



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



Crop Module 3

Creating crop files

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(2023)



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 wheta in Pakistan (Badin)

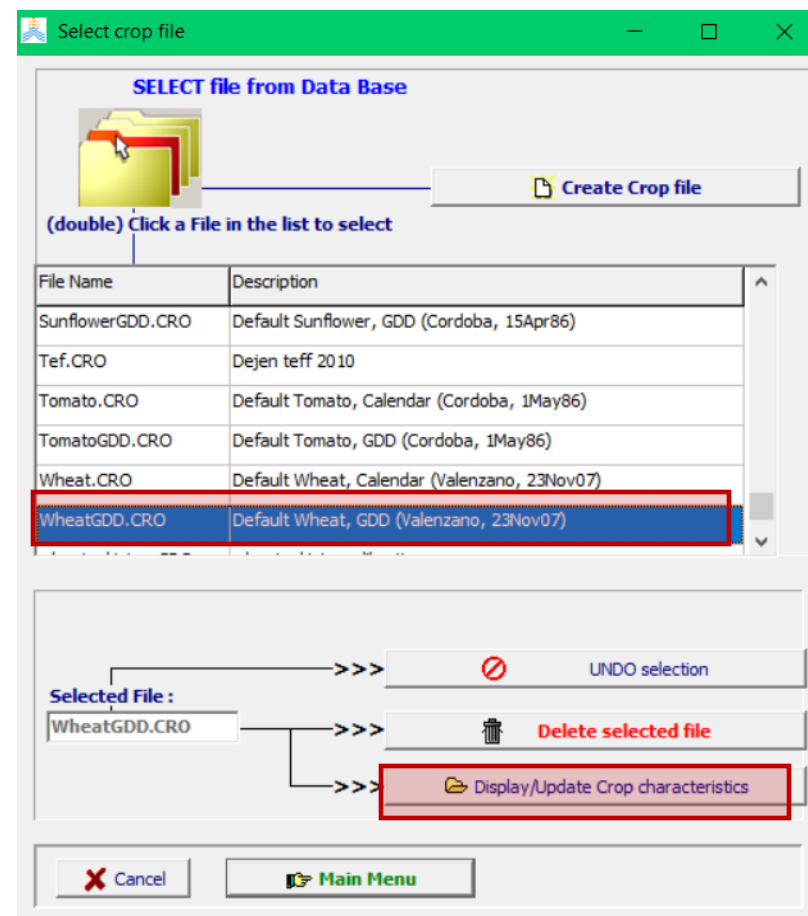
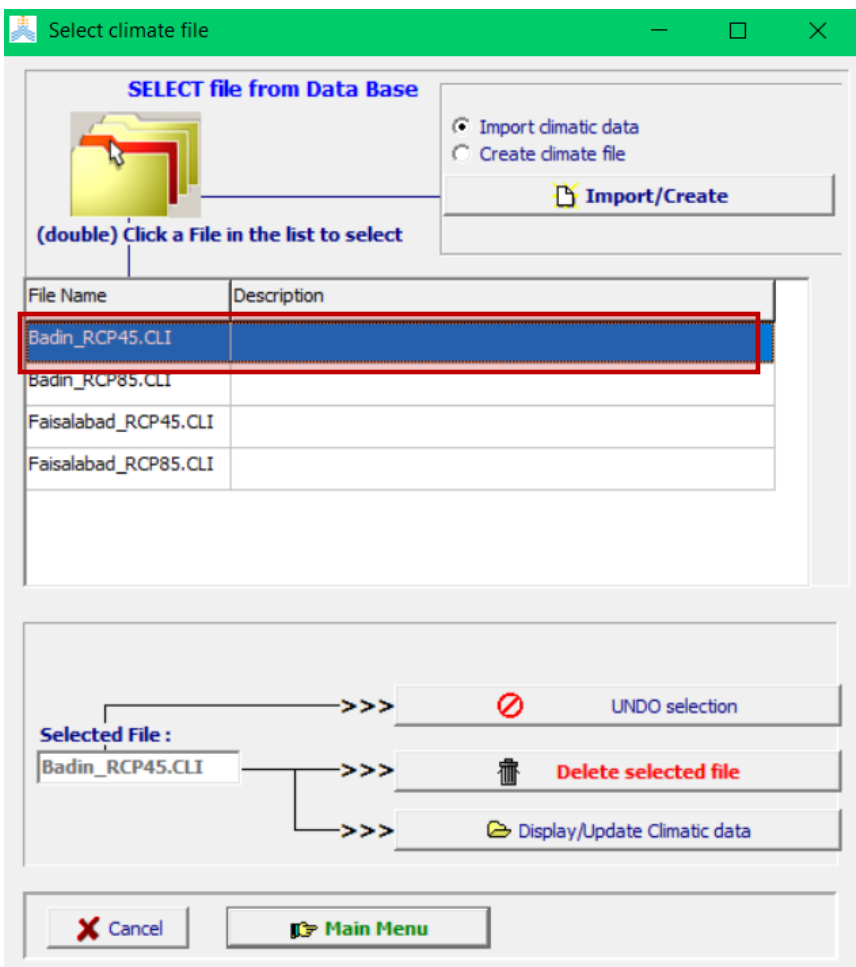
Create a crop file: wheat

Step 1. Open **AquaCrop**

Step 2. Open the climatic file **Badin_RCP45**

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

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



Step 3

Step 4



Create a crop file: wheat

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 **Growing degree-days (GDDay)**

Crop characteristics

Description | **Mode** | Development | Production | Fertility stress | Calendar

Crop canopy development

in ☐ Calendar days

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

Threshold temperatures
for crop development

Base temperature: 0.0 °C
Upper temperature: 26.0 °C

Temperature file: 1-4Badin).txt.Tnx

From: 1 January 2010
To : 31 December 2099

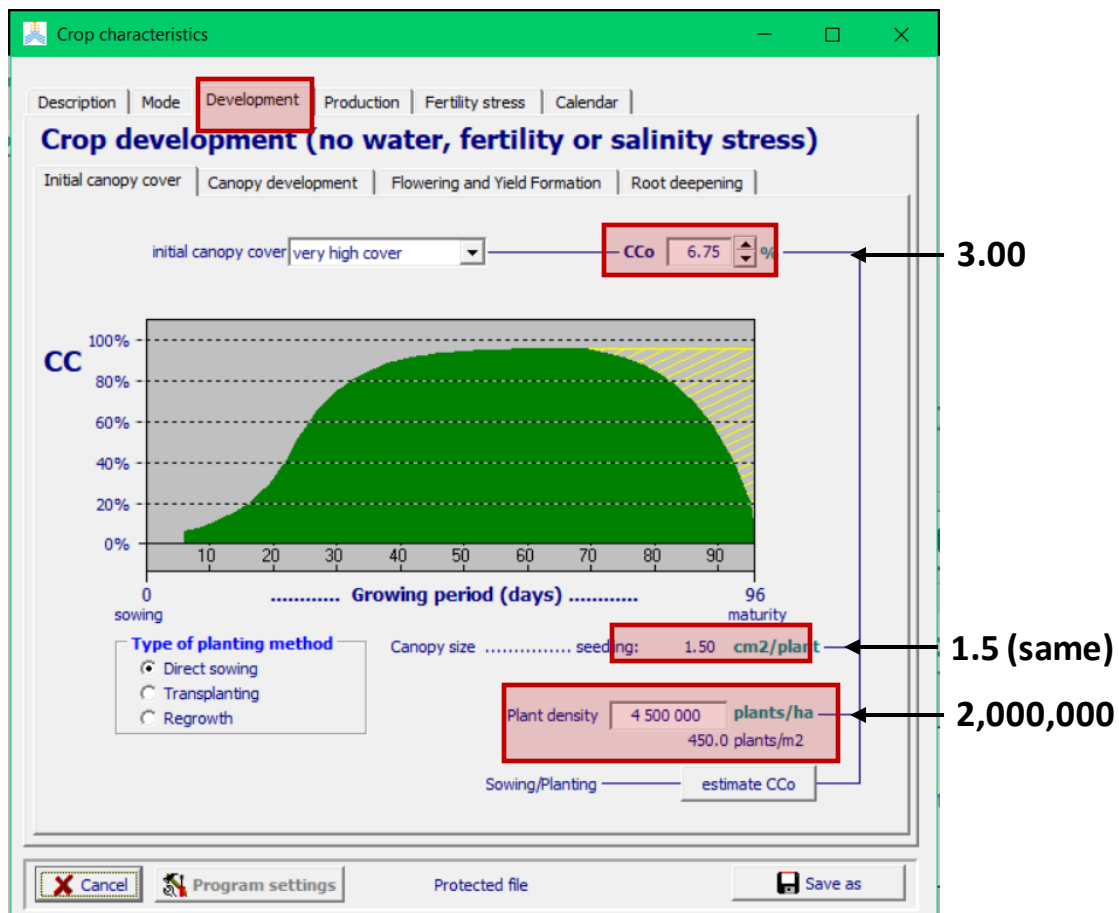
Number of distinctive years:
90 years

GDDays variation in years

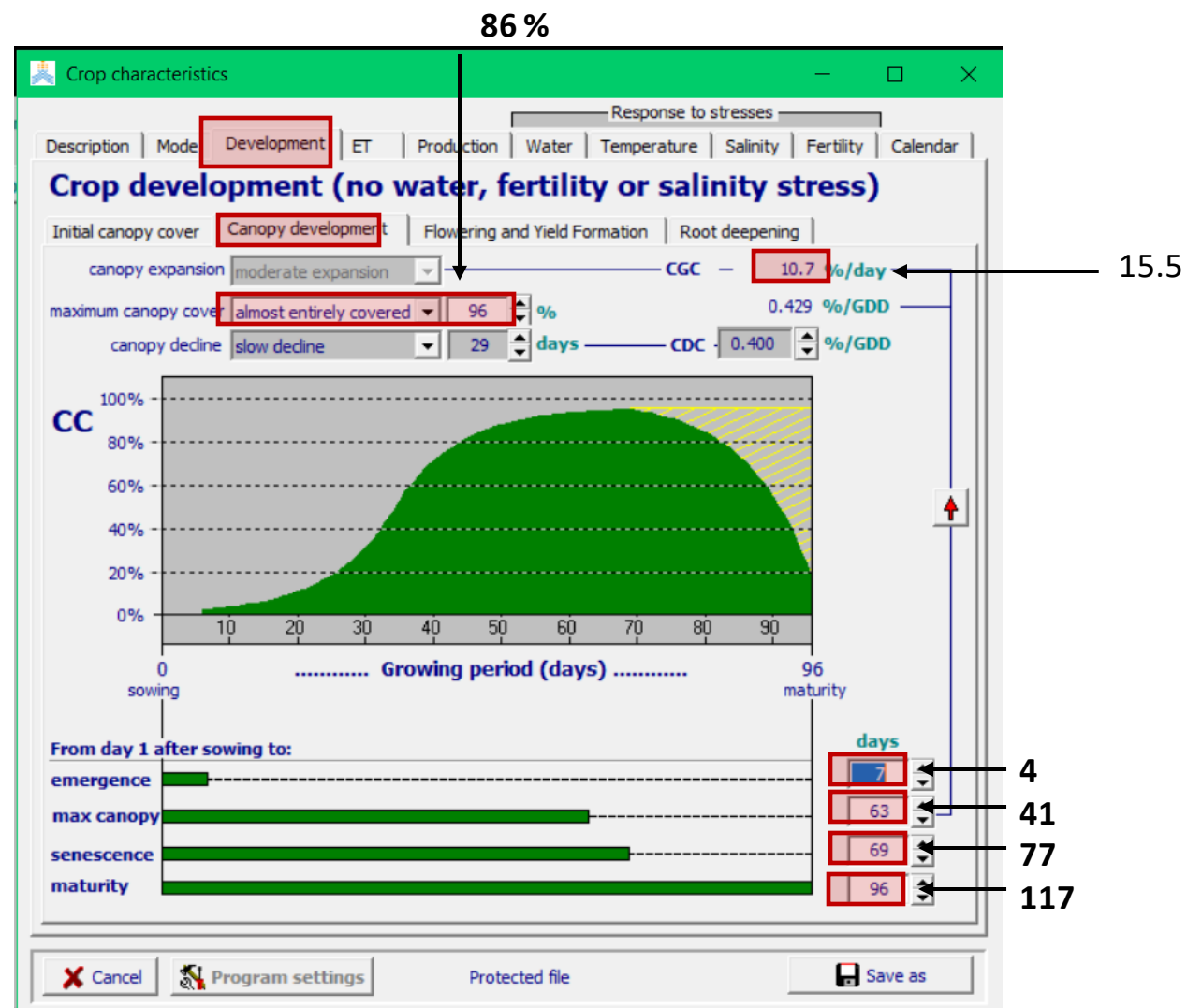
Cancel Program settings Protected file Save as

Create a crop file: development

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

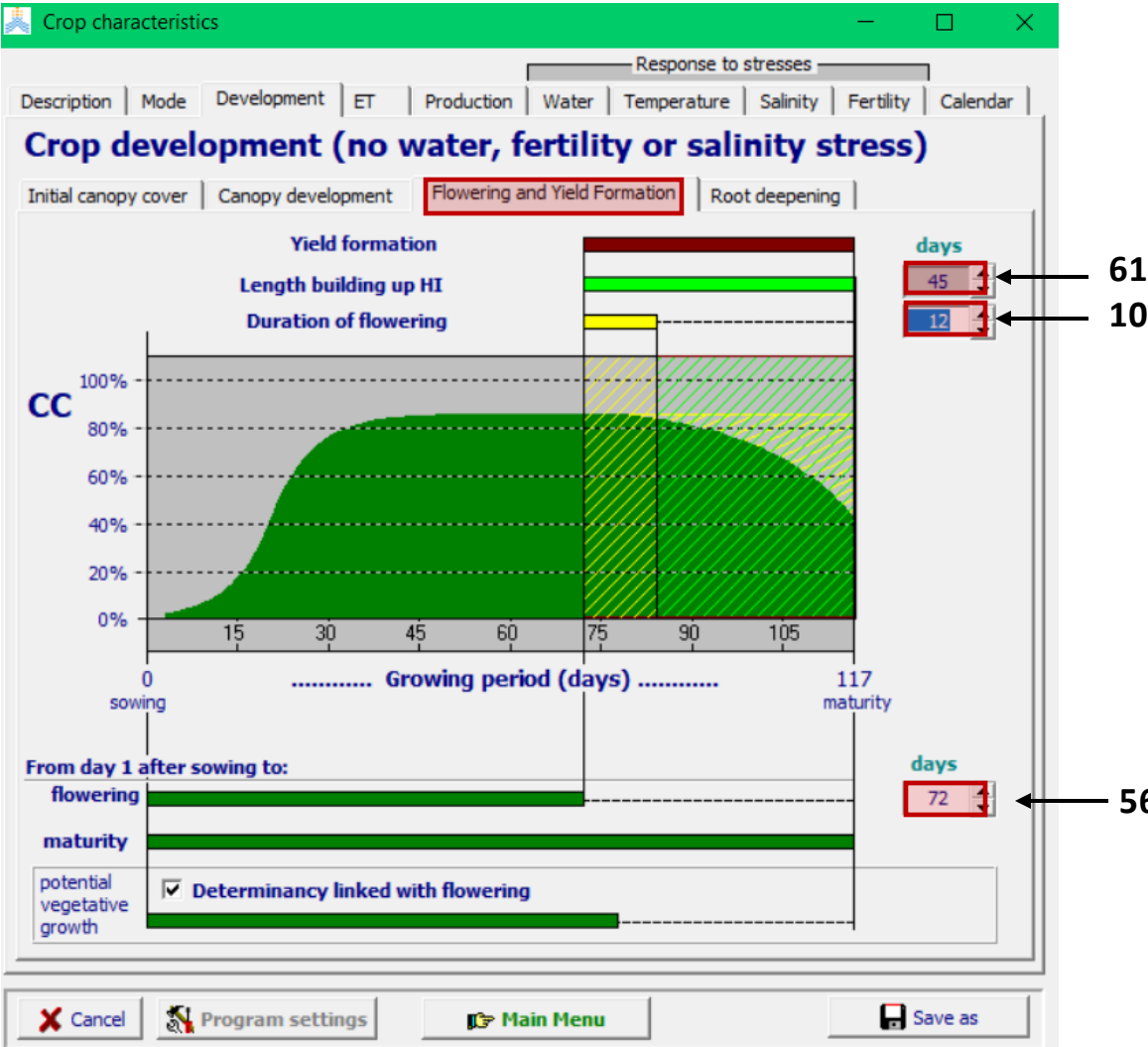


Step 2. Click on **Canopy Development** and modify the following parameters:



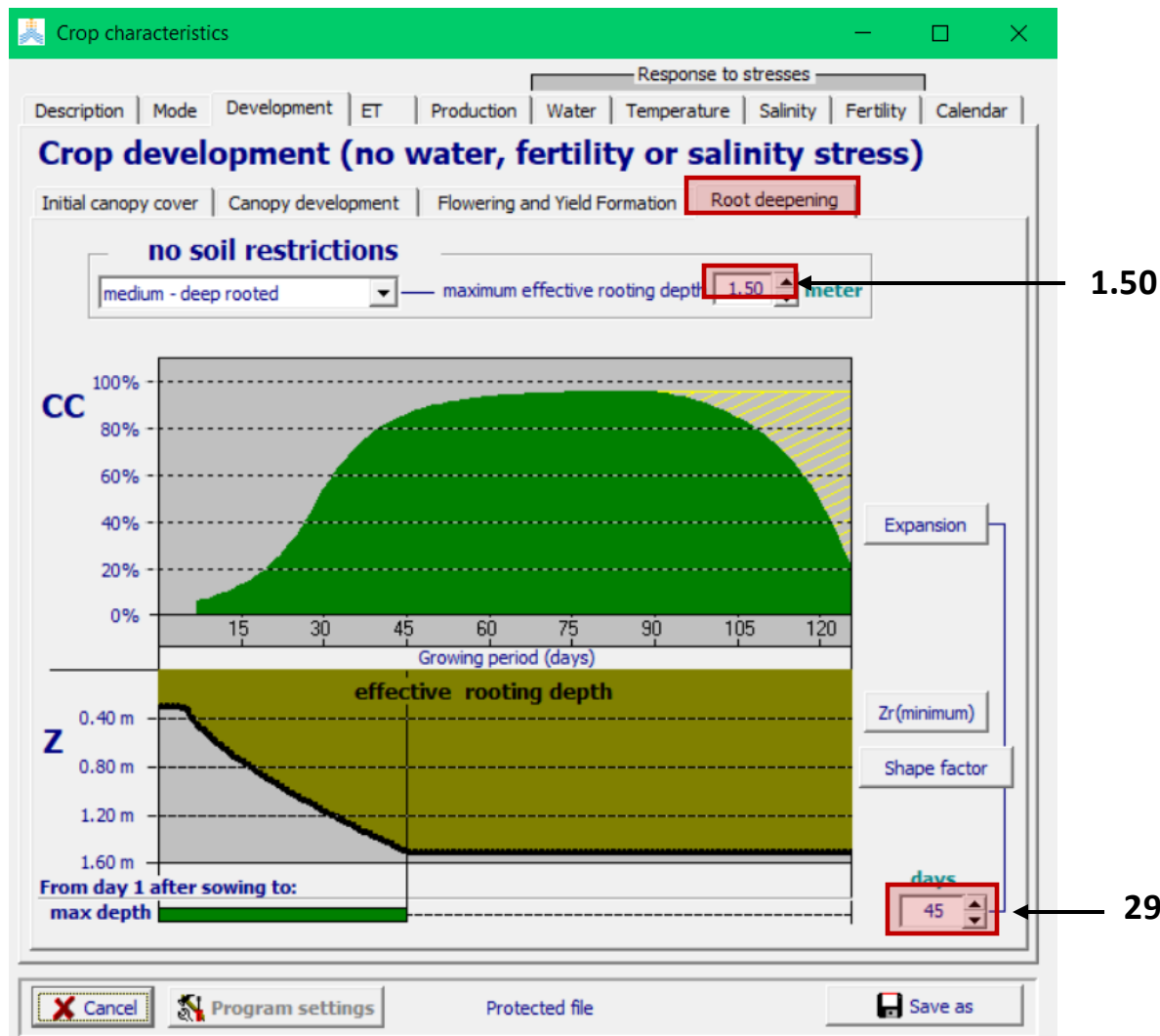
Create a crop file: flowering & yield formation

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



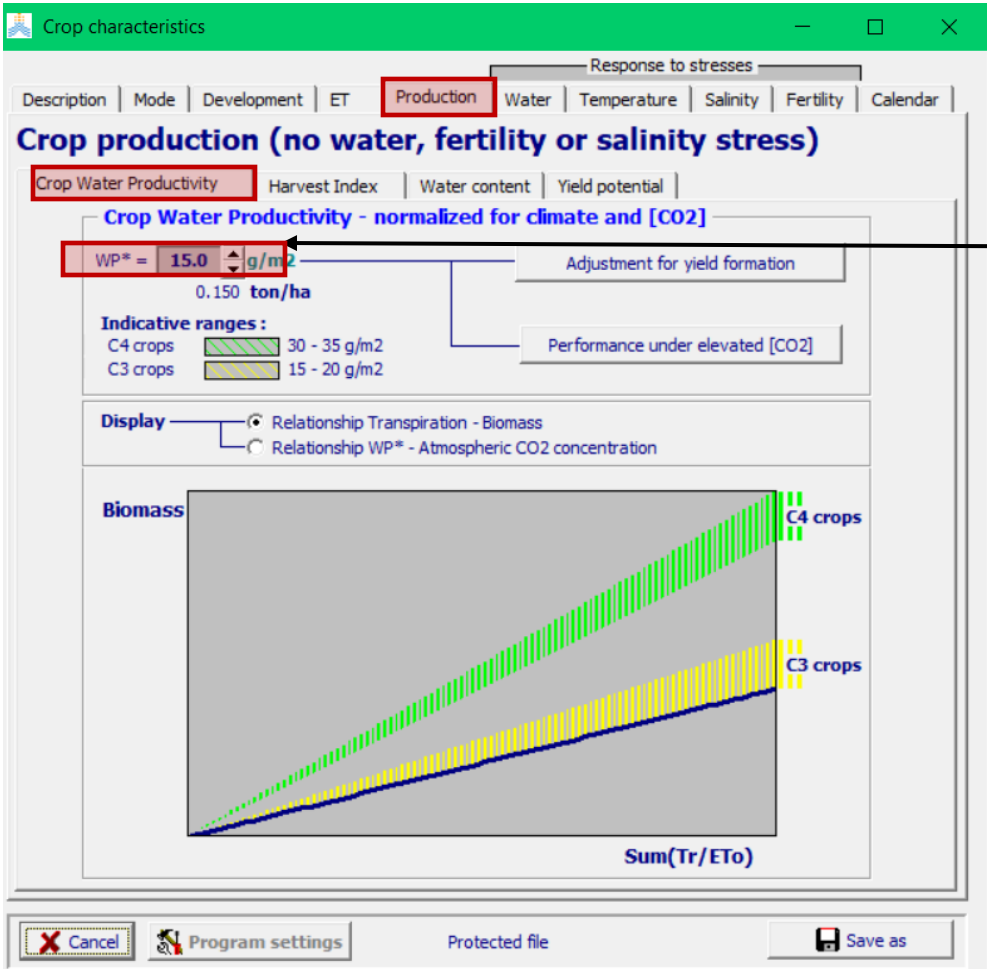
Create a crop file: root deepening

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



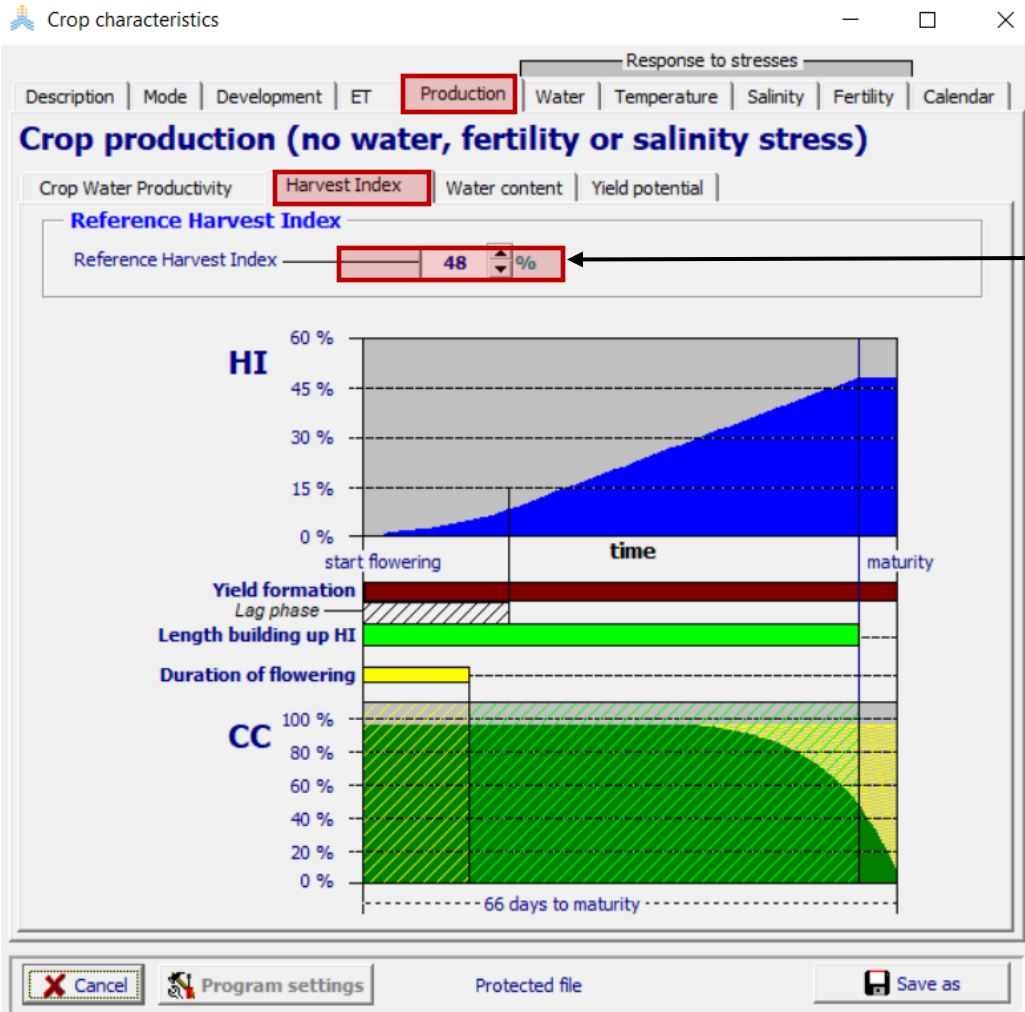
Create a crop file: production

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



15

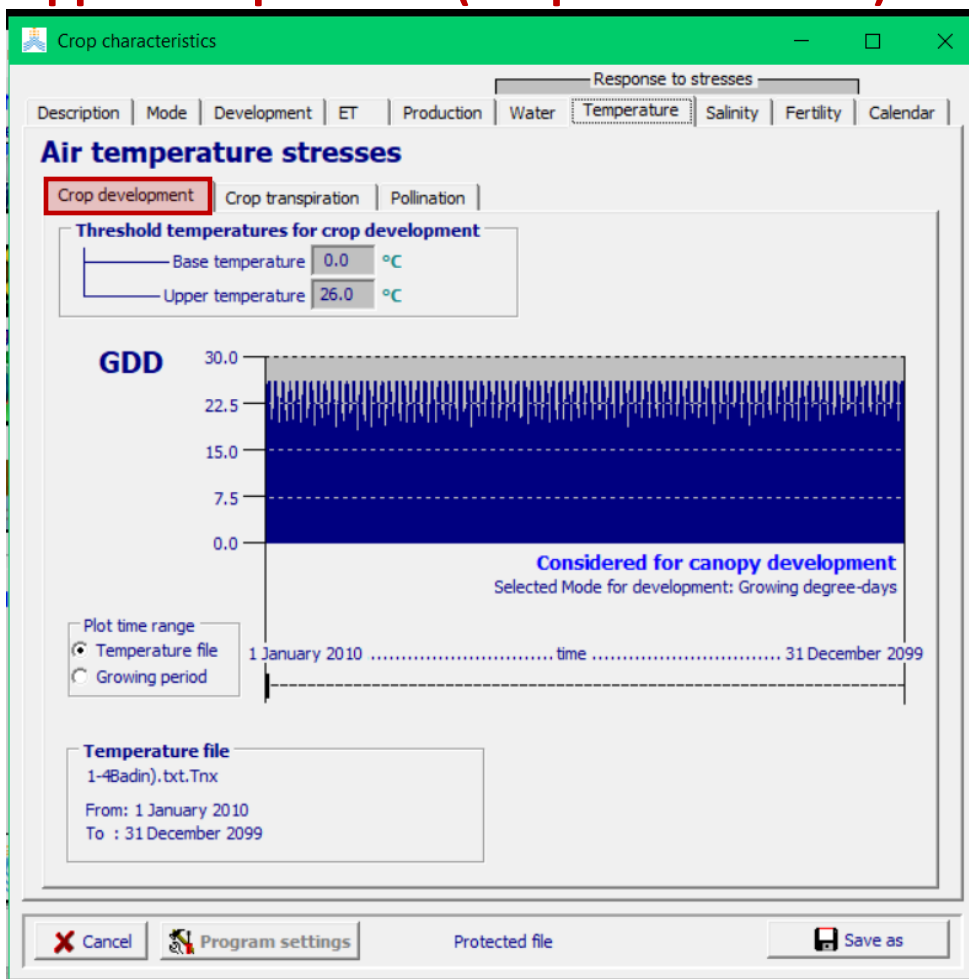
Step 2. Click on **Harvest Index** and modify the following **Reference Harvest Index** parameters:



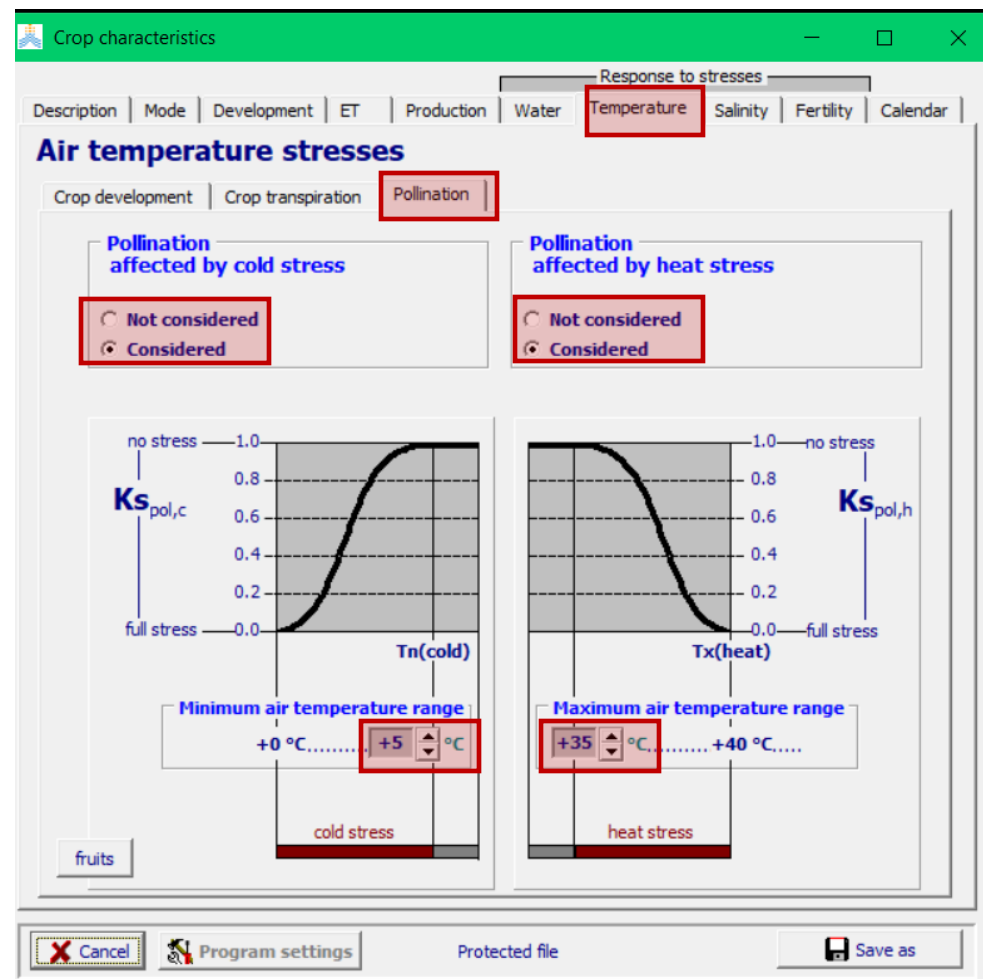
47

Create a crop file: air temperature stresses

Step 1. Click on **Crop Development**, in this section you can modify the **base** and **upper temperature (keep 0°C and 26°C)**

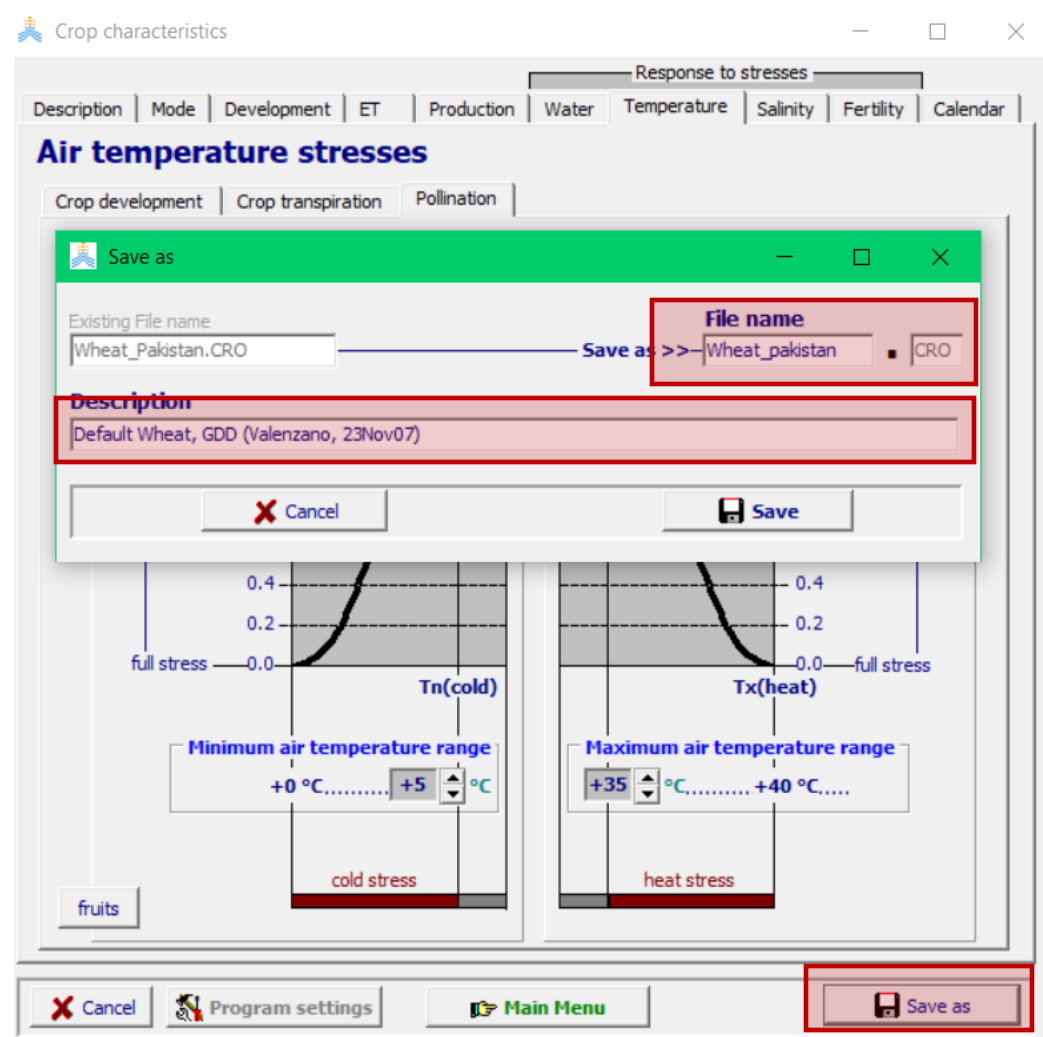


Step 2. Click on **Pollination**, select **consider** (both for cold/heat-stress) and keep **Max. air temp. Range values (+5°C and +35°C)**



Save the crop file

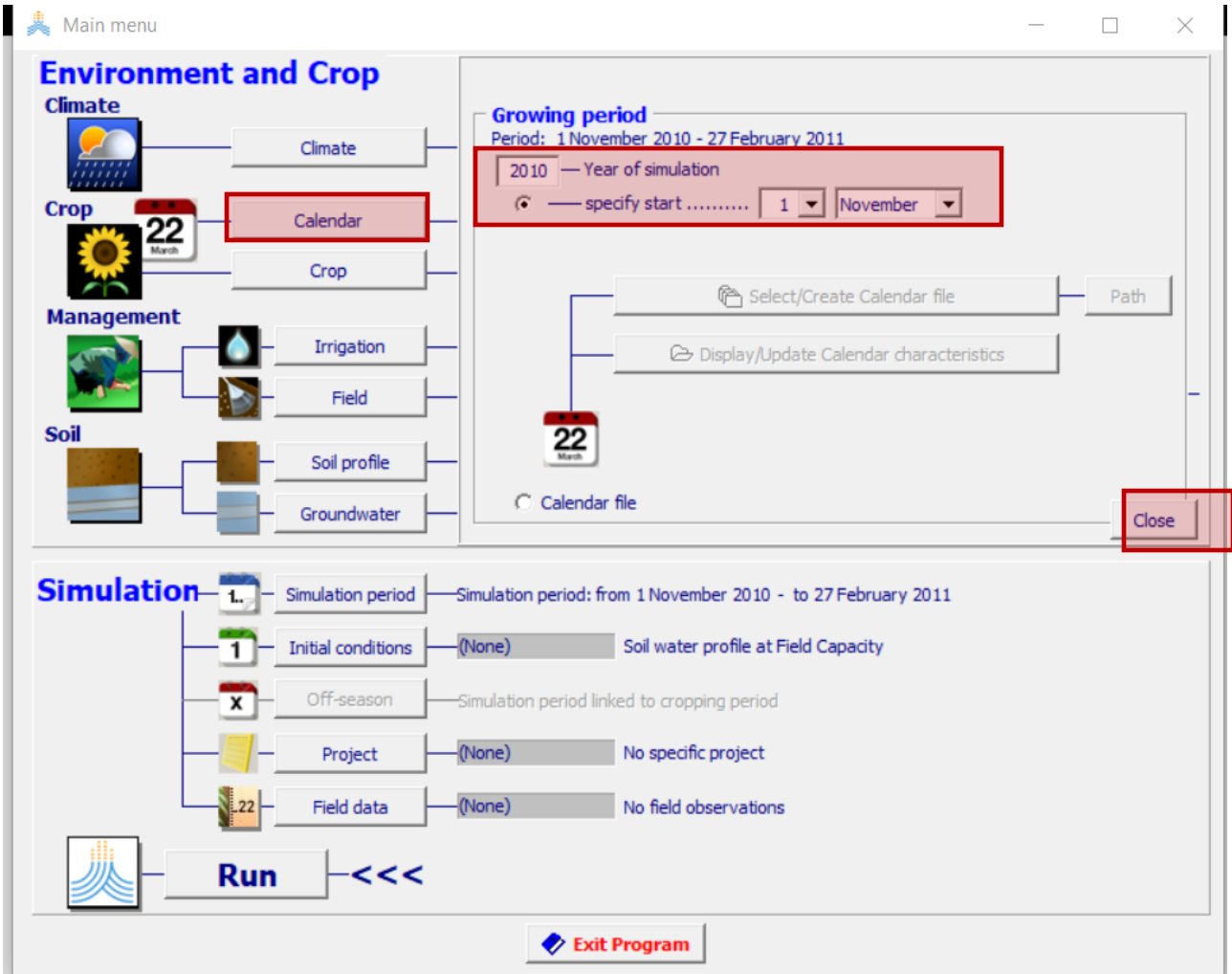
Step 1. Click on **Save as** (bottom of the screen) and enter the following **File name** **"Wheat_Pakistan"** and in **Description** **"Wheat_Pakistan"**





Crop Calendar: sowing date

Step 1. Click on **Calendar**, specify the sowing date “**1st of November**” and click on **Close**

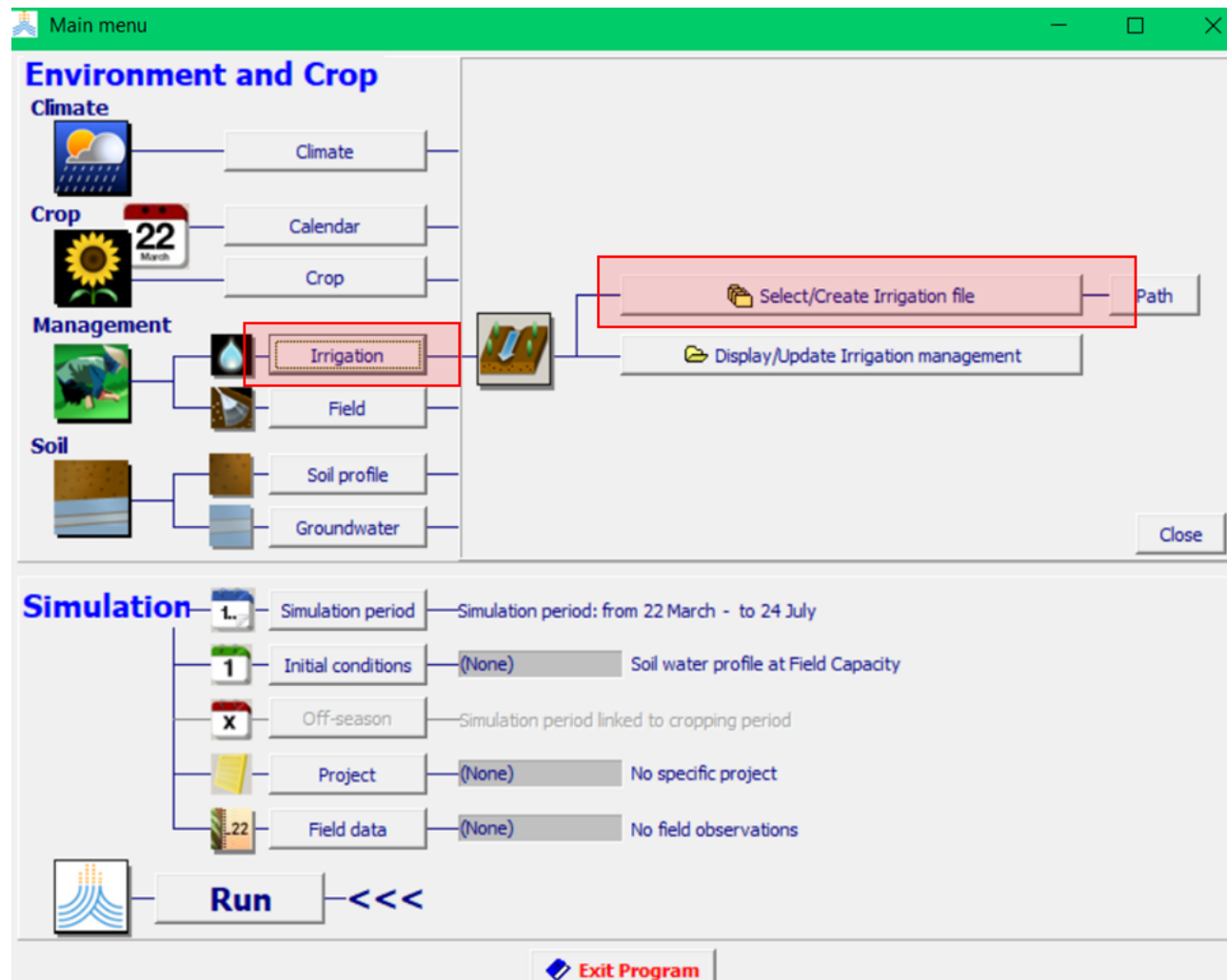




Irrigation file: fixed interval

Step 1. Click on **Irrigation**

Step 2. Click on **Select/Create Irrigation file**



Irrigation file: fixed interval

Step 1. Click on **Generation of irrigation schedule**

Step 2. Click on **Surface irrigation**

Step 3. Click on **Furrow irrigation**

Select irrigation file

SELECT file from Data Base

(double) Click a File in the list to select

File Name	Description
Example.Irr	a particular schedule
Igen.IRR	Generation of irrigation schedule (sprinkler - 80% RAW depletion -
Inet.IRR	Example net irrigation requirement (allowable depletion 30 % RAW
TR2a.IRR	Trial 2 field Sahli
Tr2bFix.IRR	Trial plot 2 (Garcia)

☐ Net irrigation water requirement
☐ Irrigation schedule
☒ **Generation of irrigation schedule**

Selected File : (None)

(no file is selected)

Create irrigation file (generation of schedule)

File: IRR Type: **Generation of Irrigation Schedule**

Description:

Irrigation method: ☐ Time and Depth criteria

Irrigation method

☐ Sprinkler irrigation
☒ **Surface irrigation**
☐ Basin irrigation
☐ Border irrigation
☒ **Furrow irrigation**
☐ Drip irrigation

adjustment for partial wetting

Info ? Percentage of soil surface wetted..... 80 %

Irrigation file: fixed interval

Create irrigation file (generation of schedule)

File: **Badin** . IRR Type: Generation of Irrigation Schedule

Description:

Irrigation method: Time and Depth criteria

Time and depth criteria

soil bunds

Time Criteria

- ☒ Fixed interval
- ☐ Allowable depletion (mm water)
- ☐ Allowable depletion (% of RAW)
- ☐ Water layer between bunds

Depth Criteria

- ☒ Fixed net application
- ☐ Back to Field Capacity

Irrigation water quality

excellent

EC_w 0.0 dS/m

assign

Day No. 1 - day 1 after sowing: 22 March

valid From	When?	Depth?	Quality
Date	Day No.	Interval (days)	Depth (mm)
22 March	1	7	11

Day No. 125 - maturity: 24 July

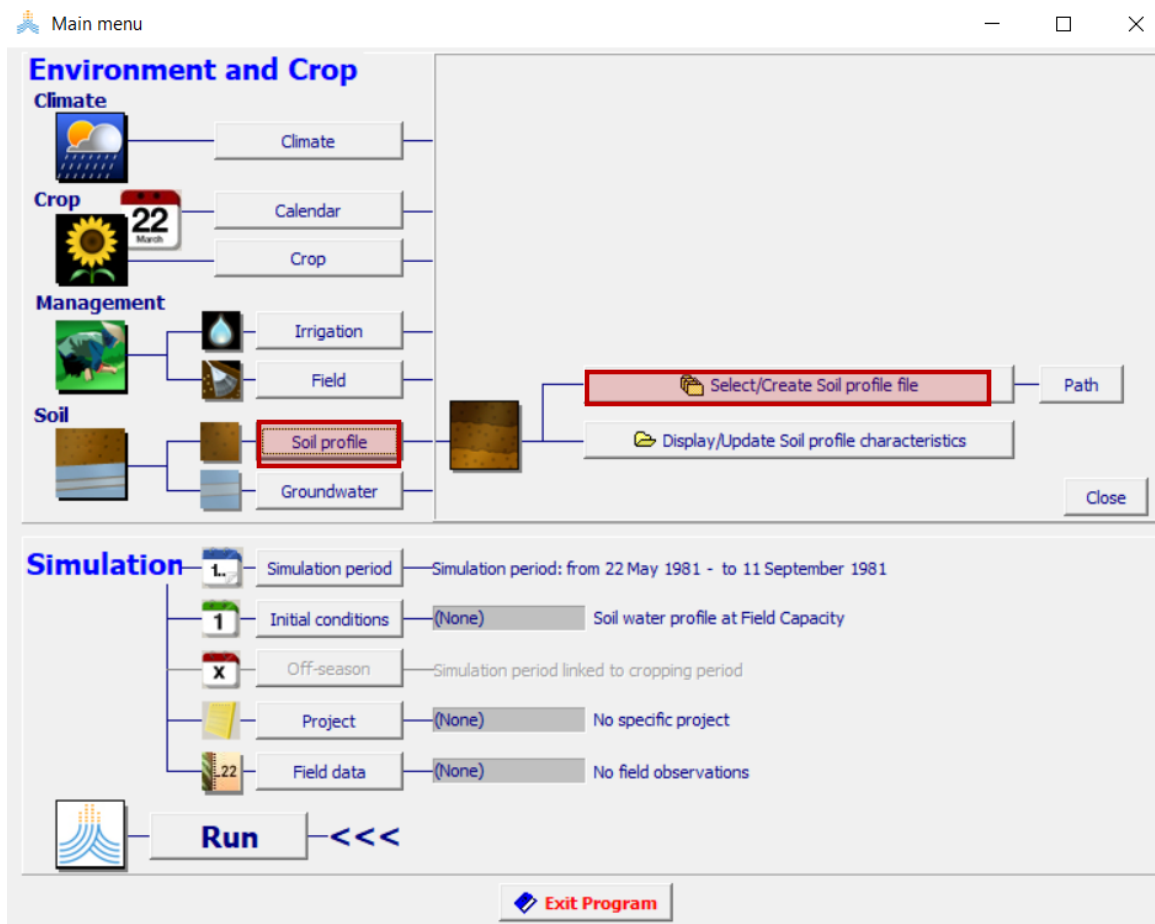
Clear All Events

Cancel Create

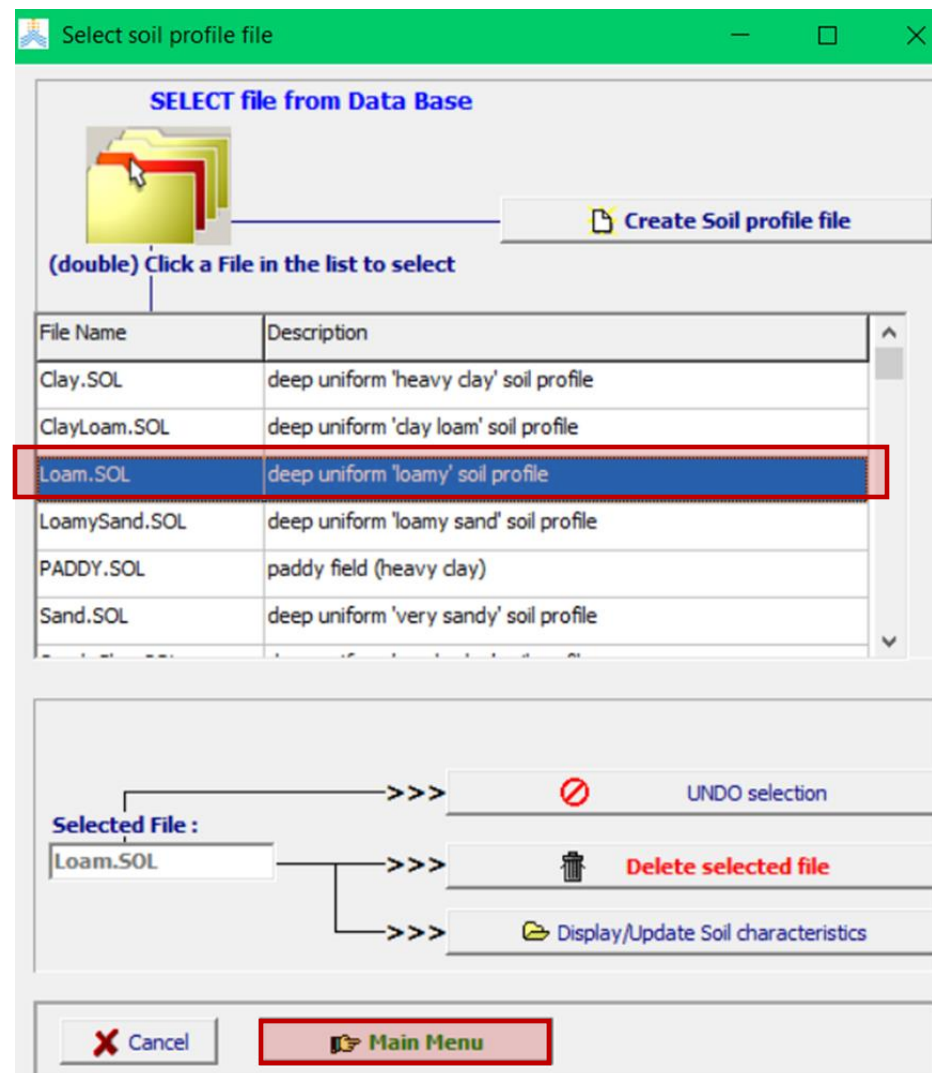
- Step 1. Click on **Fixed interval**
- Step 2. Click on **Fixed net application**
- Step 3. Select **7** under **Interval (days)**
- Step 4. Select **11** under **Depth (mm)**
- Step 5. Name the file as: **"Badin"**
- Step 6. Click on **Create**

Soil: upload a soil file for Badin

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



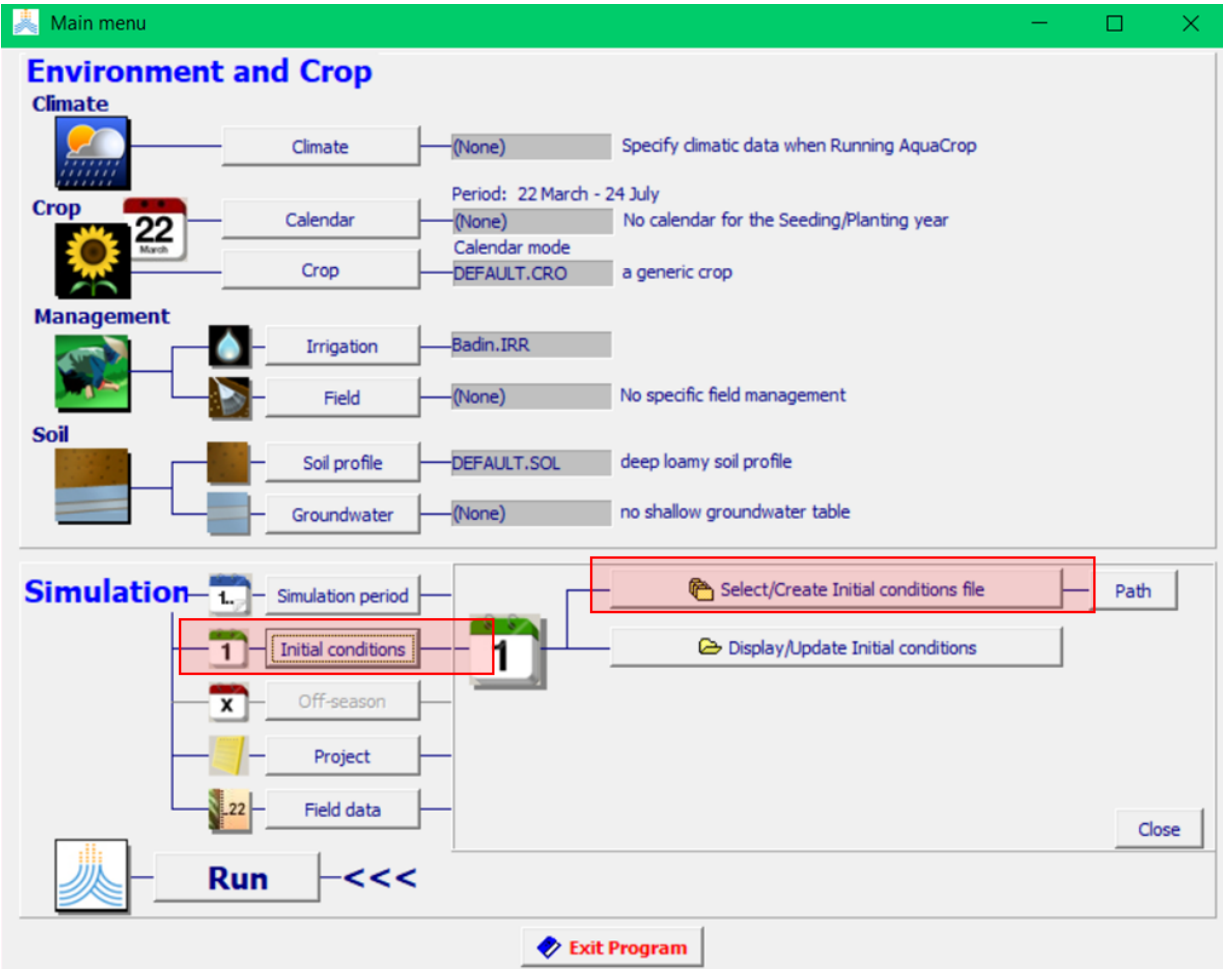
Step 2. Click on **Loam** and on **Main Menu**



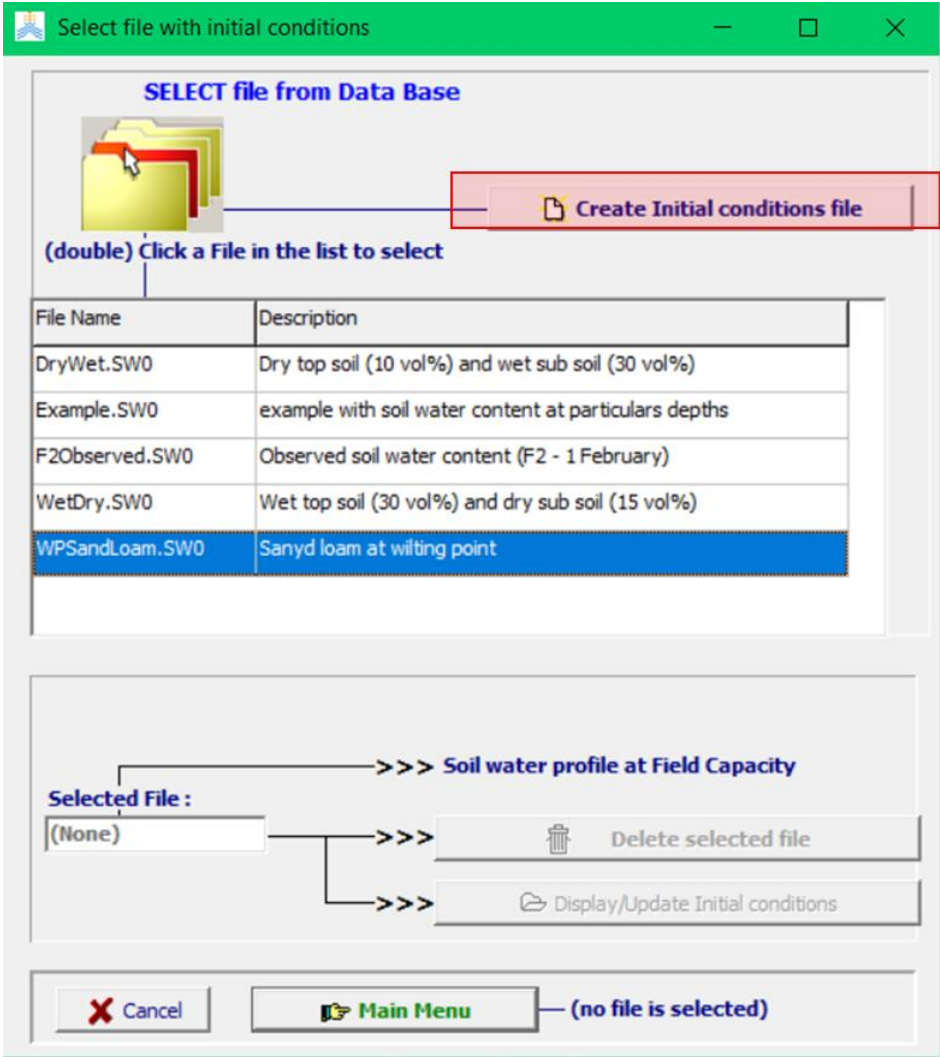


Soil water initial condition: create a SW0 file

Step 1. Click on **Initial conditions** and on **Select/Create Initial condition file**



Step 2. Click on **Create Initial condition file**





Soil water initial condition: create a SW0 file

Create Initial conditions file

File **Pakistan** . SW0 Initial conditions for: 22 March

Description

Initial soil water and salinity content | Initial crop development and production

Initial soil water and initial soil salinity content

Soil water profile | Soil salinity profile

Specify soil water and salinity content

- ☒ at particular depths (linear interpolation applied)
- ☐ for specific layers

1 depth(s) considered

depth	Soil water content	Soil salinity
m	vol %	dS/m
1 0.30	21.00	0.00

Soil water profile

soil water content vol %

0 10 20 30 40

0.20 m

0.40 m

0.60 m

0.80 m

1.00 m

Put soil profile at

Saturation

Field Capacity

Wilting Point

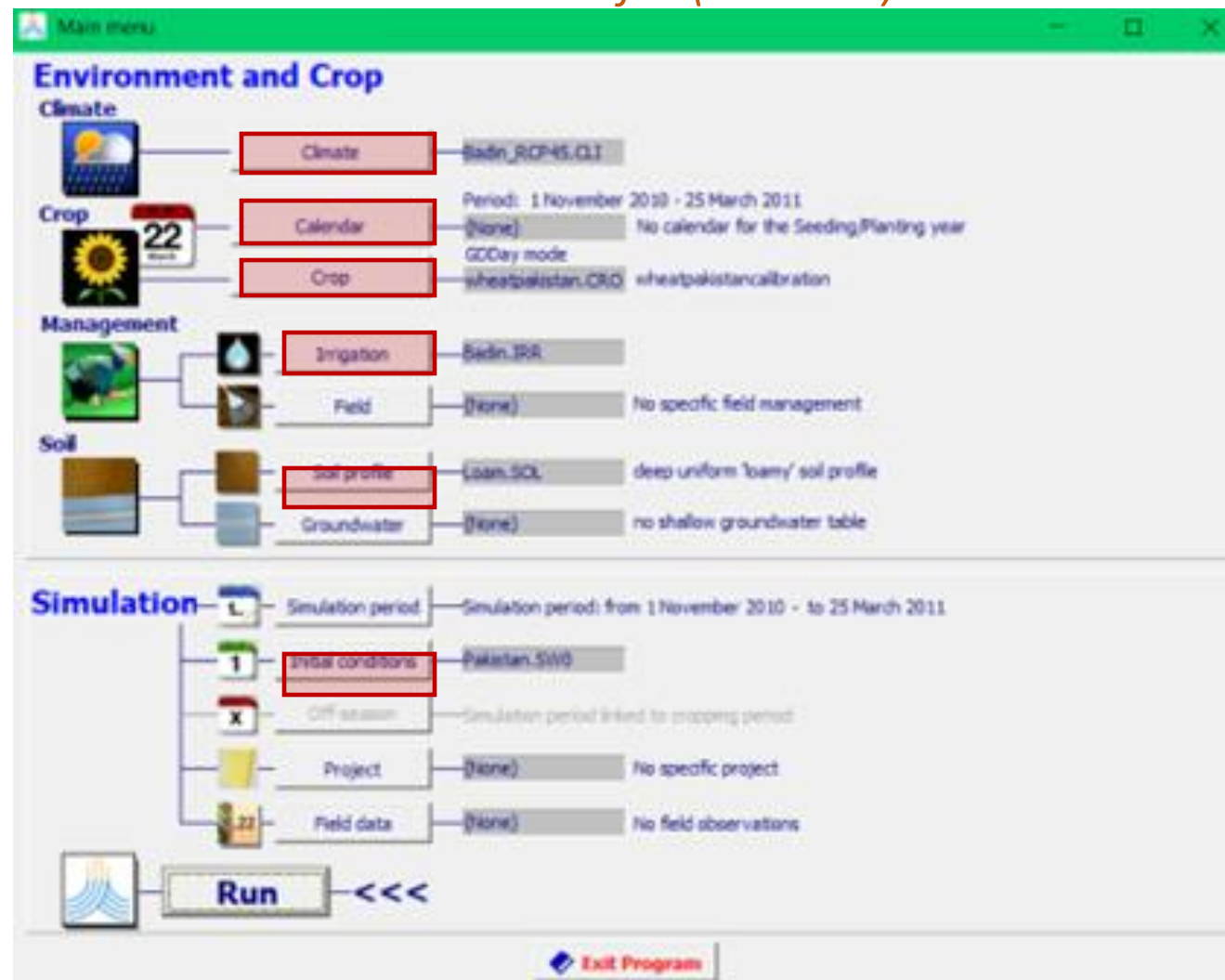
% TAW = ...

Cancel Create

- Step 1. Click on **At particular depths**
- Step 2. Specify **0.30** under "depth (m)"
- Step 3. Specify **21.00** under "Soil water content (vol%)"
- Step 4. Name it "**Pakistan**"

Status: progress made so far

We now have a climatic file (Badin_RCP45), a calendar date (1st November), a crop file (Wheat_Pakistan), an irrigation file (Badin), a soil profile file (Loam) and a soil water initial condition file (Pakistan)!





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) 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: 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 period

Growing cycle
145 days
From 1 November 2010 day 1 after sowing
To 25 March 2011 maturity

Simulation period
145 days

simulation period:
☒ linked to growing period

From 1 November 2010 ... day 1 after sowing
To 25 March 2011 .. at maturity

Graphical display (time axis)

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

Available climatic data
From 1 January 2010
To 31 December 2099
File Badin_RCP45.CLI

Cancel **Main Menu**

Run the Simulations

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

Main menu

Environment and Crop

Climate

Climate: Badin_RCP45.CLI

Crop

Calendar: Period: 1 November 2010 - 25 March 2011
(None) No calendar for the Seeding/Planting year

Crop: wheatpakistan.CRO wheatpakistancalibration

Management

Irrigation: Badin.IRR

Field: (None) No specific field management

Soil

Soil profile: Loam.SOL deep uniform 'loamy' soil profile

Groundwater: (None) no shallow groundwater table

Simulation

Simulation period: Simulation period: from 1 November 2010 - to 25 March 2011

Initial conditions: Pakistan.SW0

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 (25 March 2011)

10 days to 11 November 2010

to date 25 March 2011

INPUT 1 November 2010

ETo 4.3 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

Scale

86 %

CC Legend

time (day)

Dr Legend

Flowering

SAT

FC

PWP

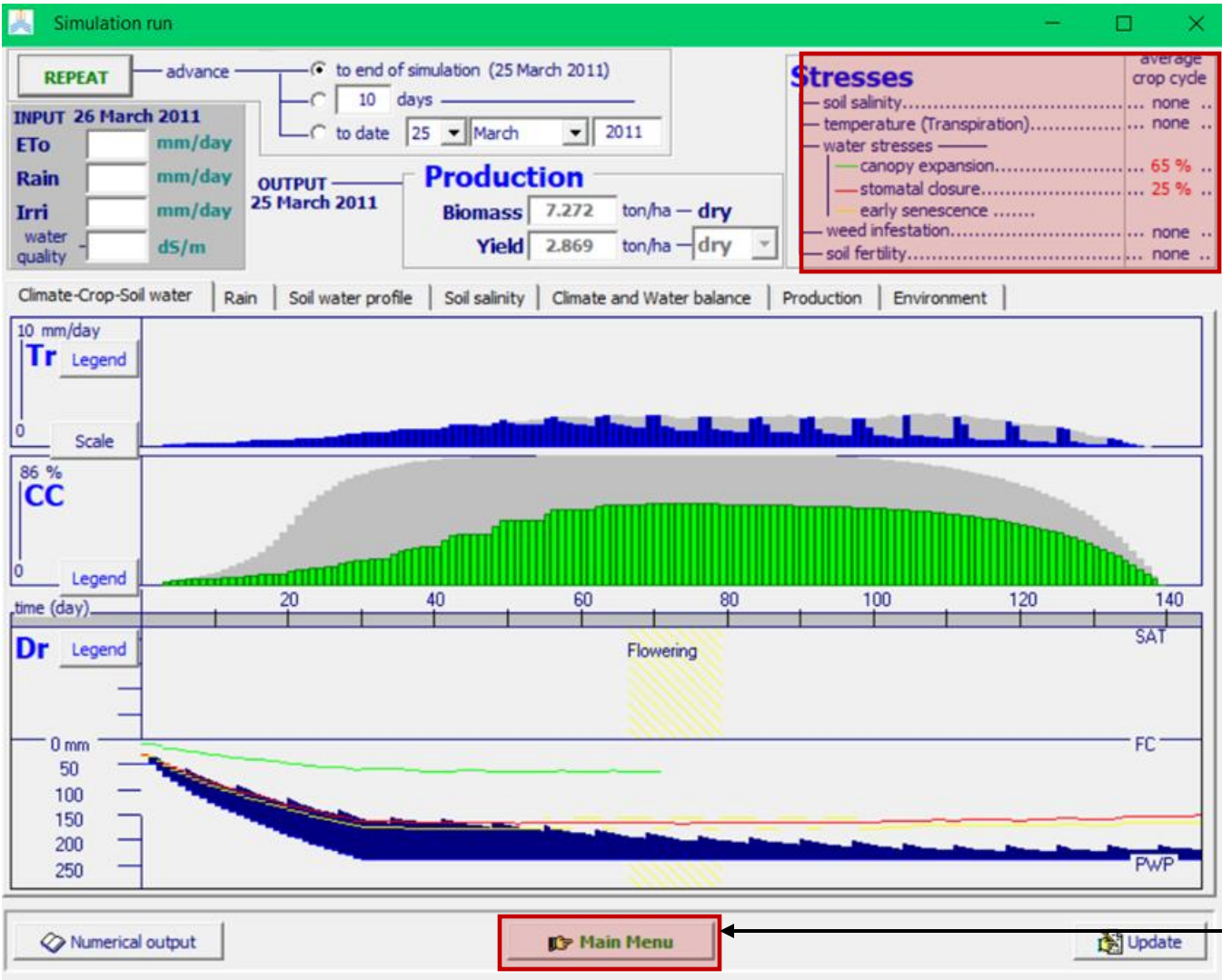
Numerical output

Main Menu

Update

Results visualization

In this section, we will look at the yield results emerging for Badin in 2010/2011, particularly water and temperature stresses



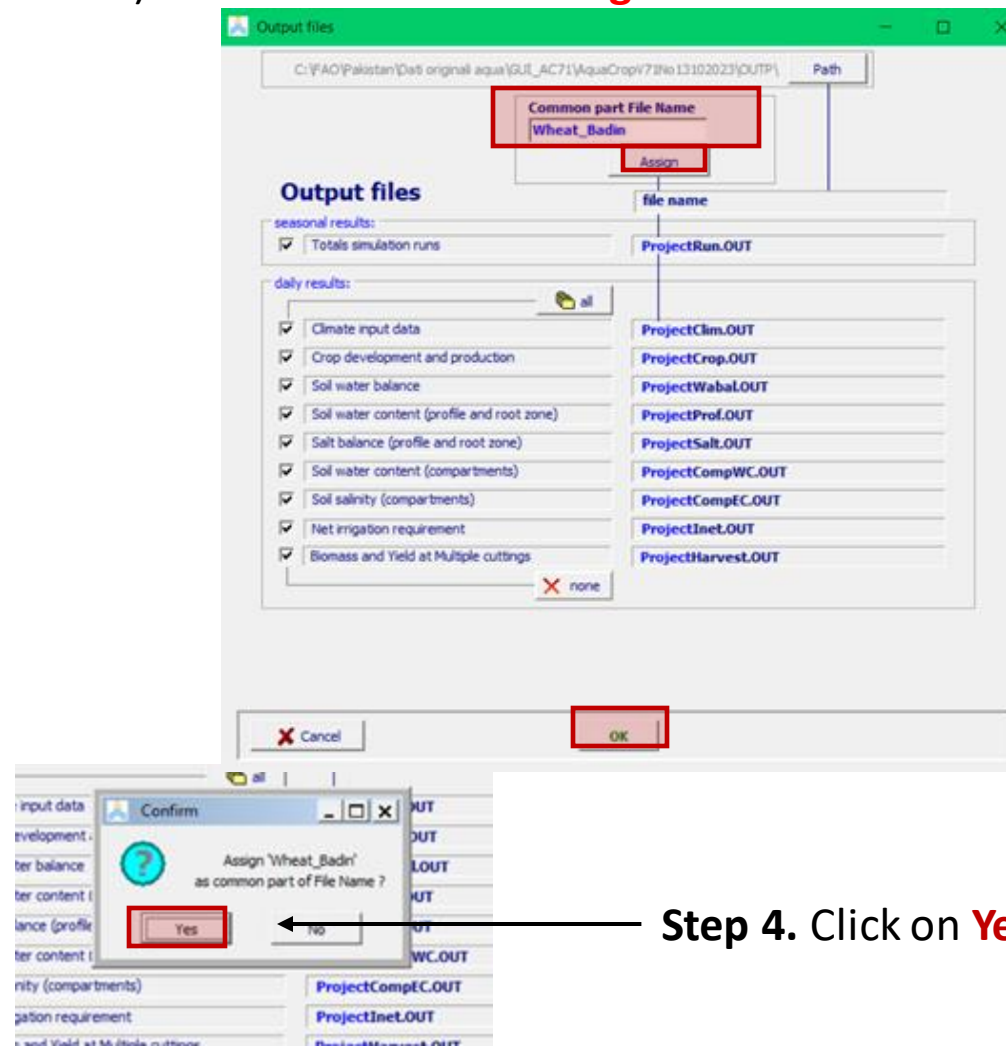
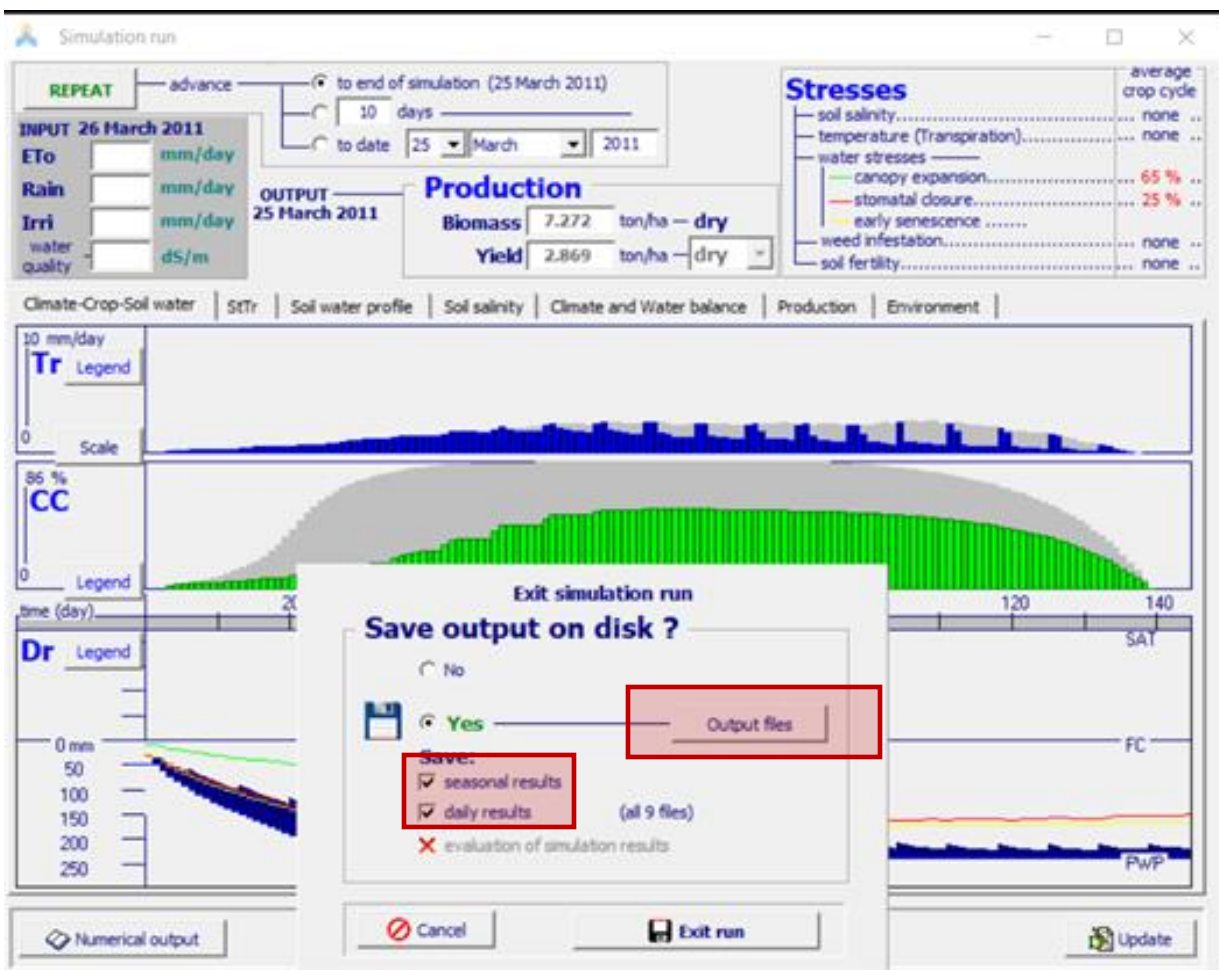
Step 1. Click on **Main Menu** to save the results

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 **“Wheat_Badin”** (make sure that all the output files are ticked) and then click on **Assing** and **OK**



Step 4. Click on **Yes**

Thank you!

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