

Supplementary Information

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Table S1. Expanses of suitable area and mean suitability in Portugal and five focal areas for the baseline period, and three future predictions under SSP3-7.0 with irrigation continuing unchanged. Changes (relative to the baseline with irrigation) are shown, too.

Area	Period	Suitable Area (km²)	Area Change (%)	Mean Suitability	Suitability Change (%)
<i>Portugal</i>	1981—2010	36,081	n/a	0.659	n/a
	2011—2040	36,626	1.51	0.637	-3.36
	2041—2070	28,889	-19.93	0.599	-9.11
	2071—2100	30,573	-15.27	0.618	-6.24
<i>Região Norte</i>	1981—2010	12,467	n/a	0.730	n/a
	2011—2040	12,748	2.25	0.658	-9.80
	2041—2070	7,267	-41.71	0.560	-23.23
	2071—2100	5,627	-54.86	0.587	-19.53
<i>Douro Wine Region</i>	1981—2010	2,399	n/a	0.883	n/a
	2011—2040	2,139	-10.84	0.679	-23.14
	2041—2070	1,133	-52.77	0.560	-36.58
	2071—2100	1,267	-47.19	0.601	-31.98
<i>Região Centro</i>	1981—2010	12,328	n/a	0.663	n/a
	2011—2040	10,682	-13.35	0.645	-2.70
	2041—2070	6,841	-44.51	0.697	5.13
	2071—2100	7,237	-41.30	0.753	13.49
<i>Baixo Alentejo</i>	1981—2010	1,245	n/a	0.483	n/a
	2011—2040	1,947	56.39	0.604	25.04
	2041—2070	1,648	32.37	0.484	0.33
	2071—2100	1,551	24.58	0.479	-0.77
<i>Algarve</i>	1981—2010	683	n/a	0.530	n/a
	2011—2040	1,278	87.12	0.597	12.63
	2041—2070	1,474	115.81	0.555	4.86
	2071—2100	2,229	226.35	0.546	3.12

Table S2. Expanses of suitable area and mean suitability in Portugal and five focal areas for the baseline period, and three future predictions under SSP3-7.0 with irrigation being stopped. Changes (relative to the baseline with irrigation) are shown, too.

Area	Period	Suitable Area (km ²)	Area Change (%)	Mean Suitability	Suitability Change (%)
<i>Portugal</i>	1981—2010	11,512	-68.09	0.594	-9.76
	2011—2040	10,215	-71.69	0.529	-19.70
	2041—2070	10,832	-69.98	0.538	-18.32
	2071—2100	13,409	-62.84	0.587	-10.86
<i>Região Norte</i>	1981—2010	4,721	-62.13	0.616	-15.61
	2011—2040	1,973	-84.17	0.479	-34.43
	2041—2070	617	-95.05	0.505	-30.82
	2071—2100	976	-92.17	0.499	-31.65
<i>Douro Wine Region</i>	1981—2010	2,076	-13.46	0.669	-24.27
	2011—2040	814	-66.07	0.478	-45.93
	2041—2070	224	-90.66	0.507	-42.58
	2071—2100	346	-85.58	0.516	-41.59
<i>Região Centro</i>	1981—2010	4,510	-63.42	0.617	-7.04
	2011—2040	4,343	-64.77	0.551	-16.92
	2041—2070	4,401	-64.30	0.584	-11.94
	2071—2100	5,608	-54.51	0.682	2.86
<i>Baixo Alentejo</i>	1981—2010	42	-96.63	0.395	-18.23
	2011—2040	628	-49.56	0.512	5.97
	2041—2070	829	-33.41	0.430	-10.92
	2071—2100	964	-22.57	0.441	-8.65
<i>Algarve</i>	1981—2010	36	-94.73	0.436	-17.64
	2011—2040	173	-74.67	0.433	-18.28
	2041—2070	237	-65.30	0.421	-20.53
	2071—2100	283	-58.57	0.414	-21.85

Table S3. Expanses of suitable area and mean suitability in Portugal and five focal areas for the baseline period, and three future predictions under SSP5-8.5 with irrigation continuing unchanged. Changes (relative to the baseline with irrigation) are shown, too.

Area	Period	Suitable Area (km ²)	Area Change (%)	Mean Suitability	Suitability Change (%)
<i>Portugal</i>	1981—2010	36,081	n/a	0.659	n/a
	2011—2040	29,763	-17.51	0.626	-4.92
	2041—2070	30,218	-16.25	0.602	-8.66
	2071—2100	37,727	4.56	0.635	-3.67
<i>Região Norte</i>	1981—2010	12,467	n/a	0.730	n/a
	2011—2040	11,136	-10.68	0.657	-9.95
	2041—2070	7,548	-39.46	0.570	-21.91
	2071—2100	6,450	-48.26	0.605	-17.14
<i>Douro Wine Region</i>	1981—2010	2,399	n/a	0.883	n/a
	2011—2040	2,156	-10.13	0.672	-23.88
	2041—2070	1,042	-56.57	0.580	-34.34
	2071—2100	1,822	-24.05	0.596	-32.52
<i>Região Centro</i>	1981—2010	12,328	n/a	0.663	n/a
	2011—2040	9,165	-25.66	0.632	-4.72
	2041—2070	6,831	-44.59	0.697	5.05
	2071—2100	10,113	-17.97	0.711	7.20
<i>Baixo Alentejo</i>	1981—2010	1,245	n/a	0.483	n/a
	2011—2040	1,602	28.67	0.558	15.51
	2041—2070	1,559	25.22	0.486	0.69
	2071—2100	2,339	87.87	0.505	4.68
<i>Algarve</i>	1981—2010	683	n/a	0.530	n/a
	2011—2040	778	13.90	0.595	12.23
	2041—2070	1,859	172.18	0.580	9.40
	2071—2100	2,508	267.20	0.537	1.42

Table S4. Expanses of suitable area and mean suitability in Portugal and five focal areas for the baseline period, and three future predictions under SSP5-8.5 with irrigation being stopped. Changes (relative to the baseline with irrigation) are shown, too.

Area	Period	Suitable Area (km²)	Area Change (%)	Mean Suitability	Suitability Change (%)
<i>Portugal</i>	1981—2010	11,512	-68.09	0.594	-9.76
	2011—2040	7,373	-79.57	0.507	-23.11
	2041—2070	11,079	-69.29	0.528	-19.86
	2071—2100	21,071	-41.60	0.582	-11.70
<i>Região Norte</i>	1981—2010	4,721	-62.13	0.616	-15.61
	2011—2040	1,700	-86.36	0.470	-35.51
	2041—2070	689	-94.47	0.502	-31.18
	2071—2100	2,012	-83.84	0.523	-28.31
<i>Douro Wine Region</i>	1981—2010	2,076	-13.46	0.669	-24.27
	2011—2040	855	-64.36	0.477	-45.99
	2041—2070	231	-90.37	0.566	-35.92
	2071—2100	523	-78.20	0.487	-44.87
<i>Região Centro</i>	1981—2010	4,510	-63.42	0.617	-7.04
	2011—2040	3,507	-71.55	0.527	-20.57
	2041—2070	4,303	-65.10	0.569	-14.25
	2071—2100	8,541	-30.72	0.654	-1.41
<i>Baixo Alentejo</i>	1981—2010	42	-96.63	0.395	-18.23
	2011—2040	315	-74.70	0.430	-10.99
	2041—2070	676	-45.70	0.434	-10.11
	2071—2100	1,679	34.86	0.471	-2.52
<i>Algarve</i>	1981—2010	36	-94.73	0.436	-17.64
	2011—2040	110	-83.89	0.450	-15.02
	2041—2070	398	-41.73	0.436	-17.65
	2071—2100	300	-56.08	0.426	-19.61

Table S5. 25th, 50th, and 75th percentiles across Portugal of the six climate variables, growing season (10 °C) heat sum, minimum and maximum temperature (TMIN and TMAX), GSHS, and the precipitation in spring, summer, and fall (PSpring, PSummer, PFall), for the baseline (1981—2010) and three future periods spanning from 2011 to 2100 under SSP3-7.0.

Variable	Percentile	1981—2010	2011—2040	2041—2070	2071—2100
TMIN (°C)	25	2.5	3.2	4.0	5.4
	50	4.7	5.3	6.2	7.3
	75	5.8	6.3	7.3	8.4
TMAX (°C)	25	26.8	28.6	30.5	31.8
	50	28.8	30.8	33.0	34.4
	75	31.4	32.8	34.9	36.2
GSHS (°C)	25	1,629	1,927	2,238	2,828
	50	2,082	2,362	2,658	3,220
	75	2,375	2,664	2,979	3,569
PSpring (mm)	25	172	143	145	131
	50	200	169	173	157
	75	280	240	252	230
PSummer (mm)	25	68	65	59	56
	50	91	90	82	80
	75	139	137	124	123
PFall (mm)	25	123	118	90	86
	50	149	140	106	104
	75	218	199	152	157

Table S6. 25th, 50th, and 75th percentiles across Portugal of the six climate variables, growing season (10 °C) heat sum, minimum and maximum temperature (TMIN and TMAX), and the precipitation in spring, summer, and fall (PSpring, PSummer, PFall), for the baseline (1981—2010) and three future periods spanning from 2011 to 2100 under SSP5-8.5.

Variable	Percentile	1981—2010	2011—2040	2041—2070	2071—2100
TMIN (°C)	25	2.5	2.9	4.3	6.2
	50	4.7	4.9	6.2	8.1
	75	5.8	6.1	7.2	9.3
TMAX (°C)	25	26.8	28.6	30.8	33.0
	50	28.8	30.8	33.2	35.7
	75	31.4	32.8	35.0	37.9
GSHS (°C)	25	1,629	1,895	2,389	3,258
	50	2,082	2,300	2,797	3,594
	75	2,375	2,606	3,121	3,973
PSpring (mm)	25	172	154	135	124
	50	200	182	161	150
	75	280	263	239	222
PSummer (mm)	25	68	61	57	57
	50	91	87	84	84
	75	139	136	131	131
PFall (mm)	25	123	113	94	68
	50	149	131	111	85
	75	218	182	160	126

Table S7. 25th, 50th, and 75th percentiles in Região Norte of the six climate variables, growing season (10 °C) heat sum, minimum and maximum temperature (TMIN and TMAX), and the precipitation in spring, summer, and fall (PSpring, PSummer, PFall), for the baseline (1981—2010) and three future periods spanning from 2011 to 2100 under SSP3-7.0.

Variable	Percentile	1981—2010	2011—2040	2041—2070	2071—2100
TMIN (°C)	25	0.9	1.7	2.1	3.8
	50	1.7	2.5	3.0	4.6
	75	2.9	3.7	4.4	5.7
TMAX (°C)	25	25.4	27.2	29.1	30.6
	50	26.6	28.8	31.5	33.2
	75	27.9	30.5	33.4	35.1
GSHS (°C)	25	1,249	1,526	1,821	2,375
	50	1,490	1,787	2,101	2,686
	75	1,722	2,019	2,332	2,926
PSpring (mm)	25	209	177	188	173
	50	321	282	298	274
	75	419	375	392	360
PSummer (mm)	25	123	121	110	110
	50	167	165	151	151
	75	203	202	185	182
PFall (mm)	25	181	167	125	128
	50	268	247	193	193
	75	333	302	240	240

Table S8. 25th, 50th, and 75th percentiles in Região Norte of the six climate variables, growing season (10 °C) heat sum, minimum and maximum temperature (TMIN and TMAX), and the precipitation in spring, summer, and fall (PSpring, PSummer, PFall), for the baseline (1981—2010) and three future periods spanning from 2011 to 2100 under SSP5-8.5.

Variable	Percentile	1981—2010	2011—2040	2041—2070	2071—2100
TMIN (°C)	25	0.9	1.2	2.4	4.3
	50	1.7	2.0	3.3	5.3
	75	2.9	3.3	4.7	6.6
TMAX (°C)	25	25.4	27.2	29.4	31.8
	50	26.6	28.8	31.6	35.0
	75	27.9	30.5	33.5	37.0
GSHS (°C)	25	1,249	1,508	1,970	2,807
	50	1,490	1,761	2,253	3,131
	75	1,722	1,978	2,485	3,370
PSpring (mm)	25	209	194	179	169
	50	321	306	285	269
	75	419	410	378	348
PSummer (mm)	25	123	119	118	118
	50	167	165	161	161
	75	203	203	194	194
PFall (mm)	25	181	148	132	105
	50	268	221	200	160
	75	333	276	246	195

Table S9. 25th, 50th, and 75th percentiles in the Douro wine region of the six climate variables, growing season (10 °C) heat sum, minimum and maximum temperature (TMIN and TMAX), and the precipitation in spring, summer, and fall (PSpring, PSummer, PFall), for the baseline (1981—2010) and three future periods spanning from 2011 to 2100 under SSP3-7.0.

Variable	Percentile	1981—2010	2011—2040	2041—2070	2071—2100
TMIN (°C)	25	1.5	2.3	2.9	4.5
	50	2.0	2.8	3.5	4.9
	75	2.5	3.3	4.1	5.4
TMAX (°C)	25	27.7	30.4	33.3	35.0
	50	28.6	31.3	34.2	35.9
	75	29.5	32.2	35.1	36.8
GSHS (°C)	25	1,505	1,837	2,184	2,813
	50	1,691	2,035	2,388	3,034
	75	1,897	2,252	2,615	3,290
PSpring (mm)	25	148	124	131	120
	50	168	142	150	137
	75	201	172	182	167
PSummer (mm)	25	88	86	79	78
	50	96	94	86	85
	75	107	105	96	95
PFall (mm)	25	130	121	89	93
	50	144	134	99	103
	75	167	155	117	119

Table S10. 25th, 50th, and 75th percentiles in the Douro wine region of the six climate variables, growing season (10 °C) heat sum, minimum and maximum temperature (TMIN and TMAX), and the precipitation in spring, summer, and fall (PSpring, PSummer, PFall), for the baseline (1981—2010) and three future periods spanning from 2011 to 2100 under SSP5-8.5.

Variable	Percentile	1981—2010	2011—2040	2041—2070	2071—2100
TMIN (°C)	25	1.5	1.9	3.2	5.2
	50	2.0	2.4	3.8	5.8
	75	2.5	2.8	4.4	6.4
TMAX (°C)	25	27.7	30.3	33.3	37.0
	50	28.6	31.2	34.2	37.8
	75	29.5	32.1	35.1	38.7
GSHS (°C)	25	1,505	1,825	2,352	3,326
	50	1,691	2,019	2,560	3,562
	75	1,897	2,233	2,789	3,828
PSpring (mm)	25	148	135	124	117
	50	168	155	142	134
	75	201	188	174	162
PSummer (mm)	25	88	85	84	84
	50	96	93	92	92
	75	107	104	102	102
PFall (mm)	25	130	108	95	76
	50	144	119	105	84
	75	167	137	123	98

Table S11. 25th, 50th, and 75th percentiles in Região Centro of the six climate variables, growing season (10 °C) heat sum, minimum and maximum temperature (TMIN and TMAX), and the precipitation in spring, summer, and fall (PSpring, PSummer, PFall), for the baseline (1981—2010) and three future periods spanning from 2011 to 2100 under SSP3-7.0.

Variable	Percentile	1981—2010	2011—2040	2041—2070	2071—2100
TMIN (°C)	25	2.4	3.1	3.8	5.2
	50	3.7	4.3	5.2	6.4
	75	5.0	5.5	6.5	7.6
TMAX (°C)	25	26.7	28.4	30.2	31.6
	50	28.0	30.0	32.3	33.8
	75	29.2	31.5	34.2	35.8
GSHS (°C)	25	1,566	1,867	2,180	2,771
	50	1,861	2,147	2,452	3,042
	75	2,065	2,343	2,641	3,222
PSpring (mm)	25	206	173	180	165
	50	255	217	226	206
	75	303	260	272	249
PSummer (mm)	25	100	100	90	87
	50	121	121	109	106
	75	146	144	130	128
PFall (mm)	25	159	148	112	112
	50	192	175	134	135
	75	230	210	161	166

Table S12. 25th, 50th, and 75th percentiles in Região Centro of the six climate variables, growing season (10 °C) heat sum, minimum and maximum temperature (TMIN and TMAX), and the precipitation in spring, summer, and fall (PSpring, PSummer, PFall), for the baseline (1981—2010) and three future periods spanning from 2011 to 2100 under SSP5-8.5.

Variable	Percentile	1981—2010	2011—2040	2041—2070	2071—2100
TMIN (°C)	25	2.4	2.7	4.2	6.1
	50	3.7	4.0	5.4	7.3
	75	5.0	5.3	6.5	8.5
TMAX (°C)	25	26.7	28.4	30.5	32.8
	50	28.0	30.0	32.5	35.4
	75	29.2	31.4	34.2	37.7
GSHS (°C)	25	1,566	1,839	2,333	3,208
	50	1,861	2,091	2,600	3,452
	75	2,065	2,275	2,785	3,649
PSpring (mm)	25	206	189	168	158
	50	255	238	213	196
	75	303	286	259	239
PSummer (mm)	25	100	97	92	92
	50	121	119	112	112
	75	146	143	136	136
PFall (mm)	25	159	135	118	92
	50	192	160	140	108
	75	230	192	169	133

Table S13. 25th, 50th, and 75th percentiles in Baixo Alentejo of the six climate variables, growing season (10 °C) heat sum, minimum and maximum temperature (TMIN and TMAX), and the precipitation in spring, summer, and fall (PSpring, PSummer, PFall), for the baseline (1981—2010) and three future periods spanning from 2011 to 2100 under SSP3-7.0.

Variable	Percentile	1981—2010	2011—2040	2041—2070	2071—2100
TMIN (°C)	25	5.1	5.7	6.7	7.7
	50	5.3	5.9	6.9	7.9
	75	5.5	6.1	7.1	8.1
TMAX (°C)	25	31.3	32.1	33.5	34.5
	50	31.8	33.1	34.9	35.9
	75	32.5	33.8	35.8	36.9
GSHS (°C)	25	2,382	2,646	2,938	3,449
	50	2,498	2,807	3,157	3,729
	75	2,605	2,931	3,310	3,906
PSpring (mm)	25	152	126	125	110
	50	161	134	133	118
	75	174	145	143	126
PSummer (mm)	25	53	51	46	44
	50	57	55	50	48
	75	63	61	55	53
PFall (mm)	25	104	104	81	74
	50	111	111	87	80
	75	121	121	94	86

Table S14. 25th, 50th, and 75th percentiles in Baixo Alentejo of the six climate variables, growing season (10 °C) heat sum, minimum and maximum temperature (TMIN and TMAX), and the precipitation in spring, summer, and fall (PSpring, PSummer, PFall), for the baseline (1981—2010) and three future periods spanning from 2011 to 2100 under SSP5-8.5.

Variable	Percentile	1981—2010	2011—2040	2041—2070	2071—2100
TMIN (°C)	25	5.1	5.4	6.6	8.6
	50	5.3	5.7	6.8	8.8
	75	5.5	5.9	7.0	9.0
TMAX (°C)	25	31.3	32.3	33.8	35.4
	50	31.8	33.3	35.1	37.0
	75	32.5	33.9	35.9	38.4
GSHS (°C)	25	2,382	2,596	3,054	3,769
	50	2,498	2,770	3,293	4,110
	75	2,605	2,915	3,450	4,328
PSpring (mm)	25	152	132	114	106
	50	161	141	122	113
	75	174	152	131	122
PSummer (mm)	25	53	48	45	45
	50	57	51	49	49
	75	63	57	54	54
PFall (mm)	25	104	103	81	59
	50	111	111	87	64
	75	121	121	96	69

Table S15. 25th, 50th, and 75th percentiles in the Algarve of the six climate variables, growing season (10 °C) heat sum, minimum and maximum temperature (TMIN and TMAX), and the precipitation in spring, summer, and fall (PSpring, PSummer, PFall), for the baseline (1981—2010) and three future periods spanning from 2011 to 2100 under SSP3-7.0.

Variable	Percentile	1981—2010	2011—2040	2041—2070	2071—2100
TMIN (°C)	25	5.9	6.5	7.5	8.6
	50	7.1	7.8	8.8	9.8
	75	8.8	9.4	10.3	11.4
TMAX (°C)	25	27.7	28.4	29.7	30.6
	50	30.4	31.0	32.4	33.3
	75	31.6	32.1	33.6	34.4
GSHS (°C)	25	2,366	2,606	2,866	3,351
	50	2,526	2,784	3,064	3,561
	75	2,696	2,960	3,260	3,784
PSpring (mm)	25	168	140	136	119
	50	198	166	160	143
	75	222	187	179	162
PSummer (mm)	25	46	43	40	38
	50	52	49	45	43
	75	57	54	49	47
PFall (mm)	25	108	107	87	78
	50	113	112	92	83
	75	121	120	98	89

Table S16. 25th, 50th, and 75th percentiles in the Algarve of the six climate variables, growing season (10 °C) heat sum, minimum and maximum temperature (TMIN and TMAX), and the precipitation in spring, summer, and fall (PSpring, PSummer, PFall), for the baseline (1981—2010) and three future periods spanning from 2011 to 2100 under SSP5-8.5.

Variable	Percentile	1981—2010	2011—2040	2041—2070	2071—2100
TMIN (°C)	25	5.9	6.4	7.4	9.4
	50	7.1	7.6	8.7	10.7
	75	8.8	9.3	10.3	12.2
TMAX (°C)	25	27.7	28.7	29.9	31.3
	50	30.4	31.3	32.6	34.1
	75	31.6	32.4	33.7	35.3
GSHS (°C)	25	2,366	2,551	2,977	3,639
	50	2,526	2,737	3,178	3,855
	75	2,696	2,918	3,384	4,123
PSpring (mm)	25	168	142	124	116
	50	198	169	148	137
	75	222	192	167	154
PSummer (mm)	25	46	41	39	39
	50	52	46	44	44
	75	57	50	48	48
PFall (mm)	25	108	108	85	60
	50	113	114	89	64
	75	121	122	95	68