

Table S1. Winter and summer types and humidity regimes as defined by Papadakis (1966)

a) Winter

Type of winter		tminabs coldest month (°C)	tmin coldest month (°C)	Tmax coldest month (°C)
Ec	Equatorial	>7	> 18	
Tp	Warm Tropical	>7	13 to 18	>21
tP	Mid Tropical	>7	8 to 13	> 21
tp	Cool Tropical	>7		< 21
Ct	Tropical Citrus	-2.5 to 7	>8	> 21
Ci	Citrus	-2.5 to 7		10 to 21
Av	Warm Avena	-10 to -2.5	>-4	> 10
av	Cool Avena	>-10		5 to 10
Tv	Triticum Avena	-29 to -10		>5
Ti	Warm Triticum	>-29		0 to 5
ti	Cool Triticum	>-29		<0
Pr	Warm Spring	< -29		>-17.8
pr	Cool Spring	<-29		<-17.8

b) Summer

Type of summer		xGS [x] (months)	Average Tmax of n warmest months [n] (°C)	Tmax warmest month (°C)	Tmin warmest month (°C)	Average tmin of 2 warmest months (°C)
G	Warm Gossypium	> 4. 5 [min]	> 25 [6]	>33.5		
g	Cool Gossypium	4 5 [min]	>25 [6]	<33.5	>20	
C	Coffea	= 12 [rnin]	> 21 [6]	<33.5	<20	
O	Oryza	>4 [A]	21-25 [6]			
M	Maize	>4.5 [A]	> 21 [6]			
T	Warm Triticum	>4.5 [A]	< 21 [6] and > 17 [4]			
t	Cool Triticum	2.5 to 4.5[A]	> 17 [4]			
P	Warm Polar	<2.5[A]	> 10 [4]			>5
p	Cool Polar	>2.5[A]	< 6 [2]			
F	Warm Frigid		<6 [2]	> 0		
f	Cool Frigid			<0		
A	Warm Andino-Alpine	< 2.5 [A]	> 10 [4]			
a	Cool Andino-Alpine	< 1 [M]	< 10 [4]			

c) Humidity

Humidity regime	Subtype	Criteria
Humid		$I_h > 1$; $L_n > 0.2 \cdot ETP$
HU	Permanently humid	All months are humid
Hu	Humid	One or more months are not humid
Mediterranean		Not humid. Winter rainfall > summer rainfall. If summer is G, july must be dry. Latitude > 20°, otherwise monsoon.
ME	Humid Mediterranean	$L_n > 0.2 \cdot ETP$ or $I_h > 0.88$
Me	Dry Mediterranean	$L_n < 0.2 \cdot ETP$; $0.22 < I_h < 0.88$; one or more months are warm ($T_{max} > 15\text{ °C}$) and humid (available water > ETP).
Me	Semi-arid Mediterranean	Too dry to be Me.
Definitions:		
Yearly humidity index: $I_h = P / ETP$ (P = yearly precipitation; ETP = yearly evapotranspiration).		
Rainwash index: $L_n = \text{sum of the balance } (P_m - ETP_m) \text{ over the 12 months, if } P_m > ETP_m$ ($P_m = \text{monthly } P$; $ETP = \text{monthly } ETP$).		
Humid month: $P_m + VR_m > ETP_m$ ($VR_m = \text{monthly variation of the soil water reservoir}$).		
Dry month: $P_m + VR_m < 0.5 \cdot ETP_m$		

Table S2. List of agroclimatic categories that each of the target crops can withstand.

Accepted categories	Alfalfa	Almond	Olive	Barley	Orange
Summer type	G	G	G	A	C
	g	g	g	G	G
	M	M	M	g	g
	O	O	O	M	
	T			O	
	t			P	
				T	
				t	
Winter type	Av	Av	Av	Av	Ci
	av	Ci	av	av	Ct
	Ci	Ct	Ci	Ci	
	Tv		Tv	Tv	
	Ti		Ti		
Humidity regime	hu	hu	hu	hu	hu
	Hu	Hu	Hu	Hu	Hu
	ME	ME	ME	ME	
		Me	Me	Me	

Table S3. K_c constants used to calculate water requirements for each crop and month of the year.

K_c	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Alfalfa			0.4	0.95	0.9	0.4	1.2	0.4	1.2	1.15		
Almond	0	0	0	0.42	0.52	0.56	0.61	0.61	0.61	0.54	0	0
Olive	0.5	0.5	0.65	0.6	0.55	0.5	0.45	0.45	0.55	0.6	0.65	0.5
Barley	0.85	1	1.15	0.85	0.55	0.25					0.3	0.6
Orange	0.66	0.65	0.66	0.62	0.55	0.62	0.68	0.79	0.74	0.84	0.73	0.63

Table S6. Irrigated and non-irrigated area of cultivation of each of the five target crops (ha) and fraction of the total arable land of Catalonia (%) according to the 2018 official records.

	Irrigated (ha)	Non-irrigated (ha)	Total (ha)	% DUN2019
Alfalfa	20,899.14	11,856.86	32,756.00	4.5
Almond	8,588.81	24,680.06	33,268.87	4.6
Olive	20,962.77	65,874.48	86,837.25	12.0
Barley	30,699.64	140,370.92	171,070.55	23.6
Orange	1,700.12	2.73	1,702.85	0.2
Subtotal	82,850.48	242,785.05	325,635.52	44.9
Other (148 crops)	165,468.56	233,453.49	398,922.05	55.1
TOTAL DUN2019	248,319.03	476,238.54	724,557.57	100.0

Table S7. Gross irrigation needs (hm³) of the plots that contain one of the five target crops as of 2018 considering the climate conditions of the baseline and 2031-50 scenarios.

	Alfalfa	Almond	Olive	Barley	Orange	Total
1971-00						
Interior	121.30	29.26	56.51	64.55	0.03	272.07
Littoral	11.87	2.74	18.71	8.57	9.07	51.08
Pyrenees	4.24	0.07	0.04	2.30	0.00	6.65
Subtotal	137.42	32.07	75.26	75.42	9.10	329.27
2031-50						
Interior	137.01	33.94	66.62	74.38	0.03	312.46
Littoral	14.41	3.39	23.88	10.99	10.77	63.58
Pyrenees	5.03	0.09	0.06	2.78	0.00	7.95
Subtotal	156.45	37.42	90.56	88.14	10.81	383.38