

Supplementary Materials: Exploitation of SAR and optical Sentinel data to detect rice crop and estimate seasonal dynamics of leaf area index

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Table S1. Recap of available optical remote sensing data over each study area during the 2016 rice season and the correspondent phenological phases (min-max according to BBCH scale) when available from field surveys. Orange (blue) cells indicate typical phases for first (second) top-dressing fertilization. Gray cells indicate the sowing period as indicated by farmers. Path/Row for Landsat images are 199/33 and 198/33 for Spain, 194/29 for Italy and 184/32 in Greece. Sentinel-2A tiles are T30SYJ, T32TMR and T34TFL for Spain, Italy and Greece respectively.

ERMES 2016 EP_L4 (HR LAI Images) and BBCH											
Spain				Italy				Greece			
DOY	Date	BBCH	Sensor	DOY	Date	BBCH	Sensor	DOY	Date	BBCH	Sensor
137	16-may	/	L7	110	19-apr	/	L8	128	07-may	/	L7
142	21-may	/	S2A	113	22-apr	/	S2A	135	14-may	/	S2A
145	24-may	/	L8	118	27-apr	/	L7	136	15-may	/	L8
146	25-may	/	L7	142	21-may	0-13	L8	144	23-may	/	L7
154	02-jun	11-12	L8	143	22-may	/	S2A	145	24-may	/	S2A
161	09-jun	12-15	L8	158	06-jun	0-15	L8	152	31-may	/	L8
162	10-jun	/	S2A	166	14-jun	0-23	L7	168	16-jun	13	L8
169	17-jun	13-17	L7	173	21-jun	/	S2A	175	23-jun	/	S2A
170	18-jun	/	L8	174	22-jun	14-29	L8	176	24-jun	/	L7
172	20-jun	16-21	S2A	182	30-jun	/	L7	184	02-jul	21	L8
177	25-jun	/	L8	183	01-jul	23-32	S2A	185	03-jul	/	S2A
178	26-jun	23-27	L7	193	11-jul	/	S2A	192	10-jul	23-30	L7
185	03-jul	/	L7	198	16-jul	29-51	L7	195	13-jul	/	S2A
186	04-jul	25-28	L8	203	21-jul	/	S2A	200	18-jul	29-37	L8
192	10-jul	/	S2A	213	31-jul	34-69	S2A	205	23-jul	/	S2A
193	11-jul	/	L8	214	01-ago	/	L7	215	02-ago	41-43	S2A
194	12-jul	31-39	L7	223	10-ago	41-77	S2A	216	03-ago	/	L8
201	19-jul	39-42	L7	230	17-ago	/	L7	224	11-ago	51-55	L7
209	27-jul	/	L8	238	25-ago	/	L8	225	12-ago	/	S2A
210	28-jul	49-57	L7	246	02-sep	/	L7	235	22-ago	/	S2A
212	30-jul	/	S2A	253	09-sep	/	S2A	240	27-ago	/	L7
217	04-ago	51-71	L7	254	10-sep	/	L8	245	01-sep	/	S2A
222	09-ago	/	S2A	263	19-sep	/	S2A	248	04-sep	/	L8
225	12-ago	/	L8	270	26-sep	/	L8	255	11-sep	/	S2A
226	13-ago	/	L7	273	29-sep	/	S2A	264	20-sep	/	L8
232	19-ago	/	S2A	278	04-Oct	/	L7	272	28-sep	/	L7

233	20-ago	/	L7	286	12-Oct	/	L8	275	01-Oct	/	S2A
241	28-ago	/	L8	/	/	/	/	288	14-Oct	/	L7
242	29-ago	/	S2A	/	/	/	/	/	/	/	/
242	29-ago	/	L7	/	/	/	/	/	/	/	/
249	05-sep	/	L7	/	/	/	/	/	/	/	/
250	06-sep	/	L8	/	/	/	/	/	/	/	/
252	08-sep	/	S2A	/	/	/	/	/	/	/	/
257	13-sep	/	L8	/	/	/	/	/	/	/	/
262	18-sep	/	S2A	/	/	/	/	/	/	/	/
265	21-sep	/	L7	/	/	/	/	/	/	/	/
274	30-sep	/	L7	/	/	/	/	/	/	/	/
281	07-Oct	/	L7	/	/	/	/	/	/	/	/
282	08-Oct	/	S2A	/	/	/	/	/	/	/	/
290	16-Oct	/	L8	/	/	/	/	/	/	/	/

Table S2. Confusion matrices related to rice crop maps.

Italy			
	Classification RICE	Classification NOT RICE	Producer's Accuracy
Reference RICE	1639	194	89.4
Reference NOT RICE	157	1237	88.7
User's accuracy	91.3	86.4	

Greece			
	Classification RICE	Classification NOT RICE	Producer's Accuracy
Reference RICE	7812	369	95.5
Reference NOT RICE	143	7364	98.1
User's accuracy	98.2	95.2	

Spain			
	Classification RICE	Classification NOT RICE	Producer's Accuracy
Reference RICE	21606	186	99.1
Reference NOT RICE	9	7367	99.9
User's accuracy	100.0	97.5	

Table S3. Statistical indicators where y_i and y_i^* are the ground measurements and the Sentinel-2 estimates respectively, whereas $\bar{y}_i$ and $\bar{y}_i^*$ are their mean values.

Metrics	
Root Mean Squared Error	$RMSE = \sqrt{\frac{1}{N} \sum_{i=1}^N (y_i - y_i^*)^2}$
Mean Error	$ME = \frac{1}{N} \sum_{i=1}^N (y_i - y_i^*)$

Mean Absolute Error	$ME = \frac{1}{N} \sum_{i=1}^N y_i - y_i^* $
Coefficient of correlation	$r = \frac{\sum_{i=1}^N (y_i - \bar{y}_i)(y_i^* - \bar{y}_i^*)}{\sqrt{(\sum_{i=1}^N (y_i - \bar{y}_i)^2)} \sqrt{(\sum_{i=1}^N (y_i^* - \bar{y}_i^*)^2)}}$



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