PODIUMSim- Policy Dialogue Model: Version II

A Water and Food Security Planning Tool

User's Manual

April 2003

International Water Management Institute

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1. Background

PODIUM - the policy dialogue model was developed by the International Water Management Institute (IWMI) in 1999 as part of the Vision 2025 exercise. The model, an interactive tool runs on a personal computer (www.iwmi.org). It enabled the users to develop scenarios of water and food supply and demand with respect to various policy options at national level. While many have recognized it as a useful tool for generating scenarios, some limitations were also have been identified. The PODIUM first version was mainly a cereal based model. Expanding the analysis to cover other crop categories was thought to be useful. Inability to capture spatial variations, especially in large countries, was another limitation. The revised version, named PODIUMSim addresses these limitations. The model was revised and improved under "Country Policy Support Studies" (CPSP) program of the International Commission for Irrigation and Drainage (ICID). Under the CPSP programme the revised model is being applied at the river-basin level for two of the largest countries India and China (*link to the models*)

The PODIUMSim, with interface in Microsoft Excel, still runs on a personal computer in an interactive mode. It can generate scenarios at sub-national level, for example at river-basins or at administrative boundaries. The aggregated results show the national picture. The purpose of this manual is to help users to understand the basic principles of different components of the revised version, the navigation from one component to other and developing and saving scenarios, and also how and where to enter data in the model.

2. Introduction

The PODIUMSim is intended for policy planners, researchers, students and others who are interested in developing water and food supply and demand scenarios under different options of policies or hypothesis. It can explore vital questions such as: Can river basins feed their population in 2025? What is the food surplus or deficit at sub-national level and subsequently at national level? Do we have enough water to irrigate the crops needed to ensure future national food requirements?

The model maps the complex relationships between numerous factors (drivers in the model) that affect water and food demand and supply and displays output information in both graphical and tabular formats. Projections for future years are determined in relation to base year data by the expected changes in the drivers over this period.

PODIUMSim enable for users to set goals, such as food production for an adequate level of per capita consumption, and explore ways of reaching that goal: through expanding irrigated area or rainfed area, increasing cropping intensity or importing more food. Likely scenarios can also be developed in terms of population growth, diets and developments in agriculture and water resources; then determine the necessary steps to ensure food security and sustainable water use.

PODIUMSim can also help explore critical planning questions such as:

- o How much improvement in irrigation efficiency would be needed to cover additional water requirements in the future?
- o What level of rainfed yield increases is required if additional food requirements were to be met by increases in rainfed productivity?
- o How much food would a country have to import to feed its population in 2025, if there are no new investments in developing additional water resources?

PODIUMSim consists of three main components;

i. Annual consumption-demand scenario development at national level
ii. Seasonal production scenario development for irrigated and rainfed agriculture at sub-national level and,
iii. Annual water supply scenarios development at sub-national and seasonal water demand scenarios development for irrigated sector and annual water demand scenarios for domestic, industrial and environmental sectors at sub-national level.

Each of the components consists of several steps. These are embedded in one or several spreadsheets. This manual is intended to help user to understand what factors are used in different components for generating scenarios, how to generate scenarios, how to save scenarios and how to navigate between spreadsheets of different or within components.

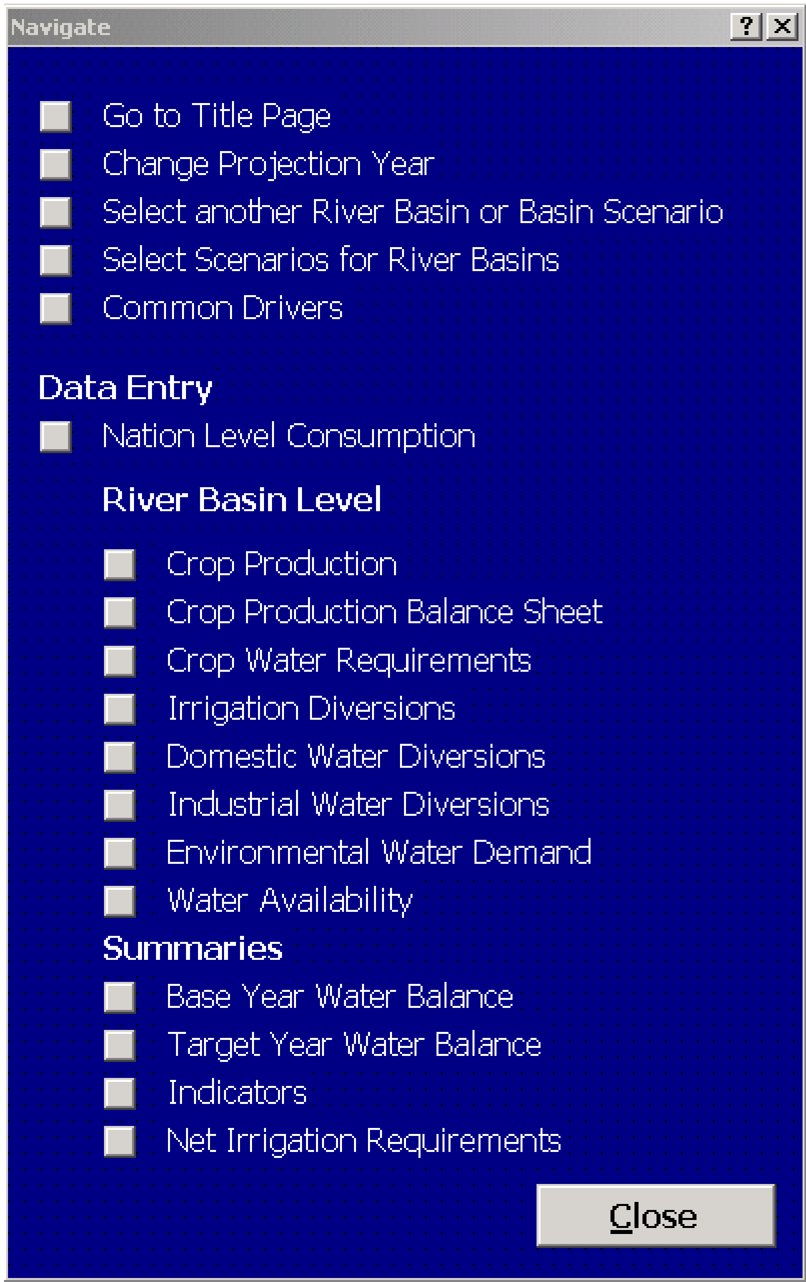
Firstly we introduce some of the frequently appearing navigation tools in the model. Users are recommended to these navigation tools as much as possible. Next we explain how to start the scenario building process for a target year. Thirdly, the scenario generation of national consumption is explained. Fourthly, we explain how information of already formulated scenario at sub-national level are loaded to get an aggregate picture at the country level. Next the process of creating a new scenario or editing an existing scenarios production, water supply and water demand sub-unit level is explained.

Finally we explain how to enter data for generating scenarios for a different spatial unit structure.

3. Navigation Tools

These navigation tools will appear in most spreadsheets of the model.

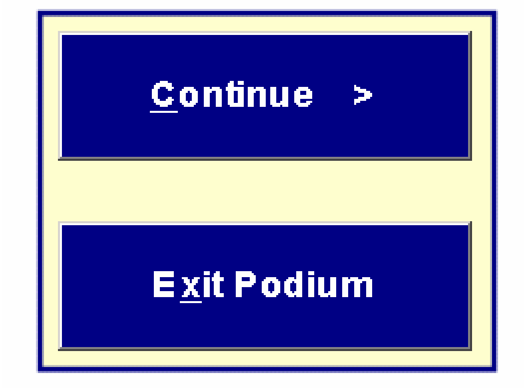
Next	Use the *"Next"* button to move to next level of action in different spreadsheets. User is advised to use this navigation method.
Previous	Use *Previous* button to move to previous level of action. User is advised to use this navigation method.
Restore Default	This option is provided in all the spreadsheets. "Restore Default" button will restore the changes made to the parameter growth rates or changes with the default values provided in the model and. If the changes are required to be saved, use "Save Button".
Save Scenario	Changes to the parameters in the model generate new scenarios. "Save Scenario" button will save these changes. This can be used to save a new scenario or replace an existing scenario. Detailed explanation will be given later.
	Use this option to move to the *Driver* page. Driver sheet helps the user to change important variables and view changes due to this graphically. National and basin level important drivers can be changed and resultant outputs could be viewed instantly.
Options	Use this button to navigate around various spreadsheets/modules of the model – from data entry levels to model output levels as shown in the next box. This button can be used to navigate between spreadsheets which are not adjacent to each other.



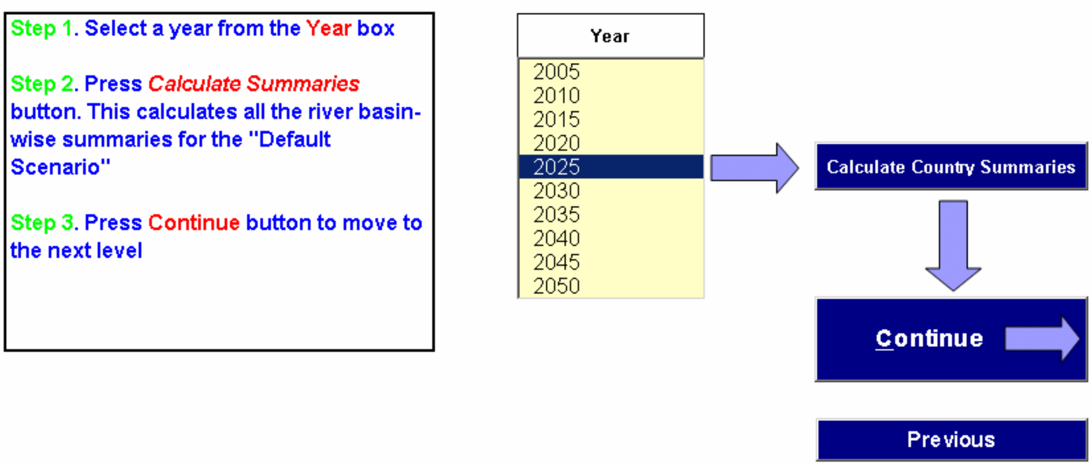
Clicking on a square would direct the user to the spreadsheet with the description in front. For example clicking on the square in front of "Crop production" would take the user to the crop production scenario generation module. "Option" box can be used to navigate to any of the different spreadsheets than the spreadsheet selected by the "Next" button.

4. Starting PODIUMSim

First open the Microsoft Excel file "**PODIUMSIm-*countryname*"** and the title page appears in the screen. Pressing **"Continue"** button takes you to the next step in the model. Pressing **"Exit PODIUM**" button will exit from the model.



Pressing **"Continue"** button will take you to the **"Year"** box in the next page. This is shown below.



The next step is to select **a target year** for scenario development. This is selected from the "**Year Box**". Every five-year period from 2005 upto 2050 is available to choose from the year box. After selecting a target year, click the **"Calculate Summaries"** button. This estimates the annual summaries of key variables with respect to the default growth rates. The default annual growth rates for different drivers are provided in the model. This process may take few seconds. Next click the **"Continue"** button to proceed with scenario development.

Whenever a different year is selected, the above steps have to be repeated as the national summaries for the target year at default growth rates are required to be estimated.

Once the target year summaries with respect to default growth rates are calculated, click the **“*Continue*”** button to move to the next level. This takes the user to **“Con”** spreadsheet. This sheet estimates demand for different crop consumption.

5. Estimating National Level Consumption

This module in the spreadsheet named 'Con" estimates the annual demand for different crops at national level. The data for the base year is shown in blue and the default growth rates are shown in red. The data and growth rates of population, daily calorie supply per person and composition of grains (includes cereals and pulses) and animal products in the calorie supply, daily consumption of food crops and annual consumption of cotton per person are used at sector level (rural, urban)

		Base Year		Scenario Year		Change	
		1995		2025		30	
				Annual growth		2025	
		Urban	Rural	Urban	Rural	Urban	Rural
Population	million	253	680	2.87%	0.28%	591	739
Daily Calorie Supply - Total	calories	2412.0	2412	0.43%	0.43%	2743	2743
- % from Grain products	%	68.2%	68.2%	-0.35%	-0.35%	61.4%	61.4%
- % from Animal products	%	7.3%	7.3%	1.61%	1.61%	11.9%	11.9%
Per Capita Food Consumption							
- Rice	Kg/day	0.212	0.212	0.10%	0.10%	0.218	0.218
- Wheat	"	0.166	0.166	0.45%	0.45%	0.190	0.190
- Maize	"	0.022	0.022	0.00%	0.00%	0.022	0.022
- Other Cereals	"	0.055	0.055	0.00%	0.00%	0.055	0.055
- Pulses	"	0.035	0.035	-0.15%	-0.15%	0.033	0.033
- Oil Crops (equivalent)	"	0.076	0.076	0.72%	0.72%	0.094	0.094
- Vegetables	"	0.152	0.152	0.72%	0.72%	0.189	0.189
- Roots & Tubers	"	0.057	0.057	0.72%	0.72%	0.071	0.071
- Sugar (raw equivalent)	"	0.069	0.069	0.72%	0.72%	0.086	0.086
- Fruits	"	0.094	0.094	0.72%	0.72%	0.117	0.117
Per capita cotton (lint) use	kg/year	2.356	2.356	0.00%	0.00%	2.356	2.356

The feed conversion ratios, i.e., amount of feed used for supplying 1000 Calories of animal products

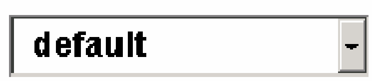
and

the percentages of seed, waste, other uses and processing are provided at national level.

Crop	(Kg per 1000 Calories)			consumption		
	1995	Growth	2025	1995	Growth	2025
Rice	0.006	0.44%	0.01	7.2%	0.00%	7.2%
Wheat	0.013	0.44%	0.01	11.8%	0.00%	11.8%
Maize	0.003	0.44%	0.00	19.6%	0.00%	19.6%
Other Cereals	0.005	0.44%	0.01	9.5%	0.00%	9.5%
Pulses	0.021	0.44%	0.02	8.3%	0.00%	8.3%
Oil Crops (equivalent)	0.015	0.44%	0.02	14.6%	0.00%	14.6%
Vegetables	0.000	0.44%	0.00	6.2%	0.00%	6.2%
Roots & Tubers	0.000	0.44%	0.00	20.0%	0.00%	20.0%
Sugar (raw equivalent)	0.009	0.44%	0.01	6.9%	0.00%	6.9%
Fruits	0.000	0.44%	0.00	13.4%	0.00%	13.4%

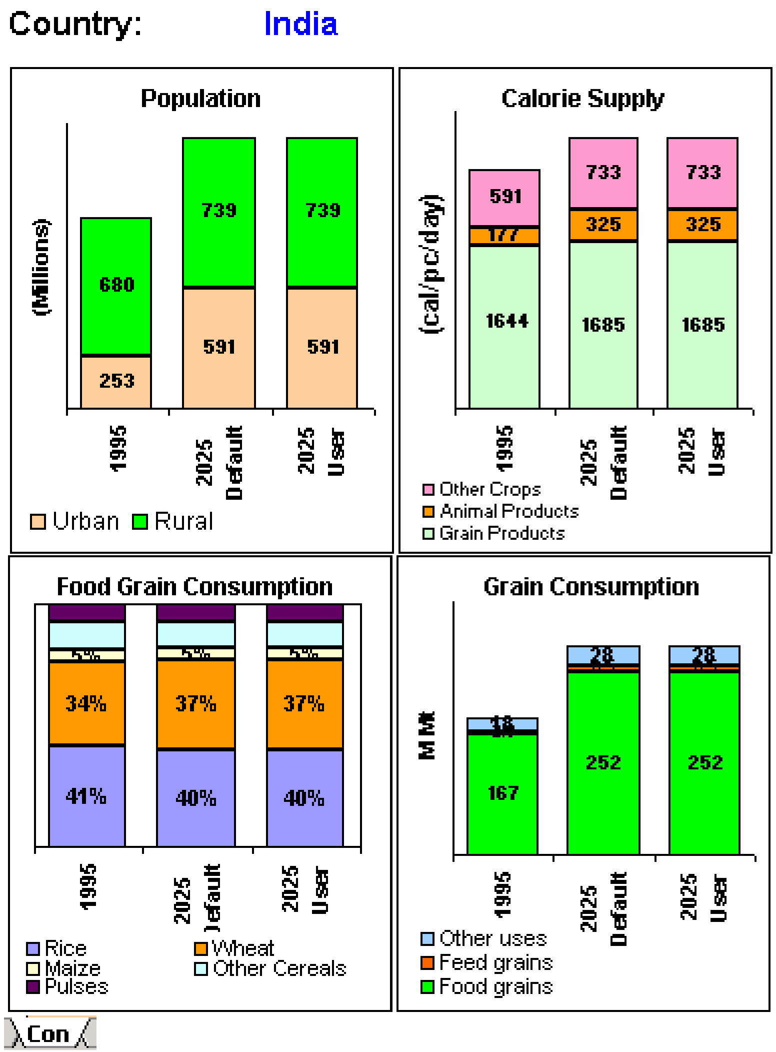
The drivers can be increased or decreased from the default growth rates by pressing the arrows ( ) as shown in the model

Pressing the **"Save Scenario"** button gives the option of choosing to save the scenarios with a new name or replace the scenarios with an existing name (**except under the default scenario name**). The existing scenario can be selected from the pull down list in the right-hand side. Up to 15 national consumption scenario can be saved in the model.



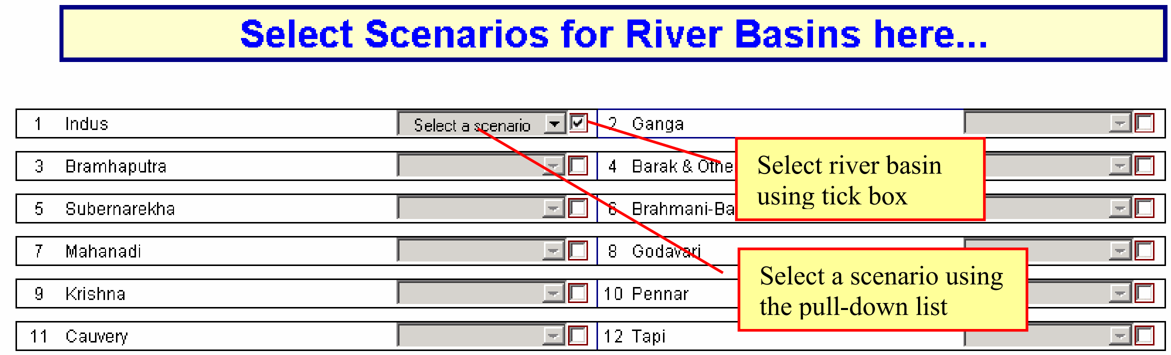
"**Delete Scenario**" button would delete an existing scenario (**"Default" scenario should not be deleted at any time**). The **"Previous"** button takes the user to the previous spreadsheet of action and the **"Next"** button directs to the next spreadsheet of action named **"Scenario"**.

The differences between the user scenario and default scenario and the changes of both scenarios from 1995 level for important factors are shown in figures as given below.



6. "Scenario": Loading Scenarios

The "**Scenario**" spreadsheet aggregates the results at sub-national level to obtain the national picture. One has the option of selecting user formulated scenarios or scenarios generated with respect to default growth rates. To select a previously formulated scenario, select a sub-national name using the tick box and then select a scenario name from the pull-down list. If no previously formulated scenarios are selected, the sub-national scenarios with respect to default growth rates are aggregated. For river basins this sheet looks like:



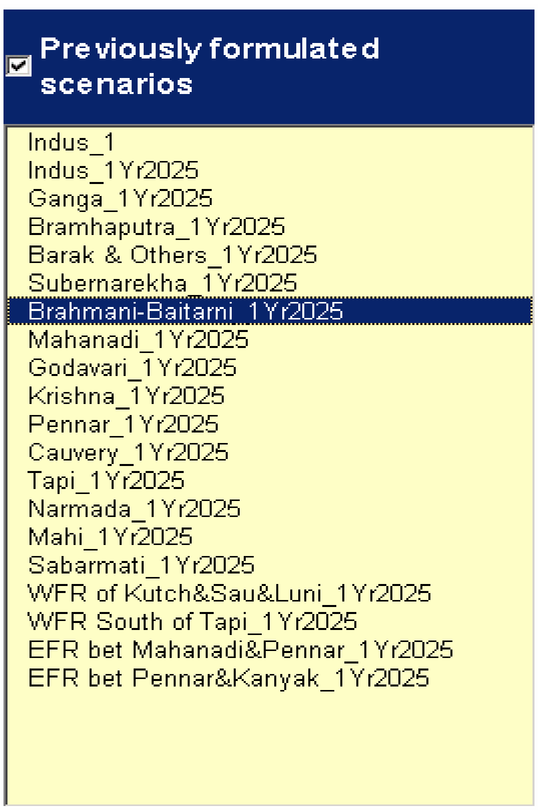
The **"Select all"** option automatically loads all scenarios of all sub-national units. This option loads different scenarios for aggregation. The scenarios can be selected from the pull-down list. If scenarios are unselected, only the scenarios with respect to default growth rates are aggregated.

Pressing "**Next**"would take to the next spreadsheet of action, i.e., "**Basin Select**" .

7. “BasinSelect”: Loading Sub-National data

This sheet allows the user to develop a new scenario or edit an already formulated scenario at sub-national level.

A new scenario can be developed by changing the default growth rates. For example, the base year data and the growth rates of default scenario for all river basins are loaded by selecting the “***Basin level analysis***” button. Then choose a river basin name from the list.



To edit an already formulated scenario, check on the *“**Previously Formulated Scenario**”* button. This loads base year data and the growth rates of an already formulated scenario which is selected. This process will take some time. A message indicating *“**Please Wait**”* will appear while the data is being loaded. **Please wait until this message disappears.**

Press *“**Next**”* to go to next spread sheet of action named *“Driver”*

8. Driver

"Driver sheet helps the user to change important drivers of most modules and view changes graphically. Both national and basin level important drivers can be changed and resultant outputs could be viewed instantly.

This sheet is divided into three sections:

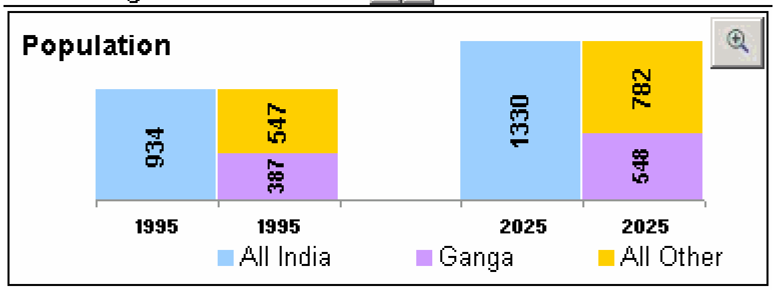
i. Demand drivers
ii. Cereal production drivers
iii. Water balance drivers

The demand driver section allows the user to change

i. national level urban and rural population
ii. basin level population
iii. daily per capita calorie intakes of urban and rural populations
iv. percentages of calorie contribution from cereal products and animal products
v. Per person daily consumption of rice, wheat, maize, other cereals and pulses by urban and rural populations

Cereal Demand Drivers - 2025

		Total	Urban	Rural
Population				
All India	**(million)**	1330	591	739
Ganga		548	235	313



		Urban	Rural
Daily Calorie Intake	calories	2743	2743
% Cereal Products		61.5%	61.5%
% Animal Products		11.9%	11.9%
% Other crop products		26.7%	26.7%
Grain Consumption Pattern:			
Rice	Kg/day	0.218	0.218
Wheat	"	0.190	0.190
Maize	"	0.022	0.022
Other cereals	"	0.055	0.055
Pulses	"	0.033	0.033
Total Grains	Kg/day	0.519	0.519

Target year Cereal Production Driver section allows the user to chnage

Cereal Production Drivers - 2025

Grain area increase	Irrigated S1	Irrigated S2	Rainfed S1	Rainfed S2
Rice (MHa)	7.23	0.92	10.15	0.27
Wheat	0.00	18.07	0.00	0.72
Maize	0.86	0.00	2.29	0.00
Other Cereals	0.16	0.29	5.74	0.31
Pulses	0.15	1.90	2.78	4.58
Grain Yield Growth				
Rice (ton/ha)	1.95	4.16	1.48	2.83
Wheat	0.00	2.10	0.00	2.05
Maize	2.18	0.00	1.60	0.00
Other Cereals	1.31	2.59	0.74	1.33
Pulses	1.49	1.24	0.79	0.78

i. irrigated and rain-fed areas of cereal crops
ii. Irrigated and rainfed yield of cereal crops

And, target year Water Balance Driver section allows the user to change

i. surface irrigation efficiencies of paddy and other crops
ii. area irrigated with groundwater
iii. water transfers from and into a river basin
iv. annual environmental water demands. Note that in the detail sheet where the environmental water demands are calculated user has the option to choose annual or monthly flows..

Water Balance Drivers - 2025

Surface Irrigation Efficiency	
Paddy	
Season 1	50.2%
Season 2	47.5%
Other crops	
Season 1	36.3%
Season 2	42.2%
Area with GW Irrigation	
Season 1	63.3%
Season 2	70.5%
Water Transfers (km^3)	
into the System	0
out of the System	0
Annual Environmental Water Demand (km^3)	0.00

The "Driver" sheet can only effect changes to limited number of drivers. Individual sheets have more drivers to develop different scenarios. These sheets are explained next.

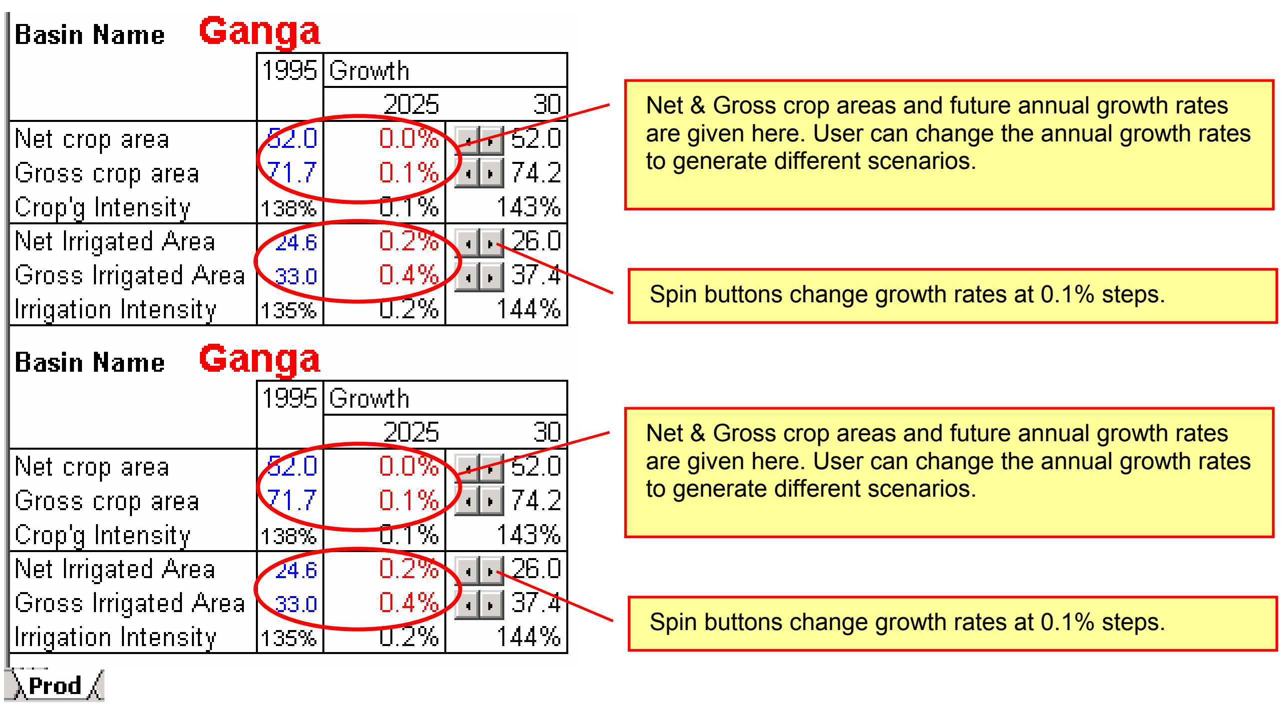
9. “Prod”: Estimating Crop Production

This sheet develops a new scenario or alters an already formulated scenario for a sub-unit selected in the “BasinSelect” step.

Once a sub-unit and the associated growth rates of the default or an already formulated scenario is selected, the next step would be to change different growth rates associated with that basin. These changes are based on pre-defined criteria or on alternate options. This involves several steps.

The first step is to estimate the agricultural production for individual crops. The PODIUMSim covers 11 crop categories including cereals with rice, wheat and maize separately and other cereals in one category, pulses, oil crops, vegetables, roots and tubers, sugar, fruits and cotton.

The first step is to determine the future net and gross crop cultivated area and net and gross irrigated area as shown below. The annual growth rates can be



Future cropping intensities and their annual growth rates are automatically get updated.

Next step in this module is to determine the future area and yields of different crops under irrigated and rainfed conditions. These can be determined for two seasons.

9.1 Irrigated crop areas

The data (in blue letters) shows seasonal irrigated crop area for 11 major crop categories in the basin. Other crops not shown in red letters) can be changed using the spin buttons – in 0.1% intervals. Summation of all irrigated crop areas in season one and season two gives the Gross Irrigated Area. A warning message as shown below appears if the summation of individual irrigated crop areas (including season one & two) exceeds Gross Irrigated Area.

WARNING: 2025 Total crop irrigated area is more than the projected GROSS irrigated area.

Irrigated Harvested Area

Crop	1995		2025			
	S1	S2	S1	S2	S1	S2
	M Ha	M Ha	%	%	%	%
Paddy	6.48	0.60	0.4%	1.3%	7.23	0.87
Wheat	0.00	14.31	0.0%	1.5%	0.00	22.24
Maize	0.70	0.00	0.7%	0.8%	0.86	0.00
Other Cereals	0.16	0.29	0.0%	0.7%	0.16	0.36
Pulses	0.11	1.52	0.8%	1.5%	0.15	2.41
Oil Crops	0.00	2.63	0.0%	1.5%	0.00	4.15
Vegetables	0.54	0.00	0.2%	0.7%	0.57	0.00
Roots & Tubers	0.00	0.00	0.0%	0.6%	0.00	0.00
Sugarcane	1.87		0.4%		2.10	0.00
Fruits	0.49		0.0%		0.49	0.00
Cotton	0.90	0.00	1.2%		1.30	0.00
Other crops	1.22	1.22	1%	1%	1.59	1.59

Another warning message, as shown below, will appear if the summation of individual irrigated crop areas in either season exceeds the net irrigated area.

WARNING: 2025 Total crop irrigated area is more than the projected NET irrigated area.

9.2 Irrigated crop yield

Irrigated Yield (ton/ha)

	S1	S2	S1	S2
Paddy	3.63	2.12	1.1%	1.1%
Wheat	0.00	5.84	0.0%	1.1%
Maize	2.10	0.00	1.1%	1.1%
Other Cereals	1.06	2.32	1.1%	1.1%
Pulses	0.75	0.72	1.1%	1.1%
Oil Crops	0.00	1.60	1.1%	1.1%
Vegetables	14.56	0.00	1.1%	1.1%
Roots & Tubers	0.00	0.00	1.1%	1.1%
Sugarcane	6.21		1.1%	
Fruits	14.43		1.1%	
Cotton	0.56	0.00	1.1%	1.1%

The seasonal irrigated crop yields are shown in blue. If the area is zero the yield is shown as zero. The future growth rates (shown in red) can be changed by 0.1% intervals. Note that the spin buttons change the annual growth rates of yields of both seasons simultaneously.

9.3 Rainfed crop areas

Rainfed Harvested Area						
Crop	1995		2025			
	S1	S2	S1	S2	S1	S2
	M ha	M ha	%	%	%	%
Paddy	0.00	0.00	0.0%	0.0%	0.0	0.0
Wheat	0.00	0.06	0.0%	0.0%	0.0	0.1
Maize	0.00	0.00	0.0%	0.0%	0.0	0.0
Other Cereals	0.04	0.00	0.0%	0.0%	0.0	0.0
Pulses	0.01	0.00	0.0%	0.0%	0.0	0.0
Oil Crops	0.00	0.00	0.0%	0.0%	0.0	0.0
Vegetables	0.00	0.00	0.0%	0.0%	0.0	0.0
Roots & Tubers	0.00	0.00	0.0%	0.0%	0.0	0.0
Sugarcane	0.00		0.0%		0.0	0.0
Fruits	0.00		0.0%		0.0	0.0
Cotton	0.00	0.00	0.0%	1.3%	0.0	0.0
Other crops	0.00	0.00			0.0	0.0

All crop areas not shown in the 11 crop categories are included in the "*Other crops*". Their growth rates for each season can be changed using the spin buttons in 0.1% intervals.

Prod

9.4 Yields of Rainfed Crops

Rainfed Yield (ton/ha)				
	S1	S2	S1	S2
Paddy	0.00	1.33	0.3%	0.3%
Wheat	0.00	2.31	0.3%	0.3%
Maize	1.57	0.00	0.3%	0.3%
Other Cereals	0.53	1.32	0.3%	0.3%
Pulses	0.55	0.55	0.3%	0.3%
Oil Crops	0.00	1.23	0.3%	0.3%
Vegetables	10.08	0.00	0.3%	0.3%
Roots & Tubers	0.00	18.28	0.3%	0.3%
Sugarcane	3.85		0.3%	
Fruits	9.21		0.3%	
Cotton	0.30	0.00	0.3%	0.3%

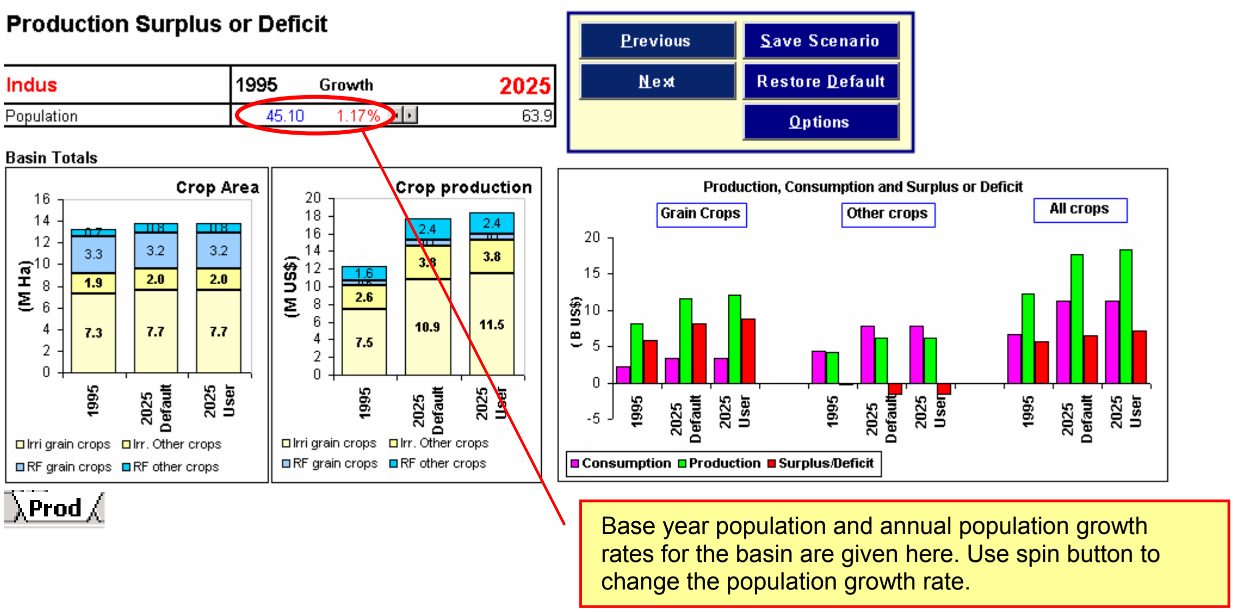
The annual growth rates of rainfed yields can be changed at 0.1% intervals. Note that the spin buttons change the annual growth rates of yields of both seasons simultaneously by 0.1% unit.

The scenarios can be saved at any time by clicking on the "Save Scenario" button. A "Save Scenario" box with different options will appear on the screen. First double click on the blank space under the "Enter Scenario Name". Then if sub-unit is river basin, a "river basin name_" in the case of a new scenario or "river basin name_scenario name" in the case of an already formulated scenario will appear in the blank area. In both cases, typing a name after the dash and by pressing "Save" button will save it as a new scenario. However, if scenario is to be replaced in the latter case, press the "Replace" button. "Replace" button will be active only when the growth rates loaded to model are from an already formulated scenario. Pressing "Next" will direct to the next active spreadsheet.

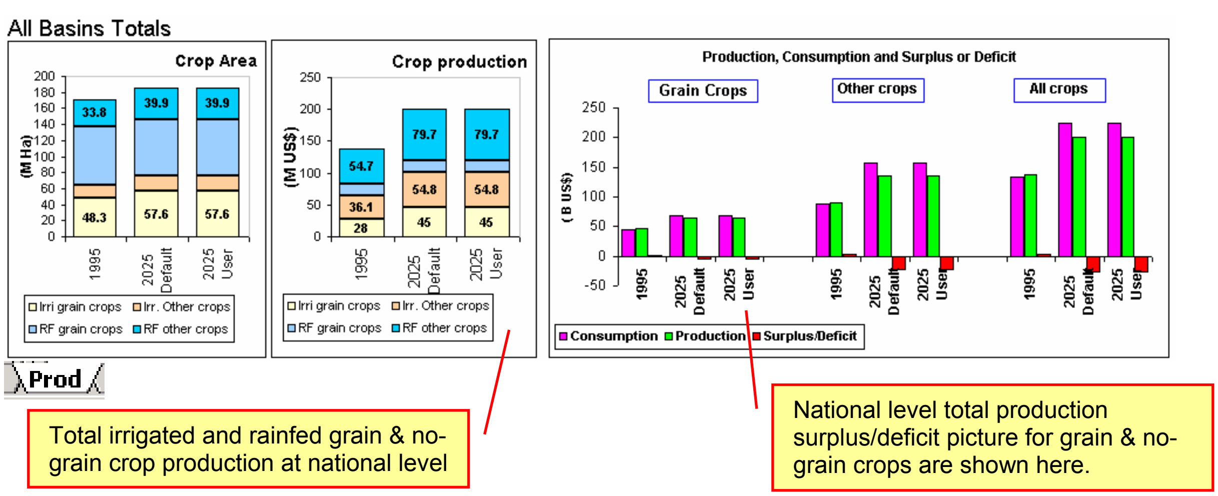
10. “ImpExp”: Estimating Crop Production Surplus or Deficit

The crop production surplus or deficit i.e., the difference between the annual production and annual consumption is shown in this sheet. The crop production surpluses or deficits both at river basin level and also at national level are presented here. The production surpluses or deficits are shown only for the grain crops (cereals and pulses) and non-grain crops.

As the crop consumption was estimated at national level, the per capita crop consumption for a sub-unit is assumed to be same as the per capita consumption at national level. The differences of consumption of sub-units are only due to different growth rates of total population. The summaries of grain and non-grain crop area, crop production and production surplus or deficit of the new scenario or the revised scenario are shown as below.



The national level picture of production surplus/deficit according to the revised scenarios is given as shown in the figure below.



By pressing the *"Next"* button directs to the next spreadsheet of action: "NETmm". This sheet estimates crop water requirements.

11. "NETmm": Estimating Crop Water Requirements

Water requirements of different crops are estimated in this sheet. Major drivers for estimating crop water requirements are,

i. Average daily potential evapotranspiration for different months - ETp
ii. Monthly 75% exceedence probability rainfall - P_{75}
iii. Starting date of the seasons (Month and Day)
iv. Number of days at different growth periods of different crops in different seasons(Four different growth periods: Initial, development, middle and late are considered)
v. Crop coefficients (Kc_{ij}) of different crops (i) at different growth periods (j)

Seasonal evapotranspiration of a crop is the sum of evapotranspiration during the four growth stages. Crop evapotranspiration in a particular growth period (ET_{ij}) is obtained by multiplying the sums of ETp's of the months (or part of the month) which fall in the growth period by associated crop coefficients. The seasonal evapotranspiration for i^{th} crop is given as

$$ET_i = \sum_{j=1}^{4} \sum_{month_p \in j} ET_p \times m_{pj} \times Kc_{ij}$$

where m_{pj} is the number of days of month p in the j^{th} growth period.

Seasonal effective precipitation is the sum of effective rainfall of the months (or parts of months) which falls in the particular season. This is given as

$$Eff.\Pr ec._k = \sum_{month_p \in season_k} \frac{m_{pk}}{n_{pk}} \times \begin{Bmatrix} P75_p(125 - 0.2 \times P75_p)/125 & if \quad p75 < 250\ mm \\ 125 + 0.1 \times P75_p & if \quad P75 > 250\ mm \end{Bmatrix}$$

where m_{pk} is the number of days in p^{th} month which fall in the k^{th} season and n_p is the total number of days in the p^{th} month.

The net irrigation requirement for the i^{th} crop in k^{th} season given as

$$NET_{ik} = Max\{ET_i - Eff.\Pr ec_k, 0\}$$

The two drivers- the average daily potential evapotranspiration (ETp) and 75 percent exceedance probability rainfall (P75) appear in the model as shown below.

	Etp (mm/day)			P75 (mm/month)	
	1995	2025 Growth	30	1995	2025 Growth
Jan	1.6	0.0%		8.2	0.0%
Feb	2.4	0.0%		7	0.0%
Mar	3.6	0.0%		17	0.0%
Apr	5.2	0.0%		11	0.0%
May	6.1	0.0%		12	0.0%
Jun	5.9	0.0%		22	0.0%
Jul	4.5	0.0%		91	0.0%
Aug	4.1	0.0%		92	0.0%
Sep	4.0	0.0%		33	0.0%
Oct	3.1	0.0%		2	0.0%
Nov	2.1	0.0%		0	0.0%
Dec	1.5	0.0%		2	0.0%

The likely impact of climate change on crop evapotranspiration can be assessed through the changes in ET and rainfall.

The sowing dates and growth periods for the two seasons and the crop coefficients for different growth periods appear in the model as shown below.

1995	Start date - S1		Growth Period - S1				Crop Coefficients				Start date - S2		Growth Period - S2			
	Date	Month	Ini.	Dev.	Mid.	Late	Ini.	Dev.	Mid.	Late	Date	Month	Ini.	Dev.	Mid.	Late
Rice	15	Jun	30	30	60	30	1.20	1.15	1.10	0.80	15	Dec	30	30	60	30
Wheat	15	Jun	20	25	60	30	0.40	0.78	1.15	0.30	15	Nov	20	25	60	30
Maize	15	Jun	20	35	40	30	0.30	0.75	1.20	0.60	15	Nov	20	35	40	30
Other Cereals	15	Jun	15	30	50	30	0.30	0.73	1.15	0.25	15	Nov	15	30	50	30
Pulses	15	Jun	15	25	35	20	0.40	0.78	1.15	0.55	15	Nov	15	25	35	20
Oil Crops	15	Jun	35	45	35	25	0.35	0.75	1.15	0.35	15	Nov	35	45	35	25
Vegetables	15	Jun	15	25	70	40	0.60	0.85	1.10	0.90	15	Dec	15	25	70	40
Roots & Tube	15	Jun	25	30	45	30	0.50	0.83	1.15	0.75	15	Nov	25	30	45	30
Sugarcane	15	Jun	30	50	180	60	1.00	1.00	1.00	1.00	15	Nov	30	50	180	60
Fruits	15	Jun	30	60	40	80	0.75	0.75	0.75	0.75	15	Nov	30	60	40	80
Cotton	15	Jun	30	50	60	55	0.35	0.78	1.20	0.60	15	Nov	30	50	60	55
Other crops	15	Jun	30	30	30	30	1.00	1.00	1.00	1.00	15	Nov	30	30	30	30

2025	Start date - S1		Growth Period - S1				Crop Coefficients				Start date - S2		Growth Period - S2			
	Date	Month	Ini.	Dev.	Mid.	Late	Ini.	Dev.	Mid.	Late	Date	Month	Ini.	Dev.	Mid.	Late
Rice	15	Jun	30	30	60	30	1.20	1.15	1.10	0.80	15	Dec	30	30	60	30
Wheat	15	Jun	20	25	60	30	0.40	0.78	1.15	0.30	15	Nov	20	25	60	30
Maize	15	Jun	20	35	40	30	0.30	0.75	1.20	0.60	15	Nov	20	35	40	30
Other Cereals	15	Jun	15	30	50	30	0.30	0.73	1.15	0.25	15	Nov	15	30	50	30
Pulses	15	Jun	15	25	35	20	0.40	0.78	1.15	0.55	15	Nov	15	25	35	20
Oil Crops	15	Jun	35	45	35	25	0.35	0.75	1.15	0.35	15	Nov	35	45	35	25
Vegetables	15	Jun	15	25	70	40	0.60	0.85	1.10	0.90	15	Dec	15	25	70	40
Roots & Tube	15	Jun	25	30	45	30	0.50	0.83	1.15	0.75	15	Nov	25	30	45	30
Sugarcane	15	Jun	30	50	180	60	1.00	1.00	1.00	1.00	15	Nov	30	50	180	60
Fruits	15	Jun	30	60	40	80	0.75	0.75	0.75	0.75	15	Nov	30	60	40	80
Cotton	15	Jun	30	50	60	55	0.35	0.78	1.20	0.60	15	Nov	30	50	60	55
Other crops	15	Jun	30	30	30	30	1.00	1.00	1.00	1.00	15	Nov	30	30	30	30

NETmm

The future changes of these parameters are not effected through growth rates. To effect future changes the exact value of the parameter needs to be entered.

Once the required changes are incorporated the model estimates the net evapotranspiration of different crops for different seasons. These will be used to estimate the net irrigation requirement for different crops. The changes on the parameters can be saved as a new scenario name or replace under the existing scenario name by clicking the *"Save Scenario"* button and following the procedure explained in the previous section.

Details of net irrigation requirements for different crops can be seen by clicking on the *"Details"* button in the top right hand corner. This takes to the sheet named *"NETm3"*. This sheet is shown as below. If details of net irrigation requirements are not required at this stage press *"Next"* to go to Gross irrigation requirement estimation sheet.

12. Sheet 9- “NETm3”: Net Irrigation Requirement

Indus

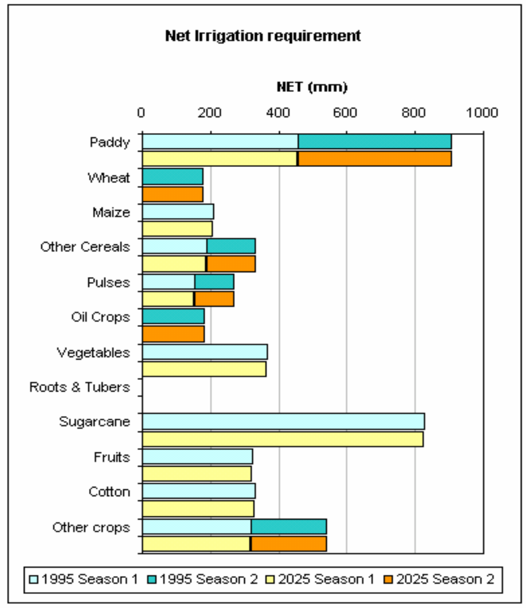
Next

Net Irrigation requirement (volume in km³)

Crop	1995 S1	1995 S2	2025 S1	2025 S2
	km^3	km^3	km^3	km^3
Basin Total	17.10	11.72	17.39	12.20
Crop total				
Paddy	9.97	1.32	10.25	1.36
Wheat	0.00	7.90	0.00	8.39
Maize	0.33	0.00	0.35	0.00
Other Cereals	0.09	0.09	0.09	0.09
Pulses	0.13	0.16	0.14	0.17
Oil Crops	0.00	1.14	0.00	1.21
Vegetables	0.23	0.00	0.23	0.00
Roots & Tubers	0.00	0.00	0.00	0.00
Sugarcane	1.17	0.00	1.21	0.00
Fruits	0.21	0.00	0.21	0.00
Cotton	3.39	0.00	3.51	0.00
Other crops	1.58	1.11	1.40	0.98

NET Evapotranspiration (mm/ha)

Crop	1995 S1	1995 S2	2025 S1	2025 S2
	mm	mm	mm	mm
Paddy	458	450	458	450
Wheat		182		182
Maize	208		208	
Other Cereals	188	148	188	148
Pulses	152	118	152	118
Oil Crops		186		186
Vegetables	365		365	
Roots & Tubers				
Sugarcane	828		828	
Fruits	322		322	
Cotton	330		330	
Other crops	319	225	319	225



This sheet shows the net irrigation requirement as depth and also as a volume on the area irrigated for each crop in different seasons. The estimated volume of net irrigation requirement is used for estimating the gross irrigation diversions. Pressing *“Next”* button will take you to Gross Irrigation Requirement estimation sheet.

13. “IrrDiv”: Estimating Gross Irrigation demand

The total irrigated area is divided into two types: Surface irrigated and groundwater irrigated areas. Major drivers affecting the gross irrigation diversion estimation are

i. ground water irrigated area as percentage of total irrigated area
ii. project irrigation efficiency for areas with only surface irrigation (and/or conjunctive irrigation) for ponded crops (predominantly paddy)
iii. project irrigation efficiency for areas with only surface irrigation (and/or conjunctive irrigation) for non-ponded crops
iv. project efficiency for ground water irrigated areas
v. percolation requirement for paddy.

These information are given in the model as shown below.

Basin Name	Unit	1995 S1	S2	Growth 2025 S1	30 S2	2025 S1	2025 S2
Groundwater irrigated area - % of total	%	56%	56%	0.0%	0.0%	56%	56%
Irrigation Efficiency Surface - Paddy	%	30%	35%	0.3%	0.3%	33%	39%
Irrigation efficiency Surface - other crops	%	30%	35%	0.3%	0.3%	33%	39%
Irrigation Efficiency - Groundwater	%	65%	70%	0.3%	0.3%	72%	77%
Percolation requirement for paddy	mm	200	200	0.0%	0.0%	200	200
Utilizable BF							
Return flow to surface - % BF	%	7%	7%	0.0%	0.0%	7%	7%
Rechange to ground water - % BF	%	63%	63%	0.0%	0.0%	63%	63%
Un-utilizable BF							
Flows to sea - % of BF	%	5%	5%	0.0%	0.0%	5%	5%
Flows to Swamp - % of BF	%	25%	25%				

IrrDiv

The gross surface irrigation diversion is estimated as

$$Surf\ \ Irri.div = (1 - \%gw\ irri.area)\left(\frac{NET_{paddy} + Percolation_{paddy}}{Irri.\ effi.\ Surf_{paddy}} + \frac{\sum_{i \in other\ crops} NET_i}{Irri.Effi.Surf_{other}} \right)$$

and the gross groundwater irrigation diversion is estimated as

$$Groundwater\ \ Irri.\ div. = (\%gw\ irri.\ area) \times \frac{\sum_{i \in allcrops} NET_i + Percolation_{paddy}}{Irri.Effi.GW}$$

The balance is defined as

$$Return\ Flow\ of\ \ irrigation = Total\ irri.\ diversons - \sum_{i \in\ all\ crops} NET_i$$

The balance flow is divided into three parts: 1) the return flow of which part is recycled, 2) non-process evaporation through flows to swamps, and 3) non-utilizable flow to sea. The latter two parts determine the amount of return flow that is available for recycling.

By changing the drivers, various scenarios of irrigation water demand and recycling of return flows in the irrigation sector are developed. As in the previous spreadsheets, the created scenarios can be saved as a new scenario or can be replaced as a scenario already formulated.

The *"Next"* button directs to the next spreadsheet of action: *"Dom"*.

14. "DomDiv": Estimating Domestic Water Demand

Domestic water demand consists of two parts: water demand for humans and "water demand for livestock.

The major drivers for determining the domestic demand are

i. Percent population in urban areas,
ii. Per capita domestic water use for humans in urban areas
iii. Per capita domestic water use for humans in rural areas
iv. Percent of the population with access to pipe water supply
v. % domestic & industrial diversions from groundwater
vi. Number of animals of different types (cattle, pigs, and other animals) and
vii. Per animal water demand from each category

The domestic water demand is estimated by

$$Dom\ water\ demand = \left\{ \begin{array}{l} totpop \times \%pop\ with\ pipe\ water\ supply \times \\ \quad \left(\%urbanpop \times per\ capita\ demand_{urban} + \%ruralpop \times per\ capita\ demand_{rural} \right) \end{array} \right\} \times 365 + \left\{ \sum_{i \in (cattle, pigs, otheranimals)} number\ of\ animals_i \times per\ head\ demand_i \right\} \times 365$$

Basin Name		1995	Growth 2025	30	
Urban Population - % of total		29%	1.55%		0.4567
% urban population with Water supply	%	70%	0.00%		70%
% rural population with water supply	%	30%	0.00%		30%
Per capita water supply in Urban	l/pc/day	135	0.00%		135
Per capita water supply in Rural	l/pc/day	40	0.00%		40
Consumptive use factor	%	20%	0.00%		20%
Livestock water demand					
Number of cattles	1000's	10000	0.00%		10000
Number of pigs	1000's	10000	0.00%		10000
Number of goats	1000's	10000	0.00%		10000
Daily demand per head					
- Cattle	l/day	20	0.00%		20
- Pigs	l/day	20	0.00%		20
- Goats	l/day	20	0.00%		20
Utilizable Balance flow					
Return flow to surface- % of BF	%	60%	0.00%		60%
Recharge to Groundwater - % of BF	%	10%	0.00%		10%
Unutilizable balance flow - % of BF	%	30%			30%
% diversions from groundwater	%	50%	0.00%		50%

The data for the base year are given in blue and the default growth rates or growth rates of an already formulated scenario are shown in red. Change the drivers to develop new scenarios.

As in the irrigation module, this also estimates the consumptive use and the return flows from domestic withdrawals that can be recycled and the return flows that cannot be utilized for further use.

Click *"Save"* button and follow the procedure described earlier to save or replace the scenario. Pressing *"Next"* button directs you to the next spreadsheet of action: *"IndDiv"*.

15. "IndDiv": Estimating Industrial Water Demands

In the current version of the model, only growth in total industrial water demand is considered. The base year data of total industrial water withdrawals and the default growth rate for the total demand are available for future scenario generation. User is expected to make reasonable projections for growth rates for industrial demand.

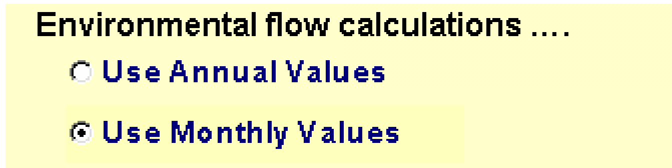
Basin Name		1995	Growth	2025	30
Industrial water demand	km3	1.254	0.0%		1.254
Consumptive use factor	%	20%	0.0%		20%
Utilizable Balance flow					
Return flow to surface- % of BF	%	0%	0.0%		0%
Recharge to Groundwater - % o	%	70%	0.0%		70%
Unutilizable balance flow - % of E	%	30%			30%
% diversions from groundwater	%	50%	0.0%		50%

Click *"Save"* button to save a new scenario or replace an existing scenario. The *"Next"* button will direct to the next spreadsheet of action named *"Env"*.

16. “Env”: Estimating Environmental Water Demand

The model estimates the portion of potentially utilized water resources that need to be reserved as environmental water demand. Two options are available for estimation. First option estimates annual demand directly. The second option estimates monthly demands and aggregate to get the annual values.

First select an option of annual or monthly assessment from the “Environmental flow Calculation” box.



	1995	2025
Environmental flow	0.0	0.00

If “Use Annual Values” is selected, specify the annual requirement in the target year in the left-hand side box.

If “Use Monthly Values” is selected then change appropriate drivers using arrow buttons to get the monthly requirements.

Data required for the base year when using monthly demand option are as follows;

i. Total environmental flow requirement of the month (EFR)
ii. Total renewable water resources of the month (MRWR)
iii. Potentially utilizable water resources of the month(PUMWR)
iv. % environmental flow met from the potential utilizable water resources

Month		1995			2025	30	
	Env. Flow Req. (10th percentile of MMR)	MMR	PUWMR	% EFR met from PUMWR	MMR	PUWMR	% EFR met from PUMWR
Jan	0	0	0	10%	0.0%	0.0%	0.0%
Feb	1	0	0	10%	0.0%	0.0%	0.0%
Mar	1	0	0	10%	0.0%	0.0%	0.0%
Apr	1	0	0	10%	0.0%	0.0%	0.0%
May	1	0	0	10%	0.0%	0.0%	0.0%
Jun	1	0	0	10%	0.0%	0.0%	0.0%
Jul	1	0	0	10%	0.0%	0.0%	0.0%
Aug	1	0	0	10%	0.0%	0.0%	0.0%
Sep	1	0	0	10%	0.0%	0.0%	0.0%
Oct	1	0	0	10%	0.0%	0.0%	0.0%
Nov	1	0	0	10%	0.0%	0.0%	0.0%
Dec	1	0	0	10%	0.0%	0.0%	0.0%
Total	11	0	0	0.1			

The future monthly demand is based on the changes in MRWR, PUMWR and the % EFR met from the PUMWR. Monthly demands are aggregated to get annual environmental demand from the potentially utilizable surface water resources.

Press *“Save”* button and follow the procedure explained earlier to save a new scenario or replace an existing scenario. Press *“Next”* button to go the next spreadsheet of action: *“Water”*.

17. “Water”: Estimating Water Availability

This part of the model estimates available water resources (excluding return flows for reuse) in the sub-unit. Both surface and ground water resources that can be potentially utilizable form the total utilizable water resources generated in the basin. This module has the capacity to deal with water transfers in from other units and water transfers out to other basins. The total water available in the basin is the sum of total utilizable water resources and the net transfers into the basin.

Water Availability **Indus**

Indus	Unit	1995	Annual growth	2025 30
Potentially Utilizable Surface Water Resources	km3	46	0.0%	46
Water transfer into the basin	km3	0	0.0%	0
Water transfers out of the basin	km3	0	0.0%	0
Potentially Utilizable Groundwater Resources	km3	14.29	0.0%	14.29
Reservior Storage capacity	km3	13.83	0.0%	13.83
Evaporation from Storage - % of capacity	%	15%	0.0%	15%
Surface return flows to sea - % of total	%	30%	0.0%	30%
Groundwater recharge flows to - % of total	%	30%	0.0%	30%

Future scenarios of water availability can be developed by changing the drivers of potentially utilizable surface and groundwater resources and water transfers in and out of the basin.
The changes in depletion through the evaporation from the surface of reservoir storages are captured by the two drivers: “Reservoir storage capacity” and “Evaporation from Storage”.

The utilizable outflows to sea from return flows (from both surface and groundwater) from all sectors are estimated through the remaining two drivers.

Changes to water supply can be saved as a new scenario or as an existing scenario by pressing the *“Save Scenario”* button. The *“Next”* button will direct to the next spreadsheet of action.

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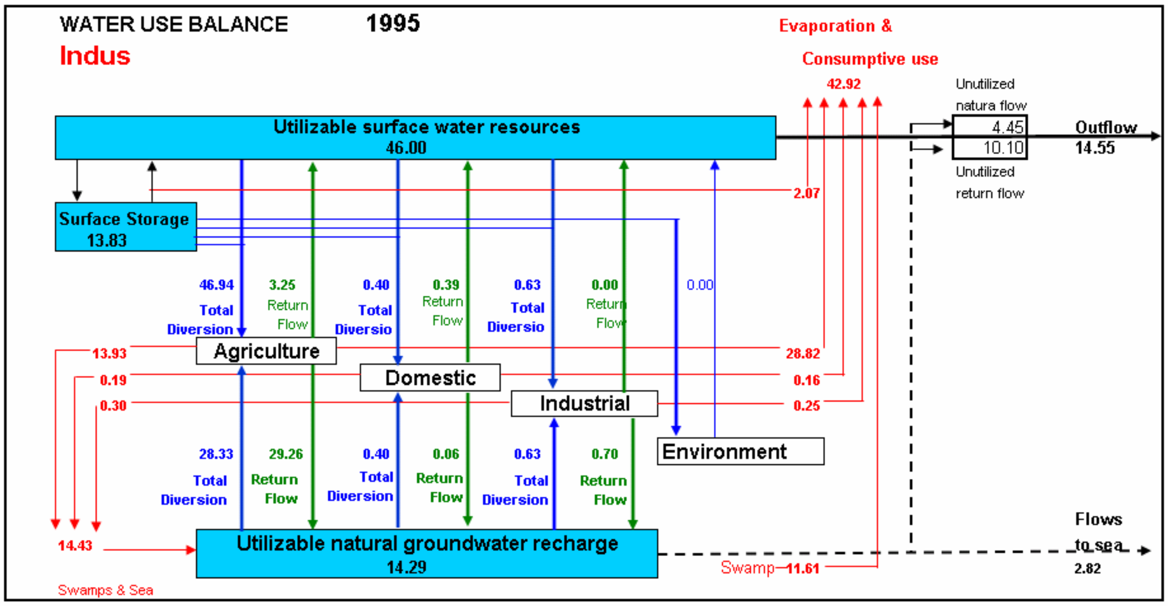
18. Water Balance at Sub-National Level

This section presents the sub-national level water balances. Water balance summaries are provided for the base year and also for the target year. Water balance figure shown below indicates all major sectors of water use.



Groundwater abstraction is 66% of total Groundwater Recharge

19. Data Entry

The base year data and a default set of future growth rates needs to be entered in the model for scenario generation. This section describes where different pieces of data need to be entered.

19.1 Data entry for Crop Consumption Estimation module

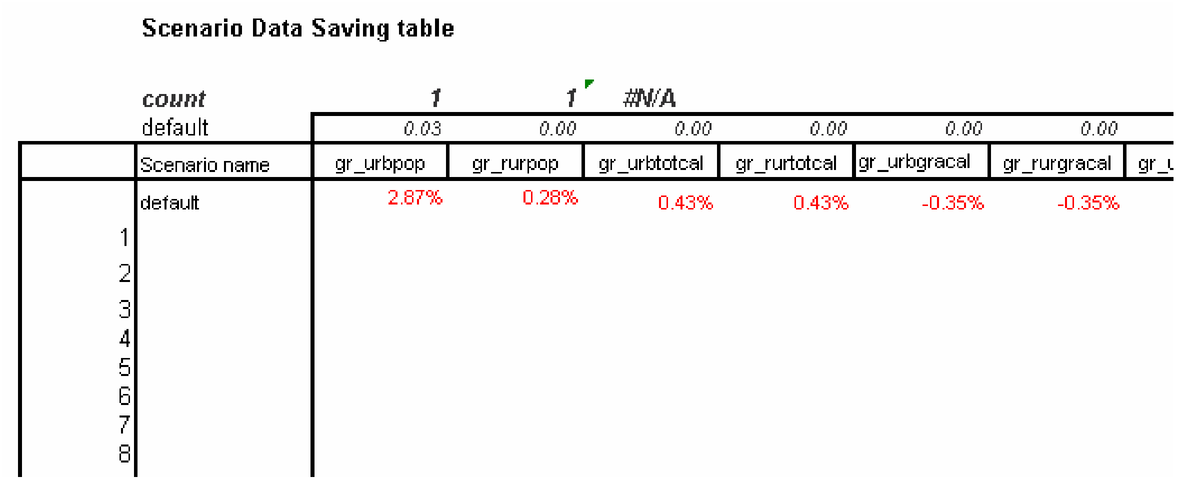
The information of this component is processed at national level and is shown in the spreadsheet named *"Con"*. The information here only consists of **annual data**. The data for this sheet is entered in the spreadsheet *"Con"* itself. These have to be entered manually. The information that has to be entered into the sheet is given in Table 1.

Table 1: Information of variables in the data entry sheet "Con"

Base year data Col. No.	Default growth rates Col No.	Variable description	Unit
L8-M8	N8-O8	Urban and Rural population	Millions
L9-M9	N9-O9	Total daily calorie supply per person	Calorie
L10-M10	N10-O10	% calorie supply from grain products	%
L11-M11	N11-O11	% calorie supply from animal products	%
L13-M13	N13-O13	Daily consumption per person in urban and rural area Rice	Kg/day
L14-M14	N14-O14	Daily consumption per person in urban and rural area Wheat	Kg/day
L15-M15	N15-O15	Daily consumption per person in urban and rural area Maize	Kg/day
L16-M16	N16-O16	Daily consumption per person in urban and rural area Other cereals	Kg/day
L17-M17	N17-O17	Daily consumption per person in urban and rural area Pulses	Kg/day
L18-M18	N18-O18	Daily consumption per person in urban and rural area Oil crops	Kg/day
L19-M19	N19-O19	Daily consumption per person in urban and rural area Vegetables	Kg/day
L19-M20	N20-O20	Daily consumption per person in urban and rural area Roots and tubers	Kg/day
L21-M21	N21-O21	Daily consumption per person in urban and rural area Sugar	Kg/Day
L22-M22	N23-O22	Annual cotton usage per person in urban and rural area	Kg/year
J28-J37	K28-K37	Feed conversion ratios of different crops	Kg/1000 Cal
N28-N37	O28-O37	(Seeds+Waste+Otheruses) - % of total consumption	%
Z28-Z37		Total domestic consumption of different commodity	M Mt
V42-V52		Average export prices (FOB) of different crops	US$/Ton

The base year data are entered in cells in blue color. The default growth rates are entered in cells in red color. When data entry is complete, use the *"Save"* button to save the information as **"Default"** scenario**.** After this save the PODIUM file itself.

Another method of entering default data is to enter them to the sheet directly as shown in the figure below. When data entry is complete then save the podium file.



Scenario Data Saving table

	count	*1*	*1*	*#N/A*				
	default	0.03	0.00	0.00	0.00	0.00	0.00	
	Scenario name	gr_urbpop	gr_rurpop	gr_urbtotcal	gr_rurtotcal	gr_urbgracal	gr_rurgracal	gr_u
	default	2.87%	0.28%	0.43%	0.43%	-0.35%	-0.35%	
1								
2								
3								
4								
5								
6								
7								
8								

19.2 Data entry for Other Modules

The information for all other modules is processed at sub-national level. Generating a new-scenario or editing an existing scenario is done only for one sub unit at a time. Therefore the information at sub-national level is stored in a separate location. The base year data and the default growth rates of sub units are stored in three different spreadsheets.

19.2.1 dataProd spreadsheet

The information entered in this spreadsheet is shown in table 2. Column 1 of the table indicates the column number of the spreadsheet of the base year data. Column 2 of the table indicates the column number of the default growth rates for the target year. Column 3 of the table indicates the variables descriptions. Column 5-7 indicates whether the data entered are annual, seasonal or monthly information.

Table 2: Information of variables in the data entry sheet *"dataProd"*

Base year data Col. No.	Default growth rates Col No.	Variable description	Unit	Annual	Seasonal	Daily
C	CK	Total population of the sub-unit	Millions	X		
D	CL	Urban population - % of total	M Ha	X		
E-F	CM-CN	Net and gross crop area	M Ha	X		
G-H	CO-CP	Net and gross irrigated area	M Ha			
I-AB	CQ-DJ	Irrigated area of different crops in two seasons	M ha		X	
AC-AV	DK-ED	Irrigated yield of different crops in two seasons	Ton/ha		X	
AW-BP	EE-EX	Rainfed area of different crops in two seasons	M Ha		X	
BQ-CJ	EY-FR	Rainfed yield of different crops in two seasons	Ton/ha		X	

19.2.2 "dataWat1" spreadsheet

The information entered in this spreadsheet are shown in table 3. Column 1 of the table indicates the column number of the spreadsheet of the base year data. Column 2 of the table indicates the column number of the default growth rates for the target year. Column 3 of the table indicates the variables descriptions. Column 5-7 indicates whether the data entered are annual, seasonal or monthly information.

Table 3: Information of variables in the data entry sheet *"dataWat1"*

Base year data Col. No.	*Default growth rates/values Col No.*	*Variable description*	*Unit*	*Annual*	*Seasonal*	*Daily*
C-N	DS-ED	*Average daily ETo of each month*	*mm/day*			*X*
O-Z	EE-EP	Average P75 of each month	*Mm/month*			*X*
AA-AL	EQ-FB[1]	Starting day of the first season of different crops	*Day*		*X*	
AM-AX	FB-FN[1]	Starting month of the season of different crops	*Month*		*X*	
AY-BJ	FO-FZ[1]	Length of the "initial" stage of growth in season 1 of different crops	Days		*X*	
BK-BV	GA-GL[1]	Length of the "development" stage of growth in season 1 of different crops	Days		*X*	
BW-CH	GM-GX[1]	Length of the "middle" stage of growth in season 1 of different crops	Days		*X*	
CI-CT	GY-HJ[1]	Length of the "late" stage of growth in season 1 of different crops	Days		*X*	
CU-DF	HK-HV[1]	Crop coefficients "initial" stage of growth in season 1 of different crops	Number		*X*	
DG-DR	HW-IJ[1]	Crop coefficients "development " stage of growth in season 1 of different crops	Number		*X*	

19.2.3 "dataWat2" spreadsheet

The information entered in this spreadsheet are shown in table 4. Column 1 of the table indicates the column number of the spreadsheet of the base year data. Column 2 of the table indicates the column number of the default growth rates for the target year. Column 3 of the table indicates the variables descriptions. Column 5-7 indicates whether the data entered are annual, seasonal or monthly information.

Table 4: Information of variables in the data entry sheet *"dataWat2"*

Base year data Col. No.	*Default growth rates/values Col No.*	*Variable description*	*Unit*	*Annual*	*Seasonal*	*Daily*
C-M	Dl-DV[1]	Crop coefficients for mid stage of different crops	*number*	*X*		
O-Z	DW-EG[1]	Crop coefficients for late stage of different crops	*number*	X		
AA-AB	EH-EI	Percentage of ground water irrigated area	*%*		*X*	
AC-AD	EJ-EK	Project efficiency for surface irrigation for paddy	*%*		*X*	
AE-AF	EL-EM	Project efficiency for surface irrigation for other crops	%		*X*	
AG-AH	EN-EO	Project efficiency for groundwater irrigation	%		*X*	
AI-AJ	EP-EQ	Deep percolation of paddy	mm		*X*	
AK-AL	ER-ES	Irrigation return flows to surface water supply	%		*X*	
AM-AN	ET-EU	Irrigation return flows to ground water supply	%		*X*	
AO-AP	EV-EW	Irrigation return flows to sea/down stream countries	%		*X*	
AQ-AR	EX-EY	Percentages of population with pipe water supply in the urban and rural sector	%	X		
AS-AT	EZ-FA	Daily per capita water supply in urban and rural areas	Liters	X		
AU	FB	Consumptive use factor of domestic diversions	%	X		
AV-AX	FC-FE	Number of cattle, pigs and other animals	Number	X		
AY-BA	FF-FH	Daily water requirement per head of cattle, pigs, and other animals	Liters	X		
BB-BC	FI-FJ	Percent domestic return flows to surface and ground water	%	X		
BD	FK	Percent domestic withdrawals from groundwater	%	X		
BE	FL	Total Industrial water demand	Km^3	X		
BF	FM	Consumptive use factor of Industrial withdrawals	%	X		
BG-BH	FN-FO	Percent industrial return flows to surface and groundwater	%	X		
BI	FP	Percent industrial withdrawals from groundwater	%	X		
BJ-BU	FQ-GB	Environmental flow requirement in each month month (EFR)	Km^3			*X*
BV-CG	GC-GN	Average Water Resources in each month (MWR)	Km^3			*X*
CH-CS	GO-GZ	Potentially utilizable water resources in each month(MPUWR)	Km^3			*X*
CT-DE	HA-HL	Percentage of EFR to be met by MPUWR in each month	%			*X*
DF-DG	HM-HN	Potentially utilizable surface and groundwater resources	Km^3	X		
DH-DI	HO-HP	Water transfers in and out of the sub-unit	Km^3	X		
DJ	HQ	Reservoir capacity	Km^3	X		
DK	HR	Evaporation from reservoir storage - % of capacity	%	X		
HS-HT	HU-HV	Percent of utilizable return flows to surface and groundwater as outflows to sea	Number			
	HW-HX[1]	Target year crop coefficient of fruits in middle and late growing stages	number			

1 – Default values are same as the base year information.

19.2.4. "dataWat3"

The information entered in this spreadsheet is shown in table 5. Column 1 of the table indicates the column number of the spreadsheet of the base year data. Column 2 of the table indicates the column number of the default growth rates for the target year. Column 3 of the table indicates the variables descriptions. Column 5-7 indicates whether the data entered are annual, seasonal or monthly information.

Table 5: Information of variables in the data entry sheet *"dataWat3"*

Base year data Col. No.	*Variable description*	*Unit*	*Annual*	*Seasonal*	*Daily*	*Default growth rates/ values[1] Col No.*
C-N	Starting day of season 2 for different crops	*Number (1-30)*		*X*		BW-CH
O-Z	Starting month of season 2 for different crops	*Number (1-30)*		*X*		CI-CT
AA-AL	Length of "initial" growth period of different crops in season 2	*# days*		*X*		CU-DF
AM-AX	Length of "development" growth period of different crops in season 2	*# days*		*X*		DG-DR
AY-BJ	Length of "middle" growth period of different crops in season 2	# days		*X*		DS-ED
BK-BV	Length of "initial" growth period of different crops in season 2	# days		*X*		EE-EP

1 – Default values are same as the base year data.