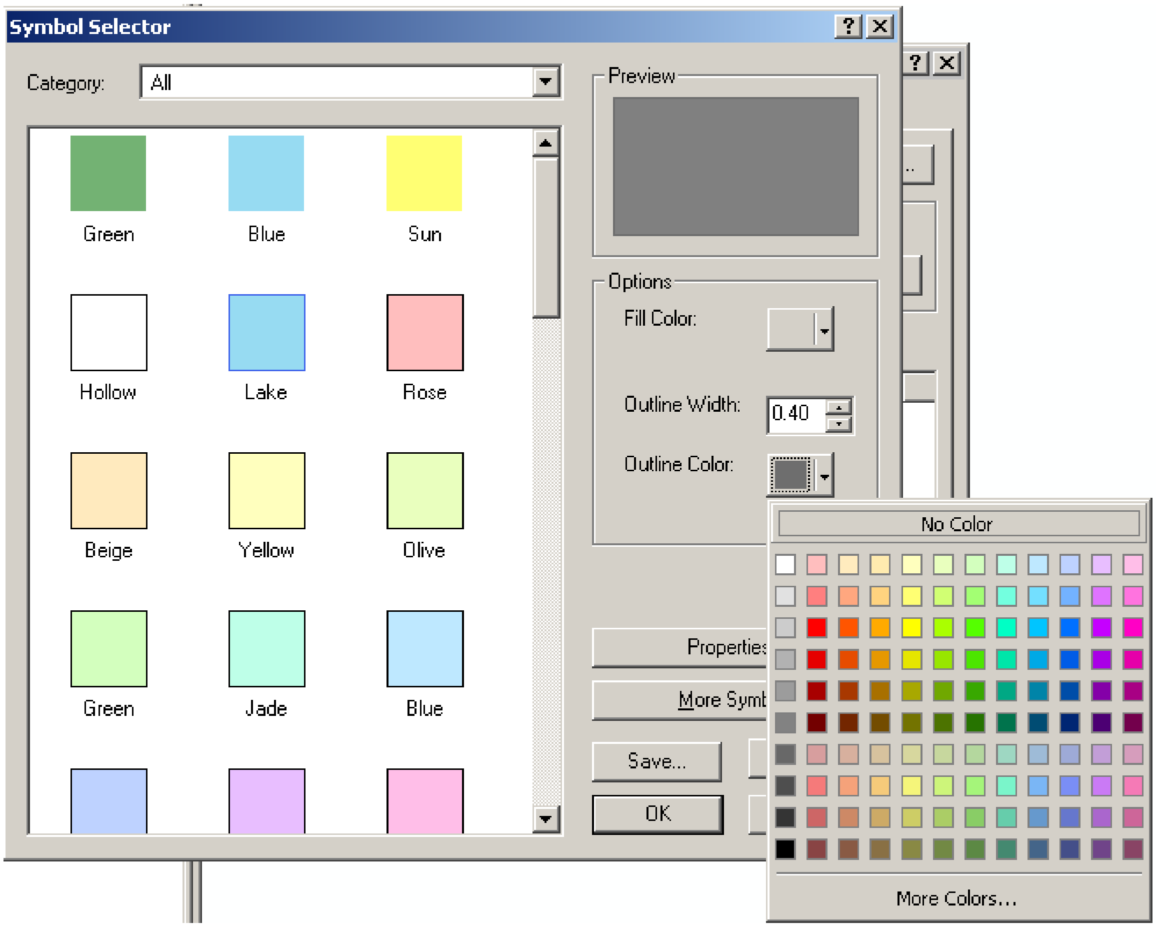
Classification

Quantile

Classes: 5

Color Ramp:

Label
0.000000 - 0.873586
73587 - 1.471440
71441 - 2.068693
68694 - 3.354081
54082 - 147674546176.000000



Symbol Selector

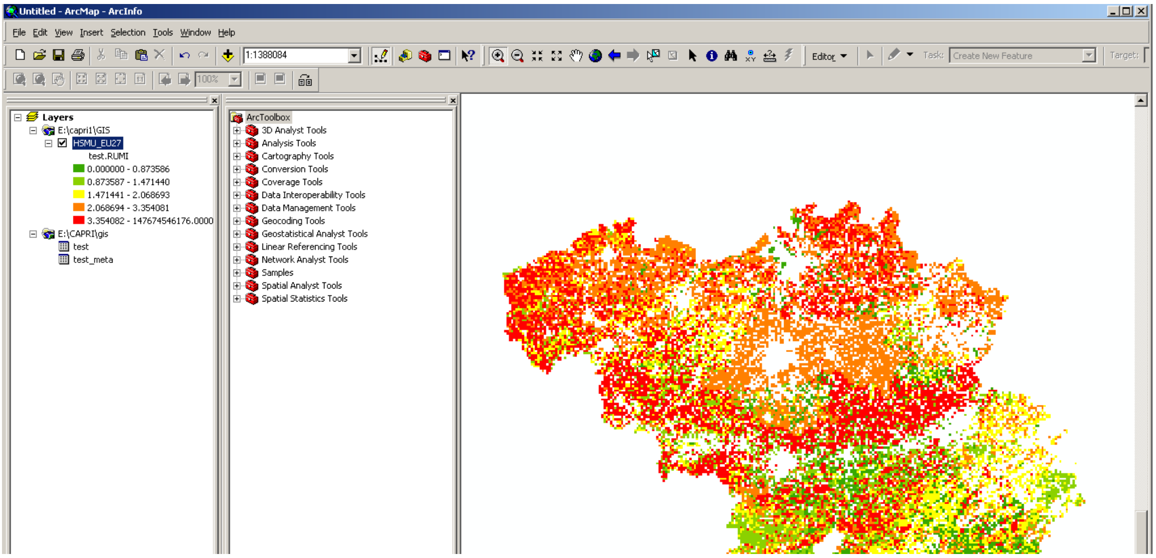
Category: All

Fill Color:

Outline Width: 0.40

Outline Color:

Afterwards, if everything went well, you should see your map.



Untitled - ArcMap - ArcInfo

1:1388084

Layers
- E:\capri1\GIS
  - ☑ HSMU_EU27
    - test.RUMI
    - 🟩 0.000000 - 0.873586
    - 🟩 0.873587 - 1.471440
    - 🟨 1.471441 - 2.068693
    - 🟧 2.068694 - 3.354081
    - 🟥 3.354082 - 147674546176.0000
- E:\CAPRI\gis
  - test
  - test_meta

What are the HSMUs and what information is available?

The HSMU are the so-called Homogenous Soil Mapping Units. Each HSMU contains one or several 1x1 km grid cells, which are not necessarily adjacent, and are defined so that these are more or less homogenous regarding climate, soil, slope, CORINE land cover class and NUTS II region. There are about 110.000 HSMUs for EU15. The spatial downscaling introduced in CAPRI-Dynaspat provides the following information per HSMU:

- Cropping shares and animal stocking densities
- Yields
- Economic indicators per crop and animal as well as in relation to UAA
- Fertilizer application rates
- Environmental indicators

How to visualize the HSMU information

Given the 1x1 grid resolution, the most obvious way to look at the information is to produce maps with the CAPRI GUI. There is a co-ordinate set available, called “HSMU.zip”, which comprises the geometry for about 1.8 Mio Polygon which represent the HSMUs.

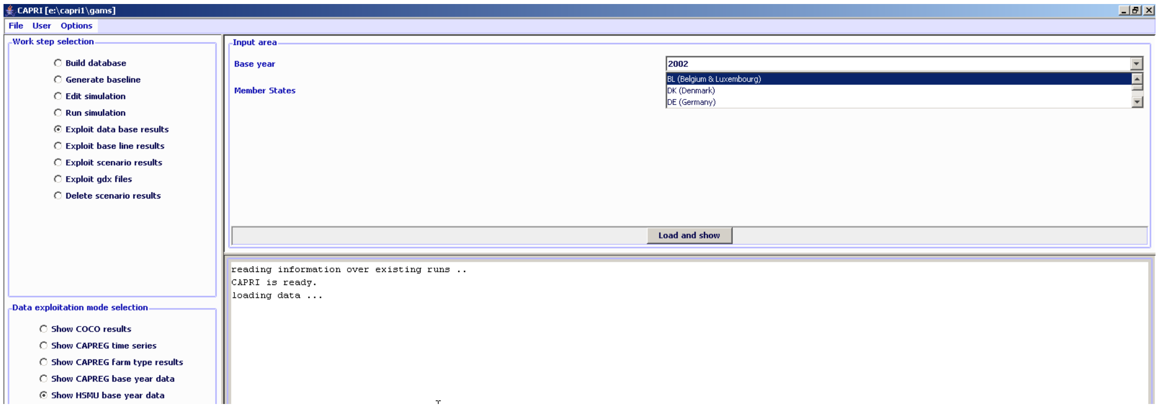
There are four options to view HSMU data:

1. Loading data for one or several Member States for the base year (dis-aggregated information from the NUTS II CAPRI data base).
2. Loading data for one or several Member States for the base year and the baseline, the latter representing dis-aggregated data from NUTS II results of the baseline calibration.
3. Loading data for one or more scenarios for a given year.
4. Loading data manually.

Loading data based on the GUI presets

As for the results at NUTS II level, there are three pre-defined exploitation possibilities included in the CAPRI GUI:

1. Viewing the results for the base year. Given the tremendous number of HSMUs, the user can select for which Member States the information should be loaded.



Work step selection

○ Build database
○ Generate baseline
○ Edit simulation
○ Run simulation
● Exploit data base results
○ Exploit base line results
○ Exploit scenario results
○ Exploit gdx files
○ Delete scenario results

Data exploitation mode selection

○ Show COCO results
○ Show CAPREG time series
○ Show CAPREG farm type results
○ Show CAPREG base year data
● Show HSMU base year data

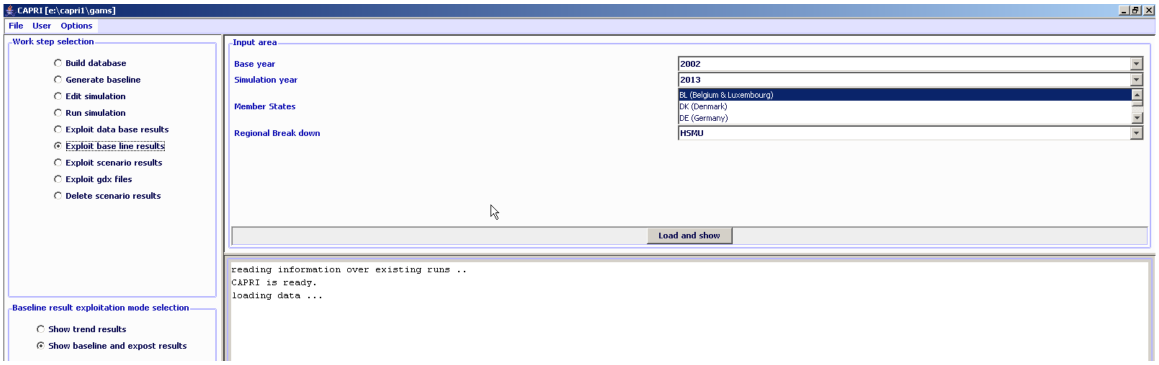
Input area

Base year: 2002

Member States: BL (Belgium & Luxembourg), DK (Denmark), DE (Germany)

```
reading information over existing runs ..
CAPRI is ready.
loading data ...
```

2. Comparing the results for the base with the baseline (projection results), comparison between two points in time. Again, the user can select the Member States.



Work step selection

○ Build database
○ Generate baseline
○ Edit simulation
○ Run simulation
○ Exploit data base results
● Exploit base line results
○ Exploit scenario results
○ Exploit gdx files
○ Delete scenario results

Baseline result exploitation mode selection

○ Show trend results
● Show baseline and expost results

Input area

Base year: 2002

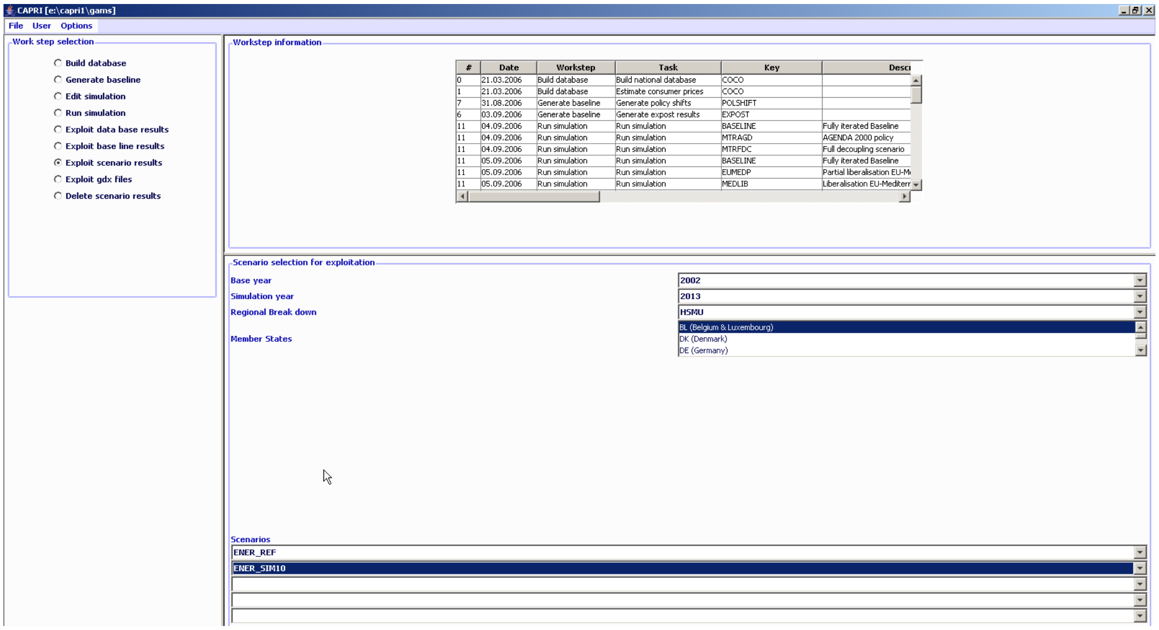
Simulation year: 2013

Member States: BL (Belgium & Luxembourg), DK (Denmark), DE (Germany)

Regional Break down: HSMU

```
reading information over existing runs ..
CAPRI is ready.
loading data ...
```

3. Comparing results from different scenarios (comparisons for one point in time, but changes in drivers/assumptions relevant for the CAPRI economic model).



Work step selection

○ Build database
○ Generate baseline
○ Edit simulation
○ Run simulation
○ Exploit data base results
○ Exploit base line results
● Exploit scenario results
○ Exploit gdx files
○ Delete scenario results

Workstep information

#	Date	Workstep	Task	Key	Desci
0	21.03.2006	Build database	Build national database	COCO	
1	21.03.2006	Build database	Estimate consumer prices	COCO	
7	31.08.2006	Generate baseline	Generate policy shifts	POLSHIFT	
6	03.09.2006	Generate baseline	Generate expost results	EXPOST	
11	04.09.2006	Run simulation	Run simulation	BASELINE	Fully iterated Baseline
11	04.09.2006	Run simulation	Run simulation	MTRAGD	AGENDA 2000 policy
11	04.09.2006	Run simulation	Run simulation	MTRFDC	Full decoupling scenario
11	05.09.2006	Run simulation	Run simulation	BASELINE	Fully iterated Baseline
11	05.09.2006	Run simulation	Run simulation	EUMEDP	Partial liberalisation EU-Mı
11	05.09.2006	Run simulation	Run simulation	MEDLIB	Liberalisation EU-Mediterr

Scenario selection for exploitation

Base year: 2002

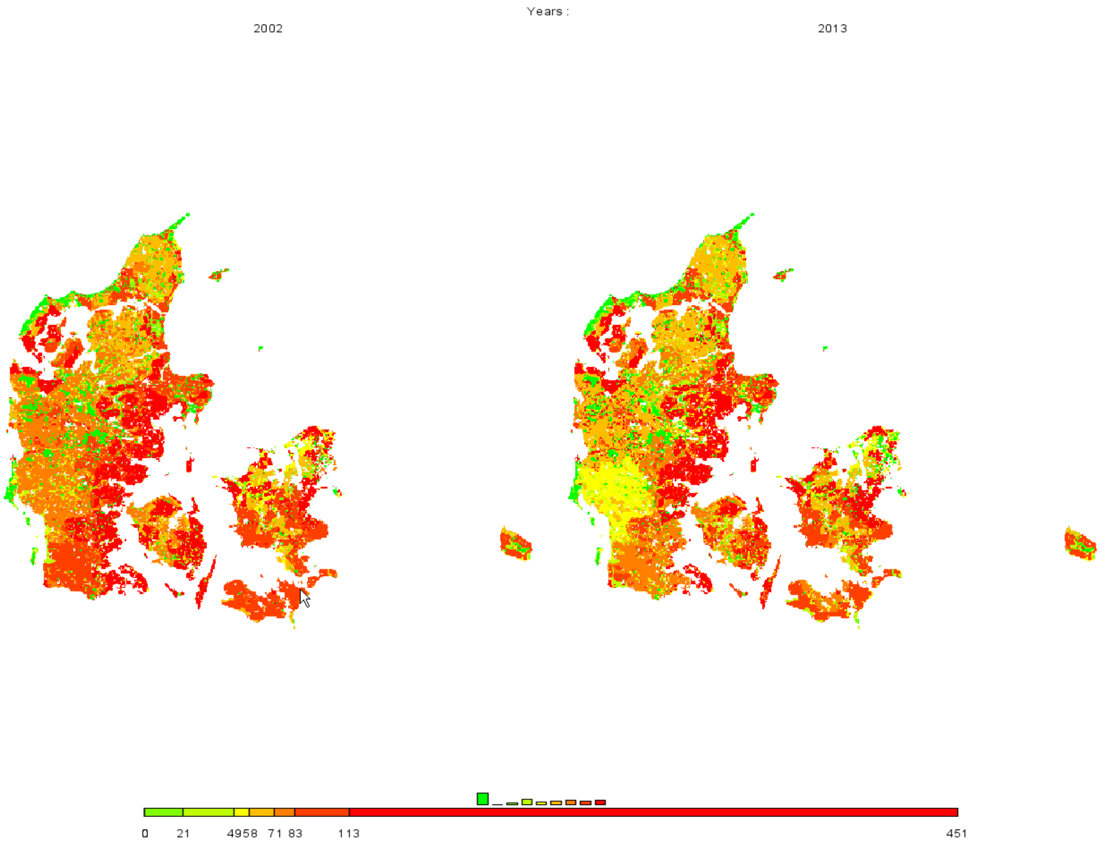
Simulation year: 2013

Regional Break down: HSMU

Member States: BL (Belgium & Luxembourg), DK (Denmark), DE (Germany)

Scenarios: ENER_REF, ENER_SIM10

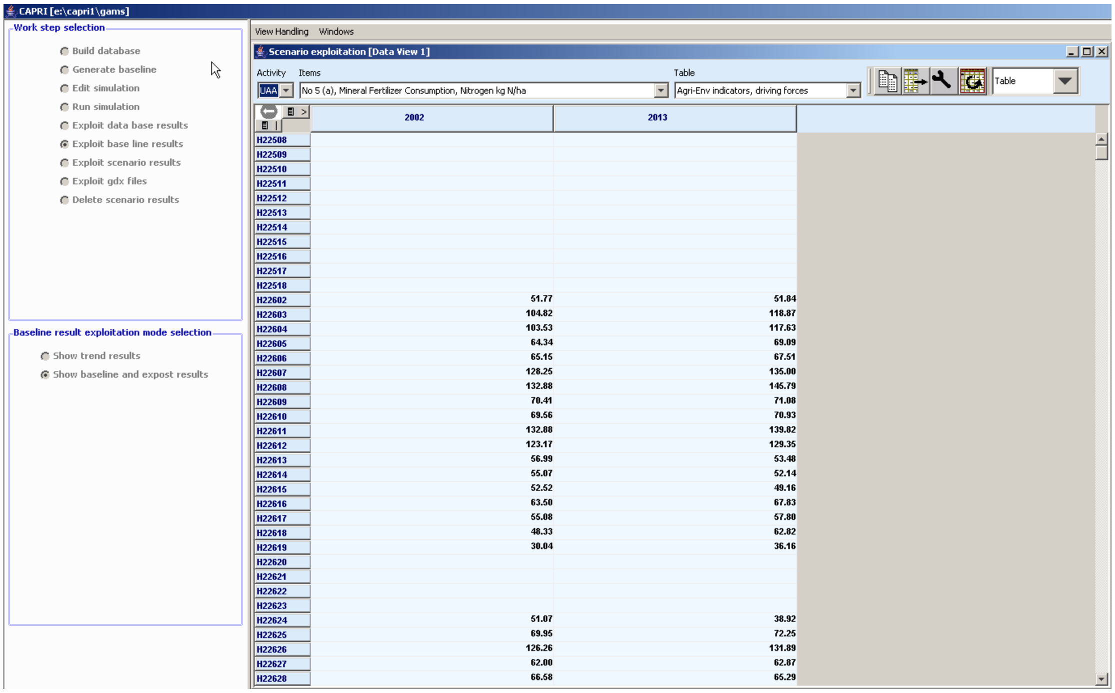
Once the loading is accomplished, the right hand side of the GUI is filled with a tabular view of the results, which can easily be turned into maps (other forms of exploitation, as for example graphs are less suited, given the large number of observations). Details on how to work with the exploitation tools are found in a separate document. The screen-shot below shows results for Denmark as an example.



In order to ease the exploitation of the results, pre-defined tables are set up. Currently they are broken down into five categories:

1. Agri-environmental indicators, driving forces (mineral fertilizer consumption, consumption of pesticides, irrigation shares, energy consumption, livestock densities, shares or arable / grass land or permanent crops)
2. Agri-environmental indicators, pressures and benefits (Gross nitrogen and phosphorous balance, greenhouse gas emissions, High Nature Value Farm land indicator)
3. Economic indicators at HSMU level (market revenues, variable production costs, income)
4. Climate, soil, slope and altitude
5. Results from the DNDC meat model (gas losses for different nitrogen compartments, mineralization, leaching)

The tables on agri-environmental indicators (driving forces, pressures and benefits) are set-up as close as possible according to the official EU Guidelines for Rural Development indicators.



Work step selection

- ○ Build database
- ○ Generate baseline
- ○ Edit simulation
- ○ Run simulation
- ○ Exploit data base results
- ● Exploit base line results
- ○ Exploit scenario results
- ○ Exploit gdx files
- ○ Delete scenario results

Baseline result exploitation mode selection

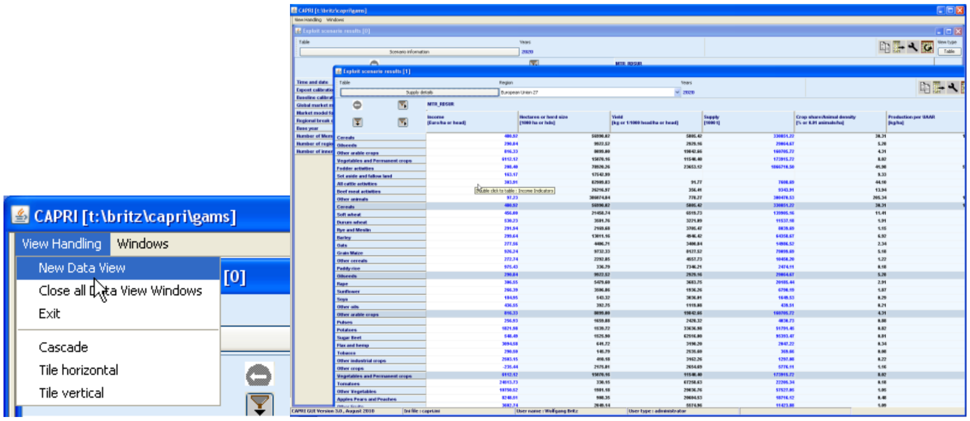
- ○ Show trend results
- ● Show baseline and expost results

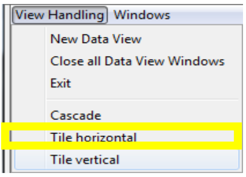
Activity: UAA
Items: No 5 (a), Mineral Fertilizer Consumption, Nitrogen kg N/ha
Table: Agri-Env indicators, driving forces
Table

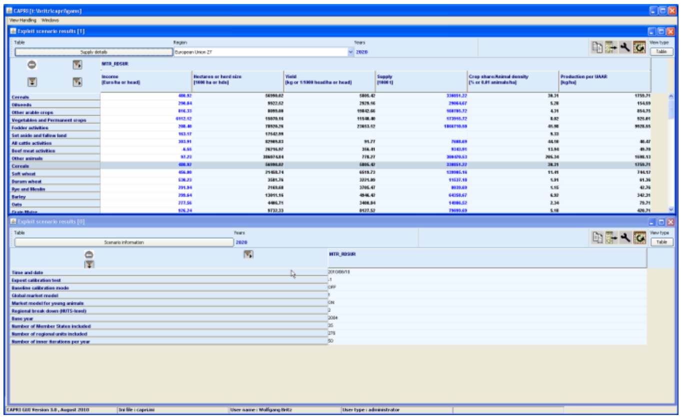
	2002	2013
H22508		
H22509		
H22510		
H22511		
H22512		
H22513		
H22514		
H22515		
H22516		
H22517		
H22518		
H22602	51.77	51.84
H22603	104.82	118.87
H22604	103.53	117.63
H22605	64.34	69.09
H22606	65.15	67.51
H22607	128.25	135.00
H22608	132.88	145.79
H22609	70.41	71.08
H22610	69.56	70.93
H22611	132.88	139.82
H22612	123.17	129.35
H22613	56.99	53.48
H22614	55.07	52.14
H22615	52.52	49.16
H22616	63.50	67.83
H22617	55.08	57.80
H22618	48.33	62.82
H22619	30.04	36.16
H22620		
H22621		
H22622		
H22623		
H22624	51.07	38.92
H22625	69.95	72.25
H22626	126.26	131.89
H22627	62.00	62.87
H22628	66.58	65.29

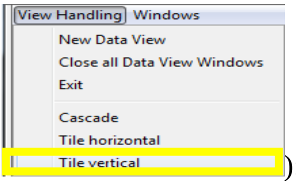
Working with several views

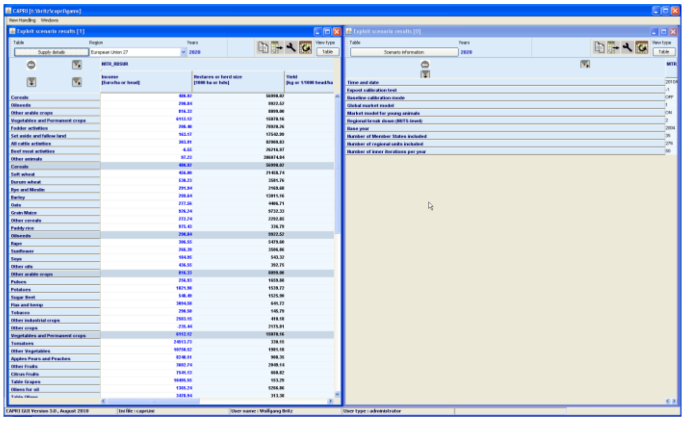
The interface allows to open additional views which will be stacked on each other as can be seen below.


CAPRI [t:\britz\capri\gams]
View Handling
Windows
New Data View
Close all Data View Windows
Exit
Cascade
Tile horizontal
Tile vertical
Exploit scenario results [0]
Exploit scenario results [1]

In addition one can arrange the views on screen, either horizontally ()



or vertically ():



MTR_RDSUR

	Income [Euro/ha or head]	Hectares or herd size [1000 ha or hds]	Yield [kg or 1/1000 head/ha
Cereals	408.92	56998.02	
Oilseeds	298.84	9932.52	
Other arable crops	816.33	8899.00	
Vegetables and Permanent crops	6112.12	15878.16	
Fodder activities	208.40	70978.26	
Set aside and fallow land	163.17	17542.99	
All cattle activities	303.91	87909.83	
Beef meat activities	-6.55	26216.97	
Other animals	97.23	306874.04	
Cereals	408.92	56998.02	
Soft wheat	456.80	21458.74	
Durum wheat	538.23	3501.76	
Rye and Meslin	291.94	2169.68	
Barley	299.64	13011.16	
Oats	277.56	4406.71	
Grain Maize	926.24	9732.33	
Other cereals	272.74	2292.85	
Paddy rice	975.43	336.79	
Oilseeds	298.84	9932.52	
Rape	306.55	5479.60	
Sunflower	266.39	3506.86	
Soya	184.95	543.32	
Other oils	436.55	392.75	
Other arable crops	816.33	8899.00	
Pulses	256.93	1659.80	
Potatoes	1821.98	1539.72	
Sugar Beet	548.49	1525.90	
Flax and hemp	3894.58	641.72	
Tobacco	298.50	145.79	
Other industrial crops	2503.95	418.18	
Other crops	-235.44	2175.01	
Vegetables and Permanent crops	6112.12	15878.16	
Tomatoes	24813.73	338.15	
Other Vegetables	10758.52	1981.18	
Apples Pears and Peaches	8248.51	908.35	
Other Fruits	3602.74	2049.14	
Citrus Fruits	7541.93	668.82	
Table Grapes	10406.56	163.29	
Olives for oil	1365.24	5266.86	
Table Olives	3478.94	313.38	

	MTR
Time and date	2010
Expost calibration test	-1
Baseline calibration mode	OFF
Global market model	1
Market model for young animals	ON
Regional break down (NUTS-level)	2
Base year	2004
Number of Member States included	35
Number of regional units included	276
Number of inner iterations per year	60

CAPRI GUI Version 3.0, August 2010 | Ini file : capri.ini | User name : Wolfgang Britz | User type : administrator

Examples

Drawing a map showing the nitrate surplus for EU27 at regional level in the base year

First, we need to select “Exploit data base results” in the work step selection panel, and then choose the radio button “Show CAPREG base year data”. Then, in the Member States drop-down list, right click the mouse, and select “EU27”. The “Load and show button will then load the results.

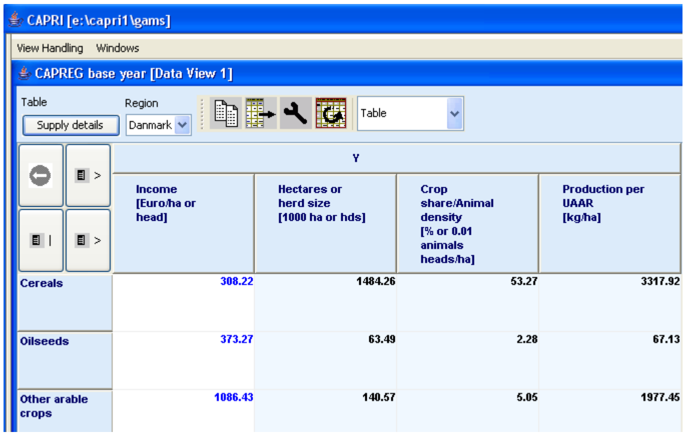
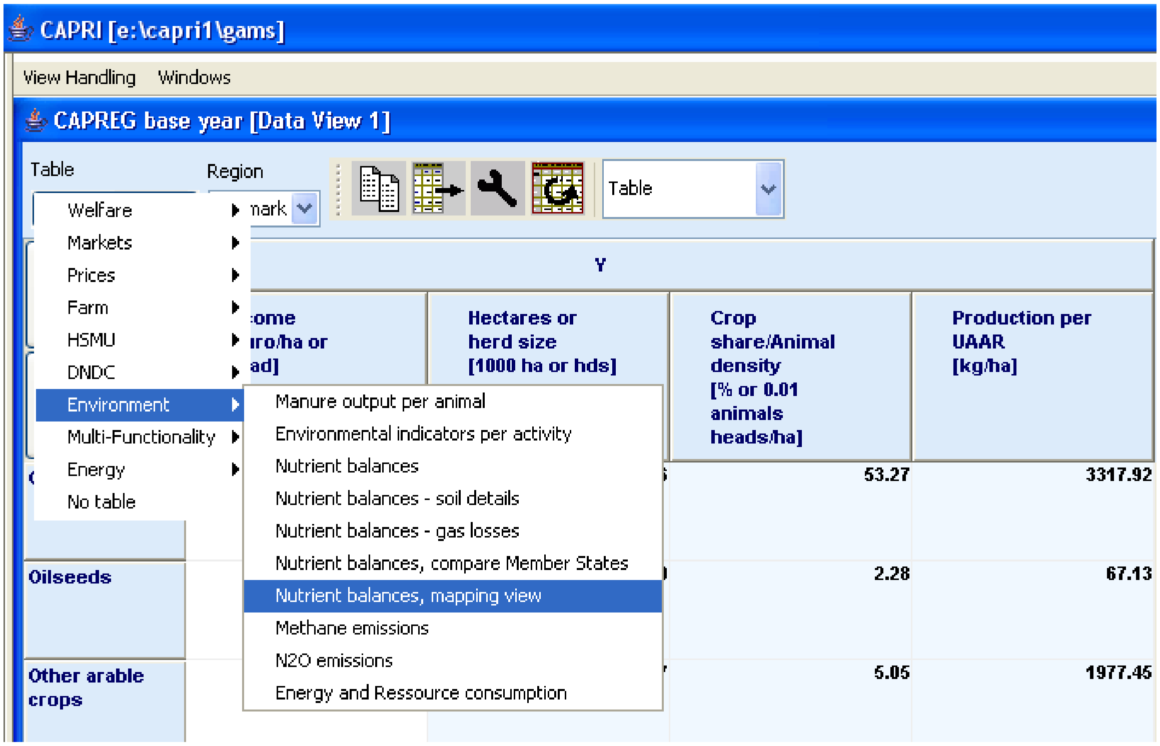


Table: Supply details

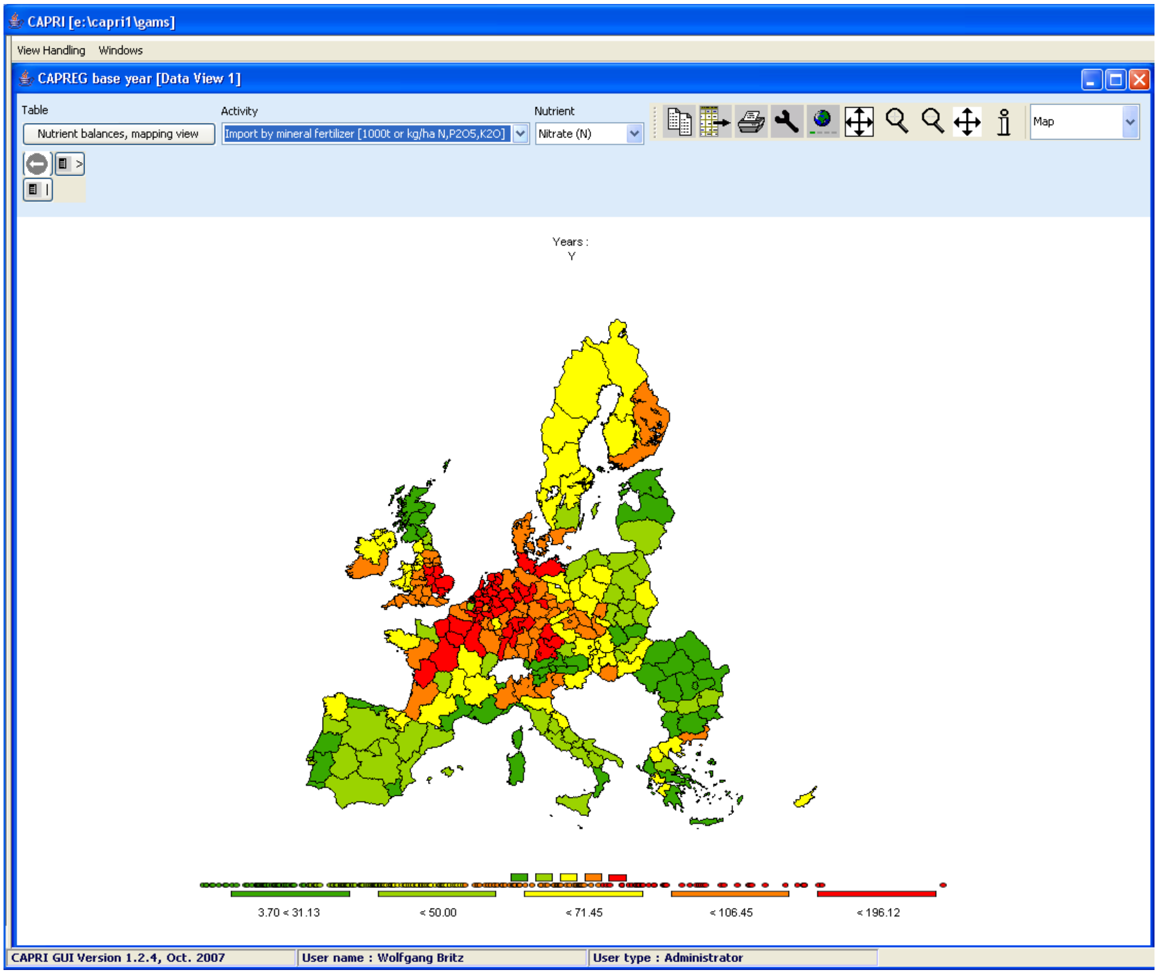
Region: Danmark

	Y			
	Income [Euro/ha or head]	Hectares or herd size [1000 ha or hds]	Crop share/Animal density [% or 0.01 animals heads/ha]	Production per UAAR [kg/ha]
Cereals	308.22	1484.26	53.27	3317.92
Oilseeds	373.27	63.49	2.28	67.13
Other arable crops	1086.43	140.57	5.05	1977.45

Next, select a different selection of tables by pressing on the button below “Table”, which currently shows the topic “Supply details”. In the drop-down list, go-to “Environment” and select “Nutrient balances, mapping view”.


CAPRI [e:\capri1\gams]
View Handling
Windows
CAPREG base year [Data View 1]
Table
Region
mark
Table
Welfare
Markets
Prices
Farm
HSMU
DNDC
Environment
Multi-Functionality
Energy
No table
Manure output per animal
Environmental indicators per activity
Nutrient balances
Nutrient balances - soil details
Nutrient balances - gas losses
Nutrient balances, compare Member States
Nutrient balances, mapping view
Methane emissions
N2O emissions
Energy and Ressource consumption
Y
come
ro/ha or
ad]
Hectares or herd size [1000 ha or hds]
Crop share/Animal density [% or 0.01 animals heads/ha]
Production per UAAR [kg/ha]
53.27
3317.92
Oilseeds
2.28
67.13
Other arable crops
5.05
1977.45

The following map should appear. You may select different elements of the balance now by using the drop-down box below “activity” or change the nutrient, by using the drop-down box under “nutrient”.



CAPRI [e:\capri1\gams]

CAPREG base year [Data View 1]

Table: Nutrient balances, mapping view

Activity: Import by mineral fertilizer [1000t or kg/ha N,P2O5,K2O]

Nutrient: Nitrate (N)

Map

Years : Y

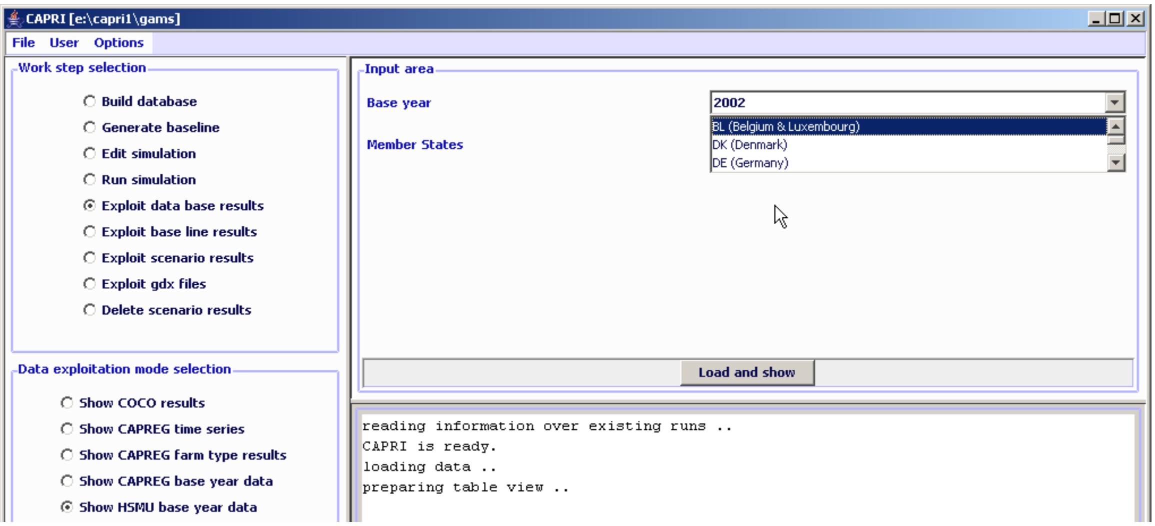
CAPRI GUI Version 1.2.4, Oct. 2007

User name : Wolfgang Britz

User type : Administrator

Drawing a map of the High Nature Value Farmland indicator for Belgium & Luxembourg for the base year

Firstly, we need to select “Exploit data base results” in the work step selection panel, and then choose the radio button “Show HSMU base year data”. Then, in the Member States drop-down list, Belgium & Luxembourg must be selected, as shown below.



Work step selection

- ○ Build database
- ○ Generate baseline
- ○ Edit simulation
- ○ Run simulation
- ● Exploit data base results
- ○ Exploit base line results
- ○ Exploit scenario results
- ○ Exploit gdx files
- ○ Delete scenario results

Data exploitation mode selection

- ○ Show COCO results
- ○ Show CAPREG time series
- ○ Show CAPREG farm type results
- ○ Show CAPREG base year data
- ● Show HSMU base year data

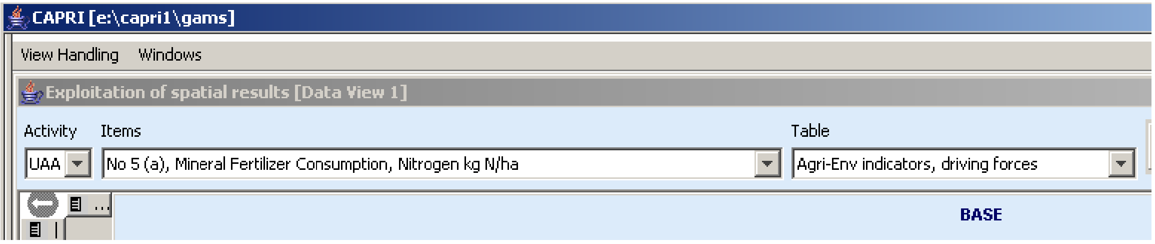
Input area

Base year: 2002

Member States: BL (Belgium & Luxembourg), DK (Denmark), DE (Germany)

```
reading information over existing runs ..
CAPRI is ready.
loading data ..
preparing table view ..
```

Pressing the “load and show” button will then bring up the first table links to the HSMU results as shown below.

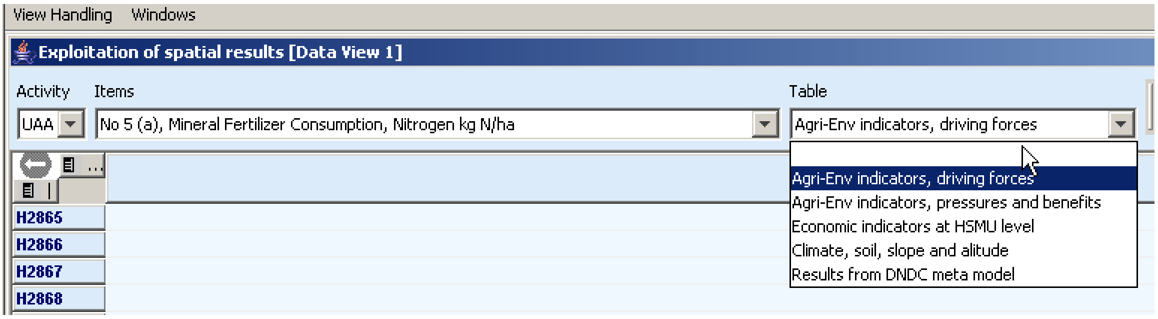


Activity: UAA

Items: No 5 (a), Mineral Fertilizer Consumption, Nitrogen kg N/ha

Table: Agri-Env indicators, driving forces

Now, according to the guidelines for RD indicators, HNV is to be found under “Pressures and benefits”, which is stored as another table. So opening the drop down list for the tables allows us to select the correct table.



Activity: UAA

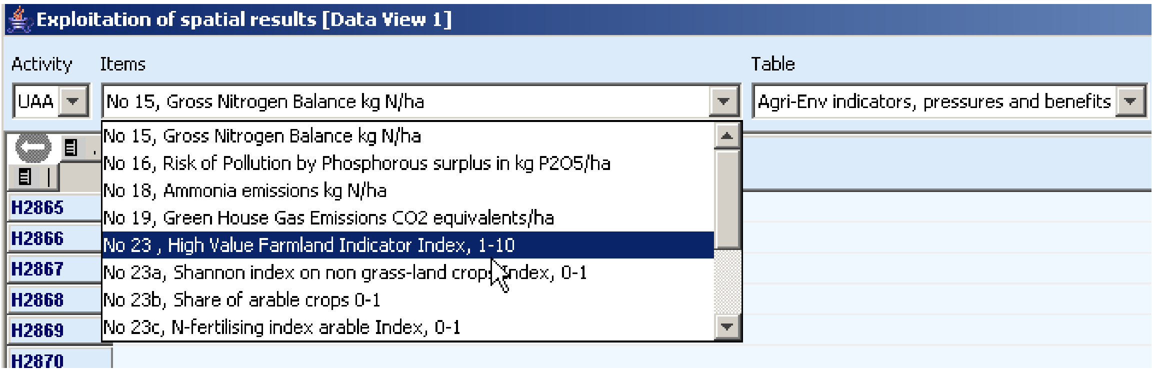
Items: No 5 (a), Mineral Fertilizer Consumption, Nitrogen kg N/ha

Table: Agri-Env indicators, driving forces

- Agri-Env indicators, driving forces
- Agri-Env indicators, pressures and benefits
- Economic indicators at HSMU level
- Climate, soil, slope and alitude
- Results from DNDC meta model

H2865
H2866
H2867
H2868

Next, we need to find the correct item and in order to do so, the drop-down list for the items must be selected and the indicator 23 selected, as seen below.


Exploitation of spatial results [Data View 1]

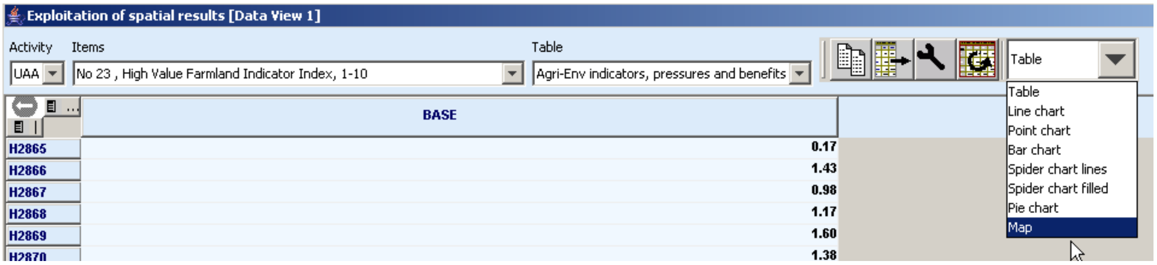
Activity: UAA

Items: No 15, Gross Nitrogen Balance kg N/ha

Table: Agri-Env indicators, pressures and benefits

- No 15, Gross Nitrogen Balance kg N/ha
- No 16, Risk of Pollution by Phosphorous surplus in kg P2O5/ha
- No 18, Ammonia emissions kg N/ha
- No 19, Green House Gas Emissions CO2 equivalents/ha
- No 23 , High Value Farmland Indicator Index, 1-10
- No 23a, Shannon index on non grass-land crops Index, 0-1
- No 23b, Share of arable crops 0-1
- No 23c, N-fertilising index arable Index, 0-1

Those numbers should now be shown as a map. To do so, select “Map” from the drop-down list where “Table” is shown.


Exploitation of spatial results [Data View 1]

Activity: UAA

Items: No 23 , High Value Farmland Indicator Index, 1-10

Table: Agri-Env indicators, pressures and benefits

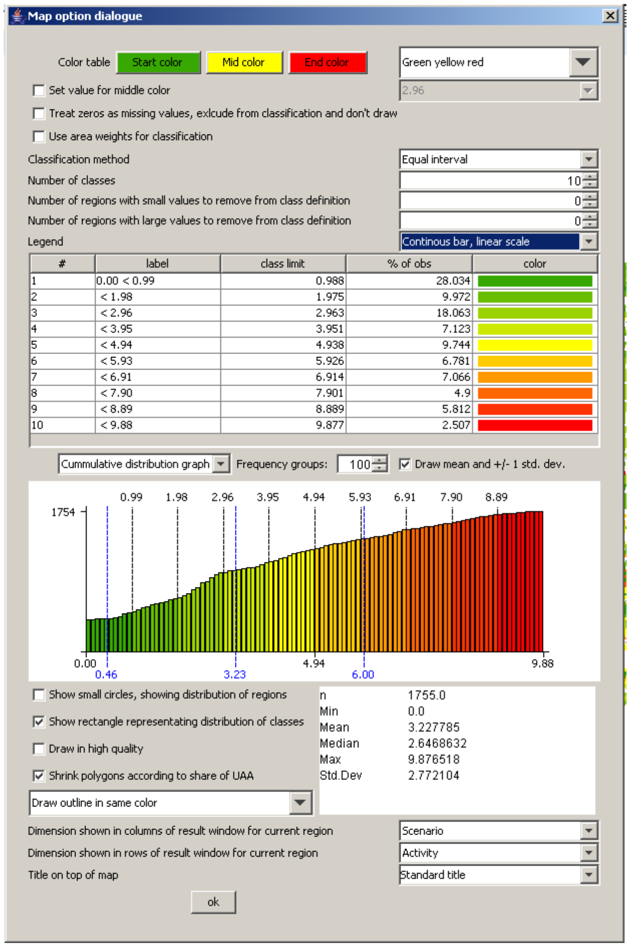
Table

- Table
- Line chart
- Point chart
- Bar chart
- Spider chart lines
- Spider chart filled
- Pie chart
- Map

	BASE
H2865	0.17
H2866	1.43
H2867	0.98
H2868	1.17
H2869	1.60
H2870	1.38

The “hour glass” cursor is shown and the geometry will be loaded which may take a few seconds. Afterwards, the standard map comes up (green-yellow-red color model, quantile classification, polygons shrinked, no area weights, zeros included in classification). Now, for the HNV indicator ranging from 0-10, where 10 is the best possible index value, and real zeros indicate missing values, the following settings could be appropriate:

- Equal interval classification with 10 classes
- Zeros treated as missing values
- And, using area weights may be appropriate so that the frequency graph below the maps shows the share of UAA in each of the ten classes
- As linear scale works nicer for our example, and, as the data only ranges to 9.88, we should round the number to an integer (use the “tools” button 🔧, and choose “0” in the “Fraction digits” scroll-down box.)



Map option dialogue

Color table Start color Mid color End color Green yellow red

☐ Set value for middle color 2.96

☐ Treat zeros as missing values, exlcude from classification and don't draw

☐ Use area weights for classification

Classification method: Equal interval

Number of classes: 10

Number of regions with small values to remove from class definition: 0

Number of regions with large values to remove from class definition: 0

Legend: Continous bar, linear scale

#	label	class limit	% of obs	color
1	0.00 < 0.99	0.988	28.034	🟩
2	< 1.98	1.975	9.972	🟩
3	< 2.96	2.963	18.063	🟩
4	< 3.95	3.951	7.123	🟨
5	< 4.94	4.938	9.744	🟨
6	< 5.93	5.926	6.781	🟨
7	< 6.91	6.914	7.066	🟧
8	< 7.90	7.901	4.9	🟧
9	< 8.89	8.889	5.812	🟥
10	< 9.88	9.877	2.507	🟥

Cummulative distribution graph Frequency groups: 100 ☑ Draw mean and +/- 1 std. dev.

☐ Show small circles, showing distribution of regions

☑ Show rectangle representating distribution of classes

☐ Draw in high quality

☑ Shrink polygons according to share of UAA

Draw outline in same color

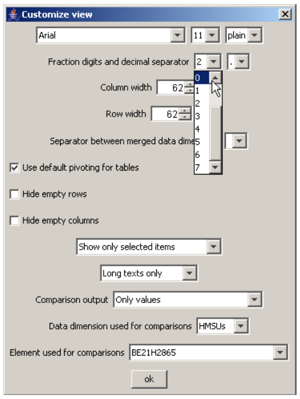
n	1755.0
Min	0.0
Mean	3.227785
Median	2.6468632
Max	9.876518
Std.Dev	2.772104

Dimension shown in columns of result window for current region: Scenario

Dimension shown in rows of result window for current region: Activity

Title on top of map: Standard title

ok



Customize view

Arial 11 plain

Fraction digits and decimal separator 2 .

Column width 62

Row width 62

Separator between merged data dime

☑ Use default pivoting for tables

☐ Hide empty rows

☐ Hide empty columns

Show only selected items

Long texts only

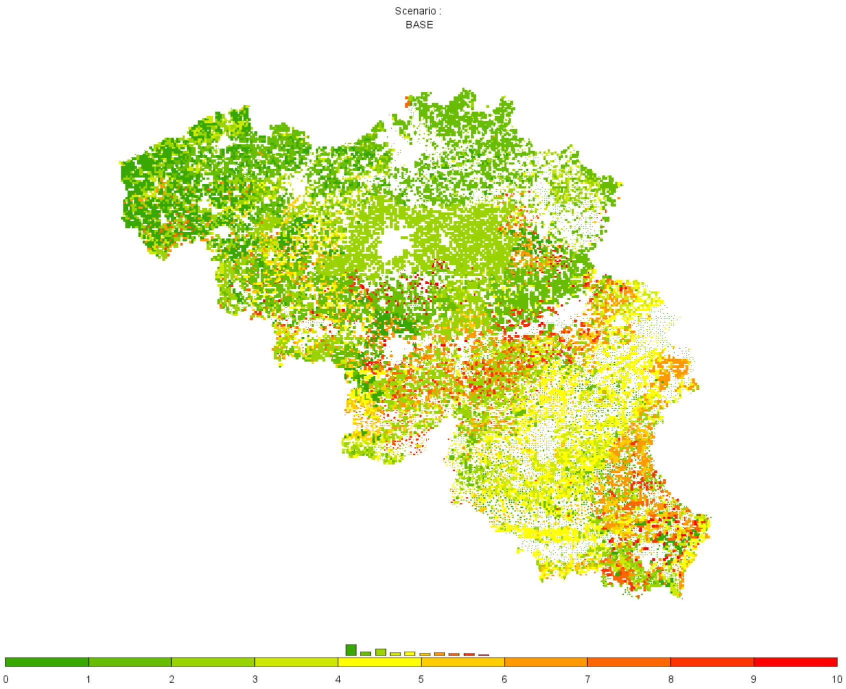
Comparison output: Only values

Data dimension used for comparisons: HMSUs

Element used for comparisons: BE21H2865

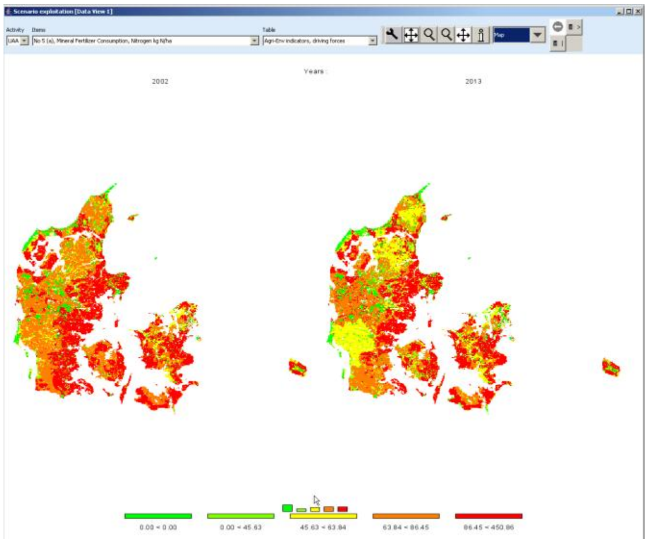
ok

That should give the following map, which then can be exported to other applications via the clipboard 📋 or can be send to the printer 🖨:



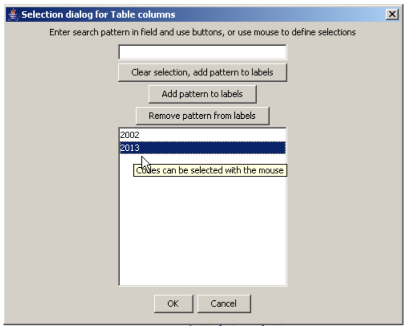
Drawing a map showing changes between the base year and the ex-ante results from the baseline

When scenarios or different points are compared with each other, it is often useful to draw maps which show relative or absolute changes. The following map is the typical starting point when the baseline is analyzed: two maps with identical class definitions, one for the base and one for the projection year.


Scenario exploitation [Data View 1]

Activity: UAA
Items: No 5 (a), Mineral Fertilizer Consumption, Nitrogen kg N/ha
Table: Agri-Env indicators, driving forces
Map

In order to draw a map with changes, we must first get rid of the base year by de-selecting the first map. This is done by using the “column selection” button which is found in the upper right corner of the window. When the button is double-clicked, a dialog opens, and one can select the projection year with the mouse, only. Afterwards, the left map will no longer be present.



Selection dialog for Table columns

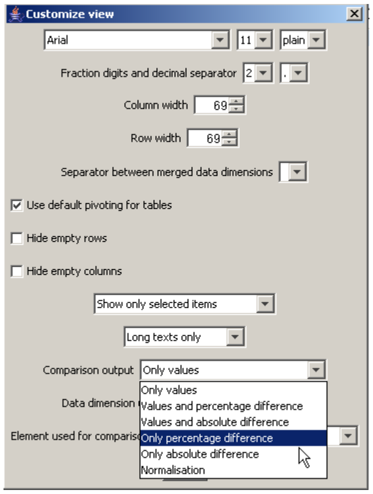
Enter search pattern in field and use buttons, or use mouse to define selections

Clear selection, add pattern to labels
Add pattern to labels
Remove pattern from labels

2002
2013

Codes can be selected with the mouse

Next, we need to change the absolute values shown in the map to relative changes to the base year. That can be accomplished by using the tool dialogue (press button). In the tool dialogue, select “only percentage differences” in the drop-down box labeled “comparison output”, and then put the “data dimension used for comparisons” to “Years”. The “Element used for comparisons” should be “2002”. After pressing o.k., the map will change as shown.



Customize view

Arial | 11 | plain

Fraction digits and decimal separator 2 .

Column width 69

Row width 69

Separator between merged data dimensions

☑ Use default pivoting for tables

☐ Hide empty rows

☐ Hide empty columns

Show only selected items

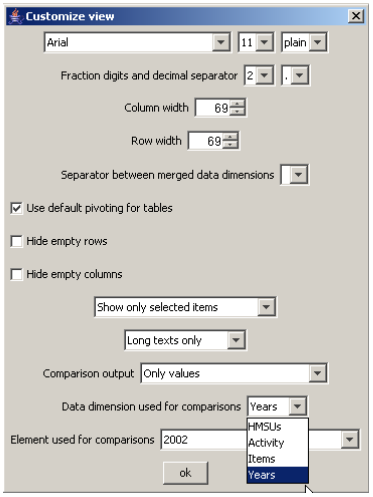
Long texts only

Comparison output: Only values

Only values
Values and percentage difference
Values and absolute difference
Only percentage difference
Only absolute difference
Normalisation

Data dimension

Element used for comparis



Customize view

Arial | 11 | plain

Fraction digits and decimal separator 2 .

Column width 69

Row width 69

Separator between merged data dimensions

☑ Use default pivoting for tables

☐ Hide empty rows

☐ Hide empty columns

Show only selected items

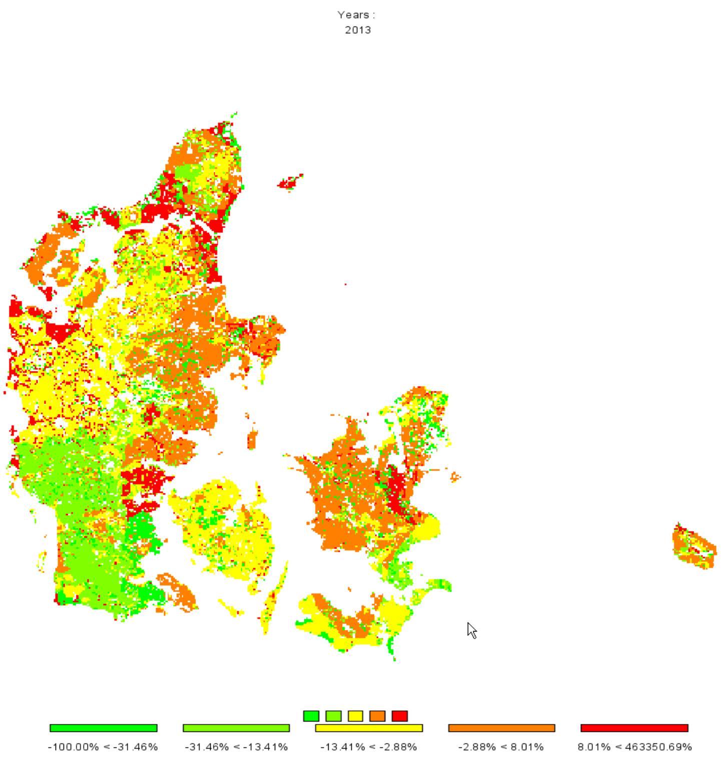
Long texts only

Comparison output: Only values

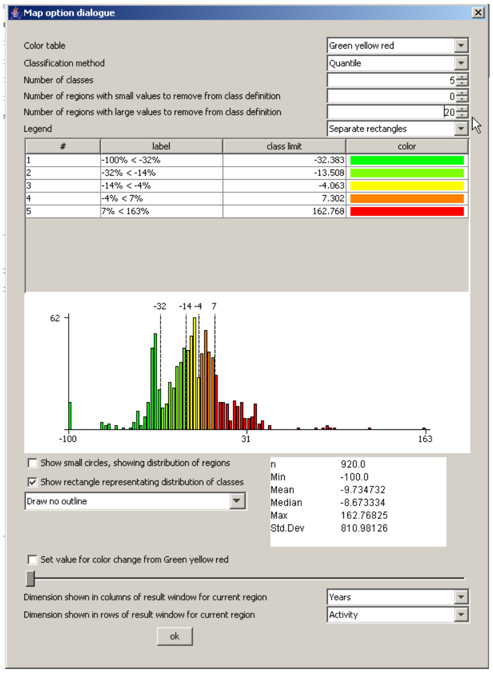
Data dimension used for comparisons: Years

HMSUs
Activity
Items
Years

Element used for comparisons: 2002



Now, there are two things we would most probably like to change: the number of digits shown in the legend, and getting rid of very large values shown in the legend. The number of digits can be changed with the “tool” dialogue by changing the fraction digits. Large numbers can be excluded from the classification by increasing the “Number of regions with larger numbers to exclude from class definition”, in the example below the number had been set to 20.


Map option dialogue

Color table: Green yellow red
Classification method: Quantile
Number of classes: 5
Number of regions with small values to remove from class definition: 0
Number of regions with large values to remove from class definition: 20
Legend: Separate rectangles

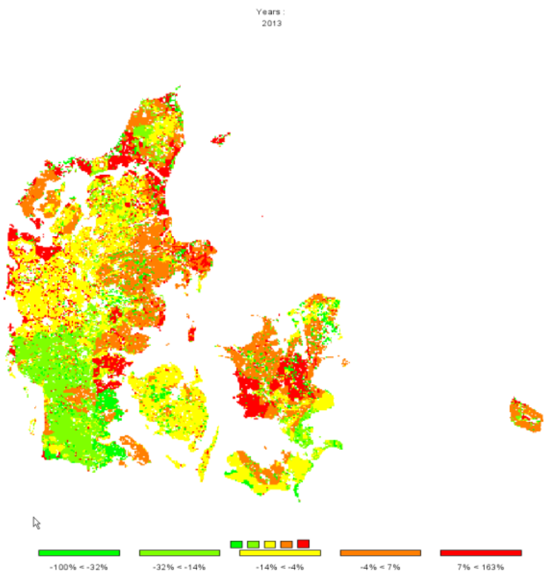
#	label	class limit	color
1	-100% < -32%	-32.383	🟩
2	-32% < -14%	-13.508	🟩
3	-14% < -4%	-4.063	🟨
4	-4% < 7%	7.302	🟧
5	7% < 163%	162.768	🟥

☐ Show small circles, showing distribution of regions
☑ Show rectangle representating distribution of classes
Draw no outline

```
n         920.0
Min       -100.0
Mean      -9.734732
Median    -8.673334
Max       162.76825
Std.Dev   810.98126
```

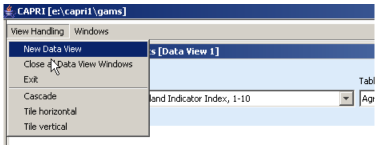
☐ Set value for color change from Green yellow red

Dimension shown in columns of result window for current region: Years
Dimension shown in rows of result window for current region: Activity

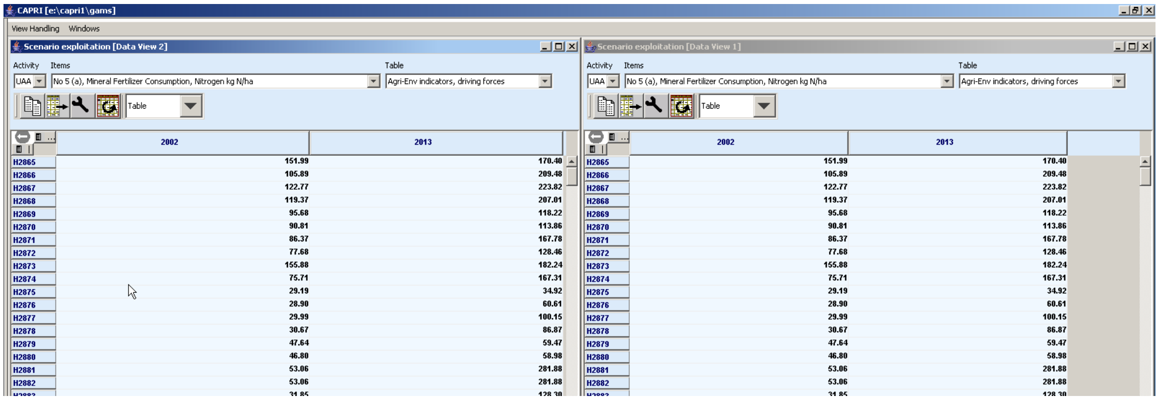


Drawing a map with the base year results next to one showing changes from the base year to the baseline results

There are two ways to draw different maps. If more then one column is selected in the underlying table view, several maps with identical coloring and scaling will be drawn as shown in the sample above. That is not advisable – in our example we need two different scales: one appropriate for the absolute values and one appropriate for changes. In order to do so choose "View Handling", "New Data View" and then "Tile vertical".



We will then see something similar to the one shown below.



Scenario exploitation [Data View 2]

Activity: UAA
Items: No 5 (a), Mineral Fertilizer Consumption, Nitrogen kg N/ha
Table: Agri-Env indicators, driving forces

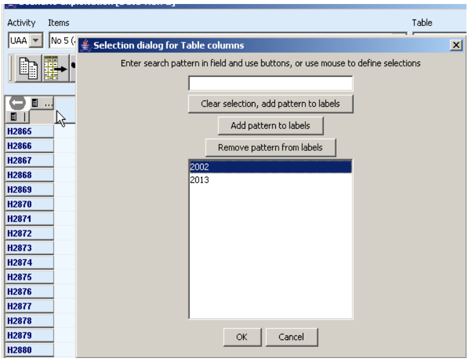
	2002	2013
H2865	151.99	170.40
H2866	105.89	209.48
H2867	122.77	223.82
H2868	119.37	207.01
H2869	95.68	118.22
H2870	90.81	113.86
H2871	86.37	167.78
H2872	77.68	128.46
H2873	155.88	182.24
H2874	75.71	167.31
H2875	29.19	34.92
H2876	28.90	60.61
H2877	29.99	100.15
H2878	30.67	86.87
H2879	47.64	59.47
H2880	46.80	58.98
H2881	53.06	281.88
H2882	53.06	281.88
H2883	31.85	128.30

Scenario exploitation [Data View 1]

Activity: UAA
Items: No 5 (a), Mineral Fertilizer Consumption, Nitrogen kg N/ha
Table: Agri-Env indicators, driving forces

	2002	2013
H2865	151.99	170.40
H2866	105.89	209.48
H2867	122.77	223.82
H2868	119.37	207.01
H2869	95.68	118.22
H2870	90.81	113.86
H2871	86.37	167.78
H2872	77.68	128.46
H2873	155.88	182.24
H2874	75.71	167.31
H2875	29.19	34.92
H2876	28.90	60.61
H2877	29.99	100.15
H2878	30.67	86.87
H2879	47.64	59.47
H2880	46.80	58.98
H2881	53.06	281.88
H2882	53.06	281.88
H2883	31.85	128.30

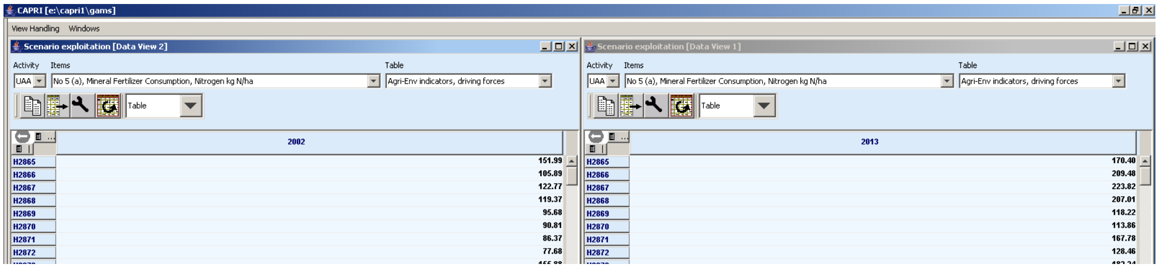
Now, in the left hand side, only the results for the base year should be shown. That can be accomplished by deselecting the column for "2013" – use the column selection button to do so.



Selection dialog for Table columns

Enter search pattern in field and use buttons, or use mouse to define selections

The very same trick should be applied for the other view, only deselecting the results for "2002". Now we see something as below:


CAPRI [e:\capri1\gams]

Scenario exploitation [Data View 2]

Activity: UAA
Items: No 5 (a), Mineral Fertilizer Consumption, Nitrogen kg N/ha
Table: Agri-Env indicators, driving forces
Table

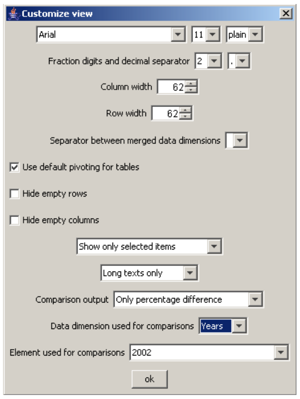
	2002
H2865	151.99
H2866	105.89
H2867	122.77
H2868	119.37
H2869	95.68
H2870	90.81
H2871	86.37
H2872	77.68

Scenario exploitation [Data View 1]

Activity: UAA
Items: No 5 (a), Mineral Fertilizer Consumption, Nitrogen kg N/ha
Table: Agri-Env indicators, driving forces
Table

	2013
H2865	170.40
H2866	209.48
H2867	223.82
H2868	207.01
H2869	118.22
H2870	113.86
H2871	167.78
H2872	128.46

Now, for the map with the results for 2013, we should switch to percentage difference to the year “2002” by opening the “tool” dialog 🔧. There, under “Comparison output”, choose ”Only percentage difference”, Select “Years” under “Data dimension used for comparisons” and ensure that “2002” is selected in “Element used for comparisons”.


Customize view

Arial 11 plain

Fraction digits and decimal separator: 2 .

Column width: 62

Row width: 62

Separator between merged data dimensions:

☑ Use default pivoting for tables

□ Hide empty rows

□ Hide empty columns

Show only selected items

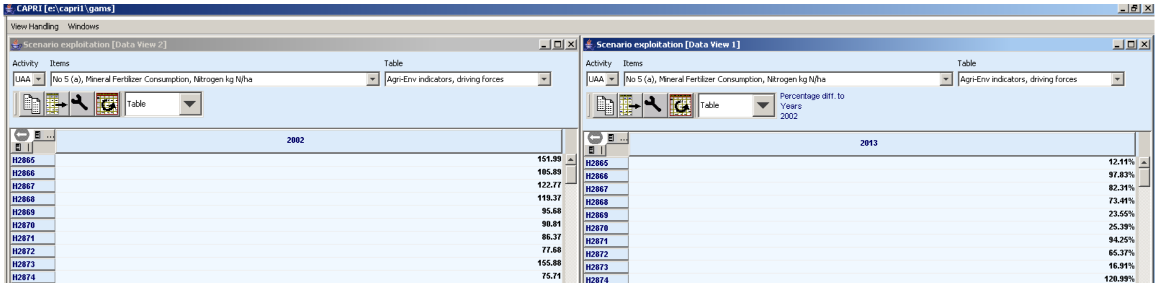
Long texts only

Comparison output: Only percentage difference

Data dimension used for comparisons: Years

Element used for comparisons: 2002

Now we should get a result as below.


CAPRI [e:\capri1\gams]

Scenario exploitation [Data View 2]

Activity: UAA
Items: No 5 (a), Mineral Fertilizer Consumption, Nitrogen kg N/ha
Table: Agri-Env indicators, driving forces
Table

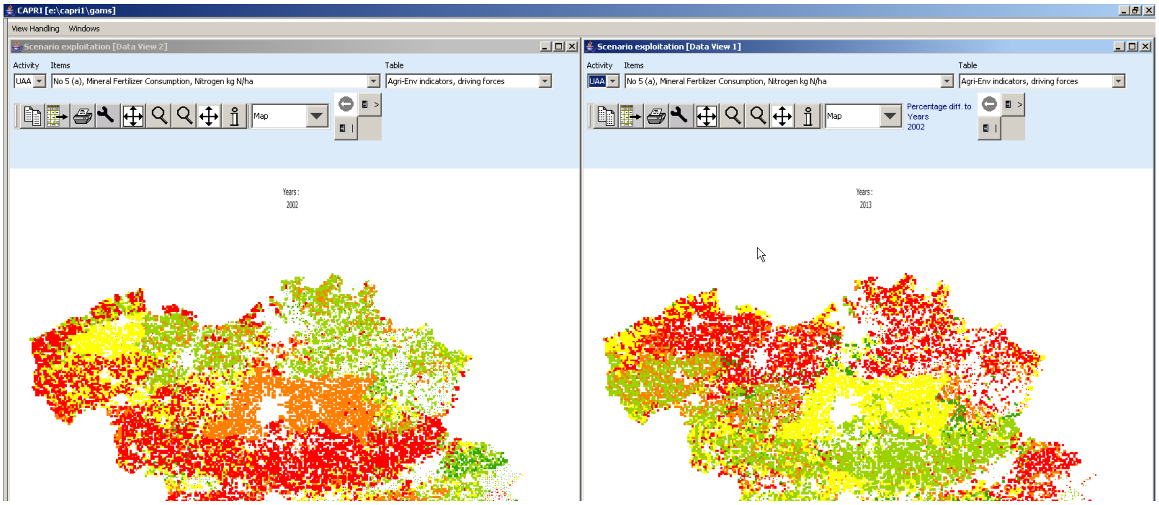
	2002
H2865	151.99
H2866	105.89
H2867	122.77
H2868	119.37
H2869	95.68
H2870	90.81
H2871	86.37
H2872	77.68
H2873	155.88
H2874	75.71

Scenario exploitation [Data View 1]

Activity: UAA
Items: No 5 (a), Mineral Fertilizer Consumption, Nitrogen kg N/ha
Table: Agri-Env indicators, driving forces
Table
Percentage diff. to
Years
2002

	2013
H2865	12.11%
H2866	97.83%
H2867	82.31%
H2868	73.41%
H2869	23.55%
H2870	25.39%
H2871	94.25%
H2872	65.37%
H2873	16.91%
H2874	120.99%

Now, for both views, the output should be switched to maps, and there we are …



CAPRI [e:\capri1\gams]

View Handling Windows

Scenario exploitation [Data View 2]

Activity: UAA

Items: No 5 (a), Mineral Fertilizer Consumption, Nitrogen kg N/ha

Table: Agri-Env indicators, driving forces

Map

Years :
2002

Scenario exploitation [Data View 1]

Activity: UAA

Items: No 5 (a), Mineral Fertilizer Consumption, Nitrogen kg N/ha

Table: Agri-Env indicators, driving forces

Map

Percentage diff. to
Years
2002

Years :
2013

The software behind the mapping viewer and the CAPRI exploitation tools

Reading the following chapter is not necessary to work with the GUI, but rather intended for a reader who is technically interested. The original software implementation of CAPRI was based on software available at ILR at that time and comprised a DBMS realized in FORTRAN with C/C++ code for the GUI. The very first maps in CAPRI (in 1998) were produced with an MS-EXCEL mapping plug-in which was at that time a cost-free add-on. However, moving the data to EXCEL and then loading them in the viewer was not a real option for the daily debugging work on the data base and the model. Therefore, shortly before the first CAPRI project ended in 1999, a JAVA applet was programmed by W. Britz which was able to draw simple maps from CSV-Files, automatically produced by the CAPMOD GAMS code. That code with slight modification remained active for quite a while, and some of the features are still to be found in the current mapping viewer. Then for a while, the exploitation tools were based on XML/XSLT+SVG and a mapping viewer in SVG was realized. However, the XML solution had the big disadvantage of requiring a large amount of single ASCII input files, and was not really performant when complex pivoting was used.

Therefore, the next evolution step was a pure Java GUI with direct access to GDX files which is the current state of the art in CAPRI. GDX files are an internal file format used by GAMS which allows a rather efficient I/O for large sparse tables. An API library allows to access GDX files from other applications. That design has the obvious advantage to be firstly based onto the portable JAVA language. Secondly, as no external DBMS is used, it is possible to use CAPRI by solely executing GAMS programs. CAPRI might hence run on any system supported by GAMS, without the need to install additional software.

The GUI consists of three rather independent components. Firstly, a GUI to control the different work steps of CAPRI. The code deals mostly with defining GUI controls (button, scroll-down lists etc.) to manipulate properties of CAPRI tasks, and then to start them as GAMS processes. That part has been thoroughly refactored with the revision of 2008. A second important part is the CAPRI exploitation tool, which are basically generic enough to be used for other modeling systems as well. The current refactoring left most of the code untouched compared to the code developed since 2006, with the exemption of the graphics which is now based on the JFreeChart library. However, as discussed below, in 2007, the mapping viewer was refactored in larger part to host the 1x1 km grid solution developed in the CAPRI-Dynaspat project. The exploitation tool is a rather unique solution to exploit result sets from economic models based on the definitions of views which are defined in XML tables. It combines features from

DBMS reporting, data mining, spreadsheet functionalities and GIS into one package. And thirdly, there are some specialized pieces as the HTML based GAMS documentation generator which are linked into the GUI.

CAPRI tasks as business model

A core concept in the new layout is a business object called *AgpTask*. Technically defined as an interface, such an object represents a work task in the overall CAPRI system such a run of CAPREG to build the regional data base. The interface requires getters and setters for properties such as *baseYear*, *simYear or MemberStates*. The setters can be accessed either by a GUI interface or by the batch execution facility, formally by a class implementing the interface *AgpTaskHandler*.

Most tasks are GAMS executable tasks according to their *isGams* property. These tasks also provide access to the name of the related GAMS program via *getGamsProgramName*. Each of these tasks has also a method called *generateIncludeFile* which generates the specific so-called include file in GAMS format for that task.

The objects also know about the main GDX file they are generating via *getGdxResultFiles*. Related to that, they allow setting the logical names of the data dimension in the result data set via *setDimNames* and *setXMLTablesDims*.

Once the properties of a task had been defined, their logical consistency can be checked by invoking the method *checkSettings.* Check settings returns a string with a description of the first error encountered.

That layout eases dramatically the update process of CAPRI. Definition of new tasks or changes to existing ones will generally not require changes in the GUI, but simply creates the necessity of either implementing a new object with the required methods or updating an existing one.

Execution of tasks via a GamsStarter and GamsThread

Execution of tasks with the property *isGams* is handled by a *GamsStarter* object. An instance of *GamsStarter* lets the task write out the necessary include file(s) in GAMS format to generate a specific instance of the specific task (a simulation run for a specific scenario, simulation year, with the market model switched on or off …). A *GamsStarter* also knows about the working directory or other specific GAMS settings as the scratch directory. It may generate a pipe for the GAMS output to the console to show it in a GUI.

An *AgpTask* can be executed by a *GamsStarter* who will then create a *GamsThread*. A *GamsThread* extends the *SwingWorker* interface of Java so that it may communicate with the normal event queue of JVM. A *GamsThread* can be gracefully terminated by sending a SIGNT signal to the GAMS process. That will let the GAMS execution stop at a specific point determined by the GAMS engine itself and start the finalisation handling of GAMS as well as the removal of intermediate files and directories.

Refactoring the mapping part

When the 1x1 km grid layer was added to CAPRI during the CAPRI-Dynaspat project it became obvious that the existing JAVA code to produce maps needed some revision, especially regarding the way the geometry was stored. In this context, the question of using an existing GIS independently from CAPRI or the use of existing GIS classes plugged-into the CAPRI GUI was raised again and some tests with open-source products were undertaken. A stand-alone GIS as the sole option was certainly the less appealing solution. Firstly, it would have required producing rather large intermediate files and would have left the user with the time-consuming and often error prone task of exporting and importing the data. Secondly, the user would need to switch between two different programs and GUI standards. And thirdly, all the usual problems with installing and maintaining additional software on a work station would occur. However, as indicated later, the GUI naturally allows passing data over to external applications and does hence not prevent the user from using a full-fledged GIS solution.

The main points taken into account during the search of a map viewing solution for CAPRI were: (1) possibility to import data from the CAPRI GUI efficiently, (2) user-friendliness, (3) performance and (4), in the case of plug-in libraries, expected realization and maintenance resource need, and naturally (5) license costs. It turned quickly that an ideal product was not available. Some of the products were not able to allow for the necessary link between newly imported tables with region codes and an existing geo-referenced geometry. Others had very complex user interfaces or produced run-time errors, took ages to draw the HSMU maps or were quite expensive. From the different options tested, the gvSIG (http://www.gvsig.com/index.php?idioma=en) freeware GIS seemed to be the only option, allowing the user to import data from a CSV – which must however be semi-colon delimited – and join one of the columns to a shapefile. At least the version installed at that time was however running not very stable.

In the end, it was decided to build on the existing code base and let Wolfgang Britz write the additional code “on demand”. The main advantage of that approach is the fact that the mapping view is transparently integrated in the CAPRI GUI, it is sufficient to switch from “Table” to “Map” in a drop-down list to produce a colored map, and that user demands regarding additional functionality may be and had been added, taking into account the specific needs of the CAPRI network.

Compared to ArcGIS, where the EU27 HSMU geometry plus codes and centroids requires about 340 Mbytes, the CAPRI version requires about 27Mbytes solely. Reading in the CAPRI GUI is somewhat slower compared to ArcGIS due to unzip on demand. The actual drawing operation takes about the same time as in ArcGIS (about 11 second for the full data set). Classification in Java is typically faster.

Views as the basic concept

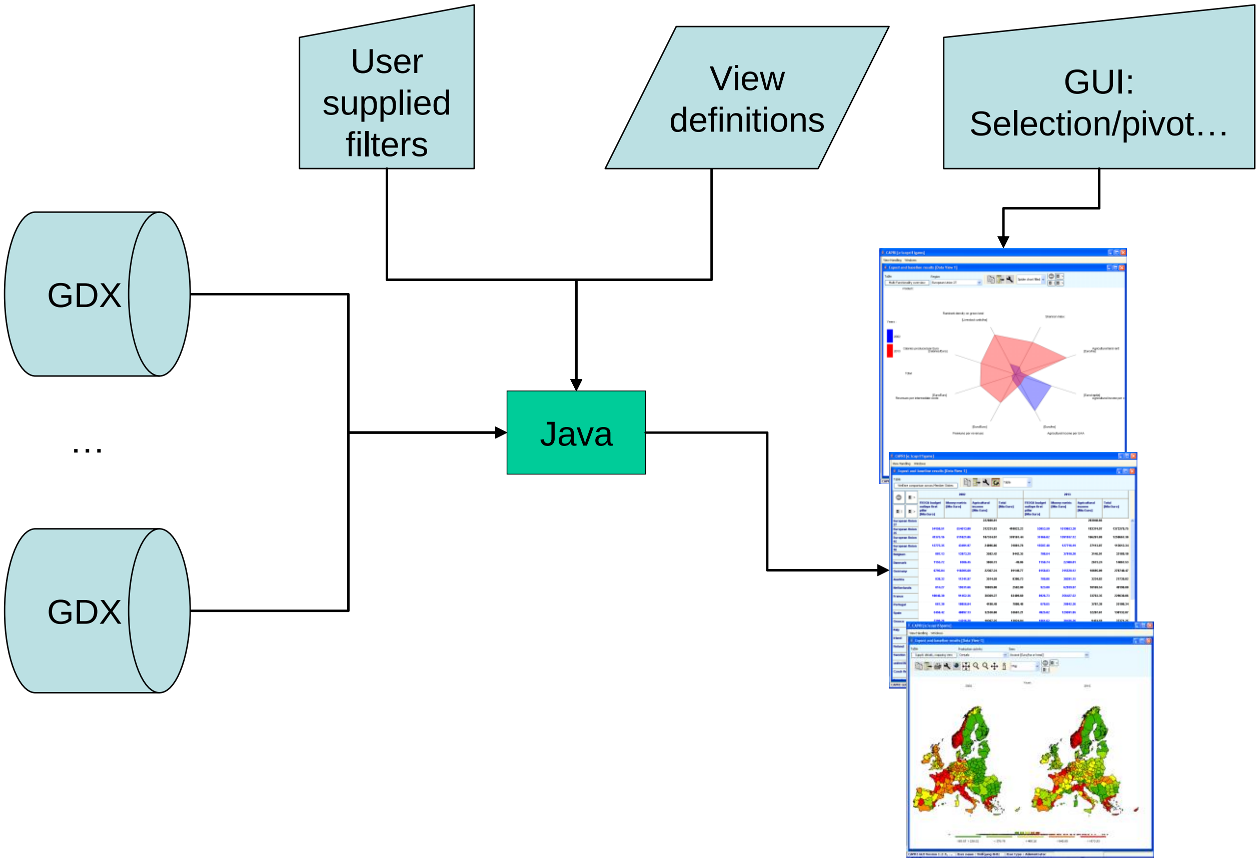
The concept of the CAPRI exploitation tools is centred on the idea of a view. Content wise, each view may be understood as showing one or several indicators relating to results of CAPRI working steps, e.g. environmental effects of farming, prices or market balances. Each view thus:

- extracts a certain collection of numerical values
- labels them so that they carry information to the user (long texts, units)
- chooses a matching presentation – as a table, map or graphic
- and arranges them in a suitable way on screen.

The views can be linked to each other, allowing a WEB like navigation through the data cube. Views can be grouped to themes. The user may open several views in parallel, and he may change the views interactively according to his needs, e.g. switch from a map to a tabular presentation, or change the pivot of the table, sort the rows etc.

Internally, each view is stored in an XML schema. Technically, a view can be understood as a combination of a pre-defined selection query, along with reporting information. The XML schema allows to attach long texts, units and tooltips to the items of a table, and thus to show meta-data information to the user. The XML schema hence replaces look up tables in a DBMS. It may equally store information regarding the pivoting, the view type (table, map, different graphic types), and for maps, classification, color ramp and number of classes. The views can be grouped into logical entities, and are shown as a popup menu to the user.

Tabular views may feature column and row groups. Empty columns and rows can be hidden; tables can be sorted by column, with multiple sort columns supported. Numerical filter can be applied to columns.



Data model

The underlying data model is very simple and straightforward. All data are kept in one large multi-dimensional data cube, and all values must either be float values or strings. Currently, only read-only is supported. Each data dimension is linked to a vector of string keys. Those keys are the base for the filter definitions. Currently, data cubes with up to six dimensions are used (regions – activities – items – trading partners – years – policy scenarios). The data storage model is equally optimised to the specific needs. As only float values or strings are supported, all data can be stored as one primitive array of either floats or strings. To allow fast and efficient indexing, a linear index is constructed from the multi-dimensional data cube, and the non-zero data and their indices are stored in a hash table. That renders data retrieval very fast. All data are loaded in memory at initialisation time: For moderately long linear indices about 10 Bytes are required to store a non-zero float and its index as an integer. If the maximal linear index is very large, the index is stored as a long and the storage need goes up to about 16 Bytes. For moderately sized data cubes, 20 Million numbers can hence be hosted in about 200 Mbytes.

The data are read from a generic file format generated by GAMS (General Algebraic Modelling System, a commonly used software package in economic modelling) called GDX, the software package on which CAPRI is based. Access to GDX is handled via an API provided by GAMS.

Client based solution

Technically, the exploitation tool is completely client based. That reflects the specific user profile of the CAPRI modelling system where the exploitation tool is integrated with an economic model and tools building up its data base. The main aim of the tool is to support forward looking policy analysis. For this purpose users will create their own scenarios and in some cases even own variants of the export data, which will lead to processes requiring considerable processing and storage resources. A client-server solution where the production process and data storage would need to be hosted on a web server is therefore not a preferred solution, also as users will often develop variants of the modelling system by code modification in GAMS, and contribute to its development. The structure of the data driver would however very easily support linkage to a network or WEB based data bases. It should however be noted that the data base and GAMS code are managed via a Software versioning system, which is a kind of client-server environment.

The geometry model

The mapping viewer of CAPRI is based on very simple and straightforward concepts. First of all, it basically supports solely polygon geometries not comprising holes, line strings (interpreted as rivers) and points for labelling. The storage model is optimised to host rectangles, and is especially efficient if the polygons vertexes are all points in a raster. The topology is not read from a shapefile, but stored in a generic rather simple format. However, a shapefile interface to generate the generic format is available. The vertices are stored in x,y coordinates, already projected in a rectangular coordinate system, and the viewer does not deal with the geographic coordinate system, but simply scales the rectangular coordinates in the viewport. The viewer in its current version solely supports one layer of quantities. Those restrictions naturally allow reducing memory needs, and, thanks to the rather simple data structures, also rather allow performing drawing operations. It should be noted that the JIT compiler of JAVA is indeed rather fast.

The biggest topology currently handled simultaneously covers an intersection of Corinne Land Cover, slope classes and Soil Morphological Units and comprises around 2.7 Million polygons for EU27. As the majority of the polygons are rectangles, not more then 6-7 Million points needed to be stored. The topology handler and the drawing routines separate rectangles, for which only the two outer points are stored, from polygons, for which the vertices and centroids are stored.

The viewer is written in Java. There are two variants. One is a stand-alone version of the viewer realised as an applet. It reads from an internal portable binary data format, and java classes, data and geometry can be packed into one jar file, e.g. to ship it to a client. The second version is transparently integrated in the GUI of the CAPRI modelling system.

Swing is used for the GUI in order to profit from the most simple implementation, the viewer has been written completely new, and is not based on existing GIS libraries. Even certain standard JAVA classes as e.g. for hash tables, have been replaced by own implementations, to reduce implementation overhead. Some care was given to support flexibility in classification, given that only quantities are supported, so that the tool covers natural breaks, quantiles, equal spread, mean standard and nested means. Area weighting is supported as well.

In order to export data to other applications, the tools support first of all tab delimited clipboard export, allowing import e.g. into EXCEL. Maps can be exported as JPEGs over the clipboard. Alternatively, the user may export to external file, in CSV format, DBF, to MS Access or to GAMS. DBF export will generate a second file comprising meta data.

The exploitation tools of CAPRI build on a rather simple structure. Each CAPRI work step stores its results as a GAMS parameter, representing a multi-dimensional sparse cube which is stored as a GDX file. The exploitation loads the non-zeros from one or several GDX files into memory. However, given the length of the different dimensions and the use of short codes, the user would be typically lost on his own in the large tables. The XML definition file is the equivalent of a collection of “SQL queries” as it defines views which combine filters in the dimensions of the cube with information on how to show the results (pivot, table, graph or map).

The structure of the XML definition files for the views

General comments

It is not intended to let the user edit this file, but in order to have a complete documentation, some information about the structure is included in here. The XML parser used by the GUI's java code is not a general XML parser, as tests revealed that the java base general XML parsers were rather slow. For the XML file used for the definition the views (the standard name is "tables.xml"), using a simple parser has some consequences: only one tag is allowed per line, and tags are not allowed to span several lines. Also, error handling is so far only rudimentary as users are not supposed to edit that file.

The table viewer currently supports up to 6 dimensions, which are named as:

1. Region
2. Activity
3. Product
4. Scenario
5. Year
6. Dim5

in the XML-file. These "logical dimensions" can be mapped to any dimension of the original data cube read in by the java code. Pivoting can then be used to map these "logical" dimensions to viewport dimensions seen by the user such as the columns and rows of a table.

Necessary tags for tables

A table definition is found between the <table> … </table> tags. It must at least define:

- The table theme, such as <theme>Welfare</theme>. The themes are shown as a drop-down menu in the exploitation tools.
- The table name, such as <name>Welfare comparison between Member States</name>. The names must be unique.
- The items of the tables.

The order of the themes and table names will define their order in the drop-down menu.

Defining the items of the table

The underlying idea of having a “hand defined” list of items for one of the definitions stems from the observation that most tables have only a very limited number of columns, and that these are normally formatted with care regarding their text comprised. Each table therefore requires a definition of items, but the items must not necessarily be mapped in the column viewport.

```
 <item>
   <itemName>Money metric</itemName>
   <key>CSSP</key>
   <unit>Mio Euro</unit>
   <longtext>Consumer welfare measurement: expenditures necessary to reach utility in current simulation under prices of reference scenario</longtext>
   <link>Money metric</link>
 </item>
```

An item definition is enclosed in the <item>…</item> tags. It must at least comprise a <key> and an <itemName> tag. The case sensitive key must match the symbol identifier as found in the GDX file, whereas the itemName can be freely chosen.

Facultative tags are:

<unit>: a physical unit shown in table

<longtext>: a text shown when the mouse hovers of the column

<link>: a link to another table for the table cells under the column.

<colormode>: the color mode used when a map is drawn for the item. The following modes are supported:

• GYR	Green Yellow Red
• RYG	Red Yellow Green
• GR	Green Red
• RG	Red Green
• BG	Blue Green
• GB	Green Blue

- WB White Black
- BW Black White
- LD Light Blue Dark Blue
- DL Dark Blue Light Blue

Items can only stem from the product or activity dimension. In order to define from which dimension they are taken, the user can set either:

<isActivity>NO</isActivity>

Which means that the table loops over the products, and the items refer to the activity dimension. A typically example is a table with market balance elements: items such as “FEDM” are found in the columns of the CAPRI tables where also the activities are stored. Consequently, the table will loop over the products, and not over the activities. Alternatively:

<isActivity>YES</isActivity>

allows only items from the product dimension, and lets the table loop over the activities. A typical example provides a table showing activity levels, yield or economic indicators for the production activities.

Additional tags

<defpivot>

Defines the default pivot used for the table. The pivot string consists of characters. The first character position is for the table row blocks, the second for the table rows, the third for the column blocks and the last for the columns. The logical dimensions are labelled with the following characters:

R	regions
P	products
I	Items
S	Scenario
D	Dim5
A	Activity

The definition <defpivot>0R0S</defpivot> thus means: regions are in the rows, scenarios in the columns. The definition <defpivot>PISR</defpivot> puts the products in the row blocks, the items in the rows, the scenarios in the column blocks and the regions in the columns.

<defview>

Defines the default view used for the tables, the list of default views is equal to what the user can select in the drop-down box:

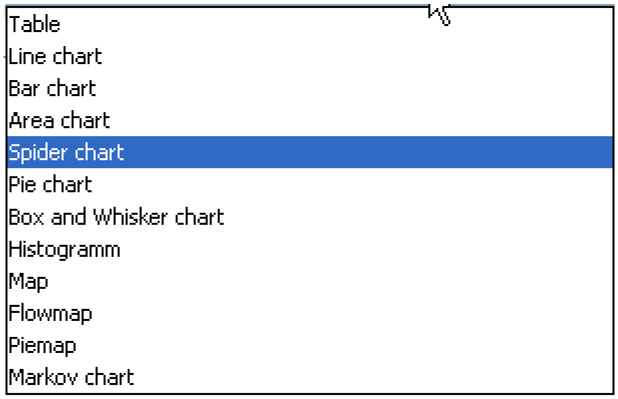


Table
Line chart
Bar chart
Area chart
Spider chart
Pie chart
Box and Whisker chart
Histogramm
Map
Flowmap
Piemap
Markov chart

<COO>

This tag defines the geometry to use for maps. Currently, the following geometry files are available:

NUTSII.zip	NUTS 2 geometry for countries covered by the supply module
MS.zip	NUTS 0 geometry for the countries covered by the supply module
RMS.zip	Global geometry for the regions with behavioural functions in the market model
RM.zip	Global geometry for the trade blocks in the market model
HSMU.zip	1x1 km pixel clusters for EU 27 without Malta and Cyprus

There are also 1x1 km pixel clusters for individual Member States, but these are internally passed to the viewer when only one country is shown.

Alternative texts for the dimensions

Normally, the names for the dimensions are passed in the view by Java. However, their name can be changed by:

<regionText>….</regionText>

<activityText>…<activityText>

<regionText>…<regionText>

<productText>…<productText>

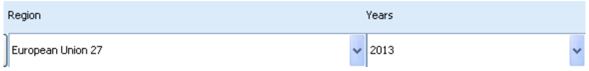
<scenText>…<scenText>

<dim5Text>…<dim5Text>

<yearText>…<yearText>

That text is shown:

- As description above the outer drop-down selection boxes:



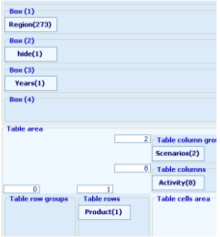
Region

European Union 27

Years

2013

- In the pivot dialogue:



- And in gaphics / map titles and the like.

Filters for the elements in the different dimensions

Without filters, all elements found on a logical dimension will be shown to the user in any table. The exemptions are the items either defined for the product or the activity dimension, see above. In order to restrict the selection in the other logical dimensions, a selection list can be defined in the table definition. Take as an example the following XML tag:

<regionSel>MS<regionSel>

It means that the table will only show elements with the tag <region> (see below) which comprise MS in their <sel> field. The example would refer to the Member States. There is a specific selection list:

<regionSel>FromDataCube<regionSel>

Which will neglect the elements under <region> as defined in the file, but rather takes any one found in the data cube. The option was introduced to avoid the necessity to define all 180.000 HSMU codes in the file.

Attaching long texts and filters to elements

Items for activities, products, regions and dim5 are typically defined in the file, see the following example:

```
  <region>
    <key>SK020038</key>
    <itemName>SK020 - FT41 / GT100 - Specialist dairying (FT 41)</itemName>
    <sel>[all, RS, SK, FA, SKFA, FT41, GT100, FT41GT100]</sel>
  </region>
```

The definitions for one item are enclosed in the tag (<region>…</region>, <activity>…</activity>, <product>….</product>, <dim5>…</dim5>).

The order of the items in the tables is defined by these lists.

Each item has a key, which corresponds to the symbol identifier found in the GDX file. The keys are case sensitive. The itemName is a long text which is typically shown to the user. The elements found between the <sel> …</sel> tags can be used as filters in table definitions, or interactively by the user.

A specific tag is <aggreg>yes</aggreg>. When found for an item in the rows, it will be shown twice in the table: once in the top part, and then again.

Index

CAPRI installation 11

Changing fonts 55

Column and row selection 51

Comparison output 56

Cut off limit to determine empty cells 55

drag 92

drawing several maps 128

file export 91

Flow maps 76

full extent 92

Gams settings 11

Graphics

- Bar charts 68
- Box and whisker charts 73
- Clipboard export 68
- Export to file 68
- Histograms 74
- Line and point charts 70
- Markov charts 75
- Pie charts 71
- Spider plots 72

Hiding empty columns or rows 55

Histogram 56

info pointer 93

legend

- continuous linear scaling 89
- continuous logarithmic scaling bar 90

Loggin in 10

map with percentage changes 125

Maps

- Classification
  - Area weighted classification 82
  - Classification method 82
  - Color table 85
  - Equal interval 83
  - Excluding zeros from classification 82
  - Manual classification 84
  - Mean standard dev 84
  - Natural breaks 83
  - Nested mean 84
  - Quantile 83
- clipboard export 91
- Frequency diagram in map 85
- Getting data for specific polygons 93
- Highlighting specific regions in the map 94
- Histogram window 80
- Info pointer and window 93
- Regional labels in map 98
- Rivers and cities 99

- Shrinking polygons according to UAA share 81
- Store settings 100
- Updating the map 98

Number format and rounding 55

numeric filter 96

Online help 19

Pie chart maps 78

Pivoting 53

SVN settings 12

Tables
- Drill down 58
- Filtering 59
- Outlier detection 63
- Sorting 59
- Statistics 60

title of the map 92

View
- scenario result 114

View data
- Base year 113
- baseline 114

View Selection 50

View type selection 53

zoom in 92

zoom out 92