Food and Agriculture Organization of the United Nations

FAO Follow-up AquaCrop training

June 30, 2023

Jorge Alvar-Beltrán – Riccardo Soldan – Andrea Setti
FAO Climate Risk Team (OCB)

Food and Agriculture Organization of the United Nations

Workshop's agenda

30th June 2023 (4 h)

Content	Panelists
-Welcoming remarks	Ala Druta
-Introduction to AquaCrop crop water stress (15 min) -Creation of Project files (1 h) -AquaCrop Plugin (30min)	Jorge Alvar Andrea Setti Riccardo Soldan
COFFEE BREAK (15 min)	
-AquaCrop Plotter: results' visualization and interpretation (1 h) -Q&A session (30min)	Jorge Alvar Andrea Setti Riccardo Soldan

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Introduction to AquaCrop crop water stress

June 30, 2023

Introduction content

- Water stress in AquaCrop
- Effect of water stress on harvest index
- Crop module and water stress tolerance

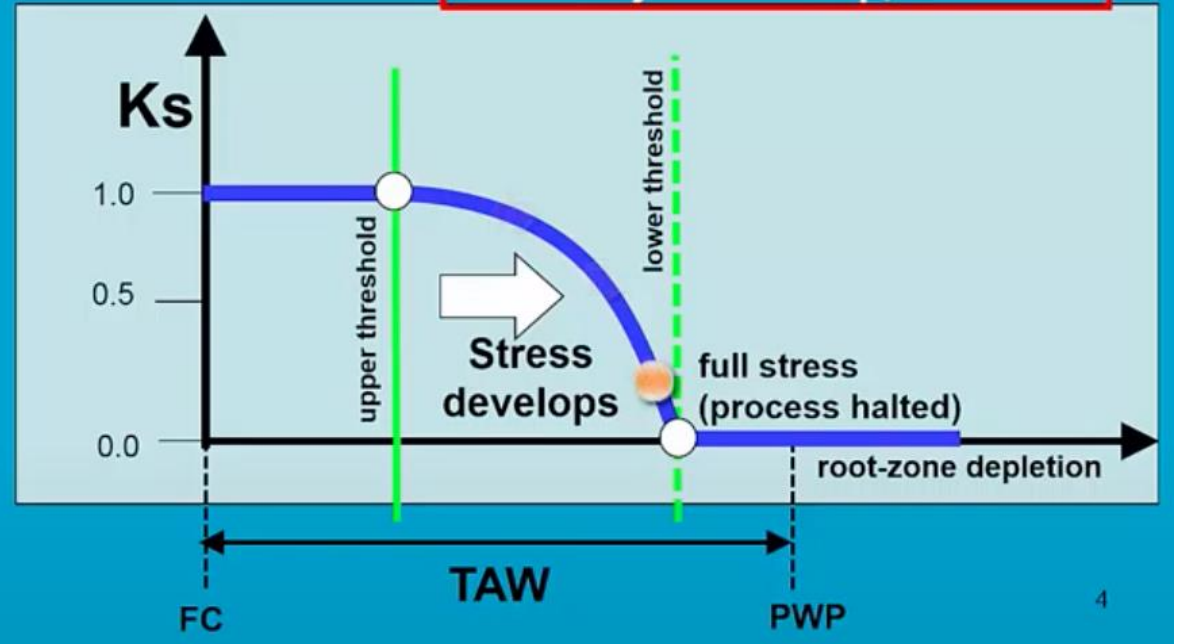
Water stress in AquaCrop

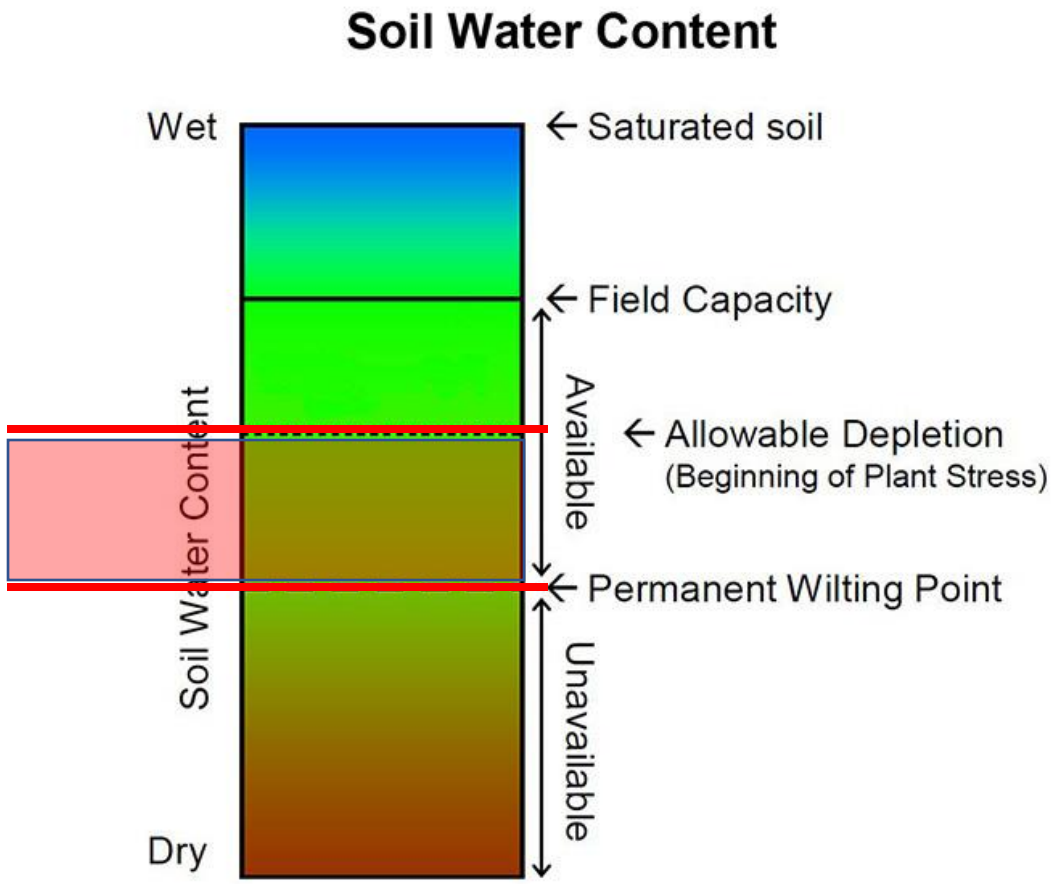
$$CGC_{adj} = Ks_{exp,w}\ CGC$$

Soil water stress coefficient

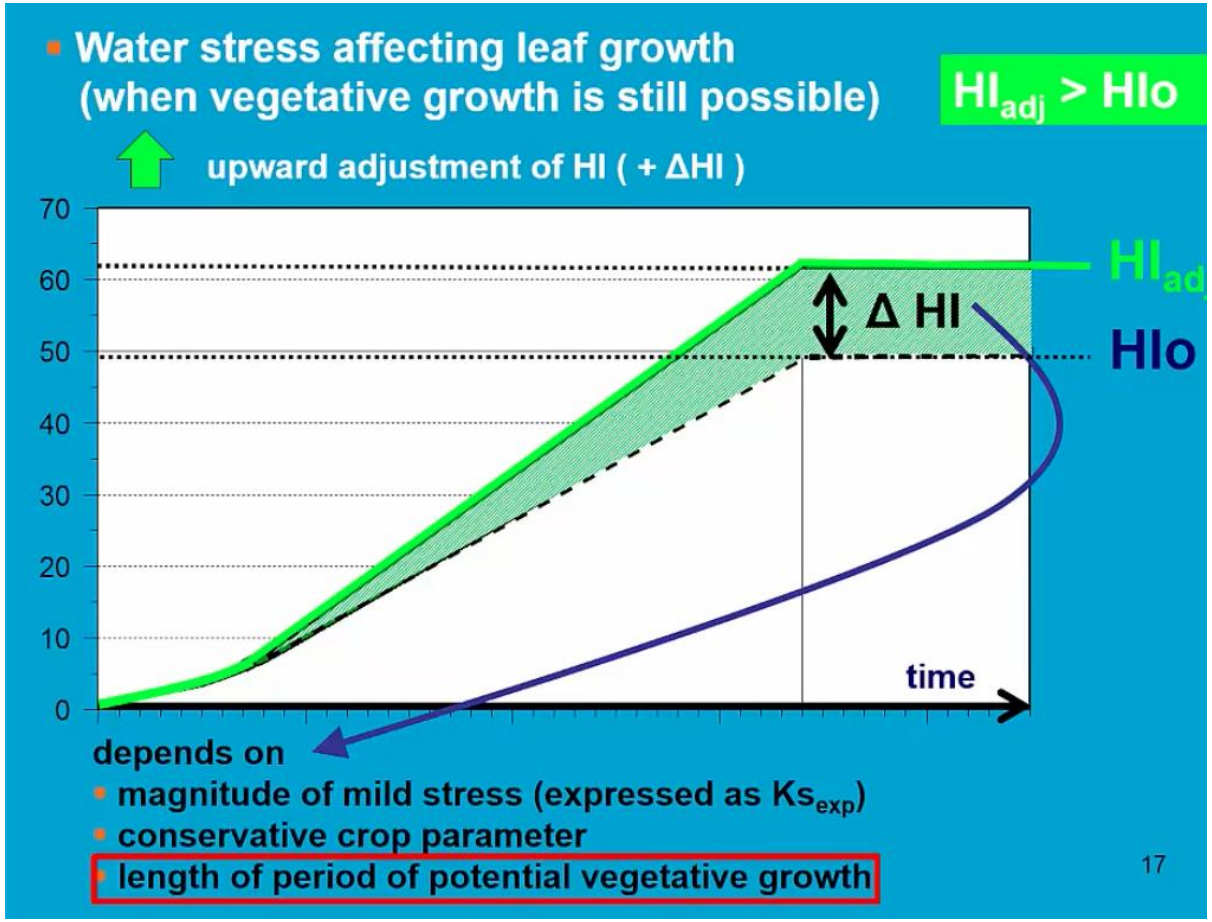
Ks is a modifier which affects a target model parameter (e.g. Canopy Growth Coefficient which expresses the speed of canopy expansion)

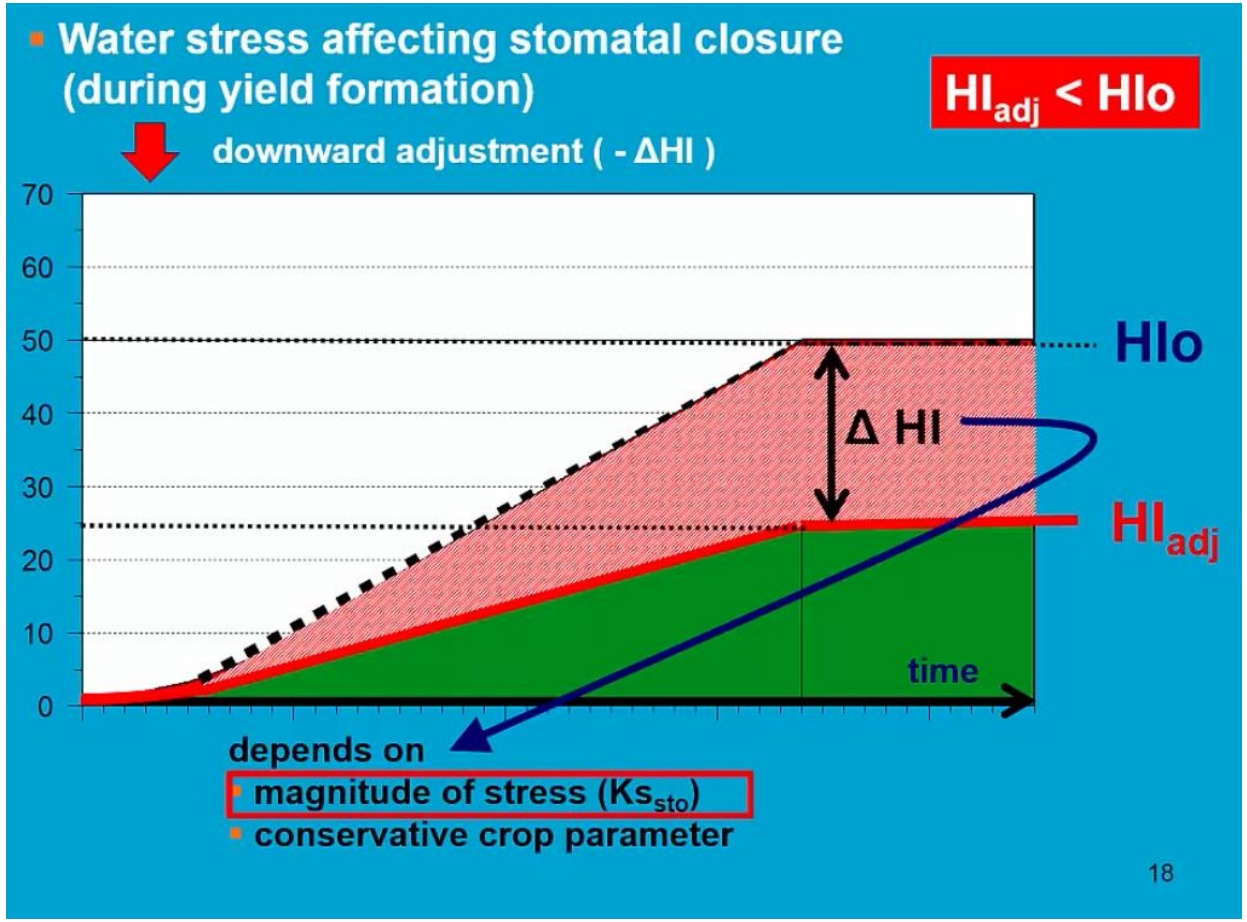
$$CGC_{adj} = Ks_{exp,w}\ CGC$$





Effect of water stress on harvest index (yields)

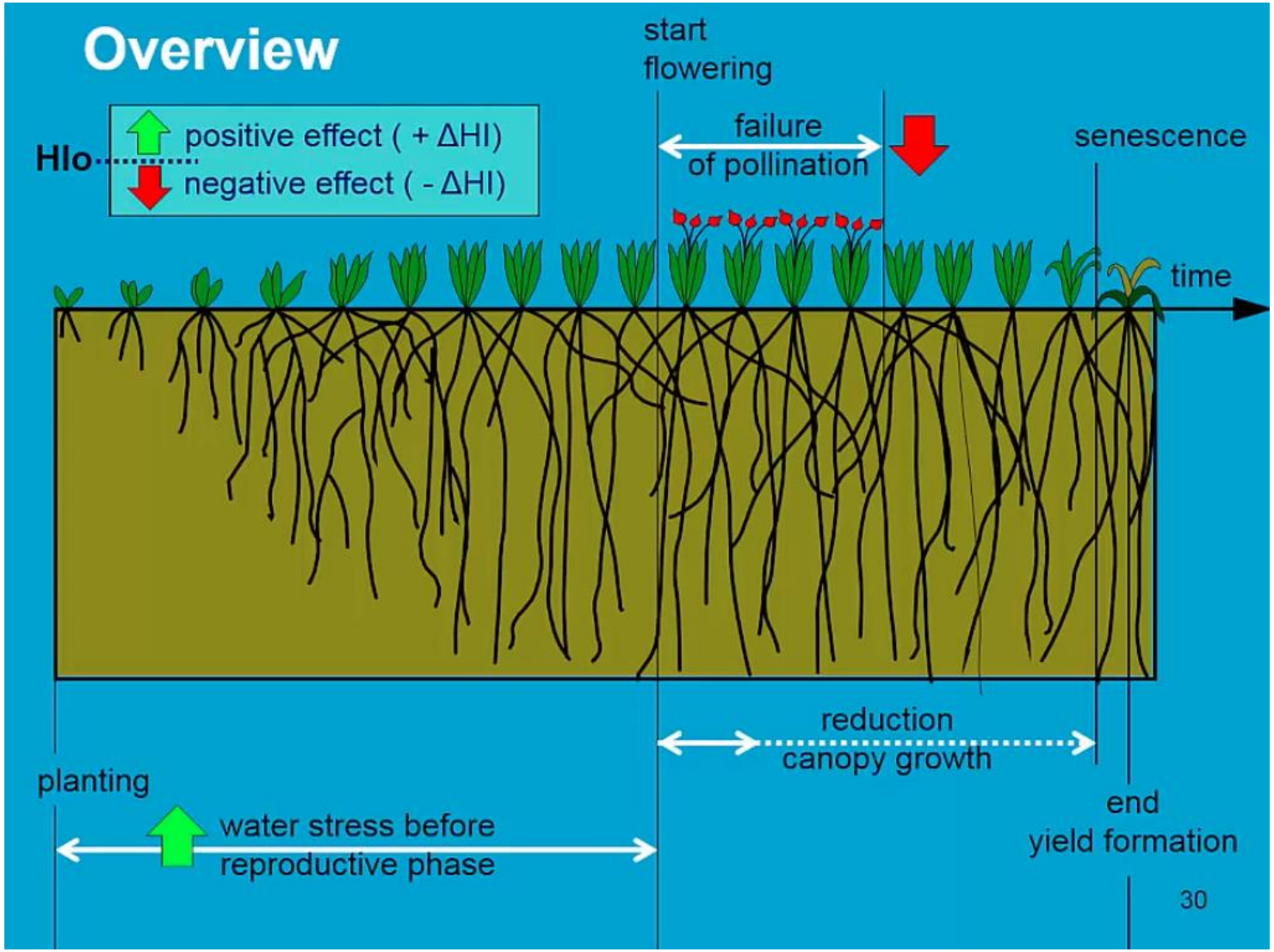




Mild and moderate stress during vegetative growth: up to + 20% Hi

Mild and moderate stress during yield formation: up to -40% Hi

Effect of water stress overview



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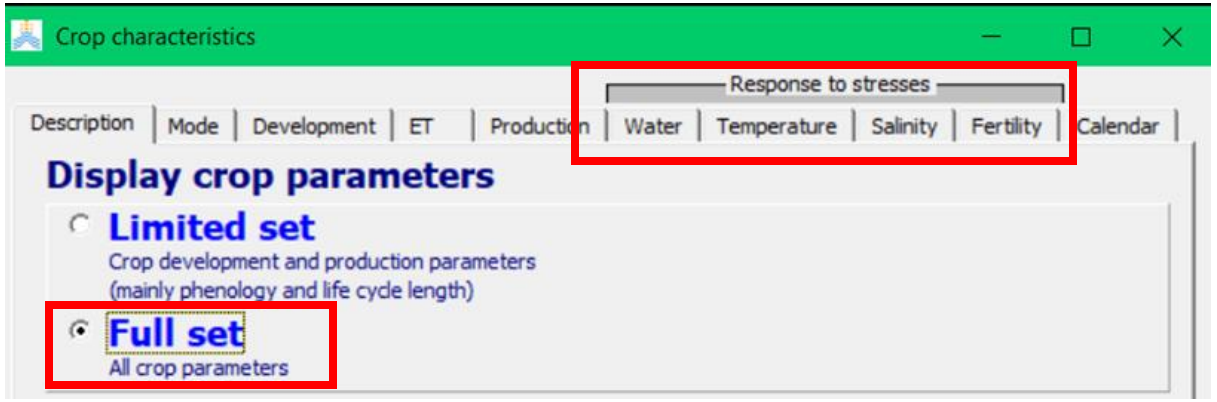
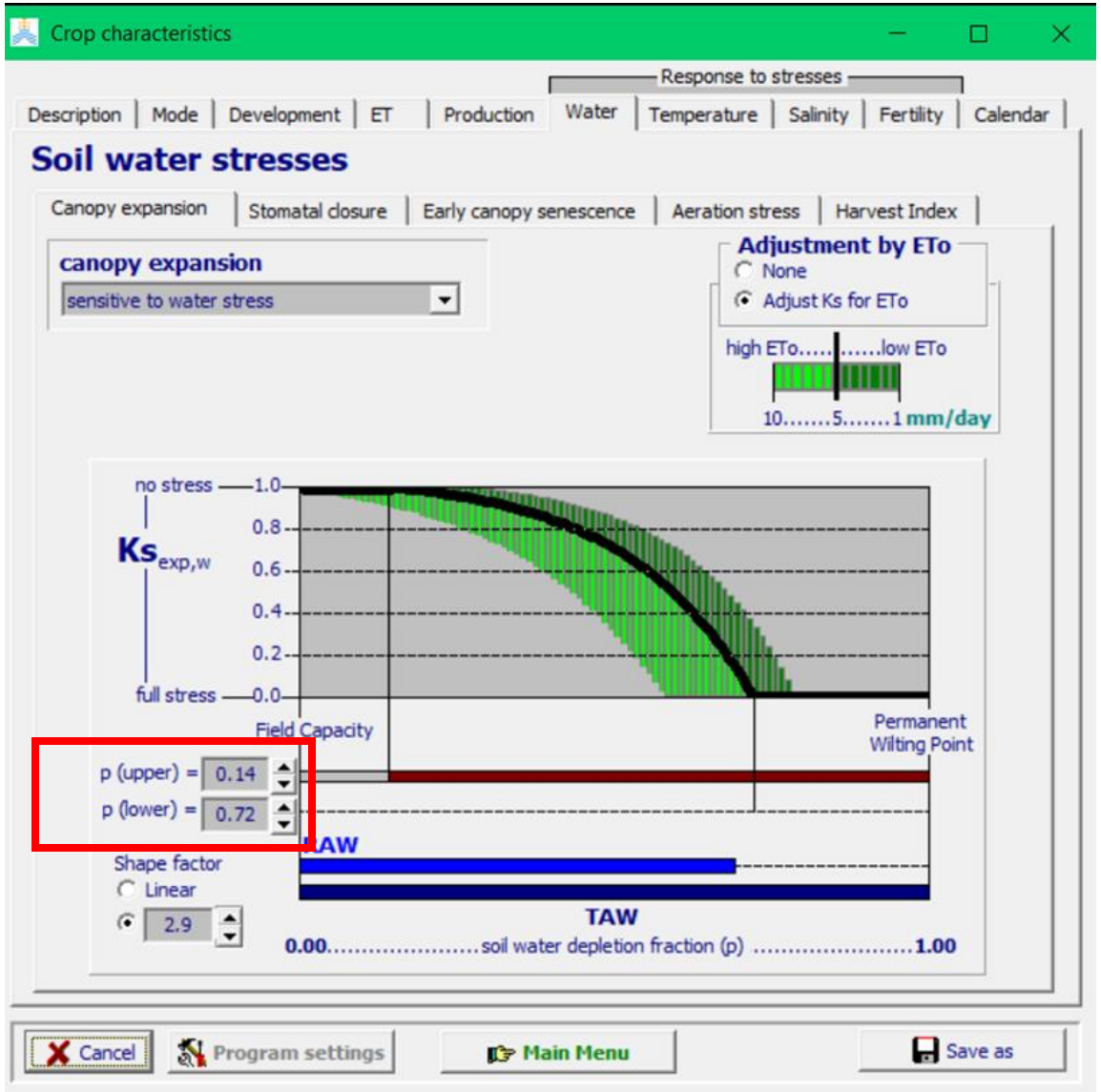
Crop module and water tolerance thresholds





* TAW – total available water
RAW – ready vailable water

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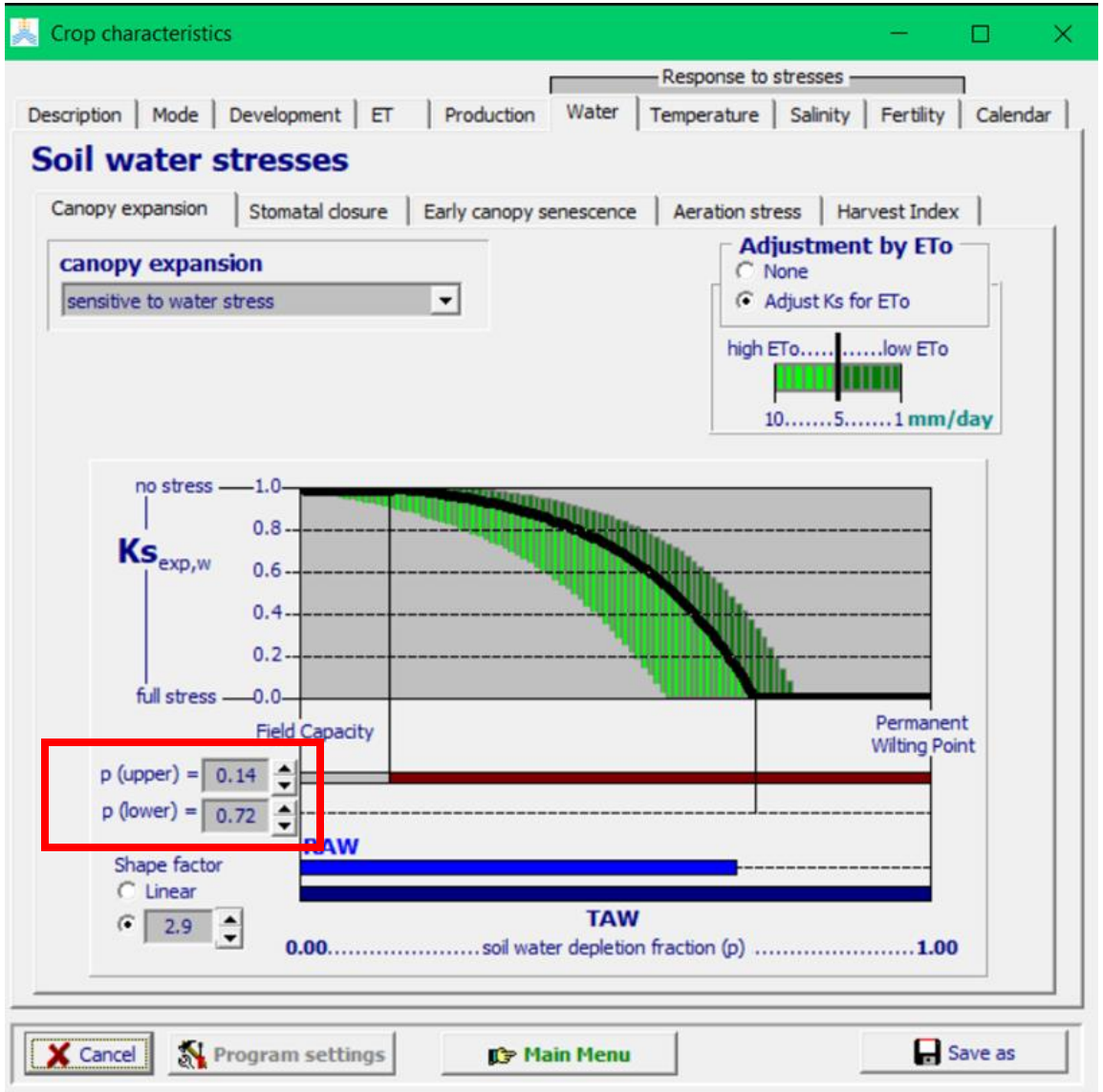
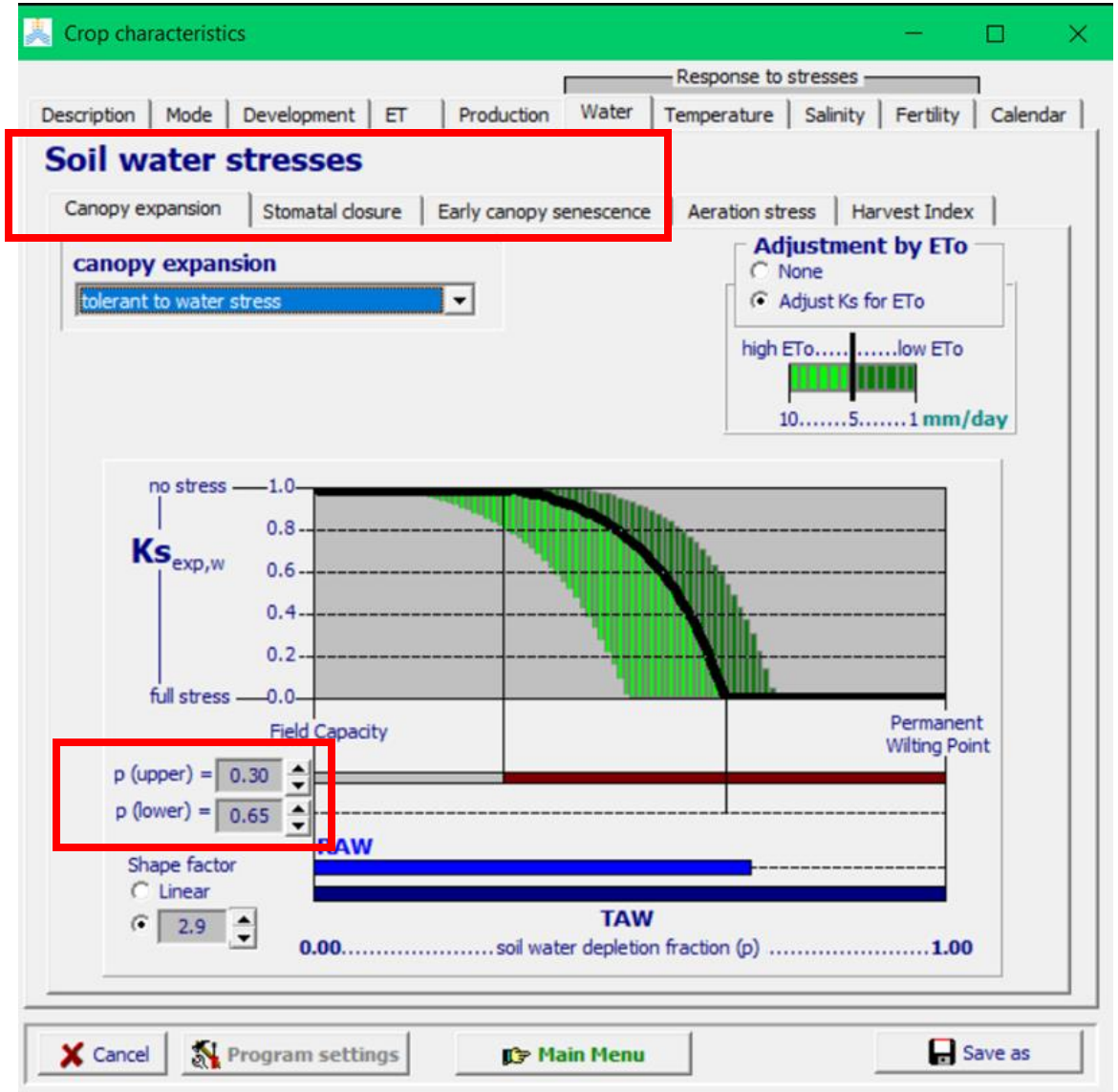
Crop module and water tolerance thresholds

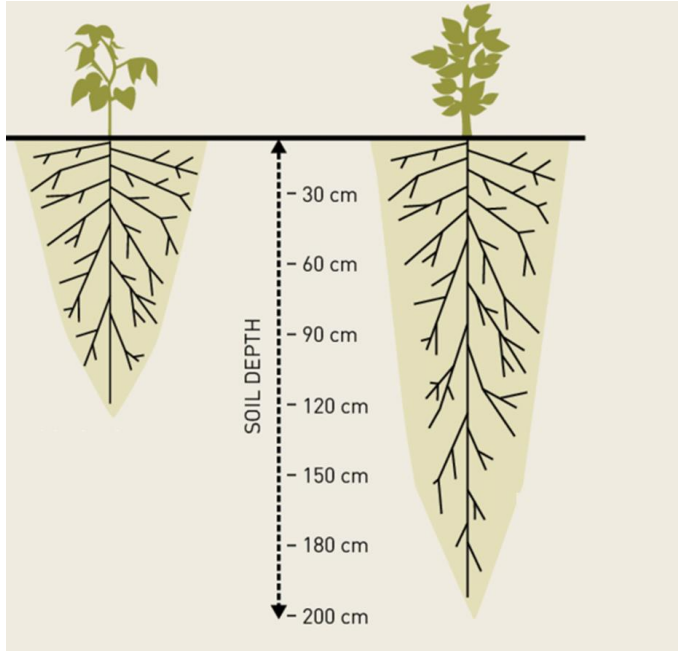


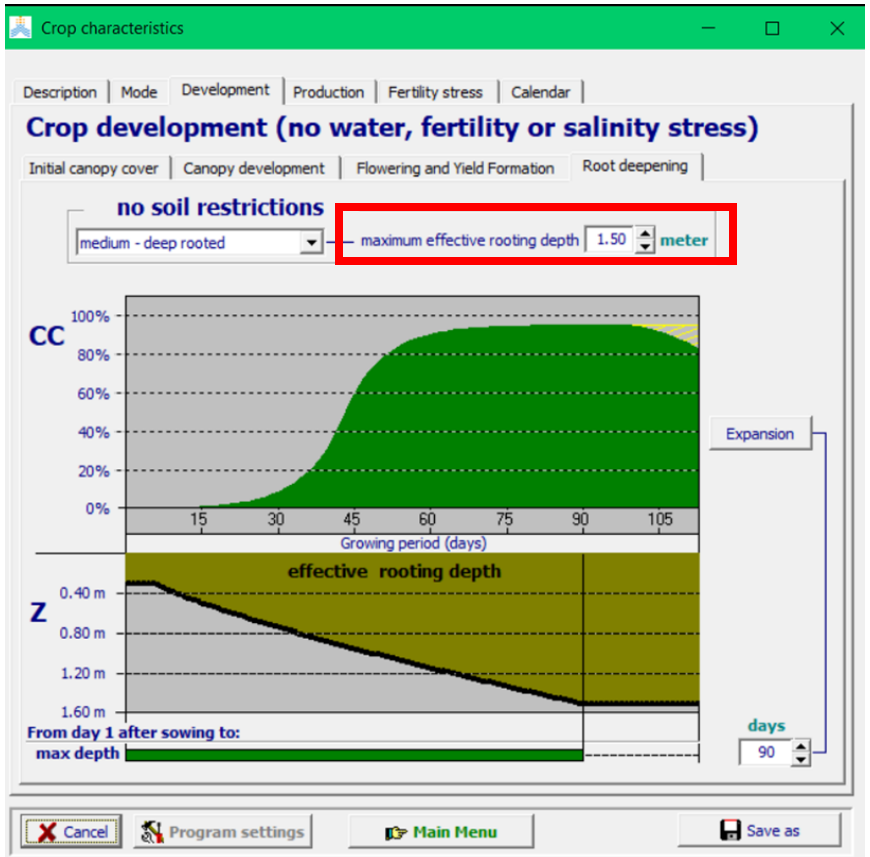


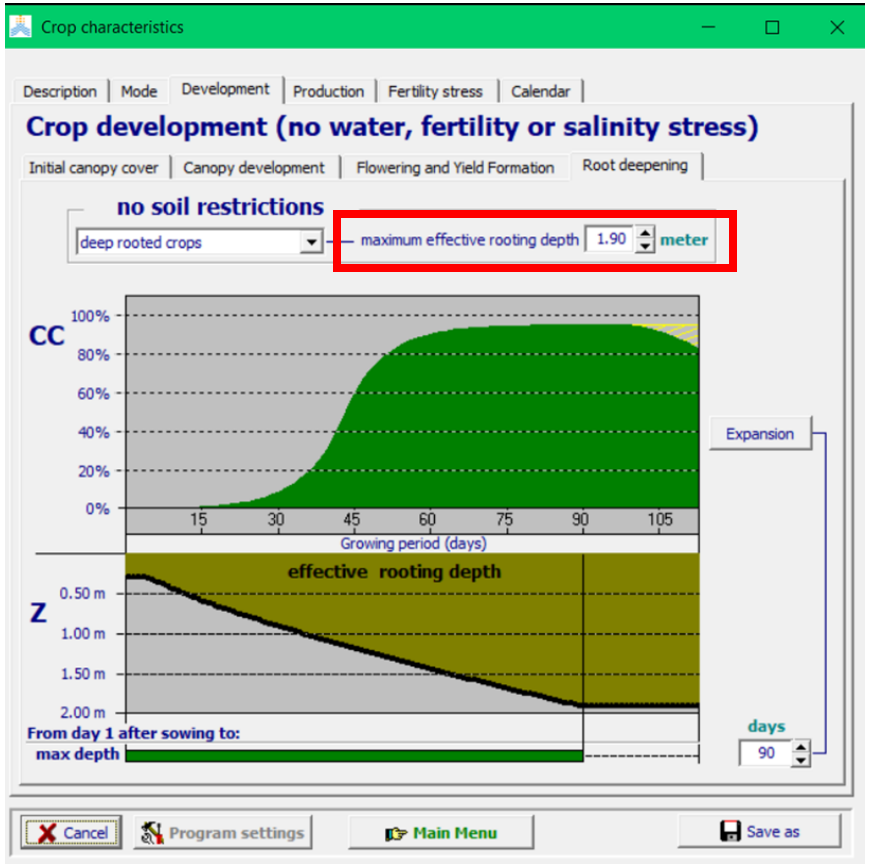
Crop module and water tolerance

Alternative options to increase crop tolerance to water stress

- Timing of flowering
- Timing to reach the maximum canopy cover
- Root depth
- Etc..







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Tutorial: how to make project files

June 30, 2023

Objective

Objective: run AquaCrop to see the effect of future climate projection on two rainfed maize varieties with different water stress tolerance, under two emission scenarios (RCPs), in Cahul.

- GCM: MOHC
- RCPs: 2.6 and 8.5
- Crop varieties: Standard (Maize medium-rooted 150cm) and improved (deep-rooted 190cm).
- Locations: Cahul

Project File (.PRM) structure

Experimental design

Locations	Cahul
GCM	MOHC
RCPs	2.6 8.5
Management	Optimal
Crop (mazie)	Standard Improved

4 Project files

Time series: 119 years -> 1/01/1981 – 31/12/2099

Maize_Standard_Cahul_10May_Optimal_26_MOHC
Maize_Standard_Cahul_10May_Optimal_85_MOHC
Maize_Improved _Cahul_10May_Optimal_26_MOHC
Maize_Improved _Cahul_10May_Optimal_85_MOHC

Instruction

- The link to all the **SLIDES** presented in this workshop can be found at: https://github.com/Risk-Team/Moldova-workshop under "Follow-up workshop: June 30th"

- The link to the **DATA** used in this workshop can be found at: https://www.dropbox.com/sh/1tvn0bs252tj7mi/AAAE4keAW4Z6-_y05F3_uSuwa?dl=0

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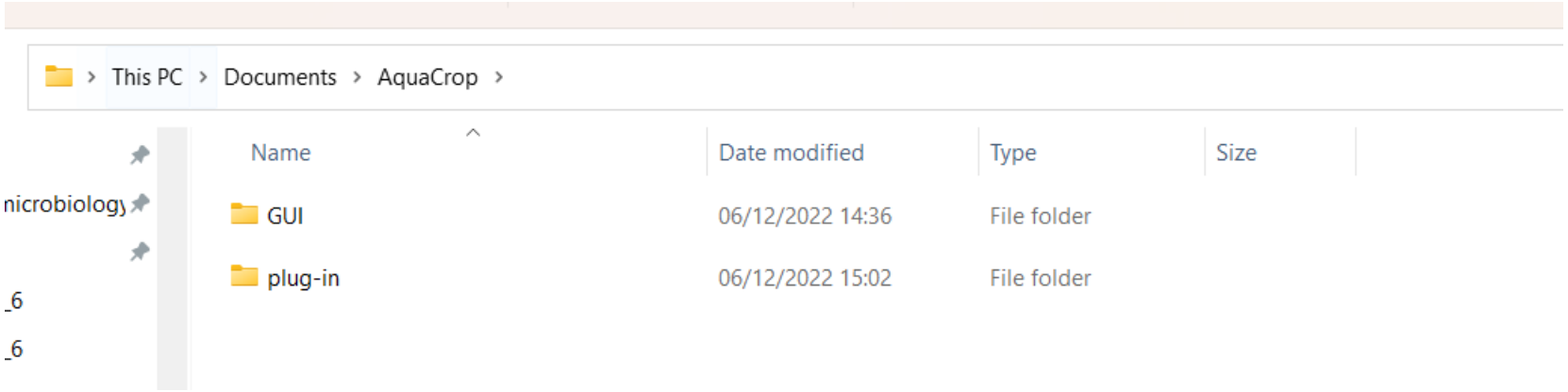
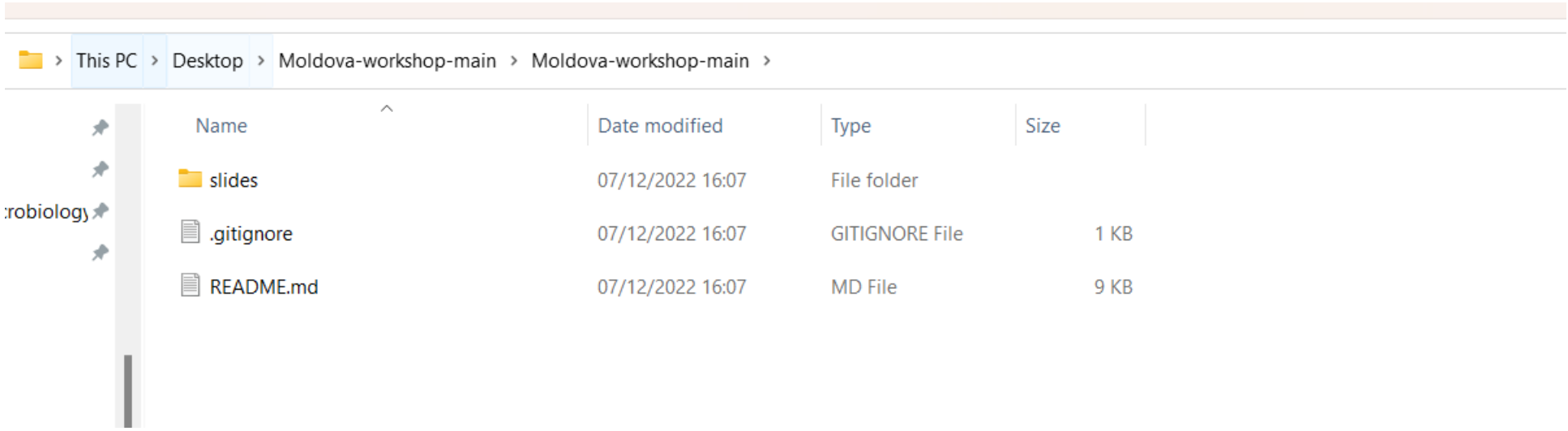
In case you do not have AquaCrop installed

- Install AquaCrop software and AquaCrop Plugin in the documents folder

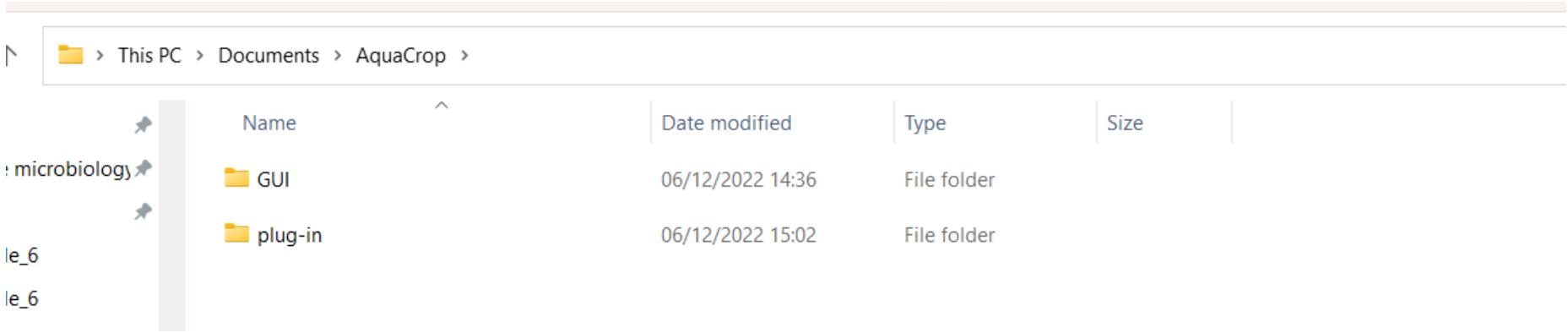


Folders location

- Where your data folder should be



- Where your AquaCrop installations should be



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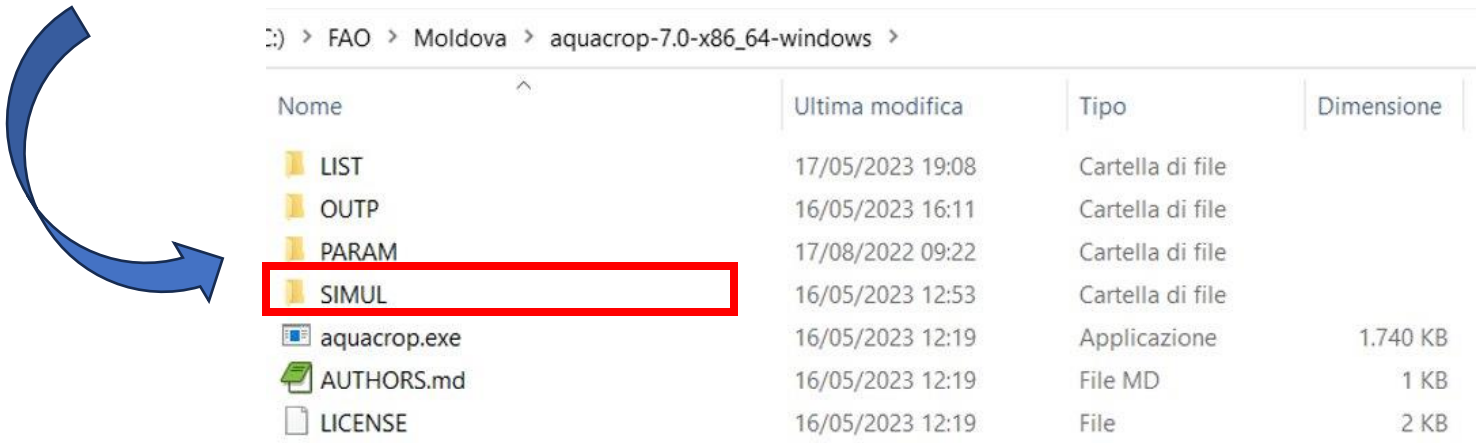
In case you do not have AquaCrop installed

- *To run the plugin the text file named "DailyResults.SIM" is needed to be in the “SIMUL” folder of the plugin. Download and paste this file .



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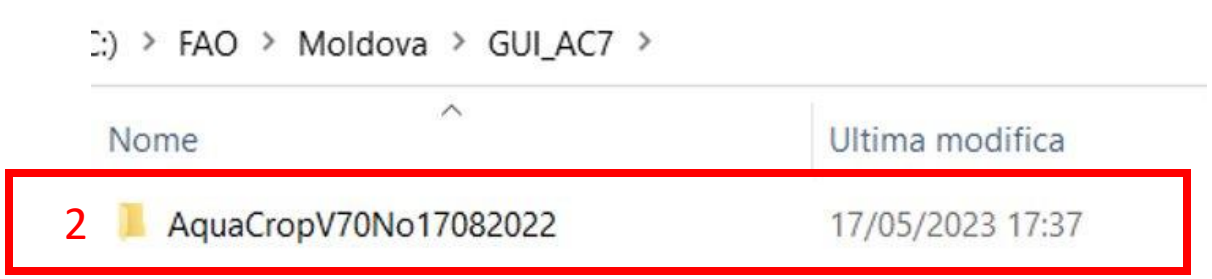
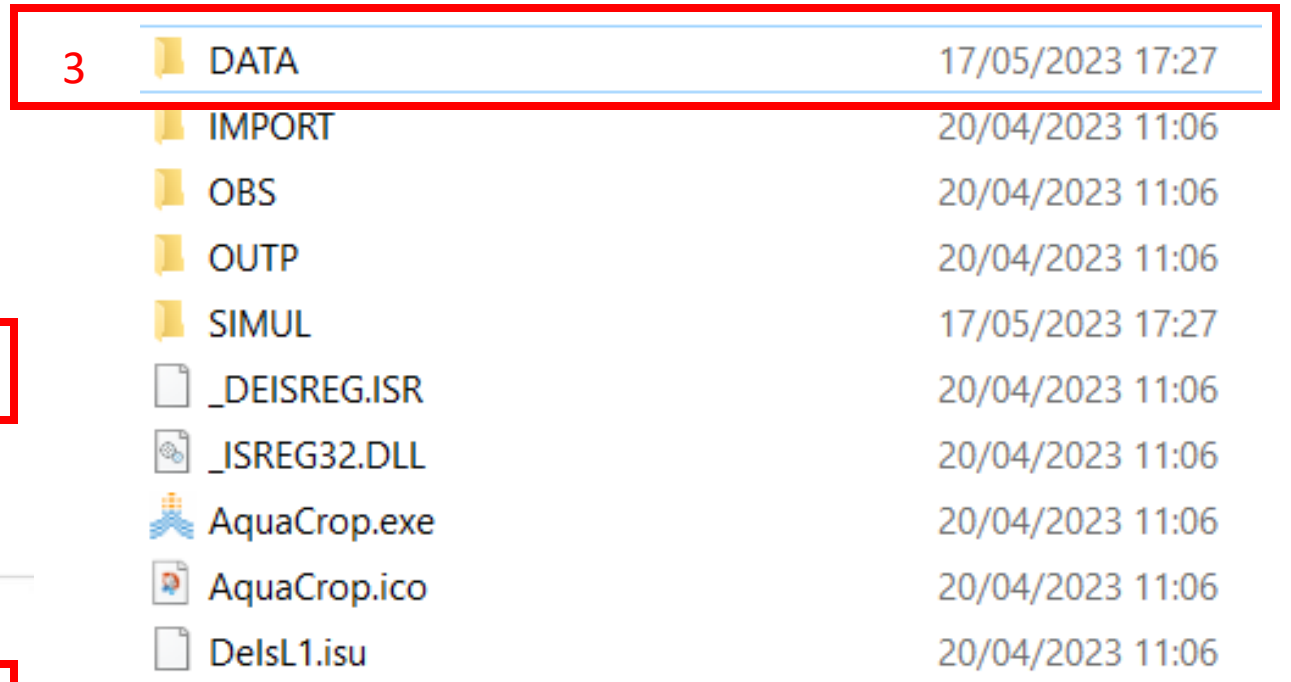
Upload of the files

Go to the GUI downloaded folder and **remove <u>all the content</u>** of your personal "DATA" folder.

Follow the shown path:





In case you would like to repristinate the AquaCrop default data you can find it in the "<u>Data with default AquaCrop files</u>" folder.

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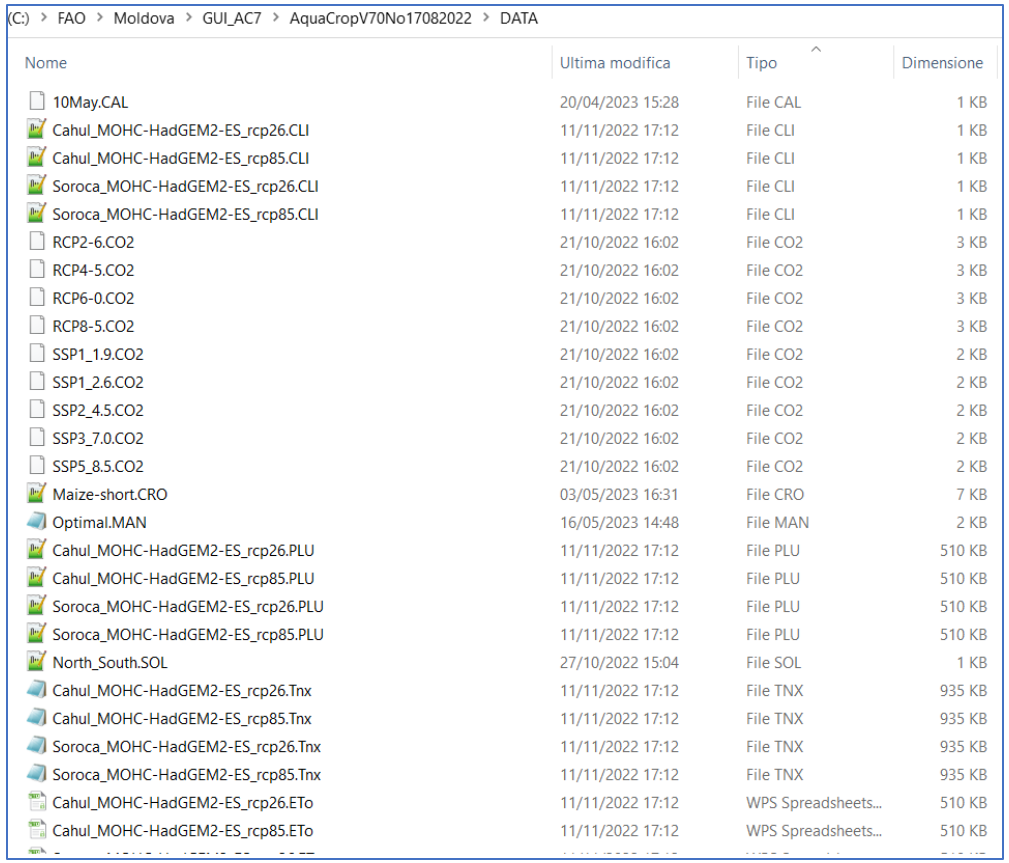
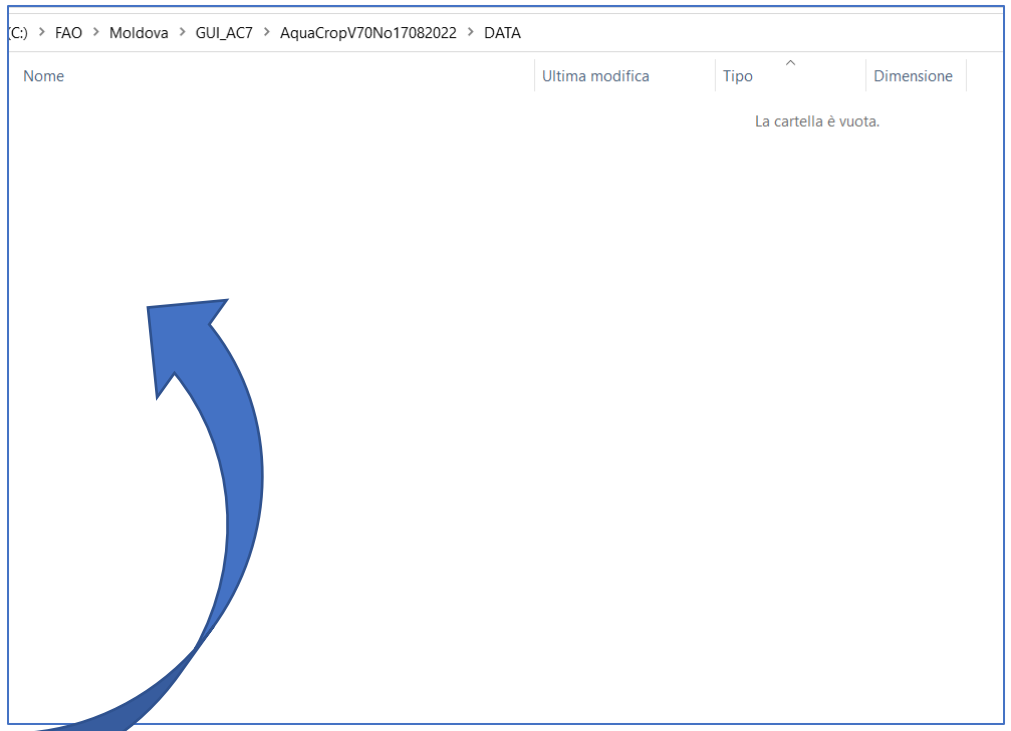
Upload of the files

Copy and paste the DATA folder content to your personal **DATA folder**.

Here **you can find the DATA** folder content



Personal DATA folder



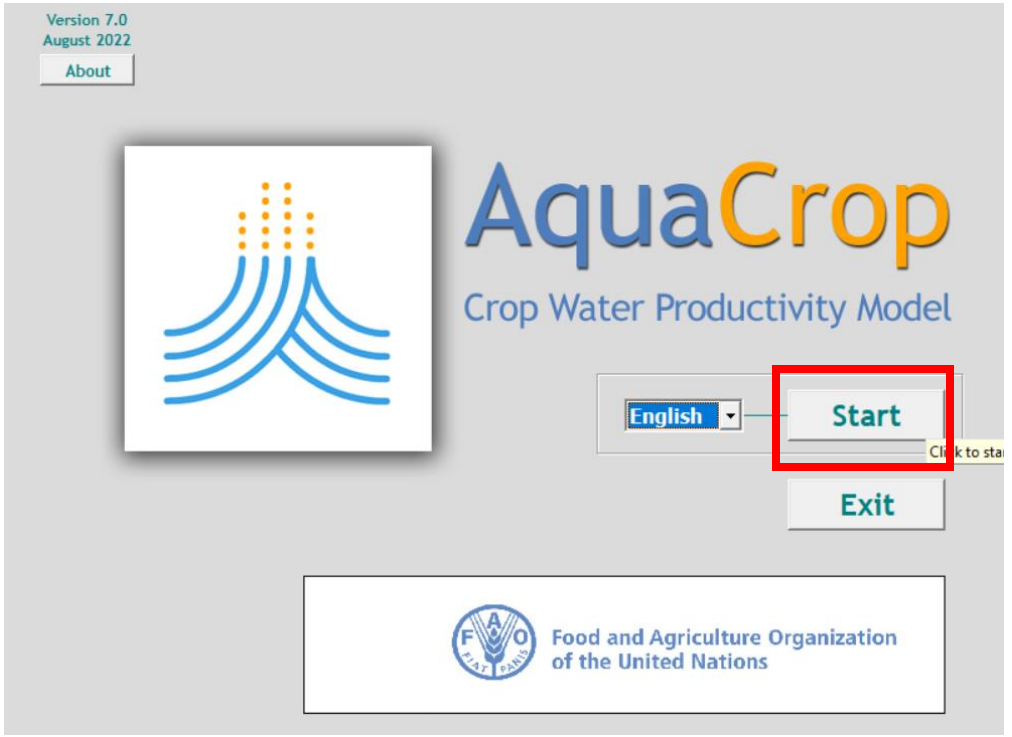
CTRL + C - CTRL + V

Open AquaCrop

1. Open AquaCrop software (double click on “AquaCrop.exe”)

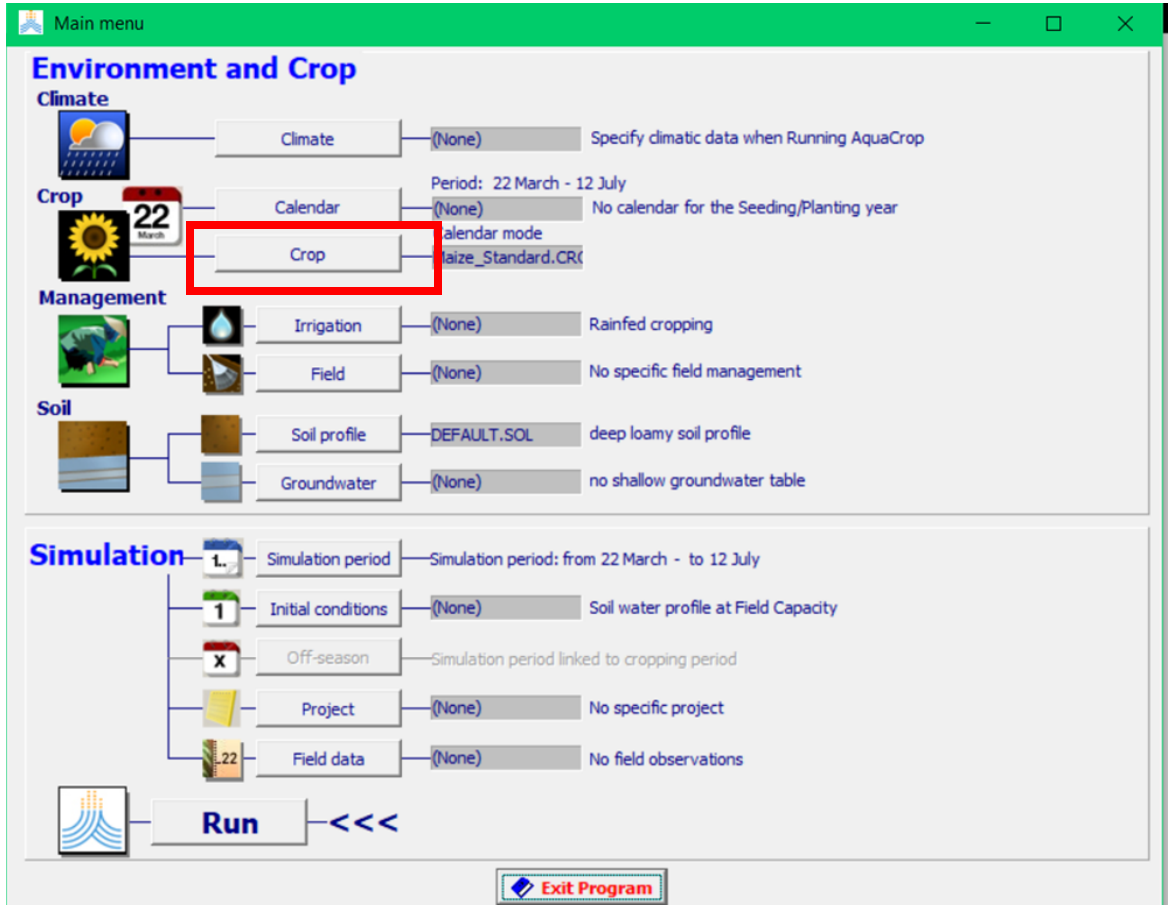
DATA	17/05/2023 17:27
IMPORT	20/04/2023 11:06
OBS	20/04/2023 11:06
OUTP	20/04/2023 11:06
SIMUL	17/05/2023 17:27
_DEISREG.ISR	20/04/2023 11:06
ISREG32.DLL	20/04/2023 11:06
AquaCrop.exe	20/04/2023 11:06
AquaCrop.ico	20/04/2023 11:06
DelsL1.isu	20/04/2023 11:06

2. Select language and press Start

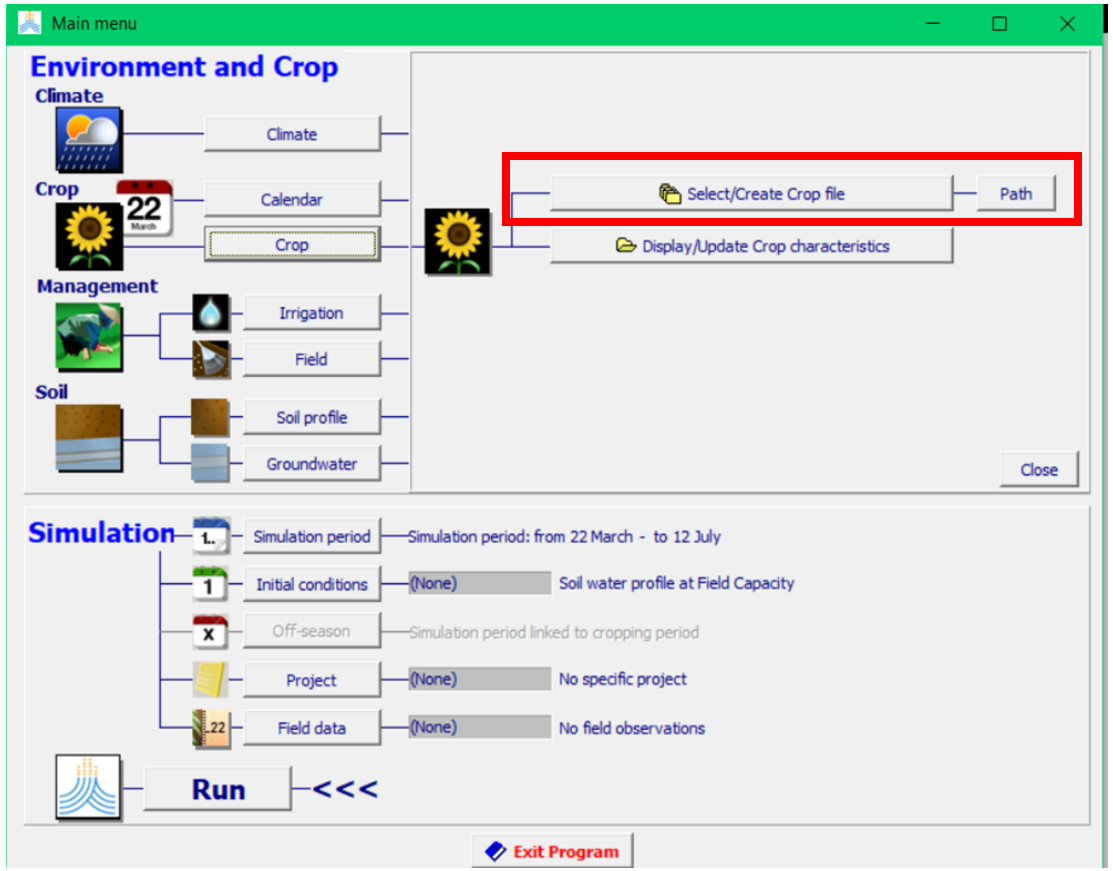


Creation of the crop file

Go to crop module

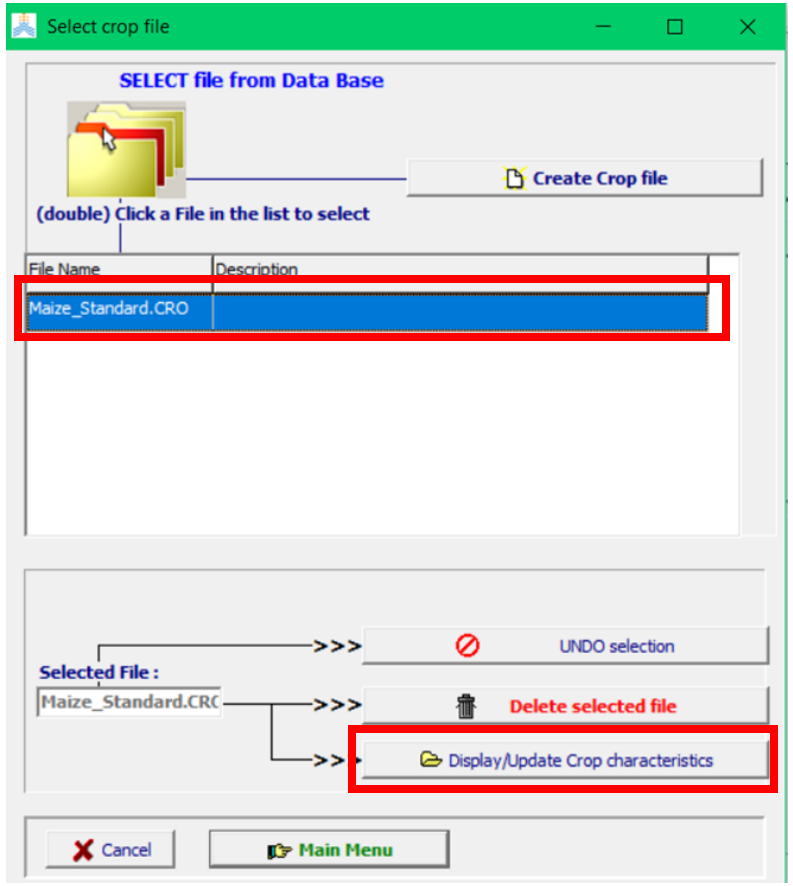


Click on Select/Create Crop file

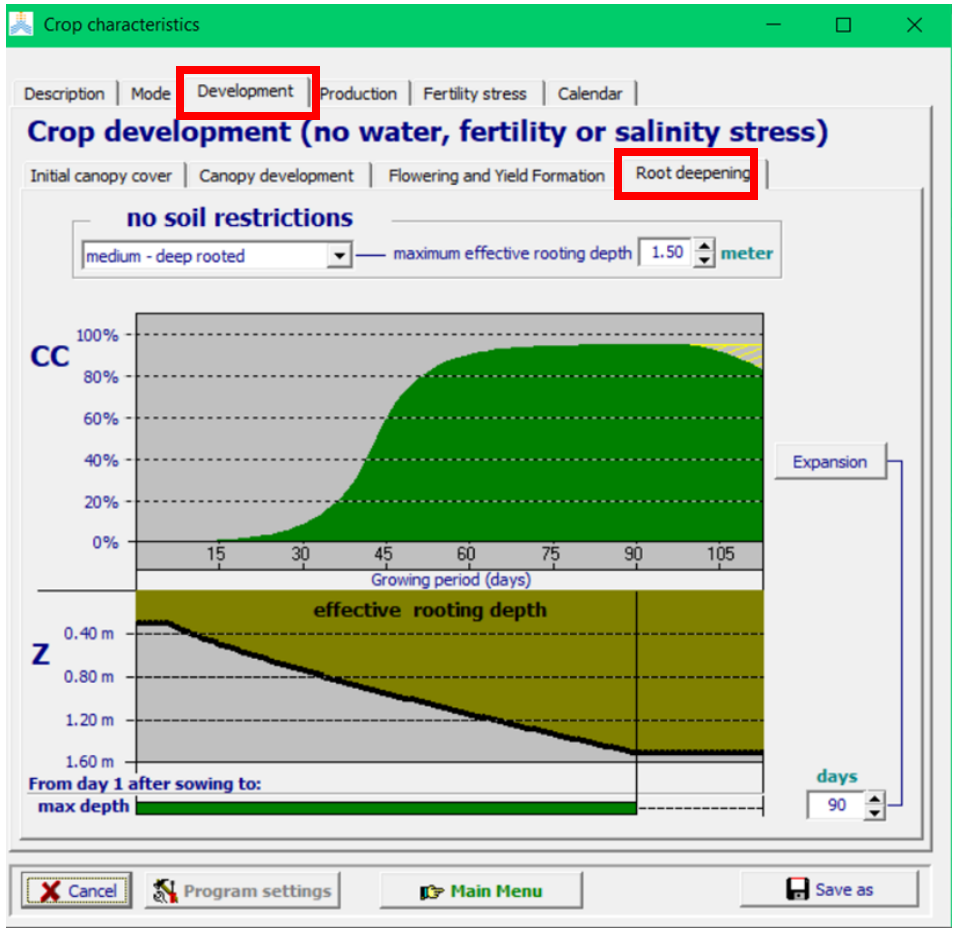


Creation of the crop file

- Select the crop file to be modified
- Click on Display/Update Crop characteristics

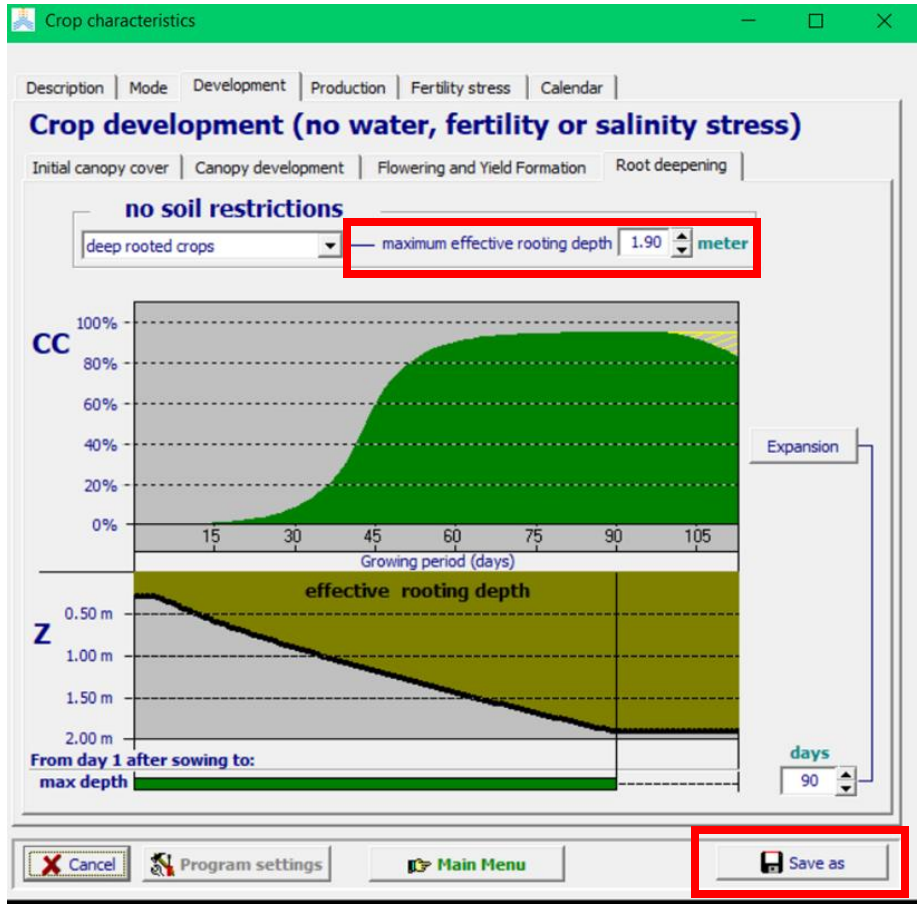


- Select the "Development" sub-module
- Click on "Root deepening"

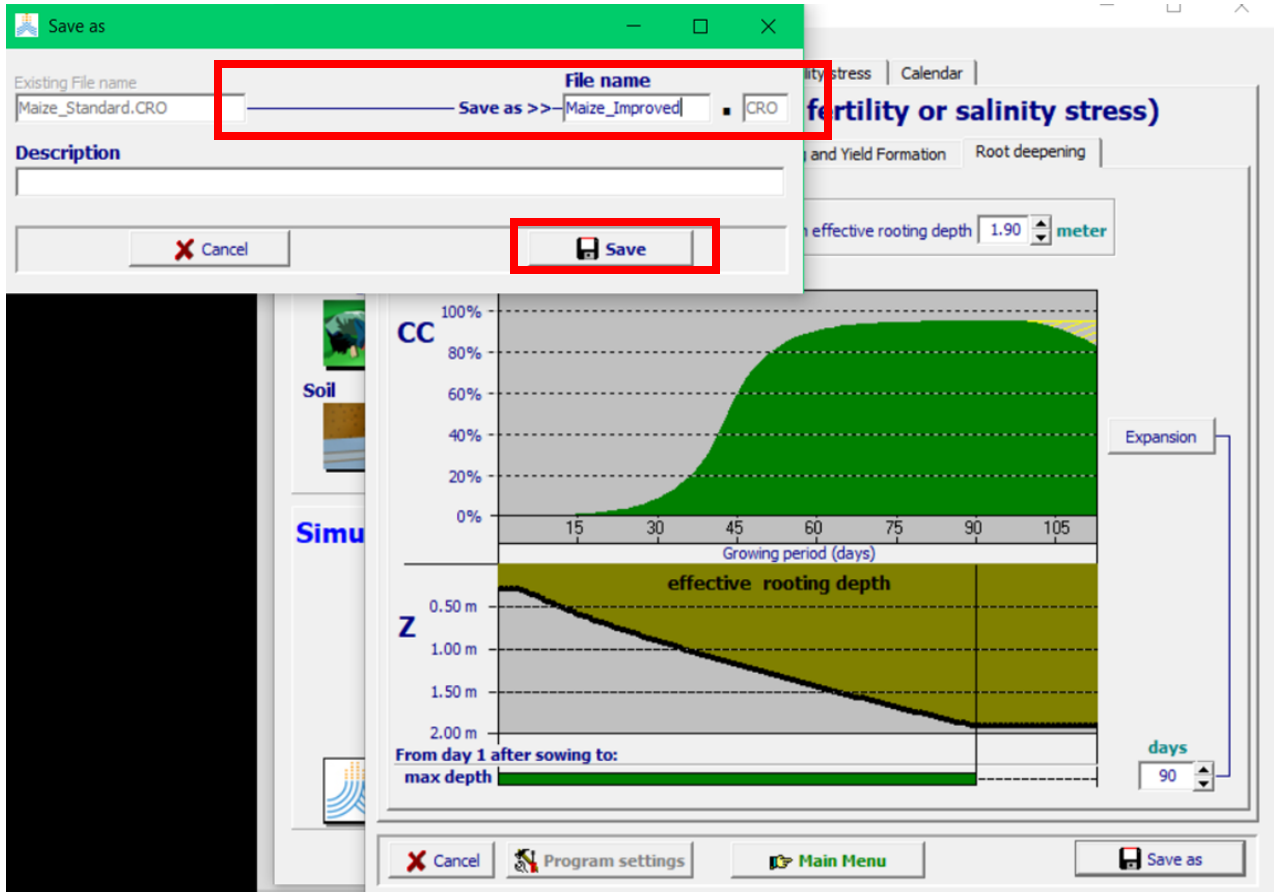


Creation of the crop file

- Bring the "Maximum effective rooting depth" up to 1.90 meters using the upper arrow.
- Select "Save as"

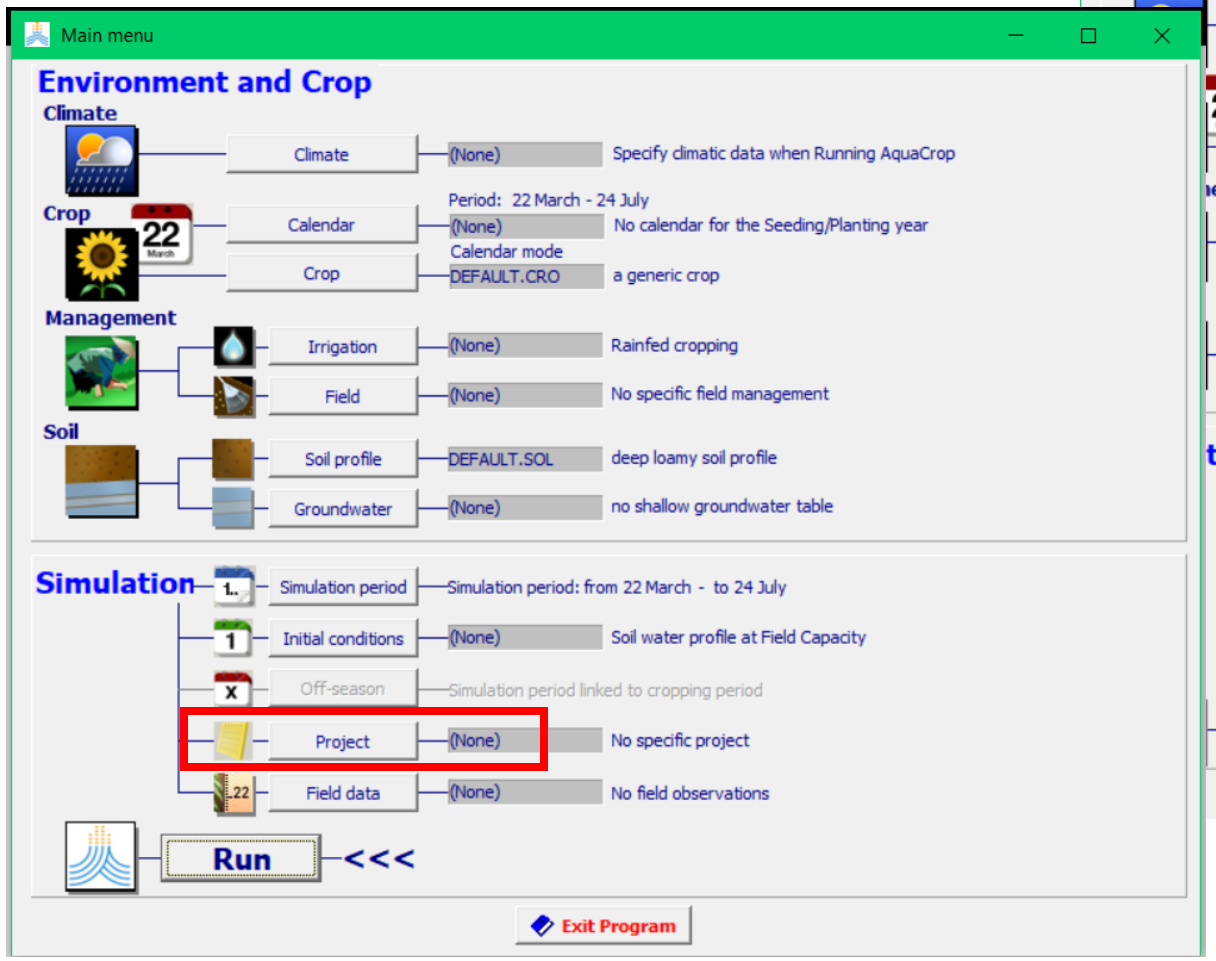


- Rename the file as "Maize_Improved"
- Click on "Save" button

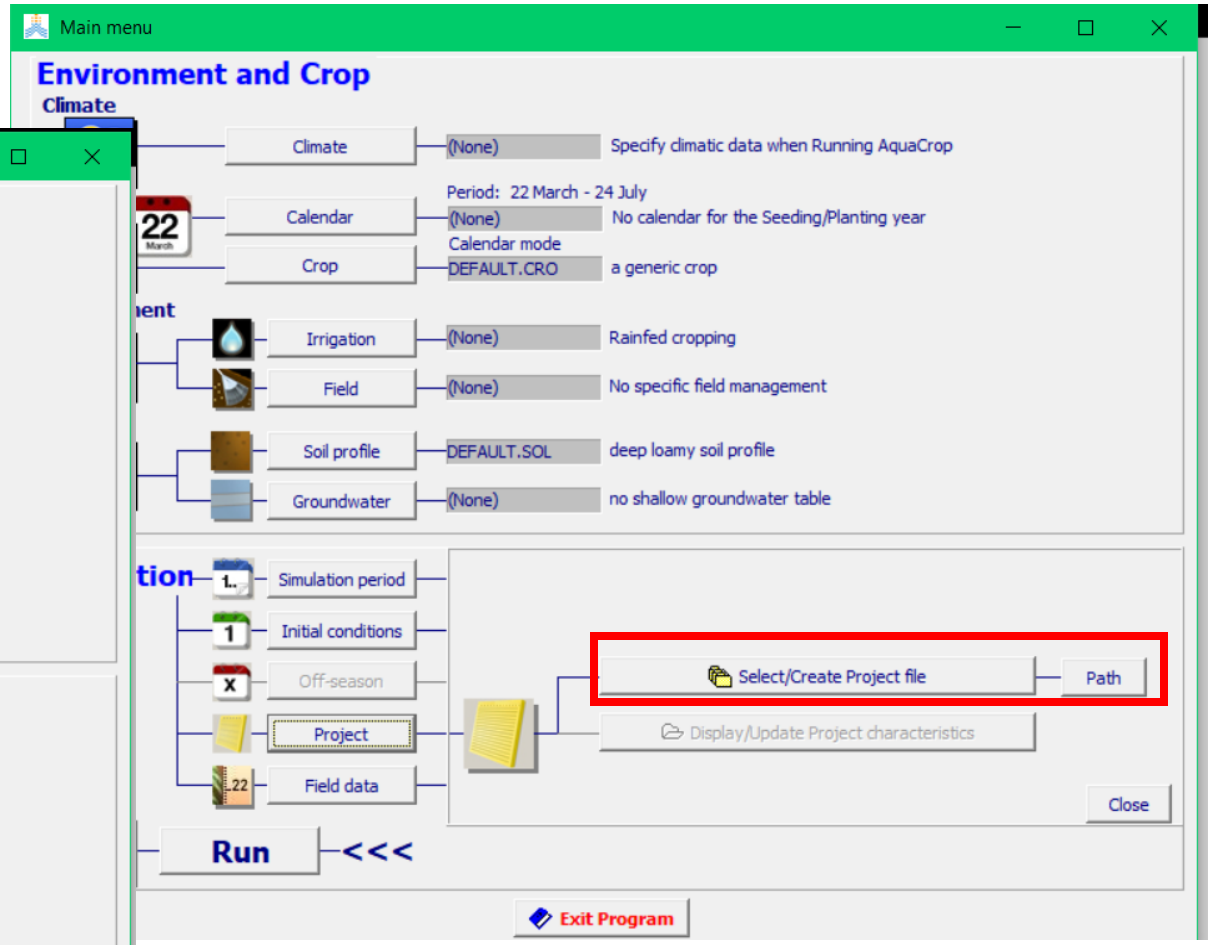


Creation of the project files (.PRM)

Press the “Project” button to create the project file

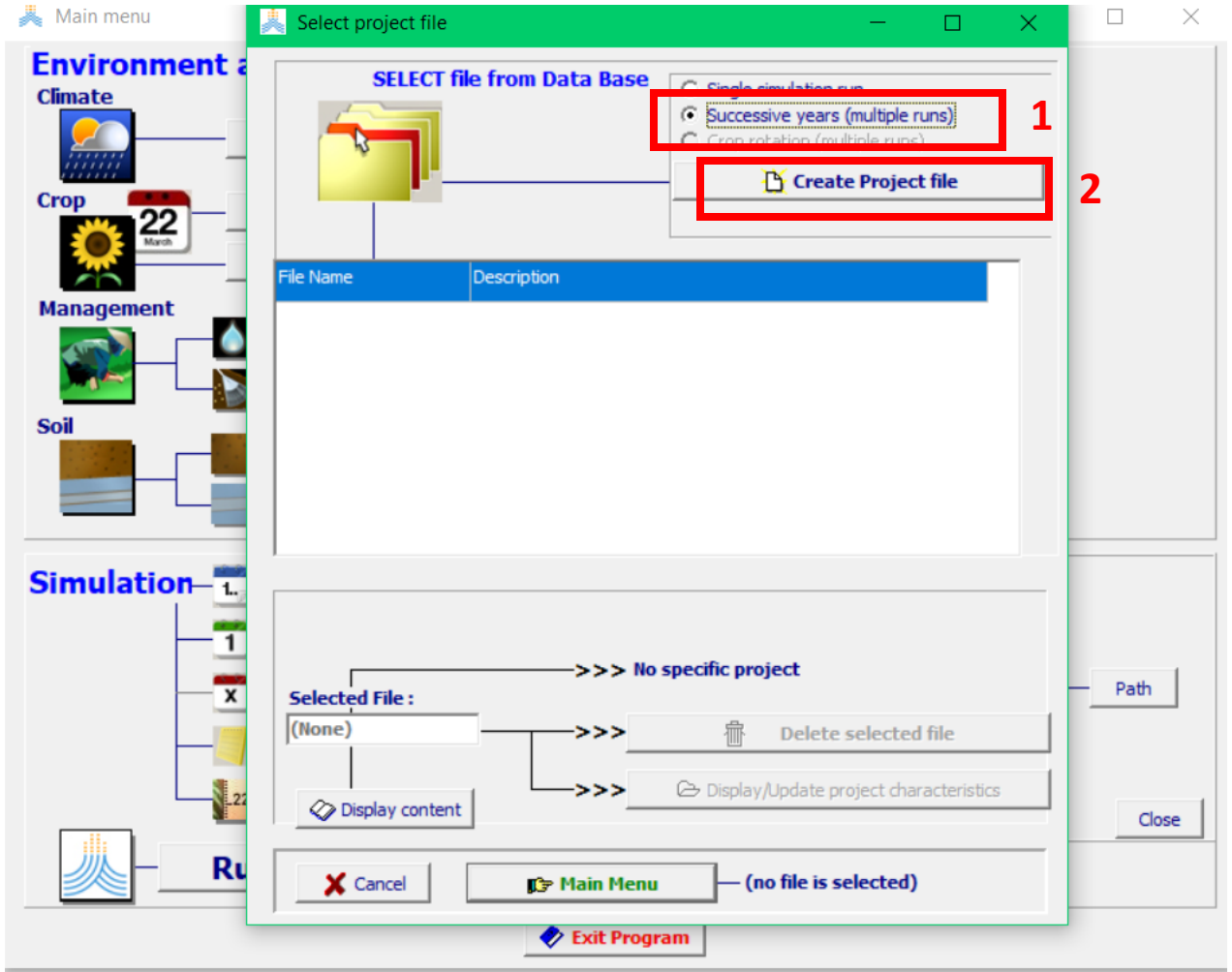


Click on “Select/Create Project file”



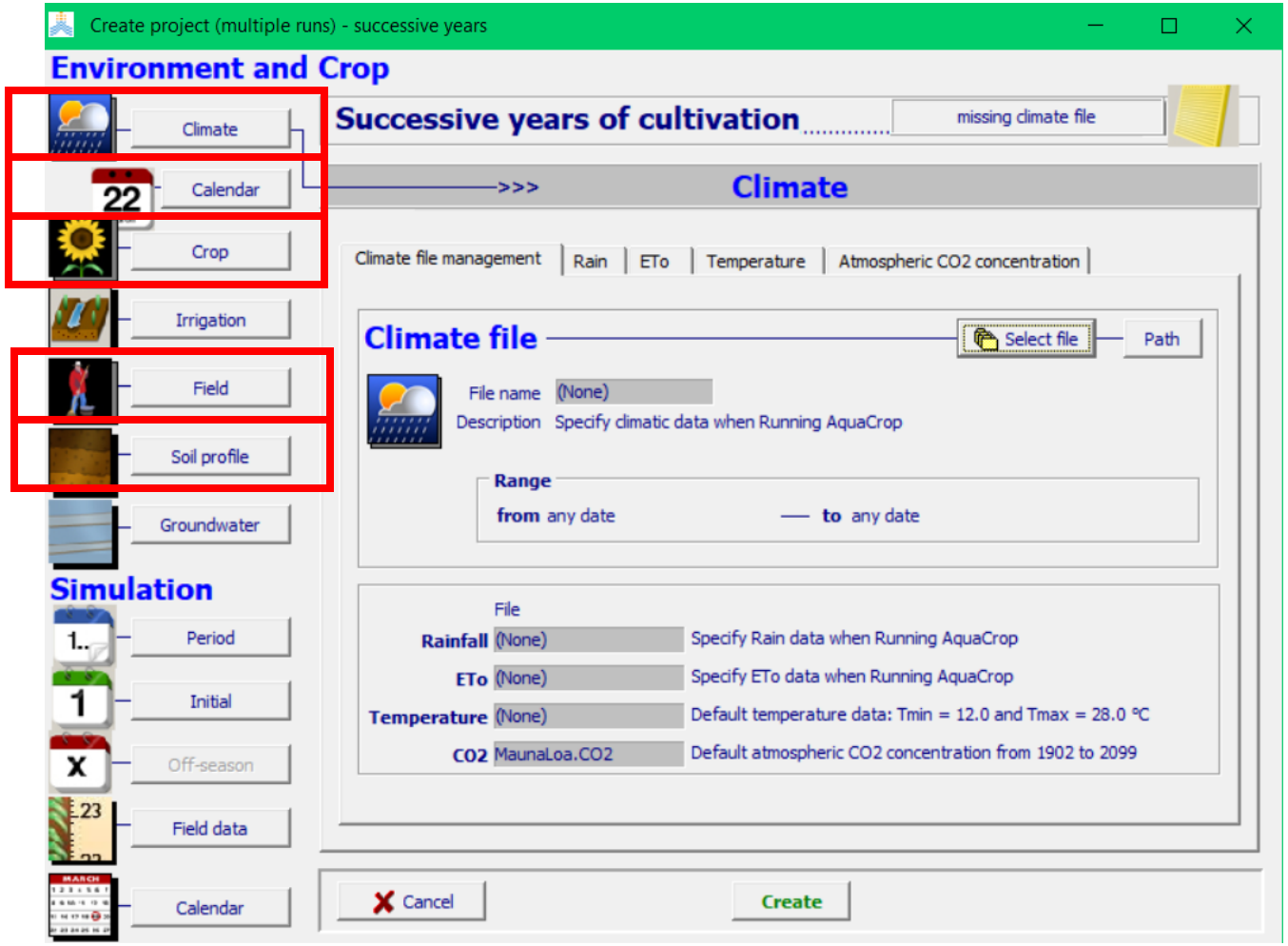
Creation of the project files (.PRM)

1. Press “successive years (multiple runs)” since we are using a climate file with data from 2030 to 2099
2. Click the below “create project file” button



Creation of the project files (.PRM)

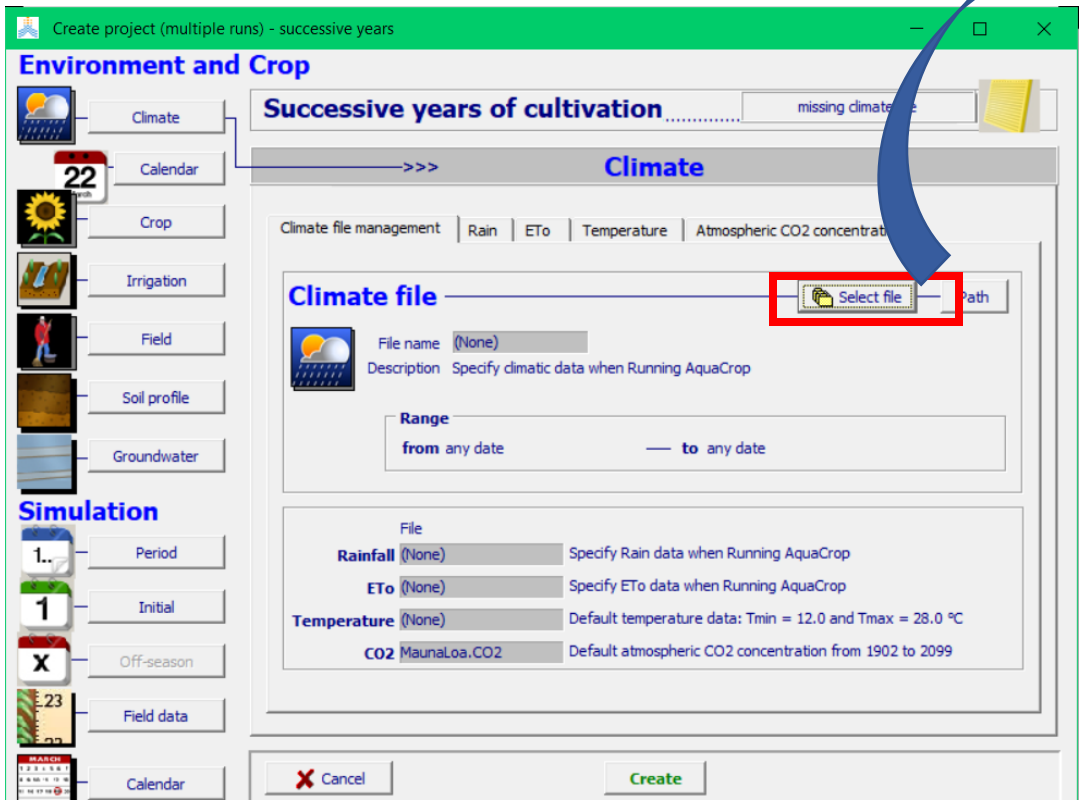
One by one, we will go through each of the highlighted components of the menu and select the correct files to create the PRM file.



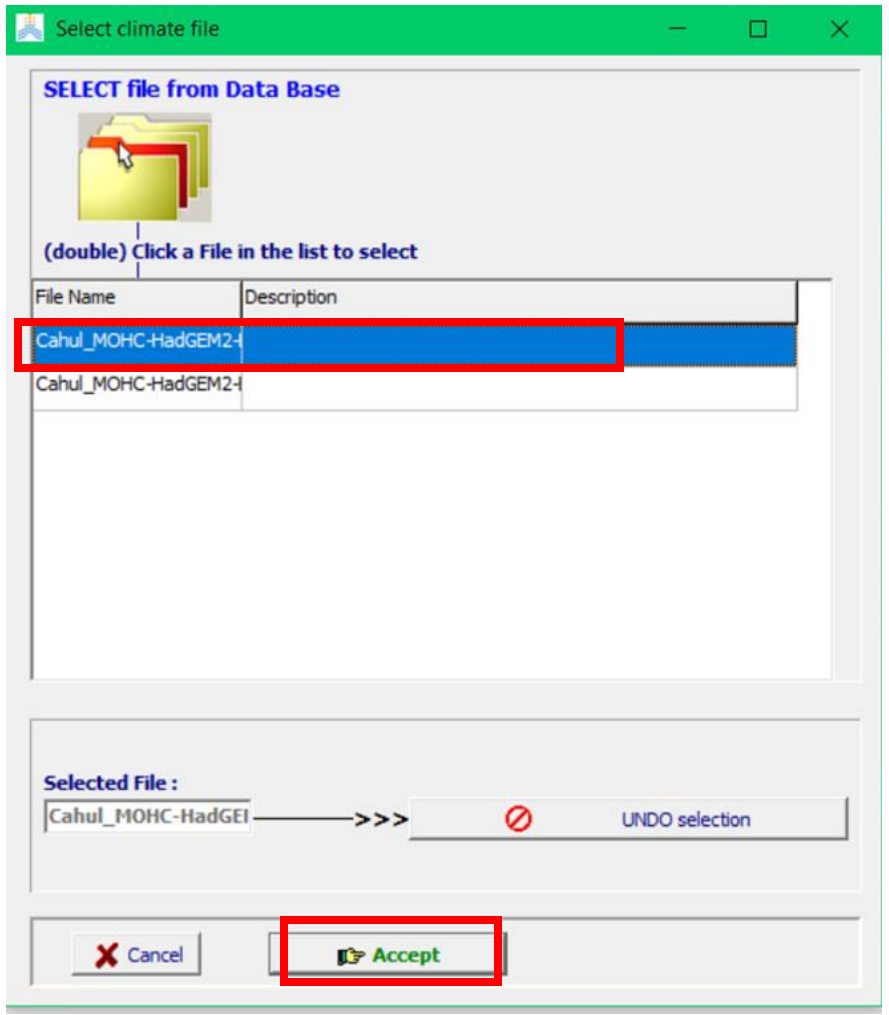
Climate module

1. Climate file

Press “Select file”



Select the first file “Cahul_MOHC-HadGEM2-”
Press the “Accept” button



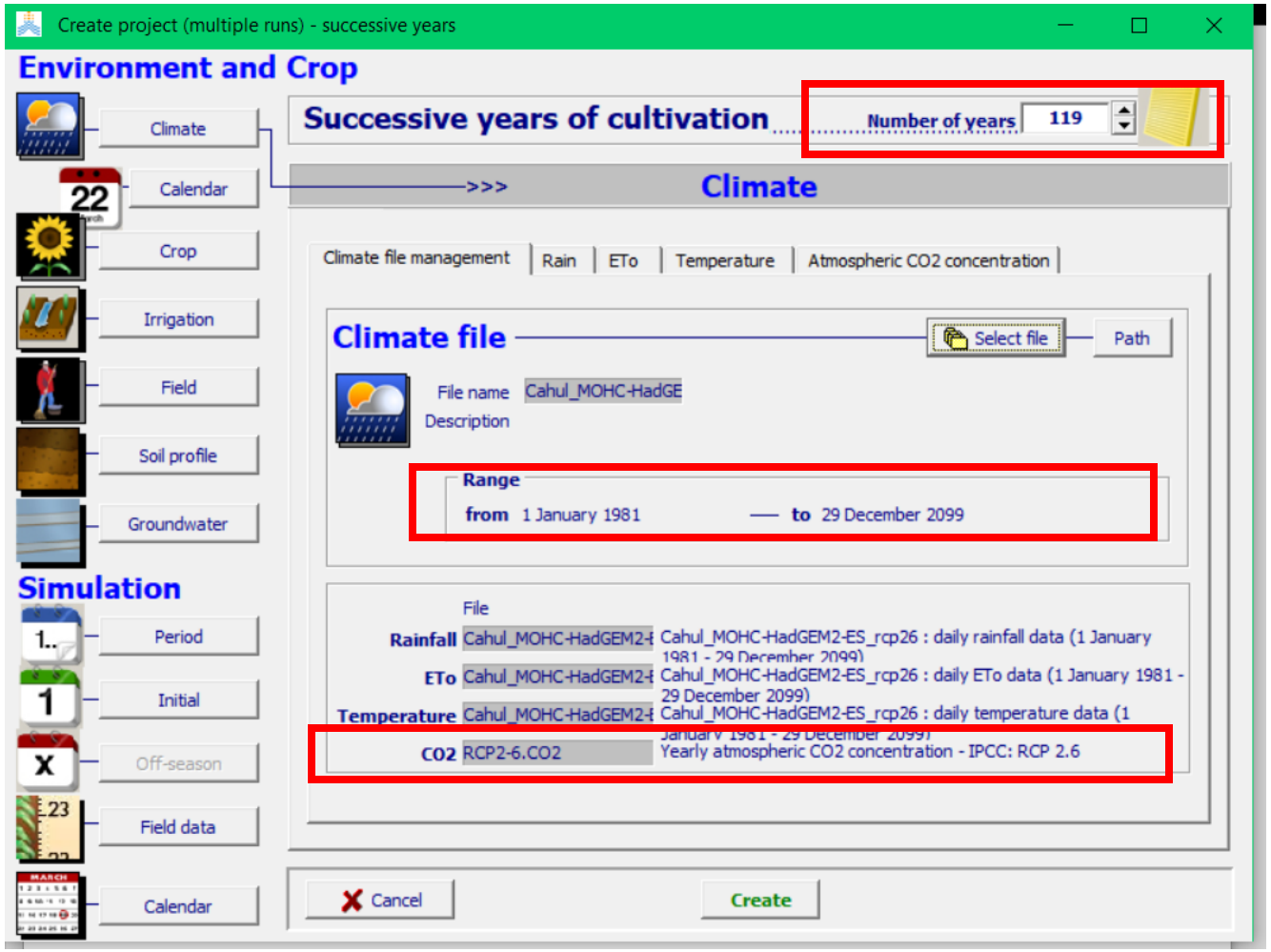
Creation of the project files (.PRM)

Here you can check the content of the selected file:

- **119 years**: 1 January 1981 to 29 December 2099

- **MOHC**: Global Climate Model

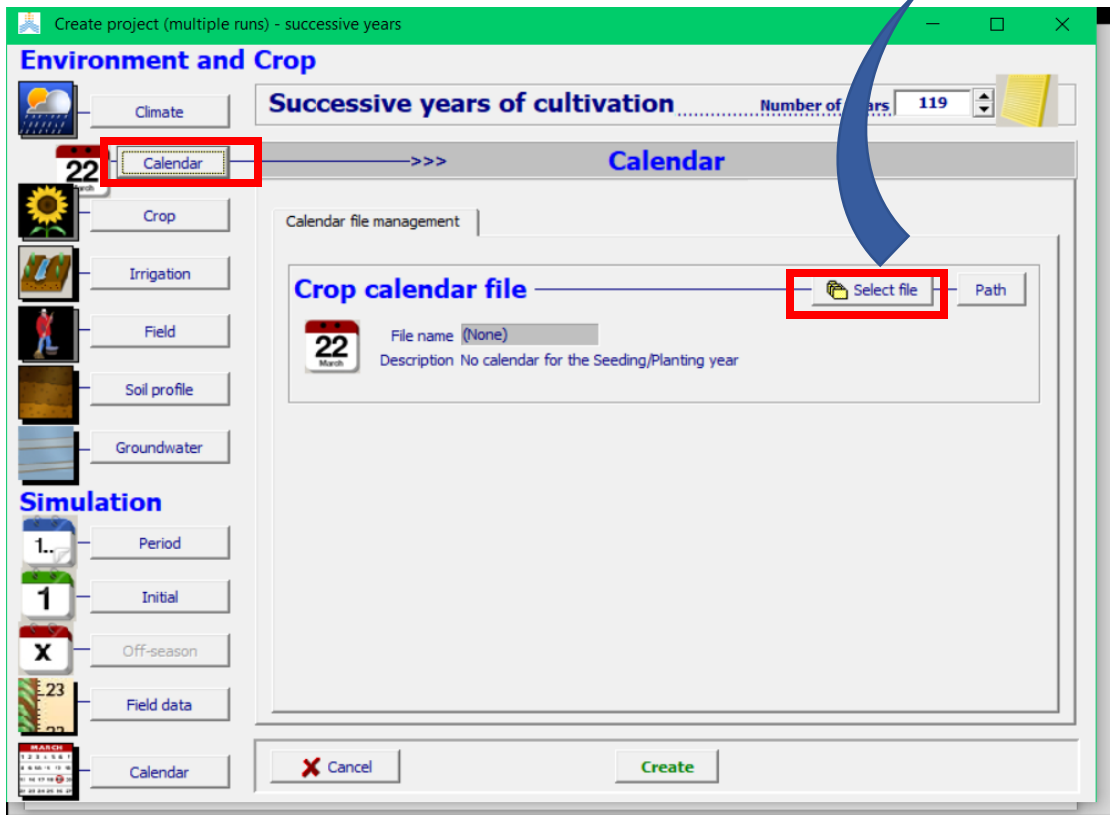
- **RCP2.6**: representative concentration pathway (2.6 - low emission scenario)



Calendar module

2. Calendar file

Press “Select file”

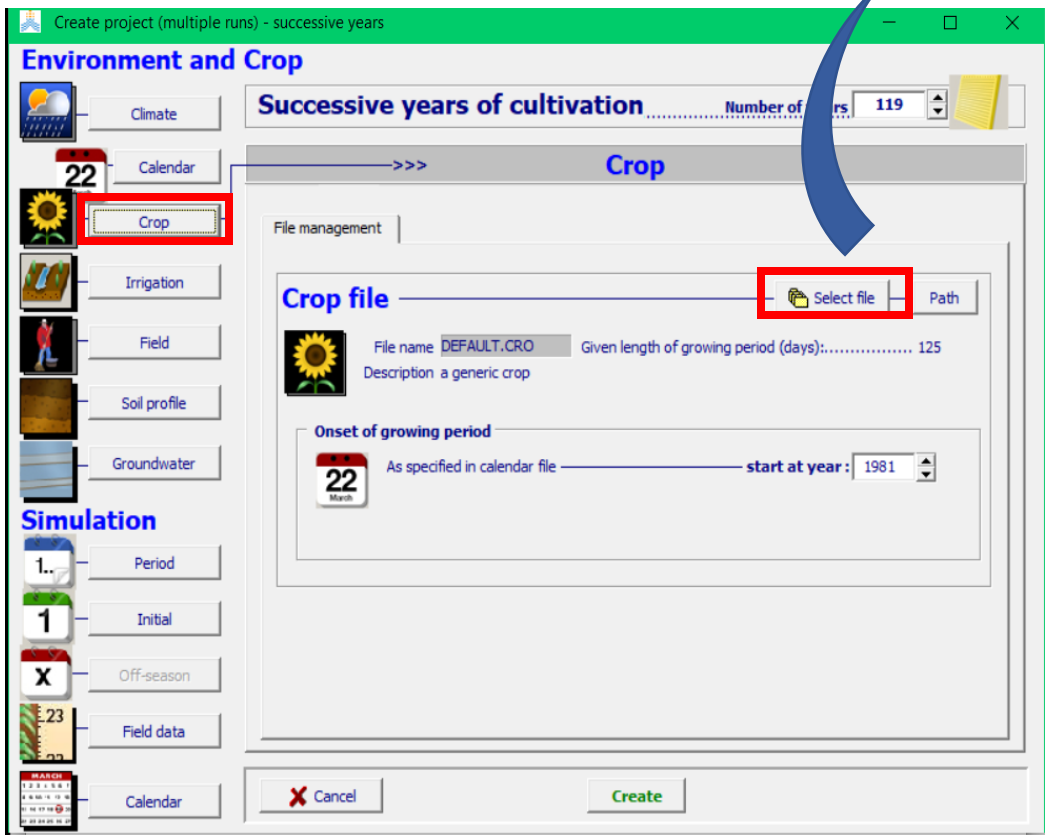


Select the file “10May”
Press the “Accept” button

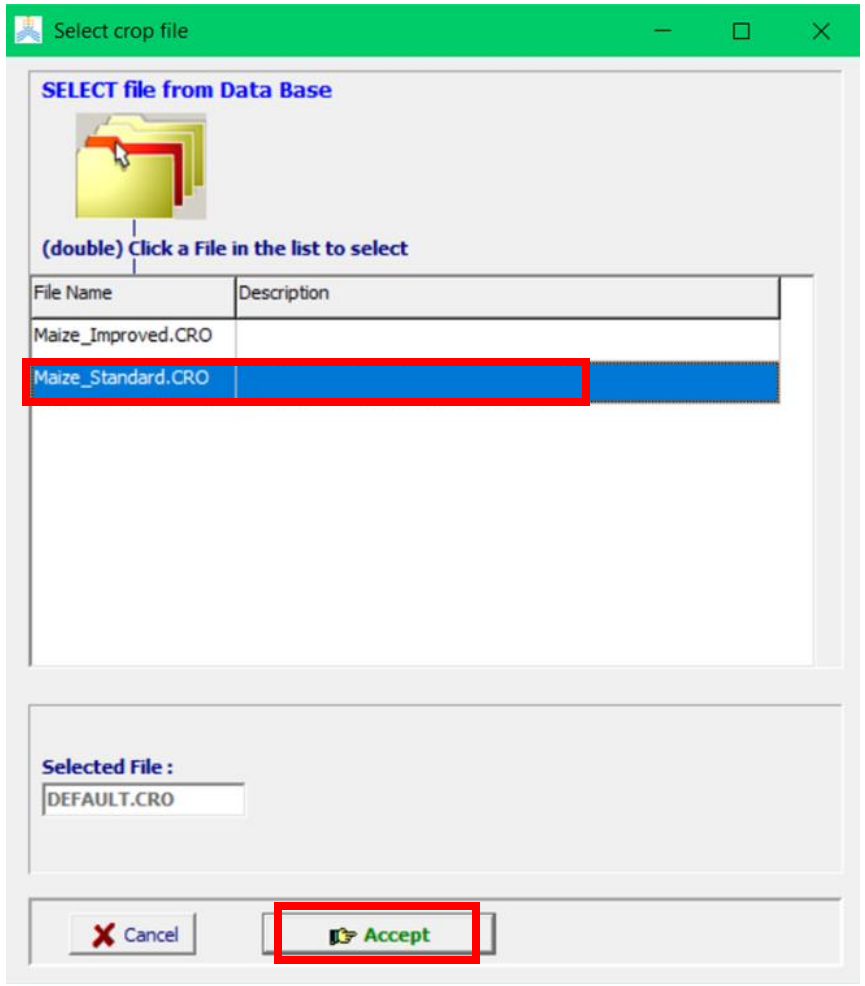
Crop module

3. Crop file

Press “Select file”

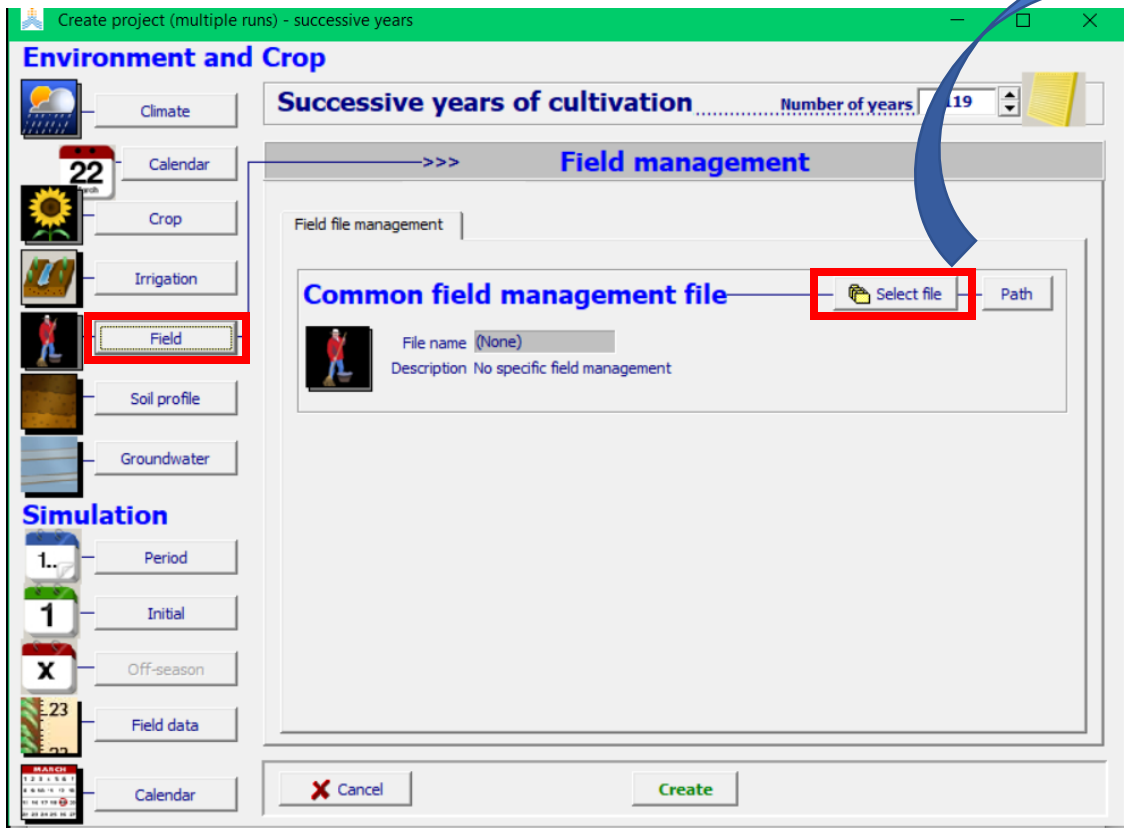


Select the file “Maize-Short”
Press the “Accept” button

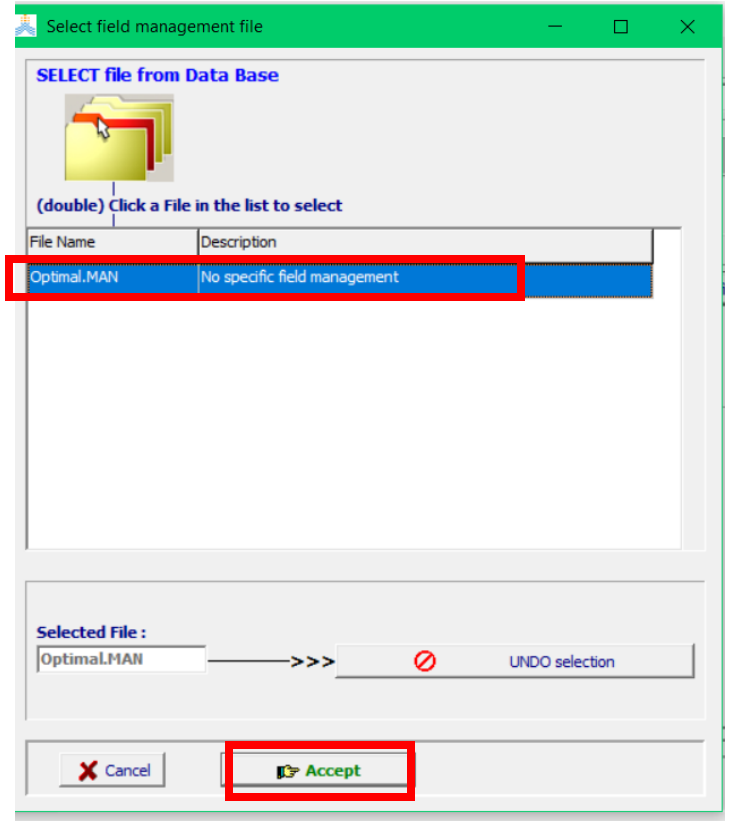


4. Field management file

Press “Select file”

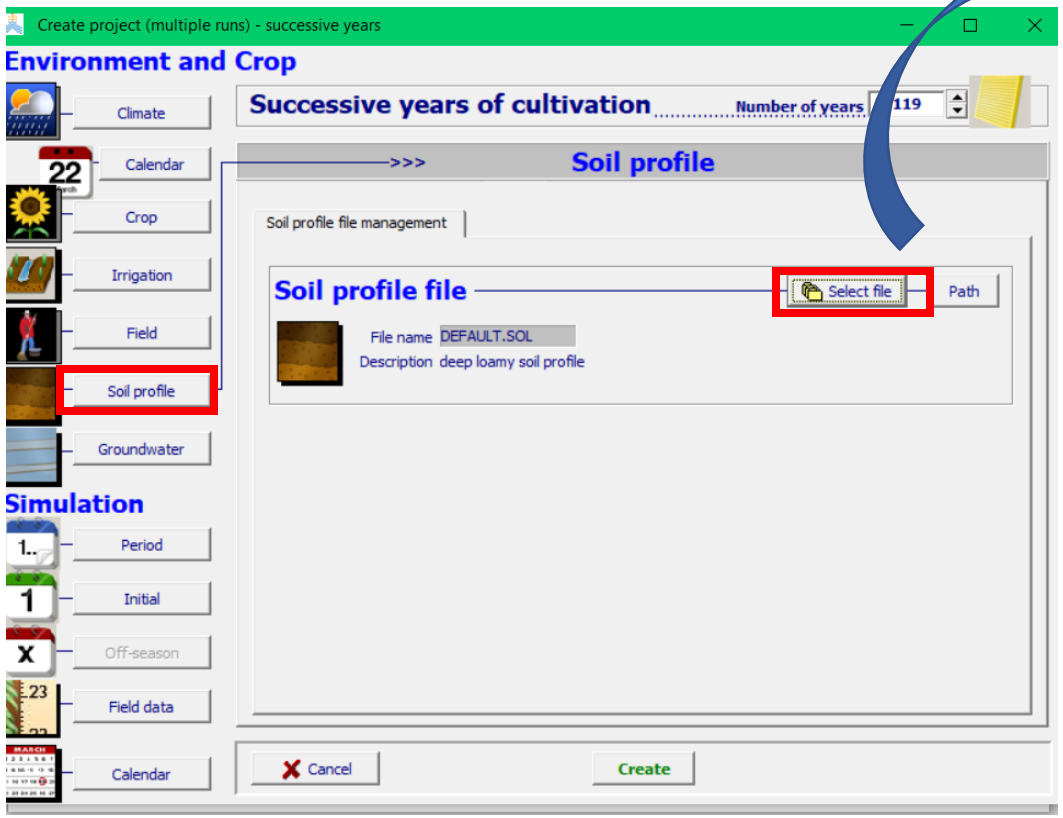


Select the file “Optimal”
Press the “Accept” button

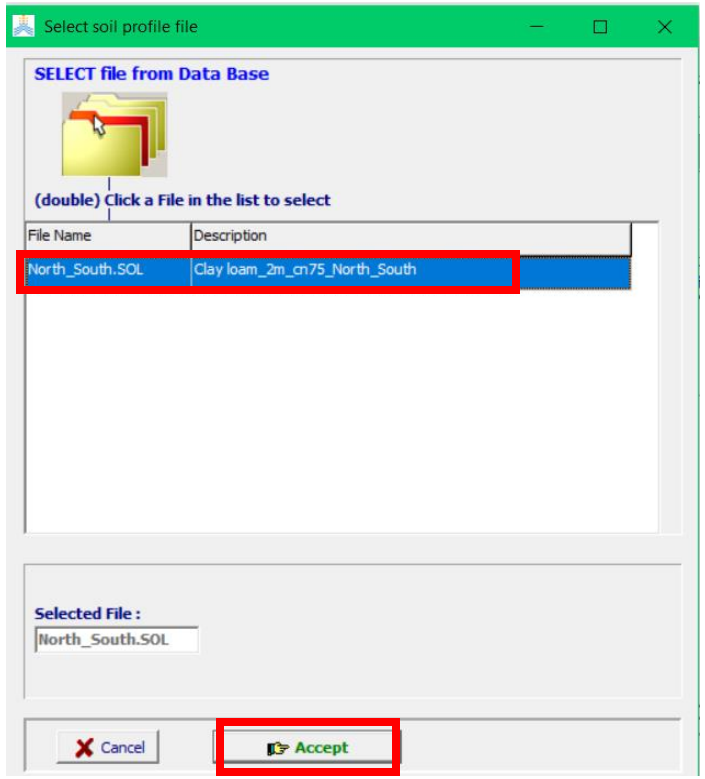


5. Soil file

Press “Select file”

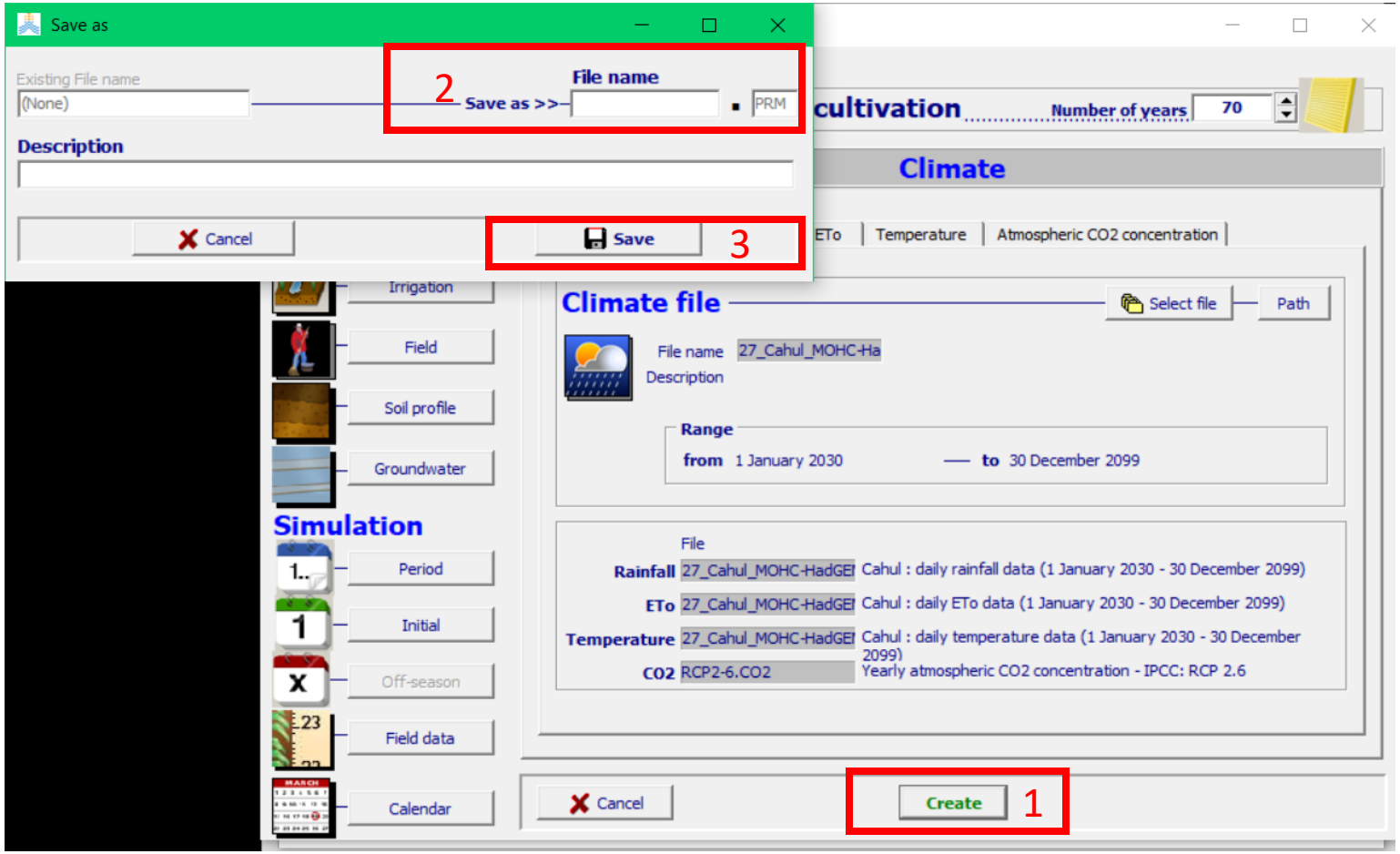


Select the file “North_South”
Press the “Accept” button



Saving project files (.PRM)

1. Press “CREATE”
2. Fill the “File name” with the name: **Maize_Standard_Cahul_10May_Optimal_26_MOHC**
3. Press the “Save” button



Creation of new project files (.PRM)

HOW TO CREATE OTHER PROJECT FILES WITH DIFFERENT VARIABLES

Creation of new project files (.PRM)

Variables scheme

Maize_Standard_Cahul_10May_Optimal_26_MOHC [X]

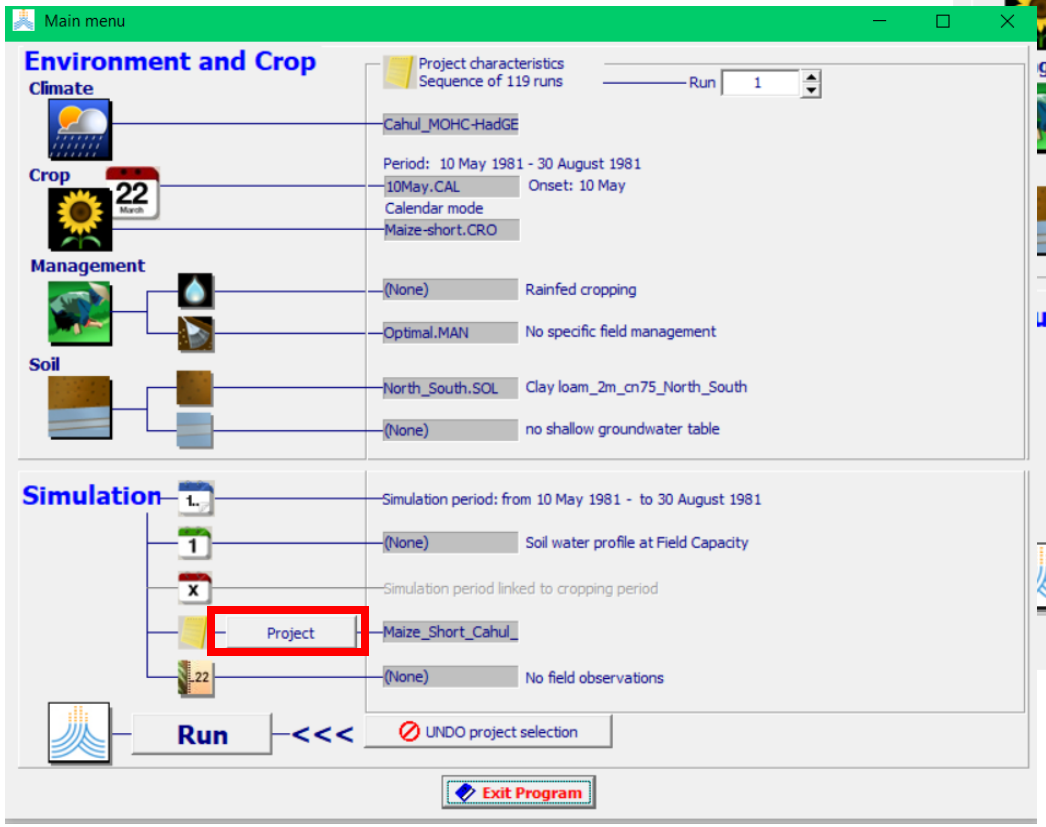
Maize_Standard_Cahul_10May_Optimal_85_MOHC [ ] → Step → Change the Climate file to Cahul RCP 8.5

Maize_Improved_Cahul_10May_Optimal_26_MOHC [ ] → Step → Change the crop file to Improved (variety)

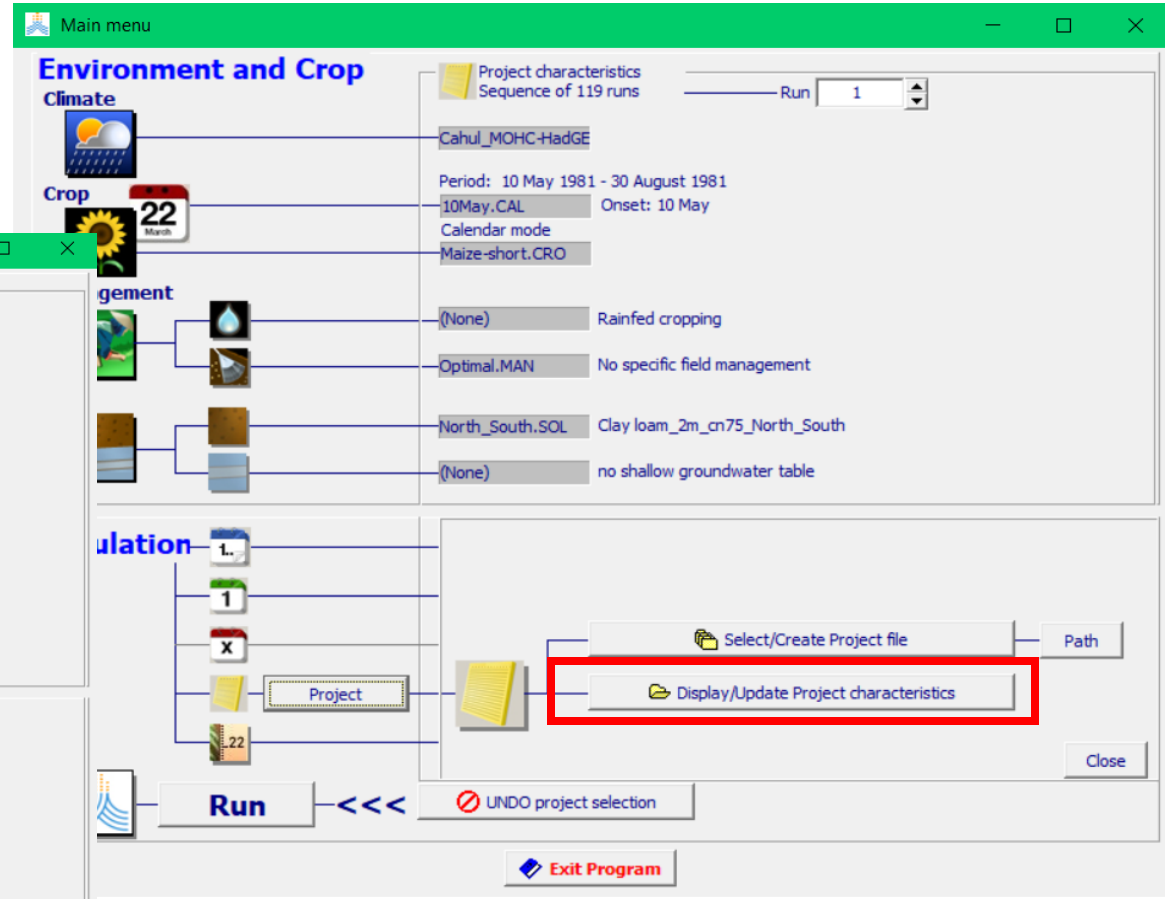
Maize_Improved_Cahul_10May_Optimal_85_MOHC [ ] → Step → Change the crop file to Improved (variety)

Creation of new project files (.PRM)

1. Press “Project” button

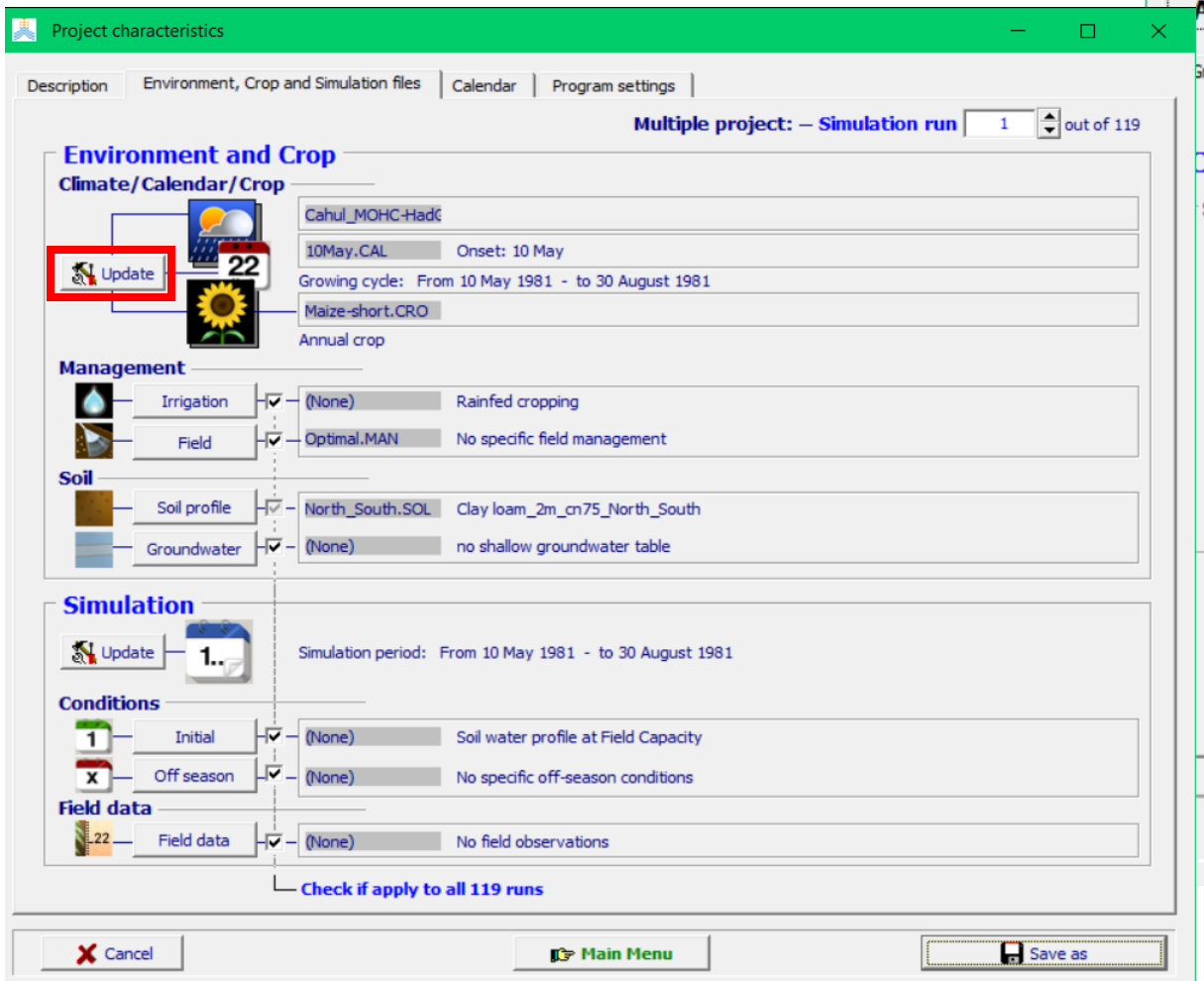


2. Select Display/Update Project characteristics

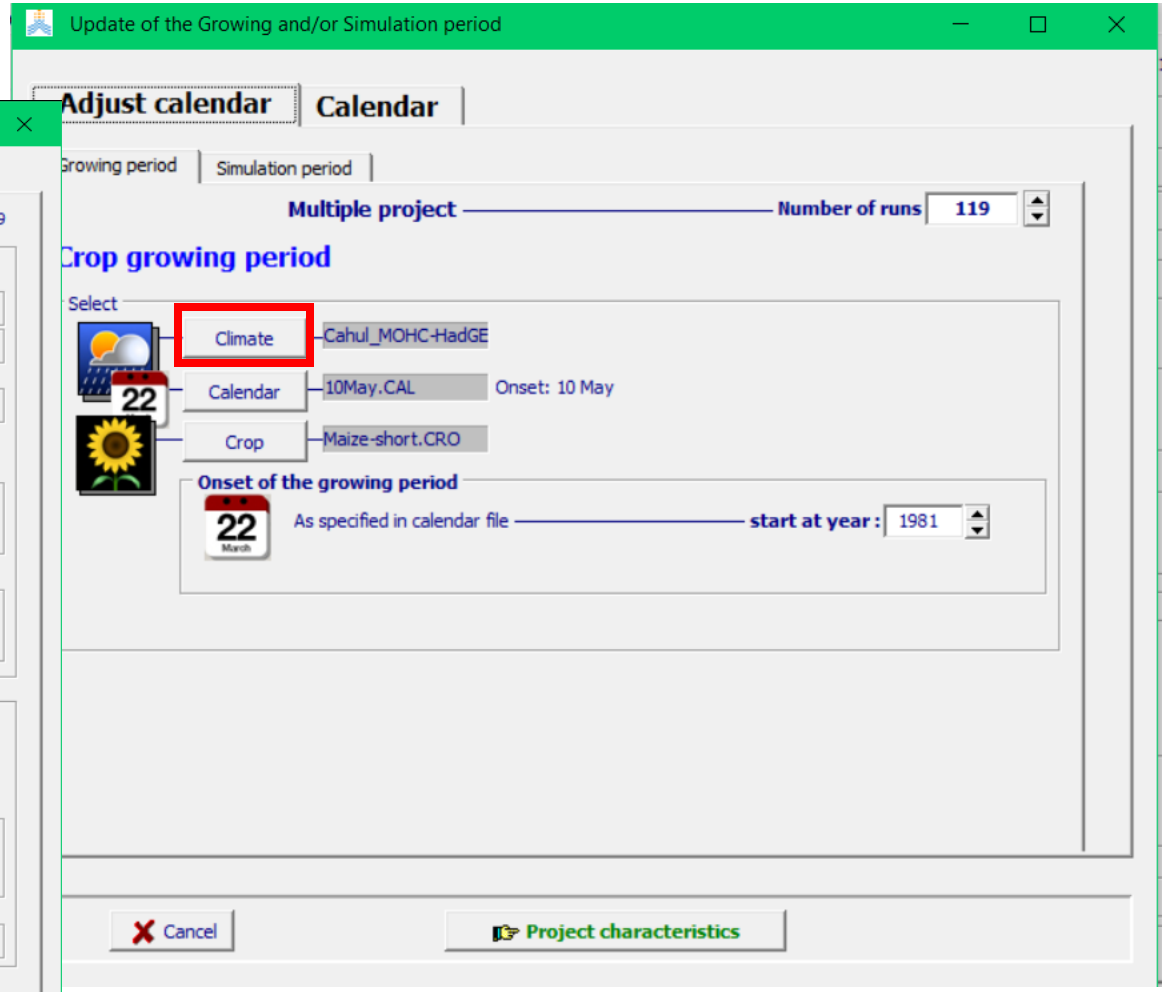


Creation of new project files (.PRM)

3. Press “Update” button

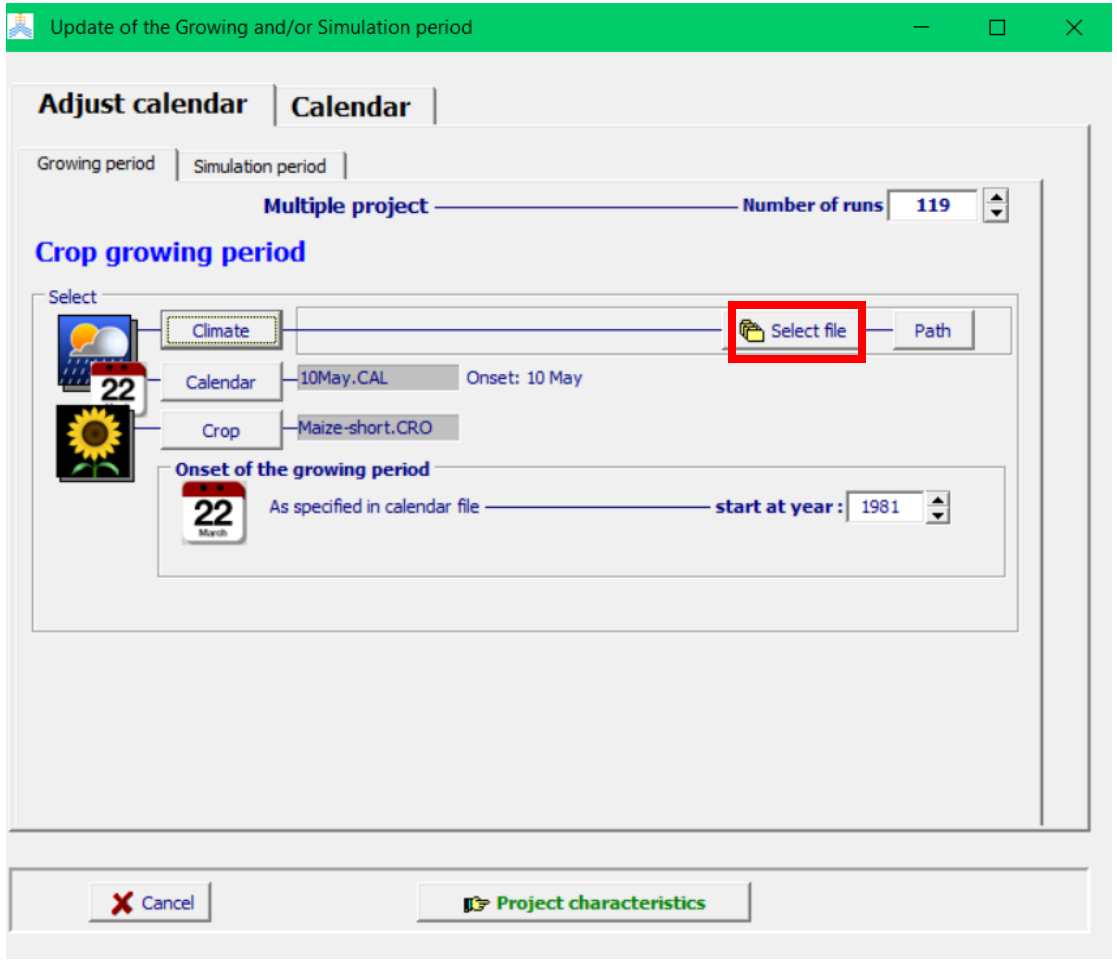


4. Click on Climate

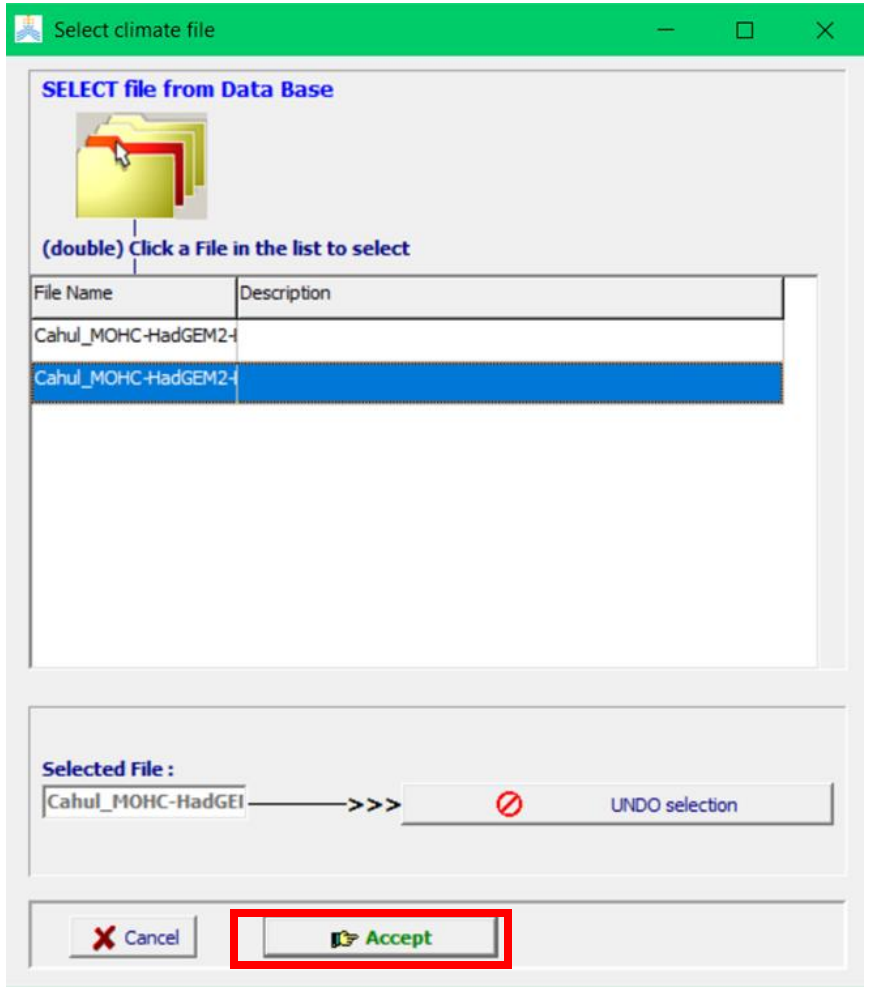


Creation of new project files (.PRM)

5. Click on “Select file”



6. Select the second file “Cahul_MOHC-HadGEM2-”

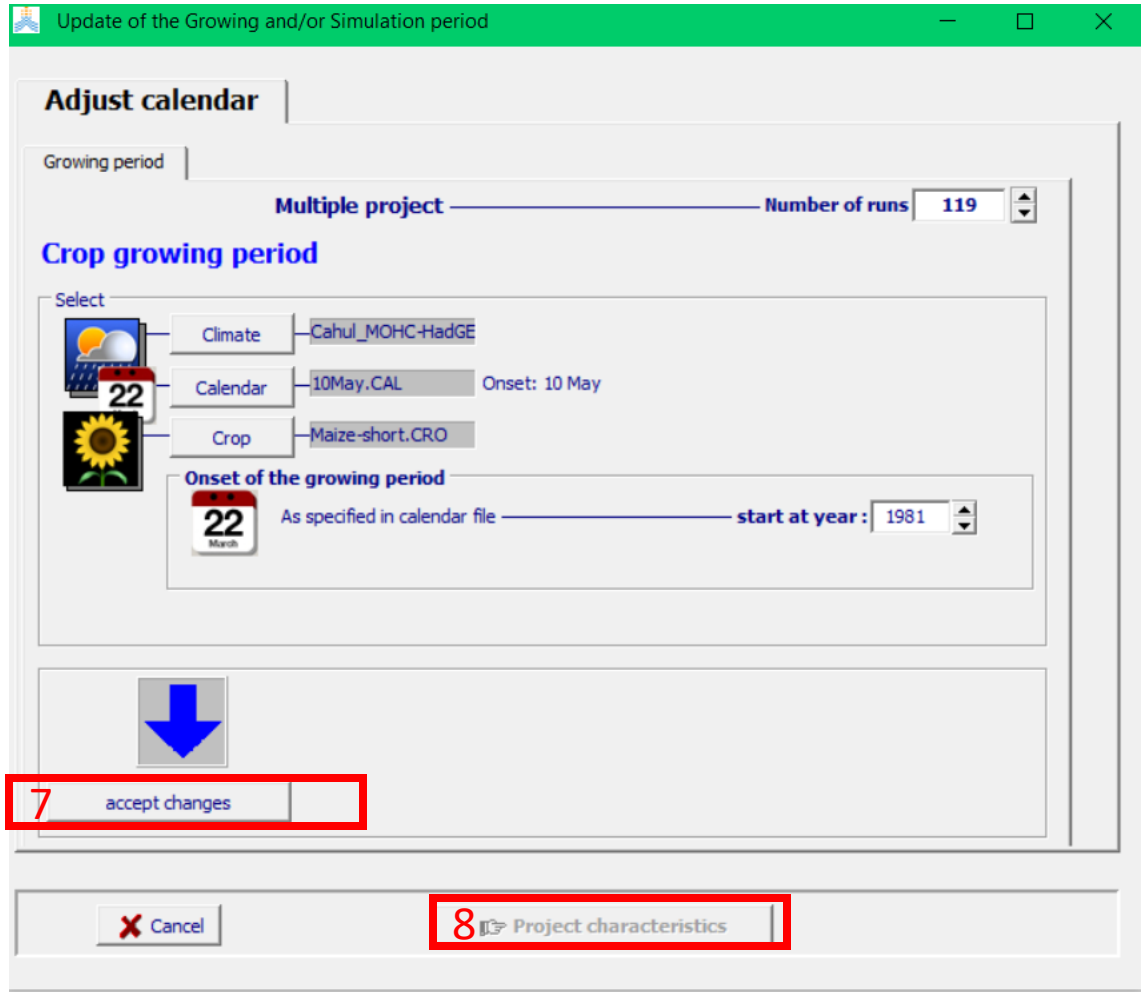


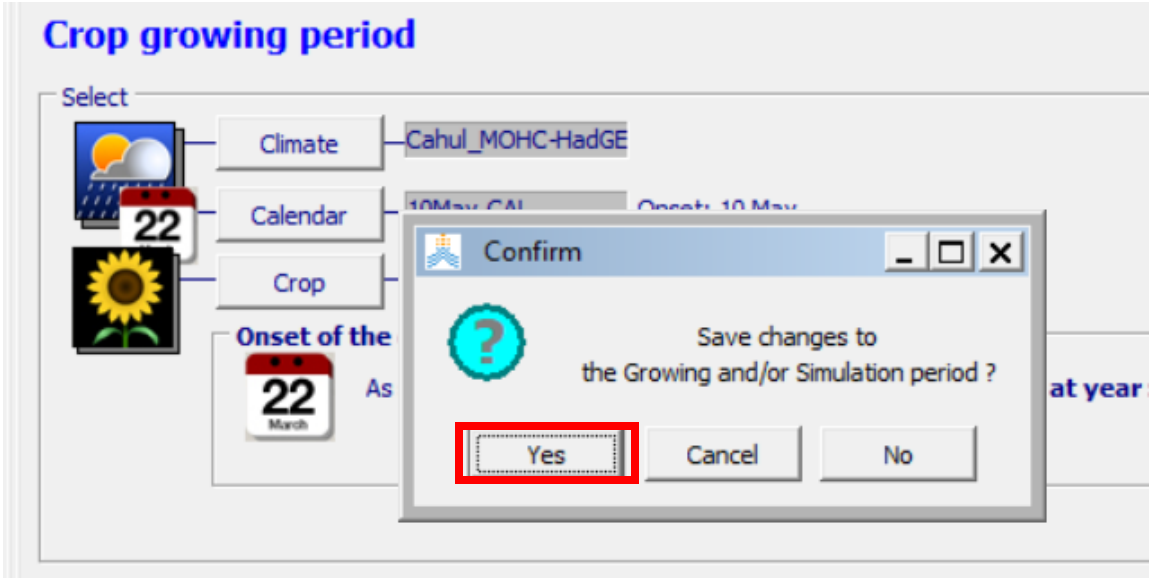
Creation of new project files (.PRM)

7. Press “Accept changes” button

8. Click on “Project Characteristics” to go back on the main project page

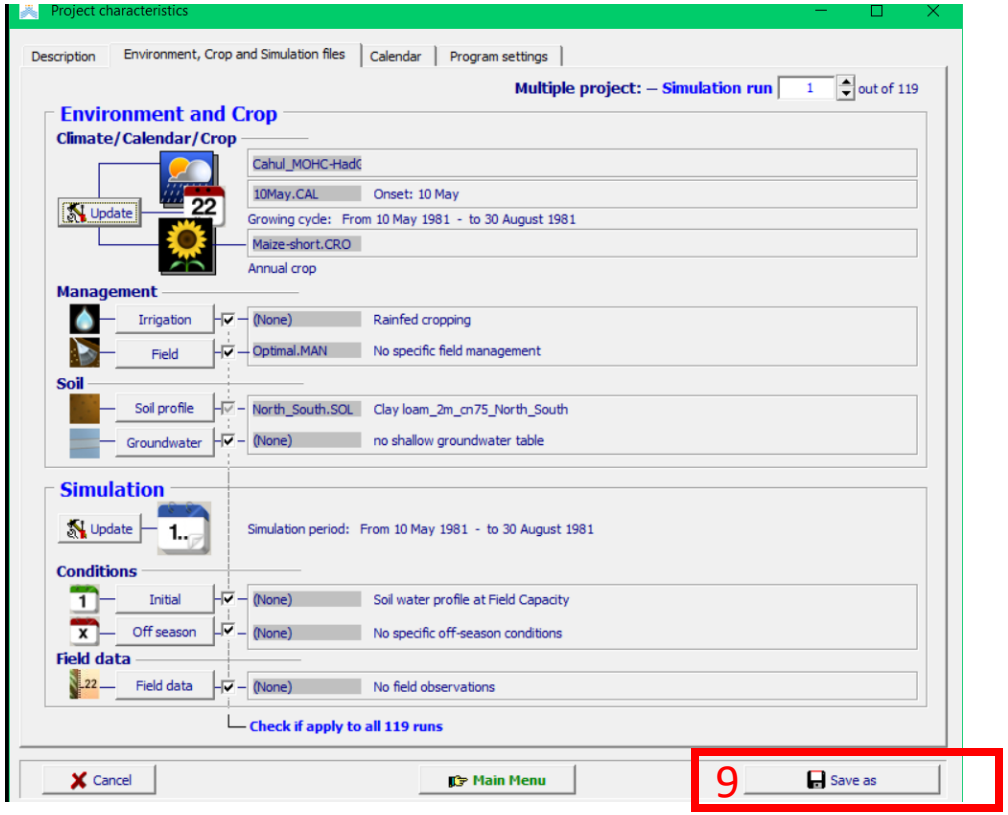
9. Select "Yes"

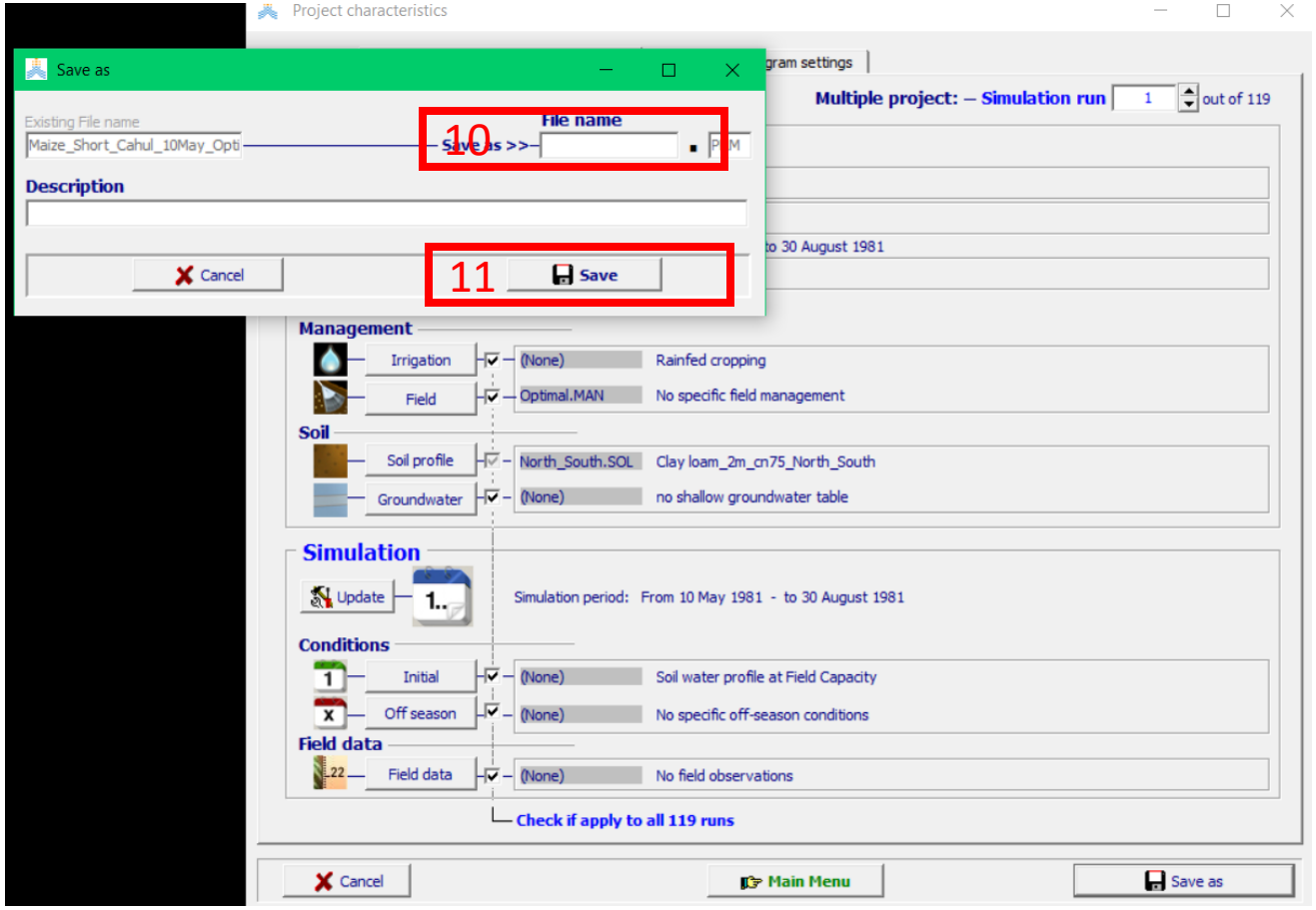




Creation of new project files (.PRM)

9. Press “Save as” button
10. Fill the “File name” with: Maize_Standard_Cahul_10May_Optimal_85_MOHC
11. Press the “Save” button





Creation of new project files (.PRM)

Variables scheme

Maize_Standard_Cahul_10May_Optimal_26_MOHC [X]

Maize_Standard_Cahul_10May_Optimal_85_MOHC [X]

Maize_Improved_Cahul_10May_Optimal_26_MOHC [ ] → Step → Change the crop file to Improved (variety)

Maize_Improved_Cahul_10May_Optimal_85_MOHC [ ] → Step → Change the crop file to Improved (variety)

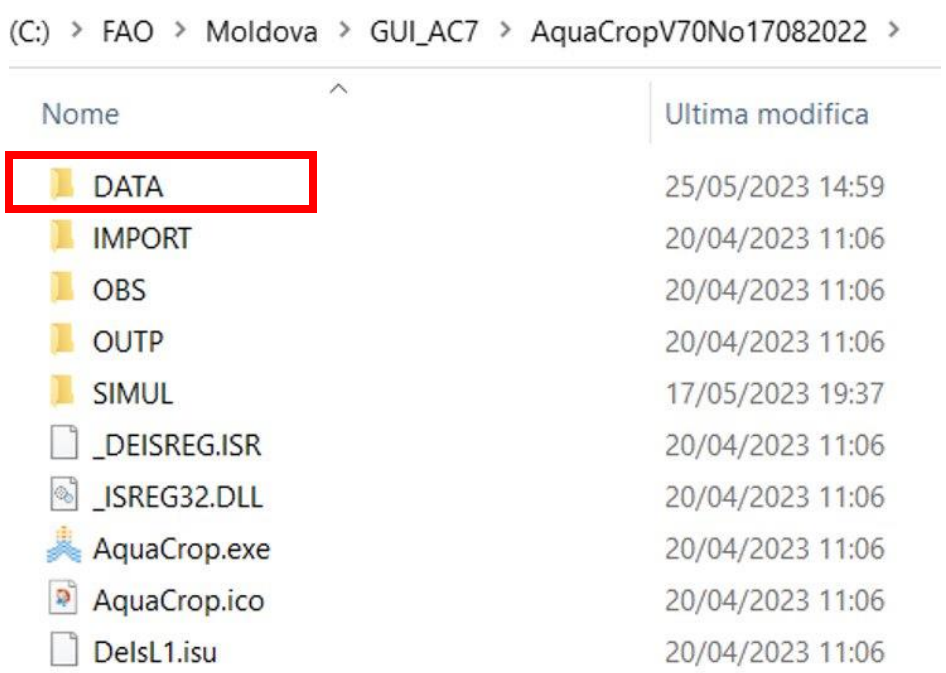
Food and Agriculture Organization of the United Nations

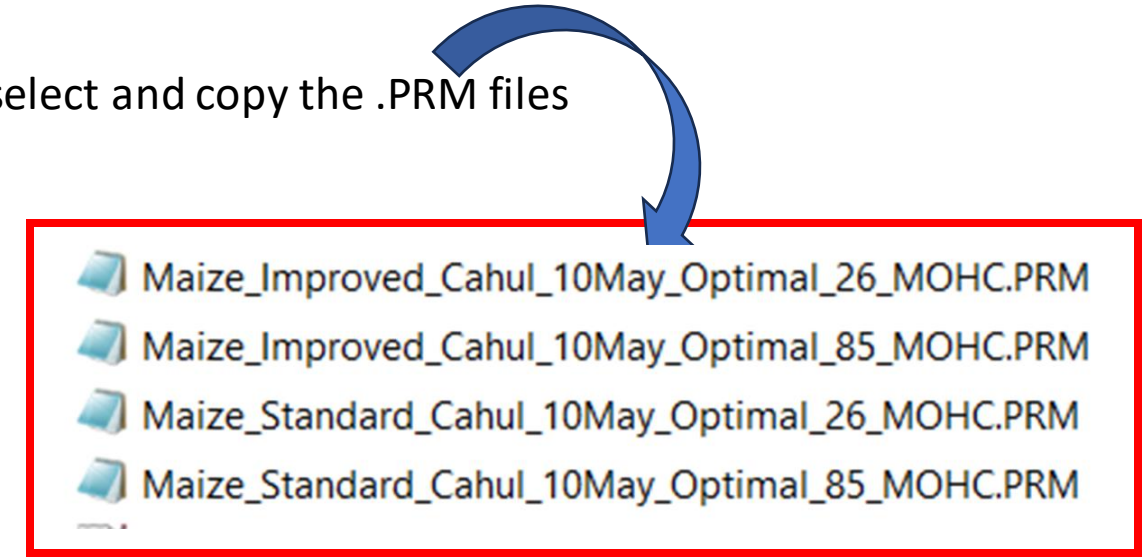
AquaCrop Plugin

June 30, 2023

Plug-in data

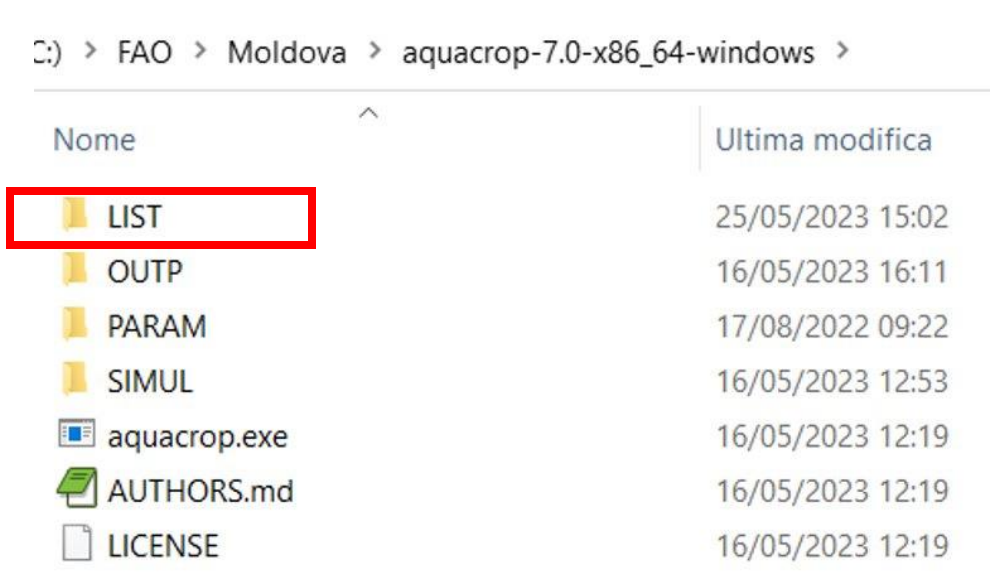
- Go to the DATA folder of "AquaCrop standard" - select and copy the .PRM files

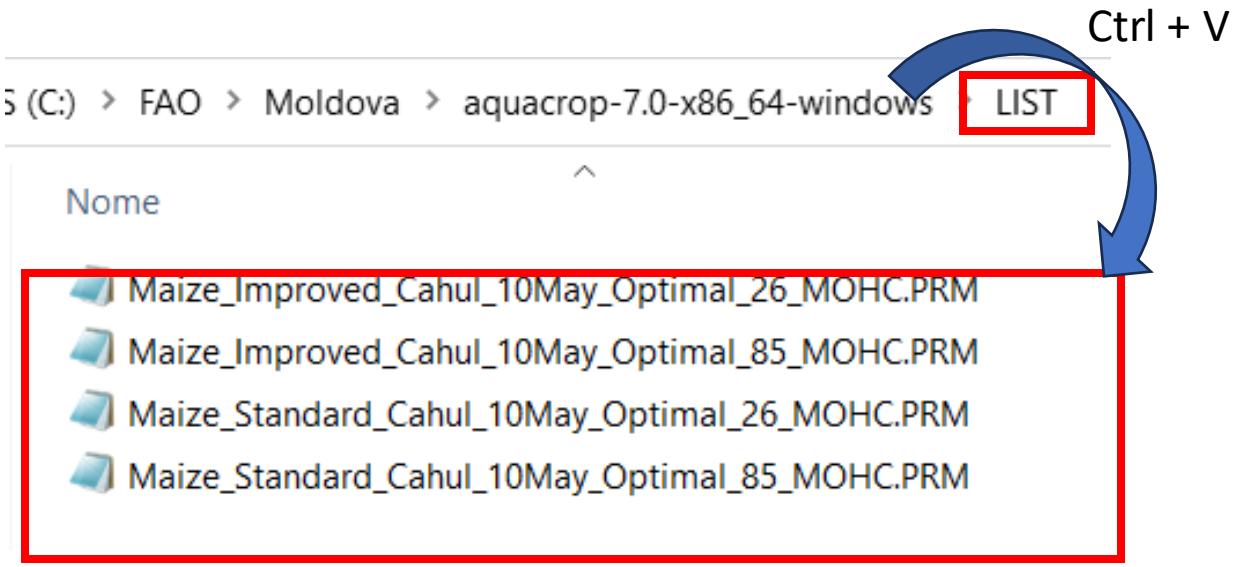




Plug-in data

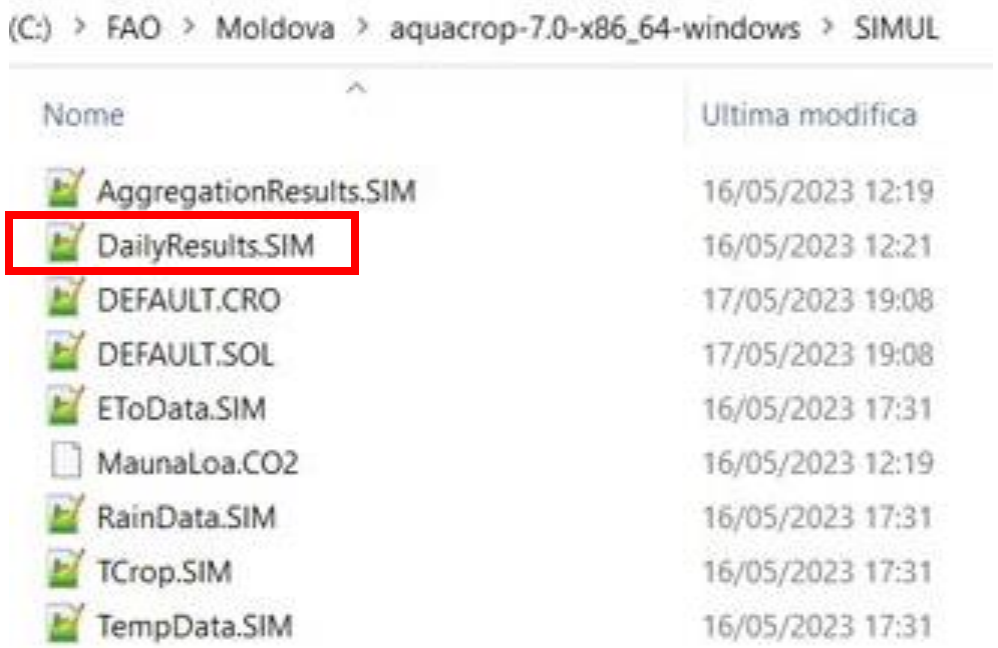
- Paste the .PRM files into the LIST folder of the Plug-in





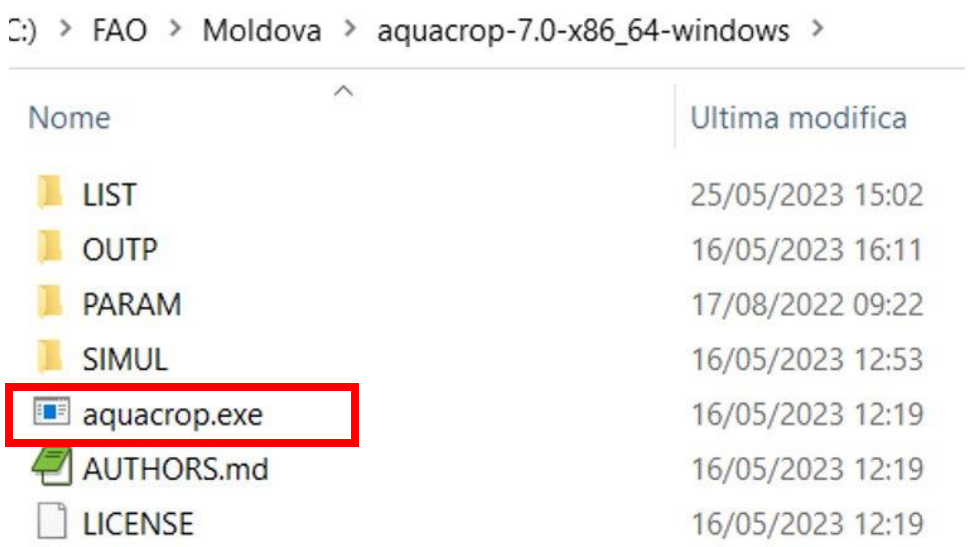
Plug-in

- *To run the plugin the text file DailyResults.SIM is needed to be in the “SIMUL” folder of the plugin. You can find it Here



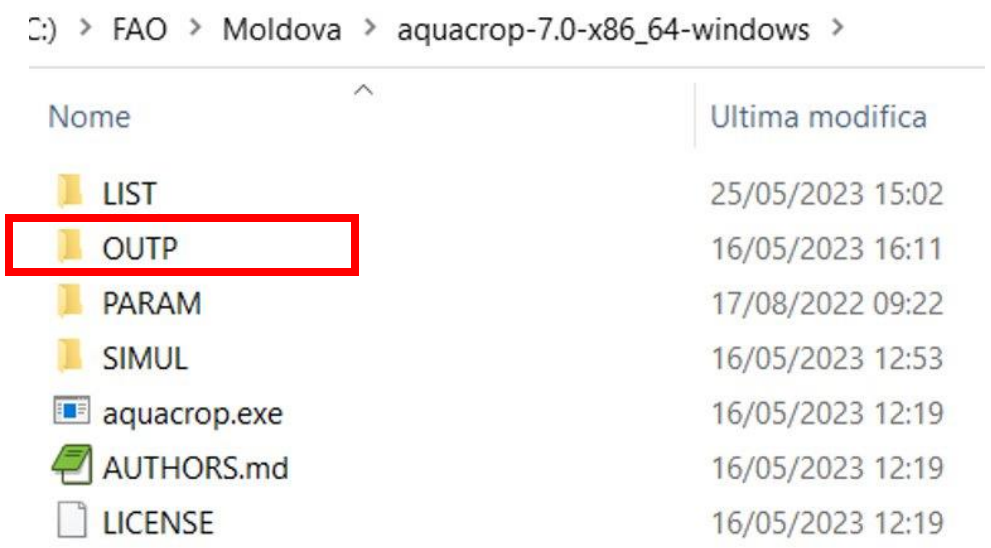
Plug-in

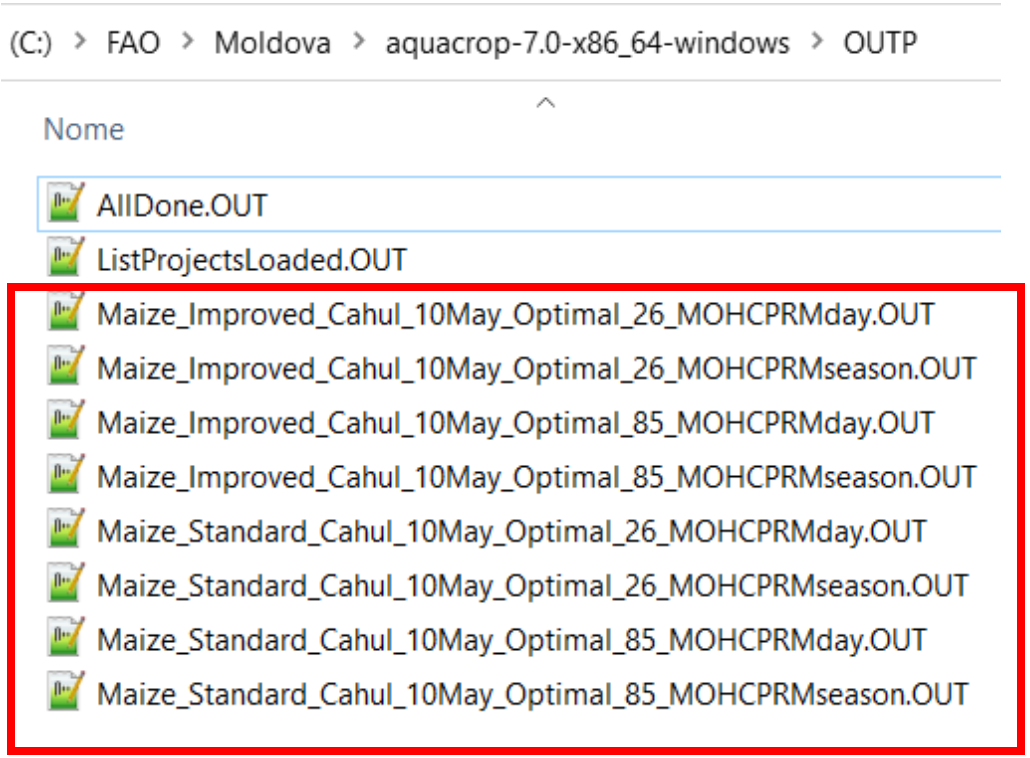
- Run the plug-in by double-clicking on aquacrop.exe (for 4 project files it will take approximately 3 minutes)



Plug-in

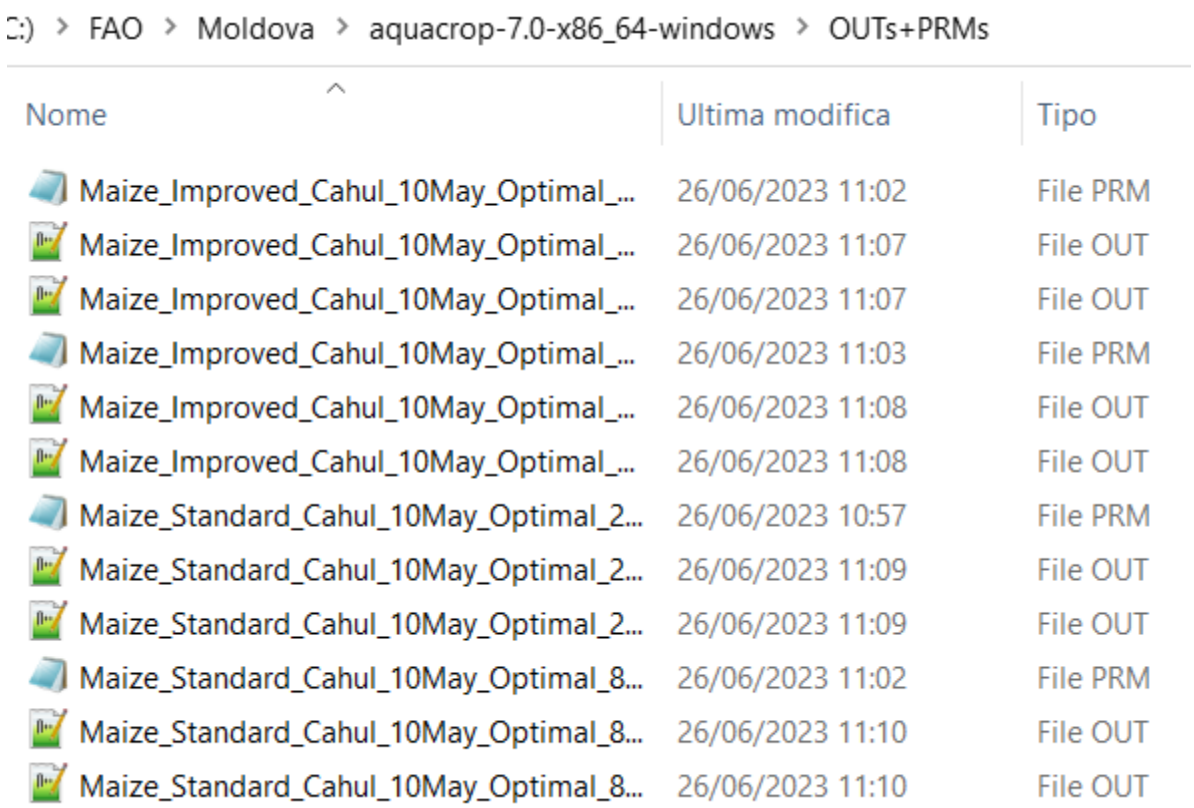
- After the plug-in worked, you will find the .OUT files (daily and seasonal) in the OUTP folder





Plug-in

Create a new folder and copy and paste the PRMs and OUTs data.



Here you can find the the PRMs and OUTs files ready to be uploaded on AquaCrop Plotter.

Here is the link to the AquaCrop plotter platform.

Thank you!

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