Running GLOBIOM scenarios with Excel

IDEA:

- Next step towards using GLOBIOM
- Only very basic GAMS knowledge required
- Not yet in the GGIG, but if demanded could be implemented

What is it:

- **Easy** way to run simple scenarios with GLOBIOM by changing values in an excel table
- For now: changing **population**, **diet preferences** and **yield** shifters

What is it good for:

- Get a feeling for GLOBIOM reactions
- Analyze side effects of simple scenarios

1) **Quick introduction to the tool**
2) **Analyze together a pre-prepared scenario with the GGIG**

gamside: D:\IIASA\Bogota\GLOBIOM_GIT\GLOBIOM_FABLE\Model\GIT_version.gpr - [D:\IIASA\Bogota\GLOBIOM_GIT\GLOBIOM_FABLE\Model\6_scenarios.gms]

File Edit Search Windows Utilities Model Libraries Help

exc | -r t\a4_myrun

0_executebatch.gms | 0_executebatch.gst | 6_scenarios.gms | calc_einc_proj.gms | define_base.gms | define_scenario.gms | excel_training1.gms | excel_training2.gms | a4_myrun.gdx

```
***
* ================================
*     Scenario set-up file
* ================================
*
* This script is the main file to launch scenarios. This file:
*   - Defines the scenarios.
*   - Sets up the initial values for food, wood and bioenergy demand projections => ``define_base.gms``, ``calc_einc_p
*   - Sets up the assumptions on technological progress => ``define_scenario.gms``.
*   - Eventually expands the model described in ``4_model.gms`` with new equations => ``model_scen.gms``.
*   - Sets up the initial values for land cover  => ``recursive_luc.gms``.
*   - Sets up the initial values for trade => ``recursive_trade.gms``.
*   - Solves the model for each year and each scenario: ``LOOP( ...., SOLVE ...)``.
*   - Defines parameters to save after each scenario is run => ``rep_declare.gms``, ``rep_compare.gms``.
***

* Include settings from GUI if run from GUI, else use the settings below
$ifThen set scen
$  include "%scen%"
$else
$  set scenario_1 SSP2
$  set scenario_2 0_Ref
$  set scenario_3 scenBase
$  set scenario_end_year 2050
$endIf

*** OPTIONAL: FOR CHANGING SHIFTERS VIA EXCEL TABLE
$setglobal excel_training_tool no
$  set CHANGE_REGION ArgentinaReg
***

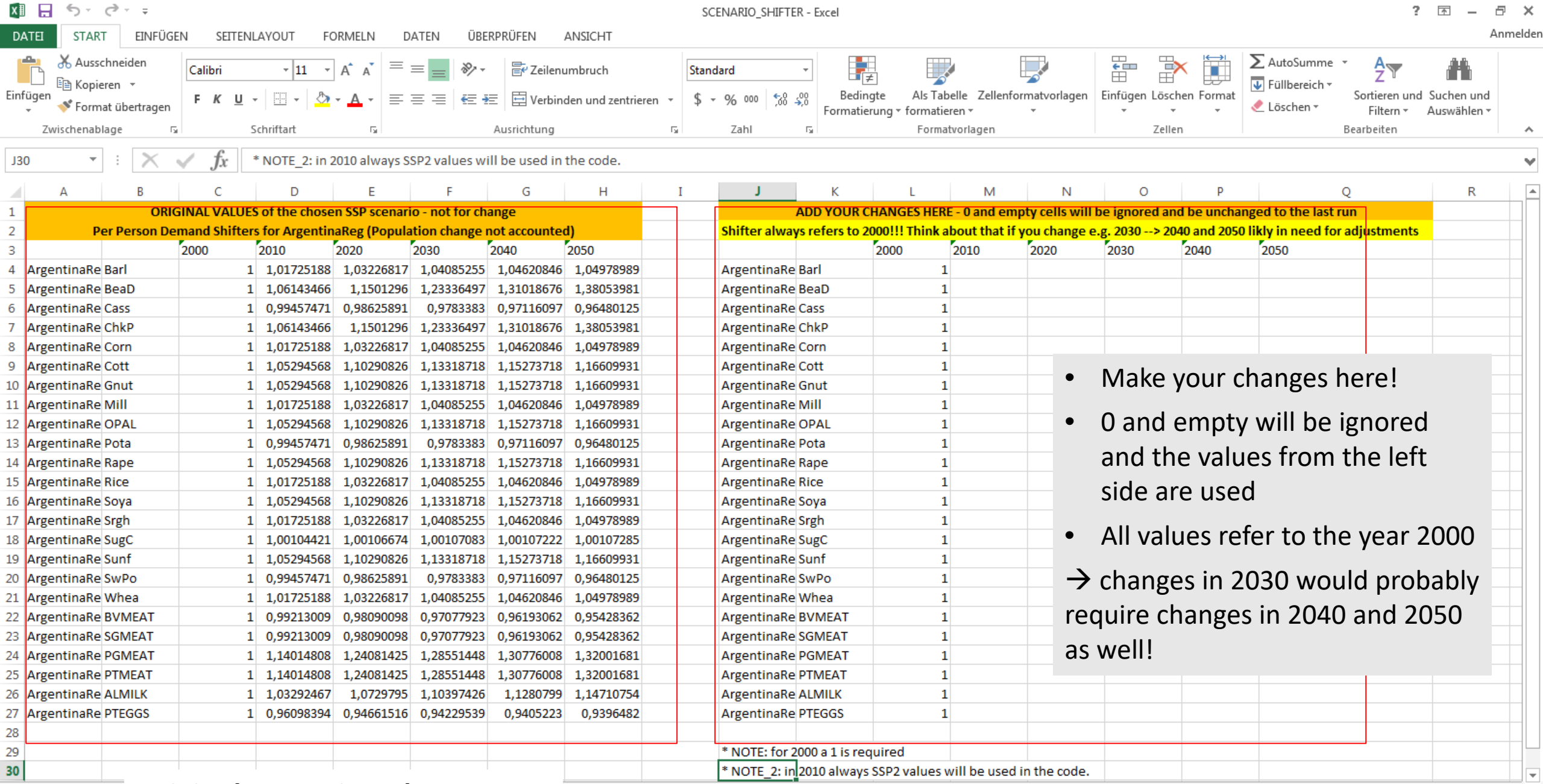
* Time counter
PARAMETER t_run(*) time-stamp for simulation; t_run("start") = jnow;

* Scenario counter - This parameter                                    number to run a specific
$if not set nsim $set nsim no
$set nsim %nsim%
```

yes

Chose your country

→ RUN GLOBIOM !!!



		2000	2010	2020	2030	2040	2050
ArgentinaRe	Barl	1	1,01725188	1,03226817	1,04085255	1,04620846	1,04978989
ArgentinaRe	BeaD	1	1,06143466	1,1501296	1,23336497	1,31018676	1,38053981
ArgentinaRe	Cass	1	0,99457471	0,98625891	0,9783383	0,97116097	0,96480125
ArgentinaRe	ChkP	1	1,06143466	1,1501296	1,23336497	1,31018676	1,38053981
ArgentinaRe	Corn	1	1,01725188	1,03226817	1,04085255	1,04620846	1,04978989
ArgentinaRe	Cott	1	1,05294568	1,10290826	1,13318718	1,15273718	1,16609931
ArgentinaRe	Gnut	1	1,05294568	1,10290826	1,13318718	1,15273718	1,16609931
ArgentinaRe	Mill	1	1,01725188	1,03226817	1,04085255	1,04620846	1,04978989
ArgentinaRe	OPAL	1	1,05294568	1,10290826	1,13318718	1,15273718	1,16609931
ArgentinaRe	Pota	1	0,99457471	0,98625891	0,9783383	0,97116097	0,96480125
ArgentinaRe	Rape	1	1,05294568	1,10290826	1,13318718	1,15273718	1,16609931
ArgentinaRe	Rice	1	1,01725188	1,03226817	1,04085255	1,04620846	1,04978989
ArgentinaRe	Soya	1	1,05294568	1,10290826	1,13318718	1,15273718	1,16609931
ArgentinaRe	Srgh	1	1,01725188	1,03226817	1,04085255	1,04620846	1,04978989
ArgentinaRe	SugC	1	1,00104421	1,00106674	1,00107083	1,00107222	1,00107285
ArgentinaRe	Sunf	1	1,05294568	1,10290826	1,13318718	1,15273718	1,16609931
ArgentinaRe	SwPo	1	0,99457471	0,98625891	0,9783383	0,97116097	0,96480125
ArgentinaRe	Whea	1	1,01725188	1,03226817	1,04085255	1,04620846	1,04978989
ArgentinaRe	BVMEAT	1	0,99213009	0,98090098	0,97077923	0,96193062	0,95428362
ArgentinaRe	SGMEAT	1	0,99213009	0,98090098	0,97077923	0,96193062	0,95428362
ArgentinaRe	PGMEAT	1	1,14014808	1,24081425	1,28551448	1,30776008	1,32001681
ArgentinaRe	PTMEAT	1	1,14014808	1,24081425	1,28551448	1,30776008	1,32001681
ArgentinaRe	ALMILK	1	1,03292467	1,0729795	1,10397426	1,1280799	1,14710754
ArgentinaRe	PTEGGS	1	0,96098394	0,94661516	0,94229539	0,9405223	0,9396482

		2000	2010	2020	2030	2040	2050
ArgentinaRe	Barl	1					
ArgentinaRe	BeaD	1					
ArgentinaRe	Cass	1					
ArgentinaRe	ChkP	1					
ArgentinaRe	Corn	1					
ArgentinaRe	Cott	1					
ArgentinaRe	Gnut	1					
ArgentinaRe	Mill	1					
ArgentinaRe	OPAL	1					
ArgentinaRe	Pota	1					
ArgentinaRe	Rape	1					
ArgentinaRe	Rice	1					
ArgentinaRe	Soya	1					
ArgentinaRe	Srgh	1					
ArgentinaRe	SugC	1					
ArgentinaRe	Sunf	1					
ArgentinaRe	SwPo	1					
ArgentinaRe	Whea	1					
ArgentinaRe	BVMEAT	1					
ArgentinaRe	SGMEAT	1					
ArgentinaRe	PGMEAT	1					
ArgentinaRe	PTMEAT	1					
ArgentinaRe	ALMILK	1					
ArgentinaRe	PTEGGS	1					

Original Scenario Values – not for change!

STEP BY STEP INSTRUCTION

1) In the 6_scenario:
    excel_training_tool → yes
    Chose your Region ('CHANGE_REGION')
2) Run GLOBIOM normally (Chose scenario)
3) Open excel Table 'Scenario_Shifter.xlsx'
4) Check the currently applied shifters (on the left)
5) Change shifters (on the right side)
    Options:
    Populations
    Demand shifters
    Yield shifters
6) **Save the Excel table!!!**
7) Re-run GLOBIOM (change the output name)
8) Compare the two runs

Example:

Analyzing a 50% demand decrease for beef in the US by 2050

gamside: D:\IIASA\Bogota\GLOBIOM_GIT\GLOBIOM_FABLE\Model\GIT_version.gpr - [D:\IIASA\Bogota\GLOBIOM_GIT\GLOBIOM_FABLE\Model\6_scenarios.gms]

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ddata | -r t\a4_myrun

6_scenarios.gms | diffile.gdx | a6_FABLE.gdx | LowDemand_USA.gdx

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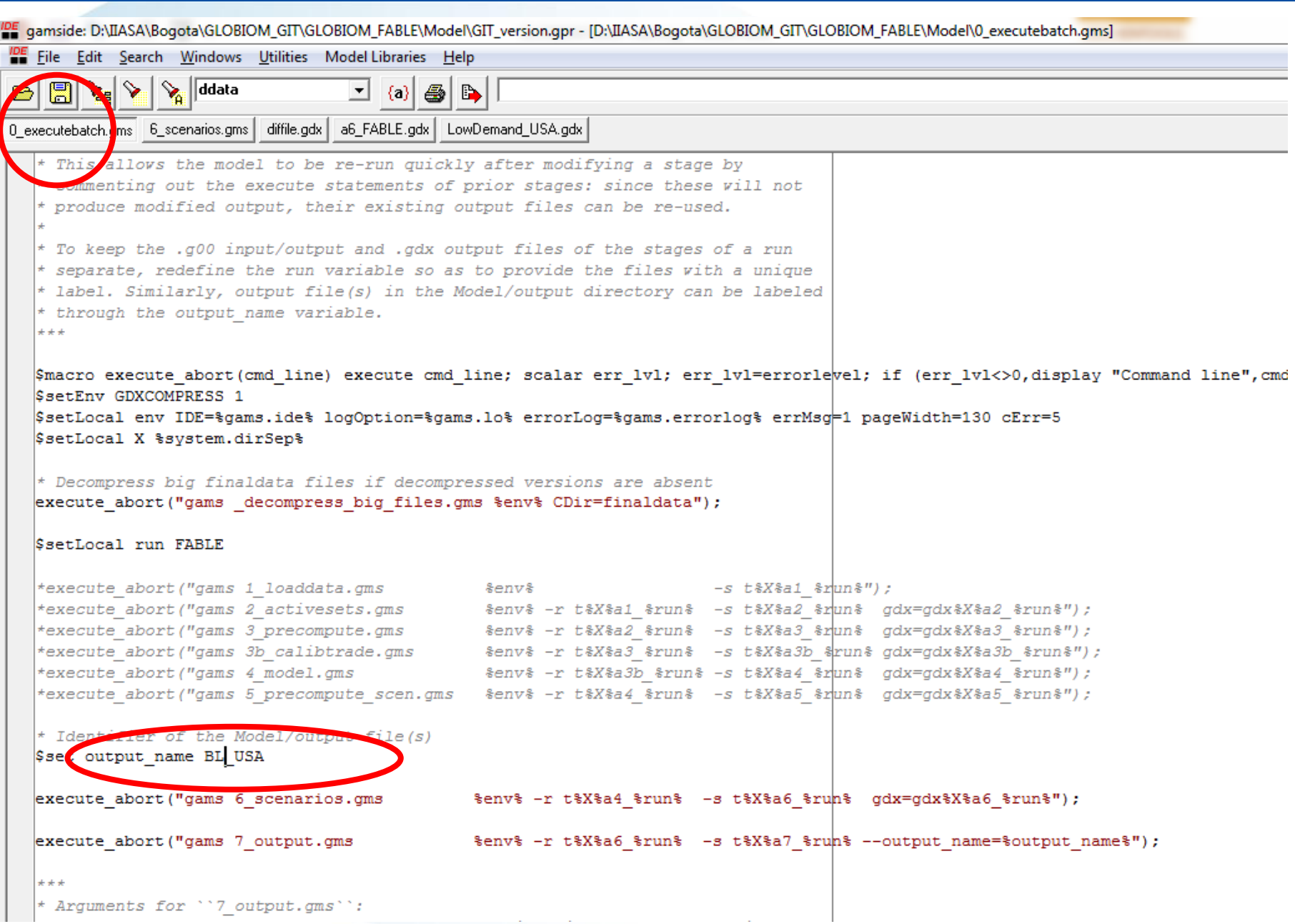
$  set scenario_3 scenBase
$  set scenario_end_year 2050
$endIf

*** OPTIONAL: FOR CHANGING SHIFTERS VIA EXCEL TABLE
$setglobal excel_training_tool yes
$  set CHANGE_REGION USAReg
***
```


gamside: D:\IIASA\Bogota\GLOBIOM_GIT\GLOBIOM_FABLE\Model\GIT_version.gpr - [D:\IIASA\Bogota\GLOBIOM_GIT\GLOBIOM_FABLE\Model\0_executebatch.gms]
File Edit Search Windows Utilities Model Libraries Help
ddata
0_executebatch.gms
6_scenarios.gms
diffile.gdx
a6_FABLE.gdx
LowDemand_USA.gdx
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* commenting out the execute statements of prior stages: since these will not
* produce modified output, their existing output files can be re-used.
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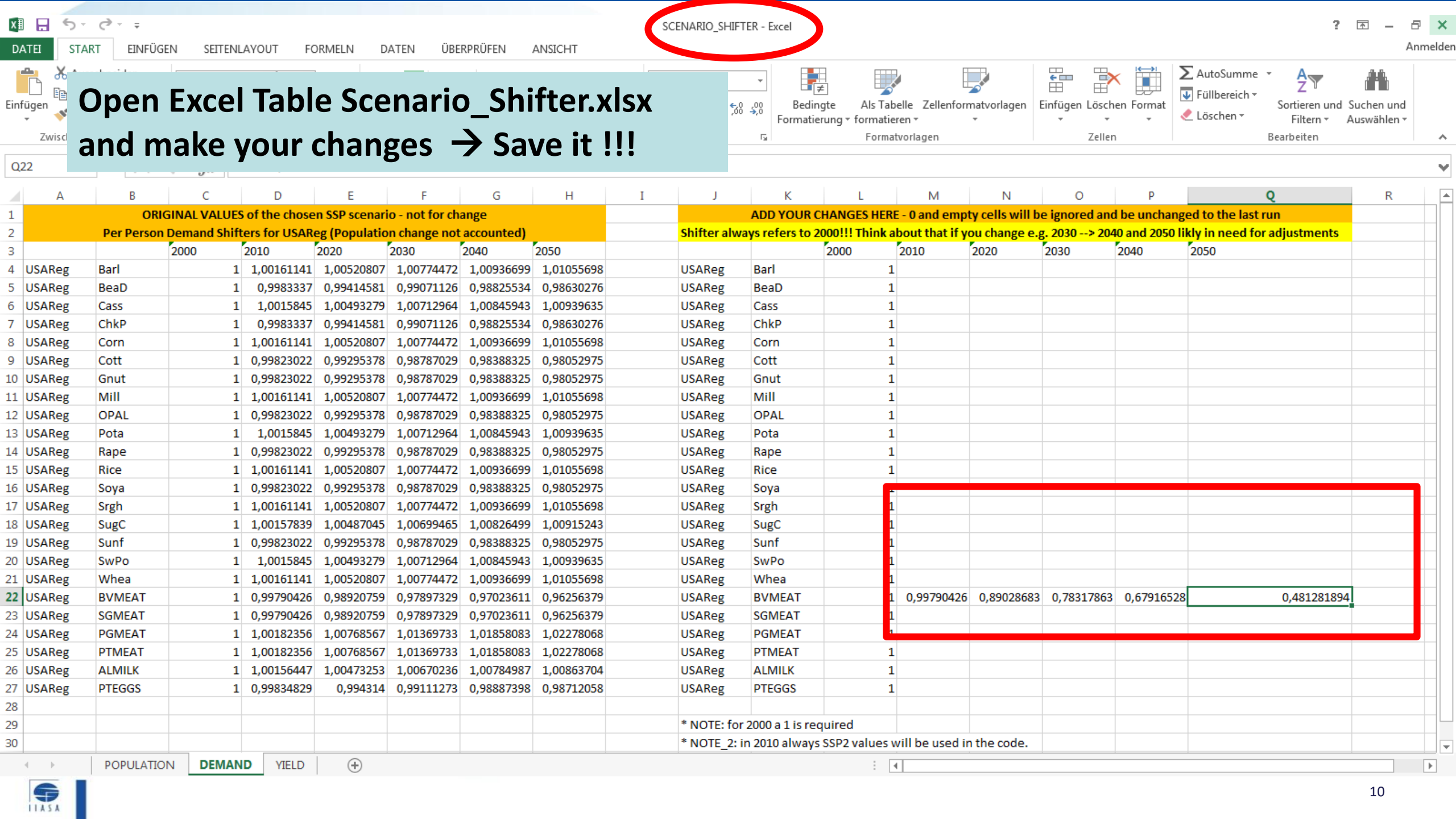
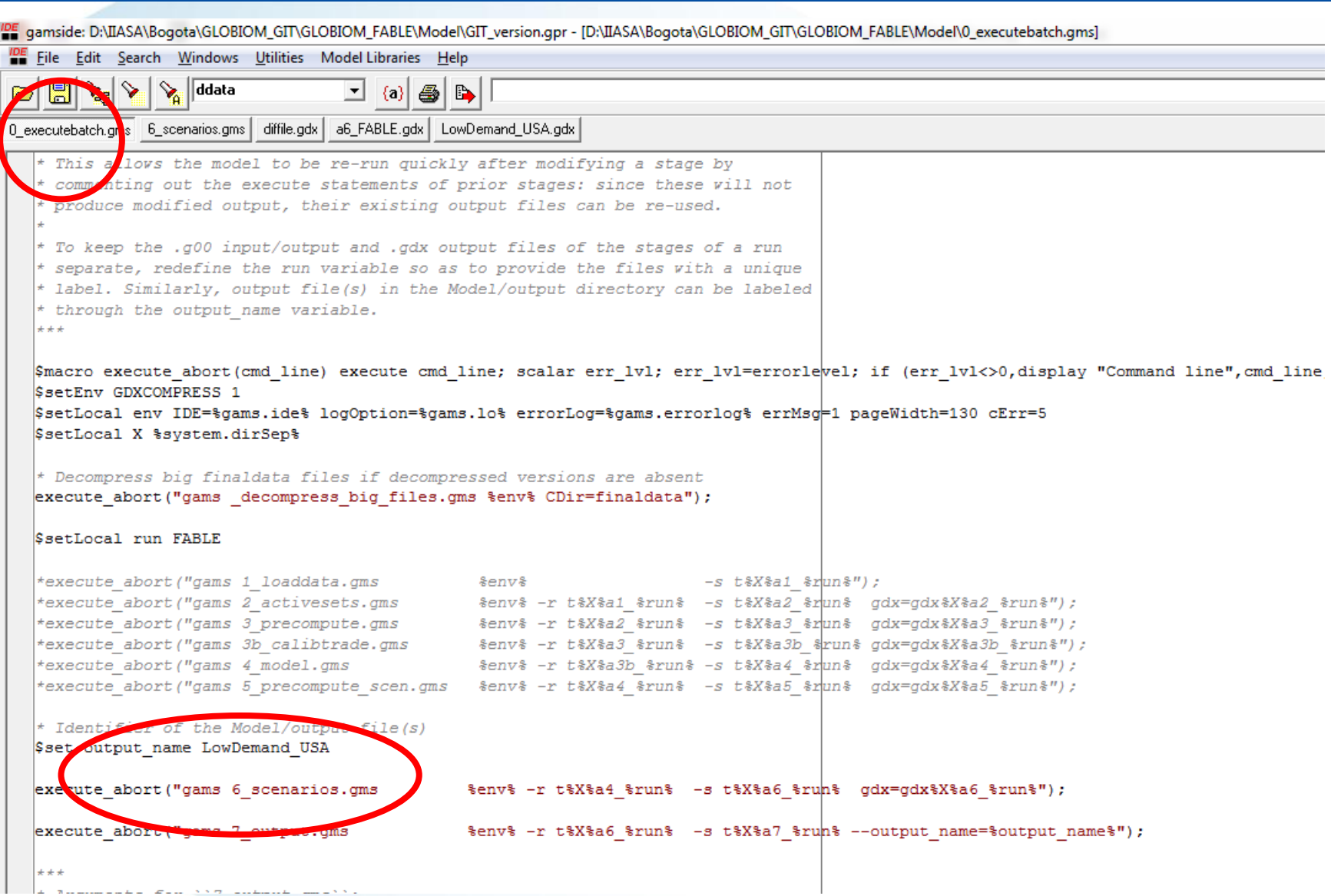
* To keep the .g00 input/output and .gdx output files of the stages of a run
* separate, redefine the run variable so as to provide the files with a unique
* label. Similarly, output file(s) in the Model/output directory can be labeled
* through the output_name variable.
***
$macro execute_abort(cmd_line) execute cmd_line; scalar err_lvl; err_lvl=errorlevel; if (err_lvl<>0,display "Command line",cmd
$setEnv GDXCOMPRESS 1
$setLocal env IDE=%gams.ide% logOption=%gams.lo% errorLog=%gams.errorlog% errMsg=1 pageWidth=130 cErr=5
$setLocal X %system.dirSep%
* Decompress big finaldata files if decompressed versions are absent
execute_abort("gams _decompress_big_files.gms %env% CDir=finaldata");
$setLocal run FABLE
*execute_abort("gams 1_loaddata.gms %env% -s t%X%a1_%run%");
*execute_abort("gams 2_activesets.gms %env% -r t%X%a1_%run% -s t%X%a2_%run% gdx=gdx%X%a2_%run%");
*execute_abort("gams 3_precompute.gms %env% -r t%X%a2_%run% -s t%X%a3_%run% gdx=gdx%X%a3_%run%");
*execute_abort("gams 3b_calibtrade.gms %env% -r t%X%a3_%run% -s t%X%a3b_%run% gdx=gdx%X%a3b_%run%");
*execute_abort("gams 4_model.gms %env% -r t%X%a3b_%run% -s t%X%a4_%run% gdx=gdx%X%a4_%run%");
*execute_abort("gams 5_precompute_scen.gms %env% -r t%X%a4_%run% -s t%X%a5_%run% gdx=gdx%X%a5_%run%");
* Identifier of the Model/output file(s)
$set output_name BL_USA
execute_abort("gams 6_scenarios.gms %env% -r t%X%a4_%run% -s t%X%a6_%run% gdx=gdx%X%a6_%run%");
execute_abort("gams 7_output.gms %env% -r t%X%a6_%run% -s t%X%a7_%run% --output_name=%output_name%");
***
* Arguments for ``7_output.gms``:



Open Excel Table Scenario_Shifter.xlsx and make your changes → Save it !!!

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	ORIGINAL VALUES of the chosen SSP scenario - not for change									ADD YOUR CHANGES HERE - 0 and empty cells will be ignored and be unchanged to the last run								
2	Per Person Demand Shifters for USAReg (Population change not accounted)									Shifter always refers to 2000!!! Think about that if you change e.g. 2030 --> 2040 and 2050 likly in need for adjustments								
3			2000	2010	2020	2030	2040	2050				2000	2010	2020	2030	2040	2050	
4	USAReg	Barl	1	1,00161141	1,00520807	1,00774472	1,00936699	1,01055698		USAReg	Barl	1						
5	USAReg	BeaD	1	0,9983337	0,99414581	0,99071126	0,98825534	0,98630276		USAReg	BeaD	1						
6	USAReg	Cass	1	1,0015845	1,00493279	1,00712964	1,00845943	1,00939635		USAReg	Cass	1						
7	USAReg	ChkP	1	0,9983337	0,99414581	0,99071126	0,98825534	0,98630276		USAReg	ChkP	1						
8	USAReg	Corn	1	1,00161141	1,00520807	1,00774472	1,00936699	1,01055698		USAReg	Corn	1						
9	USAReg	Cott	1	0,99823022	0,99295378	0,98787029	0,98388325	0,98052975		USAReg	Cott	1						
10	USAReg	Gnut	1	0,99823022	0,99295378	0,98787029	0,98388325	0,98052975		USAReg	Gnut	1						
11	USAReg	Mill	1	1,00161141	1,00520807	1,00774472	1,00936699	1,01055698		USAReg	Mill	1						
12	USAReg	OPAL	1	0,99823022	0,99295378	0,98787029	0,98388325	0,98052975		USAReg	OPAL	1						
13	USAReg	Pota	1	1,0015845	1,00493279	1,00712964	1,00845943	1,00939635		USAReg	Pota	1						
14	USAReg	Rape	1	0,99823022	0,99295378	0,98787029	0,98388325	0,98052975		USAReg	Rape	1						
15	USAReg	Rice	1	1,00161141	1,00520807	1,00774472	1,00936699	1,01055698		USAReg	Rice	1						
16	USAReg	Soya	1	0,99823022	0,99295378	0,98787029	0,98388325	0,98052975		USAReg	Soya	1						
17	USAReg	Srgh	1	1,00161141	1,00520807	1,00774472	1,00936699	1,01055698		USAReg	Srgh	1						
18	USAReg	SugC	1	1,00157839	1,00487045	1,00699465	1,00826499	1,00915243		USAReg	SugC	1						
19	USAReg	Sunf	1	0,99823022	0,99295378	0,98787029	0,98388325	0,98052975		USAReg	Sunf	1						
20	USAReg	SwPo	1	1,0015845	1,00493279	1,00712964	1,00845943	1,00939635		USAReg	SwPo	1						
21	USAReg	Whea	1	1,00161141	1,00520807	1,00774472	1,00936699	1,01055698		USAReg	Whea	1						
22	USAReg	BVMEAT	1	0,99790426	0,98920759	0,97897329	0,97023611	0,96256379		USAReg	BVMEAT	1	0,99790426	0,89028683	0,78317863	0,67916528	0,481281894	
23	USAReg	SGMEAT	1	0,99790426	0,98920759	0,97897329	0,97023611	0,96256379		USAReg	SGMEAT	1						
24	USAReg	PGMEAT	1	1,00182356	1,00768567	1,01369733	1,01858083	1,02278068		USAReg	PGMEAT	1						
25	USAReg	PTMEAT	1	1,00182356	1,00768567	1,01369733	1,01858083	1,02278068		USAReg	PTMEAT	1						
26	USAReg	ALMILK	1	1,00156447	1,00473253	1,00670236	1,00784987	1,00863704		USAReg	ALMILK	1						
27	USAReg	PTEGGS	1	0,99834829	0,994314	0,99111273	0,98887398	0,98712058		USAReg	PTEGGS	1						
28																		
29										* NOTE: for 2000 a 1 is required								
30										* NOTE_2: in 2010 always SSP2 values will be used in the code.								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$macro execute_abort(cmd_line) execute cmd_line; scalar err_lvl; err_lvl=errorlevel; if (err_lvl<>0,display "Command line",cmd_line
$setEnv GDXCOMPRESS 1
$setLocal env IDE=%gams.ide% logOption=%gams.lo% errorLog=%gams.errorlog% errMsg=1 pageWidth=130 cErr=5
$setLocal X %system.dirSep%
* Decompress big finaldata files if decompressed versions are absent
execute_abort("gams _decompress_big_files.gms %env% CDir=finaldata");
$setLocal run FABLE
*execute_abort("gams 1_loaddata.gms %env% -s t%X%a1_%run%");
*execute_abort("gams 2_activesets.gms %env% -r t%X%a1_%run% -s t%X%a2_%run% gdx=gdx%X%a2_%run%");
*execute_abort("gams 3_precompute.gms %env% -r t%X%a2_%run% -s t%X%a3_%run% gdx=gdx%X%a3_%run%");
*execute_abort("gams 3b_calibtrade.gms %env% -r t%X%a3_%run% -s t%X%a3b_%run% gdx=gdx%X%a3b_%run%");
*execute_abort("gams 4_model.gms %env% -r t%X%a3b_%run% -s t%X%a4_%run% gdx=gdx%X%a4_%run%");
*execute_abort("gams 5_precompute_scen.gms %env% -r t%X%a4_%run% -s t%X%a5_%run% gdx=gdx%X%a5_%run%");
* Identifier of the Model/output file(s)
$set output_name LowDemand_USA
execute_abort("gams 6_scenarios.gms %env% -r t%X%a4_%run% -s t%X%a6_%run% gdx=gdx%X%a6_%run%");
execute_abort("gams 7_output.gms %env% -r t%X%a6_%run% -s t%X%a7_%run% --output_name=%output_name%");
***

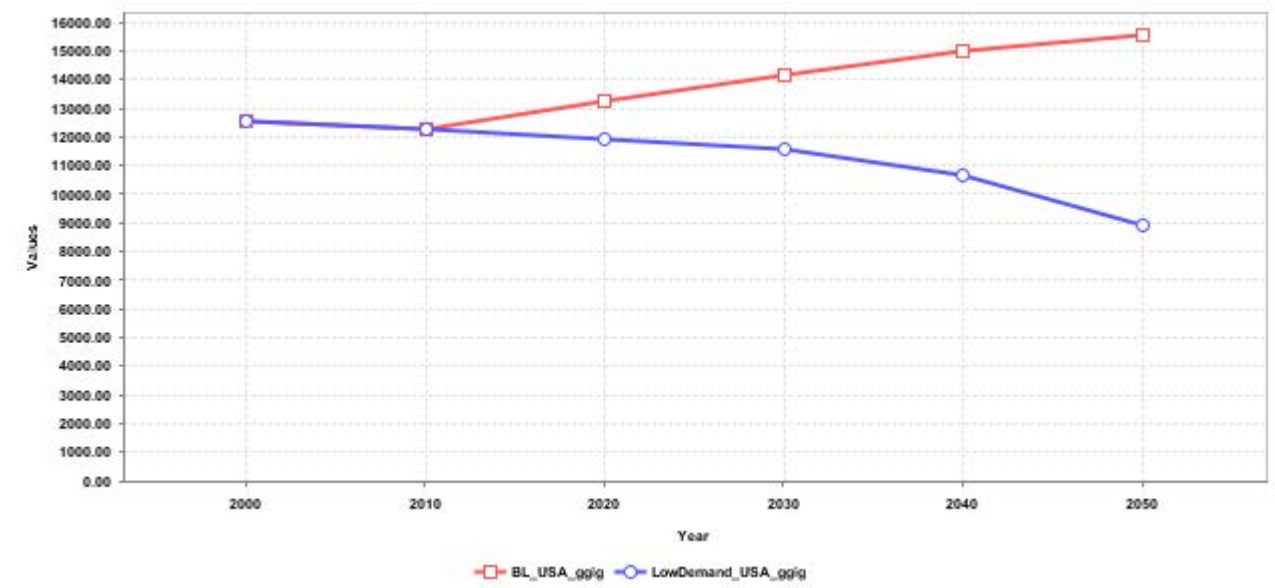
Compare the two new GDX files

→ e.g. with the GGIG

→ Will show examples now

Consumption changes bovine meat

Consumption bovine Meat in 1000 t



In pivot:

Table row = output gdx

Table column = year

In selection:

Region = USAReg

Unit = 1000 t

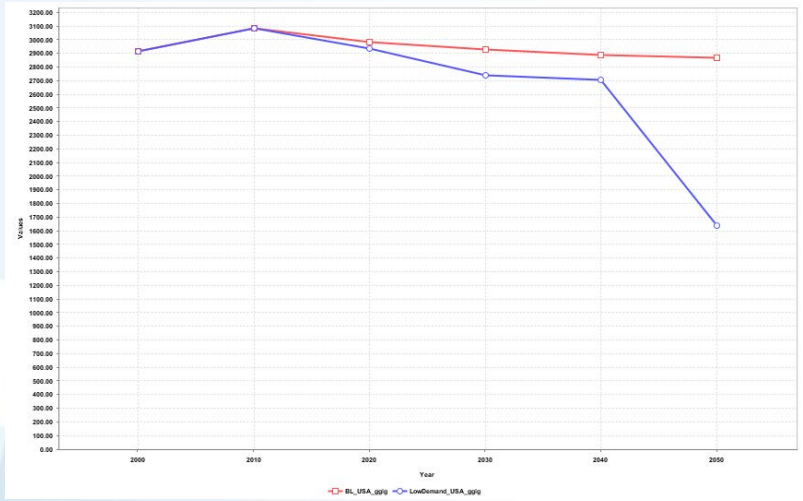
Indicator = Domestic Use

Item = Bovine meat

	2000	2010	2020	2030	2040	2050
BL_USA_ggig	12517.08	12261.73	13270.38	14175.56	14972.83	15576.83
		-2.04%	6.02%	13.25%	19.62%	24.44%
LowDemand_ USA_ggig	12517.08	12261.73	11943.34	11564.13	10632.88	8900.61
	0.00%	-2.04%	-4.58%	-7.61%	-15.05%	-28.89%

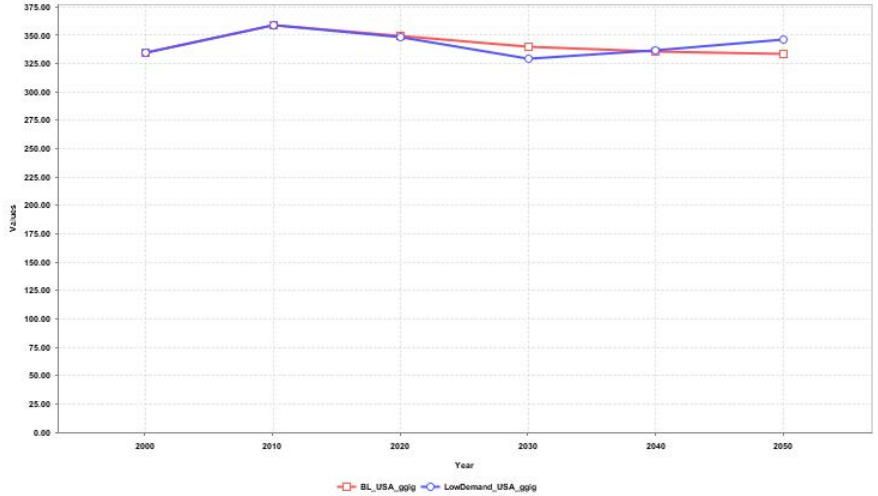
Price change bovine meat and milk

Prices bovine Meat in 2000 USD per ton



	2000	2010	2020	2030	2040	2050
BL_USA_ggig	2912.34	3082	2981.56	2929.2	2887.22	2867.17
		5.83%	2.38%	0.58%	-0.86%	-1.55%
LowDemand_USA_ggig	2912.34	3082	2933.97	2741.57	2705.01	1641.4
	0.00%	5.83%	0.74%	-5.86%	-7.12%	-43.64%

Prices milk in 2000 USD per ton



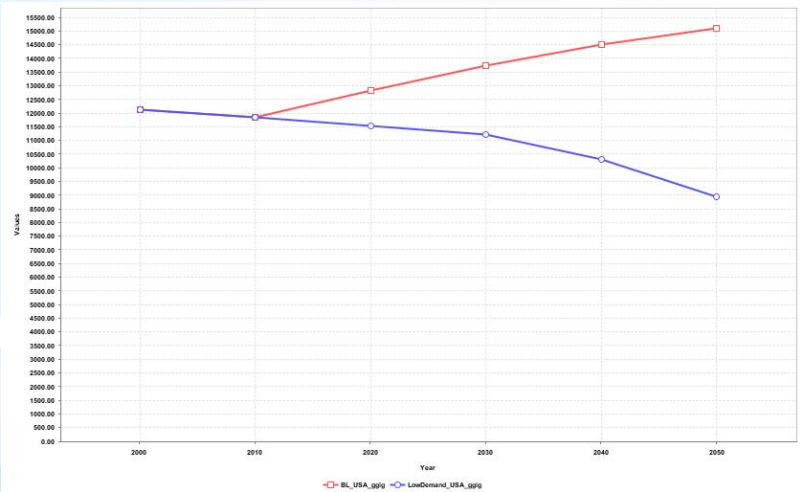
	2000	2010	2020	2030	2040	2050
BL_USA_ggig	334.69	359.31	348.81	340.09	335.31	333.8
		7.35%	4.22%	1.61%	0.18%	-0.27%
LowDemand_USA_ggig	334.69	359.31	348.33	329.58	336.19	346.06
	0.00%	7.35%	4.07%	-1.53%	0.45%	3.40%

In pivot: Table row = output gdx, Table column = year

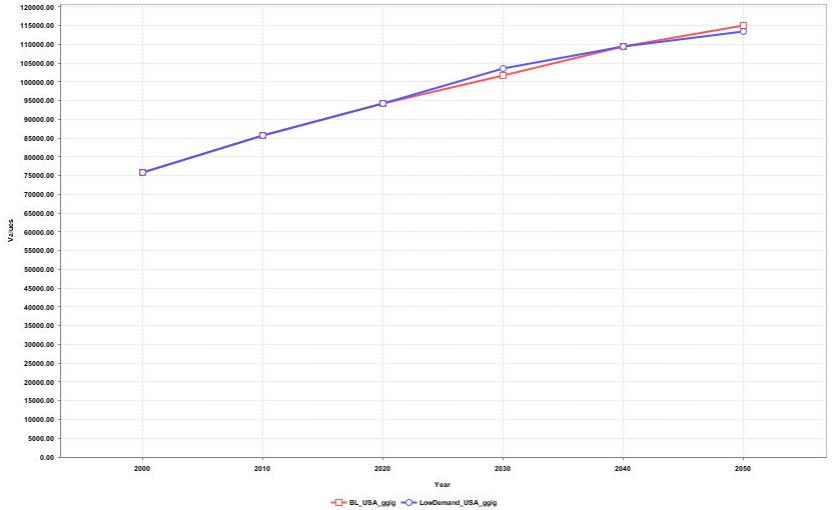
In selection: Region = USAReg, Unit = USD 2000 per ton, Indicator = Real producer price, Item = Bovine meat / milk – excluding butter

Production change bovine meat and milk

Production bovine meat in in 1000 t



Production milk in 1000 t



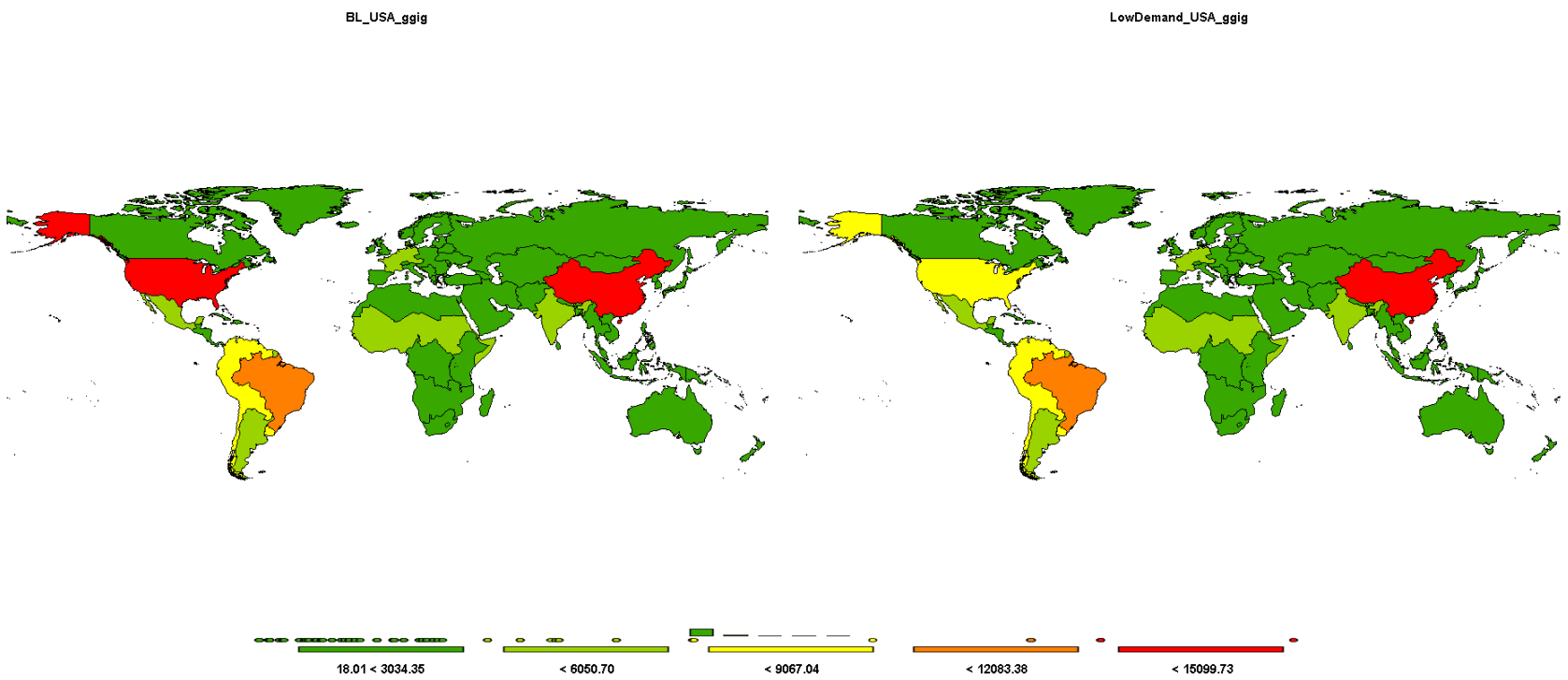
	2000	2010	2020	2030	2040	2050
BL_USA_ggig	12132.27	11858	12842.91	13730.64	14514.39	15099.73
		-2.26%	5.86%	13.17%	19.63%	24.46%
LowDemand_USA_ggig	12132.27	11858	11533.52	11202.85	10316.18	8957.79
	0.00%	-2.26%	-4.94%	-7.66%	-14.97%	-26.17%

	2000	2010	2020	2030	2040	2050
BL_USA_ggig	75714.37	85650.15	94154.2	101828.8	109468.1	115014.9
		13.12%	24.35%	34.49%	44.58%	51.91%
LowDemand_USA_ggig	75714.37	85650.15	94159.3	103535.4	109363.8	113459.5
	0.00%	13.12%	24.36%	36.74%	44.44%	49.85%

In pivot: Table row = output gdx, Table column = year

In selection: Region = USAReg, Unit = USD 2000 per ton, Indicator = Real producer price, Item = Bovine meat / milk – excluding butter

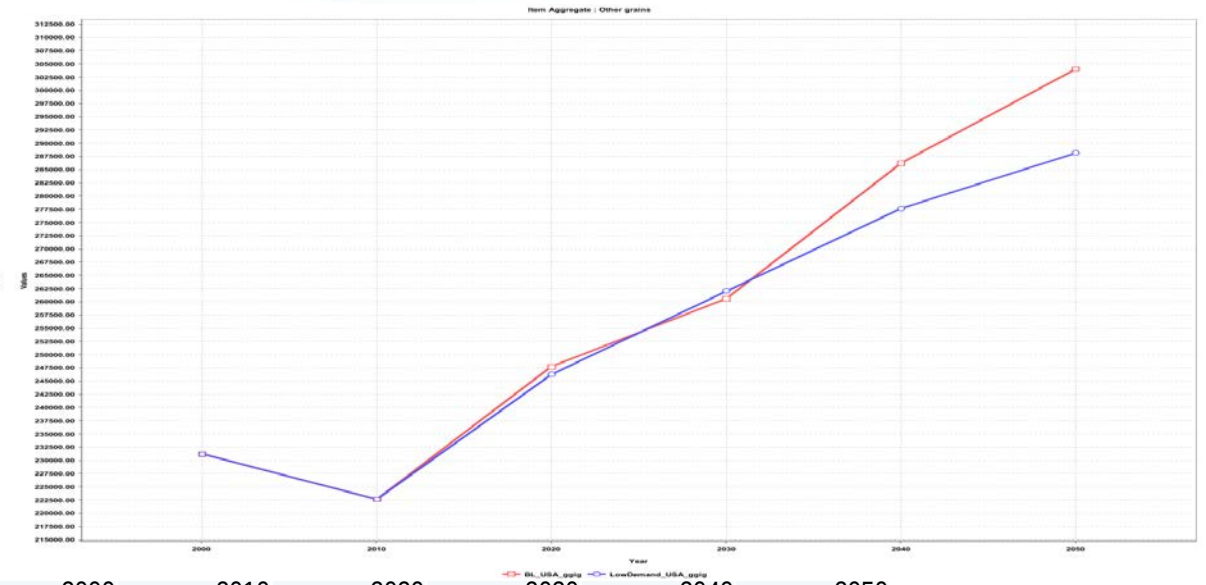
Bovine meat production



In selection: No aggregation GGIG

In pivot: Table row = Region, Table column = OuptutGDX
In selection: Item = Bovine meat, Indicator = production, Year = 2050, Unit = 1000 t
View type = map

Change in feed use of other grains, all cereals, oilseeds and crops



Crops

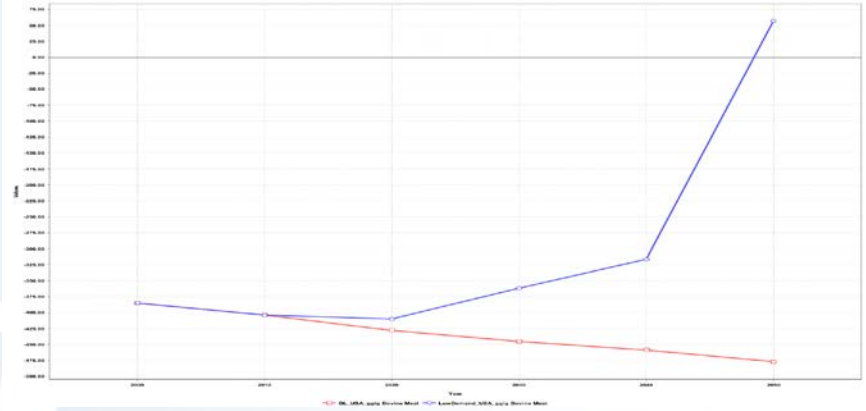
		2000	2010	2020	2030	2040	2050
Other grains	BL_USA_ggig	176919.9	180898.3	207865	227512	246986.3	260409.3
Other grains	LowDemand_USA_ggig	176919.9	180898.3	206873.8	228552.7	241170.6	249743.4
All cereals	BL_USA_ggig	185906.1	190181.4	217890.2	238340.8	258829.7	273012.3
All cereals	LowDemand_USA_ggig	185906.1	190181.4	216760.5	239378.6	252422.1	261224.5
Oilseeds	BL_USA_ggig	31649.83	17260.37	12888.88	3593.64	7219.21	9906.51
Oilseeds	LowDemand_USA_ggig	31649.83	17260.37	12585.87	3643.39	5026.49	5789.21
Crops	BL_USA_ggig	231166.2	222636.7	247690.2	260571.1	286182.6	304028.2
Crops	LowDemand_USA_ggig	231166.2	222636.7	246259.6	262037.7	277592.8	288159.9

In selection: Items aggregated GGIG

In pivot: Table row = output gdx, Table column = year
In selection: Region = USAReg, Unit = 1000 t, Indicator = Feed use, Item aggregate = Other rains / all cereals / oilseeds / crops

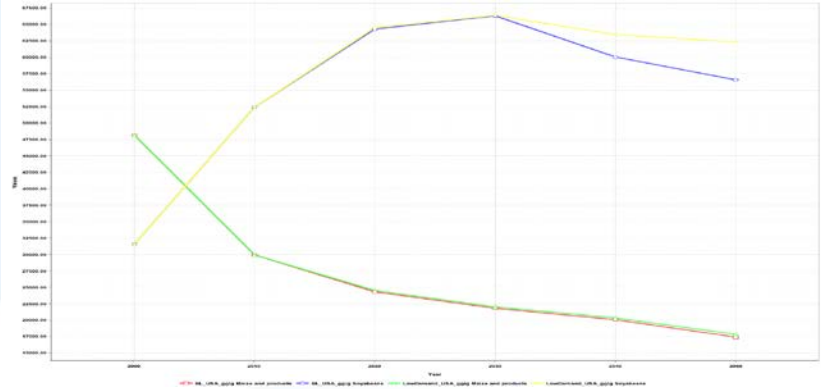
Change in net trade

Change in net trade bovine meat



Change in net trade of milk

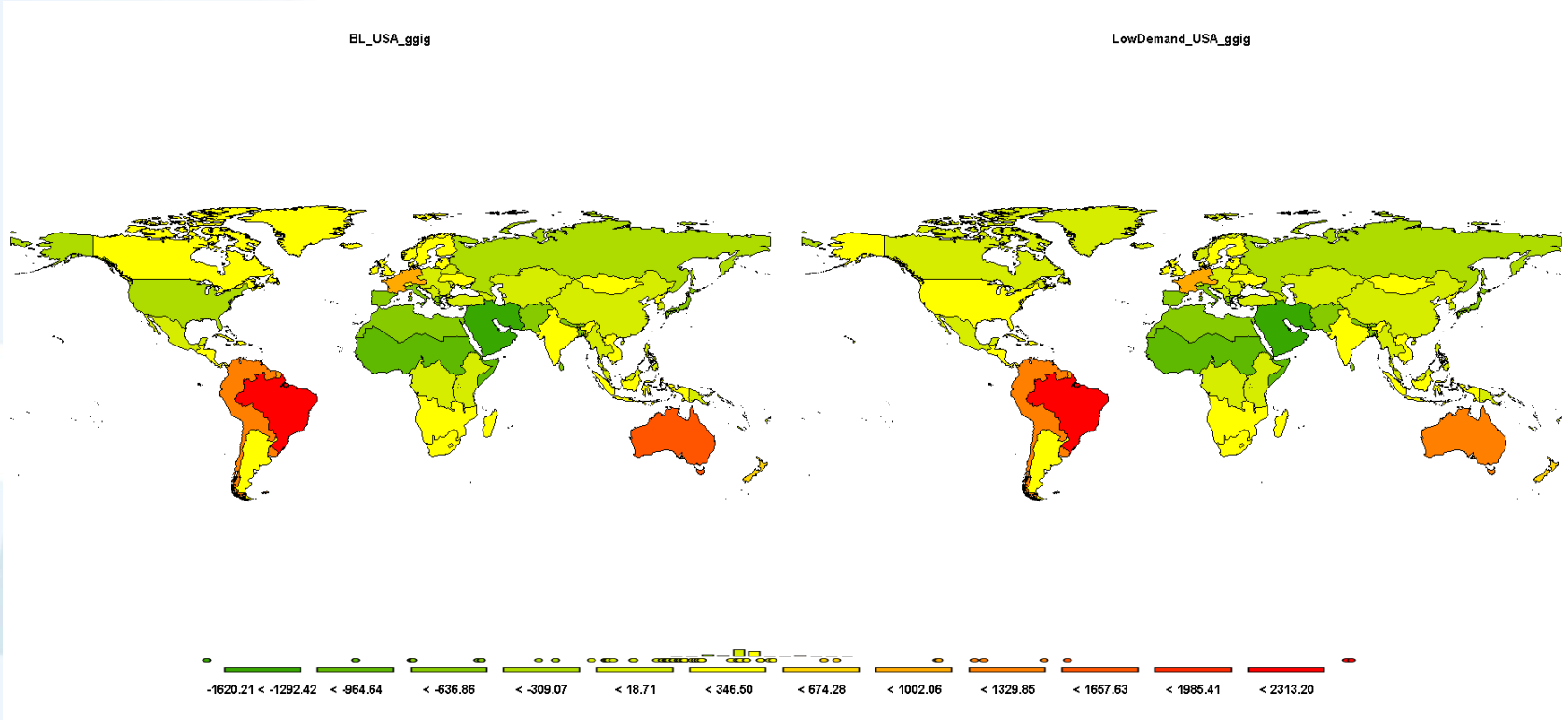
Change in net trade maize and soy beans



Change in net trade in 2050

	BL_USA_ggig	LowDemand_USA_ggig
Maize and products	17397.65	17852.07
	-63.86%	-62.91%
Soyabeans	56582.03	62362.85
	79.42%	97.75%
Bovine Meat	-477.11	57.19
	-23.99%	114.86%
Milk - Excluding Butter + (Total)	-3828.32	-4183.34
	-0.07%	-9.35%

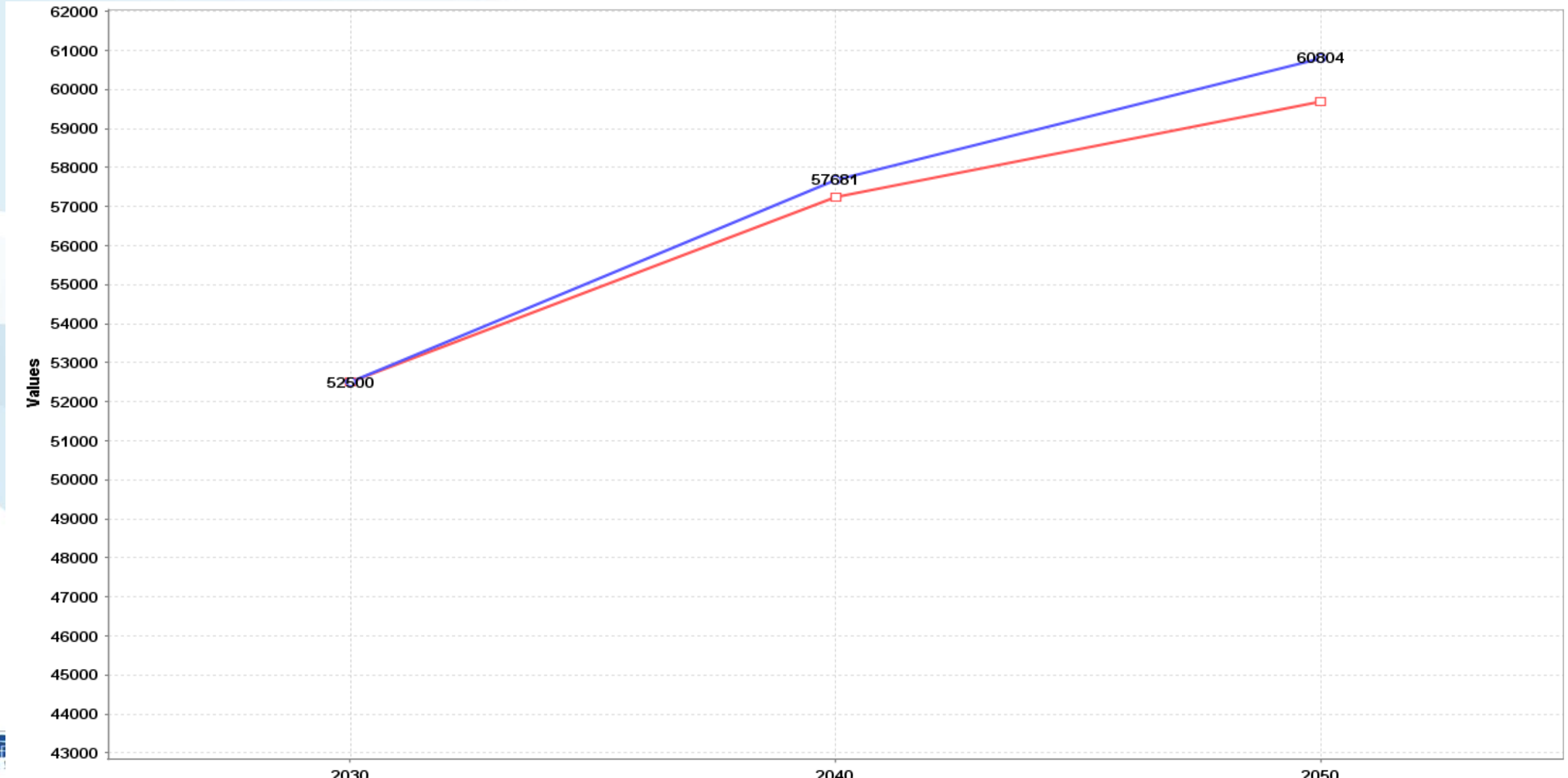
Bovine meat exports



In selection: No aggregation GGIG

In pivot: Table row = Region, Table column = OuptutGDX
In selection: Item = Bovine meat, Indicator = net trade, Year = 2050, Unit = 1000 t
View type = map

USA CEREALS EXPORTS



Ruminant meat exports