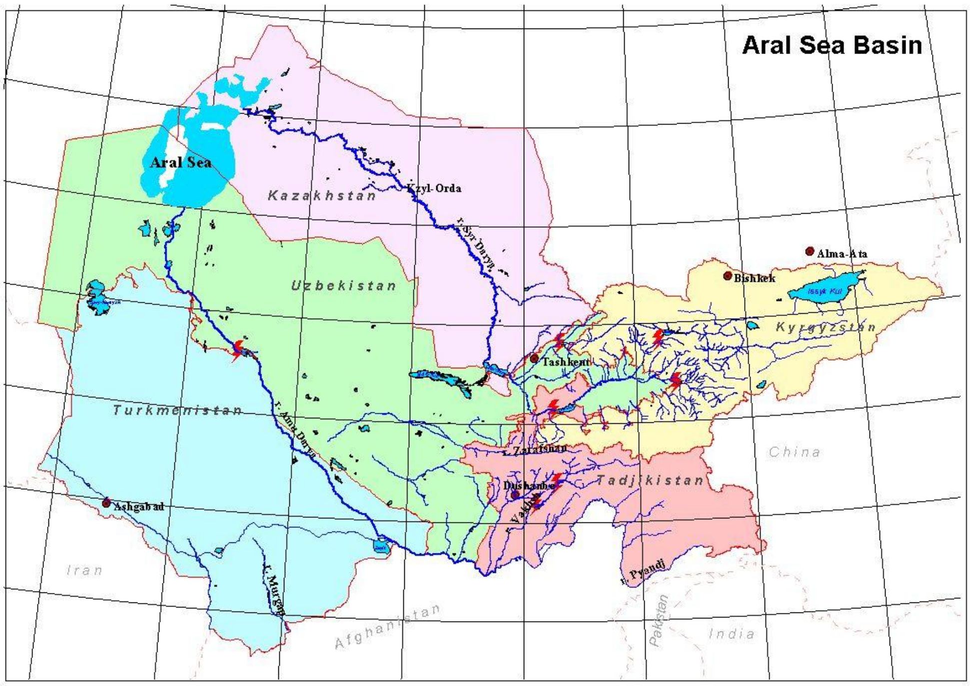
Executive Committee
International Fund for saving the Aral Sea

ARAL SEA BEAM (BASIN ECONOMIC ALLOCATION MODEL)

USER'S MANUAL



November 2012

Contents

Introduction

This manual presents the web-based user interface for the model, named the Aral Sea BEAM (Basin Economic Water Allocation). The model has been developed by Global Water Partnership, DHI and COWI on behalf of the EC IFAS (Executive Committee of the International Fund for Saving the Aral Sea) in during a study, which was carried out from August 2011 to October 2012.The USAID provided financial support for the study in question.

In brief, the Aral Sea BEAM (henceforth: BEAM) constitutes a decision support system to investigate the welfare impacts of changes to water allocation mechanisms and water management infrastructure in the Aral Sea basin. The model is coded in the GAMS software environment. The web-based user interface allows a user to change model inputs and parameters without making changes to the underlying model code. The web-based interface generates a result file in an Excel spreadsheet format to facilitate viewing and processing of results. In this way, the model is accessible to all with access to the Internet.

What is BEAM?

BEAM is a computer based model that is used to simulate the water resources of the Aral Sea basin. BEAM includes hydrological elements such as inflows from mountain catchments; infrastructure elements such as reservoirs and canals; and economic elements such as hydropower facilities and irrigated farms. Water in the natural environment is simulated through simulation of flows through the river system as well through a mass balance of the Aral Sea and other terminal lakes.

BEAM belongs to a class of simulation models called river basin planning models, or water resources planning models. These models are used for optimization of reservoir operations, analysis and optimization of water allocation institutions, and long-term water supply planning. The focus of these models is on representing the essential hydrological, infrastructure, and institutional components of a water resources system. These models generally do not feature detailed representations of physical processes such as rainfall-runoff relationships, river hydraulics, or water quality, although some aspects of these processes can be included.

BEAM is different from most other river basin planning models with respect to the way in which water is allocated by the model. In most other river basin planning models, water is allocated using fixed demands and/or prioritization schemes that satisfy some water uses before others (e.g., domestic use may take priority over irrigation). In the BEAM representation, water is allocated according to economic optimization criteria. In other words, the BEAM model allocates water across time and space to different uses so that the economic value of water use is maximized. The purpose of the BEAM model is to explore whether it

Box 1 Aral Sea basin at a glance

The Aral Sea basin comprises 5 countries with a total population of a little more than 60 million over an area of 4 mllion km^2. The 5 countries are: Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan and Uzbekistan. They are all former Soviet republics. Also, the basin comprises parts of Afghanistan and Iraq.

A characteristic feature of the basin is that there are large differences in available water resources - from Tajikistan with an average of about 5,000 m^3 available per person annually to Turkmenistan with a little less than 300 m^3 available per person annually. Tajikistan and the Kyrgyz Republic include the major glaciated mountains of the basin and their upstream position is advantageous for water availability and, not least, hydropower. In contrast, Kazakhstan, Turkmenistan and Uzbekistan are in a downstream position. They are largely dependent on inflow from the two upstream countries.

Agriculture is a key component of the basin’s economy and accounts for as much as 90% of its water use. However, hydropower may account for an increasing share of water use in future insofar as the upstream countries have planned various dams to increase hydropower production, such as the Rogun dam on the Vakhsh River in Tajikistan. If so, it will have some serious impacts on downstream agriculture.

Climate change is expected to have a significant impact in the basin. The countries will face warmer temperatures, a changing hydrology and more extreme weather. Water scarcity will become a major challenge.

may be possible to change existing water allocation patterns in ways that enhance overall welfare in the Aral Sea basin. The BEAM model also facilitates the estimation of the economic impact of changes to water allocation patterns on different groups within the basin, including the riparian states as well as different sectors such as irrigation and hydropower. The model further allows the user to estimate the economic impact of changes to physical infrastructure such as new reservoirs and irrigation efficiency improvements.

The BEAM simulation runs on a monthly time step for one year. The simulation period corresponds to the hydrological year used for water planning in the Aral Sea basin. This hydrological year begins on 1 October and ends on 30 September.

How to use this manual

This manual provides instructions for running BEAM and viewing results using the BEAM user interface. The BEAM user interface is accessed from the Internet. A specially designed website hosts the user interface, which consists of a web portal that is used to define scenarios, run the model, and access results. The web portal enables the user to select model input parameter values using input boxes and pull-down menus. After a scenario has been defined, the user runs the GAMS model, after which an Excel spreadsheet file containing model results is made available for download. The output Excel file contains tables and charts containing summary and detailed results. The Excel format facilitates the development of additional charts tailored to the user's needs.

To run BEAM and view results, the following steps are taken:

1. From the user interface, define the scenarios to be run. A scenario is a particular representation of the hydrological, infrastructure, and economic components of the river basin.
2. Run the GAMS model.
3. Retrieve the results file and view results.

This manual provides information about carrying out the above steps.

Before using BEAM

What do you need to have in order to work with the model?

In order to work with BEAM, the following are required:

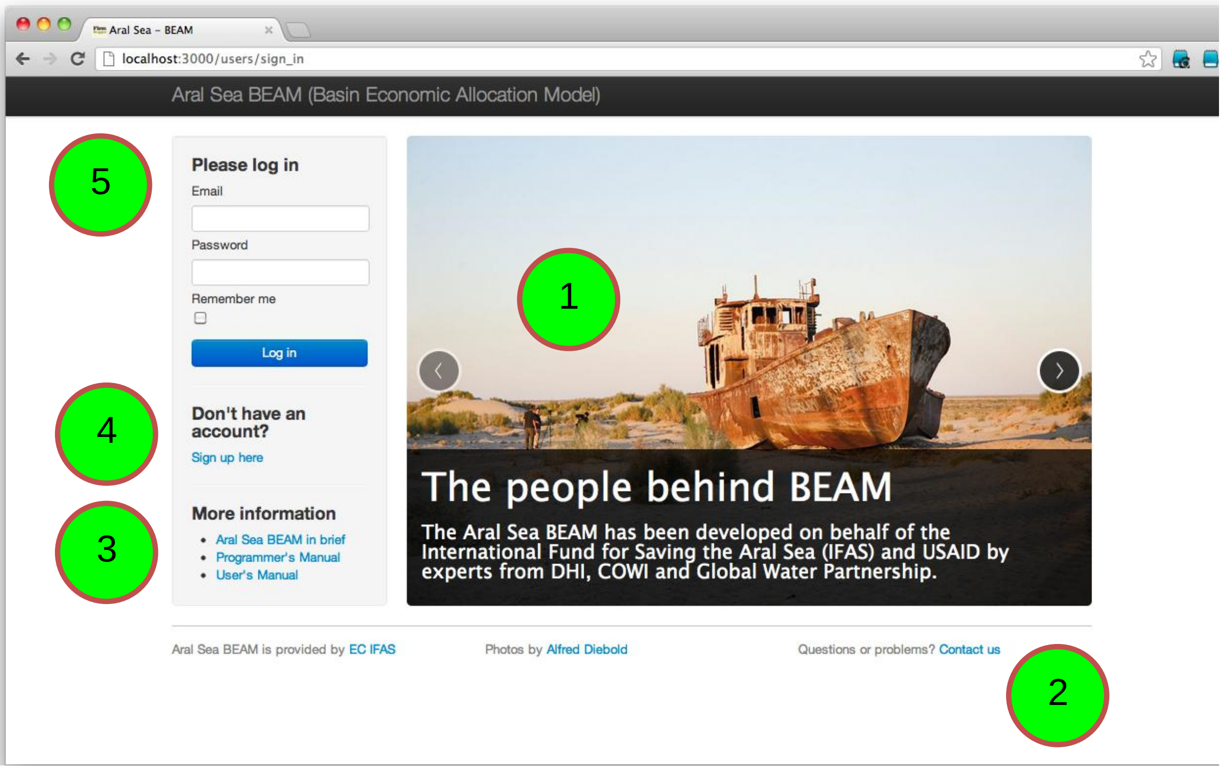
1. A personal computer.
2. Microsoft Excel.
3. Access to the Internet.

How to access the user interface

The user interface is accessed through the following link: http://beam.cowi.com.

How to log in

The first window you will see looks as follows:



Most important is that you may log in from this window. However, other services are provided.

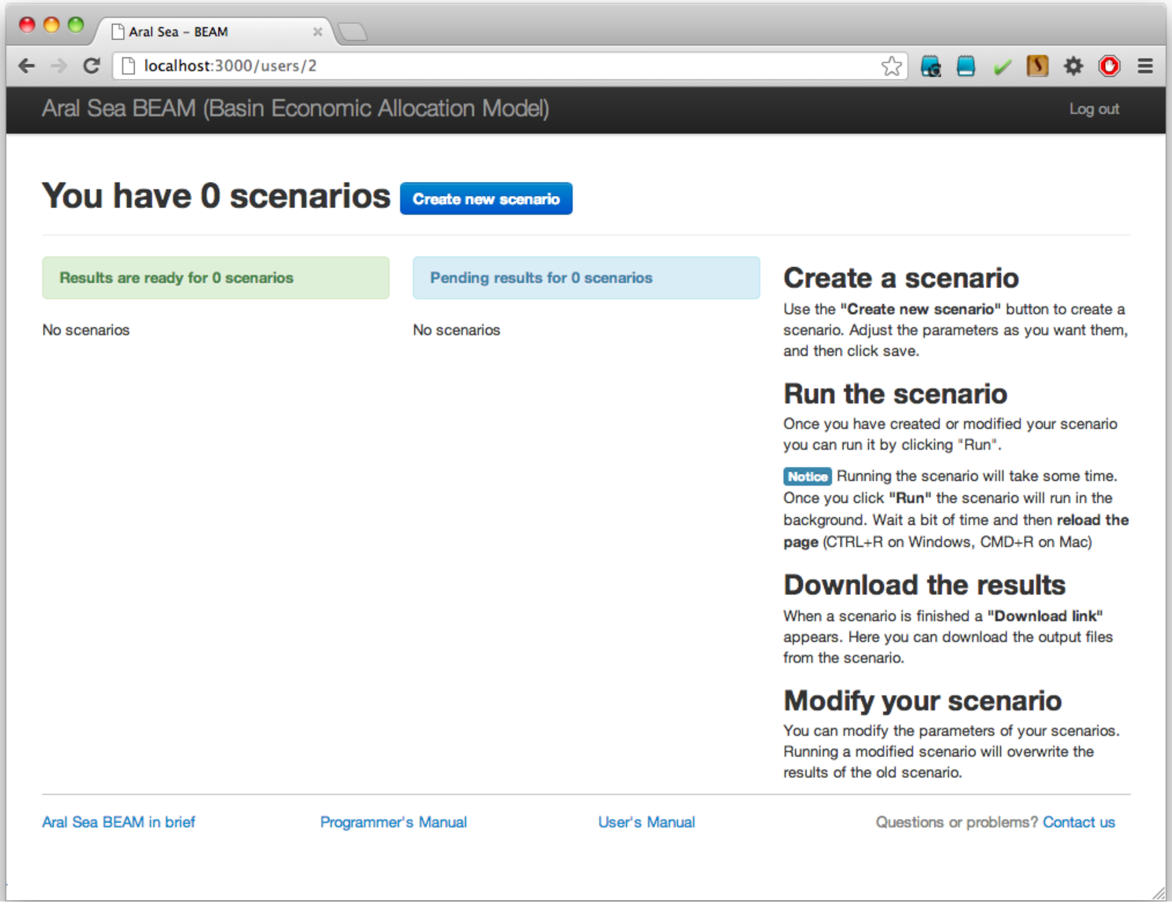
Below all services provided are mentioned – one by one:

1. You will see a picture, two arrows (one to the left, one to the right) and a short text. If you click on the arrows you will arrive at another picture with another short text about the model. In all, there are three pictures and hence three short texts. Please note that whenever you find some text in blue, you may click on it, thereby activating the underlying hyperlink.
2. At the bottom you will find hyperlinks to the EC IFAS website, the website of Alfred Diebold named “Water Unites” and model team. If you have a question, you are most welcome to drop a mail to the model team. It will do its best to answer your question within 5 working days.

3. To the left of the picture there is a heading labelled “More information”. Here you may download a brief and two manuals, including the current manual. They are available in English and Russian languages.
4. First time you want to log in, you will have to create an account. This you do by clicking the hyperlink just below the heading “Don’t have an account?”, filling in the form that appears and simply submitting it. Having done this you will be logged in. When filling in the form, you will be asked to provide an email address and a password (you choose the password yourself).
5. Next time you want to log in, you do this simply by providing your email address and password.

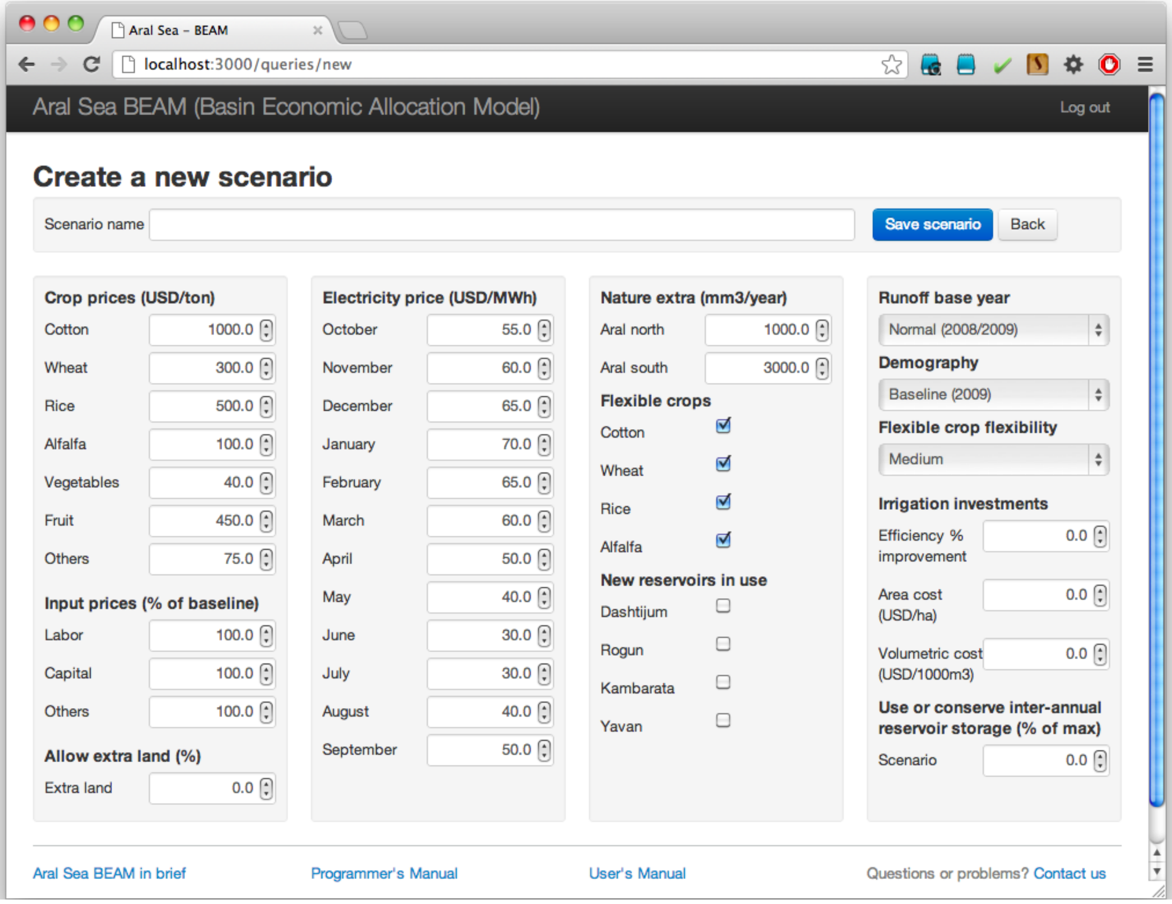
How to create a new scenario

When you log in for the first time you will see the below window:



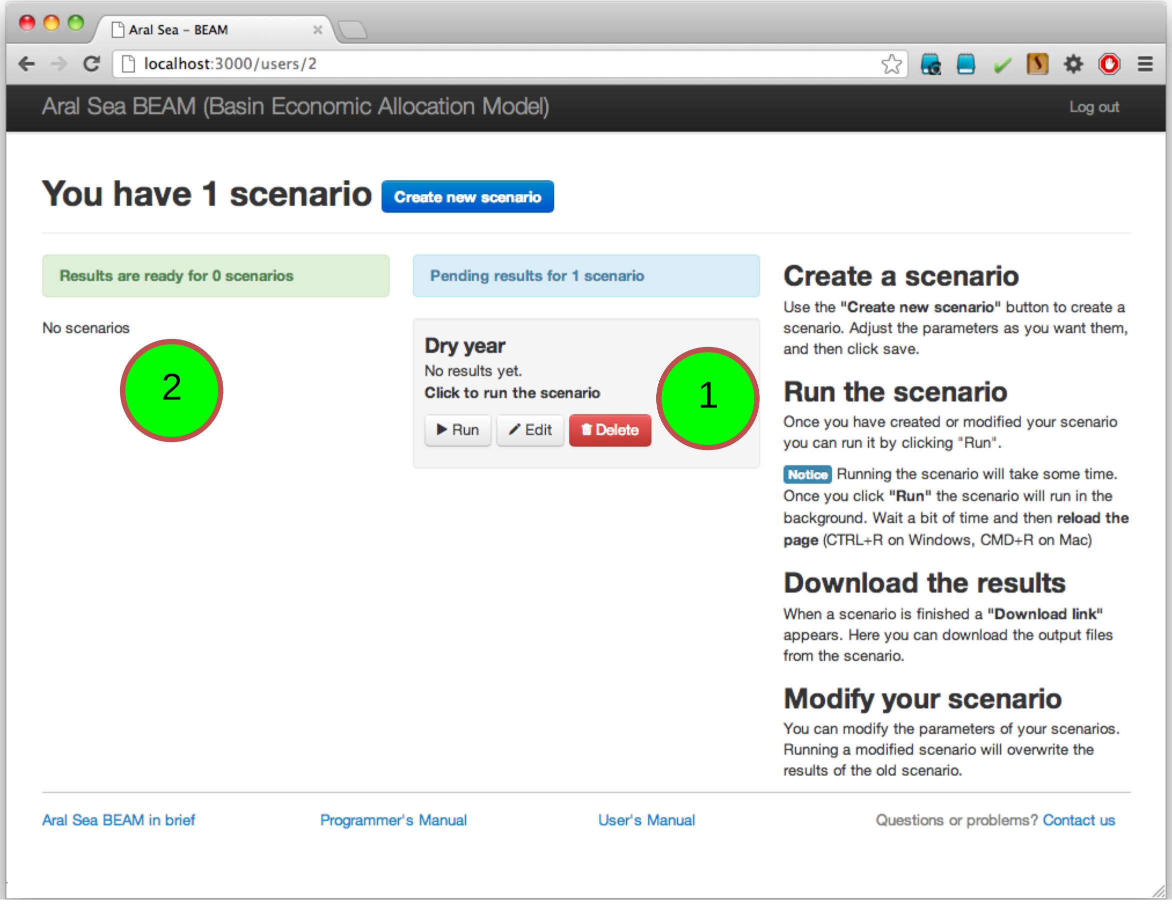
You create your first scenario by clicking on the blue button labeled “Create new scenario”.

Having done this the window below will appear:



Briefly speaking, you give your scenario a name, make choices in the window and click “Save scenario”.

You will then come back to the window providing an overview of the scenarios you have created. The window you will see looks as follows, if the scenario name chosen is “Dry year”:



You may then create yet another scenario or run the scenario “Dry year”. If you want to run the scenario “Dry year” and afterwards download and watch the results you do the following:

1. You click the button “Run”. Then the underlying GAMS model is running. When it is running the label “Click to run the scenario” will change into “Scenario is running”. After a couple of minutes the results should be ready. Then you will have to reload (or refresh) the page. If you do so and the results are ready, the label “Scenario is running” will change into “These are the latest results”.
2. Having done this, the scenario will appear to the left in the window. Here you may download the results simply by clicking the hyperlink labelled “Download results”. A zip file containing scenario results will then be downloaded to your computer. You may also re-run the scenario, edit it or delete it.

At any time it is possible to modify (or edit) a scenario. Likewise, it is possible to delete a scenario. Please note that whenever you delete a scenario you also delete accompanying results.

There is no limit for the number of scenarios.

In the remaining sections of this manual we will look at modifying input data and developing scenarios, viewing and working with results – and reporting.

Modifying input data and developing scenarios

How to modify input data and develop scenarios

The user interface is used to modify input data and develop scenarios. A scenario is set of model assumptions defined by the user for the purpose of investigating how these assumptions might affect water use and welfare in the basin. It is possible to modify the following types of assumptions in BEAM:

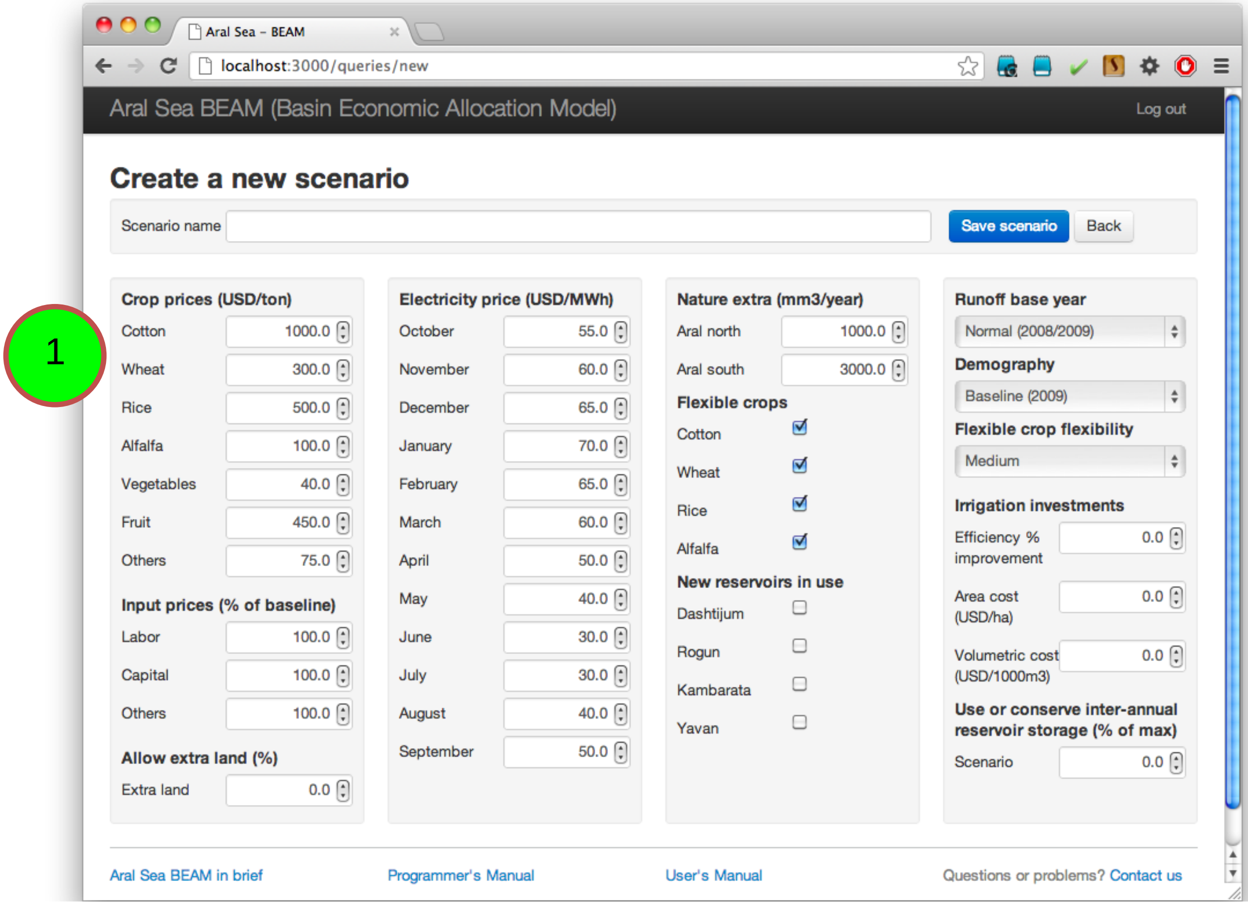
1. Crop sales prices.
2. Crop input factor prices.
3. An option to bring new irrigated lands into production.
4. Electricity prices.
5. Allocation of water to the Aral Sea.
6. Types of crops for which cropping patterns may change from the baseline (flexible crops).
7. New reservoirs and hydropower facilities.
8. Hydrological conditions.
9. Demographic conditions (which affect domestic and industrial water demands).
10. Flexibility parameter regarding flexible crops.
11. The level of investment in irrigation efficiency improvements.
12. The extent to which inter-annual carryover storage can be used or conserved in a given year.

Any combination of the types of assumptions listed above may be used to define a scenario.

How to modify crop sales prices

Crop sales prices are modified using the following step.

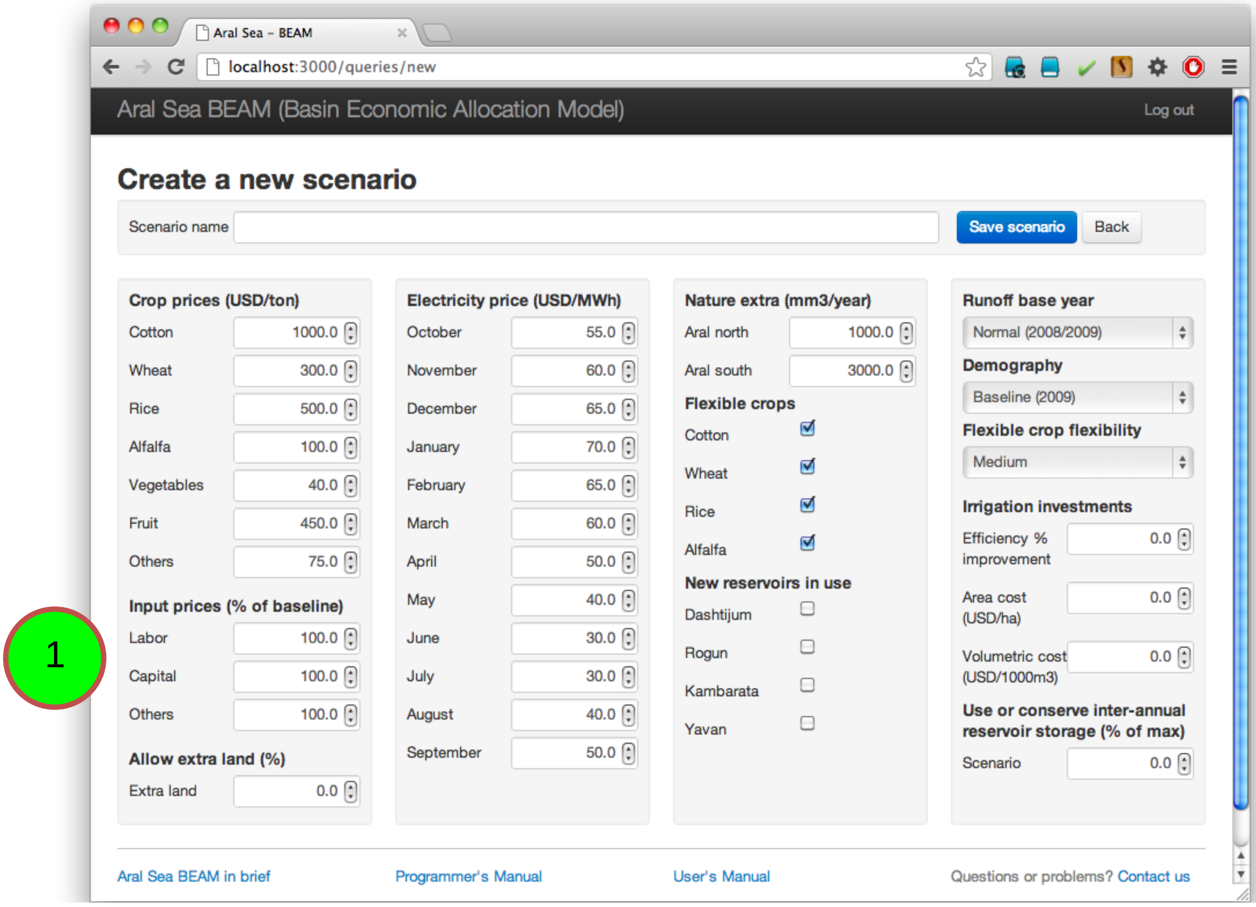
1. Define or modify crop prices for all active crops in the model by changing the prices listed in the section with the heading “Crop prices”. All prices must be given in units of USD/ton.



How to modify crop input factor prices

It is possible to modify the prices of inputs to crop production including labor, capital, and a third aggregate input called “Others” that includes non-capital factors such as fertilizer, seeds, fuel, and pesticides. Crop input factor prices are modified using the following step.

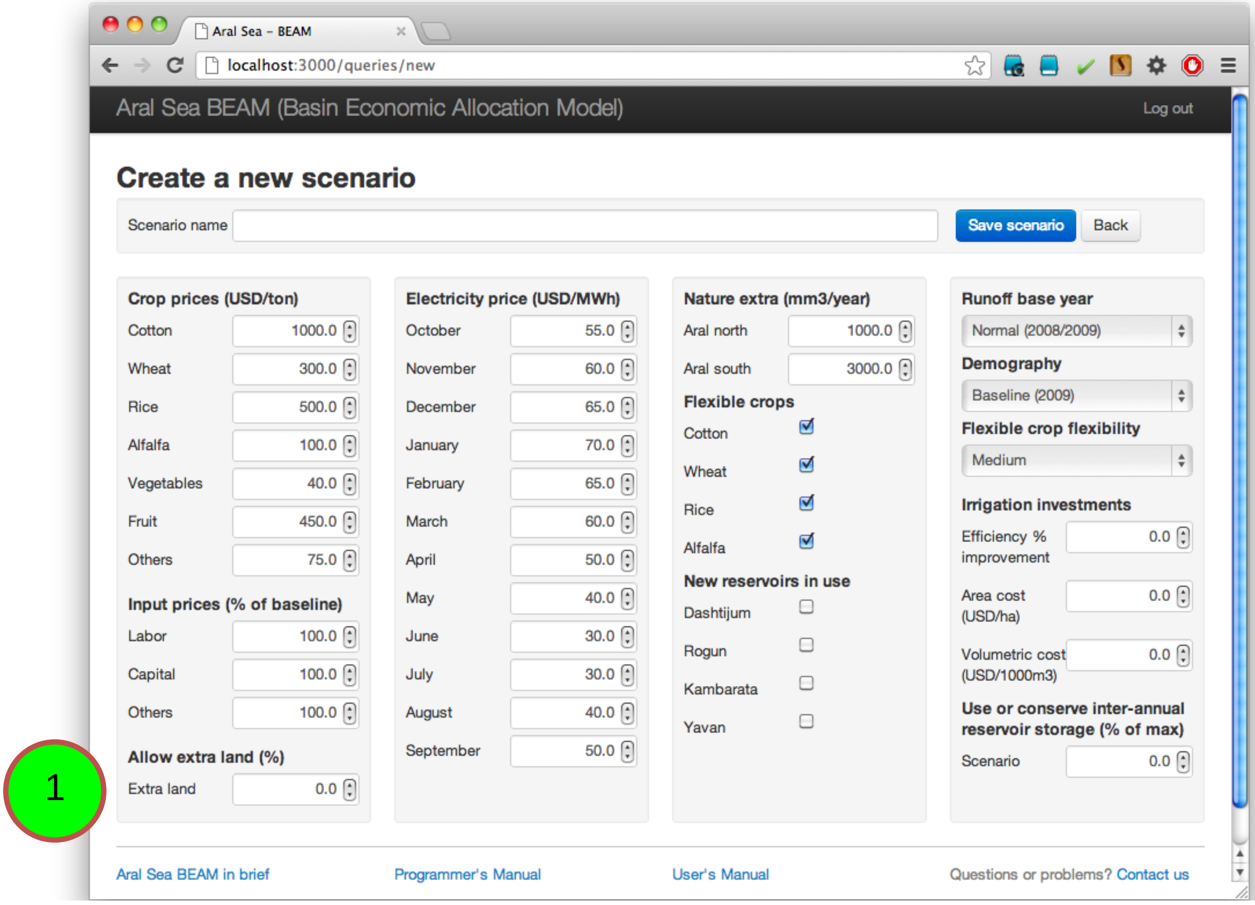
1. Modify crop input factor prices by changing the percentage terms listed in the section “Input prices”. All input factor prices are adjusted using percentage terms that relate scenario prices to baseline prices. These percentages are applied throughout the study area. It is not possible to adjust factor prices by crop type or by region.



How to allow for new lands to be brought into irrigated production

It is possible to allow for new lands to be brought into irrigated production. The model may then increase the total irrigated area in one or more planning zones if this is economically optimal. If the user exercises this option, then total irrigated area of all planning zones is increased by a user-specified percentage (relative to the observed baseline). It is not possible to use different percentages in different planning zones. If the irrigated area increases, only crops selected as “flexible” crops can expand to fill the newly irrigated area. To allow for new irrigated lands to be brought into production:

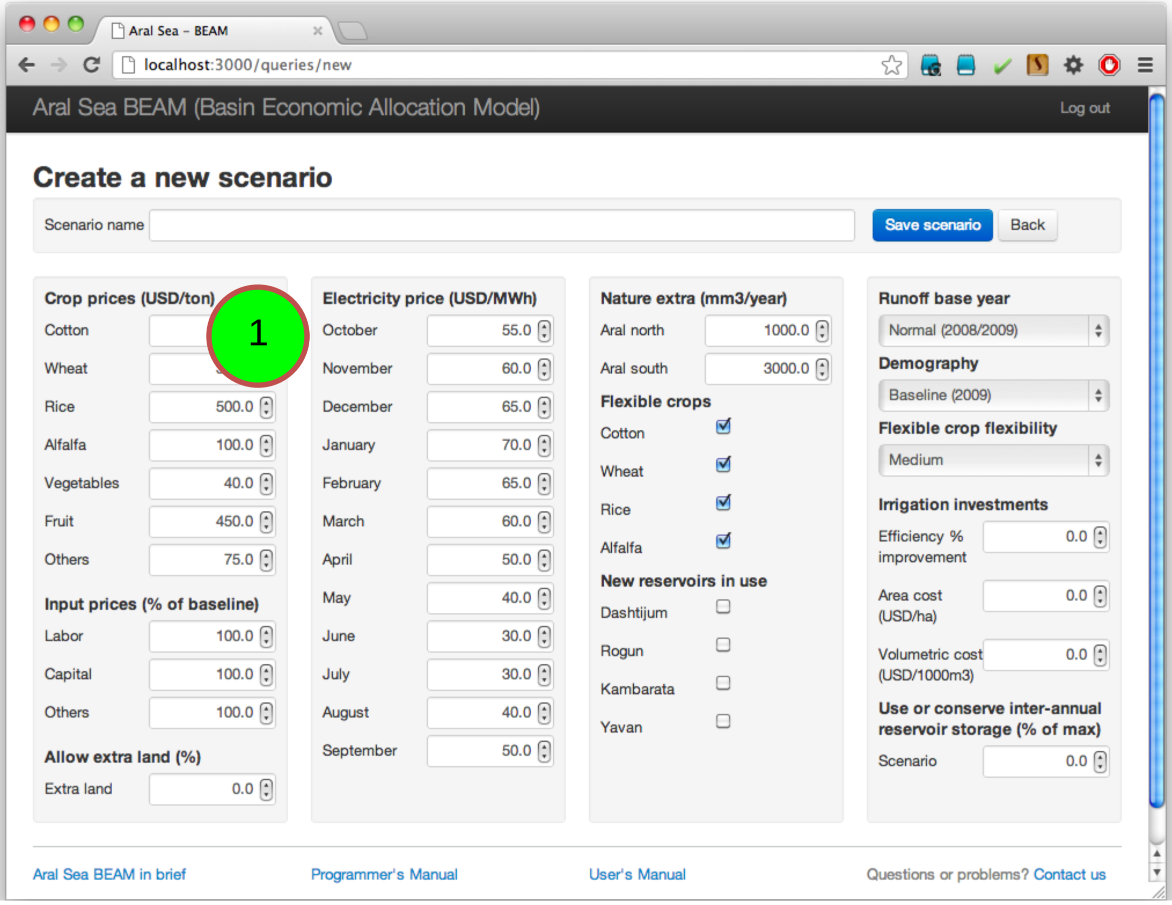
1. Enter the percentage increase to be allowed in the cell labelled “Extra land” in the section “Allow extra land”.



How to modify electricity prices

Electricity prices affect the value of hydropower production and therefore have an impact on the amount of water released through hydropower facilities. Electricity prices vary by month but not by location (i.e., it is assumed that prices change in response to seasonal demand changes, but that prices reflect the cost of importing alternative power supplies on a common system in the region). To modify electricity prices:

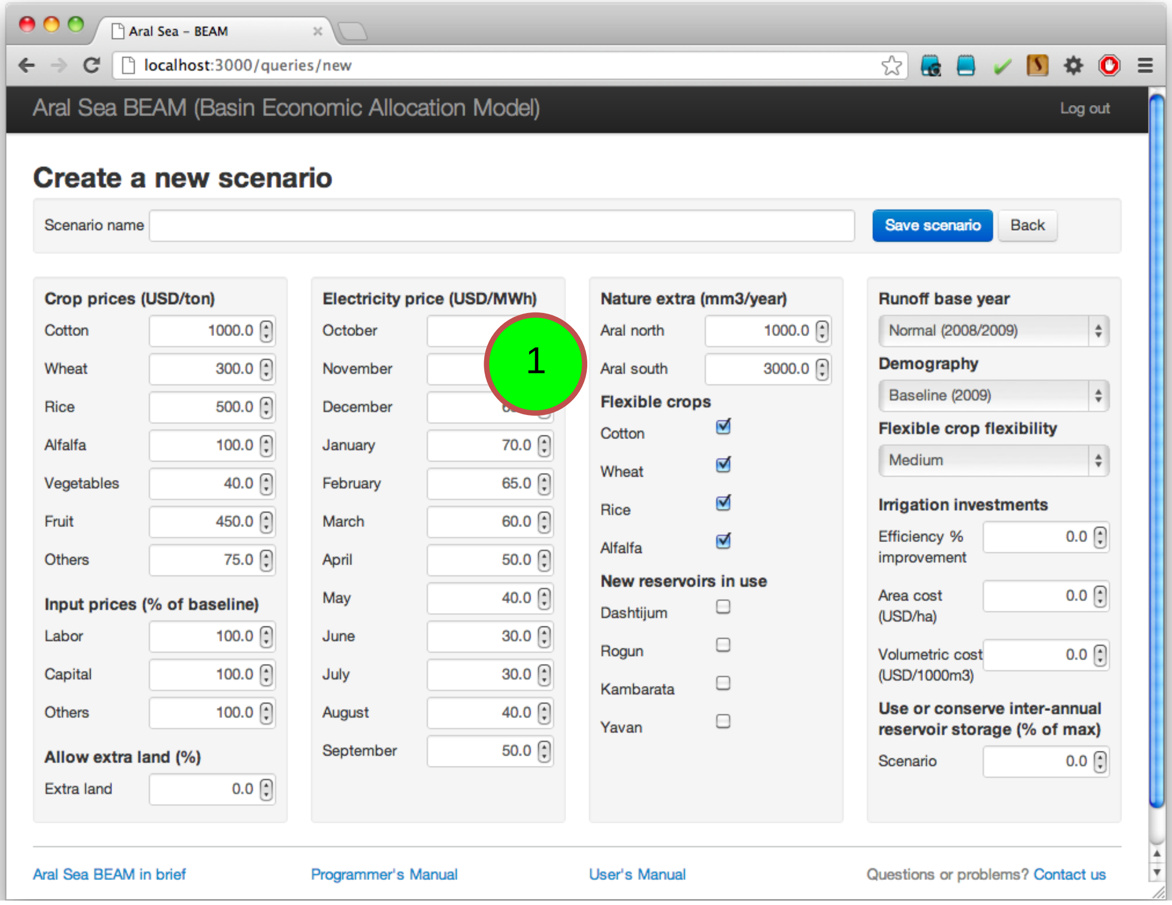
1. Modify prices given in the section “Electricity price”. Prices should be given in units of USD/MWh.



How to modify the allocation of water to the Aral Sea

When water is allocated according to economic optimization criteria, the allocation is constrained so that flows will reach the Aral Sea (i.e., Aral Sea demands must be satisfied before water can be allocated to other uses). The Aral Sea is divided into northern and southern parts because of the dike that has been built to conserve the northern portion of the sea. It is possible to increase the amount of water reaching each sea in order to investigate the economic impact of reserving more water for the Aral Sea. The baseline quantities allocated to the Aral Sea depend on the hydrological conditions selected for the scenario. If “Normal (2008-2009)” conditions are selected under “”Runoff base year” (see below), then 8 km^3/year are reserved for the South Aral Sea and 4 km^3/year are reserved for the North Aral Sea. If “Dry (2000-2001)” conditions are selected, then only 2 km^3/year are reserved for the South Aral Sea and 1.5 km^3/year are reserved for the North Aral Sea. The annual requirement is distributed through the months of the year so that some flow must reach each sea in every month. The amount of water reaching either of the seas can be increased using the following step:

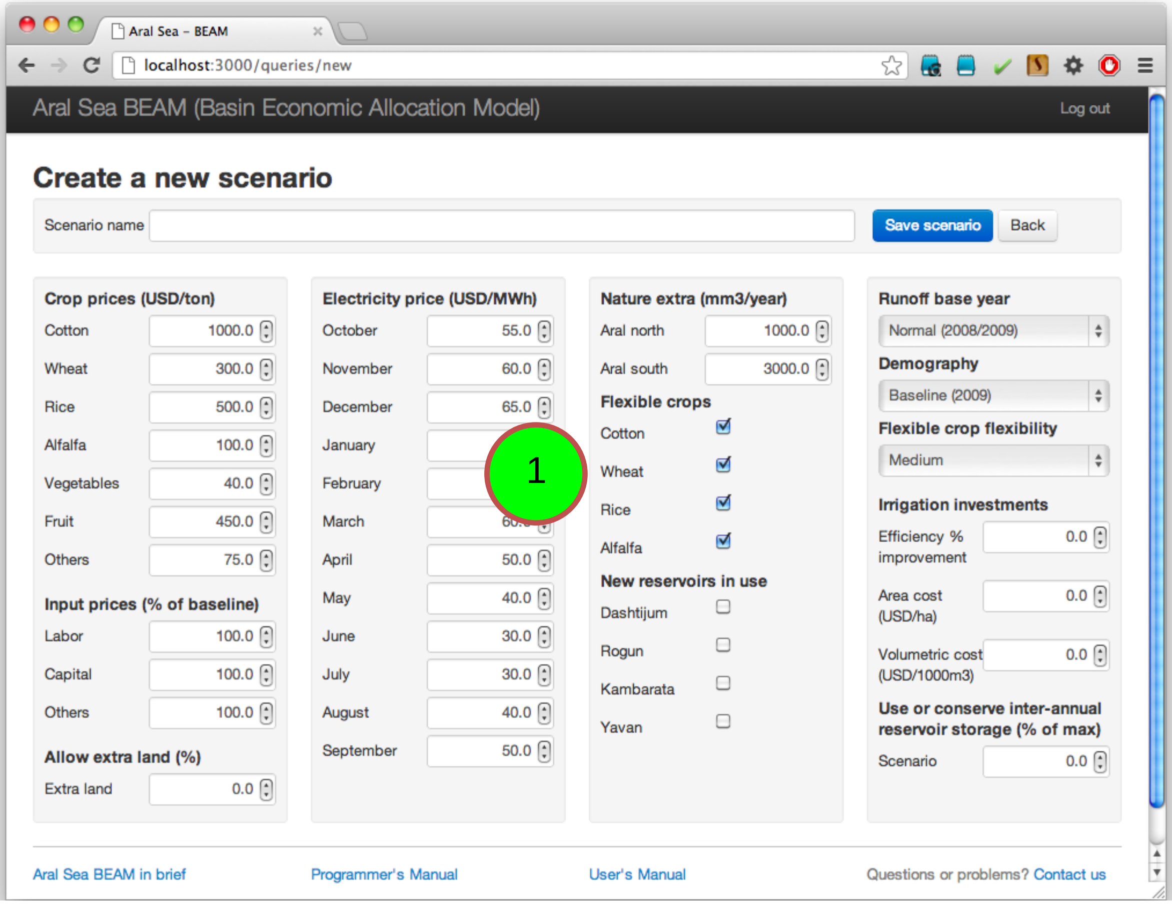
1. Specify the increase in the annual water requirement by modifying the numbers in the cells in the section with the heading “Nature extra”. The units must be in mm^3/year.



How to modify the group of flexible crops

The group of flexible crops is a group of crops for which cropping patterns are allowed to change from the baseline in response to water availability and other economic factors when running the GAMS model. The group of flexible crops can include any combination of cotton, wheat, rice, and alfalfa (see also below under "How to modify the flexibility parameter"). The group of flexible crops is modified using the following step:

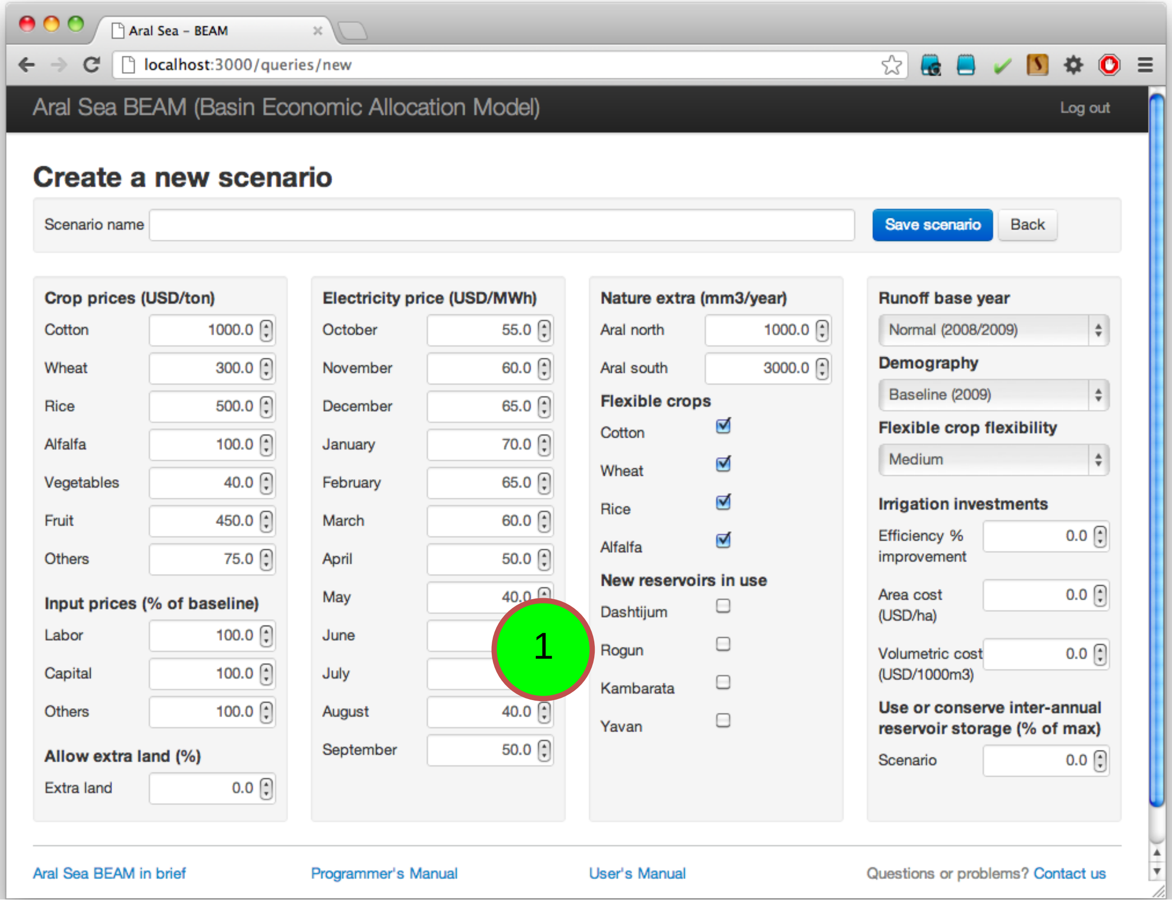
1. Simply tick in the crops you wan to define as flexible crops. The crops you have ticked in then belong to the group of flexible crops.



How to introduce new reservoirs and hydropower facilities

It is possible to include proposed reservoirs and/or hydropower facilities in a scenario to estimate the impact of these facilities on basin-wide welfare. A total of four proposed projects can be included: Dashtijum, Rogun, Kambarata-1, and Yavan. To include proposed reservoirs and/or hydropower facilities:

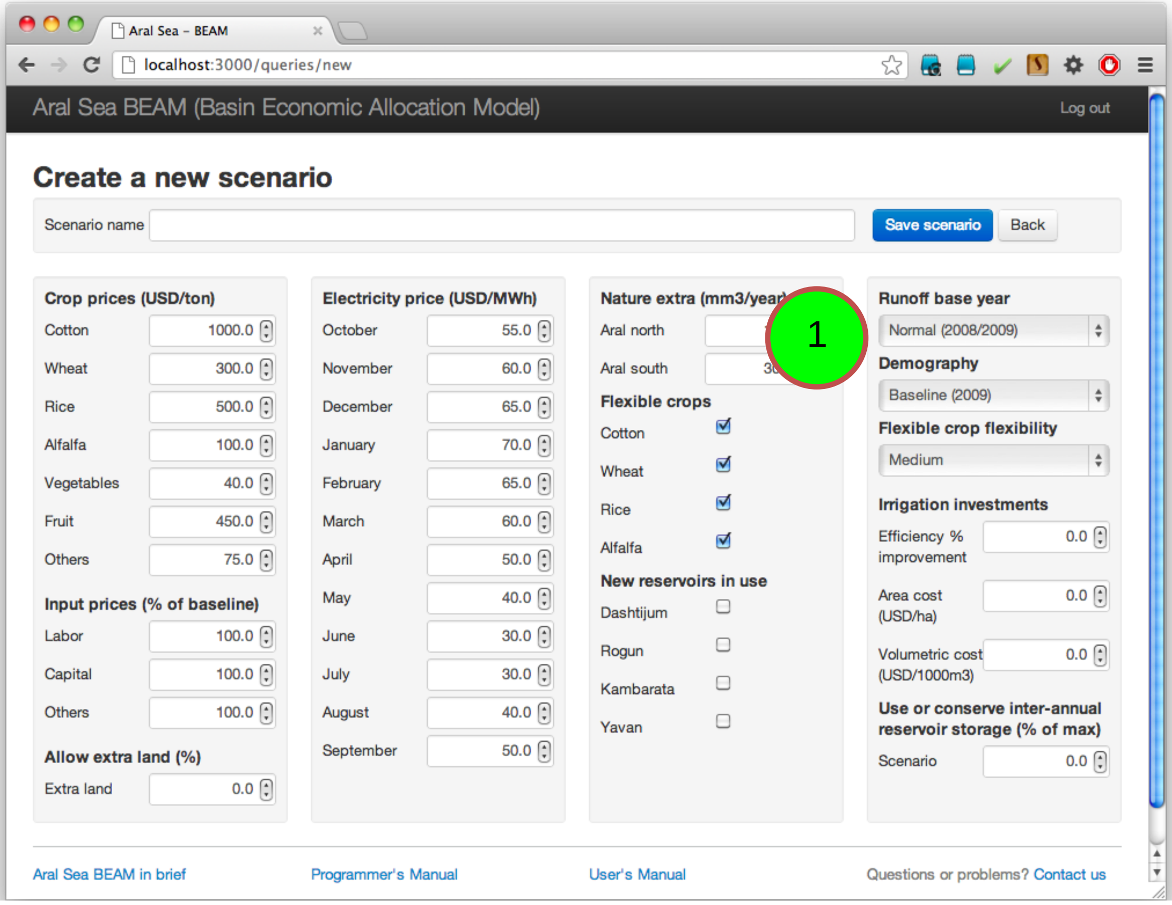
1. Tick in the reservoirs and/or hydropower facilities you would like to include in the section under the heading "New reservoirs in use".



How to modify hydrological conditions

It is possible to use two sets of assumptions about hydrological conditions in BEAM. The first assumes that inflows to the river system from mountain catchments are the same as those observed during the 2009 hydrological year. A hydrological ear runs from 1 October Year X to 30 September Year x+1. Hence, the 2009 hydrological year runs from 1 October 2008 to 30 September 2009. The 2009 year was considered an average or normal year in the basin. The second set of assumptions assumes that inflows to the river system from mountain catchments are the same as those observed during the 2001 hydrological year. The 2001 hydrological year runs from 1 October 2000 to 30 September 2001. The 2001 year was considered a dry year in the basin. To modify hydrological conditions:

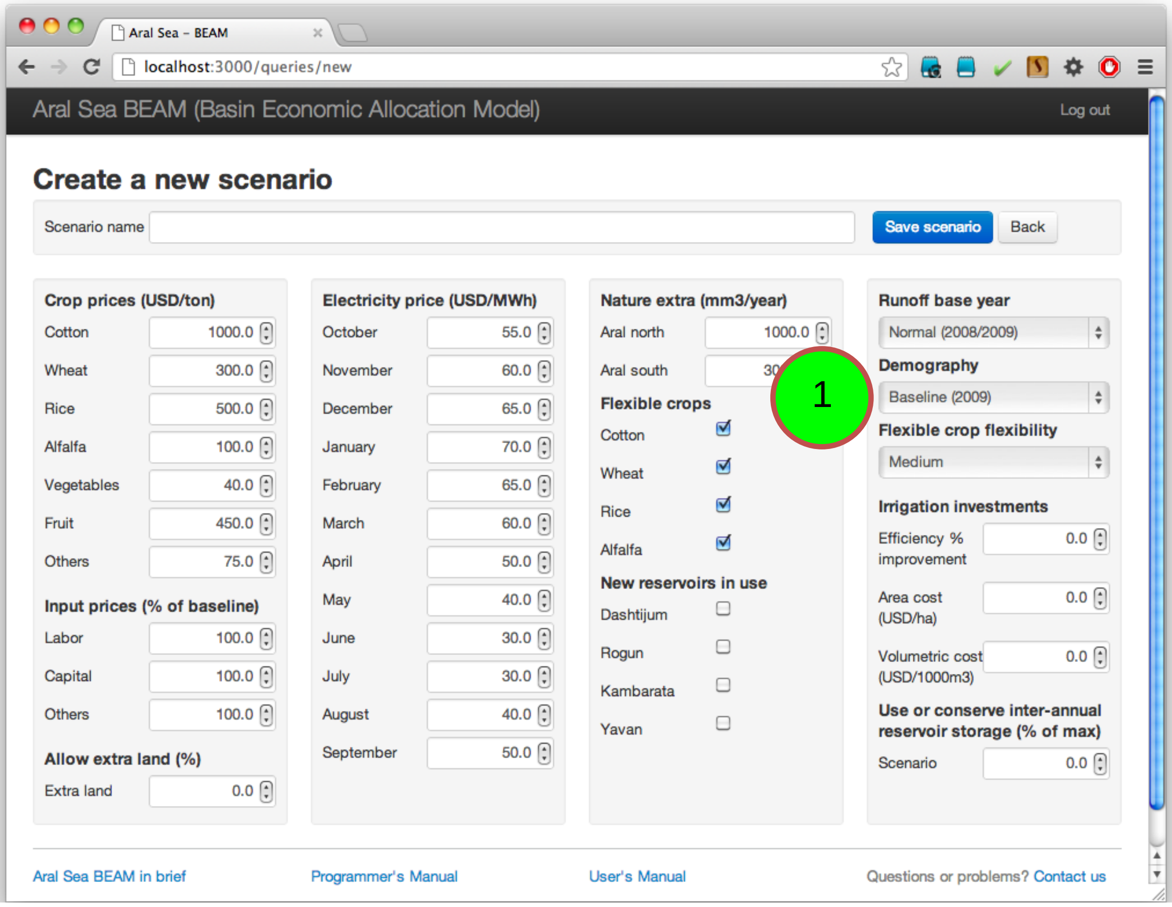
1. Select a hydrological year using the drop-down menu in the section "Runoff base year".



How to modify demographic conditions

Demographic conditions are assumed to control domestic and industrial water use in the model. Domestic and industrial water uses are implemented in BEAM as constraints (i.e., these water uses must be satisfied before water can be allocated to other uses). It is assumed that domestic and industrial water use will vary with population. It is possible to select three levels of demographic conditions: population levels observed during the 2009 base year; projections for the year 2020; and projections for the year 2050. To modify demographic conditions:

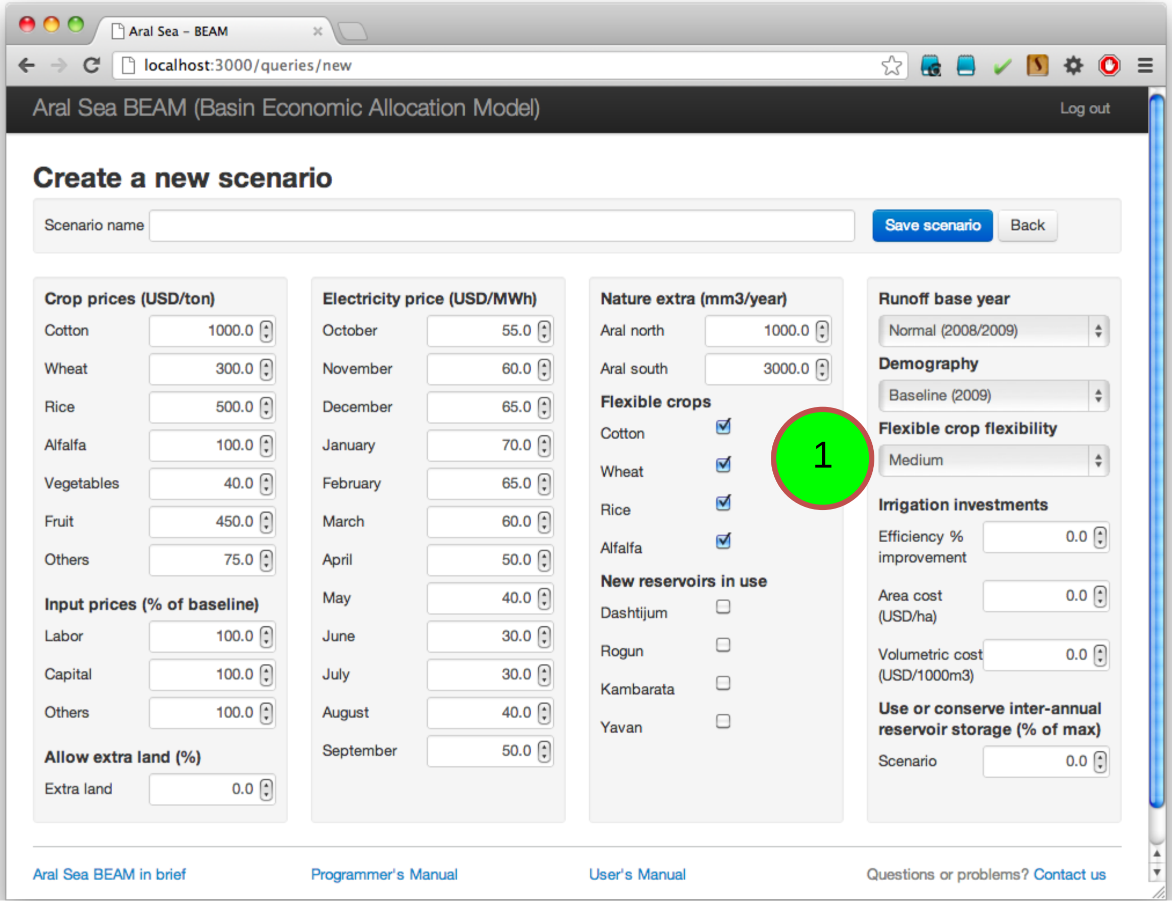
1. Select a set of demographic conditions using the drop-down menu in the section "Demography".



How to modify the flexibility parameter

The so-called "flexibility parameter" controls the extent to which cropping patterns may change relative to an observed baseline. The model baseline consists of cropping patterns and other conditions observed in 2009. When land and water are allocated according to economic optimization criteria, the flexibility parameter controls the extent to which cropping patterns may change. The flexibility parameter is modified using the following step:

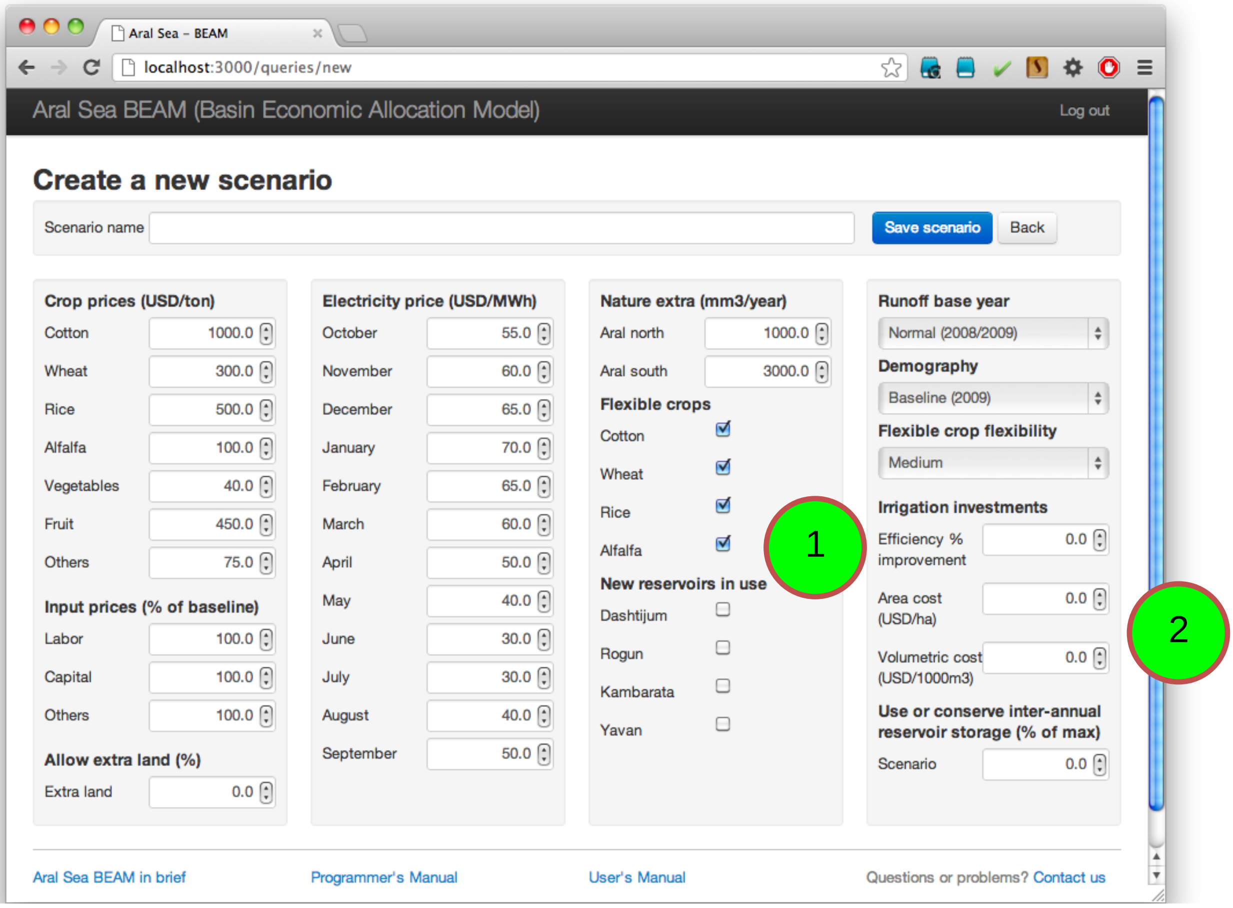
1. Modify the flexibility parameter using the drop-down menu under the heading "Flexible crop flexibility".



How to modify the level of irrigation investments

It is possible to develop scenarios that simulate the impact of irrigation efficiency improvements. These scenarios assume that irrigation water use decreases in response to investment in water saving technologies. Investments in irrigation efficiency improvements may include both area-related costs and water use-related costs. Water savings and cost information are modified by the user. To modify irrigation efficiency data:

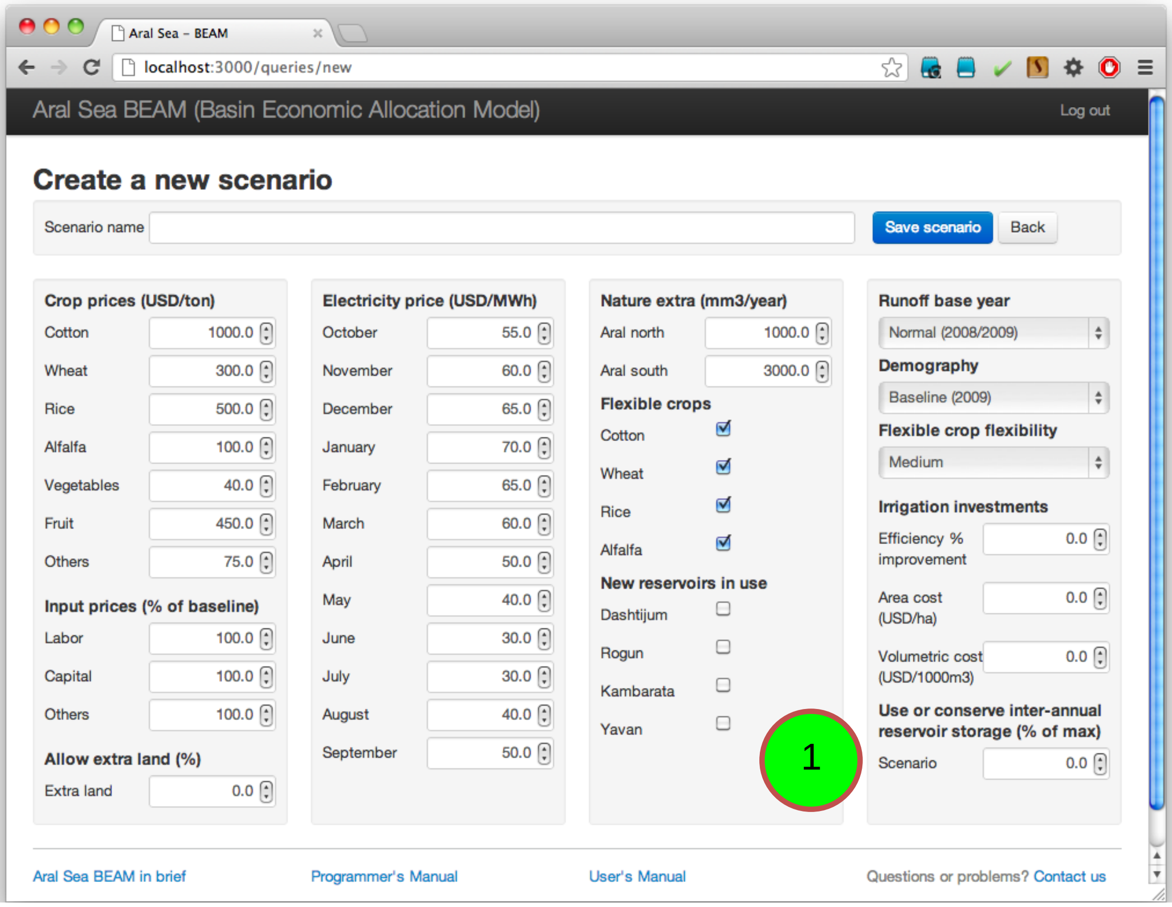
1. Modify the level of water savings by changing the value in the cell labelled “Efficiency % improvement” in the section with the heading “Irrigation investments”. The value should be the percentage reduction in per hectare water use relative to baseline crop water use. The same percentage reduction is applied to all crop types and at all locations (i.e., it is not possible to specify percentages for different crops or locations).
2. Provide the costs for the two different cost categories used (i.e., area-related costs and water use-related costs). The per hectare cost of installing and operating water saving technologies is inserted in the cell labelled “Area cost (USD/ha)”. The per unit water cost of operating water saving technologies is inserted in the cell labelled “Volumetric cost (USD/1000m3)”.



How to modify the extent to which inter-annual carryover storage can be used or conserved

BEAM runs for a time period of one year, and storage at the beginning of the simulation period is normally constrained to equal storage at the end of the simulation period; otherwise, it is possible that the optimization model would reduce end-of-period reservoir storages to unrealistic levels. However, some of the reservoirs in the Aral Sea basin were built to provide inter-annual carryover storage to supplement flows during dry years. The user can choose to use or conserve a portion of this storage by modifying the percentage share in the section with the heading “Use or conserve inter-annual reservoir storage (% of max)”. The user selects the portion of reservoir storage to use or conserve as a percentage of the maximum capacity. If a negative value is entered, the end of period storage will be less than the beginning of period storage (in other words, inter-annual storage will be used). If a positive value is entered, the end of period storage will be greater than the beginning of period storage (inter-annual storage will be conserved). The option to use or conserve inter-annual storage is applied to Toktogul and Nurek reservoirs only. The parameter is modified as follows:

1. Modify the inter-annual storage parameter by changing the value in the section “Use or conserve inter-annual reservoir storage (% of max)”. The value should be given in units of percentage of maximum reservoir capacity.

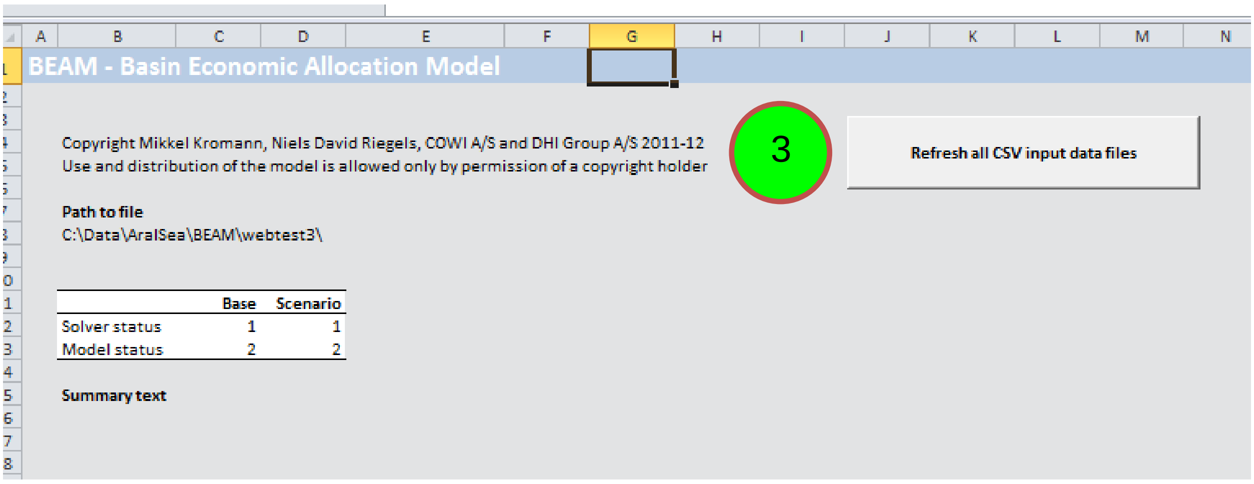


Viewing and working with results

How to update the output Excel file with results from the GAMS model

The zip file containing model contains an .xls file used to display model results and a number of .csv files containing output from the GAMS model. The contents of the .csv files must be imported into the .xls file by the user. To import model output into the .xls file:

1. Unzip the contents of the downloaded zip file into a new directory.
2. Open the .xls file, which is called “beamOutput.xls”.
3. Click on the control button “Refresh all CSV input data files” on the “frontpage” worksheet.



How is the output Excel file organized

The output user interface consists of a number of worksheets that hold output from the GAMS model. These worksheets are organized into the following four groups:

1. The “frontpage” worksheet with the control button that is used to import GAMS model output.
2. A worksheet called “schematic” that holds the model schematic.
3. A set of worksheets with black-colored tabs holding summary output from the GAMS model.
4. A set of worksheets with blue-colored tabs holding direct output from the GAMS model. The data presented on the worksheets with black-colored tabs summarize data from the worksheets with blue-colored tabs. The data on the blue-colored tabs should only be accessed or altered by users familiar with the underlying GAMS model code.
5. A fourth group of worksheets containing information used to import data from the underlying GAMS model. The data on the fourth group of worksheets should only be accessed or altered by users familiar with the underlying GAMS model code.

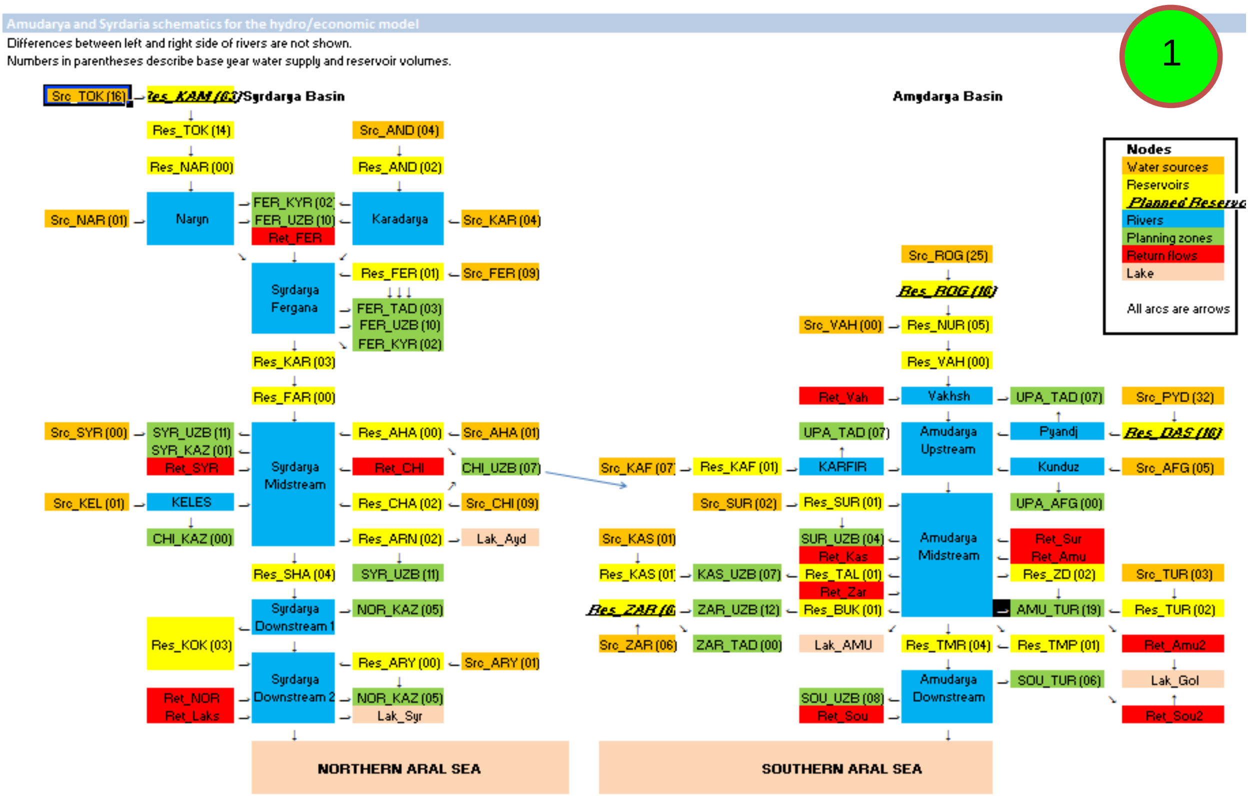
How to view the model schematic

The model schematic is available on the “schematic” worksheet. The model schematic includes six types of nodes:

1. Water source nodes represent inflows from rim catchments.
2. Reservoir nodes represent reservoir and hydropower facilities. The reservoir node type includes both existing and planned reservoirs.
3. River nodes represent junctions where two or more upstream nodes come together and/or where two or more downstream nodes diverge.
4. Planning zone nodes represent consumptive water use locations.
5. Return flow nodes represent return flows from consumptive water use locations.
6. Lake nodes represent terminal lakes.

The arrows shown between nodes indicate the direction of flow. To interpret the schematic, a color scheme is used to identify different node types. To view the model schematic:

1. Navigate to the “schematic” worksheet.



How to view assumptions used in a model scenario

The output user interface always presents results from two scenarios: the baseline scenario and the scenario that was defined using the input user interface. This facilitates the comparison of scenario results to the baseline. To keep track of assumptions used in a scenario, all assumptions are recorded on the “assumptions” worksheet. To view assumptions:

1. Navigate to the “assumptions” worksheet.

Assumptions for baseline and Scenario

	Baseline	Scenario
Cotton price USD/ton	1.000	1.000
Wheat price USD/ton	300	300
Rice price USD/ton	500	500
Alfalfa price USD/ton	100	100
Vegetable price USD/ton	40	40
Fruit price USD/ton	450	450
Other crops price USD/ton	75	75
Labor price (% of baseline)	100%	100%
Capital price (% of baseline)	100%	100%
Diesel/fertilizer price (% of baseline)	100%	100%
Crop change transformation elasticity	0,50	0,50
Extra nature water need, Aral Sea North, mm3/year	0	0
Extra nature water need, Aral Sea South, mm3/year	0	0
Cotton flexible (0/1)?	Fixed	Flexible
Wheat flexible (0/1)?	Fixed	Flexible
Rice flexible (0/1)?	Fixed	Flexible
Alfalfa flexible (0/1)?	Fixed	Flexible
Rainfall year	2009	2009
Modelled years	2009	2009
Irrigation efficiency investment USD/ha	0	0
Irrigation efficiency investment USD/m3	0	0
Irrigatopn efficiency improvement (%)	0%	0%
Investments in Dashtijum	0	0
Investments in Rogun	0	0
Investments in Kambarata-1	0	0
Investments in Naryn cascade	0	0
Investments in Vakhsh cascade	0	0
Investments in Yavan	0	0
Electricity price m01 USD/MWh	70	70
Electricity price m02 USD/MWh	70	70
Electricity price m03 USD/MWh	60	60
Electricity price m04 USD/MWh	50	50
Electricity price m05 USD/MWh	40	40
Electricity price m06 USD/MWh	30	30
Electricity price m07 USD/MWh	30	30
Electricity price m08 USD/MWh	40	40
Electricity price m09 USD/MWh	50	50
Electricity price m10 USD/MWh	50	50
Electricity price m11 USD/MWh	60	60
Electricity price m12 USD/MWh	65	65
Reservoir buildup	0%	0,0%
Demographic change in water use, households	0%	0%
Demographic change in water use, industry	0%	0%
Fallow land	0%	0%

1

How to view summary economic data

Summary economic data are available on the “economy” worksheet. Data are presented for both the baseline scenario and the user-defined scenario defined using the web interface. All data are aggregated to the basin-wide and annual levels, and are also disaggregated to national and monthly levels. The following types of summary data are presented:

1. Total value added: Total value added is the sum of agricultural value added and hydropower value added. For details of how value added is estimated, the reader is referred to the BEAM programmer’s manual. These tables allow the user to view the impact of a scenario on overall welfare relative to the baseline. The disaggregated data allow the user to see how the distribution of income changes with respect to geography (measured in terms of income to individual countries) and with respect to time (measured over the months of the year).
2. Agricultural value added: Agricultural value added is equal to agricultural production value minus agricultural input costs. These tables allow the user to view the impact of a scenario on the agriculture sector. For the agricultural sector, the distribution of value added over the months of the year is not meaningful because the monthly results presented in the table are simply equal to the annual value added divided by 12. The disaggregation to monthly data is made in this way to facilitate the presentation of monthly data in the “Total income” table.
3. Hydropower value added: These tables allow the user to view the impact of a scenario on the hydropower sector. These data are also disaggregated by country and by month.

1

Total value added, baseline, 1000 USD

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
KYR	47.636	65.857	64.057	73.344	78.670	74.664	63.047	46.702	40.112	34.812	39.073	45.077	673.051
TAD	168.312	196.864	174.799	161.123	152.220	146.859	128.832	109.925	86.440	92.203	121.505	145.465	1.684.547
TUR	114.092	114.092	114.092	114.092	114.092	114.092	114.092	114.092	114.092	114.092	114.092	114.092	1.369.104
UZB	456.957	467.510	466.678	468.518	476.402	464.217	456.588	454.066	459.029	459.290	459.383	458.806	5.547.444
KAZ	41.453	42.380	42.842	43.303	43.303	42.380	41.458	40.535	39.613	39.613	40.534	41.451	498.865
All	828.450	886.703	862.468	860.380	864.687	842.212	804.017	765.320	739.286	740.010	774.587	804.891	9.773.011

Total value added, Scenario, 1000 USD

	Oct	Nov	Dec
KYR	45.591	81.033	91.228
TAD	144.898	212.129	179.063
TUR	118.128	118.128	118.128
UZB	474.755	484.849	484.016
KAZ	42.546	43.525	43.987
All	825.918	939.664	916.422

2

Agricultural value added, baseline, 1000 USD

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
KYR	16.001	16.001	16.001	16.001	16.001	16.001	16.001	16.001	16.001	16.001	16.001	16.001	192.012
TAD	59.657	59.657	59.657	59.657	59.657	59.657	59.657	59.657	59.657	59.657	59.657	59.657	715.884
TUR	114.092	114.092	114.092	114.092	114.092	114.092	114.092	114.092	114.092	114.092	114.092	114.092	1.369.104
UZB	438.436	438.436	438.436	438.436	438.436	438.436	438.436	438.436	438.436	438.436	438.436	438.436	5.261.232
KAZ	36.845	36.845	36.845	36.845	36.845	36.845	36.845	36.845	36.845	36.845	36.845	36.845	442.140
All	665.031	665.031	665.031	665.031	665.031	665.031	665.031	665.031	665.031	665.031	665.031	665.031	7.980.372

Agricultural value added, Scenario, 1000 USD

	Oct	Nov	Dec
KYR	16.791	16.791	16.791
TAD	62.940	62.940	62.940
TUR	118.128	118.128	118.128
UZB	455.774	455.774	455.774
KAZ	37.990	37.990	37.990
All	691.623	691.623	691.623

3

Hydropower value added, baseline, 1000 USD

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
KYR	31.635	49.856	48.056	57.343	62.669	58.663	47.046	30.701	24.111	18.811	23.072	29.076	481.039
TAD	108.655	137.207	115.142	101.466	92.563	87.202	69.175	50.268	26.783	32.546	61.848	85.808	968.663
TUR	0	0	0	0	0	0	0	0	0	0	0	0	0
UZB	18.521	29.074	28.242	30.082	37.966	25.781	18.152	15.630	20.593	20.854	20.947	20.370	286.212
KAZ	4.608	5.535	5.997	6.458	6.458	5.535	4.613	3.690	2.768	2.768	3.689	4.606	56.725
All	163.419	221.672	197.437	195.349	199.656	177.181	138.986	100.289	74.255	74.979	109.556	139.860	1.792.639

Note: Includes monthly costs for operation and (for new HEPS) depreciation

Hydropower value added, Scenario 1000 USD

	Oct	Nov	Dec
KYR	28.800	64.242	74.437
TAD	81.958	149.189	116.123
TUR	0	0	0
UZB	18.981	29.075	28.242
KAZ	4.556	5.535	5.997
All	134.295	248.041	224.799

Note: Includes monthly costs for operation and (f

4. Summary data are also available for hydropower production and irrigation investment costs. In the present version of BEAM, costs of hydropower production are assumed to zero. The summary data related to irrigation efficiency investment costs present costs result from irrigation investment assumptions defined using the input interface.

4

Hydropower costs, baseline, 1000 USD

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
KYR	0	0	0	0	0	0	0	0	0	0	0	0	0
TAD	0	0	0	0	0	0	0	0	0	0	0	0	0
TUR	0	0	0	0	0	0	0	0	0	0	0	0	0
UZB	0	0	0	0	0	0	0	0	0	0	0	0	0
KAZ	0	0	0	0	0	0	0	0	0	0	0	0	0
All	0	0	0	0	0	0	0	0	0	0	0	0	0

Hydropower costs, Scenario 1000 USD

	Oct	Nov	Dec
KYR	0	0	0
TAD	0	0	0
TUR	0	0	0
UZB	0	0	0
KAZ	0	0	0
All	0	0	0

Irrigation efficiency investment costs, baseline, 1000 USD

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
KYR	0	0	0	0	0	0	0	0	0	0	0	0	0
TAD	0	0	0	0	0	0	0	0	0	0	0	0	0
TUR	0	0	0	0	0	0	0	0	0	0	0	0	0
UZB	0	0	0	0	0	0	0	0	0	0	0	0	0
KAZ	0	0	0	0	0	0	0	0	0	0	0	0	0
All	0	0	0	0	0	0	0	0	0	0	0	0	0

Irrigation efficiency investment costs, Scenario, 10

	Oct	Nov	Dec
KYR	0	0	0
TAD	0	0	0
TUR	0	0	0
UZB	0	0	0
KAZ	0	0	0
All	0	0	0

5. Summary value added data are also available as a per cent of GDP. This provides information about the importance of agriculture and hydropower in the basin to each of the riparian countries. GDP values used to prepare the tables are 2009 PPP figures.

5

Total value added, baseline, % of GDP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
KYR	0,13%	0,13%	0,13%	0,13%	0,13%	0,13%	0,13%	0,13%	0,13%	0,13%	0,13%	0,13%	5,32%
TAD	0,42%	0,42%	0,42%	0,42%	0,42%	0,42%	0,42%	0,42%	0,42%	0,42%	0,42%	0,42%	11,73%
TUR	0,33%	0,33%	0,33%	0,33%	0,33%	0,33%	0,33%	0,33%	0,33%	0,33%	0,33%	0,33%	3,91%
UZB	0,53%	0,53%	0,53%	0,53%	0,53%	0,53%	0,53%	0,53%	0,53%	0,53%	0,53%	0,53%	6,76%
KAZ	0,02%	0,02%	0,02%	0,02%	0,02%	0,02%	0,02%	0,02%	0,02%	0,02%	0,02%	0,02%	0,26%

Total value added, Scenario, % of GDP

	Oct	Nov	Dec
KYR	0,36%	0,64%	0,72%
TAD	1,01%	1,48%	1,25%
TUR	0,34%	0,34%	0,34%
UZB	0,58%	0,59%	0,59%
KAZ	0,02%	0,02%	0,02%

Agricultural value added, baseline, % of GDP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
KYR	0,13%	0,13%	0,13%	0,13%	0,13%	0,13%	0,13%	0,13%	0,13%	0,13%	0,13%	0,13%	1,52%
TAD	0,42%	0,42%	0,42%	0,42%	0,42%	0,42%	0,42%	0,42%	0,42%	0,42%	0,42%	0,42%	4,99%
TUR	0,33%	0,33%	0,33%	0,33%	0,33%	0,33%	0,33%	0,33%	0,33%	0,33%	0,33%	0,33%	3,91%
UZB	0,53%	0,53%	0,53%	0,53%	0,53%	0,53%	0,53%	0,53%	0,53%	0,53%	0,53%	0,53%	6,41%
KAZ	0,02%	0,02%	0,02%	0,02%	0,02%	0,02%	0,02%	0,02%	0,02%	0,02%	0,02%	0,02%	0,23%

Agricultural value added, Scenario, % of GDP

	Oct	Nov	Dec
KYR	0,13%	0,13%	0,13%
TAD	0,44%	0,44%	0,44%
TUR	0,34%	0,34%	0,34%
UZB	0,56%	0,56%	0,56%
KAZ	0,02%	0,02%	0,02%

Hydropower value added, baseline, % of GDP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
KYR	0,25%	0,39%	0,38%	0,45%	0,50%	0,46%	0,37%	0,24%	0,19%	0,15%	0,18%	0,23%	3,81%
TAD	0,76%	0,96%	0,80%	0,71%	0,64%	0,61%	0,48%	0,35%	0,19%	0,23%	0,43%	0,60%	6,75%
TUR	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
UZB	0,02%	0,04%	0,03%	0,04%	0,05%	0,03%	0,02%	0,02%	0,03%	0,03%	0,03%	0,02%	0,35%
KAZ	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,03%

Note: Includes monthly costs for operation and (for new HEPS) depreciation

Hydropower value added, Scenario, % of GDP

	Oct	Nov	Dec
KYR	0,23%	0,51%	0,59%
TAD	0,57%	1,04%	0,81%
TUR	0,00%	0,00%	0,00%
UZB	0,02%	0,04%	0,03%
KAZ	0,00%	0,00%	0,00%

Note: Includes monthly costs for operation and (f

6. Summary value added data are also available in per person GDP units. Each figure in the tables is equal to value added divided by per person GDP. This provides information about the importance of agriculture and hydropower in the basin to each of the riparian countries which controlling for population size.

6

Total value added, baseline, multiple of per capita GDP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
KYR	20711	28633	27851	31889	34204	32463	27412	20305	17440	15136	16988	19599	292.631
TAD	88585	103613	91999	84802	80116	77294	67806	57855	45495	48528	63950	76561	886.604
TUR	17553	17553	17553	17553	17553	17553	17553	17553	17553	17553	17553	17553	210.631
UZB	157571	161210	160923	161558	164277	160075	157444	156574	158286	158376	158408	158209	1.912.912
KAZ	3513	3592	3631	3670	3670	3592	3513	3435	3357	3357	3435	3513	42.277

Total value added, Scenario, multiple of per capita

	Oct	Nov	Dec
KYR	19822	35232	39664
TAD	76262	111647	94244
TUR	18174	18174	18174
UZB	163709	167189	166902
KAZ	3606	3689	3728

Agricultural value added, baseline, multiple of per capita GDP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
KYR	6957	6957	6957	6957	6957	6957	6957	6957	6957	6957	6957	6957	83483
TAD	31398	31398	31398	31398	31398	31398	31398	31398	31398	31398	31398	31398	376781
TUR	17553	17553	17553	17553	17553	17553	17553	17553	17553	17553	17553	17553	210631
UZB	151185	151185	151185	151185	151185	151185	151185	151185	151185	151185	151185	151185	1814218
KAZ	3122	3122	3122	3122	3122	3122	3122	3122	3122	3122	3122	3122	37469

Agricultural value added, Scenario, multiple of per

	Oct	Nov	Dec
KYR	7300	7300	7300
TAD	33126	33126	33126
TUR	18174	18174	18174
UZB	157163	157163	157163
KAZ	3219	3219	3219

Hydropower value added, baseline, multiple of per capita GDP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
KYR	13754	21677	20894	24932	27247	25506	20455	13348	10483	8179	10031	12642	209147
TAD	57187	72214	60601	53403	48717	45896	36408	26457	14096	17129	32552	45162	509823
TUR	0	0	0	0	0	0	0	0	0	0	0	0	0
UZB	6387	10026	9739	10373	13092	8890	6259	5390	7101	7191	7223	7024	98694
KAZ	391	469	508	547	547	469	391	313	235	235	313	390	4807

Note: Includes monthly costs for operation and (for new HEPS) depreciation

Hydropower value added, Scenario, multiple of pe

	Oct	Nov	Dec
KYR	12522	27931	32364
TAD	43136	78521	61117
TUR	0	0	0
UZB	6545	10026	9739
KAZ	386	469	508

Note: Includes monthly costs for operation and (f

Charts are also available for all tables presented in this section.

How to view summary hydropower data

Summary hydropower data are available on the “HEPS” worksheet. The following types of summary data are presented:

1. Aggregated value added and generation data are presented at the basin and national level. The national-level aggregated data include only Kyrgyzstan and Tajikistan. The other riparian countries are not included because the overwhelming majority of hydropower production in the basin takes place in Kyrgyzstan and Tajikistan.

1

Hydro power value added, mUSD

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Baseline	163	222	197	195	200	177	139	100	74	75	110	140	1.793
Scenario	134	248	225	231	236	194	128	108	90	113	160	154	2.021
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Baseline	32	50	48	57	63	59	47	31	24	19	23	29	481
Scenario	29	64	74	79	77	64	34	23	17	17	23	40	542
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Baseline	109	137	115	101	93	87	69	50	27	33	62	86	969
Scenario	82	149	116	115	115	98	70	66	49	72	113	89	1.134

Hydro power generation, GWh

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Baseline	2.002	2.428	1.771	1.624	1.747	1.780	1.641	1.434	1.587	1.506	1.525	1.531	20.576
Scenario	1.420	2.868	2.192	2.028	2.103	1.963	1.419	1.443	1.722	2.496	2.742	1.824	24.220
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Baseline	345	543	451	531	607	690	653	480	516	339	289	294	5.737
Scenario	288	783	857	837	808	778	394	288	288	288	288	513	6.410
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Baseline	1.399	1.513	997	774	709	772	737	675	497	583	824	942	10.423
Scenario	865	1.712	1.012	874	870	867	741	868	858	1.621	2.043	1.004	13.334

2. Hydropower generation and value added are also presented for individual reservoirs and hydropower facilities.

2

Hydro power generation, baseline, MWh

HydroProd	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Res_KAM	0	0	0	0	0	0	0	0	0	0	0	0	0
Res_TOK	344.701	542.930	451.328	531.190	607.272	689.720	652.921	479.535	515.703	339.020	288.792	293.519	5.736.631
Res_AND	71.686	71.085	70.468	68.674	65.444	61.583	59.470	63.352	70.247	71.871	71.672	71.860	817.412
Res_KAR	79.921	82.587	84.995	84.995	84.142	84.142	84.995	84.995	84.995	64.271	84.995	82.691	987.724
Res_CHA	144.000	198.835	148.749	144.000	256.629	144.000	144.000	144.000	410.816	426.246	272.991	147.261	2.581.527
Res_SHA	68.169	68.254	68.254	68.254	68.254	68.254	68.254	68.254	68.254	68.254	68.215	68.129	818.799
Res_ROG	0	0	0	0	0	0	0	0	0	0	0	0	0
Res_NUR	1.247.250	1.358.858	841.717	620.805	559.247	626.701	592.386	527.061	341.644	447.250	667.644	787.360	8.617.923
Res_TMP	46.412	105.738	105.739	105.746	105.746	105.690	39.034	66.744	95.618	88.917	70.679	80.133	1.016.196
Res_TMR	0	0	0	0	0	0	0	0	0	0	0	0	0
Res_DAS	0	0	0	0	0	0	0	0	0	0	0	0	0
Res_ZAR	0	0	0	0	0	0	0	0	0	0	0	0	0
Res_NAR	0	0	0	0	0	0	0	0	0	0	0	0	0
Res_FAR	0	0	0	0	0	0	0	0	0	0	0	0	0
Res_VAH	0	0	0	0	0	0	0	0	0	0	0	0	0
Res_CHI	0	0	0	0	0	0	0	0	0	0	0	0	0

Hydro power value added, baseline, 1000 USD

HydroInc	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Res_KAM	0	0	0	0	0	0	0	0	0	0	0	0	0
Res_TOK	31.635	49.856	48.056	57.343	62.669	58.663	47.046	30.701	24.111	18.811	23.072	29.076	481.039
Res_AND	4.784	5.705	6.140	6.487	6.261	5.135	4.174	3.494	2.827	2.876	3.827	4.793	56.503
Res_KAR	5.508	6.770	7.490	8.066	8.007	6.863	5.762	4.609	3.457	2.835	4.609	5.647	69.623
Res_CHA	14.400	20.570	19.029	20.160	28.044	17.280	14.400	11.520	16.644	17.107	16.680	14.563	210.397
Res_SHA	4.608	5.535	5.997	6.458	6.458	5.535	4.613	3.690	2.768	2.768	3.689	4.606	56.725
Res_ROG	0	0	0	0	0	0	0	0	0	0	0	0	0
Res_NUR	98.363	124.732	101.512	86.913	78.295	75.204	59.239	42.165	20.499	26.835	53.412	75.368	842.537
Res_TMP	4.121	8.504	9.213	9.922	9.922	8.501	3.752	4.110	3.949	3.747	4.267	5.807	75.815
Res_TMR	0	0	0	0	0	0	0	0	0	0	0	0	0
Res_DAS	0	0	0	0	0	0	0	0	0	0	0	0	0
Res_ZAR	0	0	0	0	0	0	0	0	0	0	0	0	0
Res_NAR	0	0	0	0	0	0	0	0	0	0	0	0	0
Res_FAR	0	0	0	0	0	0	0	0	0	0	0	0	0
Res_VAH	0	0	0	0	0	0	0	0	0	0	0	0	0
Res_CHI	0	0	0	0	0	0	0	0	0	0	0	0	0

3. Average heads are also presented for all reservoirs and hydropower facilities.

3

Hydro power heads, m

HydroHead	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Res_KAM	85	85	85	85	85	85	85	85	85	85	85	85
Res_TOK	178	181	181	181	179	176	172	168	165	164	167	173
Res_AND	99	98	97	94	90	85	82	87	97	99	99	99
Res_KAR	20	20	21	21	21	21	21	21	21	21	21	20
Res_CHA	145	145	147	145	131	115	112	126	141	146	147	147
Res_SHA	22	22	22	22	22	22	22	22	22	22	22	22
Res_ROG	86	86	86	86	86	86	86	86	86	86	86	86
Res_NUR	189	216	223	222	217	205	186	161	138	133	147	163
Res_TMP	15	15	15	15	15	15	15	15	15	15	15	15
Res_TMR	0	0	0	0	0	0	0	0	0	0	0	0
Res_DAS	55	55	55	55	55	55	55	55	55	55	55	55
Res_ZAR	85	85	85	85	85	85	85	85	85	85	85	85
Res_NAR	0	0	0	0	0	0	0	0	0	0	0	0
Res_FAR	0	0	0	0	0	0	0	0	0	0	0	0
Res_VAH	0	0	0	0	0	0	0	0	0	0	0	0
Res_CHI	0	0	0	0	0	0	0	0	0	0	0	0

Charts are also available for all tables presented in this section.

How to view summary agricultural data

Summary agricultural data are available on the “agriculture” worksheet. All data are aggregated to the basin-wide level and are also disaggregated by country and by crop type. The following types of summary data are presented:

1. Agricultural value added: Agricultural value added is equal to the difference between agricultural production value and agricultural input costs. These tables allow the user to view the impact of a scenario on the welfare of the agricultural sector. The disaggregated data allow the user to see how the welfare impacts of a given scenario are distributed by country and by crop type.
2. Agricultural production value: Agricultural production value is equal to the product of agricultural production value and crop sakes price. These tables allow the user to view the impact of a scenario on gross revenue to agriculture. The disaggregated data allow the user to see how impacts are distributed by country and crop type.
3. Agricultural production: Agricultural production is equal to the product of crop yield times crop area. These tables allow the user to view the impact of a scenario on crop production. The disaggregated data allow the user to see how impacts are distributed by country and crop type.

1

Agricultural value added, baseline, 1000 USD/year

	cot	wht	ric	alf	veg	fru	oth	Total
KYR	66.439	68.249	12.014	24.373	-369	7.026	14.281	192.013
TAD	221.912	124.262	74.225	29.306	8.767	60.477	196.926	715.875
TUR	771.750	273.616	42.345	41.704	24.176	170.849	44.659	1.369.099
UZB	2.784.742	898.126	156.058	222.774	283.288	177.083	739.161	5.261.232
KAZ	254.356	40.496	14.039	109.497	605	3.033	20.106	442.132
All	4.099.199	1.404.749	298.681	427.654	316.467	418.468	1.015.133	7.980.351

Agricultural value added, Scenario, 1000 USD/

	cot	wht	ric
KYR	73.351	79.388	10.666
TAD	255.405	102.191	109.174
TUR	842.649	224.161	66.466
UZB	3.202.436	717.879	145.818
KAZ	280.720	36.349	15.912
All	4.654.561	1.159.968	348.036

2

Agricultural production value, baseline, 1000 USD

AgriSales	cot	wht	ric	alf	veg	fru	oth	Total
KYR	91.468	83.882	14.860	36.605	15.817	9.303	62.631	314.566
TAD	324.500	253.842	81.244	48.810	39.903	67.106	232.023	1.047.428
TUR	1.312.500	678.240	46.540	52.940	48.859	195.697	56.459	2.391.235
UZB	3.689.000	1.503.390	187.729	287.964	807.521	210.255	1.008.352	7.694.211
KAZ	352.000	67.666	15.923	136.633	16.140	33.255	64.223	685.840
All	5.769.468	2.587.020	346.296	562.952	928.240	515.616	1.423.688	12.133.280

Agricultural production Scenario, 1000 USD

	cot	wht	ric
KYR	102.635	98.536	13.328
TAD	382.643	214.418	120.004
TUR	1.454.858	573.584	73.088
UZB	4.295.472	1.218.683	176.100
KAZ	392.256	58.115	18.082
All	6.627.864	2.163.336	400.602

3

Agricultural production, baseline, ton/year

AgriProd	cot	wht	ric	alf	veg	fru	oth	Total
KYR	91.468	279.606	29.719	366.050	395.415	20.672	835.080	2.018.010
TAD	324.500	846.140	162.488	488.104	997.569	149.124	3.093.641	6.061.566
TUR	1.312.500	2.260.800	93.079	529.401	1.221.484	434.882	752.784	6.604.930
UZB	3.689.000	5.011.300	375.459	2.879.640	20.188.041	467.233	13.444.693	46.055.366
KAZ	352.000	225.554	31.844	1.366.325	403.488	73.899	856.295	3.309.405
All	5.769.468	8.623.400	692.589	5.629.520	23.205.997	1.145.810	18.982.493	64.049.277

Agricultural production Scenario, ton/year

	cot	wht	ric
KYR	102.635	328.454	26.656
TAD	382.643	714.723	240.007
TUR	1.454.858	1.911.947	146.177
UZB	4.295.472	4.062.276	352.199
KAZ	392.256	193.719	36.165
All	6.627.864	7.211.119	801.204

4. Water use: These tables allow the user to view the impact of a scenario on agricultural water use. The disaggregated data allow the user to see how impacts are distributed by country and crop type.
5. Land use: These tables allow the user to view the impact of a scenario on agricultural land use. The disaggregated data allow the user to see how impacts are distributed by country and crop type.
6. Labor use: These tables allow the user to view the impact of a scenario on agricultural labor use. The disaggregated data allow the user to see how impacts are distributed by country and crop type.

4

Water use, baseline, mm3

WaterUse	cot	wht	ric	alf	veg	fru	oth	Total
KYR	220	145	194	324	127	22	1.018	2.050
TAD	2.547	2.984	700	1.304	537	189	806	9.067
TUR	13.419	7.162	525	1.152	341	548	295	23.442
UZB	16.590	9.219	2.841	4.308	6.151	569	6.569	46.247
KAZ	1.809	452	247	2.013	193	542	968	6.224
All	34.585	19.962	4.507	9.101	7.349	1.870	9.656	87.030

Water use, counterfactural mm3

	cot	wht	ric
KYR	257	178	181
TAD	3.172	2.536	1.081
TUR	15.223	6.189	830
UZB	20.211	7.592	2.727
KAZ	2.067	361	286
All	40.930	16.856	5.105

5

Land use, baseline, ha

LandUse	cot	wht	ric	alf	veg	fru	oth	Total
KYR	40.500	37.400	13.300	57.700	26.361	5.500	154.968	335.729
TAD	166.000	310.000	32.800	92.000	50.710	16.010	112.490	780.010
TUR	875.000	968.000	19.600	53.000	40.200	60.020	37.820	2.053.640
UZB	1.463.200	1.448.000	148.000	307.500	853.800	80.120	862.790	5.163.410
KAZ	158.000	65.000	8.800	127.999	25.300	73.000	141.400	599.499
All	2.702.700	2.828.400	222.500	638.199	996.371	234.650	1.309.468	8.932.288

Land use, Scenario, ha

	cot	wht	ric
KYR	47.385	45.810	12.438
TAD	205.884	268.482	50.605
TUR	990.630	835.941	30.944
UZB	1.768.672	1.198.094	141.506
KAZ	180.480	52.073	10.145
All	3.193.051	2.400.400	245.638

6

Labor use, baseline, 1000 USD/year

LabrUse	cot	wht	ric	alf	veg	fru	oth	Total
KYR	9.720	5.984	1.064	4.616	6.327	880	18.596	47.187
TAD	39.840	49.600	2.624	7.360	12.170	2.562	13.498	127.654
TUR	210.000	154.880	1.568	4.240	9.648	9.603	4.539	394.478
UZB	351.168	231.680	11.840	24.600	204.912	12.819	103.535	940.554
KAZ	37.921	10.400	704	10.240	6.072	11.680	16.968	93.985
All	648.649	452.544	17.800	51.056	239.129	37.544	157.136	1.603.858

Labor use, Scenario, 1000 USD/year

	cot	wht	ric
KYR	11.372	7.330	995
TAD	49.412	42.958	4.049
TUR	237.751	133.751	2.476
UZB	424.480	191.696	11.321
KAZ	43.315	8.331	812
All	766.330	384.066	19.653

7. Ratio of value added to water use: These tables allow the user to see how the ratio of value added to water use changes from the baseline to the scenario for each country and crop type.
8. Ratio of value added to land use: These tables allow the user to see how the ratio of value added land use changes from the baseline to the scenario for each country and crop type.

7

Ratio of value added to water use, baseline, USD/1000m3

	cot	wht	ric	alf	veg	fru	oth	Total
KYR	302	471	62	75	-3	319	14	94
TAD	87	42	106	22	16	320	244	79
TUR	58	38	81	36	71	312	151	58
UZB	168	97	55	52	46	**311**	113	114
KAZ	141	90	57	54	3	6	21	71
All	119	70	66	47	43	224	105	92

Green shaded cells are highest value, red shaded cells are lowest value (of flexible crops)

Ratio of value added to water us

	cot	wht
KYR	285	446
TAD	81	40
TUR	55	36
UZB	158	95
KAZ	136	101
All	114	69

8

Ratio of value added to land use, baseline, USD/ha

	cot	wht	ric	alf	veg	fru	oth	Total
KYR	1.640	1.825	903	422	-14	1.277	92	572
TAD	1.337	401	2.263	319	173	3.777	1.751	918
TUR	882	283	2.160	787	601	**2.847**	1.181	667
UZB	1.903	620	1.054	724	332	**2.210**	857	1.019
KAZ	1.610	623	1.595	855	24	42	142	738
All	1.517	497	1.342	670	318	1.783	775	893

Green shaded cells are highest value, red shaded cells are lowest value (of flexible crops)

Ratio of value added to land use,

	cot	wht
KYR	1.548	1.733
TAD	1.241	381
TUR	851	268
UZB	1.811	599
KAZ	1.555	698
All	1.458	483

9. Yield: These tables allow the user to see how crop yields change from the baseline to the scenario for each country and crop type.
10. Water intensity: These tables allow the user to see how per hectare water use changes from the baseline to the scenario for each country and crop type.

9

Yield, baseline, ton/ha

	cot	wht	ric	alf	veg	fru	oth	Total
KYR	2,3	7,5	2,2	6,3	15,0	3,8	5,4	6,0
TAD	2,0	2,7	5,0	5,3	19,7	9,3	27,5	7,8
TUR	1,5	2,3	4,7	10,0	30,4	7,2	19,9	3,2
UZB	2,5	3,5	2,5	9,4	23,6	5,8	15,6	8,9
KAZ	2,2	3,5	3,6	10,7	15,9	1,0	6,1	5,5
All	2,1	3,0	3,1	8,8	23,3	4,9	14,5	7,2

Yield, Scenario, ton/ha

	cot	wht
KYR	2,2	7,2
TAD	1,9	2,7
TUR	1,5	2,3
UZB	2,4	3,4
KAZ	2,2	3,7
All	2,1	3,0

10

Water intensity baseline, m3/ha

	cot	wht	ric	alf	veg	fru	oth	Total
KYR	5,4	3,9	14,6	5,6	4,8	4,0	6,6	6,1
TAD	15,3	9,6	21,3	14,2	10,6	11,8	7,2	11,6
TUR	15,3	7,4	26,8	21,7	8,5	9,1	7,8	11,4
UZB	11,3	6,4	19,2	14,0	7,2	7,1	7,6	9,0
KAZ	11,4	7,0	28,1	15,7	7,6	7,4	6,8	10,4
All	12,8	7,1	20,3	14,3	7,4	8,0	7,4	9,7

Water intensity scenario, m3/ha

	cot	wht
KYR	5,4	3,9
TAD	15,4	9,4
TUR	15,4	7,4
UZB	11,4	6,3
KAZ	11,5	6,9
All	12,8	7,0

Charts are also available for all tables presented in this section.

How to view agricultural data that are disaggregated by planning zone

Agricultural data that are disaggregated by planning zone are available on the “agricultureByZone” worksheet. Data presented are the same as data presented on the “agriculture” worksheet. The following types of summary data are presented:

1. Agricultural value added.
2. Agricultural production value.

1

204.682 618.001

Agricultural value added, baseline, 1000 USD/year

	cot	wht	ric	alf	veg	fru	oth	Total
FER_UZB	651.318	296.524	37.678	97.925	125.351	10.315	269.491	1.488.602
SYR_UZB	368.950	128.286	14.366	7.985	5.704	5.470	30.136	560.897
CHI_UZB	207.402	80.006	32.008	14.339	59.128	22.736	104.712	520.331
SUR_UZB	268.750	94.494	11.951	8.070	33.154	7.516	77.680	501.615
KAS_UZB	349.524	48.958	3.432	9.504	-975	706	39.147	450.296
ZAR_UZB	598.904	178.962	37.996	58.455	60.619	389	194.434	1.129.759
SOU_UZB	339.894	70.896	18.627	26.496	307	129.951	23.561	609.732
SYR_KAZ	63.130	17.940	302	11.132	578	324	11.073	104.479
CHI_KAZ	28.392	8.068	136	5.006	260	146	4.980	46.988
NOR_KAZ	162.834	14.488	13.601	93.359	-233	2.563	4.053	290.665
AMU_TUR	539.784	192.718	42.059	32.957	21.715	5.325	32.391	866.949
SOU_TUR	231.966	80.898	286	8.747	2.461	165.524	12.268	502.150
FER_KYR	66.439	68.249	12.014	24.373	-369	7.026	14.281	192.013
FER_TAD	26.281	58.207	21.575	10.142	6.765	8.856	88.949	220.775
UPA_TAD	192.806	59.798	50.331	18.074	1.275	50.669	98.415	471.368
ZAR_TAD	2.825	6.257	2.319	1.090	727	952	9.562	23.732
UPA_AFG	0	0	0	0	0	0	0	0
All	4.099.199	1.404.749	298.681	427.654	316.467	418.468	1.015.133	7.980.351

225.864 617.998

Agricultural value added, Scenario, 1000 USD/year

	cot	wht	ric
FER_UZB	708.080	258.042	31.952
SYR_UZB	431.035	99.323	15.036
CHI_UZB	245.653	63.448	31.759
SUR_UZB	306.546	75.669	10.945
KAS_UZB	436.338	26.864	2.367
ZAR_UZB	698.950	132.797	34.505
SOU_UZB	375.834	61.736	19.254
SYR_KAZ	68.150	18.517	244
CHI_KAZ	30.650	8.328	110
NOR_KAZ	181.920	9.504	15.558
AMU_TUR	592.447	154.724	66.232
SOU_TUR	250.202	69.437	234
FER_KYR	73.351	79.388	10.666
FER_TAD	27.584	55.199	30.361
UPA_TAD	224.860	41.058	75.548
ZAR_TAD	2.961	5.934	3.265
UPA_AFG	0	0	0
All	4.654.561	1.159.968	348.036

2

Agricultural production value, baseline, 1000 USD

	cot	wht	ric	alf	veg	fru	oth	Total
FER_UZB	856.000	411.390	45.703	109.903	283.456	11.640	321.161	2.039.253
SYR_UZB	508.000	242.400	16.977	14.769	73.612	8.907	65.582	930.247
CHI_UZB	276.000	135.600	38.000	21.335	140.790	25.634	127.551	764.910
SUR_UZB	346.000	143.400	14.091	11.250	107.448	12.070	97.024	731.283
KAS_UZB	462.000	161.400	6.000	16.500	9.463	1.038	56.662	713.063
ZAR_UZB	767.000	300.600	45.207	68.207	184.709	729	250.916	1.617.368
SOU_UZB	474.000	108.600	21.751	46.000	8.043	150.237	89.456	898.087
SYR_KAZ	87.365	23.231	398	15.815	4.236	838	19.010	150.893
CHI_KAZ	39.291	10.448	179	7.112	1.905	377	8.550	67.862
NOR_KAZ	225.344	33.987	15.346	113.706	9.999	32.040	36.663	467.085
AMU_TUR	918.000	505.800	46.040	41.437	43.819	6.161	42.216	1.603.473
SOU_TUR	394.500	172.440	500	11.503	5.040	189.536	14.243	787.762
FER_KYR	91.468	83.882	14.860	36.605	15.817	9.303	62.631	314.566
FER_TAD	44.695	96.704	24.087	17.607	22.842	10.725	102.522	319.182
UPA_TAD	275.000	146.742	54.568	29.310	14.605	55.228	118.480	693.933
ZAR_TAD	4.805	10.396	2.589	1.893	2.456	1.153	11.021	34.313
UPA_AFG	0	0	0	0	0	0	0	0
All	5.769.468	2.587.020	346.296	562.952	928.240	515.616	1.423.688	12.133.280

Agricultural production Scenario, 1000 USD

	cot	wht	ric
FER_UZB	933.944	359.589	38.851
SYR_UZB	602.487	194.535	17.897
CHI_UZB	330.955	110.376	37.968
SUR_UZB	398.141	116.669	12.976
KAS_UZB	594.236	112.108	4.441
ZAR_UZB	905.311	229.305	41.369
SOU_UZB	530.398	96.101	22.598
SYR_KAZ	95.117	24.135	323
CHI_KAZ	42.778	10.855	145
NOR_KAZ	254.361	23.125	17.614
AMU_TUR	1.025.878	423.617	72.675
SOU_TUR	428.980	149.967	413
FER_KYR	102.635	98.536	13.328
FER_TAD	47.726	93.208	33.993
UPA_TAD	329.794	111.190	82.355
ZAR_TAD	5.123	10.020	3.656
UPA_AFG	0	0	0
All	6.627.864	2.163.336	400.602

3. Agricultural production.
4. Water use.

3

Agricultural production, baseline, ton/year	cot	wht	ric	alf	veg	fru	oth	Total
FER_UZB	856.000	1.371.300	91.406	1.099.030	7.086.400	25.867	4.282.147	14.812.150
SYR_UZB	508.000	808.000	33.954	147.692	1.840.311	19.792	874.429	4.232.178
CHI_UZB	276.000	452.000	76.000	213.349	3.519.750	56.966	1.700.678	6.294.743
SUR_UZB	346.000	478.000	28.182	112.500	2.686.200	26.822	1.293.658	4.971.362
KAS_UZB	462.000	538.000	12.000	165.000	236.583	2.306	755.496	2.171.385
ZAR_UZB	767.000	1.002.000	90.415	682.069	4.617.715	1.619	3.345.540	10.506.358
SOU_UZB	474.000	362.000	43.502	460.000	201.082	333.861	1.192.745	3.067.190
SYR_KAZ	87.365	77.437	795	158.145	105.897	1.861	253.467	684.967
CHI_KAZ	39.291	34.826	358	71.124	47.626	837	113.994	308.056
NOR_KAZ	225.344	113.291	30.691	1.137.056	249.965	71.201	488.834	2.316.382
AMU_TUR	918.000	1.686.000	92.079	414.371	1.095.484	13.691	562.884	4.782.509
SOU_TUR	394.500	574.800	1.000	115.030	126.000	421.191	189.900	1.822.421
FER_KYR	91.468	279.606	29.719	366.050	395.415	20.672	835.080	2.018.010
FER_TAD	44.695	322.347	48.173	176.072	571.056	23.834	1.366.956	2.553.133
UPA_TAD	275.000	489.140	109.136	293.104	365.123	122.728	1.579.735	3.233.966
ZAR_TAD	4.805	34.653	5.179	18.928	61.390	2.562	146.950	274.467
UPA_AFG	0	0	0	0	0	0	0	0
All	5.769.468	8.623.400	692.589	5.629.520	23.205.997	1.145.810	18.982.493	64.049.277

Agricultural production Scenario, ton/year	cot	wht	ric
FER_UZB	933.944	1.198.630	77.703
SYR_UZB	602.487	648.449	35.794
CHI_UZB	330.955	367.920	75.935
SUR_UZB	398.141	388.898	25.951
KAS_UZB	594.236	373.695	8.883
ZAR_UZB	905.311	764.349	82.738
SOU_UZB	530.398	320.335	45.195
SYR_KAZ	95.117	80.451	646
CHI_KAZ	42.778	36.185	290
NOR_KAZ	254.361	77.083	35.229
AMU_TUR	1.025.878	1.412.057	145.351
SOU_TUR	428.980	499.890	826
FER_KYR	102.635	328.454	26.656
FER_TAD	47.726	310.692	67.985
UPA_TAD	329.794	370.632	164.711
ZAR_TAD	5.123	33.399	7.311
UPA_AFG	0	0	0
All	6.627.864	7.211.119	801.204

4

Water use, baseline, mm3	cot	wht	ric	alf	veg	fru	oth	Total
FER_UZB	3.167	1.582	563	659	1.694	20	1.408	9.093
SYR_UZB	2.357	1.626	217	362	794	54	909	6.319
CHI_UZB	834	760	454	325	869	46	544	3.832
SUR_UZB	1.261	676	180	168	864	74	514	3.737
KAS_UZB	2.634	2.094	280	570	144	6	401	6.129
ZAR_UZB	3.702	1.875	767	732	1.674	5	1.345	10.100
SOU_UZB	2.635	606	380	1.492	112	364	1.448	7.037
SYR_KAZ	453	87	9	275	47	9	171	1.051
CHI_KAZ	200	38	5	134	20	4	80	481
NOR_KAZ	1.156	327	233	1.604	126	529	717	4.692
AMU_TUR	10.048	5.380	499	914	306	17	247	17.411
SOU_TUR	3.371	1.782	26	238	35	531	48	6.031
FER_KYR	220	145	194	324	127	22	1.018	2.050
FER_TAD	380	603	243	468	206	39	311	2.250
UPA_TAD	2.115	2.271	430	793	289	144	459	6.501
ZAR_TAD	52	110	27	43	42	6	36	316
UPA_AFG	0	0	0	0	0	0	0	0
0	34.585	19.962	4.507	9.101	7.349	1.870	9.656	87.030

Water use, counterfactural mm3	cot	wht	ric
FER_UZB	3.494	1.399	484
SYR_UZB	2.906	1.357	238
CHI_UZB	1.037	642	471
SUR_UZB	1.495	567	171
KAS_UZB	3.698	1.587	226
ZAR_UZB	4.544	1.488	730
SOU_UZB	3.037	552	407
SYR_KAZ	504	93	7
CHI_KAZ	223	40	4
NOR_KAZ	1.340	228	275
AMU_TUR	11.515	4.621	808
SOU_TUR	3.708	1.568	22
FER_KYR	257	178	181
FER_TAD	415	595	351
UPA_TAD	2.700	1.832	691
ZAR_TAD	57	109	39
UPA_AFG	0	0	0
0	40.930	16.856	5.105

5. Land use.

5

Land use, baseline	cot	wht	ric	alf	veg	fru	oth	Total
FER_UZB	331.200	274.800	37.500	56.500	257.500	3.200	165.610	1.126.310
SYR_UZB	225.000	273.000	12.200	32.000	110.600	8.300	113.610	774.710
CHI_UZB	111.000	133.000	28.000	33.000	133.000	7.000	73.200	518.200
SUR_UZB	125.000	117.000	10.000	15.000	121.000	11.000	62.000	461.000
KAS_UZB	182.000	269.000	12.000	33.000	17.000	800	56.140	569.940
ZAR_UZB	272.000	291.000	33.700	46.000	202.100	820	181.030	1.026.650
SOU_UZB	217.000	90.200	14.600	92.000	12.600	49.000	211.200	686.600
SYR_KAZ	39.215	12.658	447	22.089	5.957	1.241	25.440	107.047
CHI_KAZ	17.636	5.693	201	9.934	2.679	558	11.441	48.142
NOR_KAZ	101.149	46.649	8.152	95.976	16.664	71.201	104.519	444.310
AMU_TUR	612.000	749.000	18.600	40.000	36.000	2.020	31.490	1.489.110
SOU_TUR	263.000	219.000	1.000	13.000	4.200	58.000	6.330	564.530
FER_KYR	40.500	37.400	13.300	57.700	26.361	5.500	154.968	335.729
FER_TAD	29.797	92.099	11.738	35.214	26.185	4.515	43.503	243.051
UPA_TAD	133.000	208.000	19.800	53.000	21.710	11.010	64.310	510.830
ZAR_TAD	3.203	9.901	1.262	3.786	2.815	485	4.677	26.129
UPA_AFG	0	0	0	0	0	0	0	0
0	2.702.700	2.828.400	222.500	638.199	996.371	234.650	1.309.468	8.932.288

Land use, Scenario	cot	wht	ric
FER_UZB	365.477	242.936	32.241
SYR_UZB	277.430	227.779	13.371
CHI_UZB	138.030	112.268	29.012
SUR_UZB	148.213	98.086	9.489
KAS_UZB	255.499	203.933	9.695
ZAR_UZB	333.918	230.879	32.075
SOU_UZB	250.105	82.213	15.623
SYR_KAZ	43.636	13.441	371
CHI_KAZ	19.625	6.045	167
NOR_KAZ	117.219	32.587	9.607
AMU_TUR	701.345	643.286	30.109
SOU_TUR	289.285	192.655	835
FER_KYR	47.385	45.810	12.438
FER_TAD	32.591	90.930	16.969
UPA_TAD	169.795	167.779	31.811
ZAR_TAD	3.498	9.773	1.825
UPA_AFG	0	0	0
0	3.193.051	2.400.400	245.638

6. Ratio of value added to land use.
7. Ratio of value added to water use.

6

Value added by water use, baseline, USD/1000m3

	cot	wht	ric	alf	veg	fru	oth	Total
FER_UZB	206	187	67	149	74	516	191	164
SYR_UZB	157	79	66	22	7	101	33	89
CHI_UZB	249	105	71	44	68	494	192	136
SUR_UZB	213	140	66	48	38	102	151	134
KAS_UZB	133	23	12	17	-7	118	98	73
ZAR_UZB	162	95	50	80	36	78	145	112
SOU_UZB	129	117	49	18	3	357	16	87
SYR_KAZ	139	206	34	40	12	36	65	99
CHI_KAZ	142	212	27	37	13	37	62	98
NOR_KAZ	141	44	58	58	-2	5	6	62
AMU_TUR	54	36	84	36	71	313	131	50
SOU_TUR	69	45	11	37	70	312	256	83
FER_KYR	302	471	62	75	-3	319	14	94
FER_TAD	69	97	89	22	33	227	286	98
UPA_TAD	91	26	117	23	4	352	214	73
ZAR_TAD	54	57	86	25	17	159	266	75
UPA_AFG	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
All	119	70	66	47	43	224	105	92

Green shaded cells are highest value, red shaded cells are lowest value (of flexible crops)

Value added by water use, Scenario, USD/1000m3

	cot	wht	ric
FER_UZB	203	184	66
SYR_UZB	148	73	63
CHI_UZB	237	99	67
SUR_UZB	205	133	64
KAS_UZB	118	17	10
ZAR_UZB	154	89	47
SOU_UZB	124	112	47
SYR_KAZ	135	199	35
CHI_KAZ	137	208	28
NOR_KAZ	136	42	57
AMU_TUR	51	33	82
SOU_TUR	67	44	11
FER_KYR	285	446	59
FER_TAD	66	93	86
UPA_TAD	83	22	109
ZAR_TAD	52	54	84
UPA_AFG	#DIV/0!	#DIV/0!	#DIV/0!
All	114	69	68

7

Value added by land use, baseline, USD/ha

	cot	wht	ric	alf	veg	fru	oth	Total
FER_UZB	1.967	1.079	1.005	1.733	487	3.223	1.627	1.322
SYR_UZB	1.640	470	1.178	250	52	659	265	724
CHI_UZB	1.868	602	1.143	435	445	3.248	1.430	1.004
SUR_UZB	2.150	808	1.195	538	274	683	1.253	1.088
KAS_UZB	1.920	182	286	288	-57	883	697	790
ZAR_UZB	2.202	615	1.127	1.271	300	474	1.074	1.100
SOU_UZB	1.566	786	1.276	288	24	2.652	112	888
SYR_KAZ	1.610	1.417	676	504	97	261	435	976
CHI_KAZ	1.610	1.417	677	504	97	262	435	976
NOR_KAZ	1.610	311	1.668	973	-14	36	39	654
AMU_TUR	882	257	2.261	824	603	2.636	1.029	582
SOU_TUR	882	369	286	673	586	2.854	1.938	890
FER_KYR	1.640	1.825	903	422	-14	1.277	92	572
FER_TAD	882	632	1.838	288	258	1.961	2.045	908
UPA_TAD	1.450	287	2.542	341	59	4.602	1.530	923
ZAR_TAD	882	632	1.838	288	258	1.963	2.044	908
UPA_AFG	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
All	1.517	497	1.342	670	318	1.783	775	893

Green shaded cells are highest value, red shaded cells are lowest value (of flexible crops)

Value added by land use, Scenario, USD/ha

	cot	wht	ric
FER_UZB	1.937	1.062	991
SYR_UZB	1.554	436	1.125
CHI_UZB	1.780	565	1.095
SUR_UZB	2.068	771	1.153
KAS_UZB	1.708	132	244
ZAR_UZB	2.093	575	1.076
SOU_UZB	1.503	751	1.232
SYR_KAZ	1.562	1.378	658
CHI_KAZ	1.562	1.378	659
NOR_KAZ	1.552	292	1.619
AMU_TUR	845	241	2.200
SOU_TUR	865	360	280
FER_KYR	1.548	1.733	858
FER_TAD	846	607	1.789
UPA_TAD	1.324	245	2.375
ZAR_TAD	846	607	1.789
UPA_AFG	#DIV/0!	#DIV/0!	#DIV/0!
All	1.458	483	1.417

8. Yield.
9. Water intensity.

8

Yield, baseline, ton/ha

	cot	wht	ric	alf	veg	fru	oth	Total
FER_UZB	2,6	5,0	2,4	19,5	27,5	8,1	25,9	13,2
SYR_UZB	2,3	3,0	2,8	4,6	16,6	2,4	7,7	5,5
CHI_UZB	2,5	3,4	2,7	6,5	26,5	8,1	23,2	12,1
SUR_UZB	2,8	4,1	2,8	7,5	22,2	2,4	20,9	10,8
KAS_UZB	2,5	2,0	1,0	5,0	13,9	2,9	13,5	3,8
ZAR_UZB	2,8	3,4	2,7	14,8	22,8	2,0	18,5	10,2
SOU_UZB	2,2	4,0	3,0	5,0	16,0	6,8	5,6	4,5
SYR_KAZ	2,2	6,1	1,8	7,2	17,8	1,5	10,0	6,4
CHI_KAZ	2,2	6,1	1,8	7,2	17,8	1,5	10,0	6,4
NOR_KAZ	2,2	2,4	3,8	11,8	15,0	1,0	4,7	5,2
AMU_TUR	1,5	2,3	5,0	10,4	30,4	6,8	17,9	3,2
SOU_TUR	1,5	2,6	1,0	8,8	30,0	7,3	30,0	3,2
FER_KYR	2,3	7,5	2,2	6,3	15,0	3,8	5,4	6,0
FER_TAD	1,5	3,5	4,1	5,0	21,8	5,3	31,4	10,5
UPA_TAD	2,1	2,4	5,5	5,5	16,8	11,1	24,6	6,3
ZAR_TAD	1,5	3,5	4,1	5,0	21,8	5,3	31,4	10,5
UPA_AFG	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
All	2,1	3,0	3,1	8,8	23,3	4,9	14,5	7,2

Yield, Scenario, ton/ha

	cot	wht	ric
FER_UZB	2,6	4,9	2,4
SYR_UZB	2,2	2,8	2,7
CHI_UZB	2,4	3,3	2,6
SUR_UZB	2,7	4,0	2,7
KAS_UZB	2,3	1,8	0,9
ZAR_UZB	2,7	3,3	2,6
SOU_UZB	2,1	3,9	2,9
SYR_KAZ	2,2	6,0	1,7
CHI_KAZ	2,2	6,0	1,7
NOR_KAZ	2,2	2,4	3,7
AMU_TUR	1,5	2,2	4,8
SOU_TUR	1,5	2,6	1,0
FER_KYR	2,2	7,2	2,1
FER_TAD	1,5	3,4	4,0
UPA_TAD	1,9	2,2	5,2
ZAR_TAD	1,5	3,4	4,0
UPA_AFG	#DIV/0!	#DIV/0!	#DIV/0!
All	2,1	3,0	3,3

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Water intensity, baseline, m3/ha

	cot	wht	ric	alf	veg	fru	oth	Total
FER_UZB	9.562	5.757	15.013	11.664	6.579	6.250	8.502	8.073
SYR_UZB	10.476	5.956	17.787	11.313	7.179	6.506	8.001	8.157
CHI_UZB	7.514	5.714	16.214	9.848	6.534	6.571	7.432	7.395
SUR_UZB	10.088	5.778	18.000	11.200	7.140	6.727	8.290	8.106
KAS_UZB	14.473	7.784	23.333	17.273	8.471	7.500	7.143	10.754
ZAR_UZB	13.610	6.443	22.760	15.913	8.283	6.098	7.430	9.838
SOU_UZB	12.143	6.718	26.027	16.217	8.889	7.429	6.856	10.249
SYR_KAZ	11.552	6.873	20.134	12.450	7.890	7.252	6.722	9.818
CHI_KAZ	11.340	6.675	24.876	13.489	7.465	7.168	6.992	9.991
NOR_KAZ	11.429	7.010	28.582	16.713	7.561	7.430	6.860	10.560
AMU_TUR	16.418	7.183	26.828	22.850	8.500	8.416	7.844	11.692
SOU_TUR	12.817	8.137	26.000	18.308	8.333	9.155	7.583	10.683
FER_KYR	5.432	3.877	14.586	5.615	4.818	4.000	6.569	6.106
FER_TAD	12.753	6.547	20.702	13.290	7.867	8.638	7.149	9.257
UPA_TAD	15.902	10.918	21.717	14.962	13.312	13.079	7.137	12.726
ZAR_TAD	16.235	11.110	21.395	11.358	14.920	12.371	7.697	12.094
UPA_AFG	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
All	12.796	7.058	20.256	14.260	7.376	7.969	7.374	9.743

Water intensity, Scenario, m3/ha

	cot	wht	ric
FER_UZB	9.560	5.759	15.012
SYR_UZB	10.475	5.958	17.800
CHI_UZB	7.513	5.718	16.235
SUR_UZB	10.087	5.781	18.021
KAS_UZB	14.474	7.782	23.311
ZAR_UZB	13.608	6.445	22.759
SOU_UZB	12.143	6.714	26.051
SYR_KAZ	11.550	6.919	18.868
CHI_KAZ	11.363	6.617	23.952
NOR_KAZ	11.432	6.997	28.625
AMU_TUR	16.418	7.183	26.836
SOU_TUR	12.818	8.139	26.347
FER_KYR	5.424	3.886	14.552
FER_TAD	12.734	6.543	20.685
UPA_TAD	15.902	10.919	21.722
ZAR_TAD	16.295	11.153	21.370
UPA_AFG	#DIV/0!	#DIV/0!	#DIV/0!
All	12.818	7.022	20.783

Charts are also available for all tables presented in this section.

How to view information about reservoir operations

Information about reservoir operations is available on the “reservoirs” worksheet. The following types of information are available:

1. Reservoir discharges, aggregated by country.

Discharges by country, baseline, mm3/month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
Kyrgistan	834	1.295	1.075	1.268	1.461	1.690	1.637	1.227	1.346	892	745	731	KYR
Tadjikstan	5.830	5.199	4.208	4.222	3.461	3.995	4.226	5.432	4.725	4.207	4.368	4.690	TAD
Turkmenistan	190	907	139	1.415	1.799	141	1.397	2.995	5.209	2.095	2.520	268	TUR
Uzbekistan	2.598	4.618	3.789	5.007	5.769	4.487	3.299	5.856	7.550	6.350	5.288	3.558	UZB
Kazakhstan	1.415	1.369	1.379	1.350	1.632	1.604	1.370	1.718	1.350	1.418	1.369	1.350	KAZ
Total	10.867	13.388	10.590	13.262	14.122	11.917	11.929	17.228	20.180	14.962	14.290	10.597	

Discharges by country, Scenario, mm3/month	Oct	Nov	Dec
Kyrgistan	683	1.856	2.047
Tadjikstan	4.335	5.515	4.237
Turkmenistan	196	799	139
Uzbekistan	2.828	4.485	3.810
Kazakhstan	1.415	1.369	1.379
Total	9.457	14.024	11.612

2. Reservoir storage changes, aggregated by river section.

Reservoir change by section, baseline, mm3/month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Upper Syrdarya	-409	717	451	-1.070	-1.648	-1.030	-778	62	2.494	1.682	892	367
Middle Syrdarya	-140	1.236	702	-215	-882	879	191	370	-47	-728	-757	-608
Lower Syrdarya	42	0	0	135	-135	0	237	-237	42	-42	-33	-9
Upper Amudarya	-2.659	1.480	29	-1.455	-688	-826	-90	527	3.423	2.675	2.311	-453
Middle Amudarya	2.453	3.023	1.218	-2.352	-4.408	-35	538	-204	-3.518	2.118	98	1.067
Lower Amudarya	0	0	0	0	0	0	0	0	0	0	0	0
Total	-713	6.456	2.400	-4.957	-7.761	-1.012	98	518	2.394	5.705	2.511	364

Reservoir change by section, Scenario, mm3/month	Oct	Nov	Dec
Upper Syrdarya	-259	34	-777
Middle Syrdarya	-348	1.996	1.651
Lower Syrdarya	807	0	0
Upper Amudarya	-1.164	1.164	0
Middle Amudarya	852	3.685	1.245
Lower Amudarya	0	0	0
Total	-112	6.879	2.119

3. Reservoir volumes, aggregated by river section.

Reservoir volume, baseline, mm3/month	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
Lower Amudarya	2.145	0	0	0	0	0	0	0	0	0	0	0	0	-2145
Lower Syrdarya	5645	6.960	6.960	6.960	7.095	6.960	6.960	7.197	6.960	7.002	6.960	6.927	6.918	1273
Middle Amudary	17.807	12.823	15.846	17.064	14.712	10.305	10.270	10.809	10.604	7.087	9.203	9.303	10.370	-7437
Middle Syrdarya	7.326	5.643	6.879	7.581	7.366	6.483	7.362	7.553	7.923	7.876	7.148	6.391	5.783	-1543
Upper Amudarya	29.509	5.738	8.021	7.963	7.065	6.141	5.244	4.536	3.367	2.826	3.248	4.200	4.757	-24752
Upper Syrdarya	27.929	20.617	20.994	21.156	20.890	19.544	18.548	17.665	16.731	16.839	16.931	18.029	19.604	-8325
Total	90361	51.781	58.700	60.724	57.128	49.433	48.384	47.760	45.585	41.630	43.490	44.850	47.432	-42929

Reservoir volume, Scenario, mm3/month	Oct	Nov	Dec
Lower Amudarya	0	0	0
Lower Syrdarya	6.960	6.960	6.960
Middle Amudarya	11.681	15.367	16.613
Middle Syrdarya	4.849	6.845	8.495
Upper Amudarya	6.906	8.070	8.070
Upper Syrdarya	21.037	21.071	20.294
Total	51.433	58.313	60.432

4. Reservoir volumes, disaggregated by individual reservoir.

Baseline reservoir volume, mm3

ResVol	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Change
Res_KAM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Res_TOK	19.230	19.015	19.301	19.153	19.088	18.334	17.194	16.195	15.328	14.543	14.733	16.115	17.808	-1.422
Res_AND	1751	1.557	1.526	1.408	1.224	1.033	885	875	1.189	1.701	1.900	1.869	1.751	0
Res_KAR	2718	2.692	3.350	3.350	3.350	3.105	3.350	3.350	3.350	3.350	3.350	3.350	2.719	1
Res_CHA	2010	1.781	2.010	2.010	1.739	1.017	802	865	1.552	1.867	2.010	2.010	2.010	0
Res_SHA	5128	5.200	5.200	5.200	5.200	5.200	5.200	5.200	5.200	5.200	5.200	5.167	5.129	1
Res_ROG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Res_NUR	7457	5.250	7.081	7.023	6.745	5.776	4.924	3.906	3.047	2.506	2.797	3.260	3.817	-3.640
Res_TMP	1091	1.242	997	1.290	974	1.290	909	1.290	1.117	1.014	1.189	1.133	1.091	0
Res_TMR	3537	5.700	5.700	6.510	6.510	4.495	3.870	3.870	3.555	2.268	2.268	2.268	3.537	0
Res_DAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Res_ZAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Res_FER	45	45	167	595	578	177	469	595	214	595	298	45	45	0
Res_AHA	54	69	114	137	148	160	210	343	31	31	129	31	54	0
Res_ARN	1000	1.101	1.405	2.084	2.129	2.201	3.000	2.995	2.990	2.628	1.659	1.000	1.000	0
Res_KOK	1750	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Res_KAF	940	488	940	940	320	365	320	630	320	320	451	940	940	0
Res_ZD	482	947	2.200	2.200	2.171	994	994	903	2.149	400	729	750	482	0
Res_TUR	1720	1.831	1.914	2.000	806	400	666	1.319	1.712	1.445	1.551	1.634	1.720	0
Res_SUR	779	823	862	883	611	607	116	273	116	469	720	759	779	0
Res_KAS	757	762	769	777	803	464	579	460	650	702	742	749	757	0
Res_TAL	125	125	1.525	1.525	1.100	1.391	1.391	1.525	641	125	125	131	125	0
Res_BUK	1880	1.393	1.879	1.879	1.737	664	1.745	1.169	664	664	1.879	1.879	1.879	-1
Res_NAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Res_FAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Res_VAH	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Res_CHI	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	50.574	50.378	56.811	58.835	55.246	48.759	46.629	46.344	44.911	40.914	41.601	42.961	45.514	-5.060

Scenario reservoir volume, mm3/month

	Sep	Oct	Nov	Dec
Res_KAM	0	0	0	0
Res_TOK	19499	19.435	19.500	18.669
Res_AND	1751	1.557	1.526	1.408
Res_KAR	2134	1.959	3.350	3.350
Res_CHA	2010	1.781	2.010	2.010
Res_SHA	4364	5.200	5.200	5.200
Res_ROG	0	0	0	0
Res_NUR	7130	6.455	7.130	7.130
Res_TMP	1200	1.065	1.200	1.065
Res_TMR	3337	4.998	5.174	6.510
Res_DAS	0	0	0	0
Res_ZAR	0	0	0	0
Res_FER	45	45	45	217
Res_AHA	53	68	113	135
Res_ARN	1000	1.041	1.372	3.000
Res_KOK	1750	1.750	1.750	1.750
	0	0	0	0
Res_KAF	940	451	940	940
Res_ZD	1330	1.134	2.200	2.178
Res_TUR	1544	1.655	1.738	1.824
Res_SUR	883	862	883	883
Res_KAS	757	762	769	777
Res_TAL	247	125	1.524	1.497
Res_BUK	1531	1.080	1.879	1.879
Res_NAR	0	0	0	0
Res_FAR	0	0	0	0
Res_VAH	0	0	0	0
Res_CHI	0	0	0	0
Total	49.974	50.343	56.424	58.543

5. Reservoir discharges, disaggregated by individual reservoir.

Baseline discharges, mm3/month

OutDis			Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
KYR	Big		0	0	0	0	0	0	0	0	0	0	0	0
KYR	Big	Res_TOK	834	1.295	1.075	1.268	1.461	1.690	1.637	1.227	1.346	892	745	731
TAD	Big	Res_AND	314	314	314	314	314	314	314	314	314	314	314	314
TAD	Big	Res_KAR	1.866	1.866	1.866	1.866	1.866	1.866	1.866	1.866	1.866	1.411	1.866	1.866
UZB	Big	Res_CHA	455	628	462	456	894	573	589	524	1.338	1.338	848	458
KAZ	Big	Res_SHA	1.350	1.350	1.350	1.350	1.350	1.350	1.350	1.350	1.350	1.350	1.350	1.350
TAD	Big		0	0	0	0	0	0	0	0	0	0	0	0
TAD	Big	Res_NUR	3.023	2.881	1.733	1.283	1.180	1.400	1.457	1.500	1.136	1.537	2.087	2.215
UZB	Big	Res_TMP	1.449	3.299	3.299	3.299	3.299	3.299	1.219	2.088	2.990	2.776	2.206	2.501
UZB	Big		0	0	0	0	0	0	0	0	0	0	0	0
TAD	Big		0	0	0	0	0	0	0	0	0	0	0	0
TAD	Big		0	0	0	0	0	0	0	0	0	0	0	0
FER	Middle	Res_FER	279	1.004	184	173	538	0	298	1.396	1.385	1.602	1.379	612
UZB	Middle	Res_AHA	0	0	0	0	0	0	0	548	178	0	142	0
UZB	Middle	Res_ARN	0	0	0	0	0	0	0	0	357	964	654	0
KAZ	Middle	Res_KOK	0	0	0	0	0	0	0	0	0	0	0	0
KAZ	Middle	Res_ARY	65	19	29	0	282	254	20	368	0	68	19	0
TAD	Middle	Res_KAF	627	138	295	759	101	415	589	1.752	1.409	945	101	295
TUR	Middle	Res_ZD	190	907	139	29	1.177	0	1.397	2.753	4.697	2.095	2.520	268
TUR	Middle	Res_TUR	0	0	0	1.386	622	141	0	242	512	0	0	0
UZB	Middle	Res_SUR	0	0	0	363	119	615	293	851	148	0	0	0
UZB	Middle	Res_KAS	0	0	0	0	377	0	255	0	0	0	0	0
UZB	Middle	Res_TAL	132	691	28	425	0	0	344	884	1.164	791	787	249
UZB	Middle	Res_BUK	562	0	0	464	1.080	0	599	961	1.375	481	651	350
KYR	Cascade		0	0	0	0	0	0	0	0	0	0	0	0
UZB	Cascade		0	0	0	0	0	0	0	0	0	0	0	0
TAD	Cascade		0	0	0	0	0	0	0	0	0	0	0	0
UZB	Cascade	Res_CHI	0	0	0	0	0	0	0	0	0	0	0	0
Total			10.584	14.392	#NAME?	12.971	13.580	11.917	11.628	17.663	20.190	16.083	15.018	10.859

Scenario discharges, mm3/month

			Oct	Nov	Dec
KYR	Big		0	0	0
KYR	Big	Res_TOK	683	1.856	2.047
TAD	Big	Res_AND	314	314	314
TAD	Big	Res_KAR	1.866	1.866	1.866
UZB	Big	Res_CHA	455	628	462
KAZ	Big	Res_SHA	1.350	1.350	1.350
TAD	Big		0	0	0
TAD	Big	Res_NUR	1.491	3.234	1.762
UZB	Big	Res_TMP	1.735	3.299	3.299
UZB	Big		0	0	0
TAD	Big		0	0	0
TAD	Big		0	0	0
FER	Middle	Res_FER	279	1.126	439
UZB	Middle	Res_AHA	0	0	0
UZB	Middle	Res_ARN	0	0	0
KAZ	Middle	Res_KOK	0	0	0
KAZ	Middle	Res_ARY	65	19	29
TAD	Middle	Res_KAF	664	101	295
TUR	Middle	Res_ZD	196	799	139
TUR	Middle	Res_TUR	0	0	0
UZB	Middle	Res_SUR	65	18	21
UZB	Middle	Res_KAS	0	0	0
UZB	Middle	Res_TAL	122	540	28
UZB	Middle	Res_BUK	451	0	0
KYR	Cascade		0	0	0
UZB	Cascade		0	0	0
TAD	Cascade		0	0	0
UZB	Cascade	Res_CHI	0	0	0
Total	Total	Total	9.285	15.150	12.051

6. Reservoir spills, disaggregated by individual reservoir.

6

Baseline reservoir overflow, mm3/month

OutFlw	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Res_KAM	0	0	0	0	0	0	0	0	0	0	0	0
Res_TOK	0	0	0	0	0	0	0	0	0	0	0	0
Res_AND	0	0	0	0	0	0	0	0	0	-81	0	0
Res_KAR	0	0	0	0	0	-213	0	0	0	0	0	0
Res_CHA	0	0	0	0	0	0	0	0	0	0	0	0
Res_SHA	-343	0	0	0	0	0	0	0	0	0	0	0
Res_ROG	0	0	0	0	0	0	0	0	0	0	0	0
Res_NUR	0	0	0	0	0	0	0	0	0	0	0	0
Res_TMP	0	0	0	0	0	0	0	0	0	0	0	0
Res_TMR	0	0	0	0	0	0	0	0	0	0	0	0
Res_DAS	0	0	0	0	0	0	0	0	0	0	0	0
Res_ZAR	0	0	0	0	0	0	0	0	0	0	0	0
Res_FER	0	0	0	0	0	0	0	0	0	0	0	0
Res_AHA	0	0	0	0	0	0	0	0	0	0	0	0
Res_ARN	0	0	0	0	0	0	0	0	0	0	0	0
Res_KOK	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
Res_KAF	0	0	0	0	0	0	0	0	0	0	0	0
Res_ZD	0	0	0	0	0	0	0	0	0	0	0	0
Res_TUR	0	0	0	0	0	0	0	0	0	0	0	0
Res_SUR	0	0	0	0	0	0	0	0	0	0	0	0
Res_KAS	0	0	0	0	0	0	0	0	0	0	0	0
Res_TAL	0	0	0	0	0	0	0	0	0	0	0	0
Res_BUK	0	0	0	0	0	0	0	0	0	0	0	0
Res_NAR	0	0	0	0	0	0	0	0	0	0	0	0
Res_FAR	0	0	0	0	0	0	0	0	0	0	0	0
Res_VAH	0	0	0	0	0	0	0	0	0	0	0	0
Res_CHI	0	0	0	0	0	0	0	0	0	0	0	0
Total	-343	0	0	0	0	-213	0	0	0	-81	0	0

Scenario reservoir overflow, mm3/month

	Oct	Nov	Dec
Res_KAM	0	0	0
Res_TOK	0	0	0
Res_AND	0	0	0
Res_KAR	0	0	-1.211
Res_CHA	0	0	0
Res_SHA	0	0	0
Res_ROG	0	0	0
Res_NUR	0	0	0
Res_TMP	0	0	0
Res_TMR	0	0	0
Res_DAS	0	0	0
Res_ZAR	0	0	0
Res_FER	0	0	0
Res_AHA	0	0	0
Res_ARN	0	0	0
Res_KOK	0	0	0
	0	0	0
Res_KAF	0	0	0
Res_ZD	0	0	0
Res_TUR	0	0	0
Res_SUR	0	0	0
Res_KAS	0	0	0
Res_TAL	0	0	0
Res_BUK	0	0	0
Res_NAR	0	0	0
Res_FAR	0	0	0
Res_VAH	0	0	0
Res_CHI	0	0	0
Total	0	0	-1.211

Charts are also available for all tables presented in this section.

How to view other information about the water balance of the basin

Other information about the water balance of the basin is available on the worksheets “waterBalance” and “balanceZoneDetail”. Much of this information is used to check water balances within the GAMS model and for other quality assurance purposes. However, some of the information on these worksheets may be useful for interpreting scenario impacts. This information is summarized here.

1. Inflows to terminal lakes in the basin are presented in the tables called “Lake inflows” on the “waterBalance” worksheet. This information is useful for interpreting the impact of a particular scenario on inflows to the Aral Sea and other terminal lakes.

1

Lake inflows (baseline), mm3/month

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Aral Sea North	1.521	1.207	1.307	1.003	1.191	1.527	1.165	982	705	674	669	919
Aral Sea South	1.101	2.501	2.970	1.876	1.585	2.849	409	300	300	300	300	1.328
Golden Lake	2	32	0	42	52	0	93	175	228	274	126	59
Lake Ayd	55	55	55	55	55	55	5	5	5	5	5	5
Syr Darya Lakes	47	113	39	109	134	73	222	326	466	417	376	184
Amu Darya Lakes	89	841	231	227	288	75	268	589	1.003	511	591	160
All lakes	2.815	4.749	4.602	3.312	3.305	4.579	2.162	2.377	2.707	2.181	2.067	2.655

Note: This table includes return flow to lakes, which is not included in the "- to lakes" rows in the tables above.

Lake inflows (Scenario), mm3/month

	Oct	Nov	Dec
Aral Sea North	1.202	1.235	1.307
Aral Sea South	1.406	2.555	2.970
Golden Lake	2	32	0
Lake Ayd	55	55	222
Syr Darya Lakes	47	113	39
Amu Darya Lakes	89	841	231
All lakes	2.801	4.831	4.769

Note: This table includes return flow to lakes

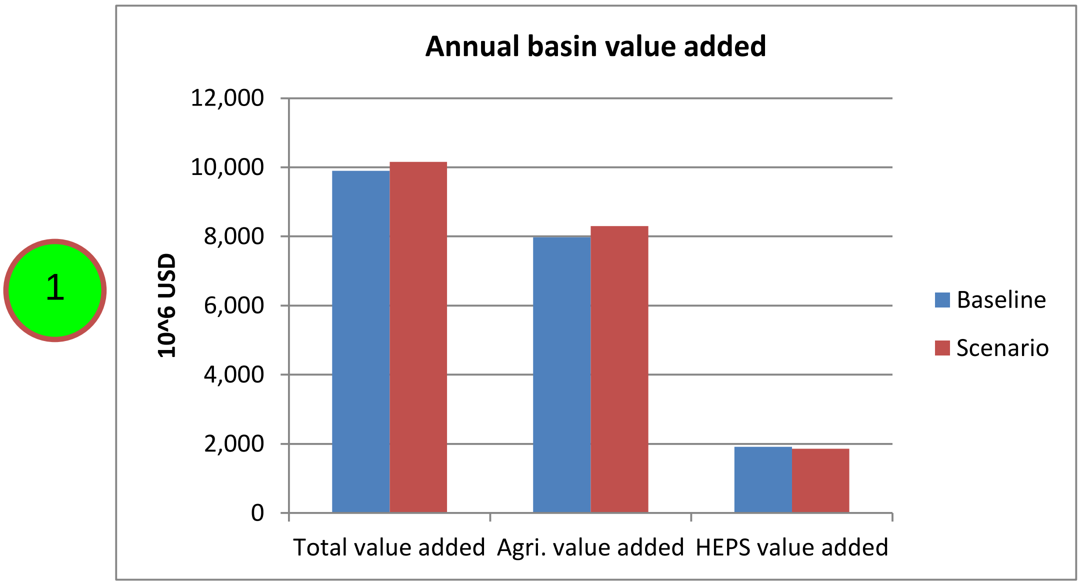
Reporting

A number of charts have been developed in an effort to standardize the reporting of scenario results and facilitate the interpretation of scenario impacts. To be consistent with the goals of the project, it should be possible to interpret the results of each scenario in terms of impacts on effectiveness, efficiency, and equity. Each chart has been developed with the intention to provide information on the impacts of a scenario on one of these three considerations.

Which charts can be used to report on effectiveness impacts?

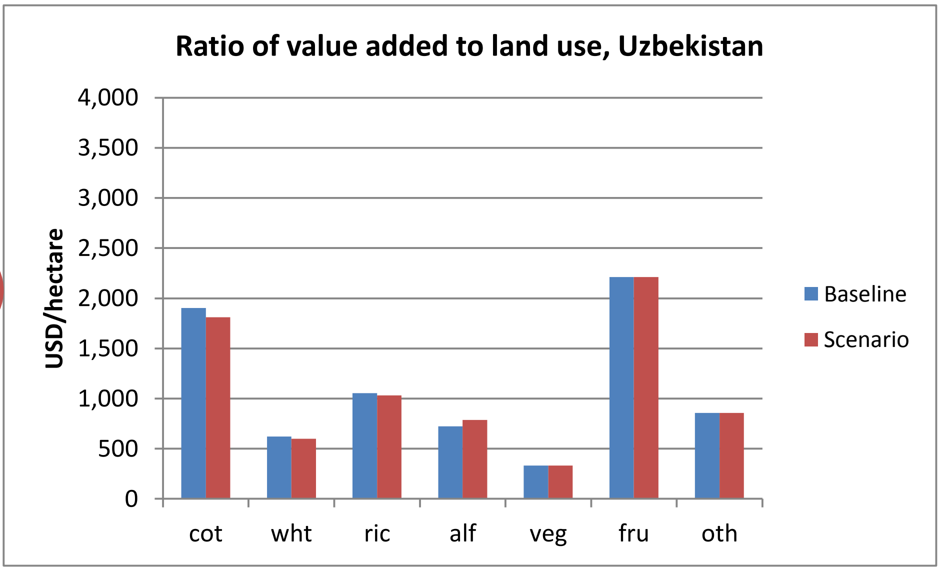
Effectiveness is defined as a measure of the extent to which water allocation institutions maximize welfare. Welfare is defined here at the basin scale. Therefore, a change to water allocation is considered to increase effectiveness if the change increases overall welfare at the basin scale. The following charts can be used to report on effectiveness impacts:

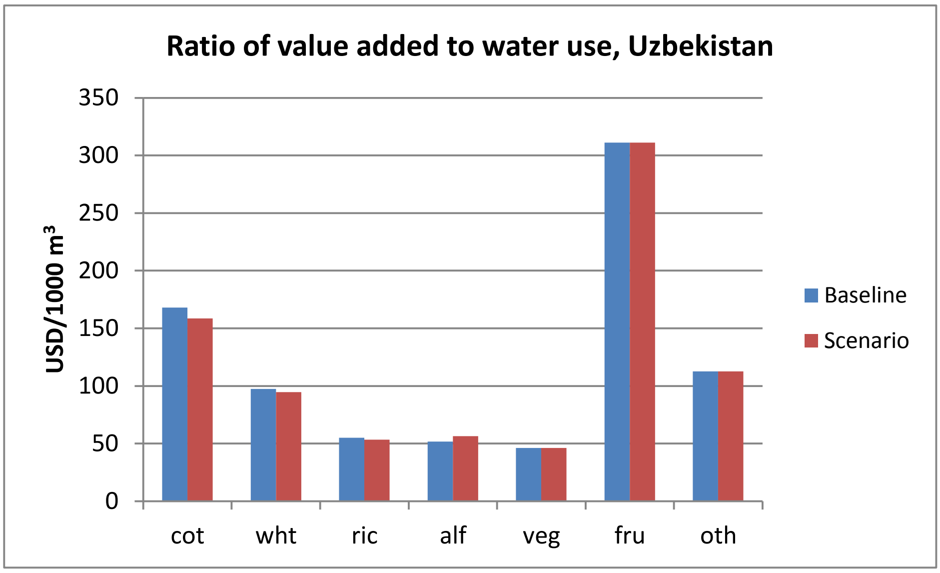
1. The chart titled “Annual basin income” on the “economy” worksheet compares overall basin value added for the baseline and the current scenario. Overall basin income is disaggregated into hydropower and irrigation (all other water uses are represented as constraints in the model and therefore do not appear in the basin income calculation). The comparison of overall income presented on the left of the chart is the best single measure of effectiveness impacts at the basin scale.



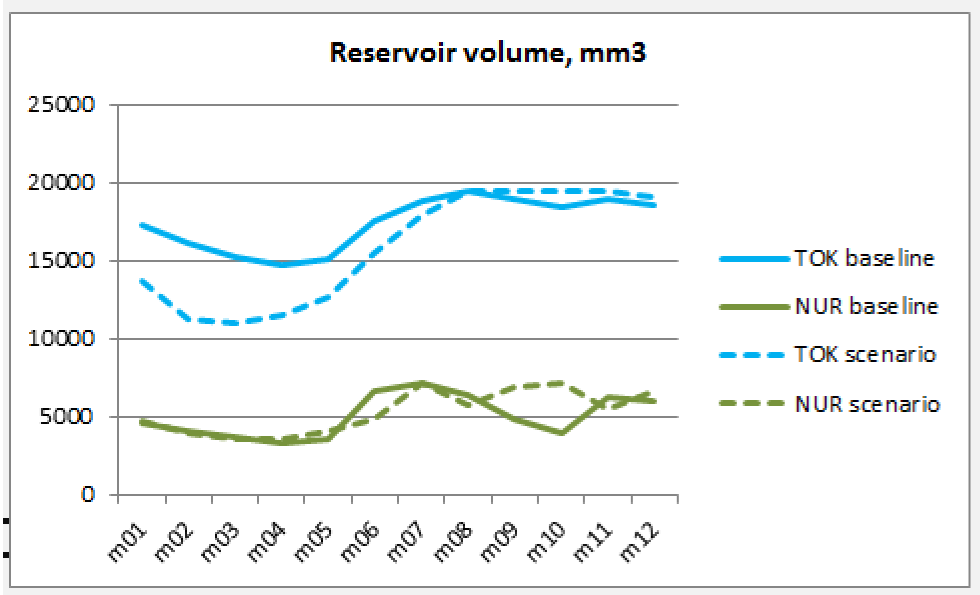
2. Although disaggregated at country level, the charts comparing value added per unit land use and per unit water use on the "agriculture" worksheet give some insight into how the effectiveness of water use changes from the baseline to the scenario.

2





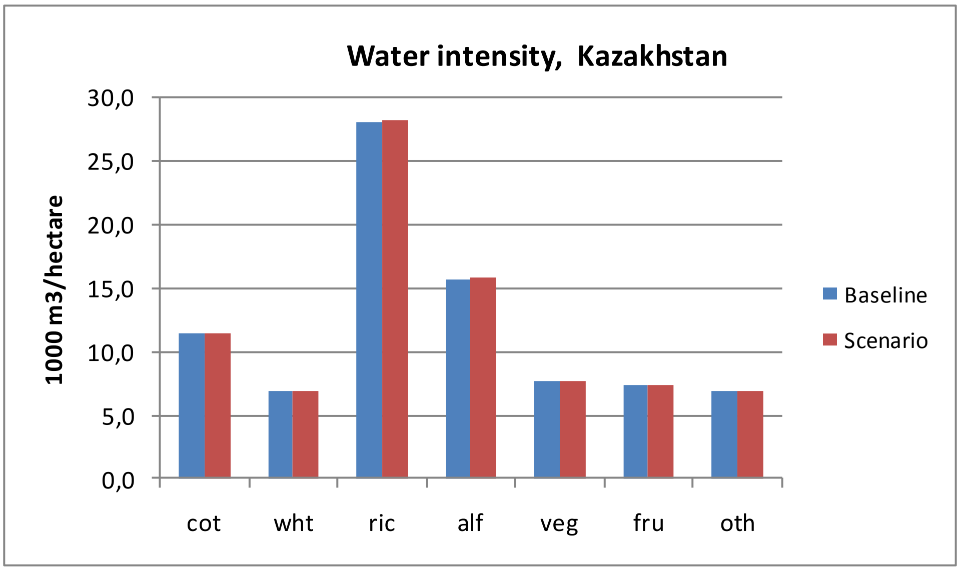
3. Because reservoir operations are driven by economic optimization criteria in all scenarios, scenario results can provide insight into how to operate reservoirs in order to maximize effectiveness. The chart titled “Reservoir volume” on the “reservoirs” worksheet compares baseline and scenario reservoir storages for the Toktogul and Naryn reservoirs. This chart provides insight into how these reservoirs could be operated differently in order to maximize basin-wide economic welfare.



Which charts can be used to report on efficiency impacts?

Efficiency is defined as a measure of water use per unit activity level. For example, the efficiency of water use in the production of irrigated cotton can be measured in terms of the annual amount of water used per hectare in production, or the amount of water used per tonne of output. Measures that increase efficiency, such as water-saving irrigation technologies, can release water for other uses and thereby enhance effectiveness. The following chart can be used to report on efficiency impacts:

1. The charts labelled “Water intensity” compare per hectare water use in the baseline and scenario.

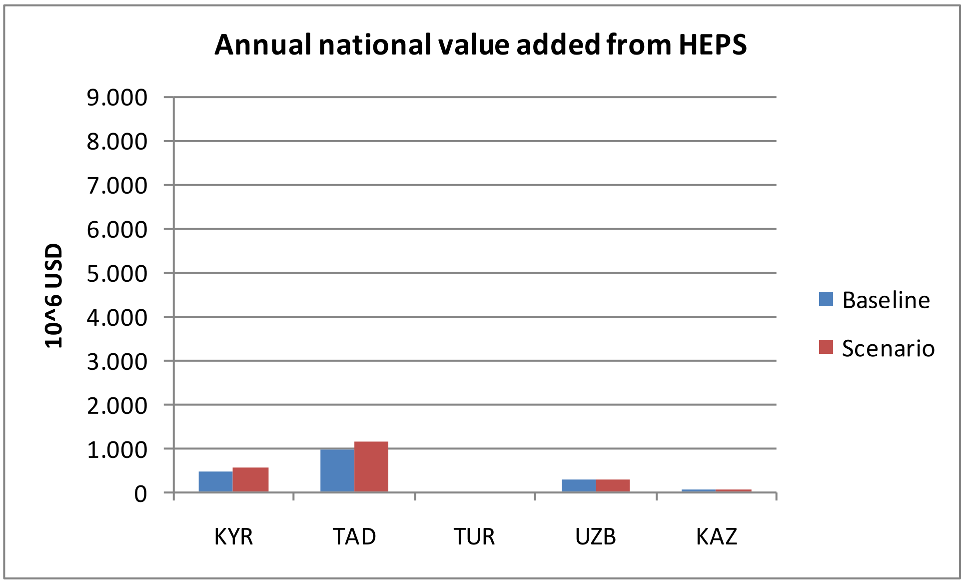


Which charts can be used to report on equity impacts?

Equity is defined as a measure the extent to which measures to improve efficiency and effectiveness affect the welfare of different groups in the region. Measures that increase overall welfare at the basin scale may have positive welfare impacts on some groups in the basin and negative impacts on other groups. Measures to increase efficiency may also have a range of impacts on different groups. The following charts can be used to report on equity impacts:

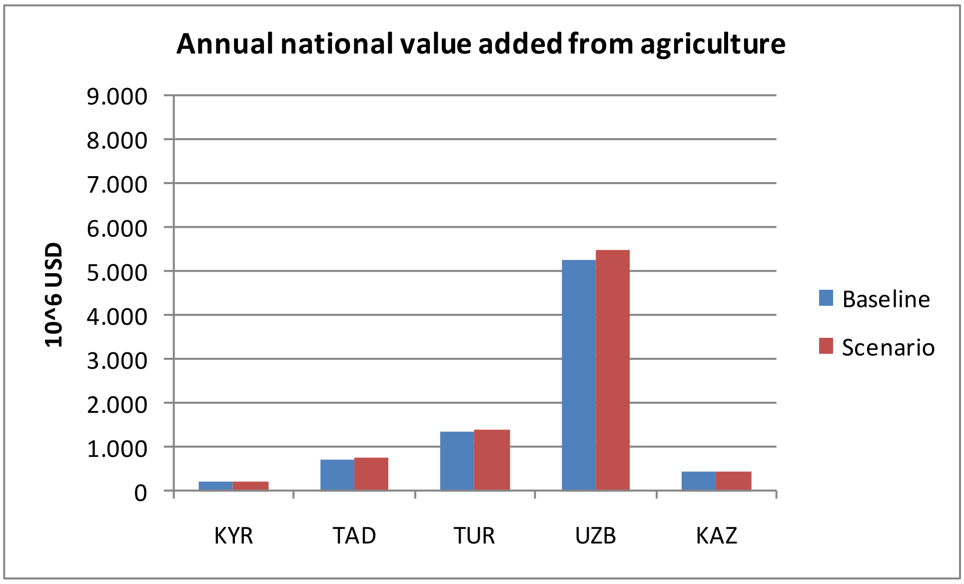
1. The chart titled "Annual national value added from HEPS" on the "economy" worksheet provides information about how welfare changes resulting from changes to hydropower production are distributed among the riparian countries. This chart is also available in GDP units.

1



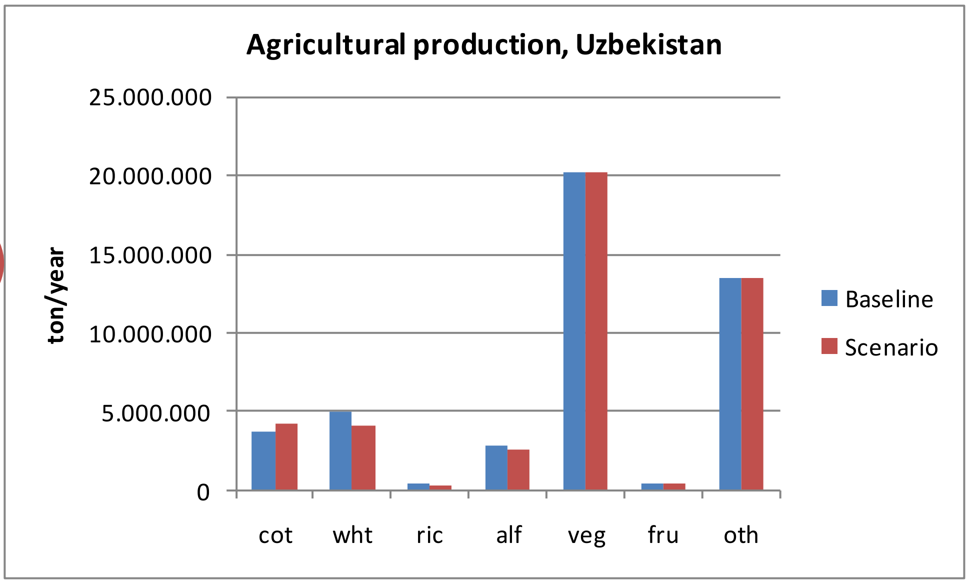
2. The chart titled "Annual national income from agriculture" on the "economy" worksheet provides information about how changes to income from agricultural production are distributed among the riparian countries. This chart is also available in GDP units.

2



3. The charts titled “Agricultural production” on the “agriculture” and the “agricultureByZone” worksheets provide information about changes in the production of crops in each country and planning zone.

3



4. The charts titled “Labor use” on the “agriculture” and the “agricultureByZone” worksheets provide information about changes in farm employment in each country and planning zone.

4