Food and Agriculture Organization of the United Nations

Crop Module 1
Introduction to AquaCrop

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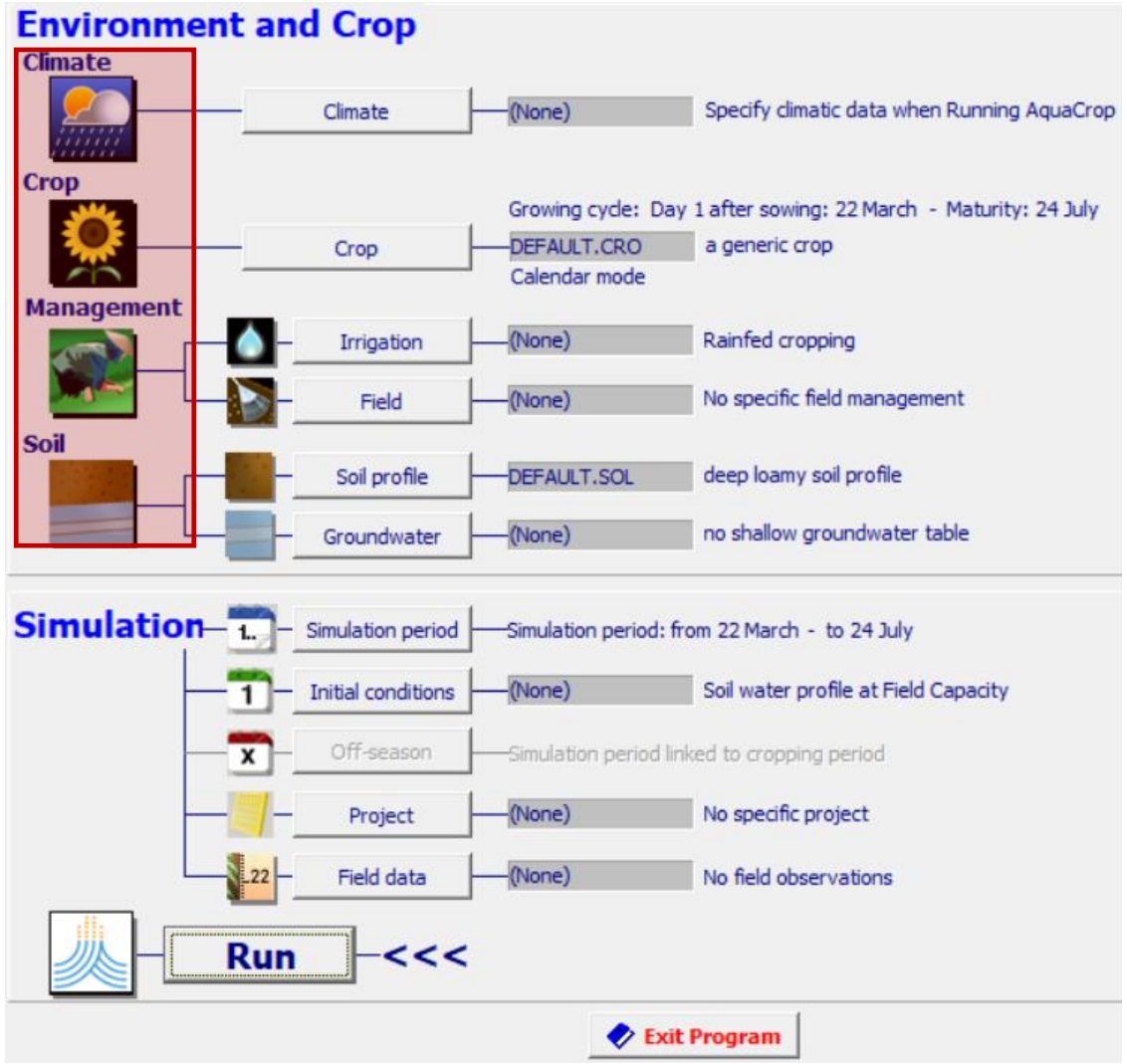
- How do crop models work
- AquaCrop interface
- AquaCrop: climate and crop modules

Day 2

- AquaCrop: management and soil modules
- Run simulations and interpret outputs



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Data used for this simulation

Climate module: AquaCrop default climatic files for Córdoba (south Spain) for year 1981. YESTERDAY

Crop module: AquaCrop default crop files (daily values) for tomato grown in Córdoba and sown 1st May. YESTERDAY

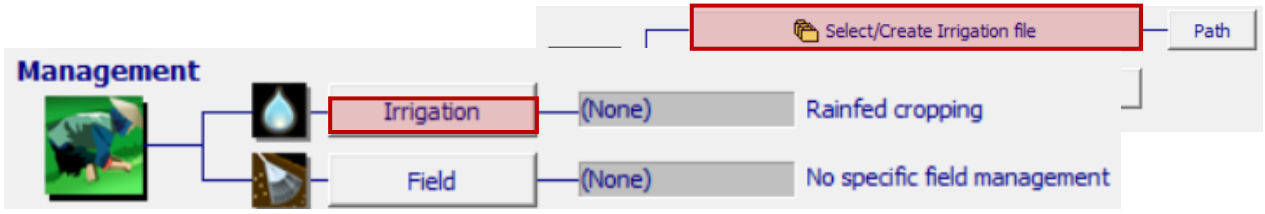
Management module:

- Irrigation sub-module: create our own irrigation files. TODAY
- Field sub-module: AquaCrop default field files (moderate soil fertility). TODAY

Soil module:

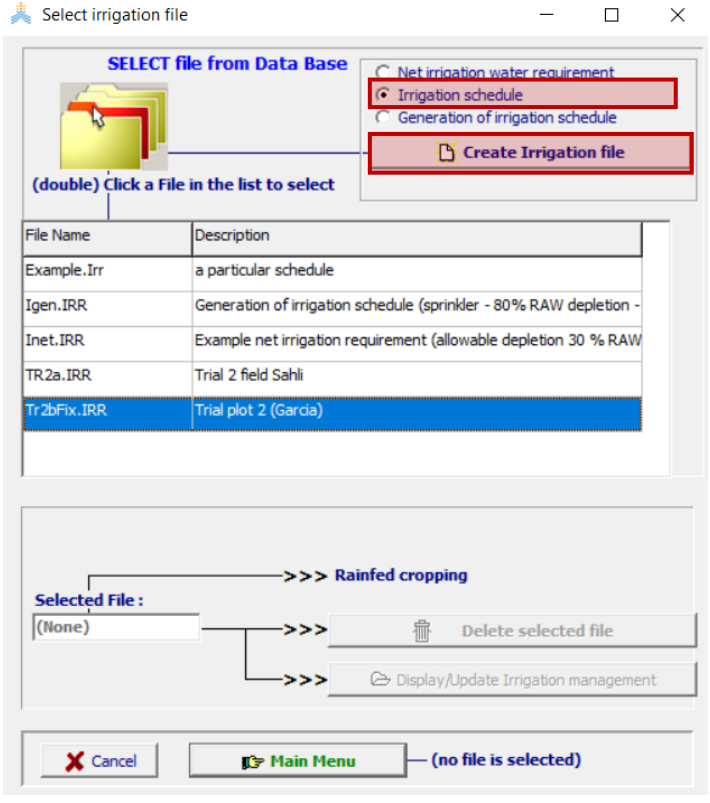
- Soil profile: AquaCrop default soil files (sandy-loam). TODAY
- Groundwater sub-module: AquaCrop default groundwater files (constant water at 2m depth). TODAY

Management module: irrigation

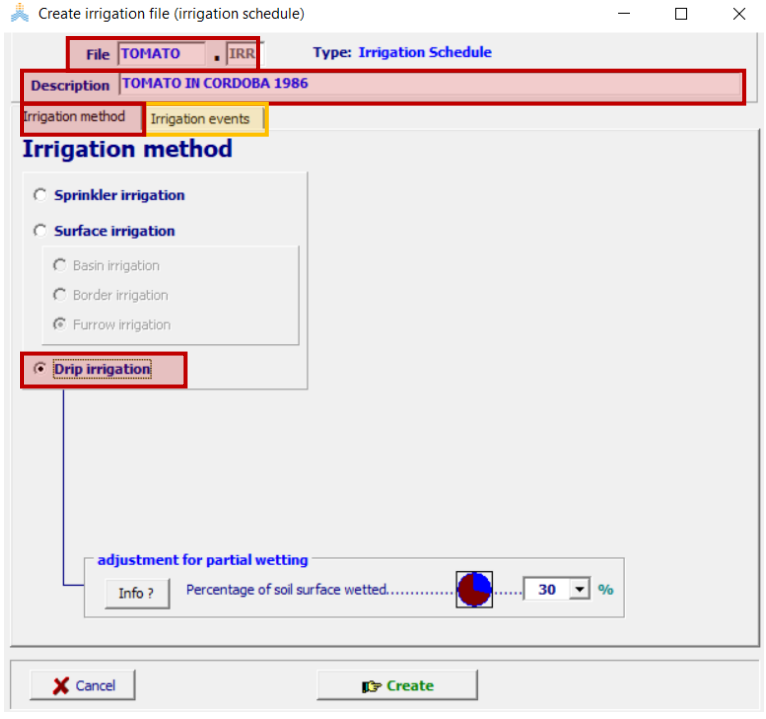


Step 1: click on **irrigation** and then **select/create irrigation file**

Step 2: click on **irrigation** schedule and then **create irrigation file**

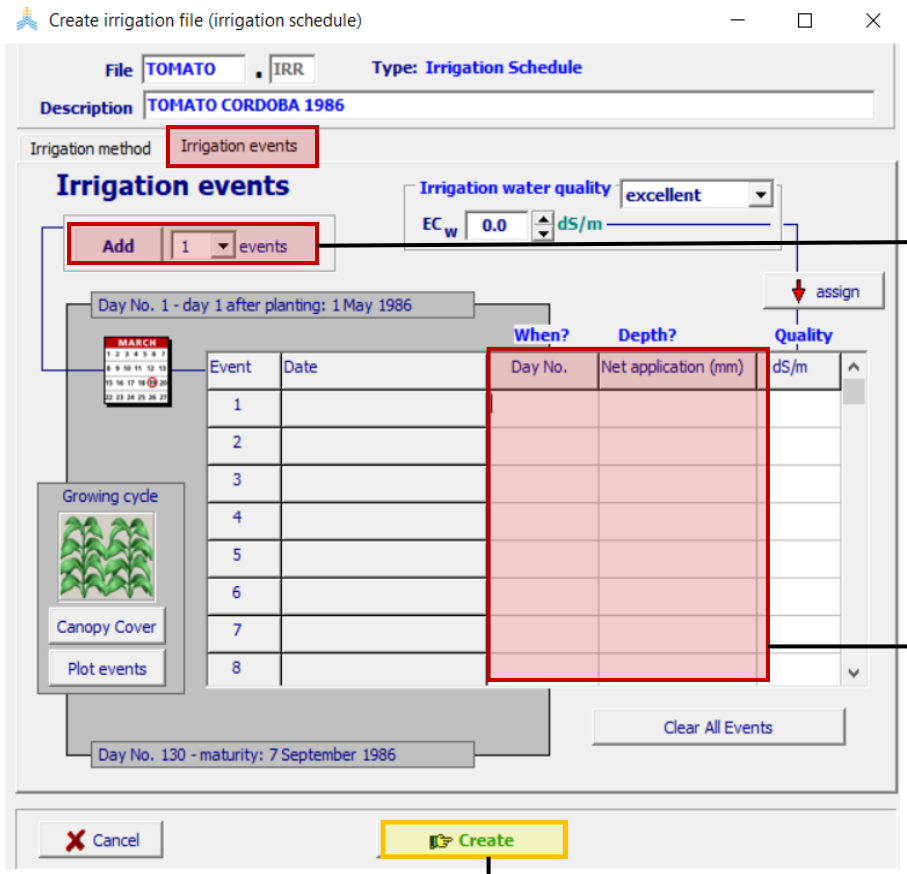


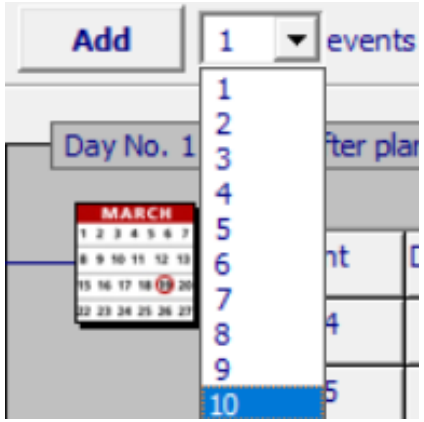
Step 3: name your file "**tomato**" and provide a description "**tomato in Córdoba 1986**" and select the irrigation method, in our case, **drip irrigation**. Then click on **irrigation events**



Management module: irrigation

Step 1: click on **add events** and add **10**





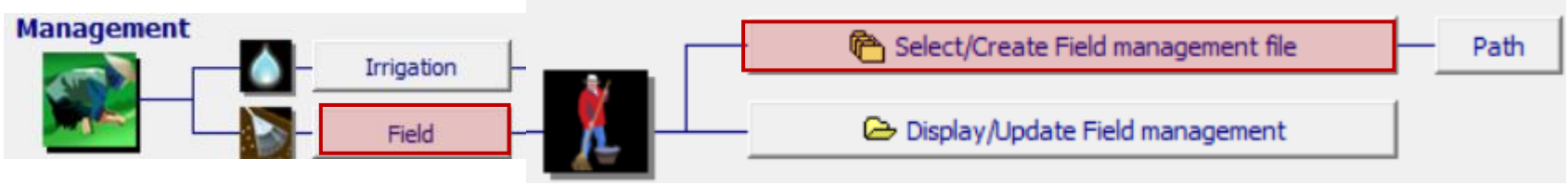
Step 2: type the frequency of irrigation, **5** days, as well as the net application of water, **10**mm. In total, you should have 20 irrigation events each with 10mm (200mm of irrigation)

Event	Date	Day No.	Net application (mm)	dS/m
1	5 May 1986	5	10	0.0
2	10 May 1986	10	10	0.0
3	15 May 1986	15	10	0.0
4	20 May 1986	20	10	0.0
5	25 May 1986	25	10	0.0
6	30 May 1986	30	10	0.0
7	4 June 1986	35	10	0.0
8	9 June 1986	40	10	0.0

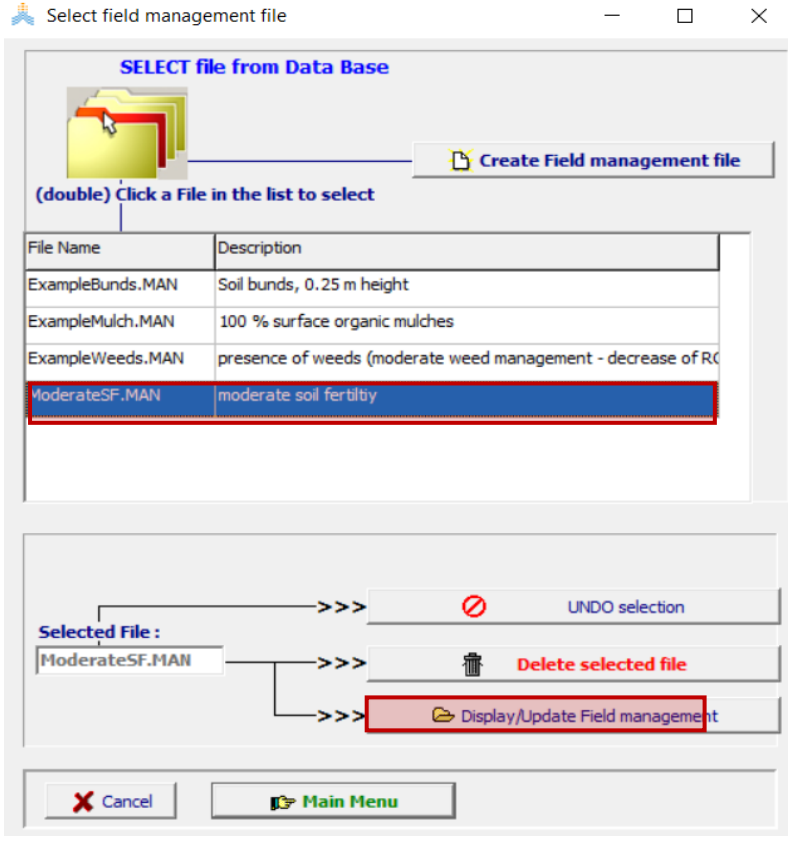
Step 3: click on **create**. AquaCrop should have created the irrigation file with the frequency and amount specified!

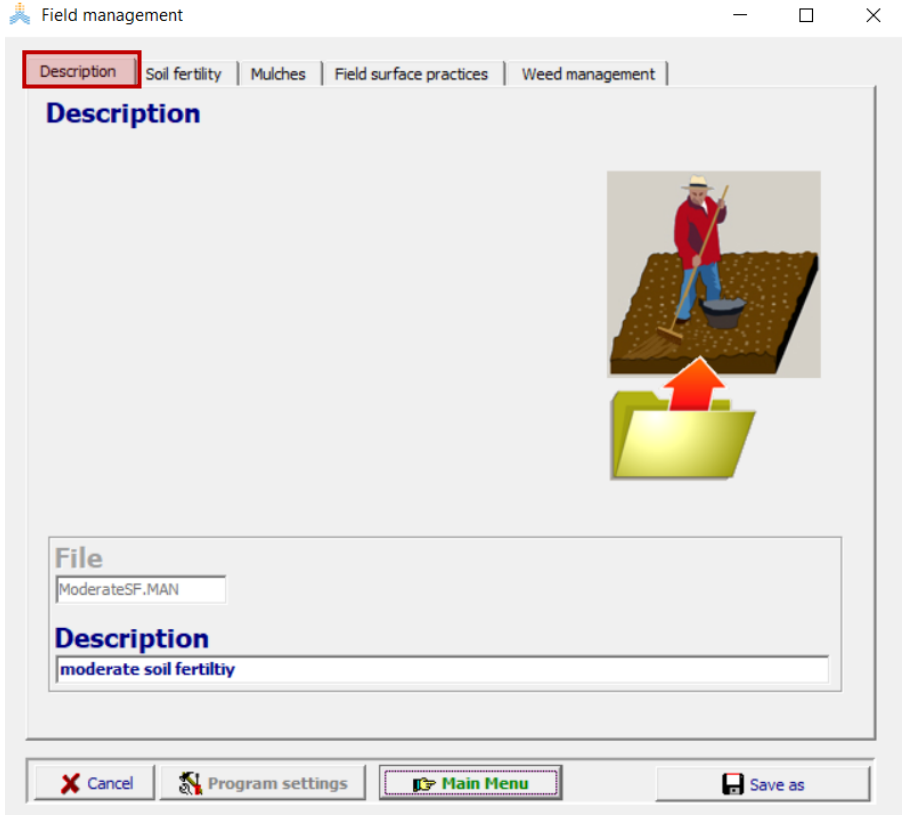
Management module: field management

Step 1: click on **field** and **select/create field management file**



Step 2: click once on **moderate soil fertility** and **display/update field management**





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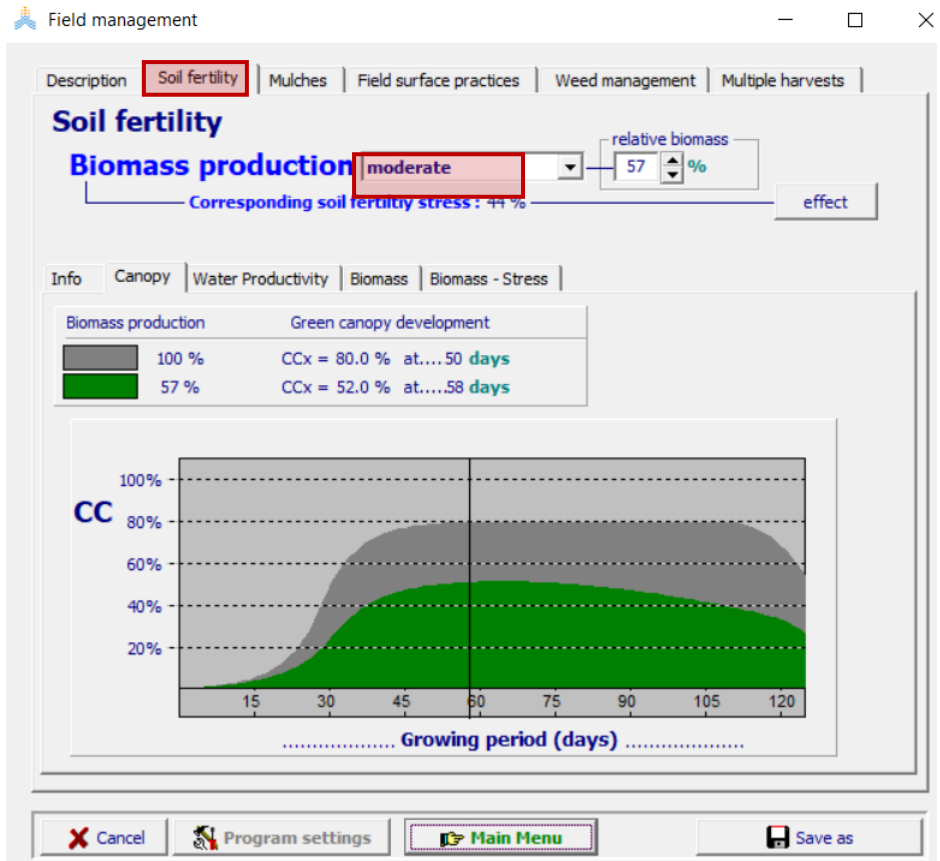
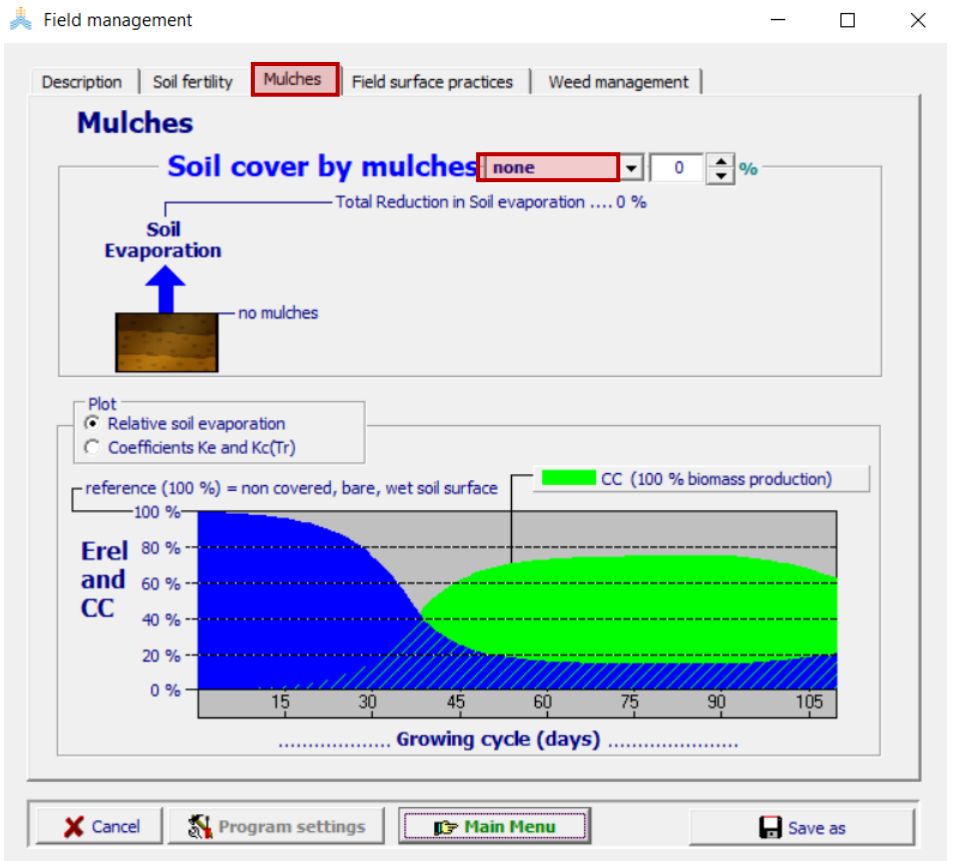
Management module: field management

Field management practices are choices of soil fertility levels, weed management, and practices that affect the soil water balance such as mulching to reduce soil evaporation, soil bunds to store water in the field, and tillage practices such as soil ridging or contours reducing run-off of rainwater.

Step 1: click on **soil fertility**

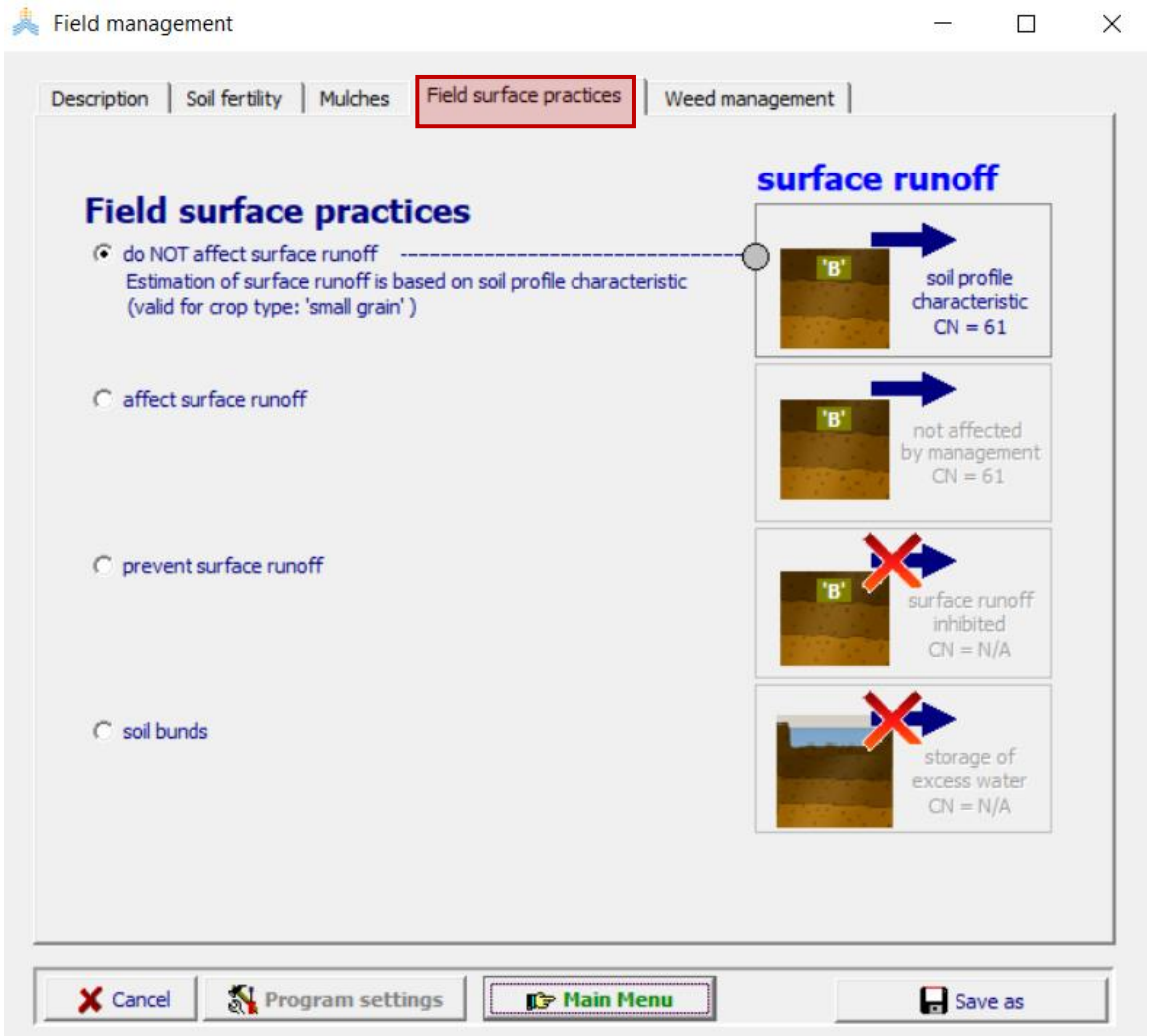


Step 2: click on **mulches**

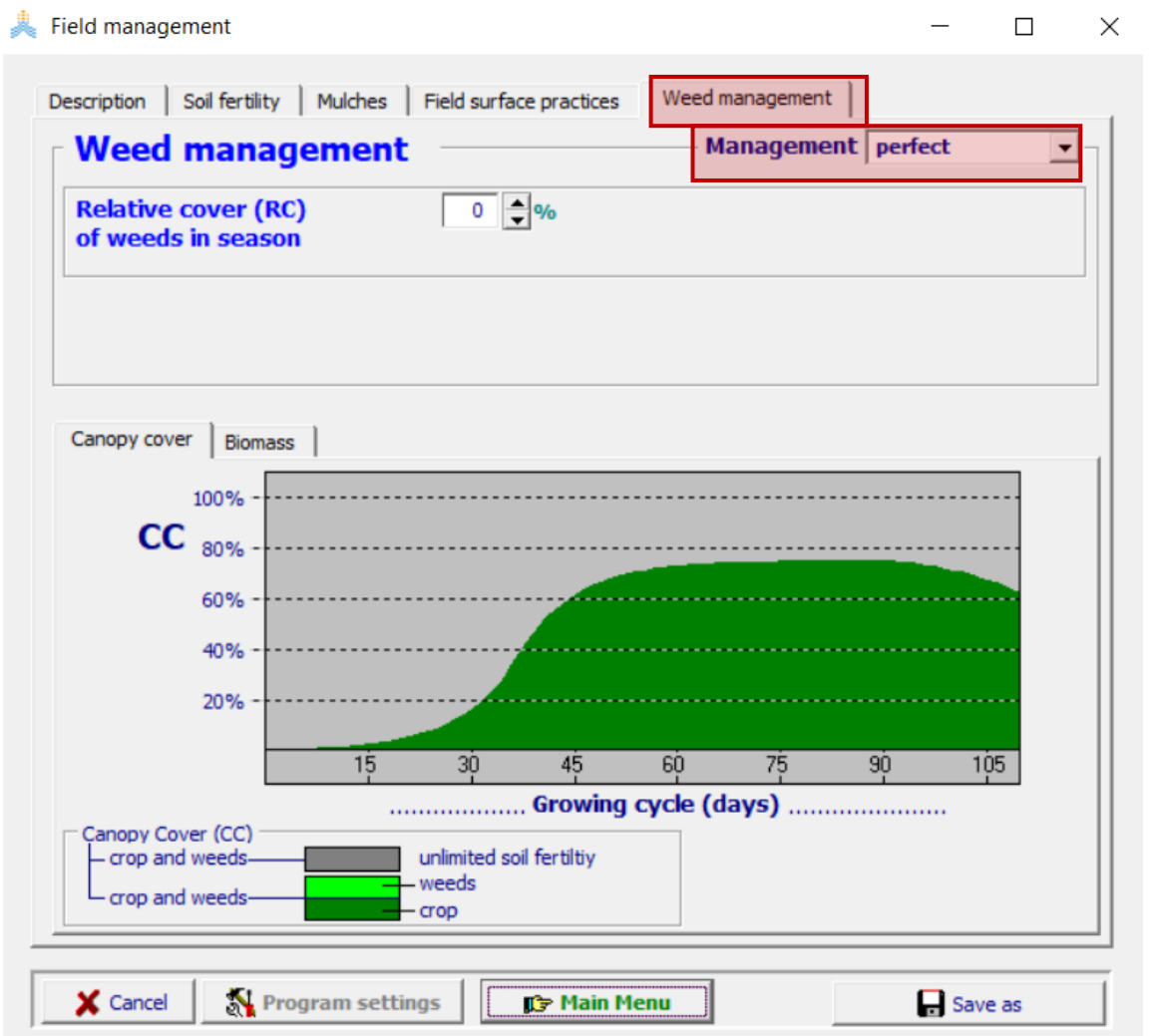


Management module: field management

Step 1: click on **field surface practices**

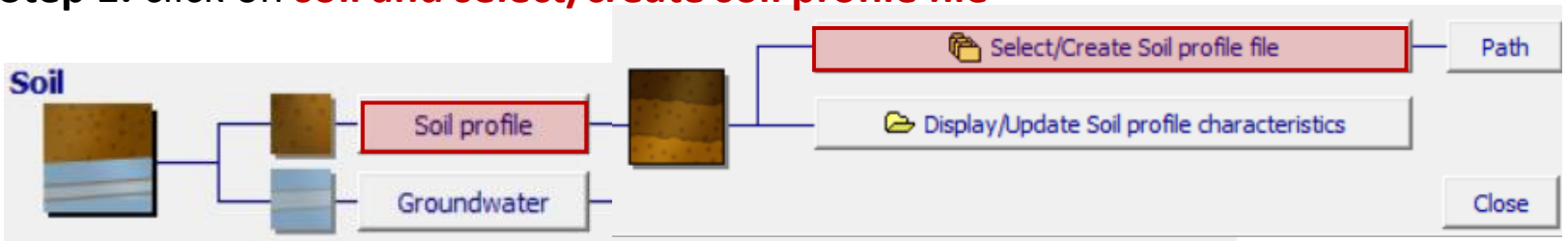


Step 2: click on **weed management**

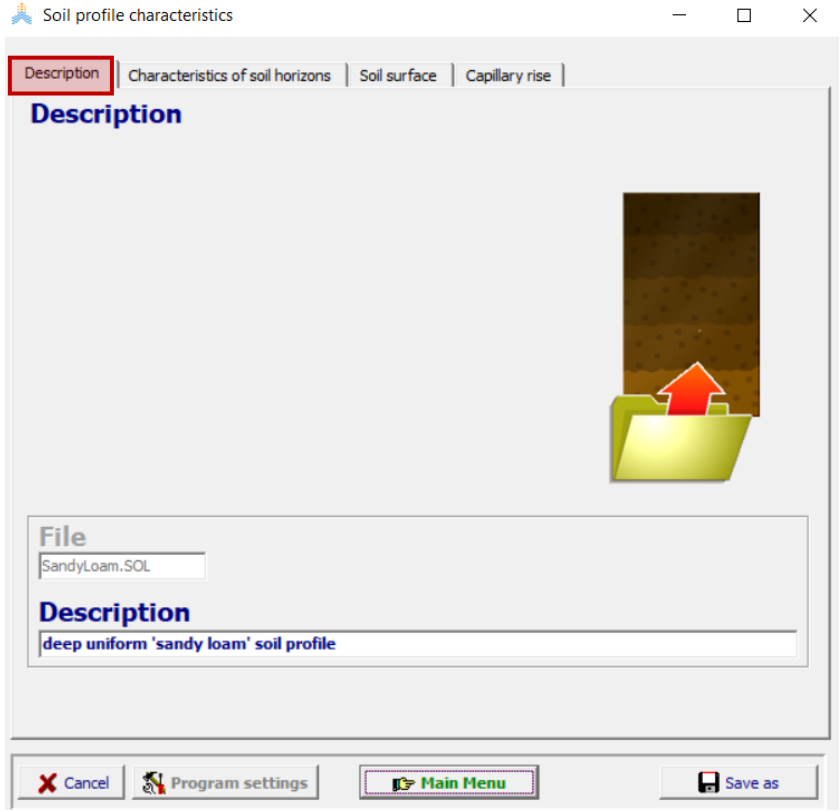


Soil module: soil profile & texture classes

Step 1: click on **soil and select/create soil profile file**



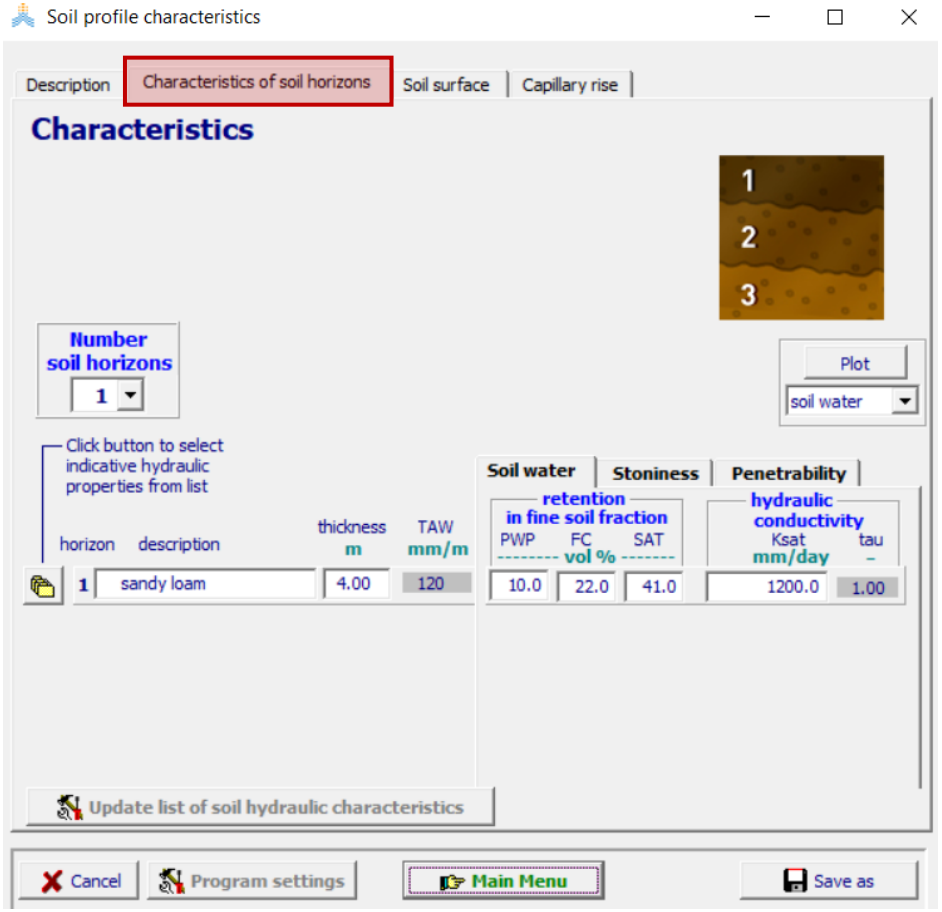
Step 2: click once on **sandy-loam** and then click on **display soil characteristics**



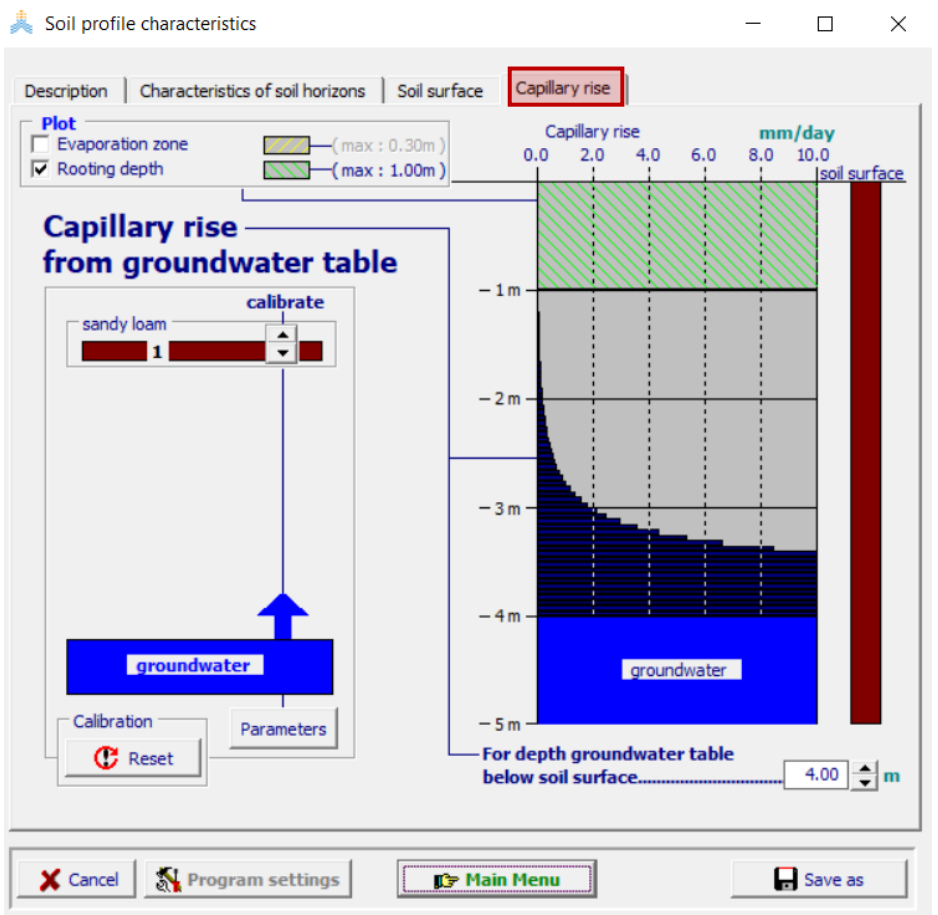
Soil module: soil profile & texture classes

The soil profile can be composed of up to five different horizons of variable depth, each with their own physical characteristics. The characteristics are the water retention in the fine soil fraction at saturation (SAT), field capacity (FC), and at permanent wilting point (PWP), and the hydraulic conductivity of the soil at saturation (Ksat).

Step 1: click on **characteristics of soil horizons**



Step 2: click on **capillary rise**



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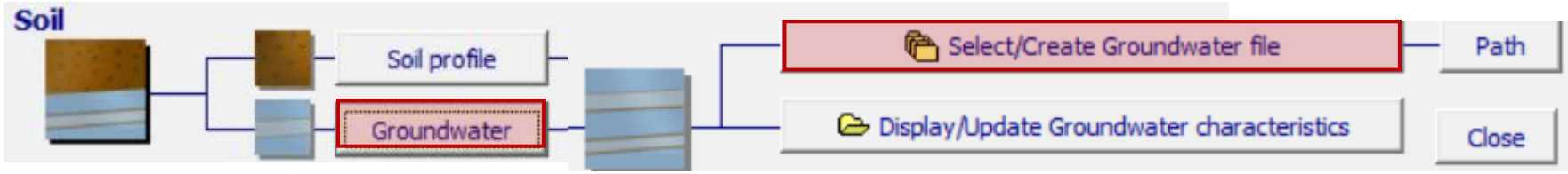
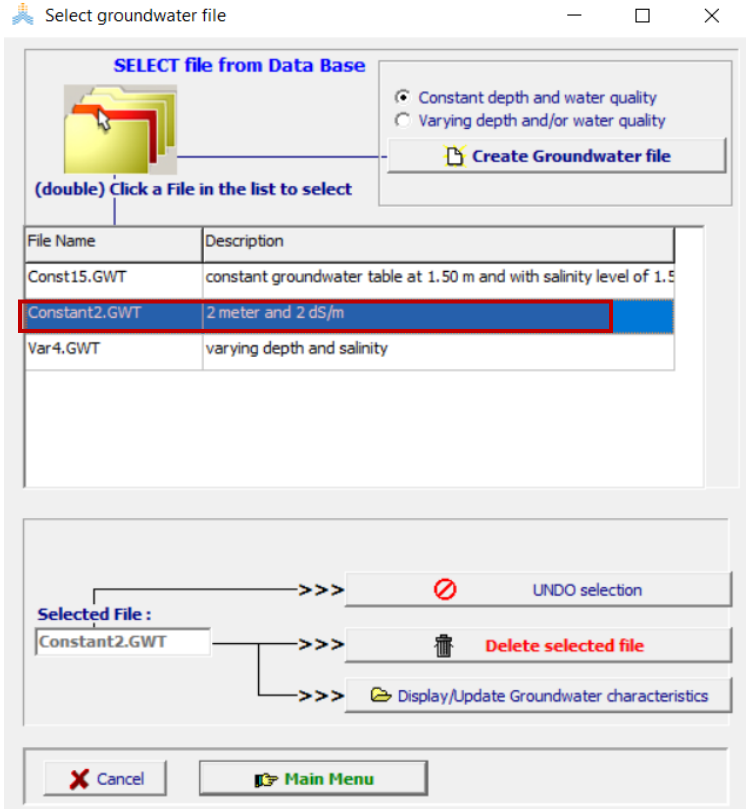
Soil module: groundwater

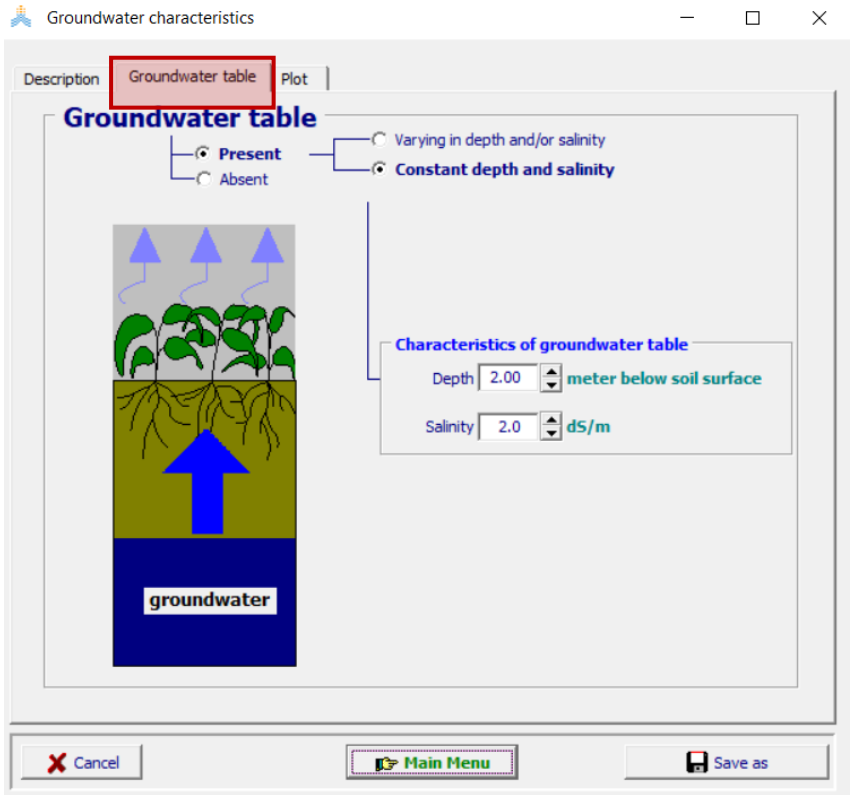
Step 1: click on **soil** and **groundwater**, then **select/create groundwater file**



Step 2: click once on **Constant 2** and then click **display**

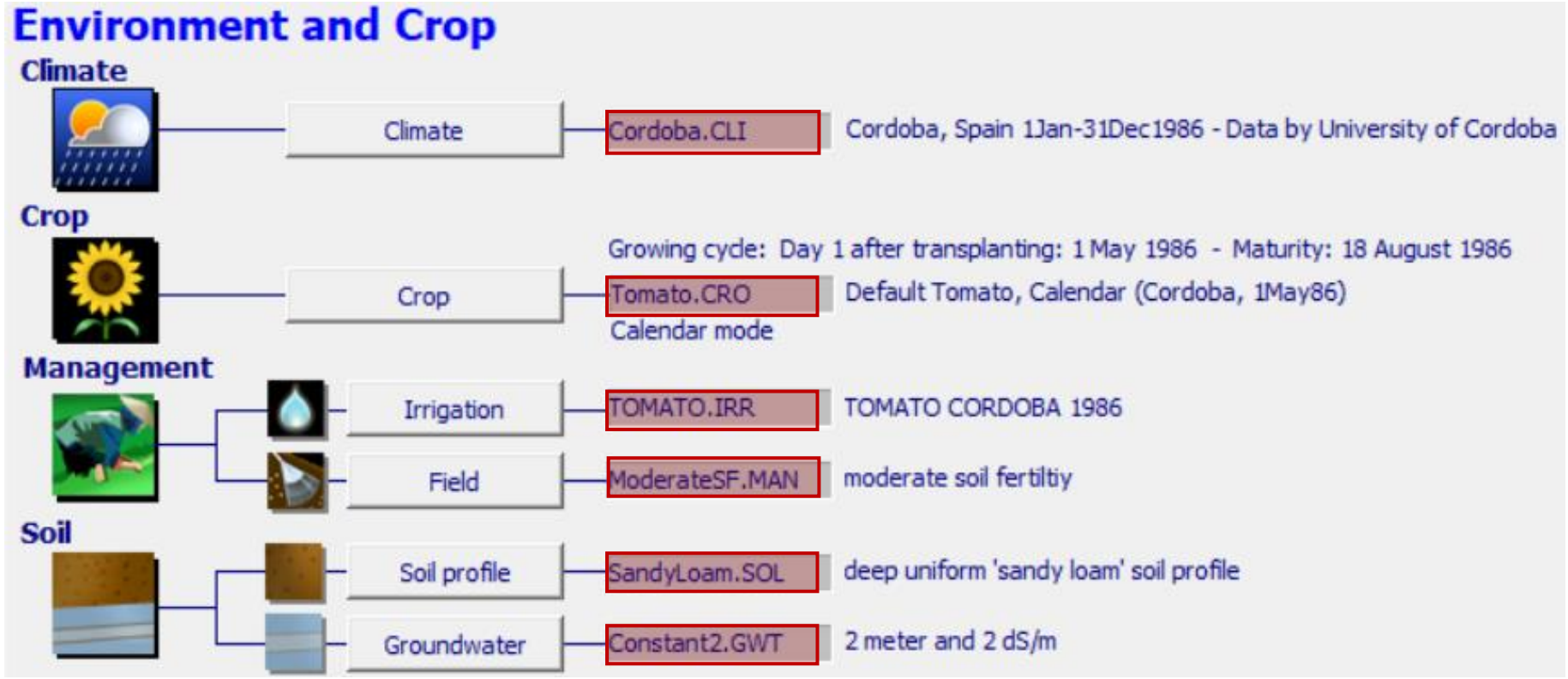


Step 3: click on **Groundwater table**



Summary of input files

Below you will find a summary of selected files to run the simulations, including climate file **(Cordoba)**, crop file **(tomato)**, irrigation schedule **(tomato)**, field management **(moderate)**, soil profile **(sandy-loam)**, and groundwater **(constant)**



Running the simulations

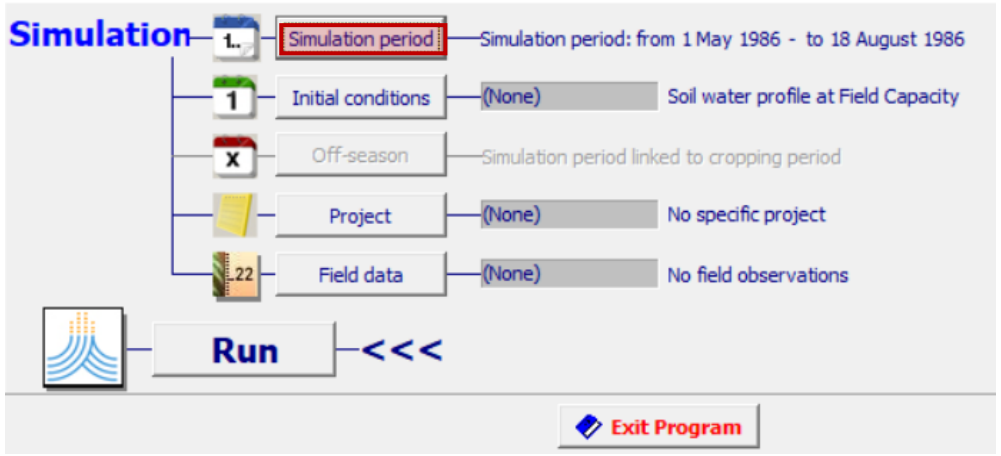
Objective:

- In this session, we will run all the climate, crop, management and soil modules for tomato grown in Córdoba (South Spain) for the year 1981!

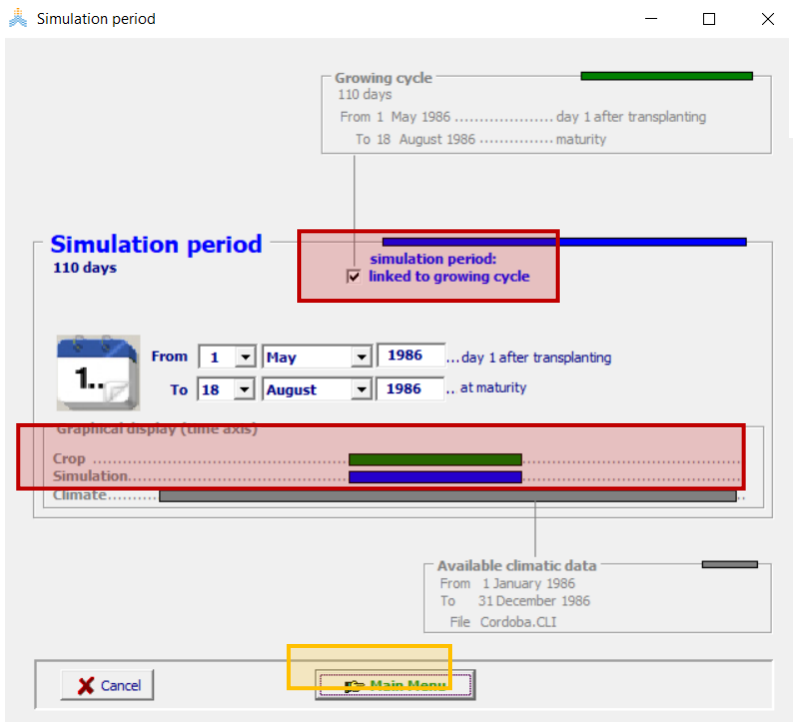
- We will also study some of the emerging outputs from the simulations, specially (i) yield production, (ii) abiotic stresses to crop development and production, (iii) climate and water balance, (iv) transpiration rates, canopy cover development, and root zone depletion.

- If we have time, we will also look at other outputs emerging from AquaCrop.

Simulation period

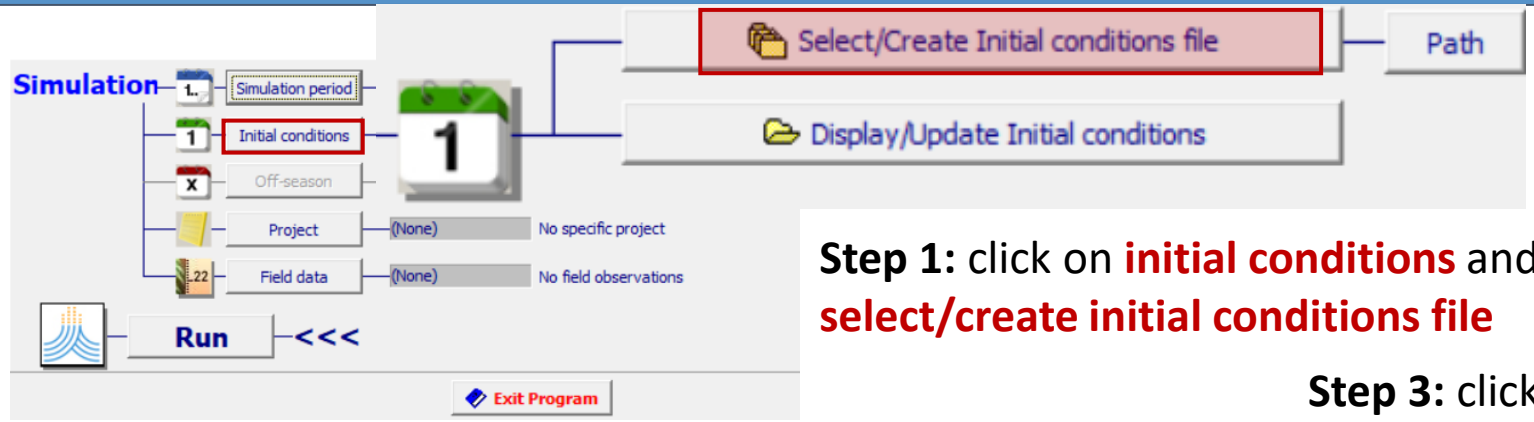


Step 1: click on **simulation period**



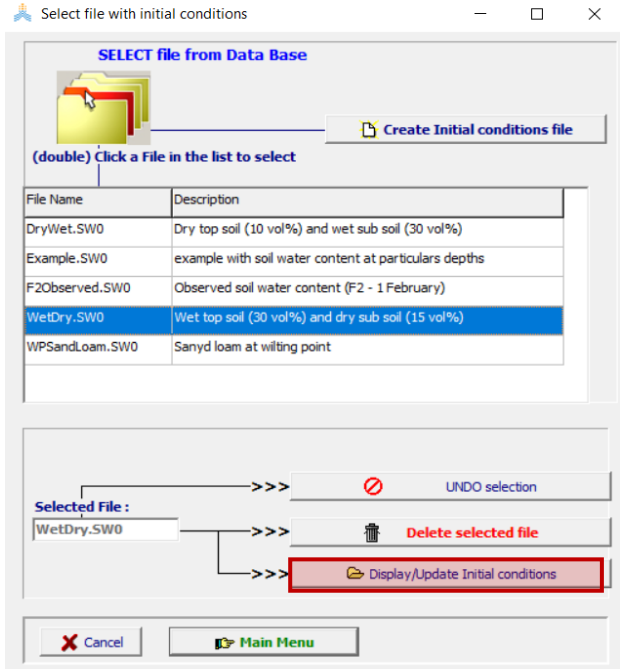
Step 2: double-check that the **simulation period** coincides or its within the timeframe of the climatic file

Initial conditions

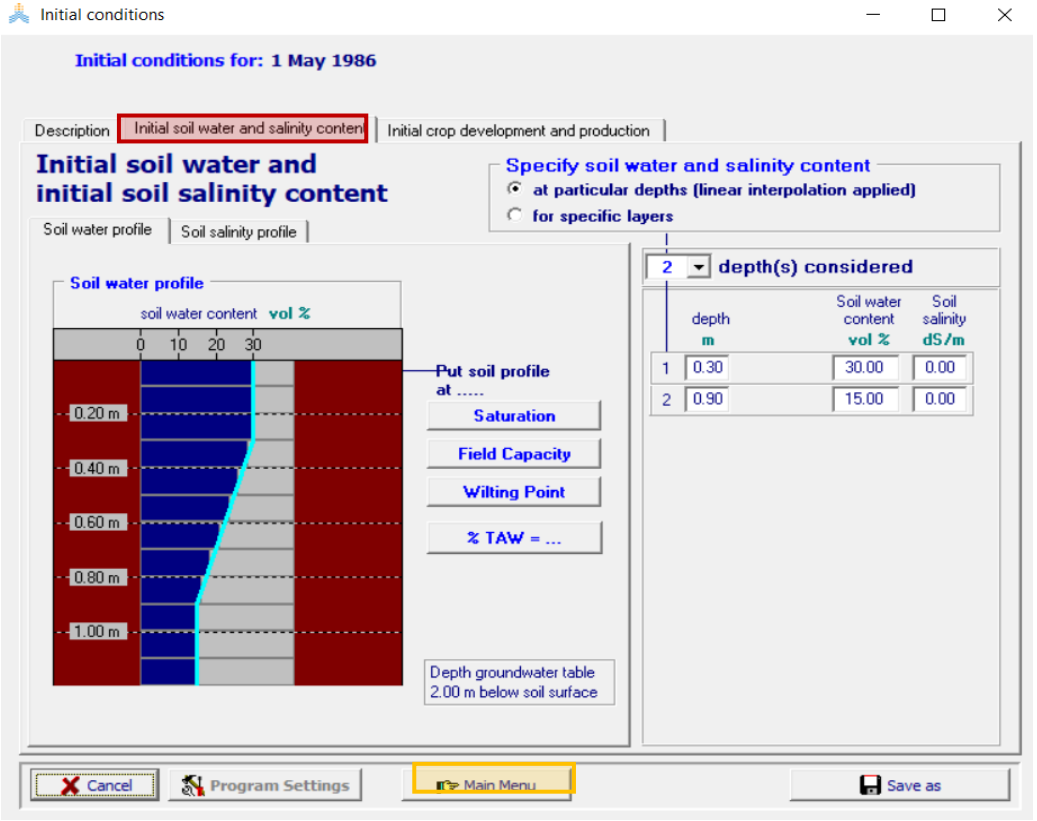


Step 1: click on **initial conditions** and then **select/create initial conditions file**

Step 2: click once on **wet/dry** and click on **display/update initial conditions**

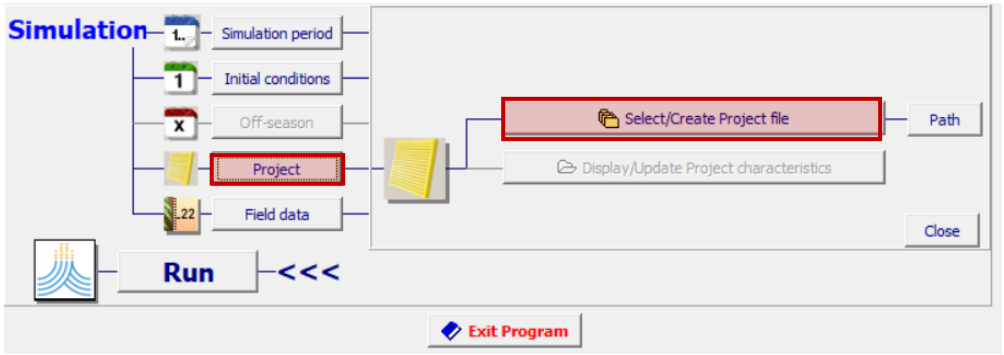


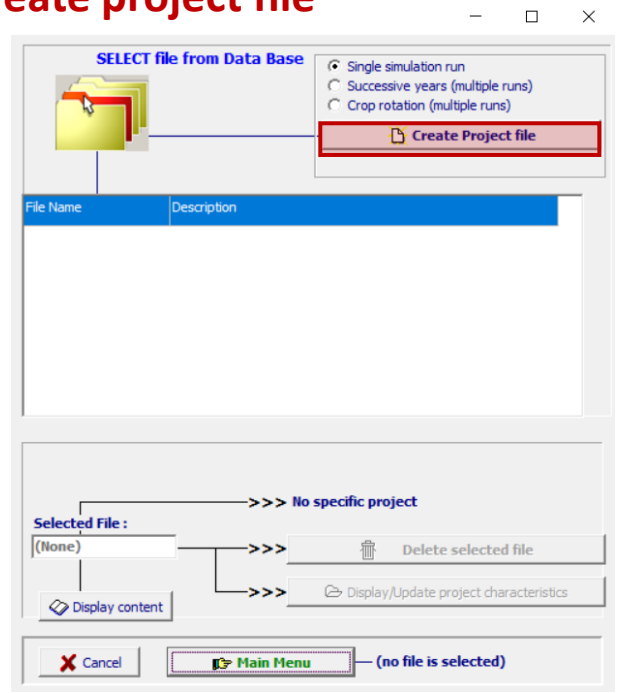
Step 3: click on **initial soil water and salinity content**



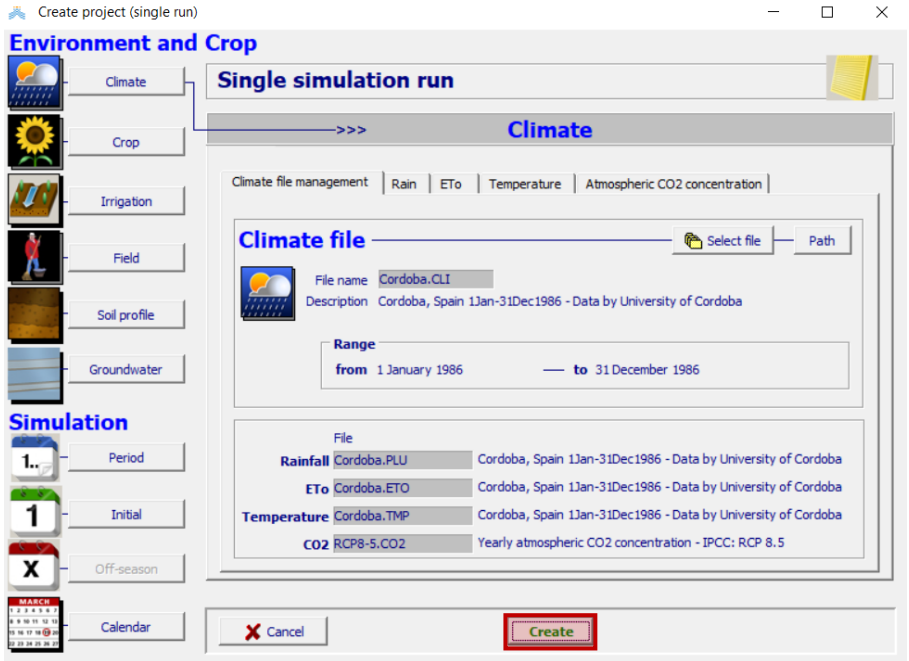
Create project file

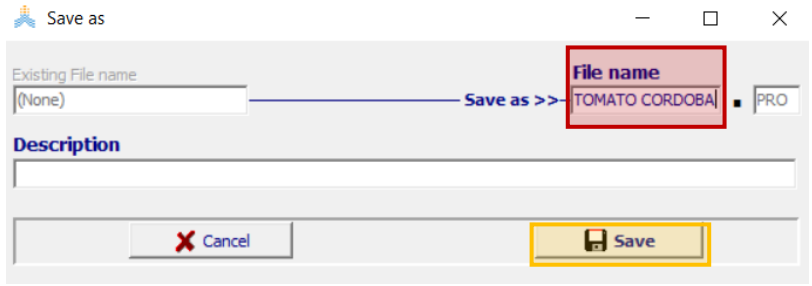
Step 1: click on **project**, then **select/create project file** and click on **create project file**





Step 2: click on **create**, name the file as "**tomato Cordoba**" and **save** the file





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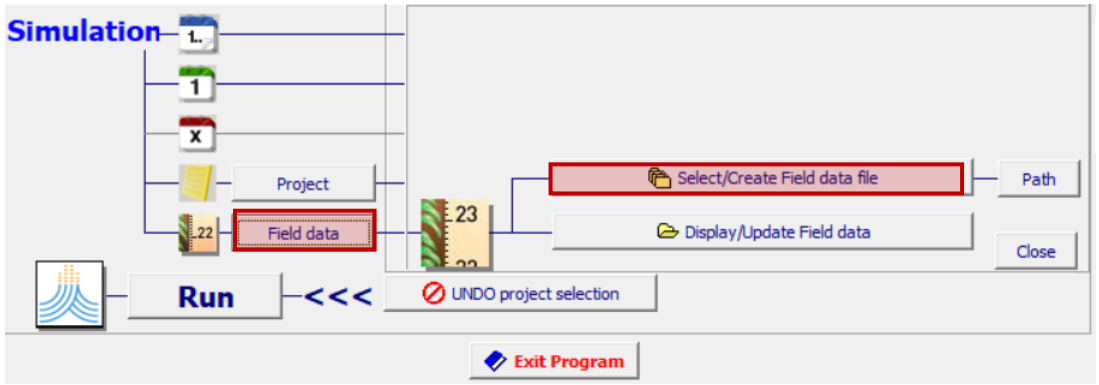
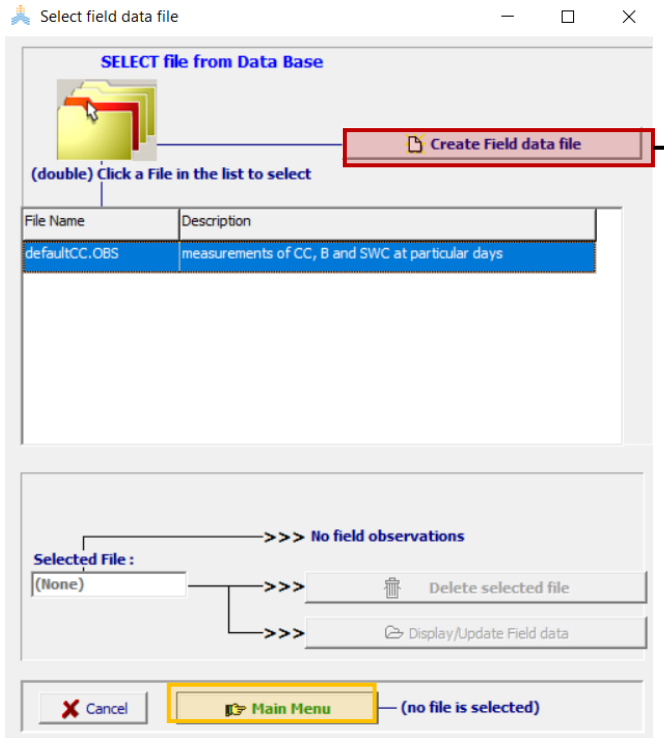
Field data: CC, biomass and SWC observations

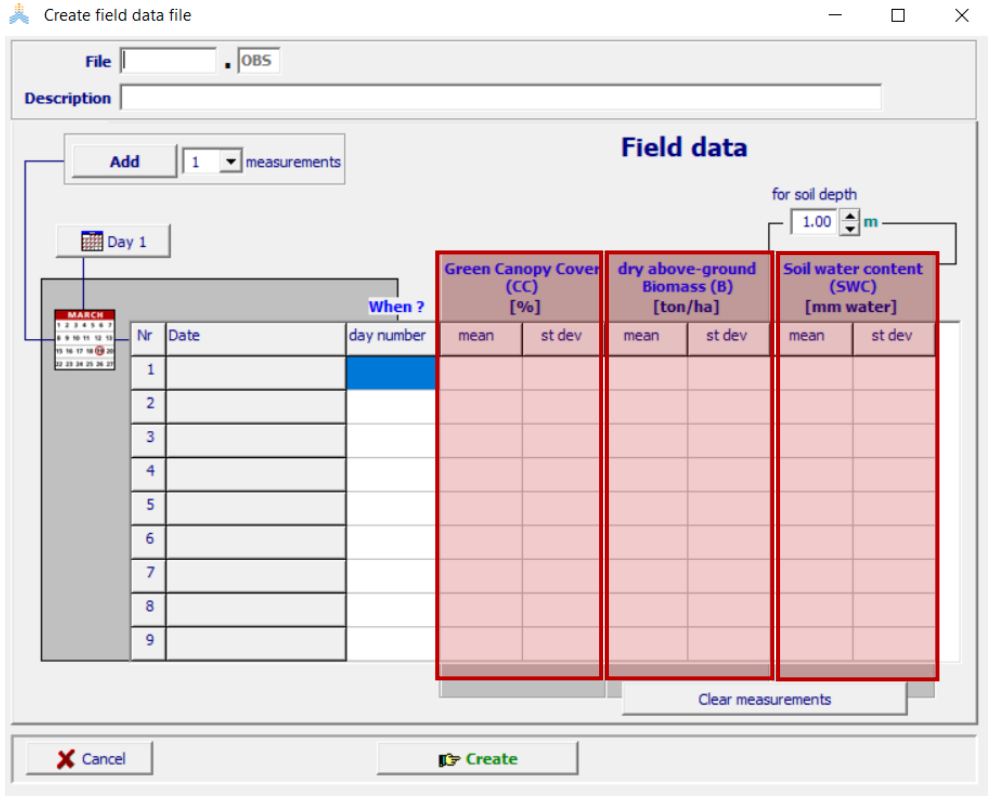


Step 1: click on **field data**, then **select/create project file**

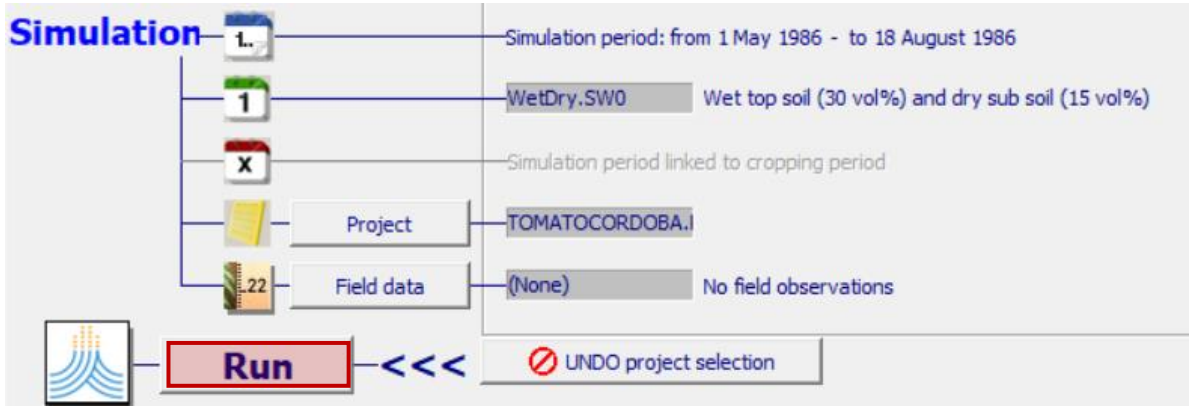
You can introduce field observations (CC, biomass and SWC) to better calibrate the model

Step 2-3: click on **create field data file**, but then click on **cancel**

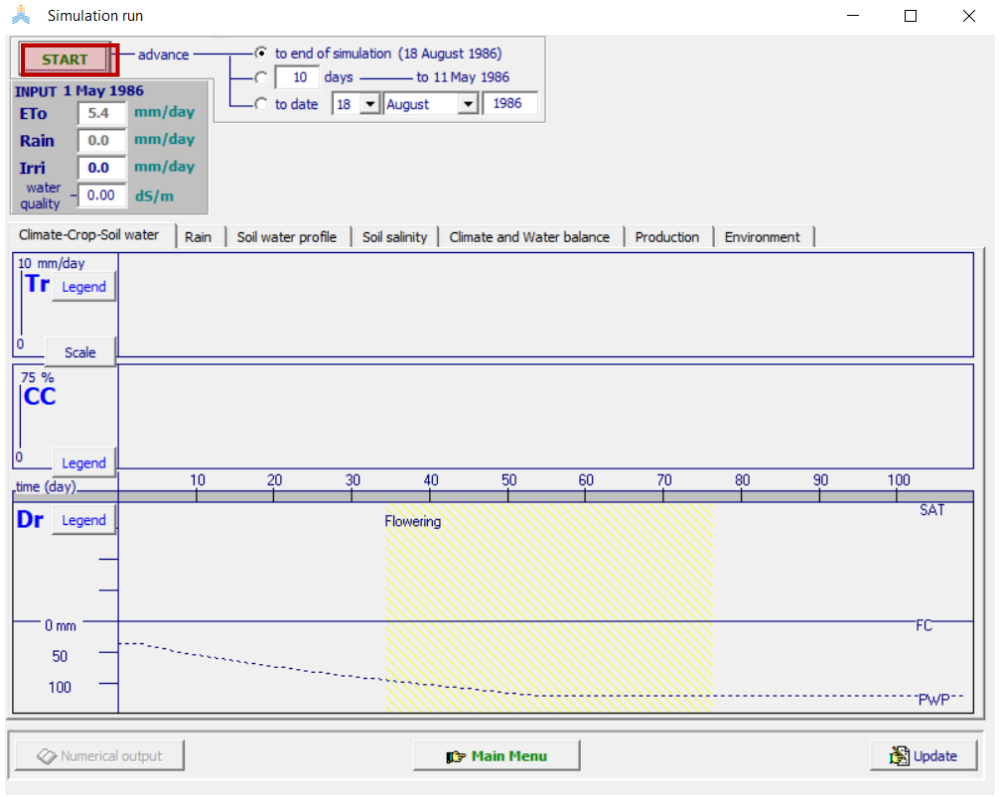




Run the simulations



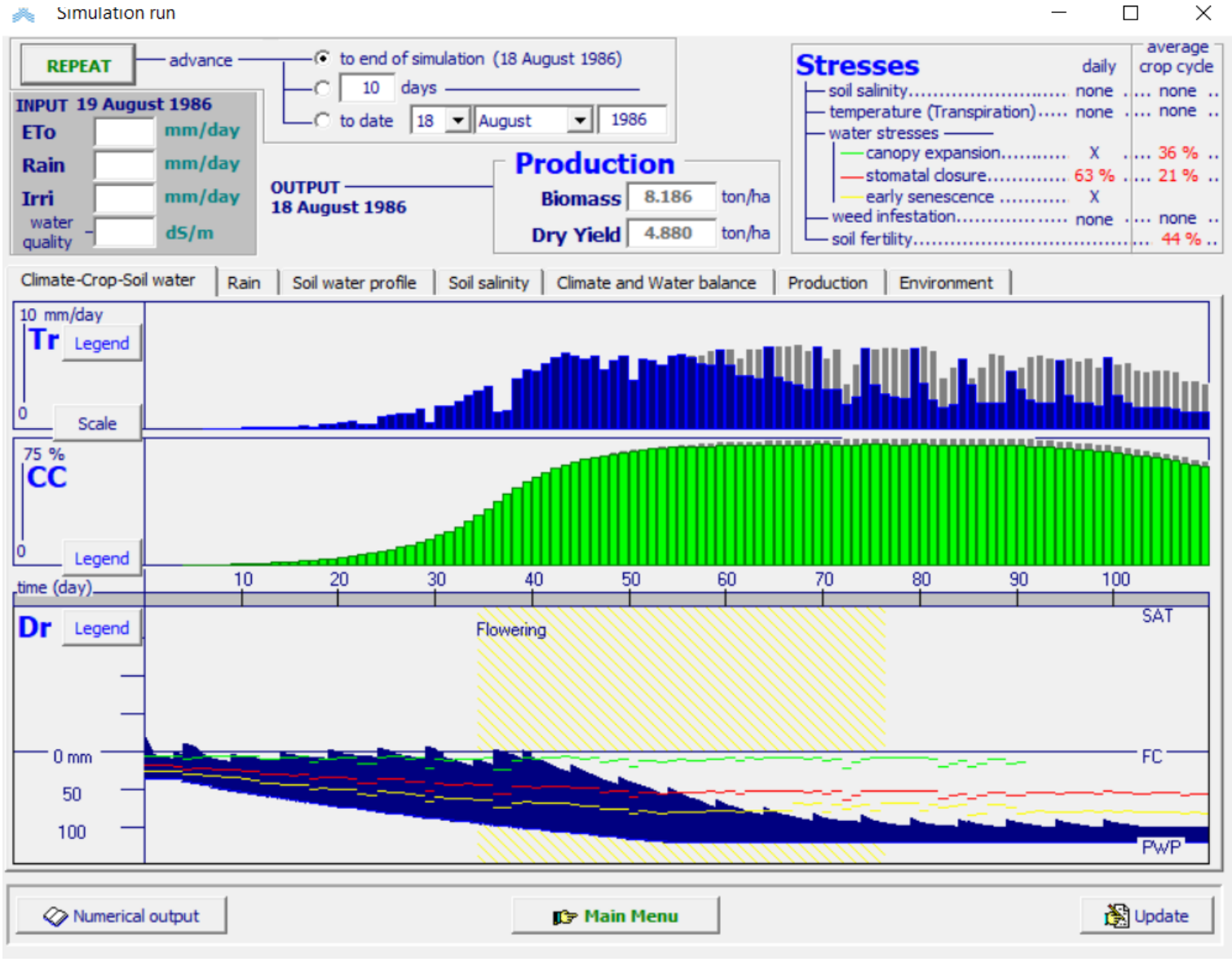
Step 1: click on **Run**



Step 2: click on **START**

Simulation outputs: production & stresses

Step 1: click on **climate-crop-soil water**



Abiotic stresses

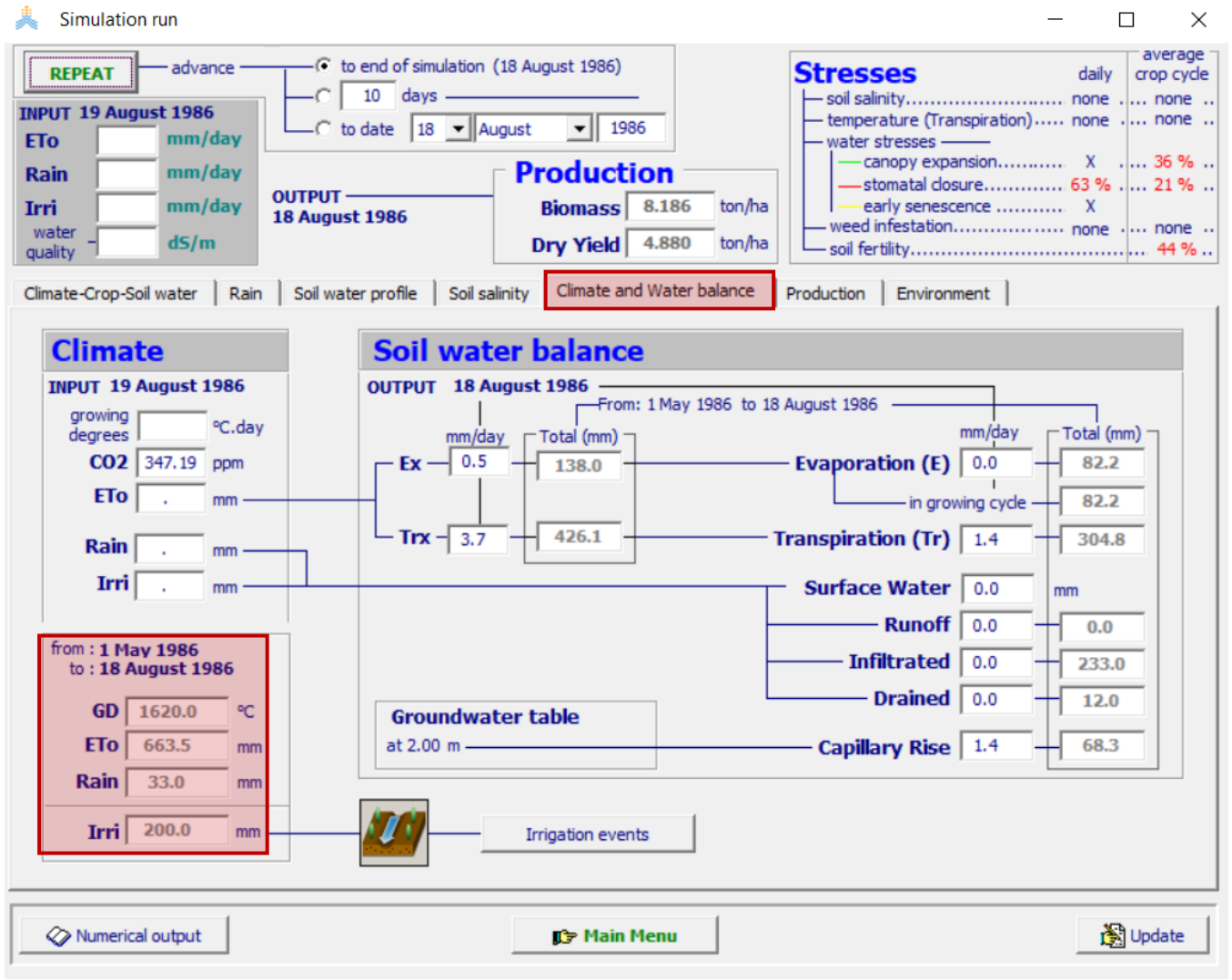
Transpiration

Canopy cover

Root zone depletion

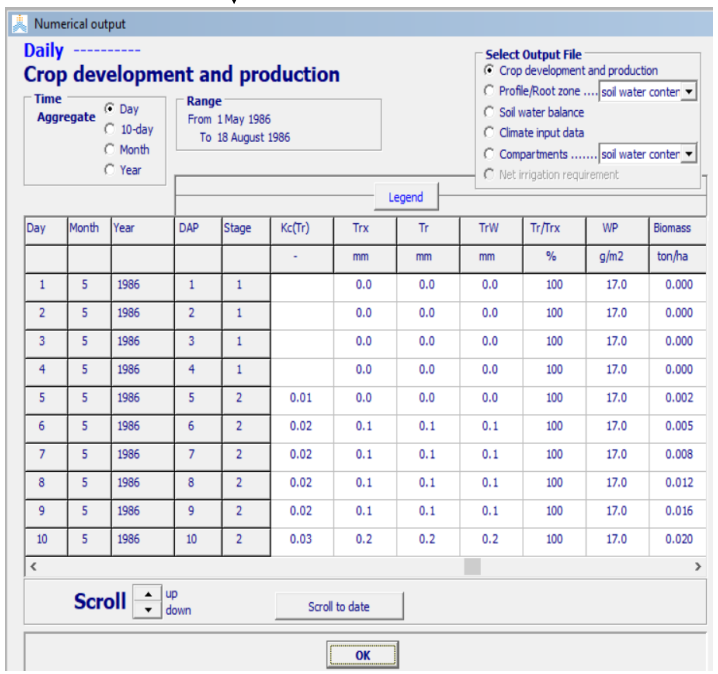
Simulation outputs: climate and water balance

Step 1: click on **Climate and Water Balance**

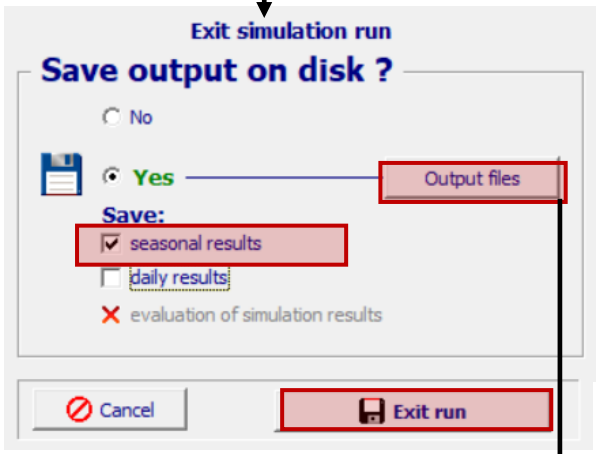


Simulation outputs: crop development & production

Step 1: click on **Numerical output**

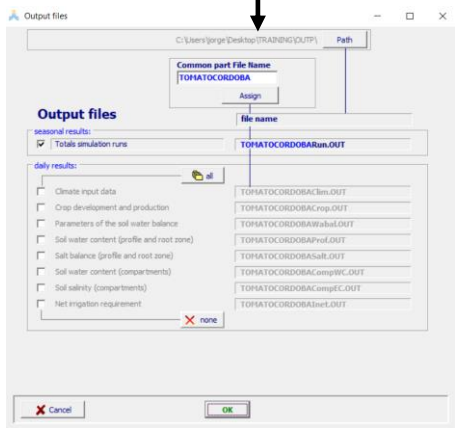


Step 2: click on **Main Menu,** click on **Yes** and save **seasonal results**



Step 3: click on **Output files**, and verify the output file. Name the file **"FIRST SIMULATION"**

Step 4: click on **Exit run**



Thank you!

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