# Water Saving in the Semi-Arid Doukkala Irrigation Scheme (Western Morocco)

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#### OUTLINE



#### Introduction & Background

#### Objectives

1

2

3

5

#### **CROP WATER DEMAND (CWD):**

- Data acquisition
- Methodology
- Results and Discussion

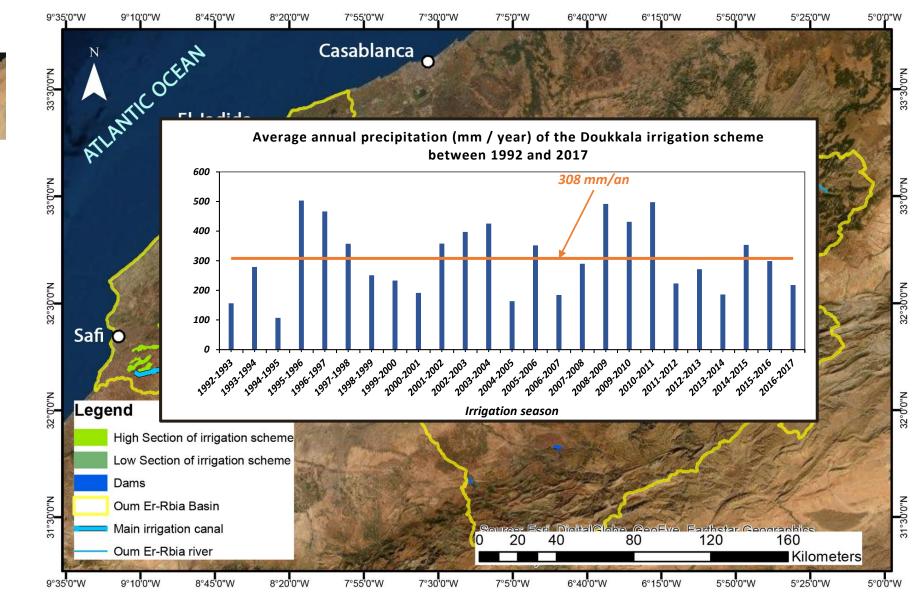
#### In season crop mapping (ICM):

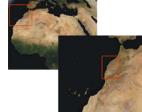
- Data acquisition
- Methodology
- Results and Discussion

#### Conclusions



#### INTRODUCTION & BACKGROUND





#### INTRODUCTION & BACKGROUND

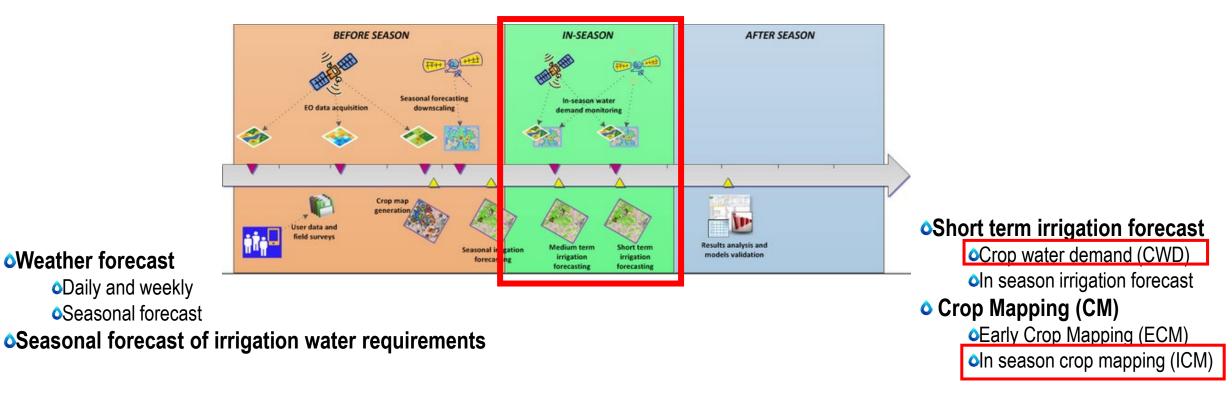




# **OBJECTIVES**

The main objective of the work is to put in place and demonstrate at the real scale of application an information platform devoted to decision-makersto facilitate planning of irrigation water resources, with the aim of:

- Saving water;
- Improving services to farmers;
- Manage and reduce the risk of drought and its impact;



# CROP WATER DEMAND (CWD)



# DATA ACQUISITION

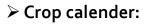
#### Agro-Meteorological data:

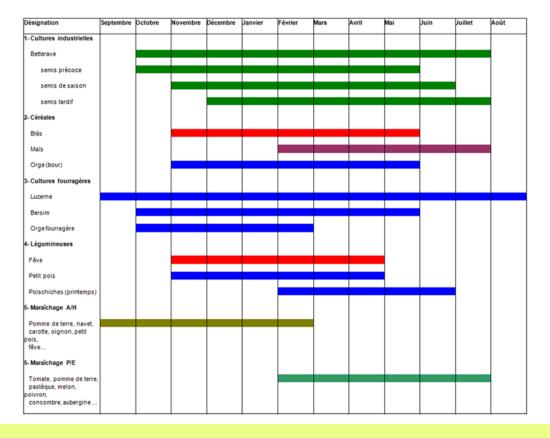
#### Hourly and daily meteorological data (data base 1991-2022)

	Temperature			Relative Humidity	/	R. Wind spee	Wind speed	Precipitation	
T <sub>max</sub> (°C)	T <sub>min</sub> (°C)	T <sub>moy</sub> (°C)	HR <sub>max</sub> (%)	HR <sub>min</sub> (%)	HR <sub>moy</sub> (%)	(MJ/m²)	(m/s)	(mm)	(mm/j)

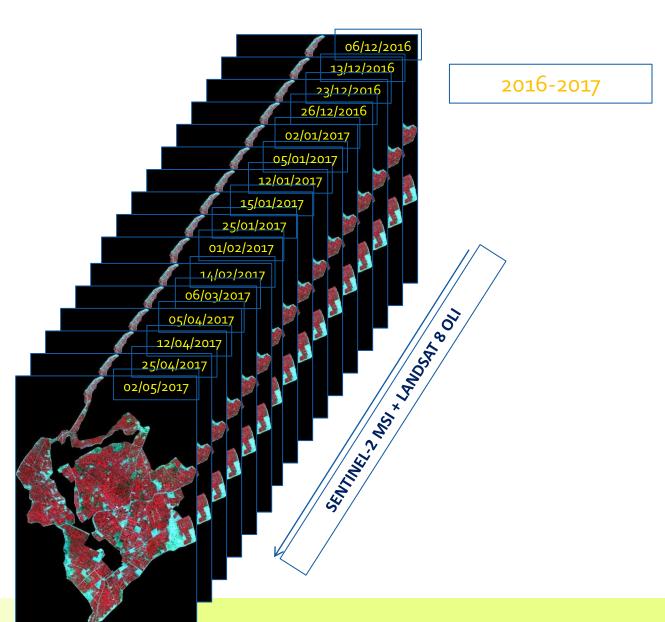
#### ➤Water allocations per quarters per CGRs

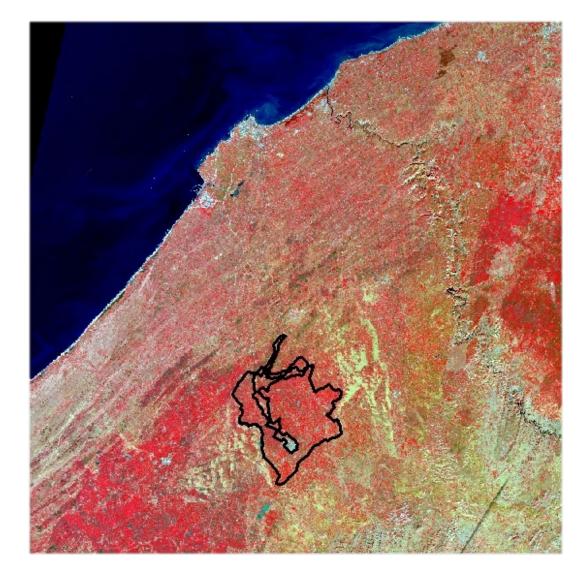
	Rá	ìles.	des	Red	evar	ICes	dlea	urd.	Irric	natio	n	
CDA	Superf, Irriguée Bet en Ha	Superf, Irriguée NBet en Ha	Superf, Irriguée Ha	CC CV	ROUN	Volum, Consomm	Redevance bett DH	Redevance nb DH	Redevance DH	RedevanceA6 bett DH	RedevanceAG nb DH	Redevance AG DH
321	1 985,9981		3 305,5991	2 506 806		3 308 034		445 803,20	1 840 590.01	50 136.12		66 160,68
322	1 487,7174						772 417,30	259 253,44	1 031 670,74	27 764,82		37 083,78
324	2 234,2901	778,4877	3 012,7778	3 368 418	930 978	4 299 396	1 874 187,74	517 996,24	2 392 183,98	67 368,36	18 619,56	85 987,92
325	1 713.3018	389,9549	2 103,2567	2 303 411	326 158	2 629 569	1 281 617.98	181 474,36	1 463 092,34	46 068,22	6 523,16	52 591.38
361	881,9819	314,6181	1 196.6000	954 828	208 332	1 163 160	449 533,01	98 082,67	547 615,68	19 096,56	4 166,64	23 263,20
362	1 622,6605	721,3243	2 343,9848	1 833 624	417 960	2 251 584	863 270,24	196 775,74	1 060 045,98	36 672,48	8 359,20	45 031,68
	11 781,7277	4 572,7250	16 354,4527	14 823 226	3 732 711	18 555 937	8 008 951,53	2 023 270,13	10 032 221,66	296 464,52	74 654,22	371 118,74
330	2 619,0128	982,3578	3 601,3706	2 537 244	705 348	3 242 592	977 346,54	271 700,03	1 249 046,57	50 744,88	14 106,96	64 851,84
331	1 886,6080	1 166,9571	3 053,5651	1 712 340	720 252	2 432 592	494 694,80	208 080,59	702 775,39	34 246,80	14 405,04	48 651,84
333	2 257,5447	1 107,0995	3 364,6442	2 273 400	896 184	3 169 584	656 785,08	258 906,93	915 692,01	45 468,00	17 923,68	63 391,68
335	2 180,2008	738,7482	2 918,9490	2 052 562	447 876	2 500 438	790 646,97	172 521,92	963 168,89	41 051,24	8 957,52	50 008,76
336	2 214,8963	525,3469	2 214,8963	2 254 068	396 576	2 254 068	868 266,98	152761,09	1 021 028,07	45 081,36	45 081,36	90 162,72
337	1 419,0791	958,9000	2 377,9791	1 103 976	587 520	1 691 496	318 938,52	169 734,14	488 672,66	22 079,52	11 750,40	33 829,92
338G	394,3262	918,5721	1 312,8983	378 864	657 612	1 036 476	145 938,37	253 312,07	399 250,44	7 577,28	13 152,24	20 729,52
338Asp	978,2228	383,1561	1 361,3789	1 141 109	421 602	1 562 711	622 703,23	230				
353	2 373,7908	1 029,8032	3 403,5940	2 436 372	724 572	3 160 944	1 147 043,90	34				
354	3 758,3816	864,9049	4 623,2865	3 614 004	537 084	4 151 088	1 701 473,08	252				
360	1 803,9273	688,8962	2 492,8235	1 875 852	497 988	2 373 840	883 151,14	234				4
361	1 963,5861	302,5174	2 266,1035	1 913 544	215 028	2 128 572	900 896,52	101				2
	23 849,5765	9 667,2594	32 991,4890	23 293 335	6 807 642	29 704 401	9 507 885,13	2 646			4.2	
340	2 418,5644	349,3466	2 767,9110	3 680 688	508 946	4 189 634	2 008 551,53	27				- A
341	1 987,0781	224,9031	2 211,9812	2 649 317	251 700	2 901 017	1 445 732,34	137	the tria	an des		
342	2 350,6140	602,4151	2 953,0291	2 645 969	681 314	3 327 283	1 443 905,39	37	At the states	Den -		TTH AND
343	2 631,5059	560,4311	3 191,9370	4 185 102	778 306	4 963 408	2 283 810,20	42-	19 95 GE	AND AND A	7	
363	5 536,1134	831,7001	6 367,8135	4 535 644	713 340	5 248 984	2 135 381,22	335	A HEALTH	A Palling	No.	
	14 923,8758	2 568,7960	17 492,6718	17 696 720	2 933 606	20 630 326	9 317 380,68	1 547	- 4 - F - 1 - K -	Ser and	Charles The	Ale colored
	56 719,6375	25 302,1284	81 496,4190	60 406 553	15 987 639	75 997 616	28 923 673,79	7 093	CONTRACTOR SE	Station .	Allen	ALL AND
	1								C. S. S. S.	ANT IN ST	Control 1	All Martin



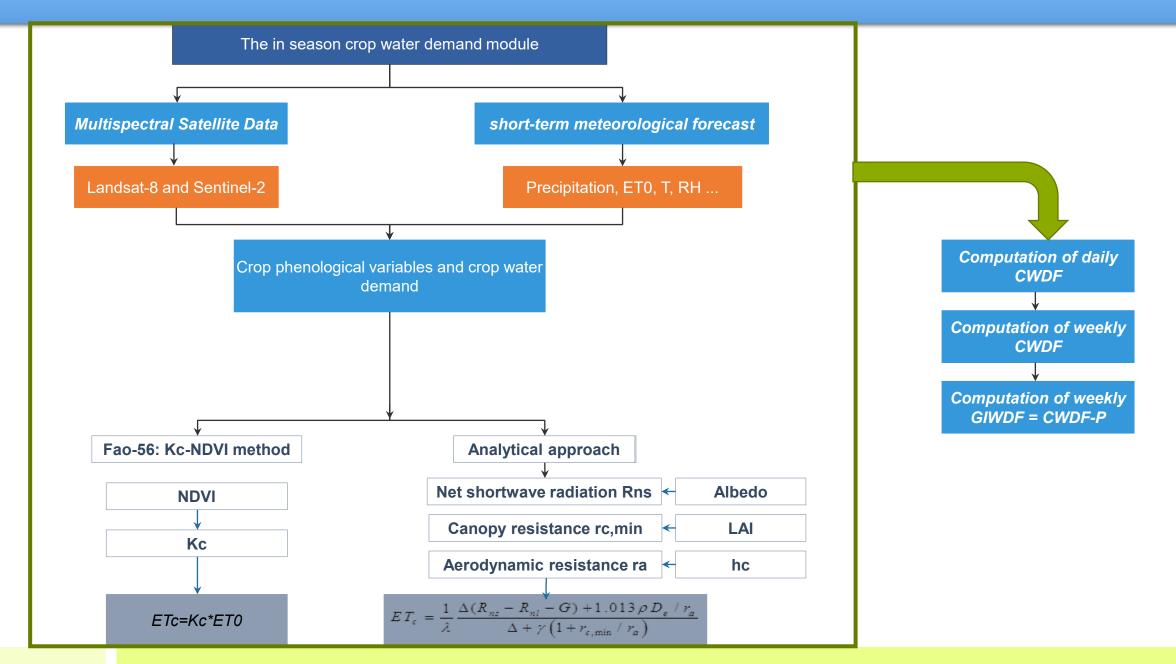


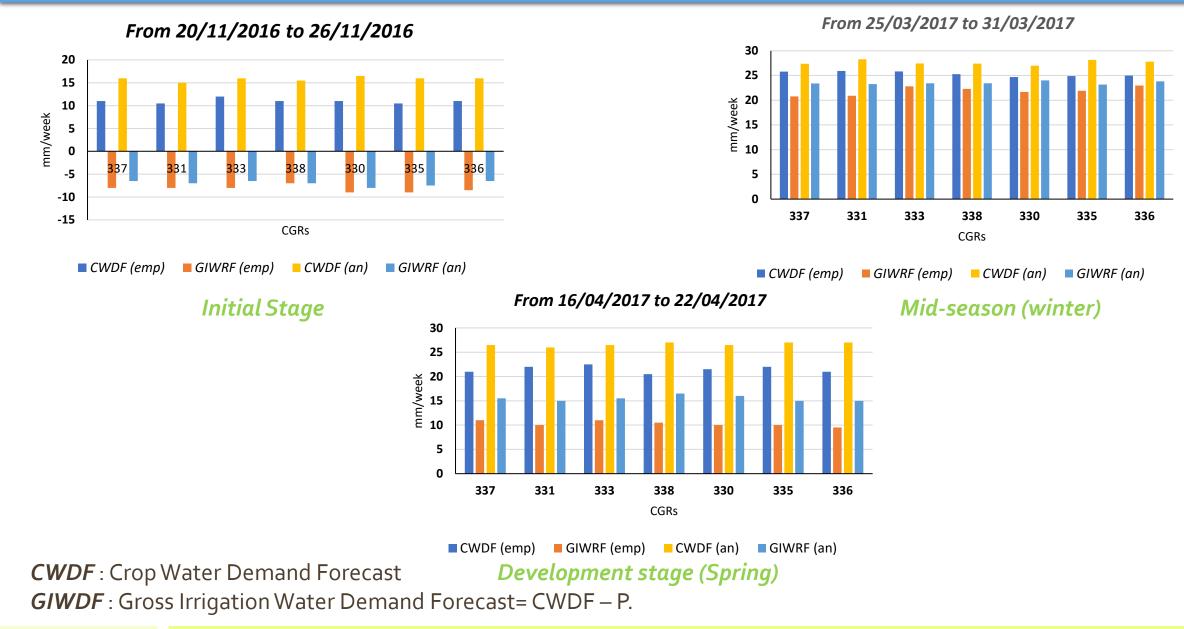
## DATA ACQUISITION



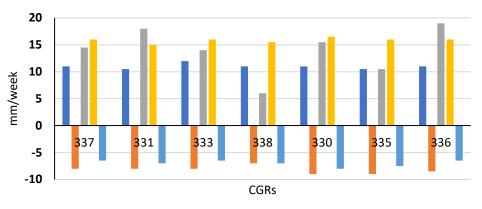


#### **METHODOLOGY**





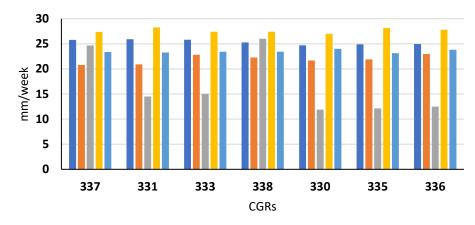
From 20/11/2016 to 26/11/2016



■ CWDF (emp) ■ GIWRF (emp) ■ Allocation ■ CWDF (an) ■ GIWRF (an)

**Initial Stage** 

From 25/03/2017 to 31/03/2017



■ CWDF (emp) ■ GIWRF (emp) ■ Allocation ■ CWDF (an) ■ GIWRF (an)

*From 16/04/2017 to 22/04/2017 Mid-season (winter)* 

CGRs

 CWDF (emp)
 GIWRF (emp)
 Allocation
 CWDF (an)

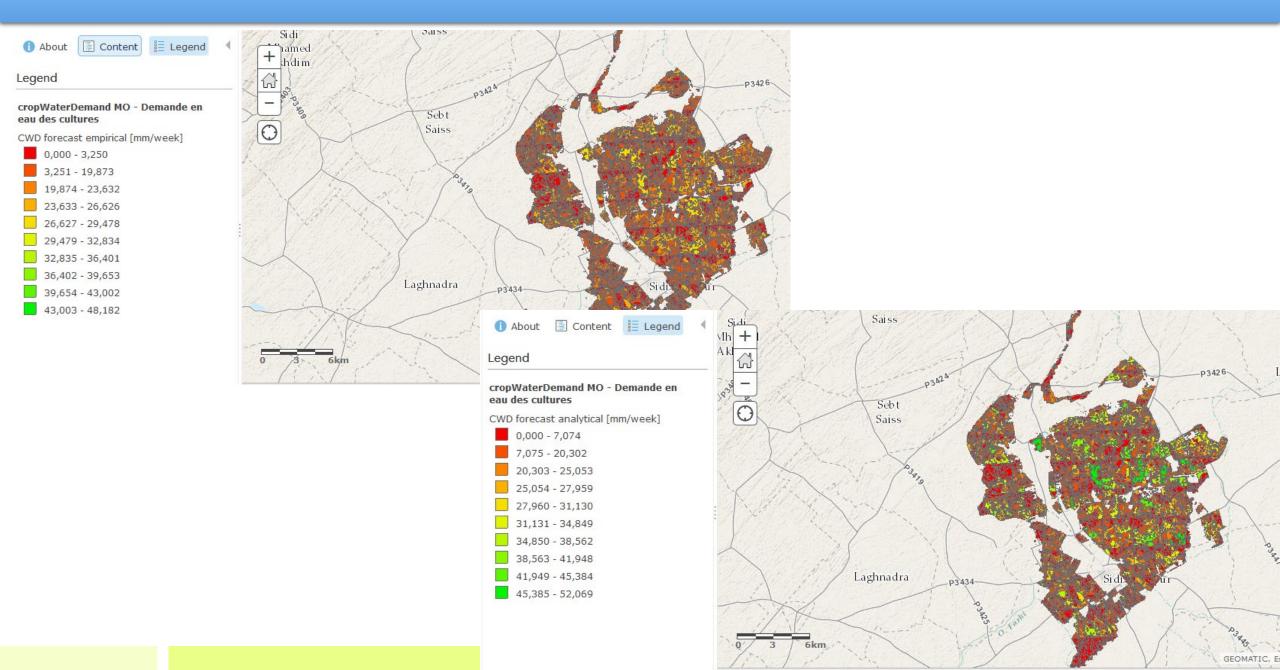
 GIWDF : Crop Water Demand Forecast
 Development stage (Spring)

 GIWDF : Gross Irrigation Water Demand Forecast
 CWDF (emp)
 Allocation
 CWDF (an)

35 30 25

25 20 15

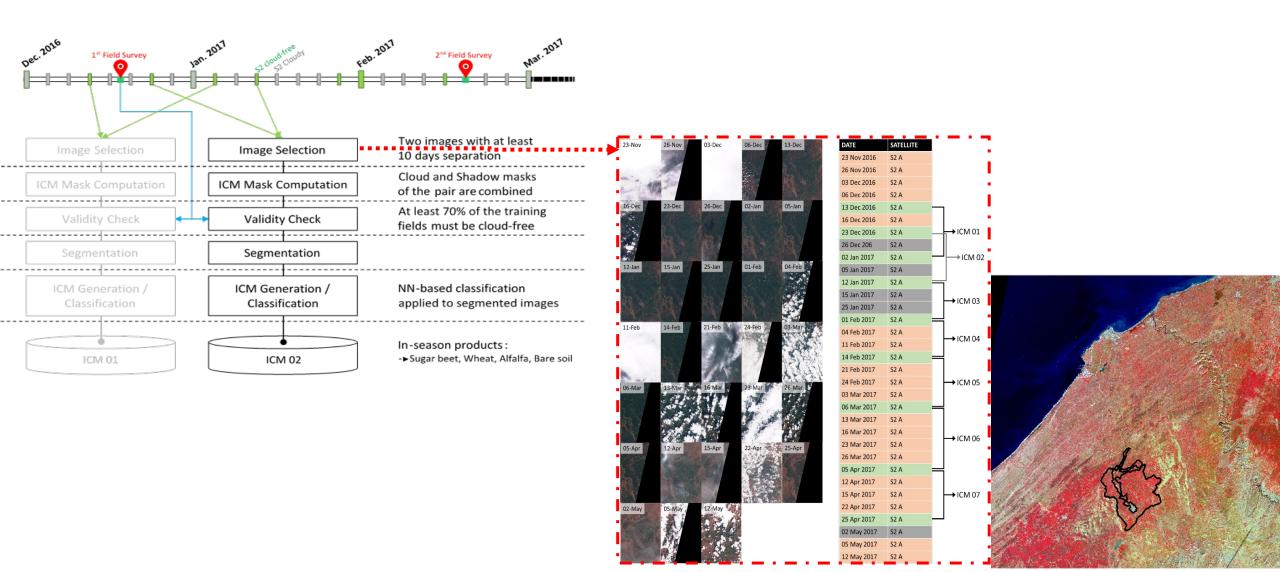
10 5 0

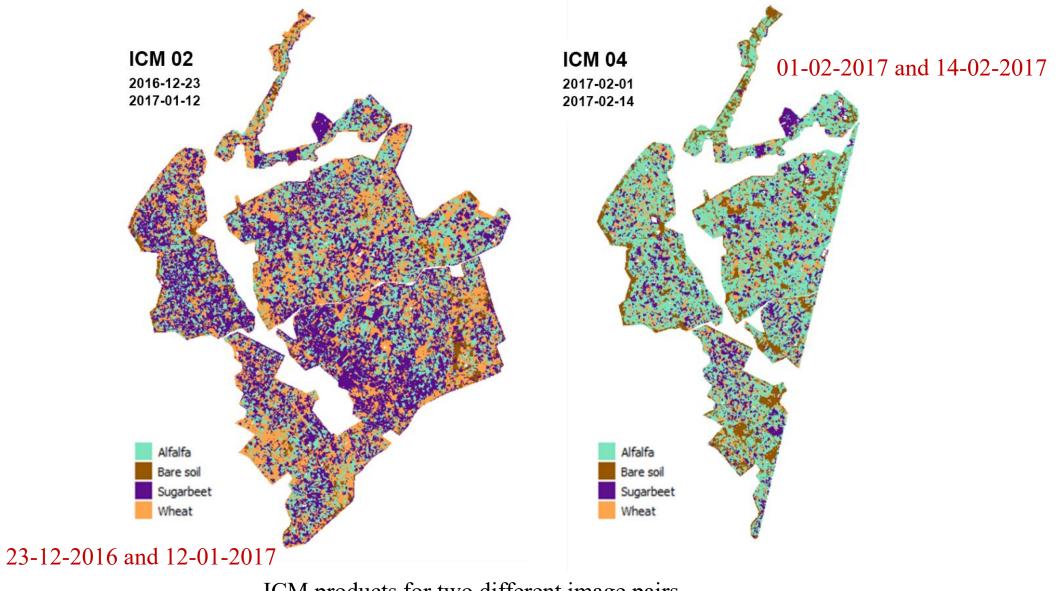


# IN SEASON CROP MAPPING (ICM)



#### **METHODOLOGY**





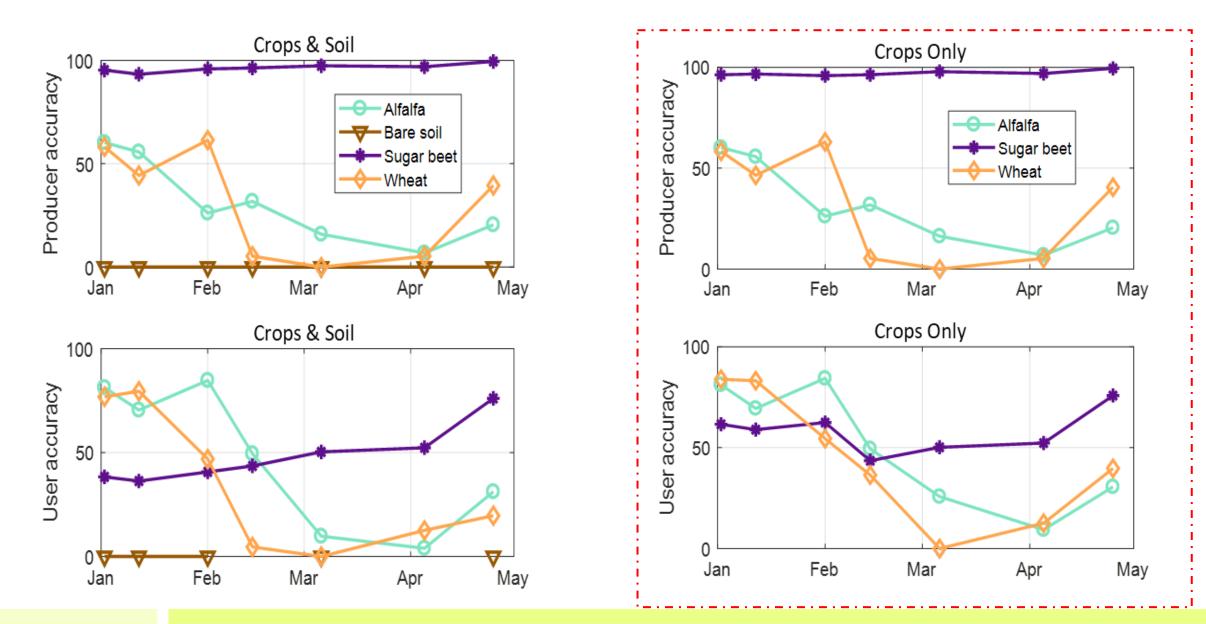
ICM products for two different image pairs

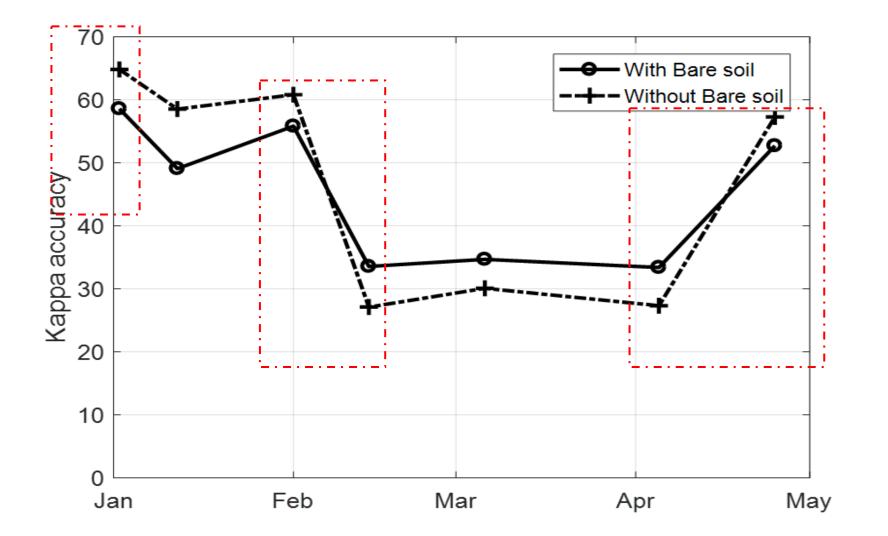
2016-12-13			Producer			
2017-01-02		Alfalfa	Bare soil	Sugarbeet	Wheat	accuracy
	Alfalfa	60.2	0	30.7	9.1	60,2
Truth	Bare soil	C	C	93.6	6.4	0
Ĕ	Sugarbeet	1.6	1.0	95.3	2.1	95,3
	Wheat	12.3	0.3	29.2	58,2	58,2
User accura	асу	81,2	0,0	38,3	76,8	

2017-01-12			Producer			
2017-02-01		Alfalfa	Bare soil	Sugarbeet	Wheat	accuracy
	Alfalfa	26,1	0,0	25,0	48,9	26,1
Truth	Bare soil	0,0	0,0	83,0	17,0	0
Ţ	Sugarbeet	0,4	0,0	95,9	3,7	95,9
	Wheat	4,3	2,5	31,8	61,4	61,4
User accuracy		84,7	0,0	40,7	46,9	

	2016-12-13 2017-01-02			Producer			
			Alfalfa	Bare soil	Sugarbeet	Wheat	accuracy
		Alfalfa	60,2		30,7	9,1	60,2
	Truth	Bare soil					
		Sugarbeet	1,6		96,3	2,1	96,3
		Wheat	12,3		29,3	58,3	58,3
	User accura	асу	81,2		61,6	83,9	

2017-01-12 2017-02-01			Producer			
		Alfalfa	Bare soil	Sugarbeet	Wheat	accuracy
	Alfalfa	26,1		25	48,9	26,1
Truth	Bare soil					
Ĕ	Sugarbeet	0,4		95,9	3,7	95,9
	Wheat	4,4		32,6	63	63
User accura	acy	84,4		62,5	54,5	





Classification performance in terms of overall Kappa accuracy

# CONCLUSIONS

- CWDF calculated by the analytical method is greater than the one calculated by the empirical and the differences are larger in spring than in winter. This is probably due to the development stage of the crop in spring.
- The differences between GIWDF and the allocation suggested that the precipitation is not taken into account by ORMVAD (water management authority ).
- The CWDF and GIWRF products have been introduced into the management protocol of ORMVAD to save water, especially during the winter season, leaving additional water available to meet requirements in spring and summer.
- The ICM approach provides detailed land use information during the irrigation season.
- The very frequent crop model updates performed by the in-season crop mapping procedure allow fine tuning of water allocation, taking into account spatial variability in the crop growth cycle.









# THANK YOU



