



**Food and Agriculture  
Organization of the  
United Nations**



## **Crop Module 3**

### **Creating crop files**

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## **Day 1**

- How do crop models work?
- AquaCrop interface
- AquaCrop: climate and crop modules (AquaCrop modules 1 and 2)

## **Day 2**

- AquaCrop: management and soil modules (AquaCrop modules 3 and 4)
- Run simulations and interpret outputs

## **Days 2-3**

- Input requirements
- Create/import climatic files on AquaCrop

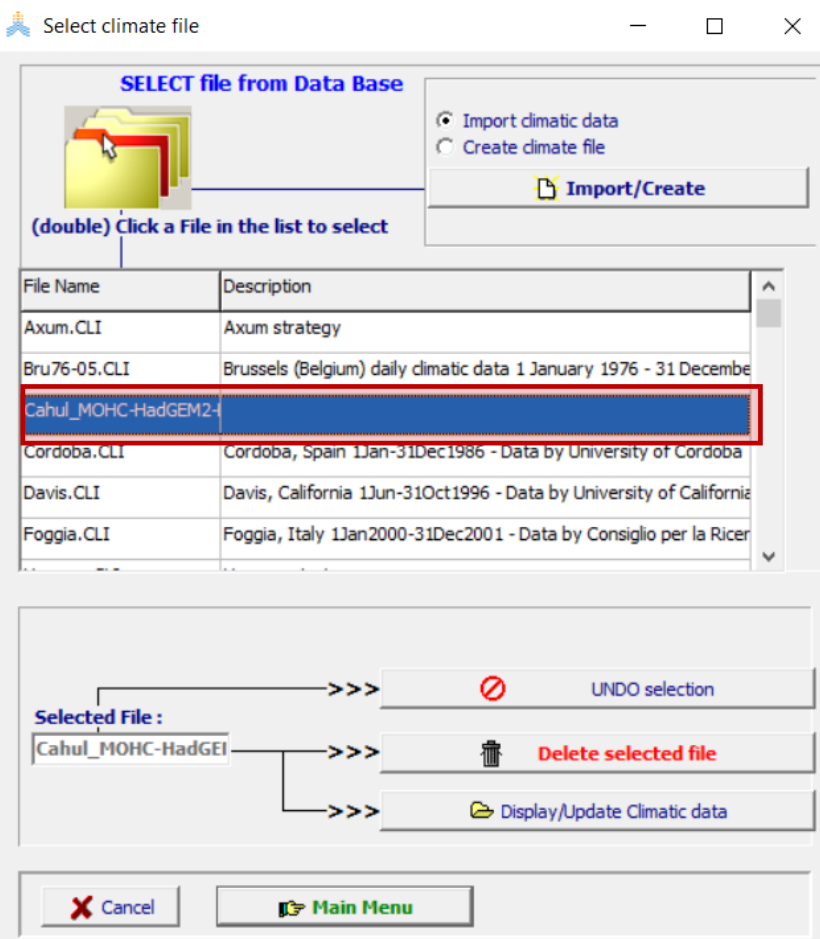
## **Day 3**

- Create a crop file
- Run simulations for maize in Moldova (Cahul)

# Create a crop file: maize

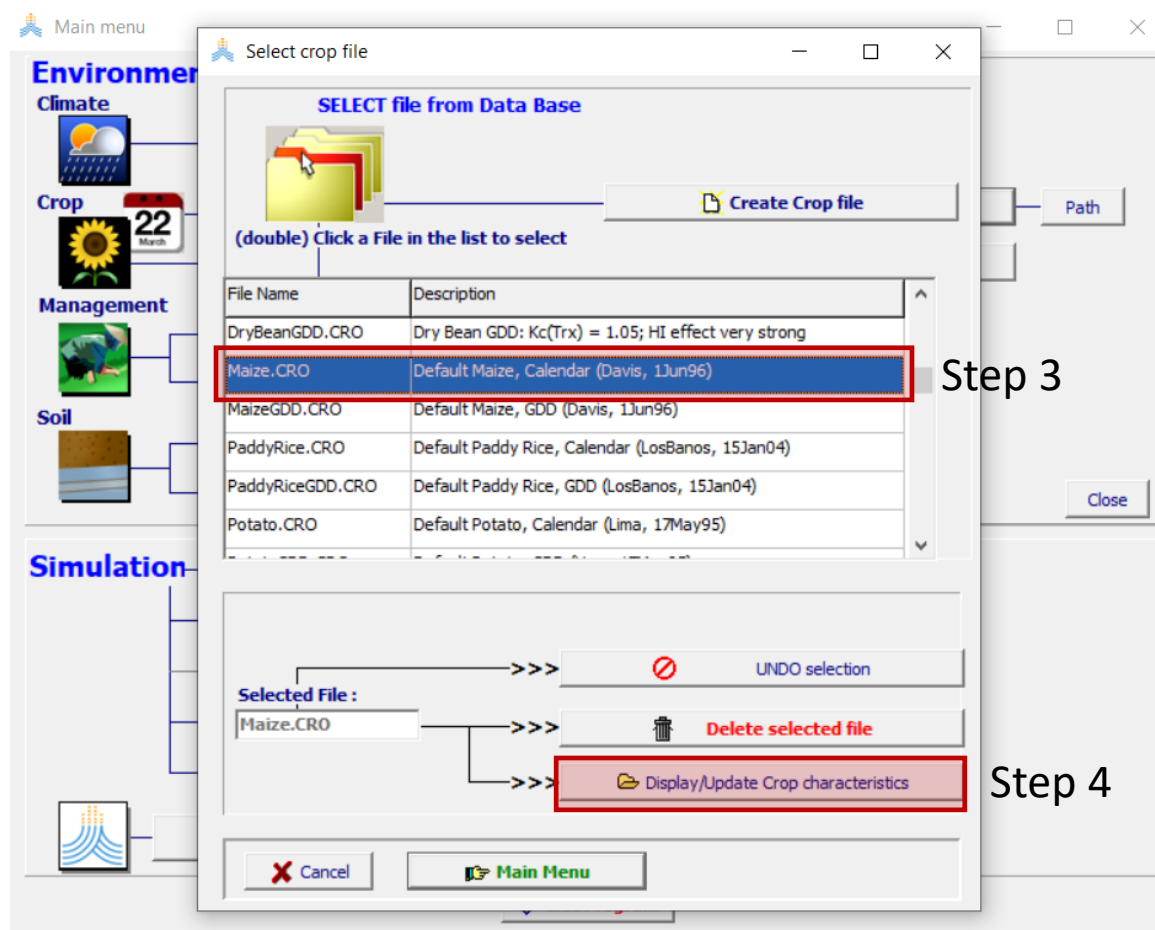
**Step 1.** Open **AquaCrop**

**Step 2.** Open the climatic file **Cahul\_MOHC-HadGEM2-ES\_rcp26**



**Step 3.** Open the default file **Maize.CRO**

**Step 4.** Click on **Display/Update Crop Characteristics**





# Create a crop file: maize

**Step 1.** Click on **Description** and select **Full Set**

Crop characteristics

Response to stresses

Description Mode Development ET Production Water Temperature Salinity Fertility Calendar

**Display crop parameters**

☐ **Limited set**  
Crop development and production parameters  
(mainly phenology and life cycle length)

☒ **Full set**  
All crop parameters

File description Protected file Type of edit fields (cells)

**Protected file (with default crop parameters)**

to adjust to local conditions

1. Adjust cultivar specific or less conservative parameters (limited set of crop parameters)

2. Use ..... Save as ..... in tool bar to save adjustments

Cancel Program settings Protected file Save as

**Step 2.** Click on **Mode** and select **Calendar days**

Crop characteristics

Response to stresses

Description Mode Development ET Production Water Temperature Salinity Fertility Calendar

**Crop canopy development**

☒ **Calendar days**

☐ **Growing degree-days (GDDay)**  
canopy development adjusted to  
temperature regime of distinctive years

Threshold temperatures  
for crop development

Base temperature: 9.0 °C  
Upper temperature: 30.0 °C

Temperature file: (None)

Assumed conditions in growing cycle  
Tmin: 12.0 °C Tmax: 28.0 °C GDD = 11.0 °C day

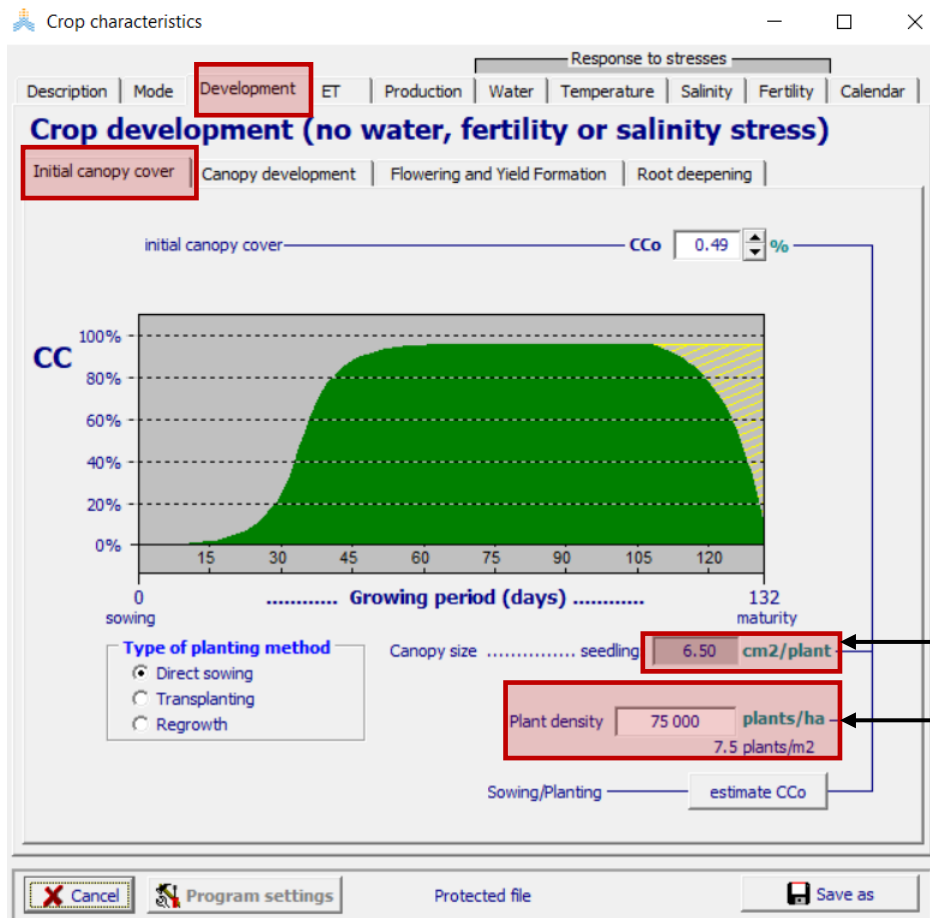
Number of distinctive years:  
only 1 year

GDDays variation in years

Cancel Program settings Main Menu Save as

# Create a crop file: development

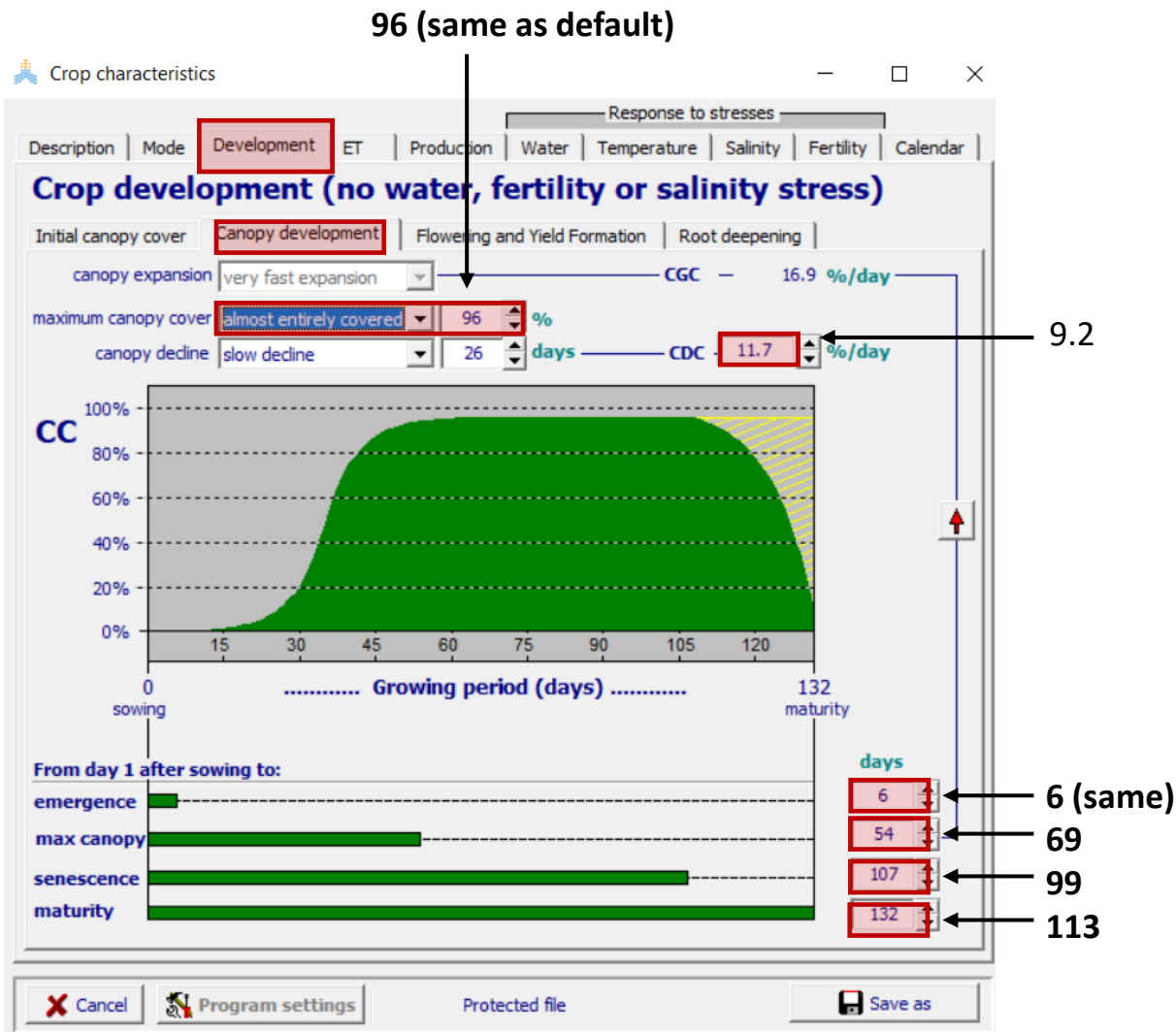
**Step 1.** Click on **Development** and modify the following **Initial canopy cover** parameters:



6.5 (same)

55,000

**Step 2.** Click on **Canopy Development** and modify the following parameters:



96 (same as default)

9.2

6 (same)

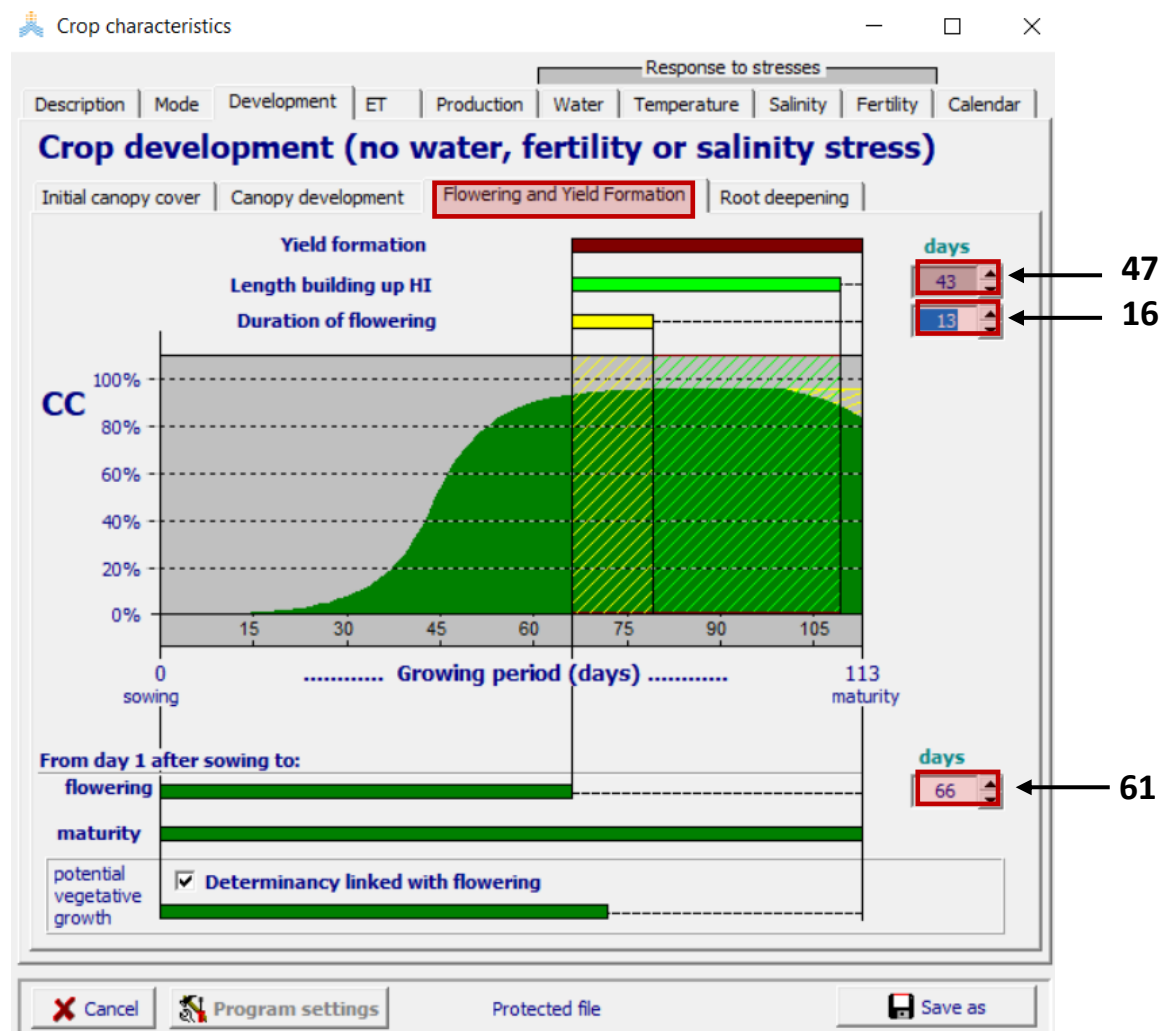
69

99

113

## Create a crop file: flowering & yield formation

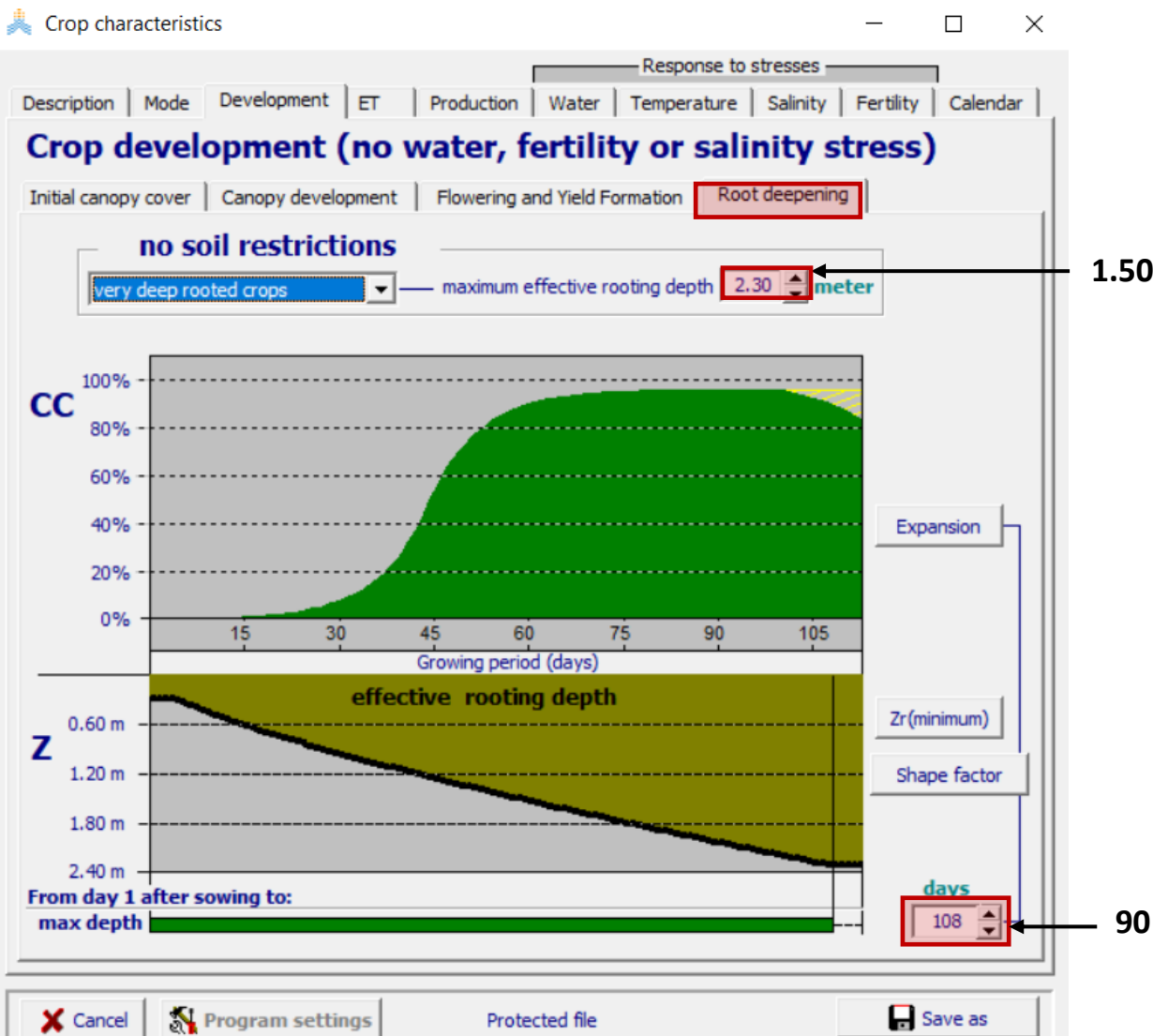
**Step 1.** Click on **Flowering and Yield Formation** and modify the following parameters:





# Create a crop file: root deepening

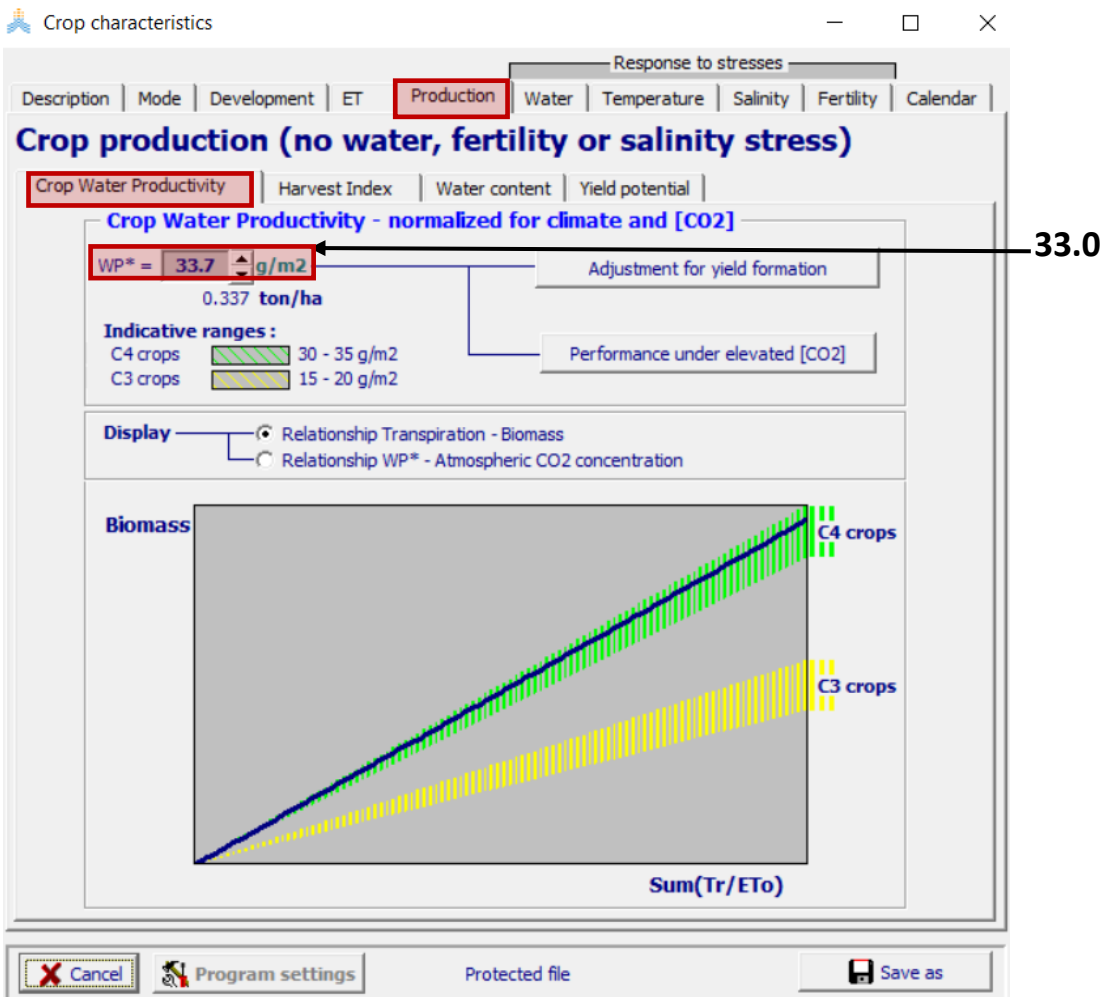
Step 1. Click on **Root Deepening** and modify the following parameters:



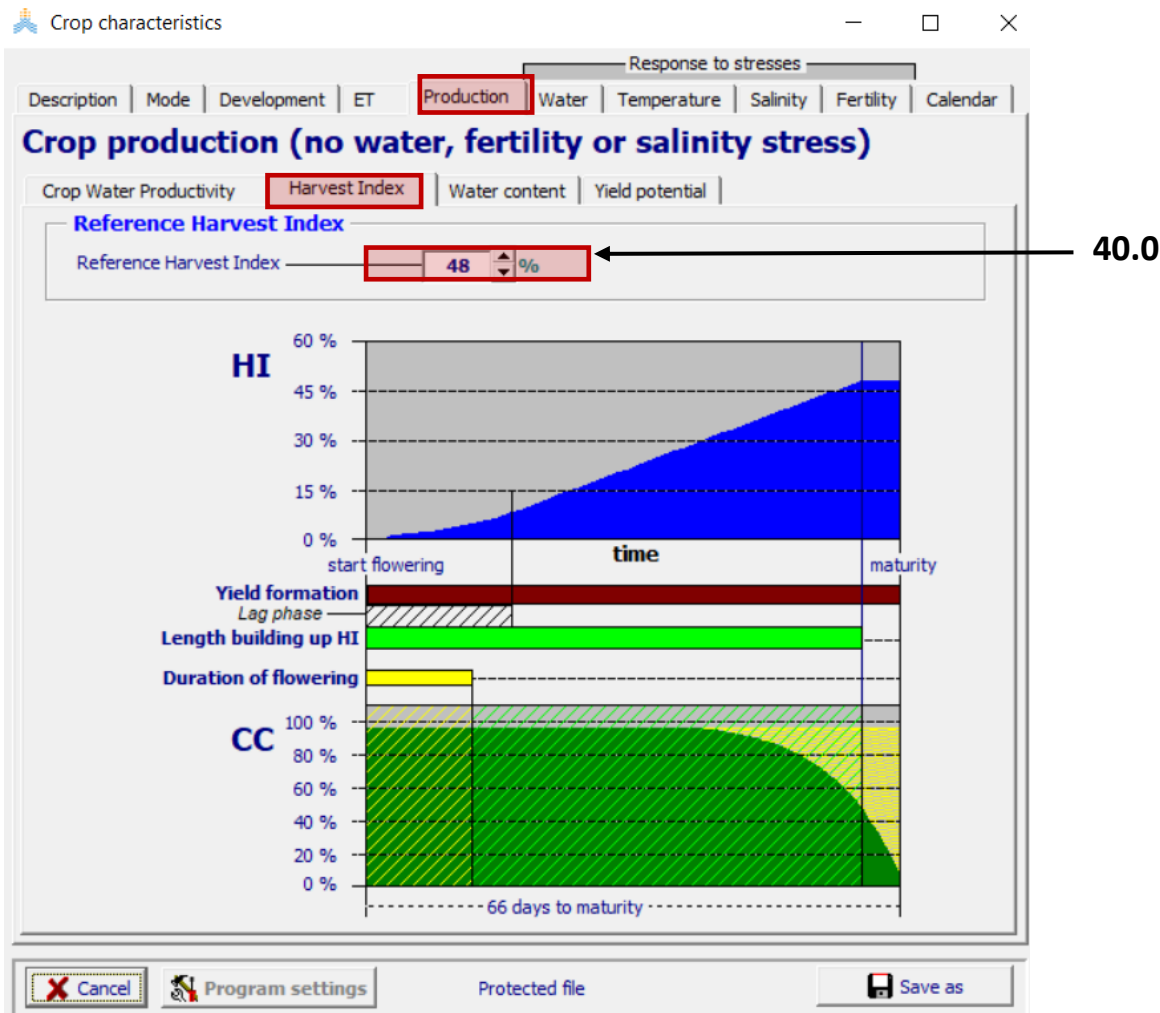


# Create a crop file: production

**Step 1.** Click on **Production** and modify the following **Crop Water Productivity** parameters:



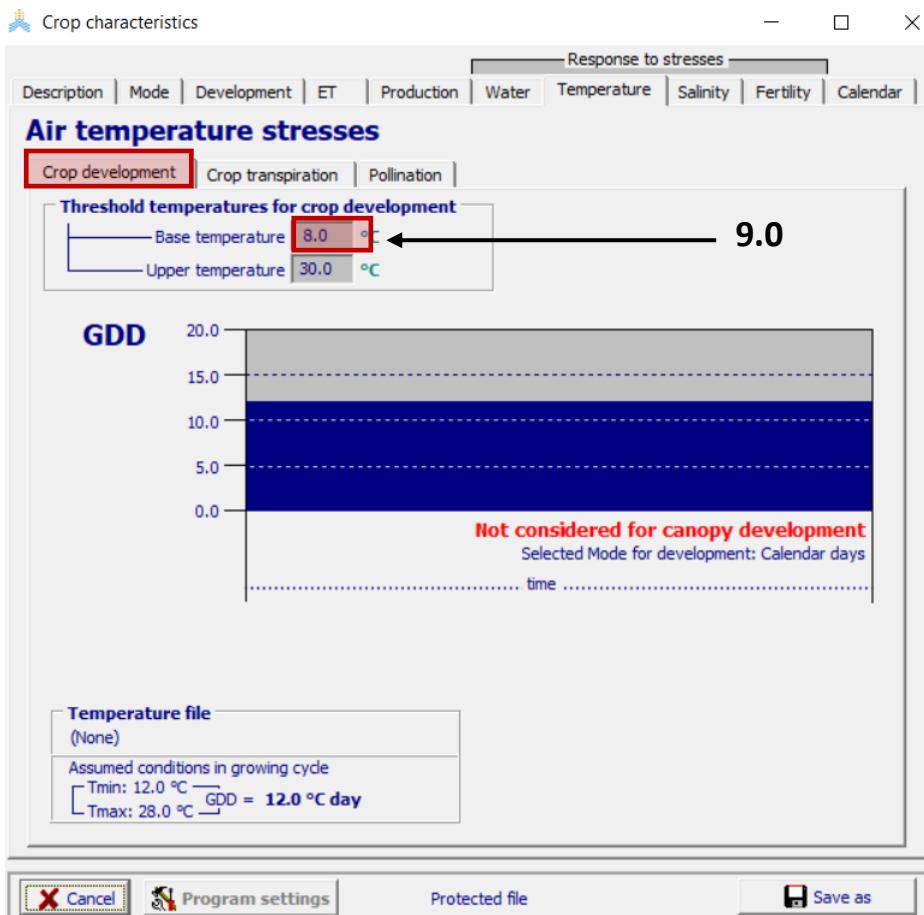
**Step 2.** Click on **Harvest Index** and modify the following **Reference Harvest Index** parameters:



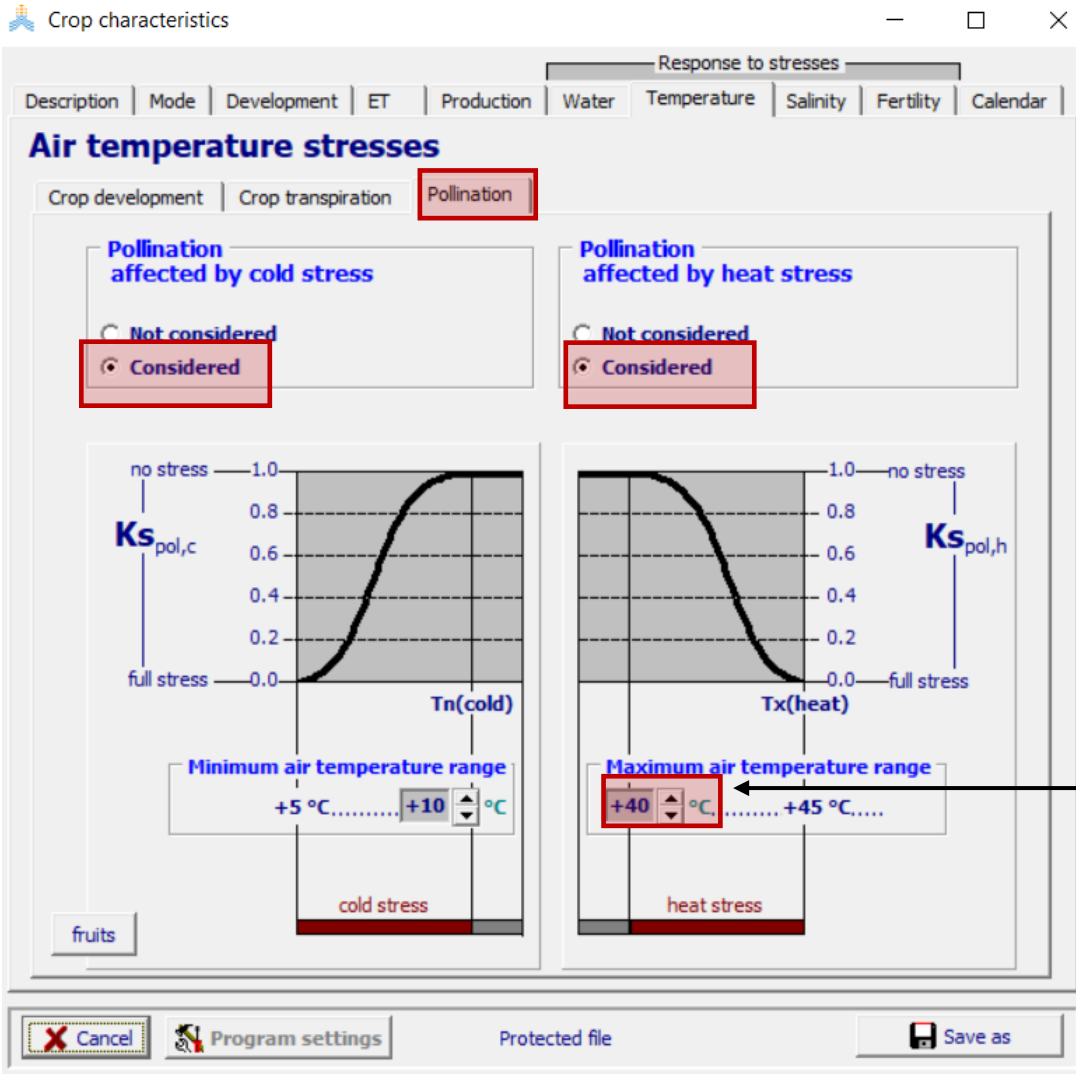


# Create a crop file: air temperature stresses

**Step 1.** Click on **Crop Development** and modify the following **Base temperature** parameters:



**Step 2.** Click on **Pollination**, select **consider** (both for cold/heat-stress) and modify **Max. air temp. range**



# Save the crop file

**Step 1.** Click on **Save as** (bottom of the screen) and enter the following **File name** “**Maize-short**” and in **Description** “**Maize-Cahul**”

Crop characteristics

Response to stresses

Description | Mode | Development | ET | Production | Water | Temperature | Salinity | Fertility | Calendar

### Air temperature stresses

Crop development | Crop transpiration | Pollination

Pollination affected by cold stress

☐ Not considered  
☒ Considered

Pollination affected by heat stress

☐ Not considered  
☒ Considered

Save as

Existing File name: Maize.CRO

File name:

Description: Default Maize, Calendar (Davis, 1Jun96)

Cancel Save

Minimum air temperature range: +5 °C ..... +10 °C

Maximum air temperature range: +40 °C ..... +45 °C

cold stress

heat stress

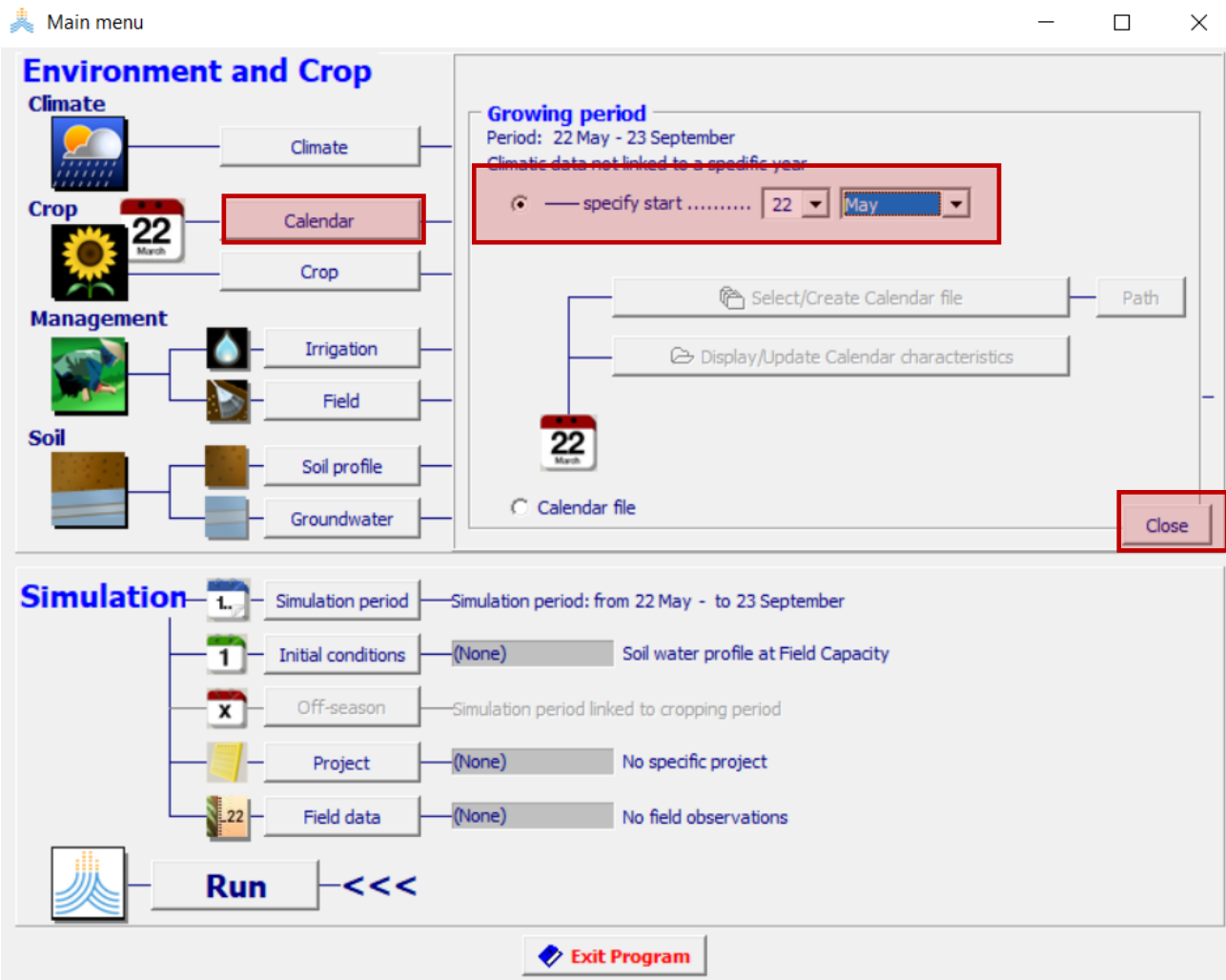
fruits

Cancel Program settings Protected file Save as



# Crop Calendar: sowing date

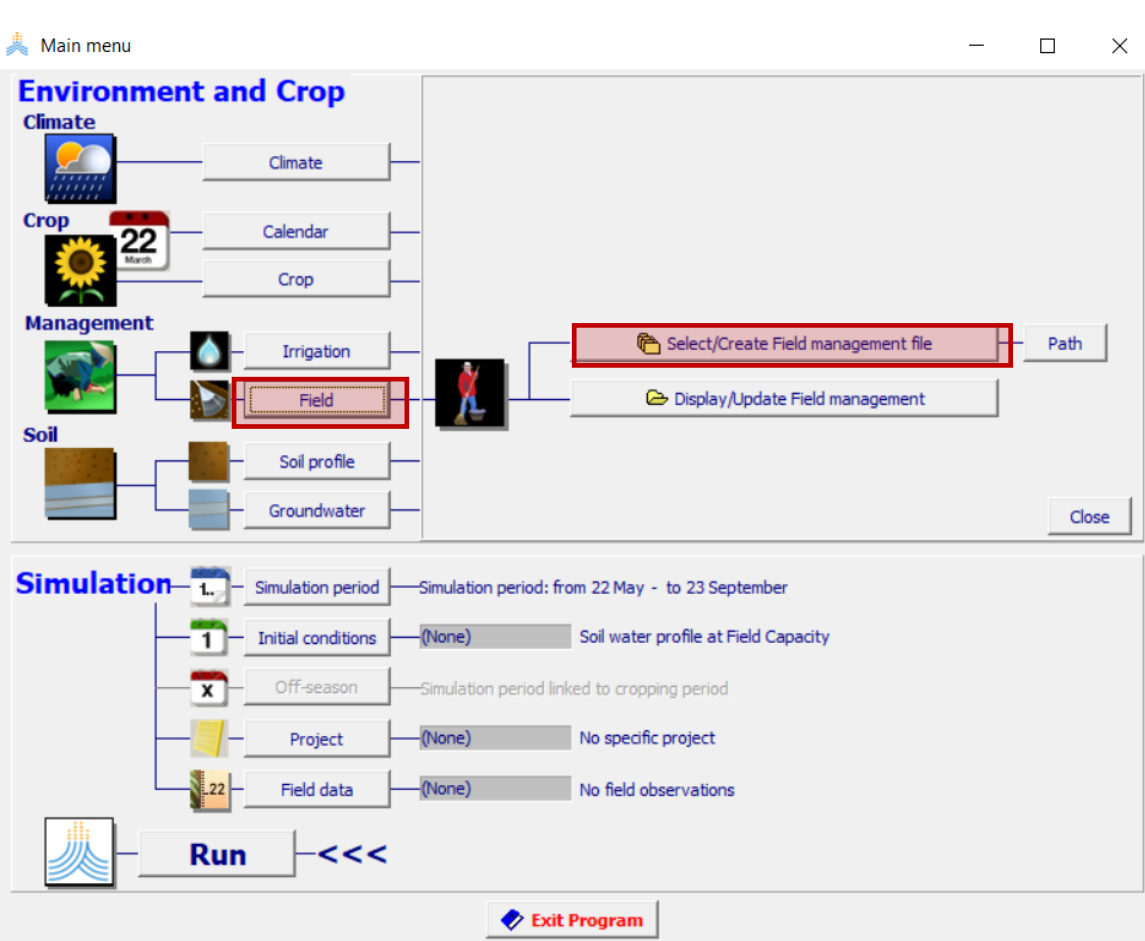
**Step 1.** Click on **Calendar**, specify the sowing date “**22nd May**” and click on **Close**



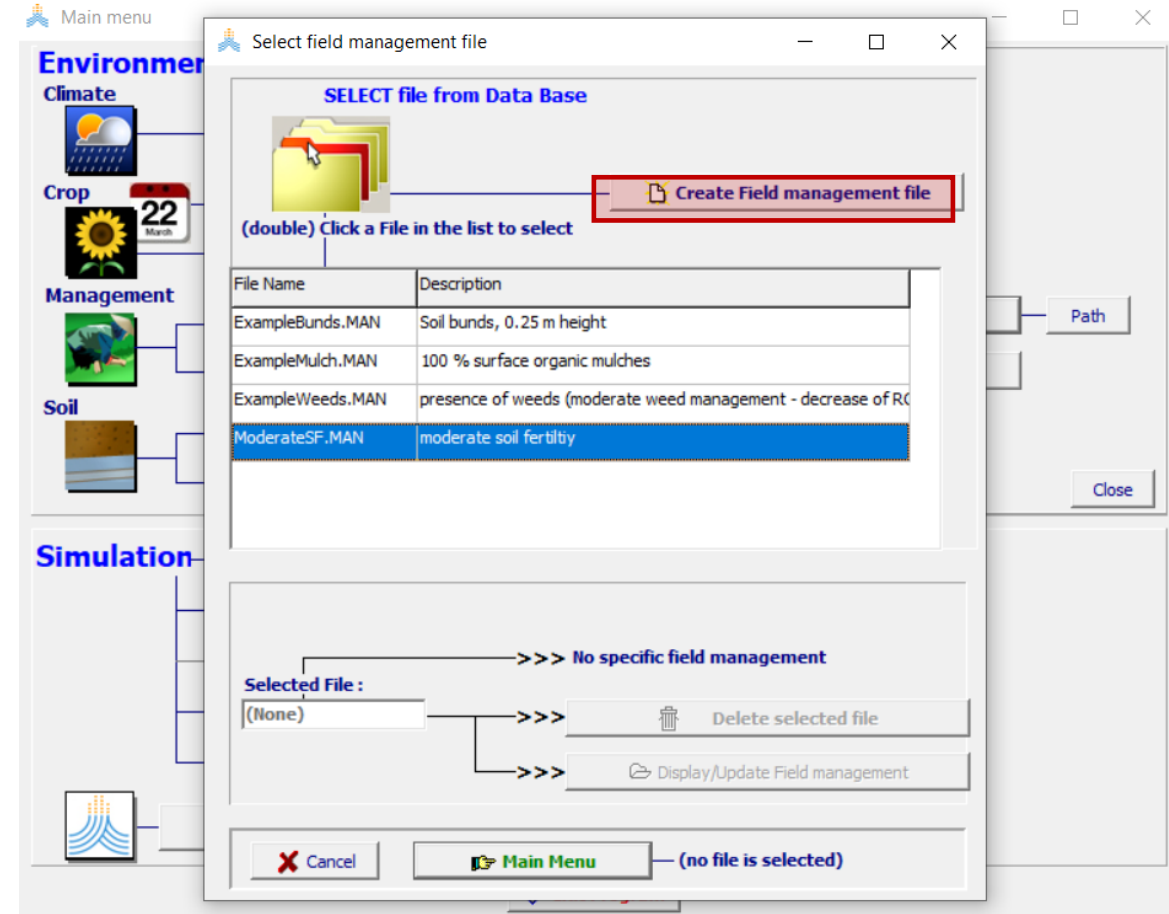


# Create a Field management file

**Step 1.** Click on **Field** and then **Select/Create Field Management file**

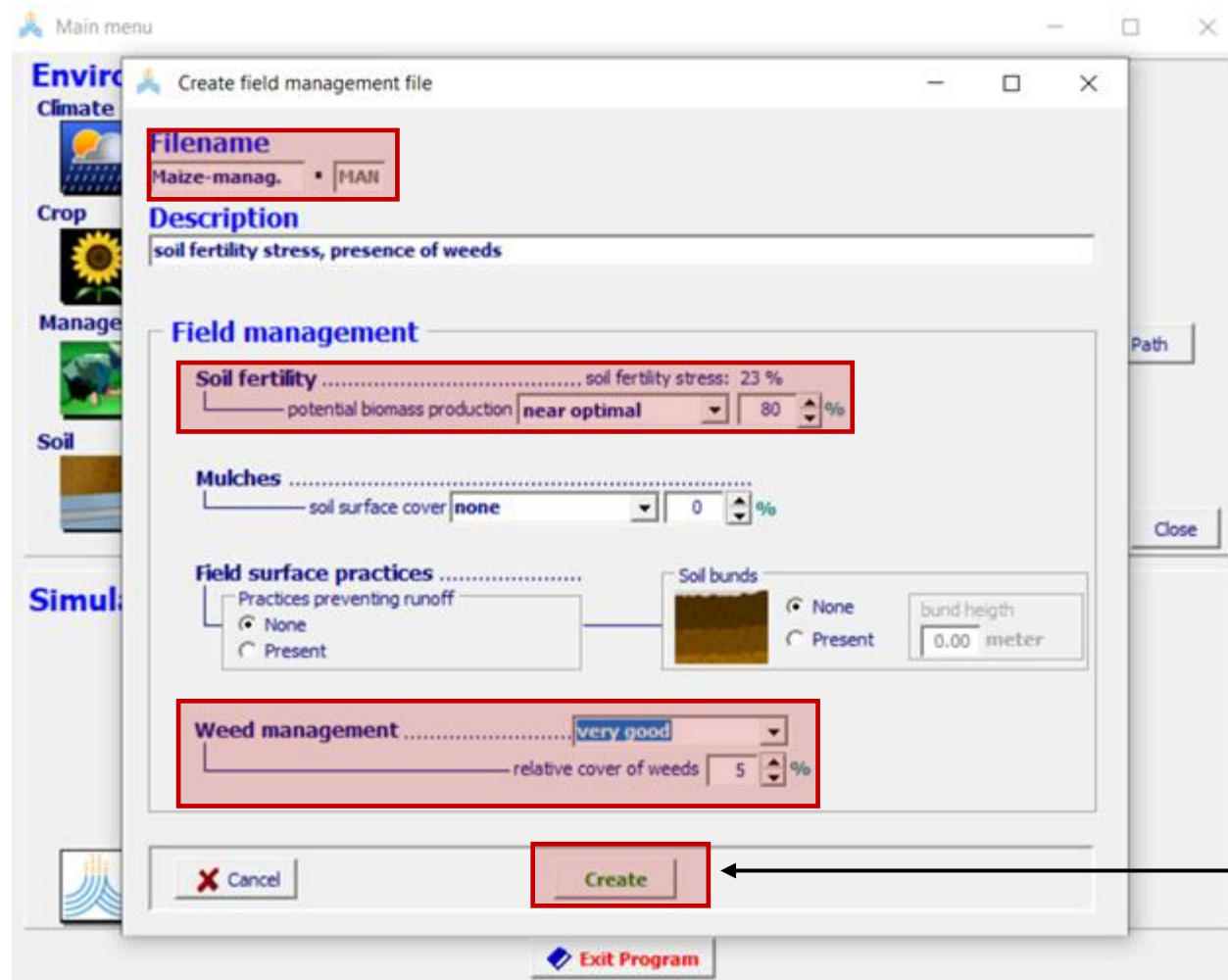


**Step 2.** Click on **Create Field Management file**



# Create a field management file

**Step 1.** Name the file **“Maize-manag.”** and change the **soil fertility conditions** to **“near optimal (80%)”** and **weed management** to **“very good (5%)”**



Main menu

Enviro

Climate

Crop

Manage

Soil

Simulation

Create field management file

Filename  
Maize-manag. MAN

Description  
soil fertility stress, presence of weeds

Field management

Soil fertility ..... soil fertility stress: 23 %  
potential biomass production near optimal 80 %

Mulches .....  
soil surface cover none 0 %

Field surface practices .....  
Practices preventing runoff  
☒ None  
☐ Present

Soil bunds  
☒ None  
☐ Present  
bund height 0.00 meter

Weed management ..... very good  
relative cover of weeds 5 %

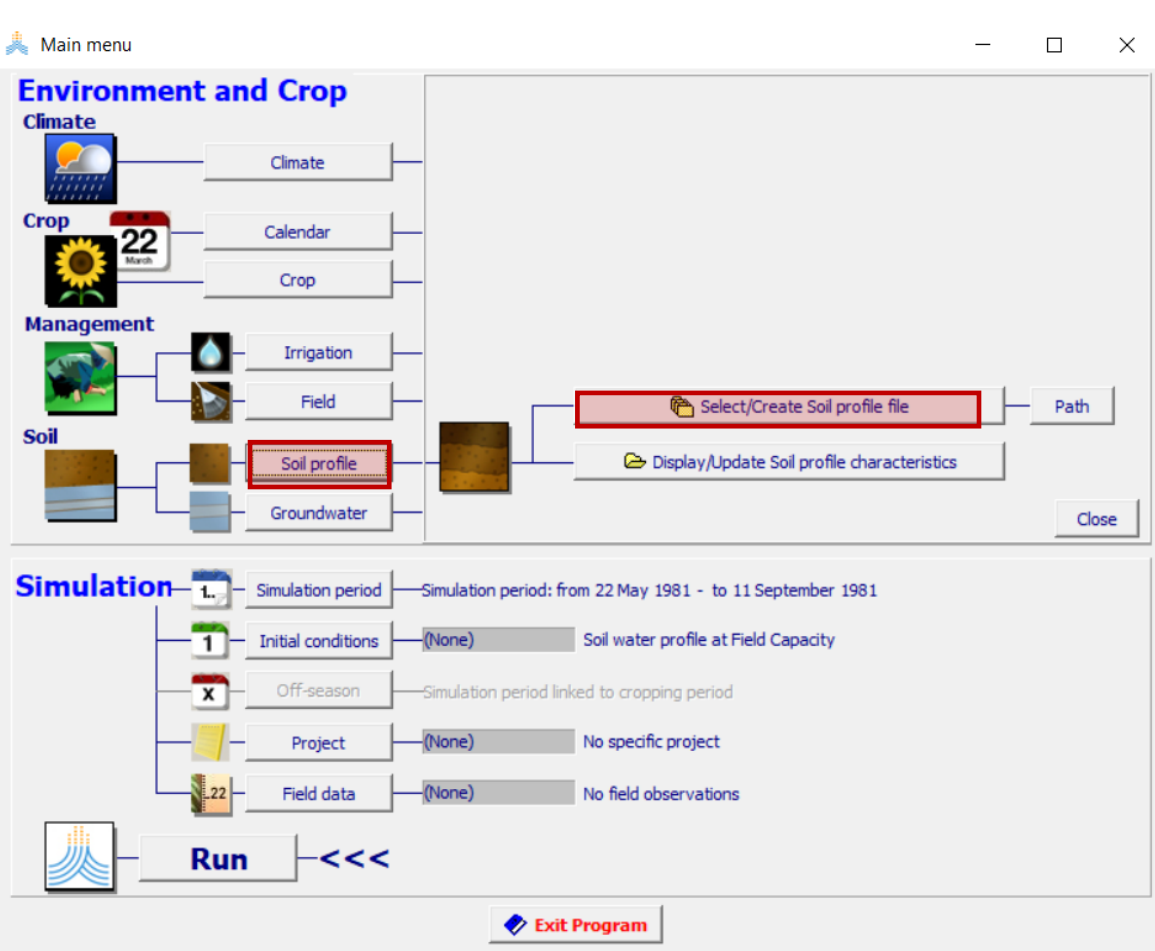
Cancel Create

Exit Program

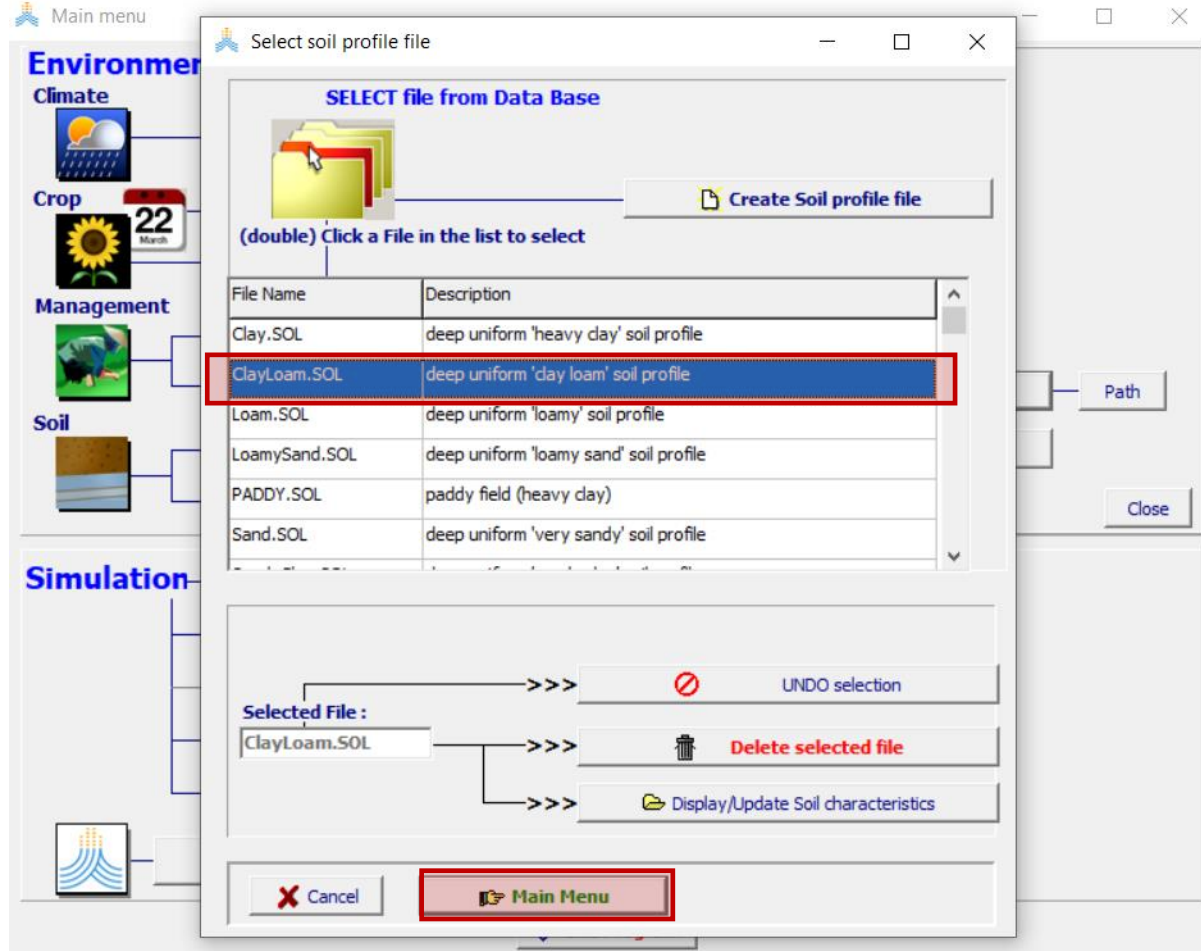
**Step 2.** Click on **Create**

# Soil: upload a soil file for Cahul

**Step 1.** Click on **Soil profile** and on **Select/Create Soil profile**



**Step 2.** Click on **Clay-Loam** and on **Main Menu**





# Status: progress made so far

*We now have a climatic file (Cahul), a calendar date (22nd May), a crop file (maize), field management file (close to optimal conditions) and soil profile file (clay-loam)!*

Main menu

Environment and Crop

Climate

Climate

Cahul\_MOHC-HadGE

Crop

Calendar

Period: 22 May 1981 - 11 September 1981

Crop

(None) No calendar for the Seeding/Planting year

Management

Irrigation

(None) Rainfed cropping

Field

Maize-manag..MAN soil fertility stress, presence of weeds

Soil

Soil profile

ClayLoam.SOL deep uniform 'clay loam' soil profile

Groundwater

(None) no shallow groundwater table

Simulation

1. Simulation period

Simulation period: from 22 May 1981 - to 11 September 1981

1 Initial conditions

(None) Soil water profile at Field Capacity

X Off-season

Simulation period linked to cropping period

Project

(None) No specific project

22 Field data

(None) No field observations

Run

<<<

Exit Program





# Select a simulation period

**Step 1.** Click on **Simulation period** and double check that the simulation period is **linked to the growing period**, then click on **Main Menu**

Main menu

### Environment and Crop

**Climate**  
Climate: Cahul\_MOHC-HadGE

**Crop**  
Calendar: (None) Period: 22 May 1981 - 11 September 1981  
No calendar for the Seeding/Planting year  
Crop mode: Maize-short.CRO

**Management**  
Irrigation: (None) Rainfed cropping  
Field: Maize-manag.,MAN soil fertility stress, presence of weeds

**Soil**  
Soil profile: ClayLoam.SOL deep uniform 'clay loam' soil profile  
Groundwater: (None) no shallow groundwater table

### Simulation

1. **Simulation period** Simulation period: from 22 May 1981 - to 11 September 1981

1 Initial conditions (None) Soil water profile at Field Capacity

X Off-season Simulation period linked to cropping period

Project (None) No specific project

Field data (None) No field observations

**Run** <<<

**Exit Program**

Simulation period

Growing cycle  
113 days  
From 22 May 1981 ..... day 1 after sowing  
To 11 September 1981 ..... maturity

**Simulation period**  
113 days

**simulation period:**  
☒ linked to growing period

From 22 May 1981 ... day 1 after sowing  
To 11 September 1981 .. at maturity

Graphical display (time axis)

Crop .....  
Simulation.....  
Climate.....

Available climatic data  
From 1 January 1981  
To 29 December 2099  
File Cahul\_MOHC-HadGEM2-ES\_rcp26.CLI

**Cancel** **Main Menu**



# Run the Simulations

Step 1. Click on **Run** and then click on **START**

Main menu

**Environment and Crop**

**Climate**

Climate: Cahul\_MOHC-HadGE

**Crop**

Calendar: (None) No calendar for the Seeding/Planting year

Crop: Maize-short.CRO

**Management**

Irrigation: (None) Rainfed cropping

Field: Maize-manag..MAN soil fertility stress, presence of weeds

**Soil**

Soil profile: ClayLoam.SOL deep uniform 'clay loam' soil profile

Groundwater: (None) no shallow groundwater table

**Simulation**

Simulation period: Simulation period: from 22 May 1981 - to 11 September 1981

Initial conditions: (None) Soil water profile at Field Capacity

Off-season: Simulation period linked to cropping period

Project: (None) No specific project

Field data: (None) No field observations

**Run** <<<

Exit Program

Simulation run

**START** advance

to end of simulation (11 September 1981)

10 days to 1 June 1981

to date 11 September 1981

**INPUT 22 May 1981**

ETo 4.7 mm/day

Rain 0.0 mm/day

Irrig 0.0 mm/day

water quality 0.00 dS/m

Climate-Crop-Soil water | Rain | Soil water profile | Soil salinity | Climate and Water balance | Production | Environment

10 mm/day

Tr Legend

weeds

crop

Scale

96 %

CC Legend

weeds

crop

time (day)

Dr Legend

Flowering

SAT

FC

PWP

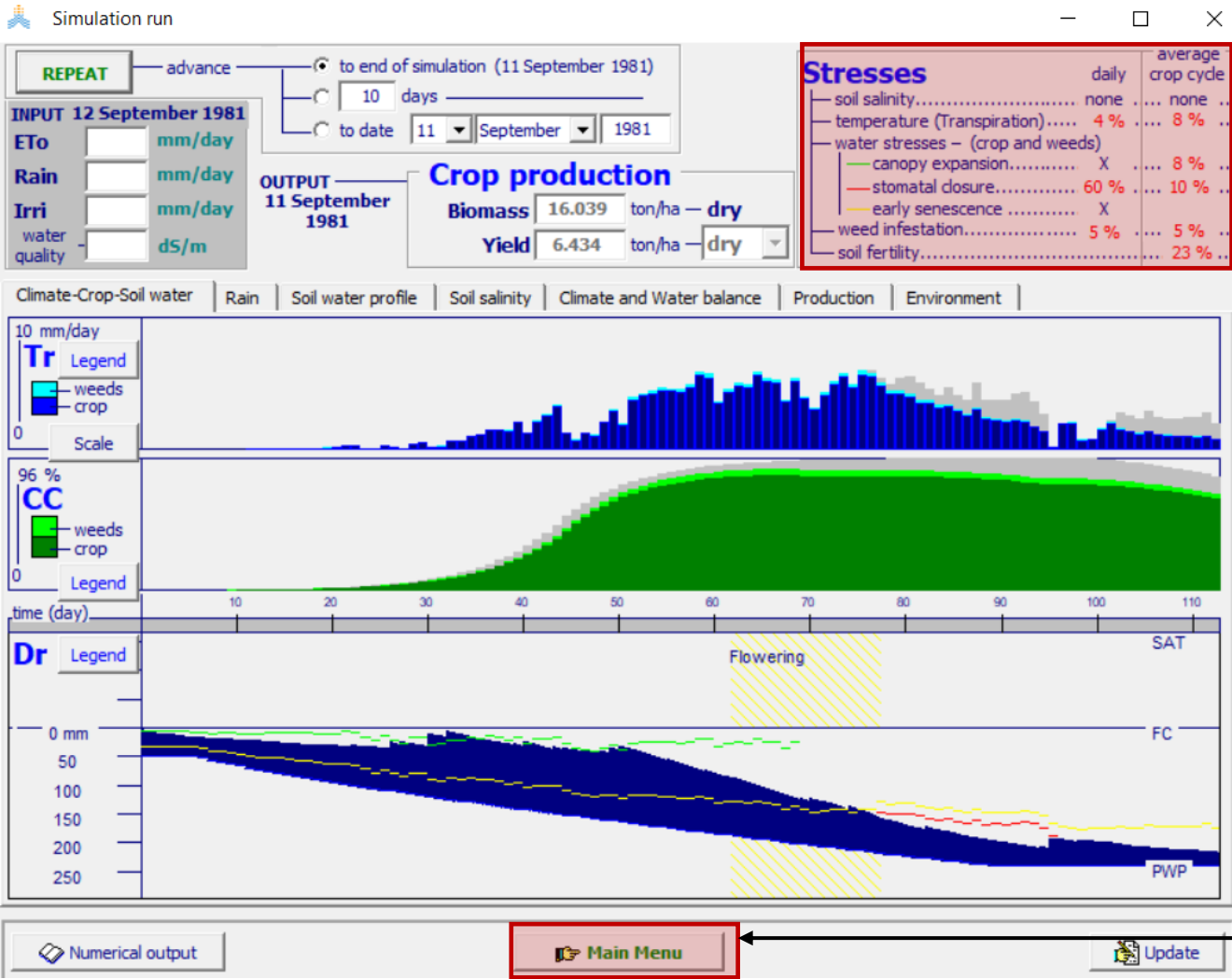
Numerical output

Main Menu

Update

# Results visualization

*In this section, we will look at the yield results emerging for Cahul in 1981, particularly water and temperature stresses*



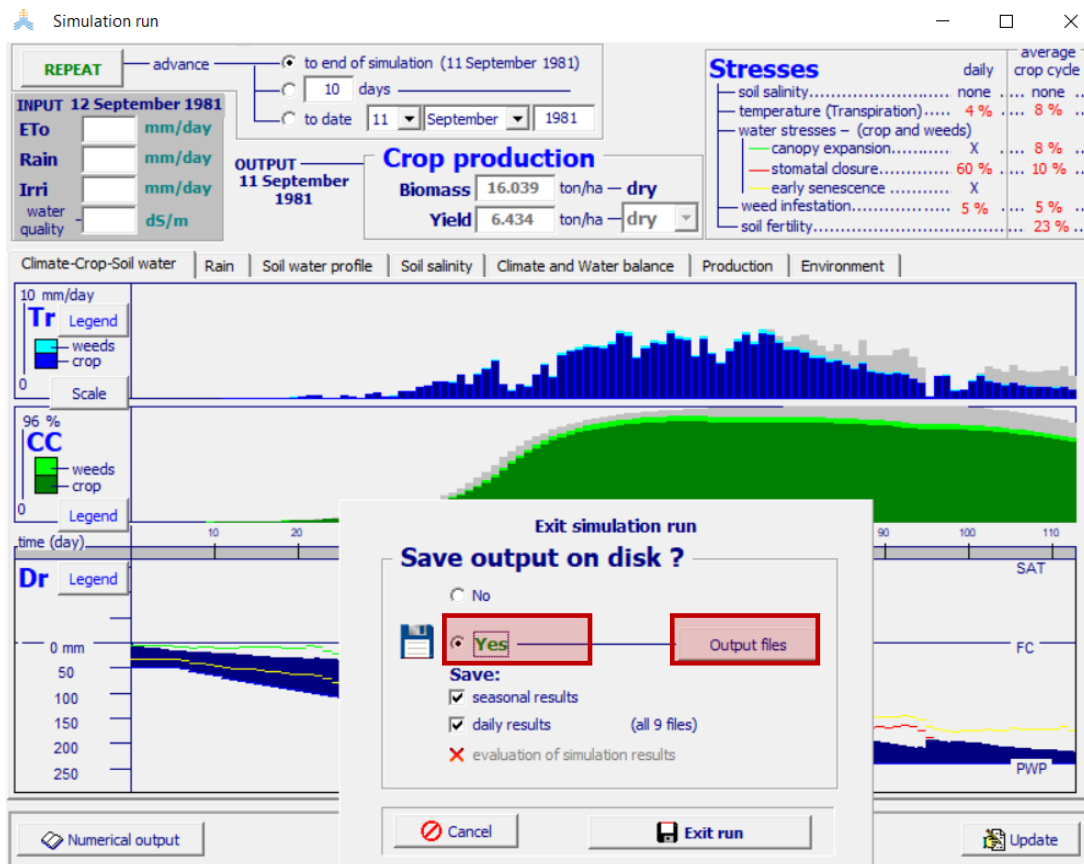
**Step 1.** Click on **Main Menu** to save the results



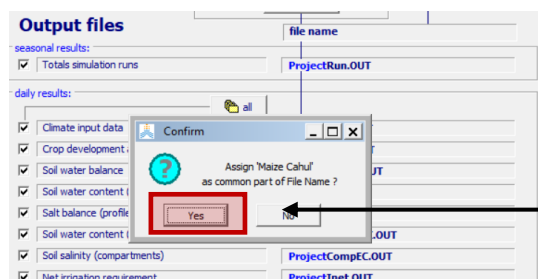
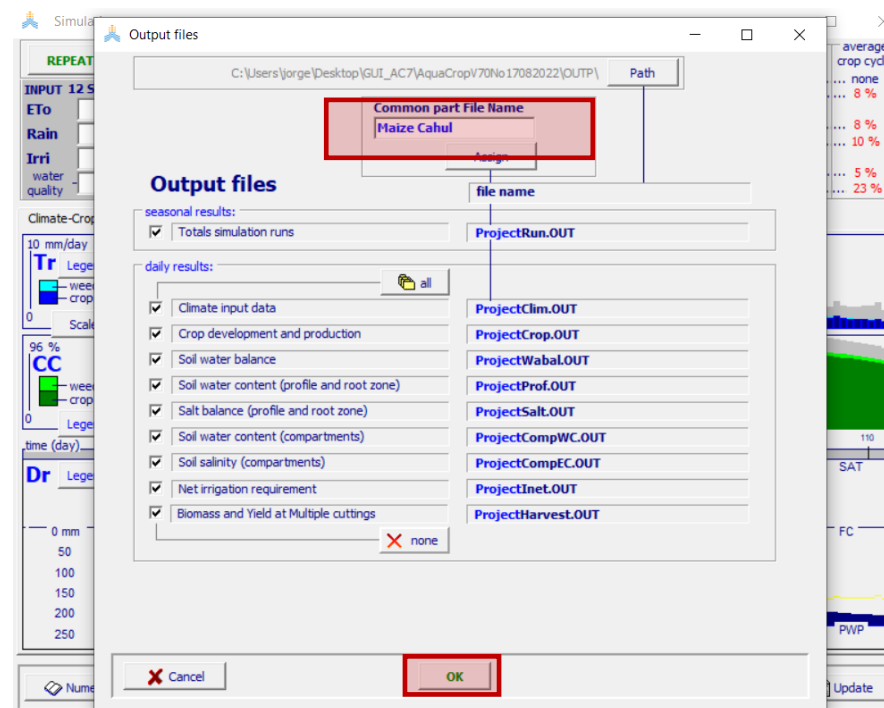
# Save the simulation results

**Step 1.** Click on **Yes** (make sure that seasonal and daily results are ticked).

**Step 2.** Click on **Output files**



**Step 3.** Under **Common part File Name** save the file as **"Maize Cahul"** (make sure that all the output files are ticked) and then click on **OK**



**Step 4.** Click on **Yes**

# Thank you!

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