



Figure S1. The location of the study area and the field trials.

Table S1. Soil characteristics of the field during the three growing seasons.

	Year 2016–2017	Year 2017–2018	Year 2018–2019
Soil properties	0–90 cm soil depth	0–90 cm soil depth	0–90 cm soil depth
Texture	Clay	Clay	Sandy clay loam
Silt (%)	25	25	22
Sand (%)	31	29	45
Clay (%)	44	46	33
Field capacity ($\text{cm}^3 \text{cm}^{-3}$)	0.41	0.403	0.33
Wilting point ($\text{cm}^3 \text{cm}^{-3}$)	0.22	0.277	0.2
Saturation ($\text{cm}^3 \text{cm}^{-3}$)	0.52	0.487	0.45
pH	8	7.4	8.27
ECe (dS m^{-1})	0.43	0.17	0.167

Table S2. Experimental details and dates of the main phenological stages for durum wheat during the growing seasons 2016–2017, 2017–2018 and 2018–2019. In brackets the days after sowing (DAS) are reported.

	Durum wheat		
Season	2016–2017	2017–2018	2018–2019
Sowing	28-Nov-16	04-Dec-18	07-Nov-18
Booting	18 April 2017 (141)	29-03-2018 (115)	03-03-2019 (116)
Flowering	8 May 2017 (161)	15-04-2018 (132)	28-04-2019 (172)
Grain filling (milk stage)	10 May 2017 (163)	25-04-2018 (142)	10-05-2019 (184)
Harvesting	5 July 2017 (219)	12-06-2018 (190)	19-06-2019 (224)
Length of crop cycle (days)	219	190	224

Table S3. List of Sentinel 2 acquisition dates.

2016–2017	2018–2019
12/12/16	22/11/18
1/1/17	17/12/2018
10/2/17	21/1/2019
20/2/2017	5/2/19
11/4/17	12/3/19
21/4/2017	11/4/19
11/5/17	1/5/19
31/5/2017	11/5/19
10/6/17	21/5/2019
30/6/2017	10/6/19

Table S4. Simulation results for the seasons 2016–2017 and 2018–2019 and deviation from measured values after assimilating S2-CC.

Variables		2016–2017-assimilated S2-CC			2018–2019-assimilated S2-CC		
		Measured	Simulated	% of deviation	Measured	Simulated	% of deviation
Biomass (t.ha ⁻¹)	I-100	10.73	10.56	−1.58	14.98	15.18	1.32
	I-50	—	—	—	14.22	14.71	3.45
	I-rainfed	8.43	7.65	−9.25	12.19	14.45	18.56
Yield (t.ha ⁻¹)	I-100	3.62	3.82	5.52	5.27	5.23	−0.76
	I-50	—	—	—	4.78	5.01	4.85
	I-rainfed	2.46	2.04	−17.07	4.26	4.78	12.17
Canopy cover—CC (%)	I-100	82	80.9	−1.34	77.33	78.8	1.9
	I-50	—	—	—	77.02	76.4	−0.8
	I-rainfed	80.2	75.7	−5.61	76.89	75.9	−1.29