Tutorial: Performing simulations with WABAL

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Content

1. Introduction

This tutorial shows step by step how to perform simulations with WABAL in MOSAICC, in a view of defining yield functions and projecting yields under climate scenarios. The tutorial focuses on case study, the simulation of corn in the province of Nueva Ecija, Philippines.

The following processes are detailed:

- Uploading input files
- Running a simulation, in both points and grid mode.
- Retrieving the outputs: display and download

Climate data are assumed to be already available in the database.

The steps of each process are illustrated with screenshot from MOSAICC. The overall structure of MOSAICC web interfaces is depicted in Figure 1.

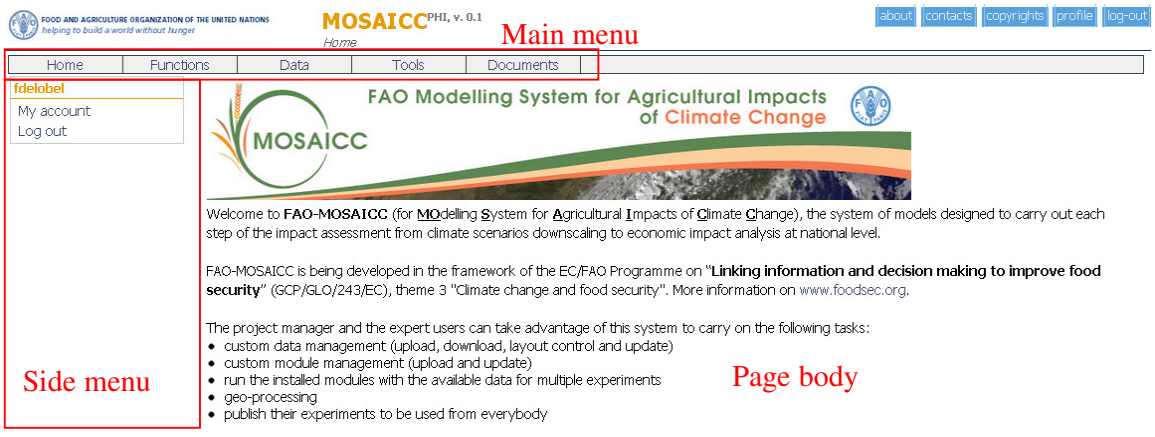


Figure 1 MOSAICC user home page and overall structure

2. Uploading input files: administrative units, soil map and crop mask

Users can upload new datasets to the MOSAICC database through the interface following the path:

- Main menu: Data
- Side menu: Upload (in the section “Geographic data”)

The screen below appears (Figure 2):

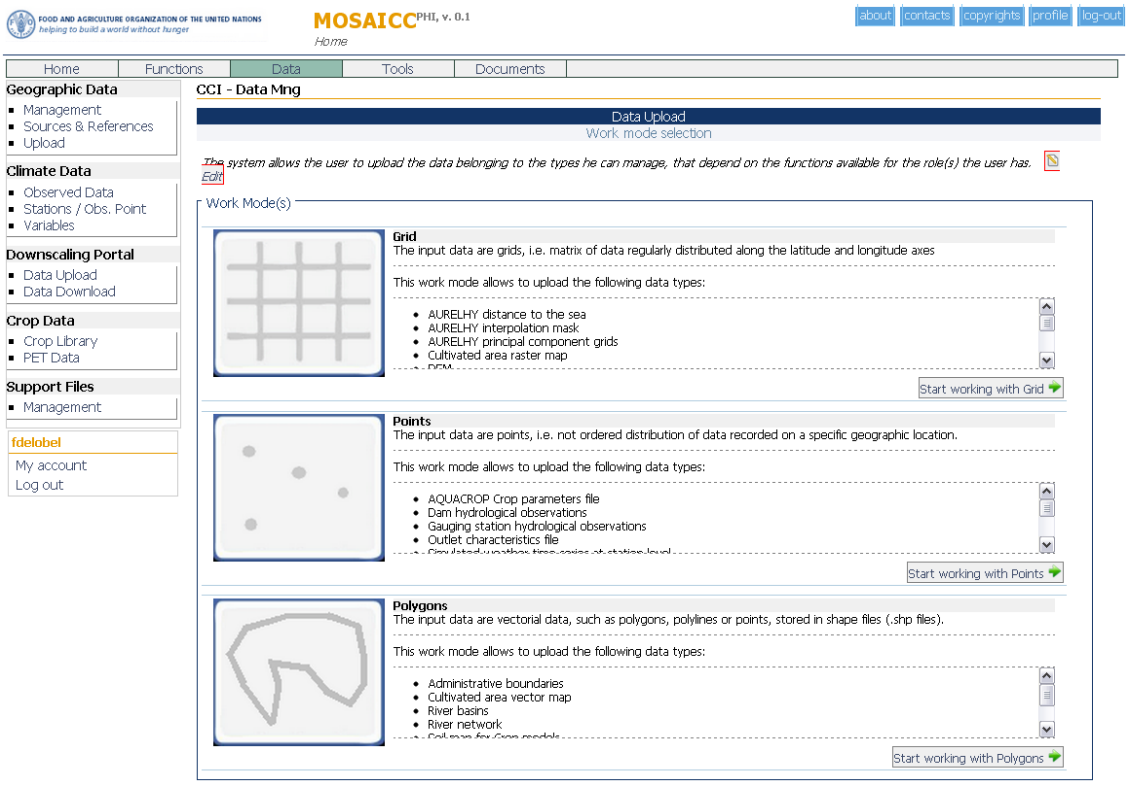


Figure 2 Data upload screen: data format selection

Three different formats can be uploaded to the MOSAICC database: point shapefiles, polygon shapefiles, raster (ArcInfo ASCII or geotiff). To upload new administrative limits, the user must click on: “Start working with Polygons” in the page body and fill in the form displayed (Figure 3):

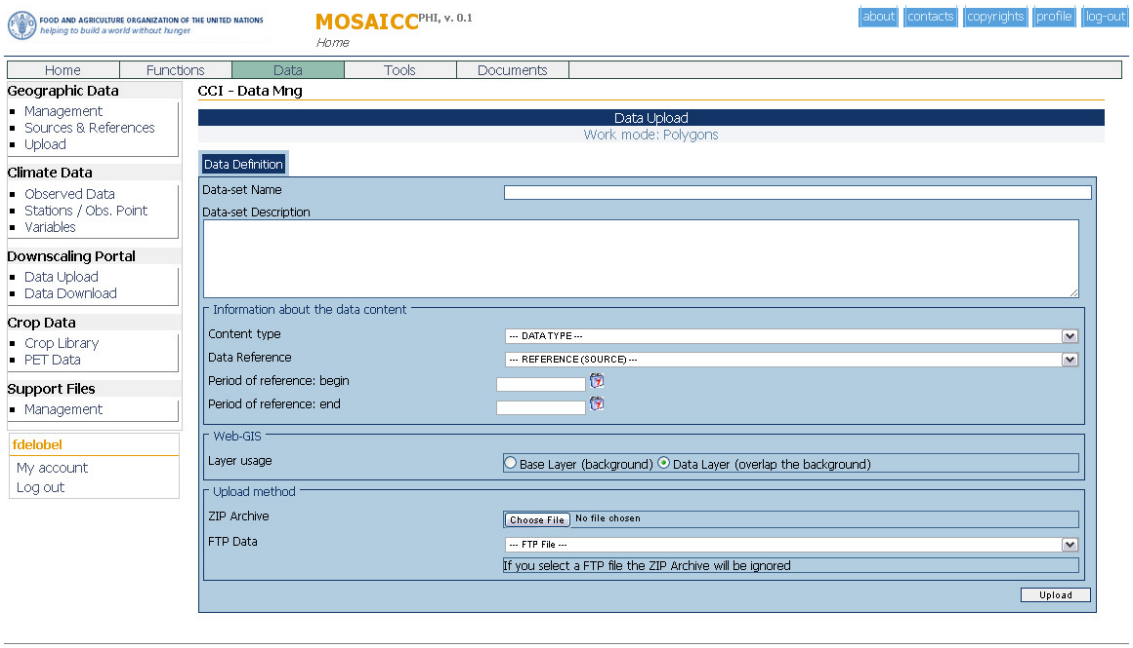


Figure 3 Data upload form

The following filled are to complete:

- Data set name: user defined name for the administrative limits
- Description: a short description of the dataset
- Content type: Administrative boundaries
- Data reference: the reference of the data. If not existing the reference must be first created in the Sources and Reference page (side menu)

The period fields are not relevant for datasets that are not time series.
The layer usage can remain set on Data layer, in order to keep the layer available for display together with other datasets in the visualisation tools throughout the interfaces.

The dataset can be uploaded either through direct upload or through FTP. Direct upload is recommended when the files have relatively small size (up to 5Mb), upload through FTP for bigger ones. For the latter option the file must be uploaded to the FTP repository beforehand. In both cases the dataset must be packed in a ZIP archive.

Here is an example filled form for a shapefile delimiting the province of Nueva Ecija and directly uploaded through the interface (Figure 4):

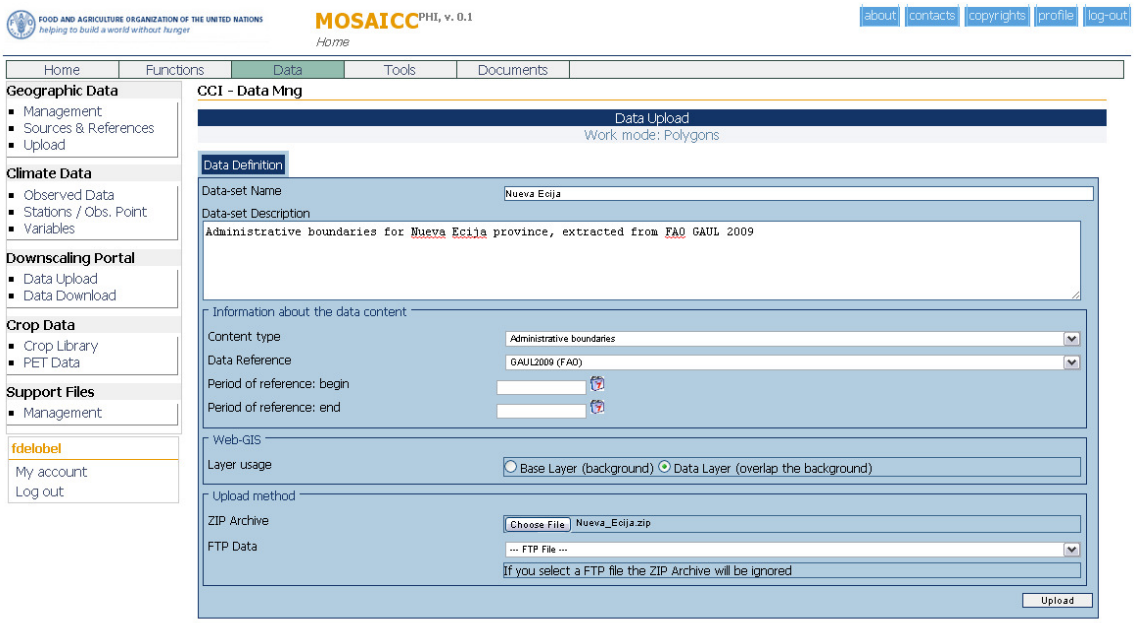


Figure 4 Filled data upload form for Nueva Ecija

Once uploaded, the file is visible in the Geographic data Management screen (see side menu).

To upload soil maps and crop masks, the procedure is the same. The only difference is that these files are grids, therefore the grid work mode must be selected on the initial upload page. The corresponding data types are “cultivated area raster map” for crop masks and “soil water holding capacity” for soil maps. Soil maps can also be uploaded as polygon shapefiles using the “soil properties for crop models” data type. Instructions for formatting soil maps in vector files are detailed in the manual “MAN_preparation of soil data”.

3. Defining the crop files

WABAL simulations are adapted for each crop through the utilization of a number of parameter describing its water requirements over the growing season. These crop specific parameters are saved in MOSAICC in crop files gathered in a Crop Labrary. The crop library is accessible going to “Data” in the main menu and then “Crop library” in the side menu, Crop Data section (Figure 5).

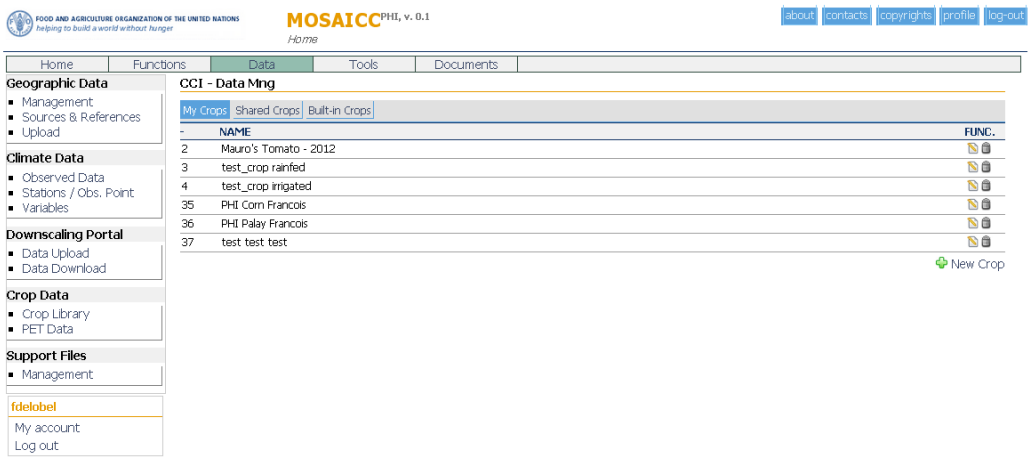


Figure 5 Crop library

The list of crops previously defined is available in the body of the page. These crop files can be edited or deleted using the two icons (a page with a pen and a bin) at the right-hand end of the row. New crop files can be created clicking on "New Crop", at the lower right corner of the list. A form appears (Figure 6).

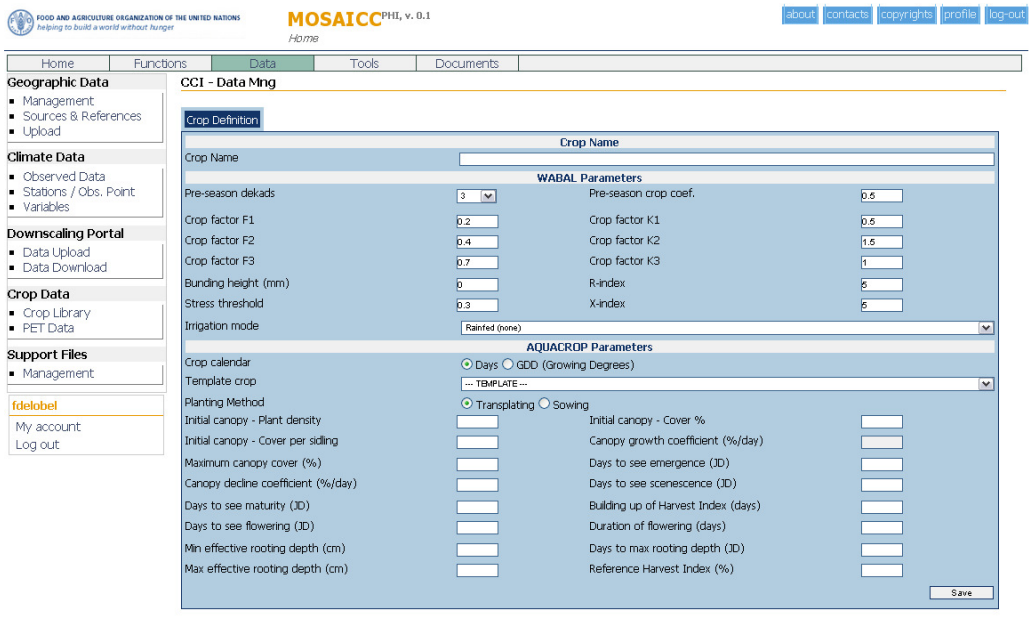


Figure 6 Crop parameters

Each crop file is saved under a unique name defined by the user in the first text box ("Crop Name"). Though the crop file can contain both WABAL and AQUACROP parameters, one of the two sets only is strictly required.

4. Running a simulation

The link to the wizard for the definition of WABAL experiment is located in the side-menu ("WABAL") of the "Functions" page. In MOSAICC, WABAL can run either on points, to

simulate for instance yields for given agronomic stations, or grids, to provide results at the level of user-defined administrative units (Figure 7).

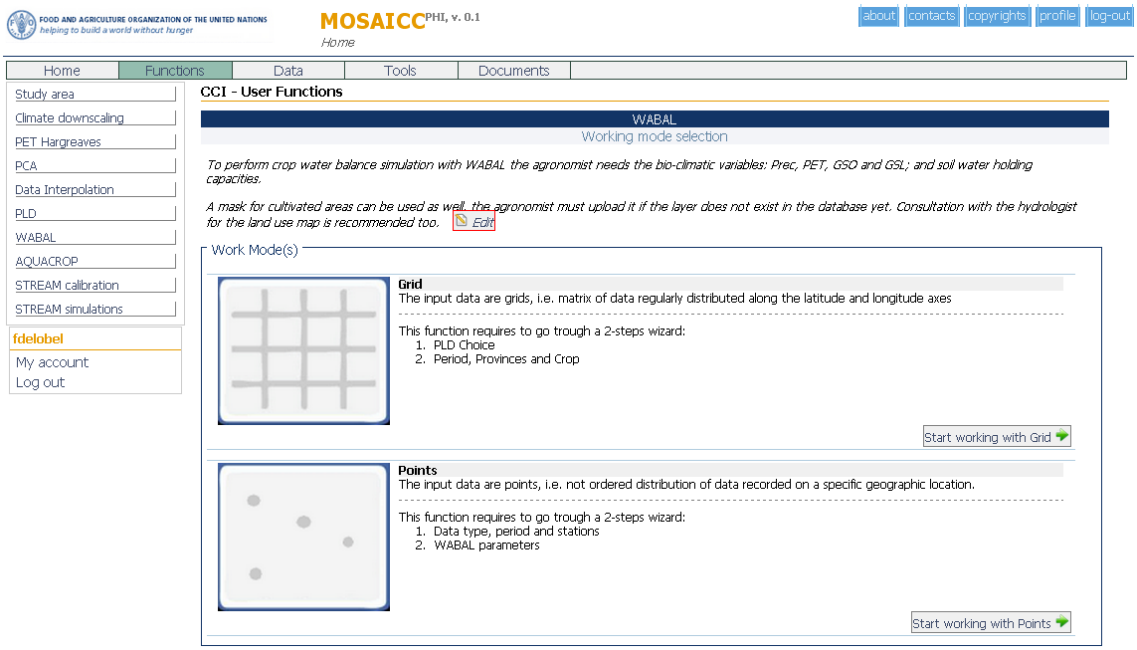


Figure 7 WABAL main page and work modes

Grid mode

The wizard to define WABAL experiment has two steps. The first step includes the following fields (Figure 8):

- Data type: to select the nature of the data, which can be observed or simulated (i.e. derived from downscaling)
- Manual set-up of PLD: to choose whether the planting dates come from a PLD experiment ("Yes") or constant values ("No")

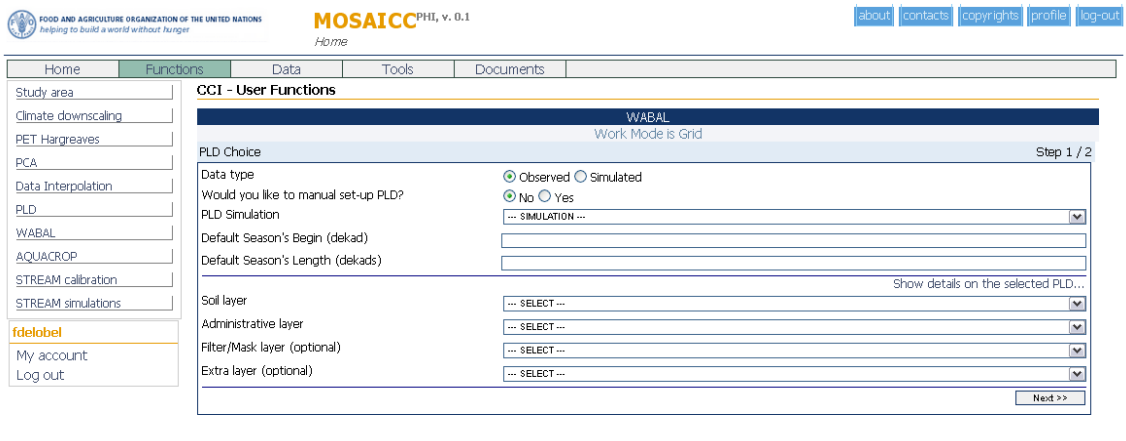


Figure 8 WABAL grid mode step 1

If the user selects "Yes" in the second field, the user can select the PLD experiment wanted in the following drop down menu ("PLD Simulation"). Instead if the user chooses to work with constants, two drop down menus appear to select the precipitation and the PET grids. Next,

two text fields are displayed: “Default Season’s Begin” and “Default Season’s Length”. These fields accept integers between 0 and 36 as their unit is the dekad. They are used as default values when a PLD experiment is failing, or as actual growing season begin and length if PLD experiments are by-passed. In the second section of the form, a soil layer with water holding capacities in mm in its attributes must be selected, as well as an administrative layer containing the units for which the simulation will be achieved. Loading the administrative units may be a slow process; it is therefore advised to select a layer containing the area of interest only.

On the next step (Figure 9), the experiment is given a name, the years and the areas of simulations are selected and the crop file is chosen. Clicking on “Run >>” launches the simulations.

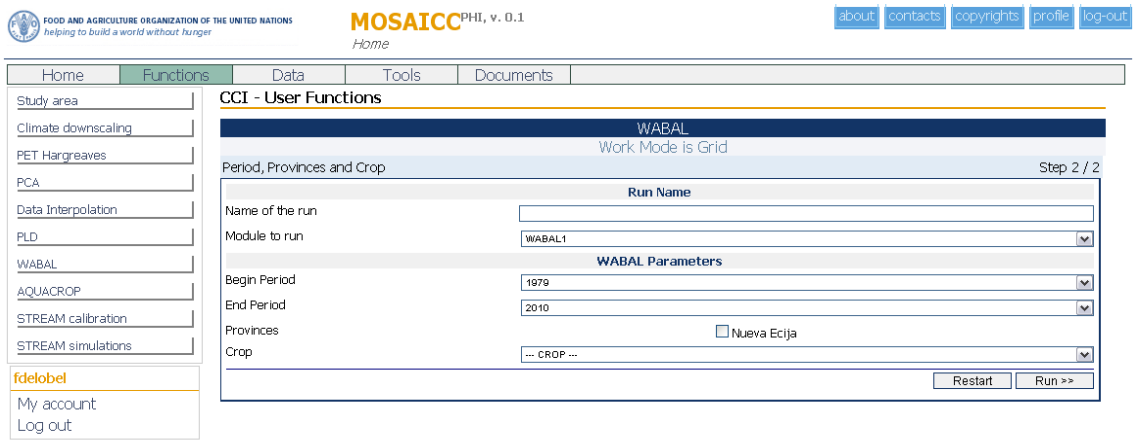


Figure 9 WABAL grids mode step 2

Points Mode

In points mode, the wizard is very similar, though it has some simplifications. The first screen (Figure 10) allow the user to choose whether to work with a PLD experiment or without, enter the growing season beginning and length (dekad) default values and to select the soil map.

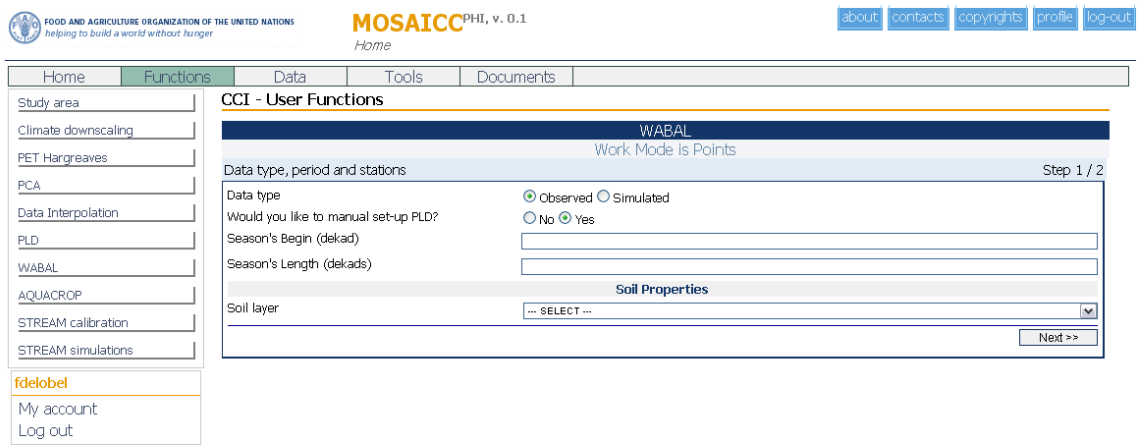


Figure 10 WABAL points mode step 1

In the second step (Figure 11), the first field serves for naming the experiment. The second one, the module to run, is fixed. The data source, i.e. the set of weather observations to be used for the simulation, can then be selected, as well as the beginning and the end years of the time series. Selecting the data source and the time series limits loads the stations from that source available for that whole period. The user can choose which stations to include in the simulation and the crop file to use. As in grids mode clicking on "Run >>" launches the simulations.

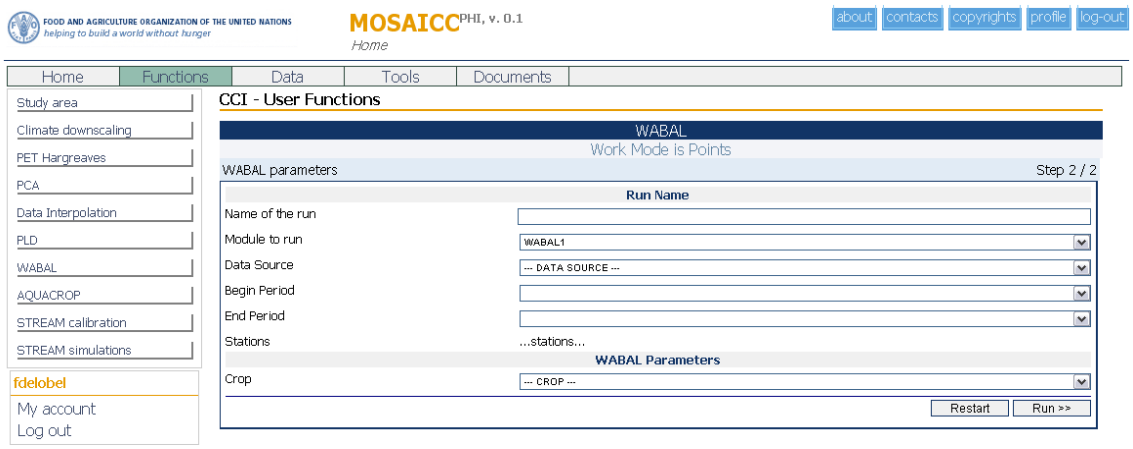


Figure 11 WABAL points mode step 2

5. Retrieving the outputs

WABAL simulations usually take few seconds to run. When a simulation is done the results can be retrieved by going to "Tools" in the main menu and "Experiments" in the side menu. All experiments carried out by the user are displayed on the screen. Filtering the experiments using the for drop-down menus at the top of the screen helps to isolate specific experiments (Figure 12). Results can be in turn visualised by clicking on the experiment number, on the left end of the row.

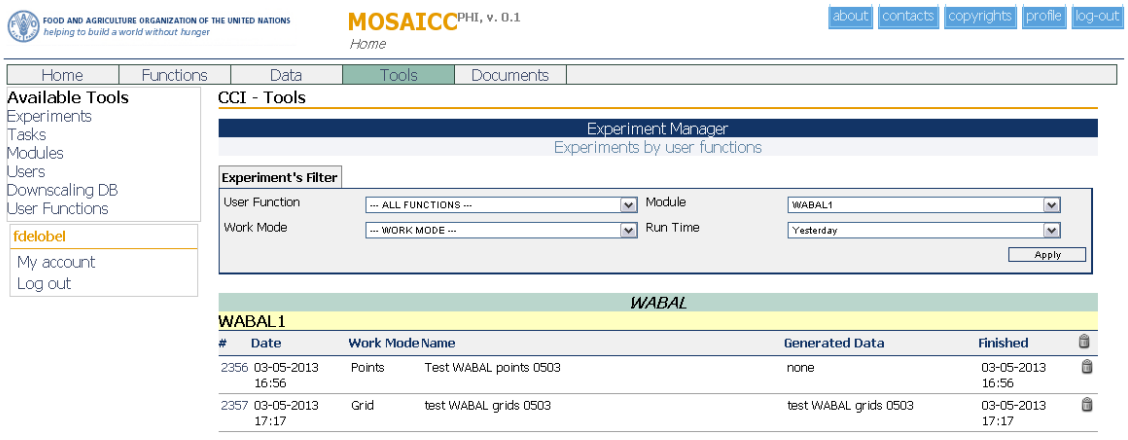
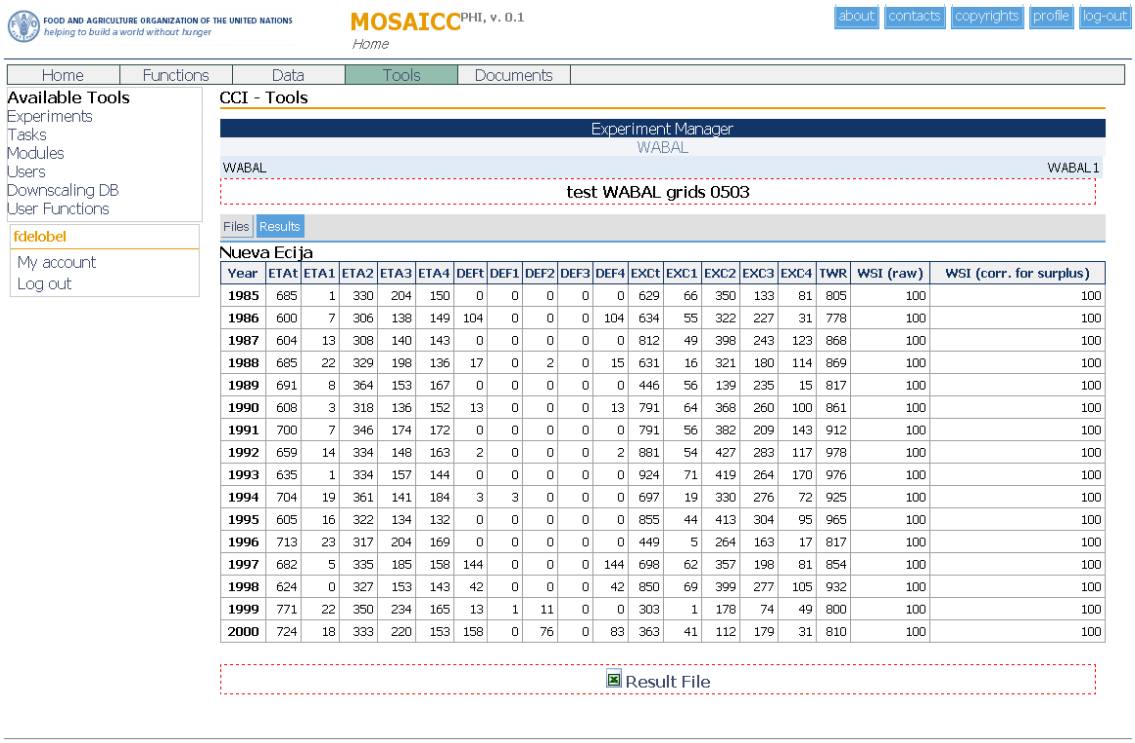


Figure 12 Experiment list and filter

The results of WABAL experiments are presented in a table, with the values for each output variable for each year of simulation (Figure 13). On table is shown for each administrative

units in grids mode or each station in points mode. The tables can be downloaded directly for statistical processing using the button “Result file” at the bottom of the screen.



Year	ETAt	ETA1	ETA2	ETA3	ETA4	DEFt	DEF1	DEF2	DEF3	DEF4	EXCt	EXC1	EXC2	EXC3	EXC4	TWR	WSI (raw)	WSI (corr. for surplus)
1985	685	1	330	204	150	0	0	0	0	0	629	66	350	133	81	805	100	100
1986	600	7	306	138	149	104	0	0	0	104	634	55	322	227	31	778	100	100
1987	604	13	308	140	143	0	0	0	0	0	812	49	398	243	123	868	100	100
1988	685	22	329	198	136	17	0	2	0	15	631	16	321	180	114	869	100	100
1989	691	8	364	153	167	0	0	0	0	0	446	56	139	235	15	817	100	100
1990	608	3	318	136	152	13	0	0	0	13	791	64	368	260	100	861	100	100
1991	700	7	346	174	172	0	0	0	0	0	791	56	382	209	143	912	100	100
1992	659	14	334	148	163	2	0	0	0	2	881	54	427	283	117	978	100	100
1993	635	1	334	157	144	0	0	0	0	0	924	71	419	264	170	976	100	100
1994	704	19	361	141	184	3	3	0	0	0	697	19	330	276	72	925	100	100
1995	605	16	322	134	132	0	0	0	0	0	855	44	413	304	95	965	100	100
1996	713	23	317	204	169	0	0	0	0	0	449	5	264	163	17	817	100	100
1997	682	5	335	185	158	144	0	0	0	144	698	62	357	198	81	854	100	100
1998	624	0	327	153	143	42	0	0	0	42	850	69	399	277	105	932	100	100
1999	771	22	350	234	165	13	1	11	0	0	303	1	178	74	49	800	100	100
2000	724	18	333	220	153	158	0	76	0	83	363	41	112	179	31	810	100	100

Figure 13WABAL output table (grid mode)