Food and Agriculture Organization of the United Nations

Crop Module 4
Interpreting AquaCrop outputs

Jorge Alvar-Beltrán

(December 15, 2022)

Content

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)

Day 4

- Interpreting the AquaCrop outputs for maize in Cahul
- Calibrating and validating the AquaCrop model

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Interpreting AquaCrop outputs: climate info.

Step 1. Open **AquaCrop** desktop folders and click on **OUTP** (outputs)

DATA	02/12/2022 19:02	Carpeta de archivos	
IMPORT	01/12/2022 8:49	Carpeta de archivos	
OBS	01/12/2022 8:49	Carpeta de archivos	
OUTP	02/12/2022 19:28	Carpeta de archivos	
SIMUL	03/12/2022 9:33	Carpeta de archivos	
_DEISREG.ISR	01/12/2022 8:49	Archivo ISR	1 KB
_ISREG32.DLL	01/12/2022 8:49	Extensión de la ap...	40 KB
AquaCrop	01/12/2022 8:49	Aplicación	16.459 KB
AquaCrop	01/12/2022 8:49	Icono	2 KB
DeIsL1.isu	01/12/2022 8:49	Archivo ISU	10 KB

Step 2. Open the file **MaizeCahulClim**

MaizeCahulClim	02/12/2022 19:28	Archivo OUT	11 KB
MaizeCahulCompEC	02/12/2022 19:28	Archivo OUT	21 KB
MaizeCahulCompWC	02/12/2022 19:28	Archivo OUT	20 KB
MaizeCahulCrop	02/12/2022 19:28	Archivo OUT	28 KB
MaizeCahulHarvest	02/12/2022 19:28	Archivo OUT	1 KB
MaizeCahulInet	02/12/2022 19:28	Archivo OUT	1 KB
MaizeCahulProf	02/12/2022 19:28	Archivo OUT	16 KB
MaizeCahulRun	02/12/2022 19:28	Archivo OUT	4 KB
MaizeCahulSalt	02/12/2022 19:28	Archivo OUT	16 KB
MaizeCahulWabal	02/12/2022 19:28	Archivo OUT	22 KB

Step 3. Visualize the **climatic** outputs

MaizeCahulClim: Bloc de notas

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AquaCrop 7.0 (August 2022) - Output created on (date) : 02/12/2022 at (time) : 19:16:36

Climate input data

** Run number: 1

Day	Month	Year	DAP	Stage	Rain mm	ETo mm	Tmin °C	Tavg °C	Tmax °C	CO2 ppm
22	5	1981	1	1	0.0	4.7	8.3	14.8	21.3	340.11
23	5	1981	2	1	0.0	4.2	8.1	15.4	22.7	340.11
24	5	1981	3	1	0.0	4.4	10.8	17.3	23.8	340.11
25	5	1981	4	1	0.0	4.2	10.5	16.8	23.1	340.11
26	5	1981	5	1	0.0	4.5	11.3	18.0	24.7	340.11
27	5	1981	6	1	0.0	5.0	11.3	18.2	25.1	340.11
28	5	1981	7	2	0.0	5.1	11.5	18.7	25.9	340.11
29	5	1981	8	2	0.0	4.0	14.6	19.4	24.1	340.11
30	5	1981	9	2	0.0	4.9	13.1	19.1	25.2	340.11
31	5	1981	10	2	0.0	5.2	11.8	18.9	26.0	340.11
1	6	1981	11	2	0.0	4.8	15.1	20.8	26.4	340.11
2	6	1981	12	2	0.0	4.7	14.2	20.4	26.7	340.11
3	6	1981	13	2	0.9	4.7	15.2	21.1	27.1	340.11
4	6	1981	14	2	0.0	5.4	13.6	20.8	27.9	340.11
5	6	1981	15	2	0.0	6.1	15.3	21.9	28.5	340.11
6	6	1981	16	2	0.0	6.2	13.9	21.2	28.5	340.11
7	6	1981	17	2	0.0	6.0	15.0	22.1	29.3	340.11
8	6	1981	18	2	0.0	6.1	14.0	22.1	30.3	340.11
9	6	1981	19	2	0.0	5.4	16.1	23.0	29.8	340.11
10	6	1981	20	2	0.0	5.2	17.6	24.1	30.7	340.11

Legend

DAP : Days after planting
Stage : 0: before/after planting
Stage : 1: emergence or transplant recovery
Stage : 2: vegetative stage
Stage : 3: flowering
Stage : 4: yield formation and ripening
Rain : Rainfall
ETo : Reference evapotranspiration
Tmin : Minimum air temperature
Tavg : Average air temperature
Tmax : Maximum air temperature
CO2 : Atmospheric CO2 concentration

At the bottom of the txt. file you will find the legend!

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Interpreting AquaCrop outputs: soil water content

Step 1. Open the file **MaizeCahulCompWC**

MaizeCahulClim	02/12/2022 19:28	Archivo OUT	11 KB
MaizeCahulCompEC	02/12/2022 19:28	Archivo OUT	21 KB
MaizeCahulCompWC	02/12/2022 19:28	Archivo OUT	20 KB
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MaizeCahulRun	02/12/2022 19:28	Archivo OUT	4 KB
MaizeCahulSalt	02/12/2022 19:28	Archivo OUT	16 KB
MaizeCahulWabal	02/12/2022 19:28	Archivo OUT	22 KB

Step 2. Visualize the **water content** outputs

MaizeCahulCompWC: Bloc de notas

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AquaCrop 7.0 (August 2022) - Output created on (date) : 02/12/2022 at (time) : 19:16:36

Soil Water Content (WC) at various depths (at center of compartments)

** Run number: 1

					at depth (m):	0.05	0.15	0.25	0.35	0.45	0.55	0.67
Day	Month	Year	DAP	Stage		WC1(vol%)	WC2(vol%)	WC3(vol%)	WC4(vol%)	WC5(vol%)	WC6(vol%)	WC7(vol%)
22	5	1981	1	1		34.8	39.0	39.0	39.0	39.0	39.0	39.0
23	5	1981	2	1		32.1	39.0	39.0	39.0	39.0	39.0	39.0
24	5	1981	3	1		29.9	39.0	39.0	39.0	39.0	39.0	39.0
25	5	1981	4	1		28.2	39.0	39.0	39.0	39.0	39.0	39.0
26	5	1981	5	1		26.7	39.0	39.0	39.0	39.0	39.0	39.0
27	5	1981	6	1		25.2	39.0	39.0	39.0	39.0	39.0	39.0
28	5	1981	7	2		23.9	39.0	39.0	39.0	39.0	39.0	39.0
29	5	1981	8	2		23.0	39.0	39.0	39.0	39.0	39.0	39.0
30	5	1981	9	2		22.0	38.9	39.0	39.0	39.0	39.0	39.0
31	5	1981	10	2		21.0	38.9	39.0	39.0	39.0	39.0	39.0

Legend

DAP : Days after planting
Stage : 0: before/after planting
Stage : 1: emergence or transplant recovery
Stage : 2: vegetative stage
Stage : 3: flowering
Stage : 4: yield formation and ripening

At the bottom of the txt. file you will find the legend for each variable!

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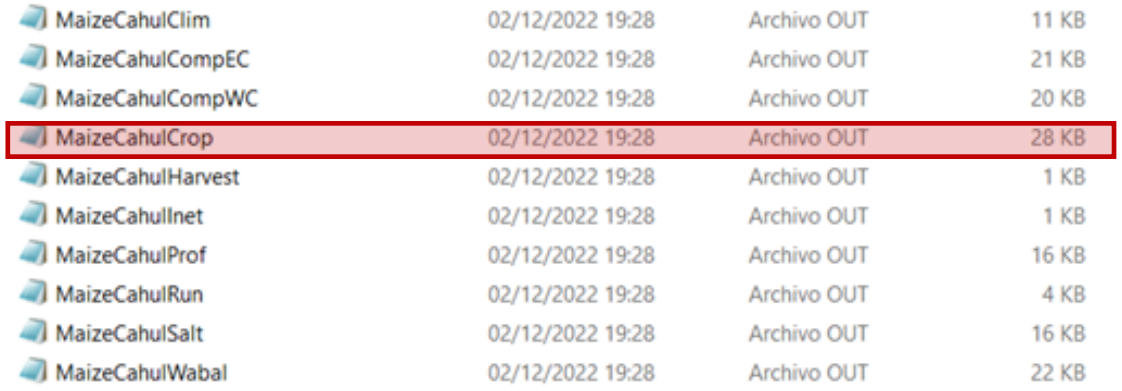
Interpreting AquaCrop outputs: crop info.

Step 1. Open the file **MaizeCahulCrop**



MaizeCahulClim	02/12/2022 19:28	Archivo OUT	11 KB
MaizeCahulCompEC	02/12/2022 19:28	Archivo OUT	21 KB
MaizeCahulCompWC	02/12/2022 19:28	Archivo OUT	20 KB
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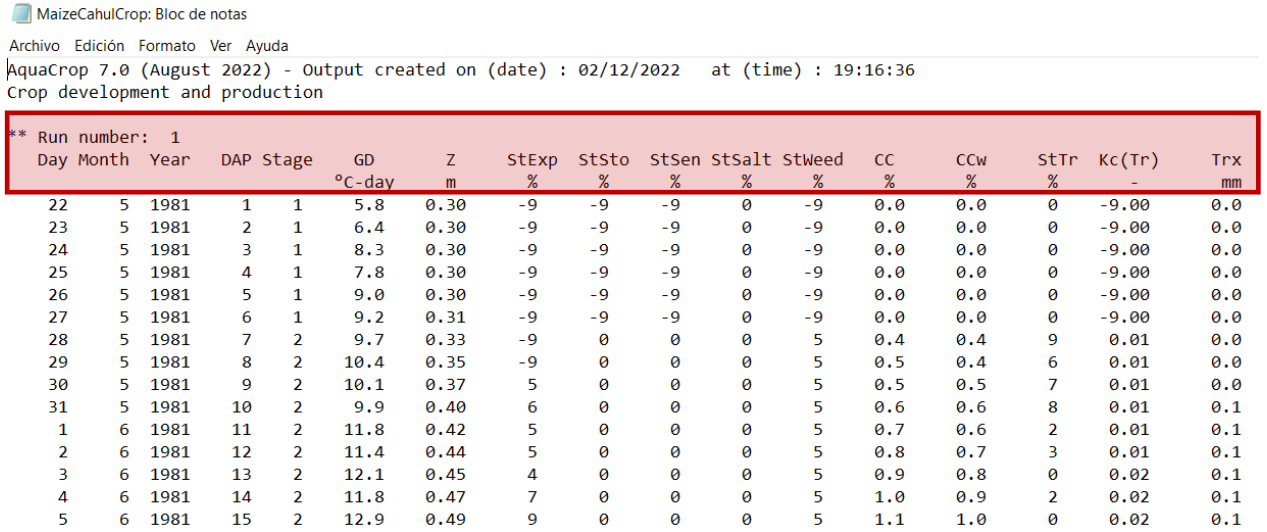
MaizeCahulRun	02/12/2022 19:28	Archivo OUT	4 KB
MaizeCahulSalt	02/12/2022 19:28	Archivo OUT	16 KB
MaizeCahulWabal	02/12/2022 19:28	Archivo OUT	22 KB

Legend

```
DAP          : Days after planting
Stage        : 0: before/after planting
Stage        : 1: emergence or transplant recovery
Stage        : 2: vegetative stage
Stage        : 3: flowering
Stage        : 4: yield formation and ripening
GD           : Growing degrees
Z            : Effective rooting depth
StExp        : Percent water stress reducing leaf expansion
StSto        : Percent water stress inducing stomatal closure
StSen        : Percent water stress triggering early canopy senescence
StSalt       : Percent salinity stress
StWeed       : Relative cover of weeds
CC           : Green total Canopy Cover of crop and weeds
CCw          : Green crop Canopy Cover in weed infested field
StTr         : Percent temperature stress affecting crop transpiration
Kc(Tr)       : Crop coefficient for transpiration
Trx          : Maximum total transpiration of crop and weeds
```

Step 2. Visualize the **stress** and **canopy development** outputs



MaizeCahulCrop: Bloc de notas

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AquaCrop 7.0 (August 2022) - Output created on (date) : 02/12/2022 at (time) : 19:16:36

Crop development and production

** Run number: 1

Day	Month	Year	DAP	Stage	GD °C-day	Z m	StExp %	StSto %	StSen %	StSalt %	StWeed %	CC %	CCw %	StTr %	Kc(Tr) -	Trx mm
22	5	1981	1	1	5.8	0.30	-9	-9	-9	0	-9	0.0	0.0	0	-9.00	0.0
23	5	1981	2	1	6.4	0.30	-9	-9	-9	0	-9	0.0	0.0	0	-9.00	0.0
24	5	1981	3	1	8.3	0.30	-9	-9	-9	0	-9	0.0	0.0	0	-9.00	0.0
25	5	1981	4	1	7.8	0.30	-9	-9	-9	0	-9	0.0	0.0	0	-9.00	0.0
26	5	1981	5	1	9.0	0.30	-9	-9	-9	0	-9	0.0	0.0	0	-9.00	0.0
27	5	1981	6	1	9.2	0.31	-9	-9	-9	0	-9	0.0	0.0	0	-9.00	0.0
28	5	1981	7	2	9.7	0.33	-9	0	0	0	5	0.4	0.4	9	0.01	0.0
29	5	1981	8	2	10.4	0.35	-9	0	0	0	5	0.5	0.4	6	0.01	0.0
30	5	1981	9	2	10.1	0.37	5	0	0	0	5	0.5	0.5	7	0.01	0.0
31	5	1981	10	2	9.9	0.40	6	0	0	0	5	0.6	0.6	8	0.01	0.1
1	6	1981	11	2	11.8	0.42	5	0	0	0	5	0.7	0.6	2	0.01	0.1
2	6	1981	12	2	11.4	0.44	5	0	0	0	5	0.8	0.7	3	0.01	0.1
3	6	1981	13	2	12.1	0.45	4	0	0	0	5	0.9	0.8	0	0.02	0.1
4	6	1981	14	2	11.8	0.47	7	0	0	0	5	1.0	0.9	2	0.02	0.1
5	6	1981	15	2	12.9	0.49	9	0	0	0	5	1.1	1.0	0	0.02	0.1

At the bottom of the txt. file you will find the legend for each variable!

Interpreting AquaCrop outputs: crop info.

Step 3. Continue visualizing **crop production** outputs

Tr mm	TrW mm	Tr/Trx %	WP g/m2	Biomass ton/ha	HI %	Y(dry) ton/ha	Y(fresh) ton/ha	Brelative %	WPet kg/m3	Bin ton/ha	Bout ton/ha
0.0	0.0	100	32.1	0.000	-9.9	0.000	-9.000	-9	0.00	0.000	0.000
0.0	0.0	100	32.1	0.000	-9.9	0.000	-9.000	-9	0.00	0.000	0.000
0.0	0.0	100	32.1	0.000	-9.9	0.000	-9.000	-9	0.00	0.000	0.000
0.0	0.0	100	32.1	0.000	-9.9	0.000	-9.000	-9	0.00	0.000	0.000
0.0	0.0	100	32.1	0.000	-9.9	0.000	-9.000	-9	0.00	0.000	0.000
0.0	0.0	100	32.1	0.000	-9.9	0.000	-9.000	-9	0.00	0.000	0.000
0.0	0.0	100	32.1	0.002	-9.9	0.000	-9.000	97	0.00	0.000	0.000
0.0	0.0	100	32.1	0.005	-9.9	0.000	-9.000	97	0.00	0.000	0.000
0.0	0.0	100	32.1	0.007	-9.9	0.000	-9.000	97	0.00	0.000	0.000
0.1	0.0	100	32.1	0.010	-9.9	0.000	-9.000	97	0.00	0.000	0.000
0.1	0.1	100	32.1	0.014	-9.9	0.000	-9.000	96	0.00	0.000	0.000
0.1	0.1	100	32.1	0.018	-9.9	0.000	-9.000	96	0.00	0.000	0.000

Legend

```
Trx          : Maximum total transpiration of crop and weeds
Tr           : Total transpiration of crop and weeds
TrW          : Crop transpiration in weed infested field
Tr/Trx       : Relative total transpiration of crop and weeds (100 Tr/Trx)
WP           : Crop water productivity adjusted for CO2, soil fertility and products synthesized
Biomass      : Total above-ground dry biomass
HI           : Harvest Index adjusted for failure of pollination, inadequate photosynthesis and water stress
Y(dry)       : Dry crop yield (HI x Biomass)
Y(fresh)     : Fresh crop yield
Brelative    : Relative biomass (Reference: no water, no soil fertility, no soil salinity stress, no weed infestation)
WPet         : ET Water productivity for yield part (kg yield produced per m3 water evapotranspired)
Bin          : Daily mass of assimilates mobilized from root system at start of season
Bout         : Daily mass of assimilates stored in root system at end of season
```

At the bottom of the txt. file you will find the legend for each variable!

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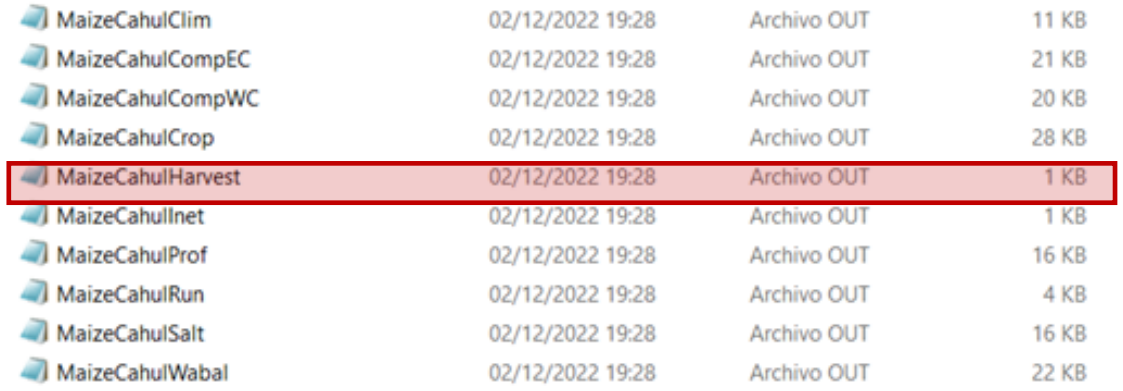
Interpreting AquaCrop outputs: harvest info.

Step 1. Open the file **MaizeCahulHarvest**



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MaizeCahulSalt	02/12/2022 19:28	Archivo OUT	16 KB
MaizeCahulWabal	02/12/2022 19:28	Archivo OUT	22 KB

Step 2. Visualize values at **harvest** (dry yield and biomass)

MaizeCahulHarvest: Bloc de notas

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AquaCrop 7.0 (August 2022) - Output created on (date) : 02/12/2022 at (time) : 19:16:36
Biomass and Yield at Multiple cuttings

** Run number: 1

Nr	Day	Month	Year	DAP	Interval days	Biomass ton/ha	Sum(B) ton/ha	Dry-Yield ton/ha	Sum(Y) ton/ha	Fresh-Yield ton/ha	Sum(Y) ton/ha
0	22	5	1981				0.000		0.000		
9999	12	9	1981				16.039		6.434		

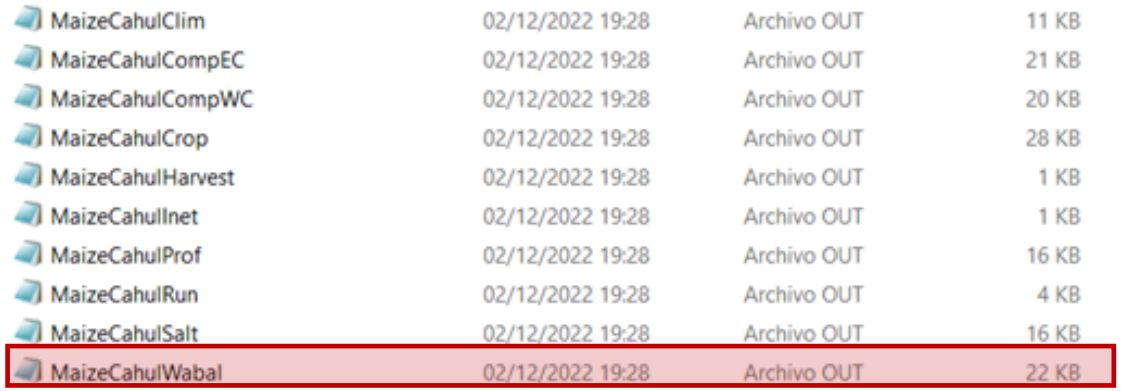
Legend

DAP : Days after planting
Interval : Number of days between events
Nr = 0 : At start of season
Nr = 1 to n : Harvest event
Nr = 9999 : At end of season

At the bottom of the txt. file you will find the legend for each variable!

Interpreting AquaCrop outputs: water balance info.

Step 1. Open the file **MaizeCahulWabal**



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MaizeCahulCompWC	02/12/2022 19:28	Archivo OUT	20 KB
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MaizeCahulHarvest	02/12/2022 19:28	Archivo OUT	1 KB
MaizeCahulInet	02/12/2022 19:28	Archivo OUT	1 KB
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MaizeCahulRun	02/12/2022 19:28	Archivo OUT	4 KB
MaizeCahulSalt	02/12/2022 19:28	Archivo OUT	16 KB
MaizeCahulWabal	02/12/2022 19:28	Archivo OUT	22 KB

Step 2. Visualize values at **harvest** (dry yield and biomass)

MaizeCahulWabal: Bloc de notas

Archivo Edición Formato Ver Ayuda

AquaCrop 7.0 (August 2022) - Output created on (date) : 02/12/2022 at (time) : 19:16:36

Soil Water balance

** Run number: 1

Day	Month	Year	DAP	Stage	WCTot	Rain	Irri	Surf	Infilt	RO	Drain	CR	Zgwt	Ex	E	E/Ex	Trx	Tr	Tr/Trx	ETx	ET	ET/ETx
					mm	mm	mm	mm	mm	mm	mm	mm	m	mm	mm	%	mm	mm	%	mm	mm	%
22	5	1981	1	1	600.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-9.90	5.2	4.2	81	0.0	0.0	100	5.2	4.2	81
23	5	1981	2	1	597.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-9.90	4.6	2.7	58	0.0	0.0	100	4.6	2.7	58
24	5	1981	3	1	595.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-9.90	4.8	2.2	45	0.0	0.0	100	4.8	2.2	45
25	5	1981	4	1	593.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-9.90	4.6	1.7	37	0.0	0.0	100	4.6	1.7	37
26	5	1981	5	1	592.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-9.90	5.0	1.6	31	0.0	0.0	100	5.0	1.6	31
27	5	1981	6	1	590.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-9.90	5.5	1.5	27	0.0	0.0	100	5.5	1.5	27
28	5	1981	7	2	589.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-9.90	5.6	1.3	23	0.0	0.0	100	5.6	1.3	24
29	5	1981	8	2	588.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-9.90	4.4	0.9	21	0.0	0.0	100	4.4	0.9	21
30	5	1981	9	2	587.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-9.90	5.3	1.0	19	0.0	0.0	100	5.4	1.0	19
31	5	1981	10	2	586.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-9.90	5.7	0.9	17	0.1	0.1	100	5.7	1.0	17
1	6	1981	11	2	585.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-9.90	5.2	0.8	15	0.1	0.1	100	5.3	0.8	16
2	6	1981	12	2	584.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-9.90	5.1	0.7	14	0.1	0.1	100	5.2	0.8	15

Legend

```
DAP       : Days after planting
Stage     : 0: before/after planting
Stage     : 1: emergence or transplant recovery
Stage     : 2: vegetative stage
Stage     : 3: flowering
Stage     : 4: yield formation and ripening
WCTot     : Water content in total soil profile
Rain      : Rainfall
Irri      : Water applied by irrigation
Surf      : Stored water on soil surface between bunds
Infilt    : Infiltrated water in soil profile
RO        : Surface runoff
Drain     : Water drained out of the soil profile
CR        : Water moved upward by capillary rise
Zgwt      : Depth of the groundwater table (-9.90 if absent)
Ex        : Maximum soil evaporation
E         : Soil evaporation
E/Ex      : Relative soil evaporation (100 E/Ex)
Trx       : Maximum crop transpiration
Tr        : Total transpiration of crop and weeds
Tr/Trx    : Relative transpiration (100 Tr/Trx)
ETx       : Evapotranspiration maximale
ET        : Evapotranspiration
ET/ETx    : Evapotranspiration relative (100 ET/ETx)
```

At the bottom of the txt. file you will find the legend for each variable!

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Crop Module 4
Calibrating & Validating the AquaCrop model

Jorge Alvar-Beltrán

(December 15, 2022)

Food and Agriculture Organization of the United Nations

Calibration and validation of AquaCrop model

- The calibration and validation is a critical step towards achieving meaningful modelling outputs.
- **5 to 10 years** of historical yield data (for a specific location) are necessary to compare observed and simulated yields values.
- To test the performance of the AquaCrop model against observed values in the field, different statistical indicators are used.
- For example, while the **root-mean square error** (RMSE, Eq. 1) is useful for testing the differences between predicted and observed values, the **normalized-RMSE** (NRMSE, Eq. 2) provides relevant information about the average of the measured data ranges.
- AquaCrop findings are considered highly performant when the differences between observed and simulated NRMSE values **are below 5%,** and good when ranging between **6 to 15%.**
- **Willmott's index** of agreement (d, Eq. 3) provides a measure of the agreement of the deviation of modelled and observed values from the observed mean, where 0 indicates disagreement and 1 perfect agreement between simulated and observed values.

Calibration and validation of AquaCrop model

- $\text{RMSE} = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(Oi - Pi)^2}$

- $\text{NRMSE} = (\frac{RMSE}{\hat{O}}) \times 100$

- $\text{d} = 1 - \frac{\sum_{i=1}^{n}(Oi-Pi)^2}{\sum_{i=1}^{n}(P_i'+O_i')^2}$

Where O_i and P_i corresponds to the observed and simulated values, respectively, and n to the number of observations. While the RMSE has the same units as that of the variable being simulated (t/ha), NRMSE units are displayed as a percentage. In addition, $O'_i = [O_i - \hat{O}]$ and $P'_i = [P_i - \hat{P}]$ shows the differences between observed and simulated values, with $\hat{O}$ and $\hat{P}$ as the observed and simulated means, respectively.

Calibration and validation of AquaCrop model

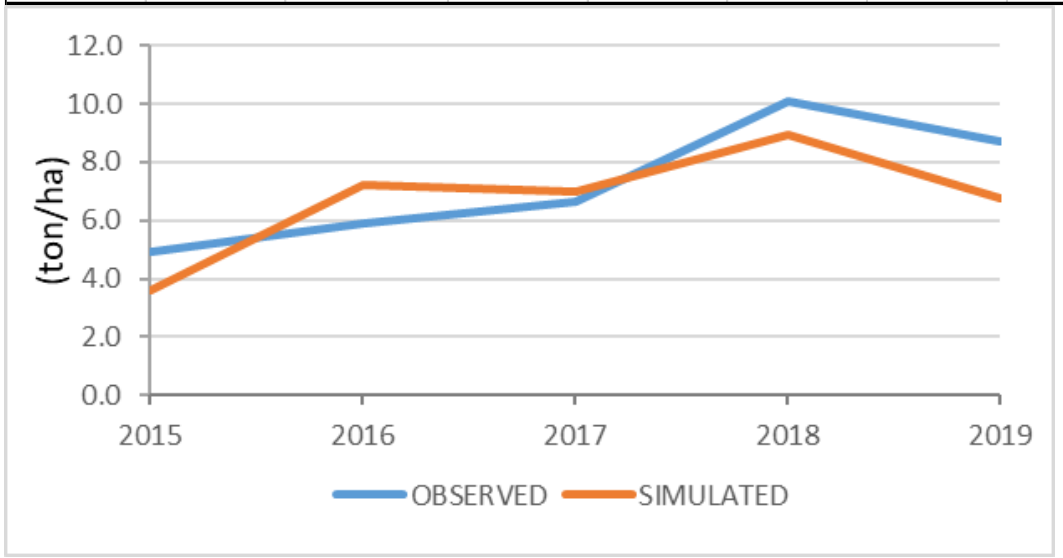
Step 1. You first **calibrate** in one location (Soroca) and **validate** against others (Chisinau and Cahul)

CALIBRATION (Soroca)

Here we introduce the observed values in the field and the simulated values from AquaCrop!

SHORT CYCLE VARIETIES (MAIZE)										
Maize (North Moldova) - Soroca - 22 May										
	OBSERVED	SIMULATED	RMSE	MAE	EF	I *Pi-Oave* I	I *Oi-Oave* I	d	MAPE	Difference
2015	4.91	3.60	1.713	1.31	0.8281	3.65	2.34		0.27	1.71
2016	5.90	7.21	1.721	1.31	0.0064	0.03	1.35		0.22	1.72
2017	6.65	6.97	0.101	0.32	0.6889	0.28	0.60		0.05	0.10
2018	10.07	8.93	1.297	1.14	18.0625	1.69	2.82		0.11	1.30
2019	8.70	6.79	3.656	1.91	8.2944	0.46	1.45		0.22	3.66
	7.246		**1.303**	**1.20**	**0.70**	**6.10**	**8.56**	**0.96**	**17.39**	**8.49**
										1.30
									NRMSE (as %)	**17.98**

Overall, the trend between simulated and observed values is similar.



Acceptable performance of the model!

Food and Agriculture Organization of the United Nations

Calibration and validation of AquaCrop model

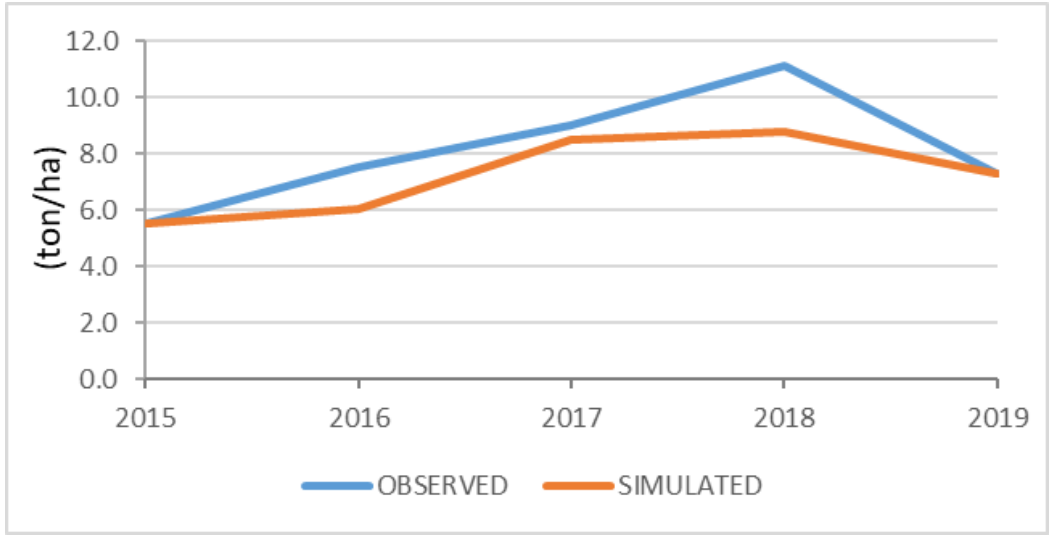
Step 1. You first **calibrate** in one location (Soroca) and **validate** against others (Chisinau and Cahul)

VALIDATION (Chisinau)

Here we introduce the observed values in the field and the simulated values from AquaCrop!

SHORT CYCLE VARIETIES (MAIZE)										
Maize (Central Moldova) - Chisinau - 22 May										
	OBSERVED	SIMULATED	RMSE	MAE	EF	I *Pi-Oave* I	I *Oi-Oave* I	d	MAPE	Difference
2015	5.52	5.501	0.000	0.02	0.09	2.59	2.57		0.00	0.00
2016	7.50	6.039	2.135	1.46	2.8224	2.05	0.59		0.19	2.13
2017	9.00	8.471	0.280	0.53	10.1124	0.38	0.91		0.06	0.28
2018	11.13	8.762	5.607	2.37	28.1961	0.67	3.04		0.21	5.61
2019	7.29	7.328	0.001	0.03	2.1609	0.76	0.80		0.00	0.00
	8.088		**1.267**	**0.88**	**0.82**	**6.46**	**7.91**	**0.96**	**9.49**	**8.02**
										1.27
									NRMSE (as %)	**15.66**

Overall, the trend between simulated and observed values is similar.



Good performance of the model!

Food and Agriculture Organization of the United Nations

Calibration and validation of AquaCrop model

Step 1. You first **calibrate** in one location (Soroca) and **validate** against others (Chisinau and Cahul)

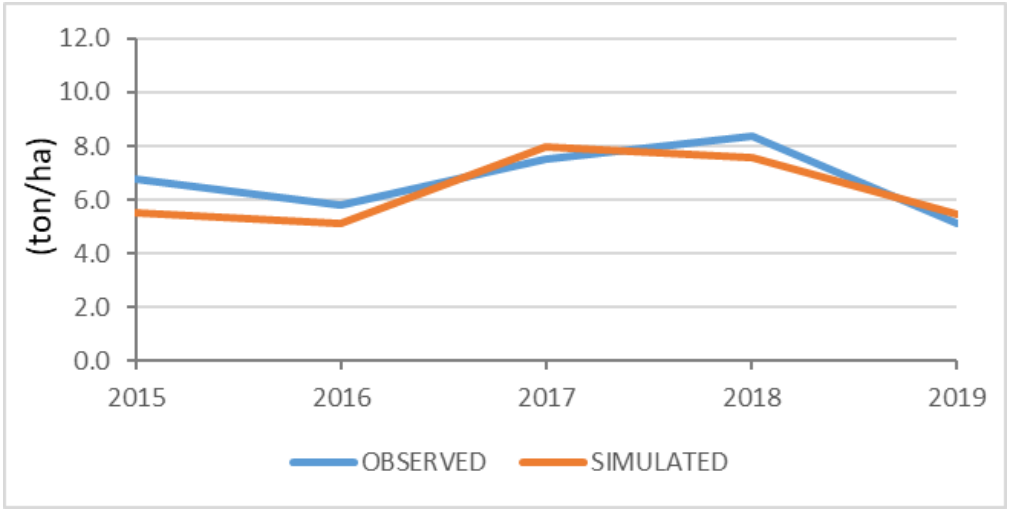
VALIDATION (Cahul)

Here we introduce the observed values in the field and the simulated values from AquaCrop!

SHORT CYCLE VARIETIES (MAIZE)										
Maize (South Moldova) - Cahul - 22 May										
	OBSERVED	SIMULATED	RMSE	MAE	EF	I *Pi-Oave* I	I *Oi-Oave* I	d	MAPE	Difference
2015	6.78	5.544	1.528	1.24	0.9216	1.18	1.18		0.18	1.53
2016	5.81	5.114	0.484	0.70	0.0001	1.61	1.61		0.12	0.48
2017	7.54	7.949	0.167	0.41	2.9584	1.23	1.23		0.05	0.17
2018	8.36	7.576	0.615	0.78	6.4516	0.85	0.85		0.09	0.61
2019	5.13	5.447	0.100	0.32	0.4761	1.28	1.28		0.06	0.10
	6.724		**0.761**	**0.69**	**0.73**	**6.14**	**6.14**	**0.98**	**10.24**	**2.89**
										0.76
									NRMSE (as %)	**11.32**

Good performance of the model!

Overall, the trend between simulated and observed values is similar.



Thank you!

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