

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

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# OUTLINE

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**Introduction & Background**

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**Objectives**

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**CROP WATER DEMAND (CWD):**

- Data acquisition
- Methodology
- Results and Discussion

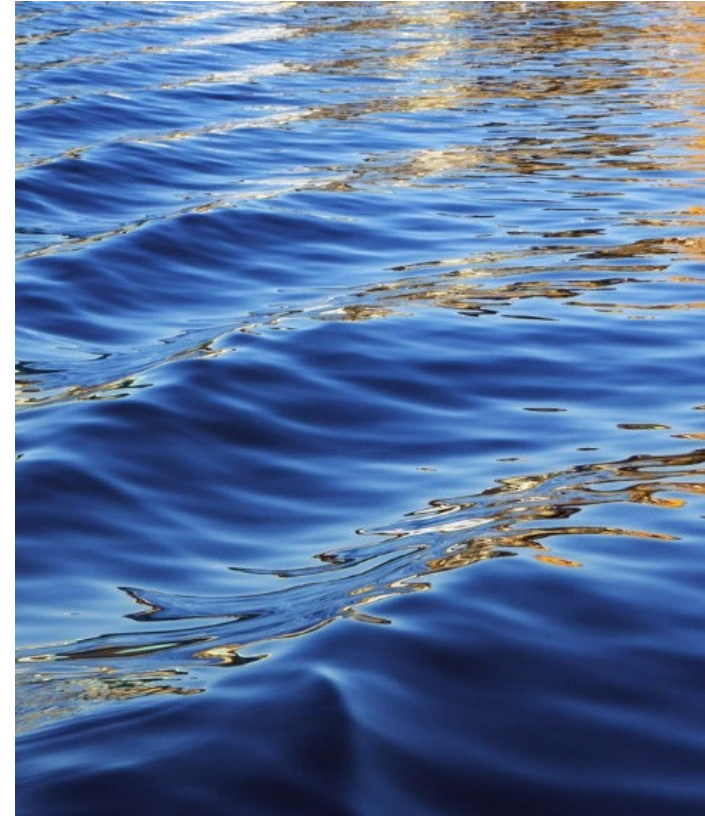
4

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

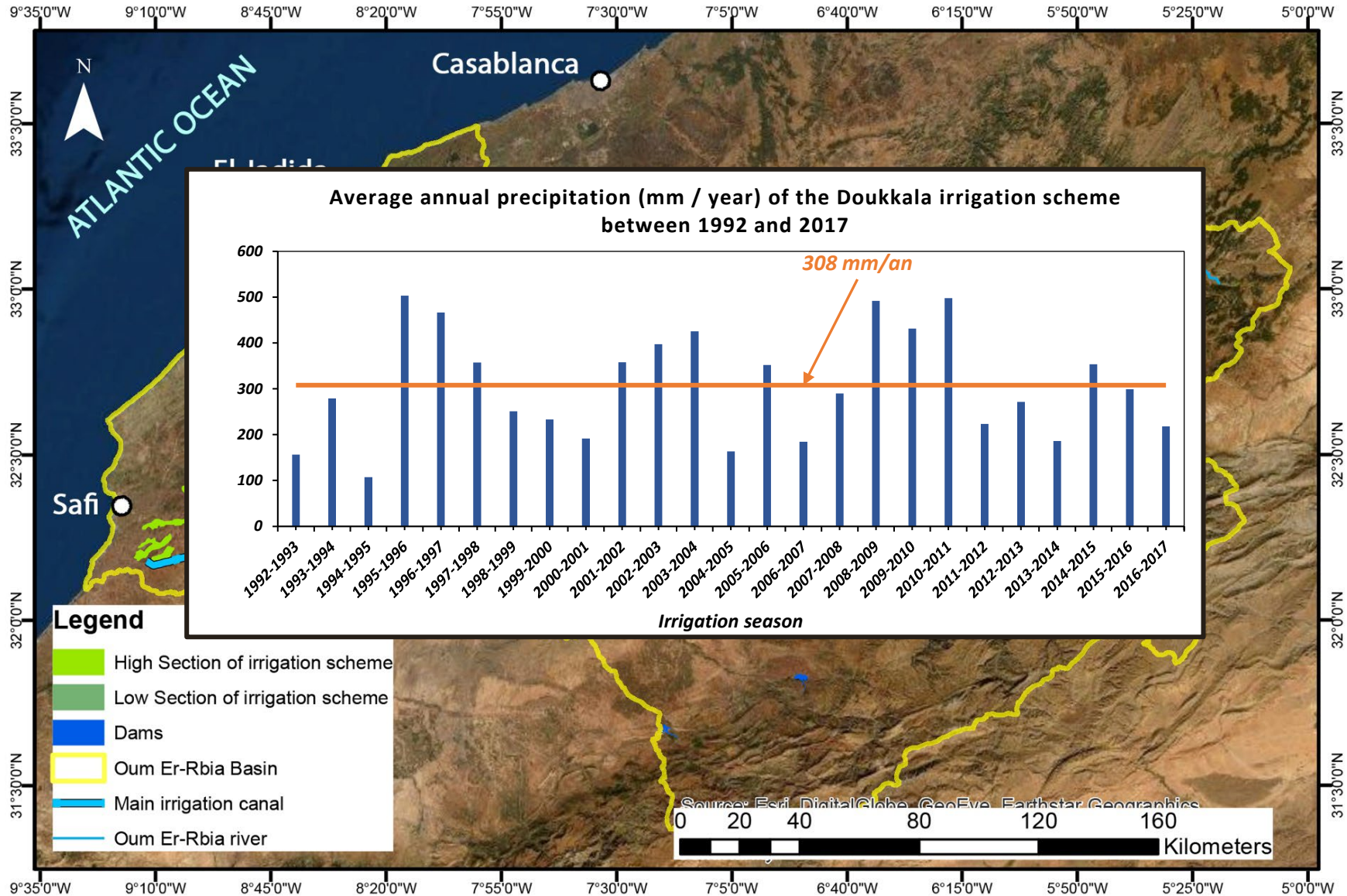
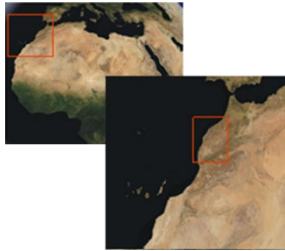
- Data acquisition
- Methodology
- Results and Discussion

5

**Conclusions**

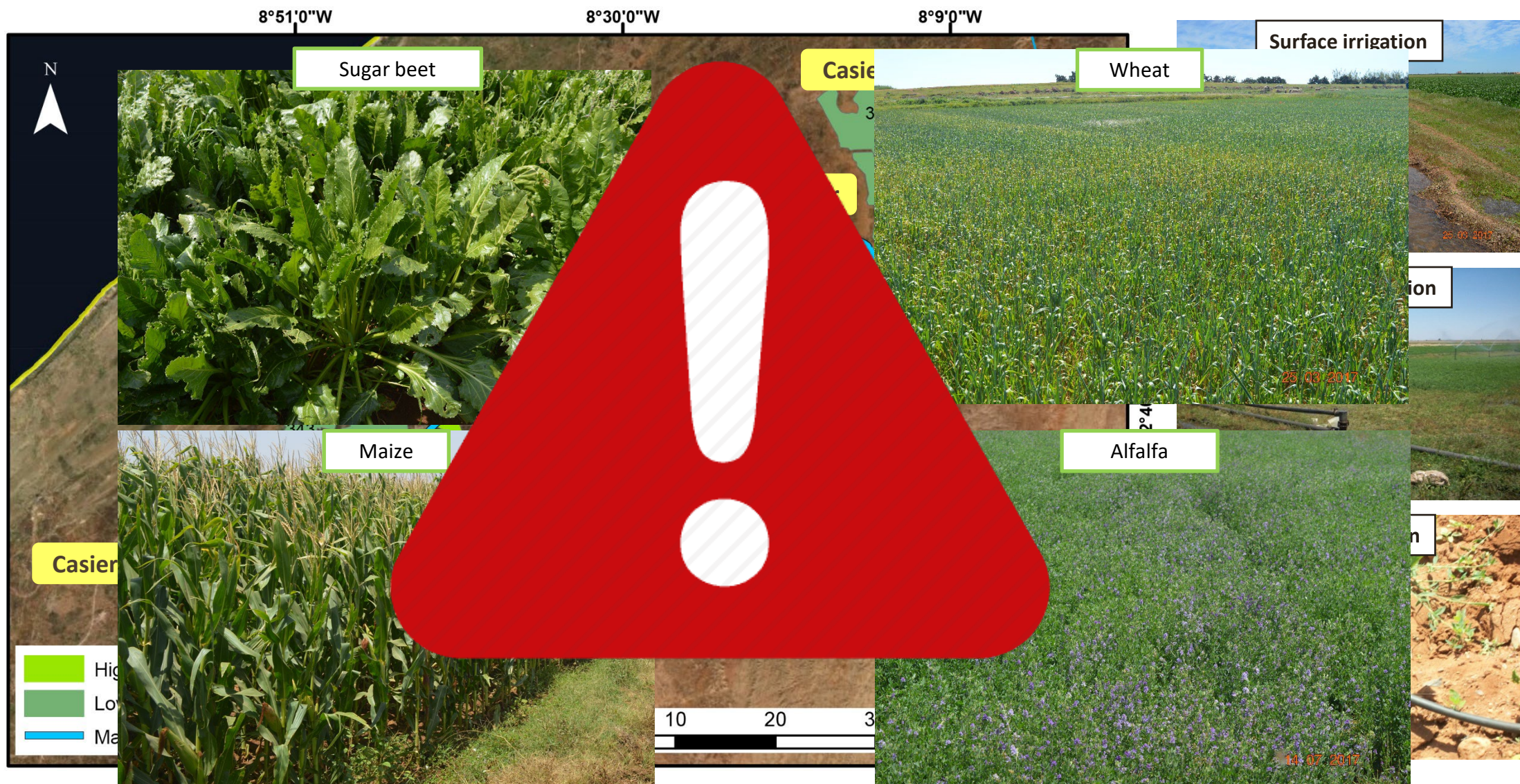


# INTRODUCTION & BACKGROUND





# INTRODUCTION & BACKGROUND





## Infrastructure Problems



## Problems associated with gravitational irrigation

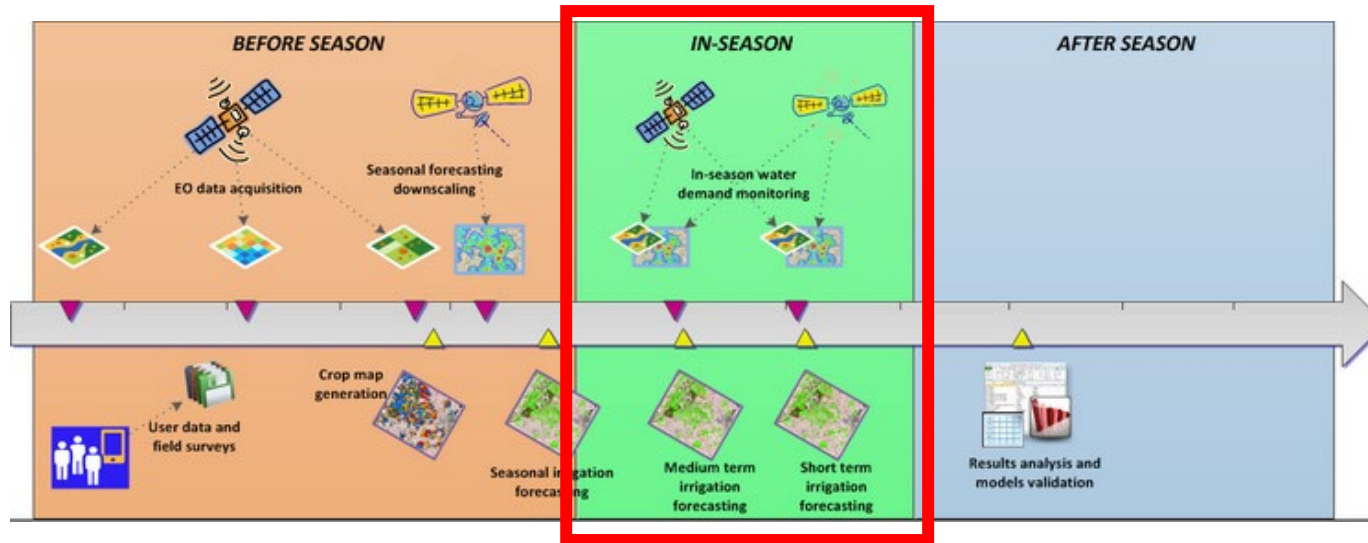


## Problem of illegal pumping in irrigation canal

# 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-makers to 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;



## Weather forecast

- Daily and weekly
- Seasonal forecast

## Seasonal forecast of irrigation water requirements

## Short term irrigation forecast

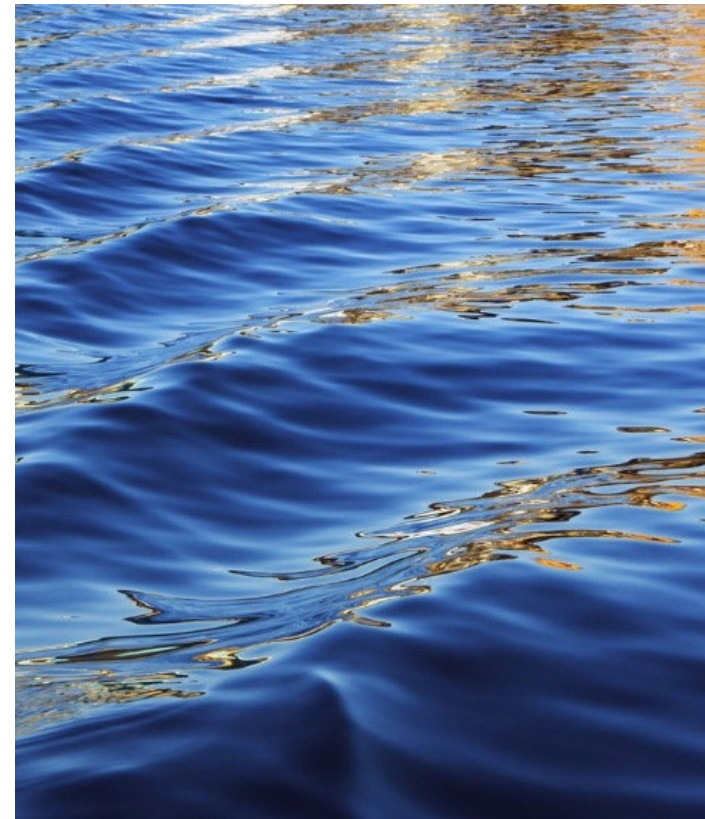
- Crop water demand (CWD)
- In season irrigation forecast

## Crop Mapping (CM)

- Early Crop Mapping (ECM)
- In season crop mapping (ICM)



# CROP WATER DEMAND (CWD)

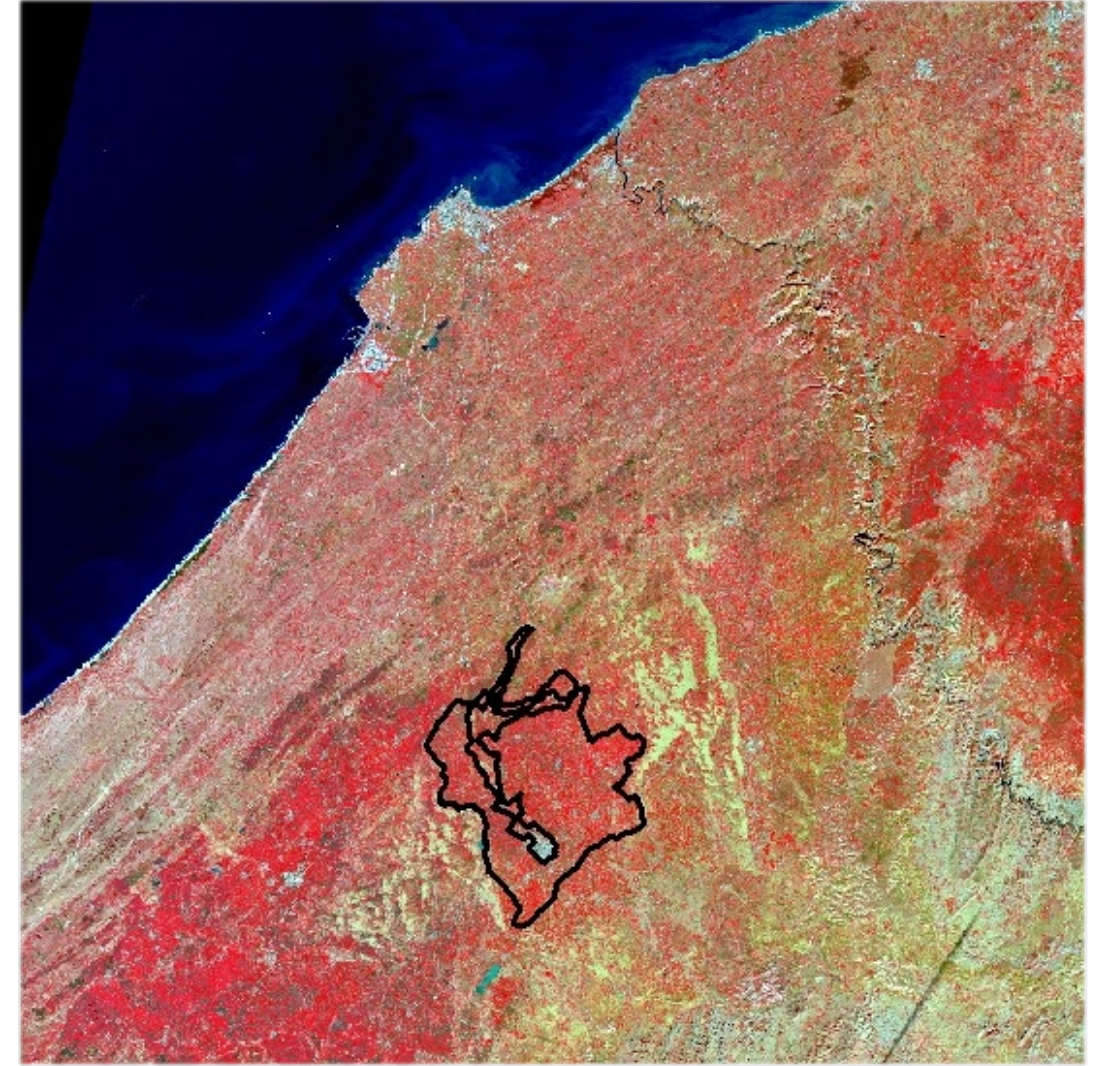
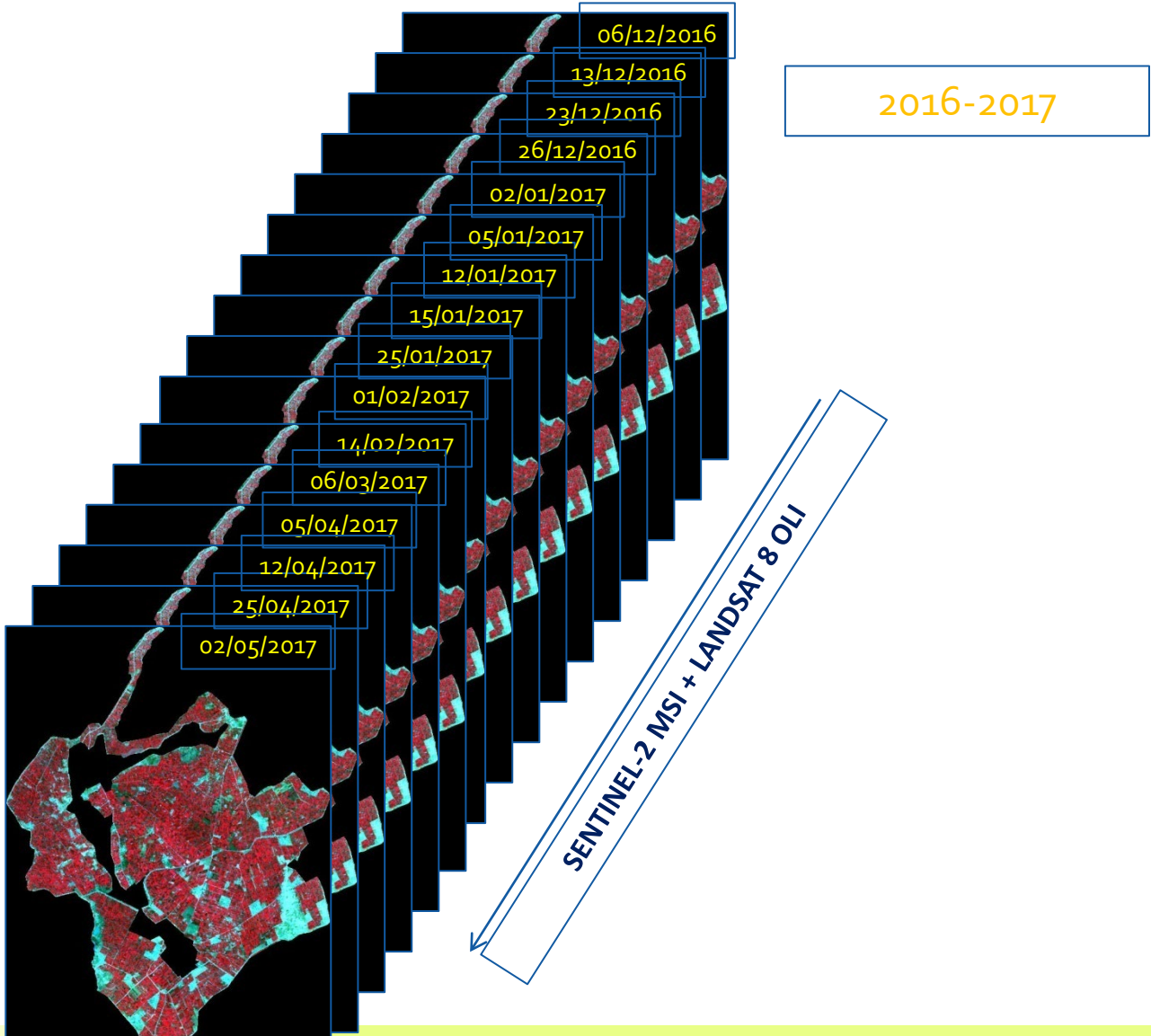




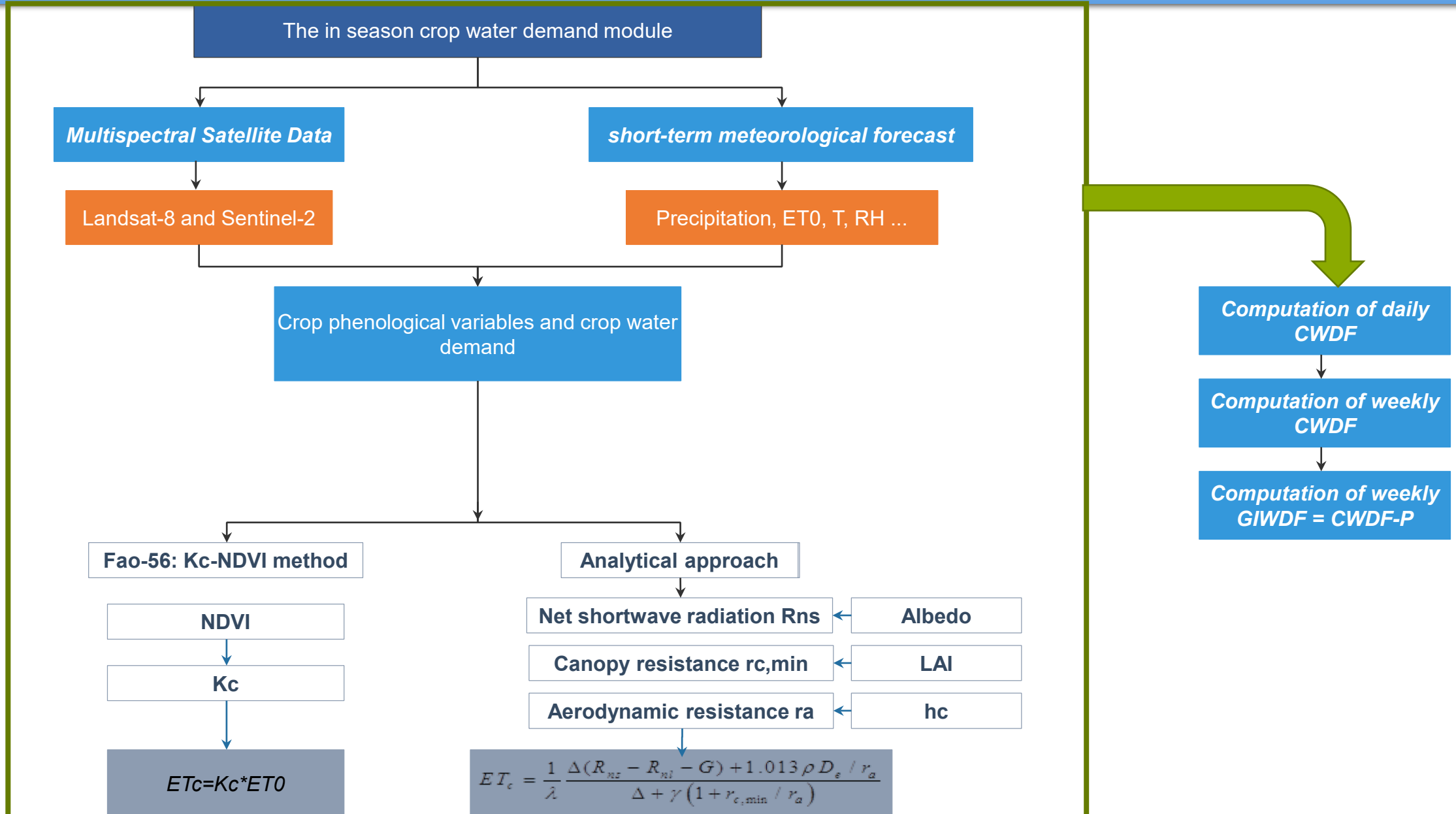




# DATA ACQUISITION



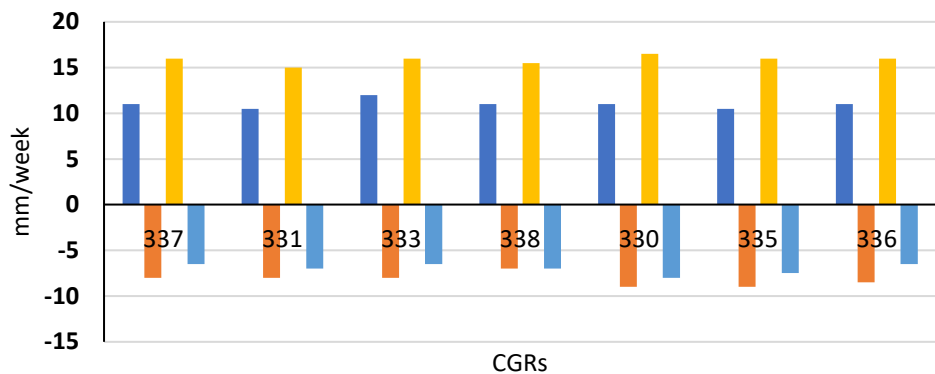
# METHODOLOGY





# RESULTS & DISCUSSION

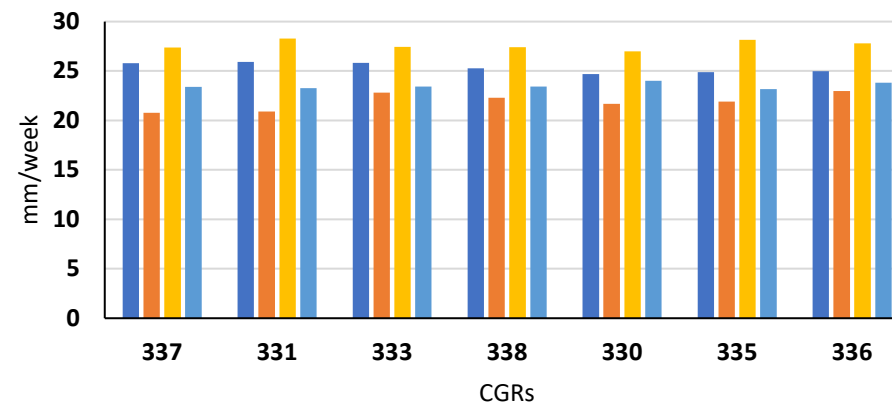
**From 20/11/2016 to 26/11/2016**



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

*Initial Stage*

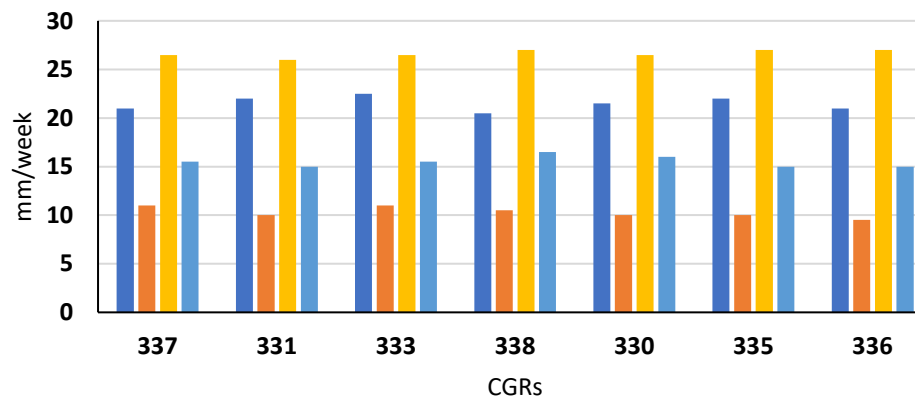
**From 25/03/2017 to 31/03/2017**



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

*Mid-season (winter)*

**From 16/04/2017 to 22/04/2017**



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

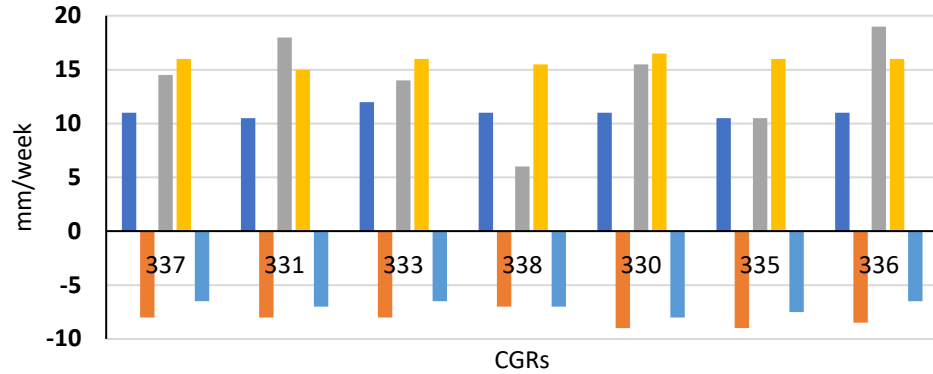
*Development stage (Spring)*

**CWDF** : Crop Water Demand Forecast

**GIWDF** : Gross Irrigation Water Demand Forecast= CWDF – P.

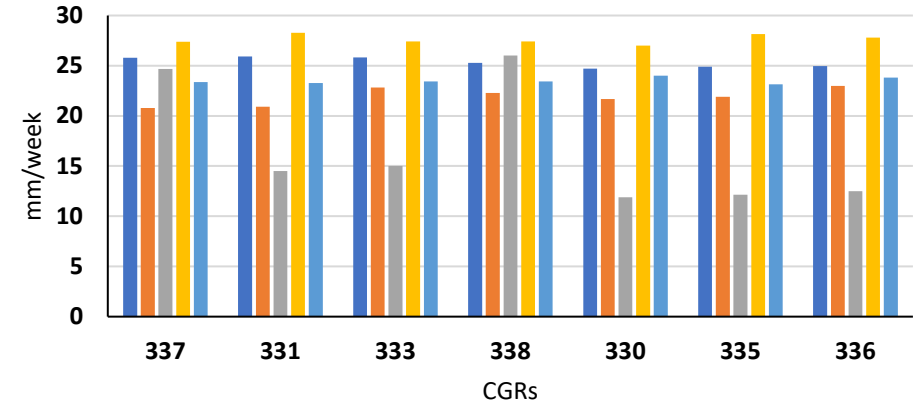
# RESULTS & DISCUSSION

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



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

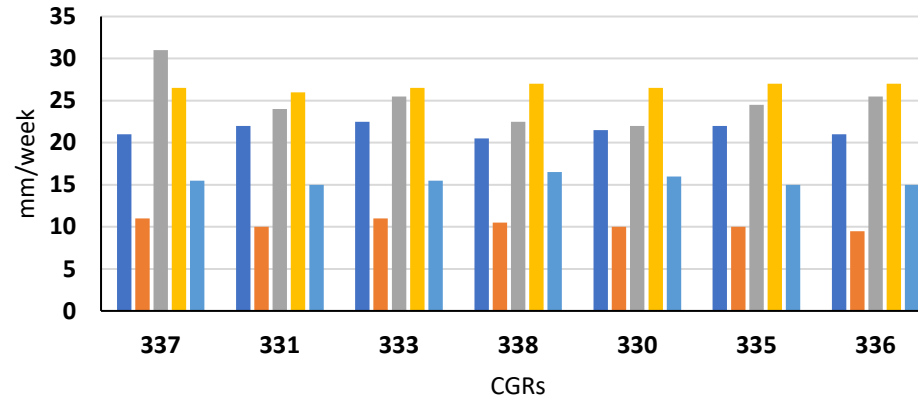
From 25/03/2017 to 31/03/2017



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

Initial Stage

From 16/04/2017 to 22/04/2017



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

Mid-season (winter)

Development stage (Spring)

CWDF : Crop Water Demand Forecast

GIWDF : Gross Irrigation Water Demand Forecast= CWDF – P.



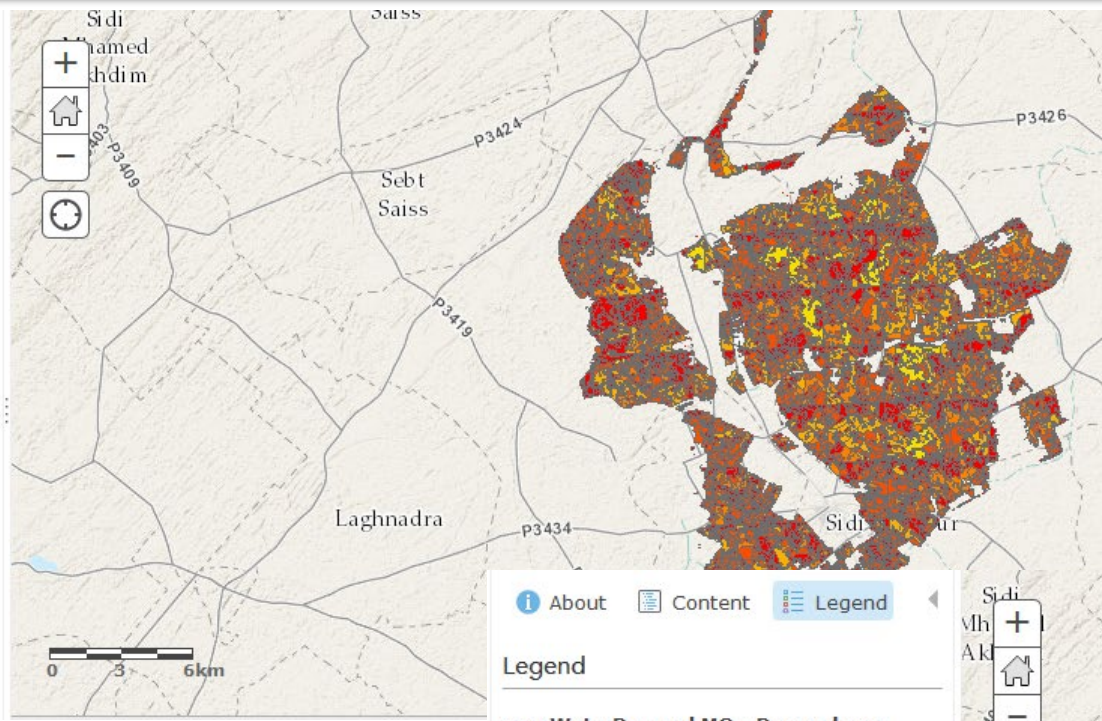
# RESULTS & DISCUSSION

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## Legend

**cropWaterDemand MO - Demande en eau des cultures**

CWD forecast empirical [mm/week]

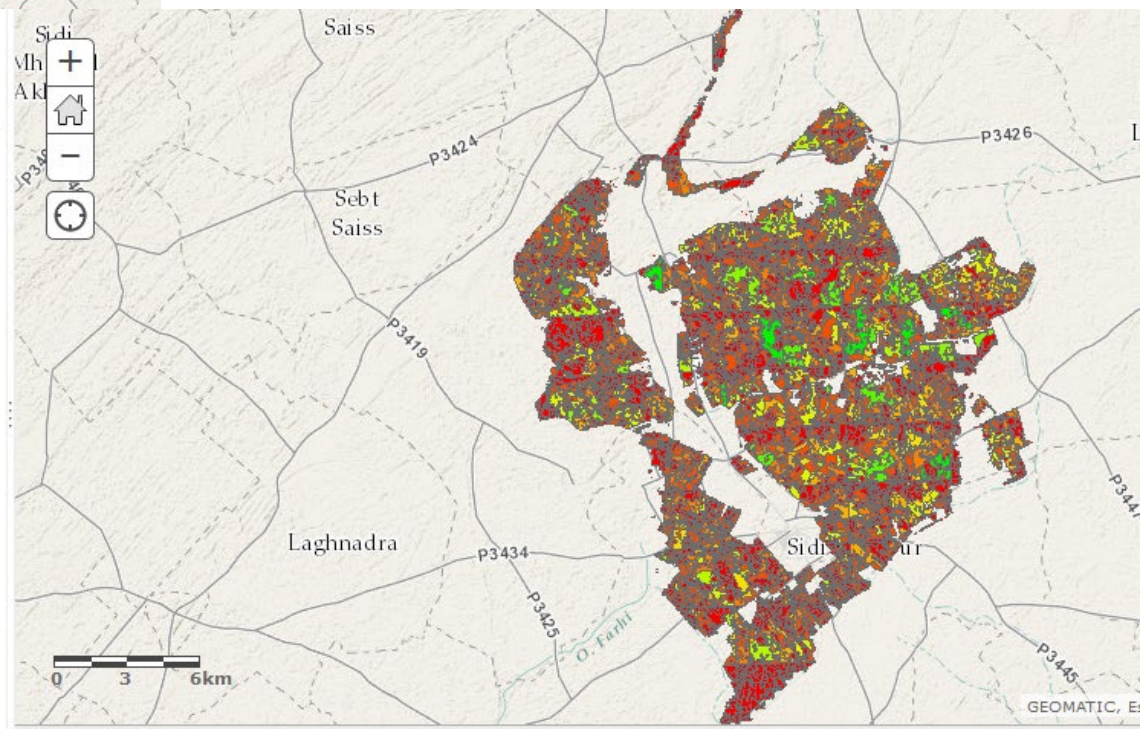


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## Legend

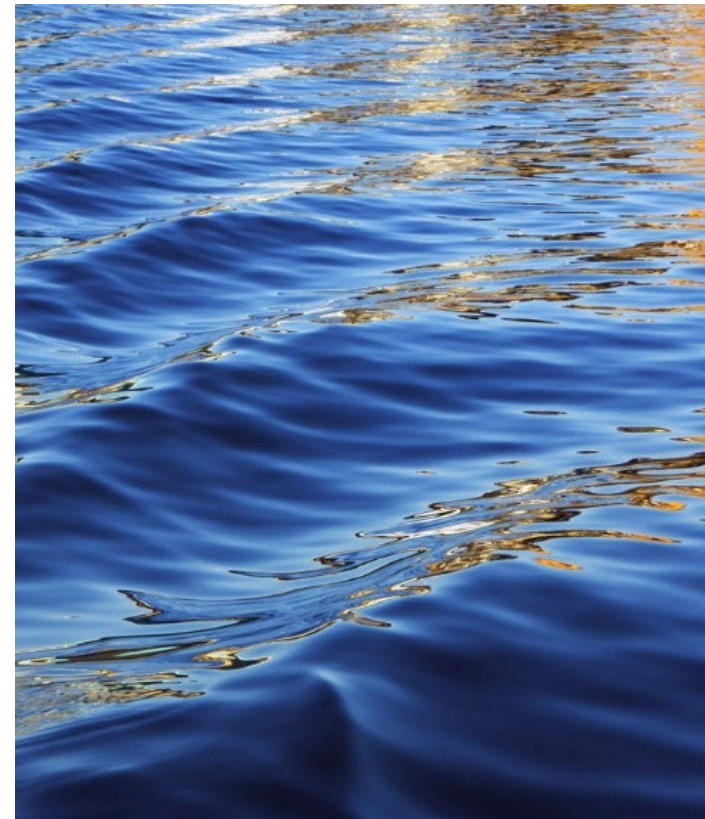
**cropWaterDemand MO - Demande en eau des cultures**

CWD forecast analytical [mm/week]



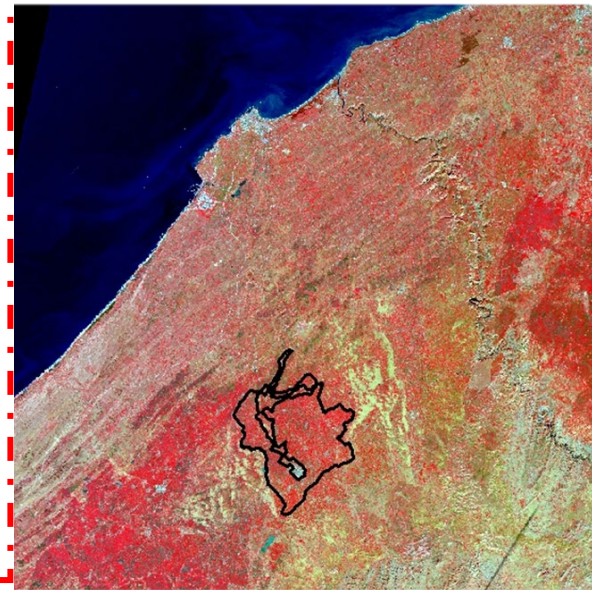
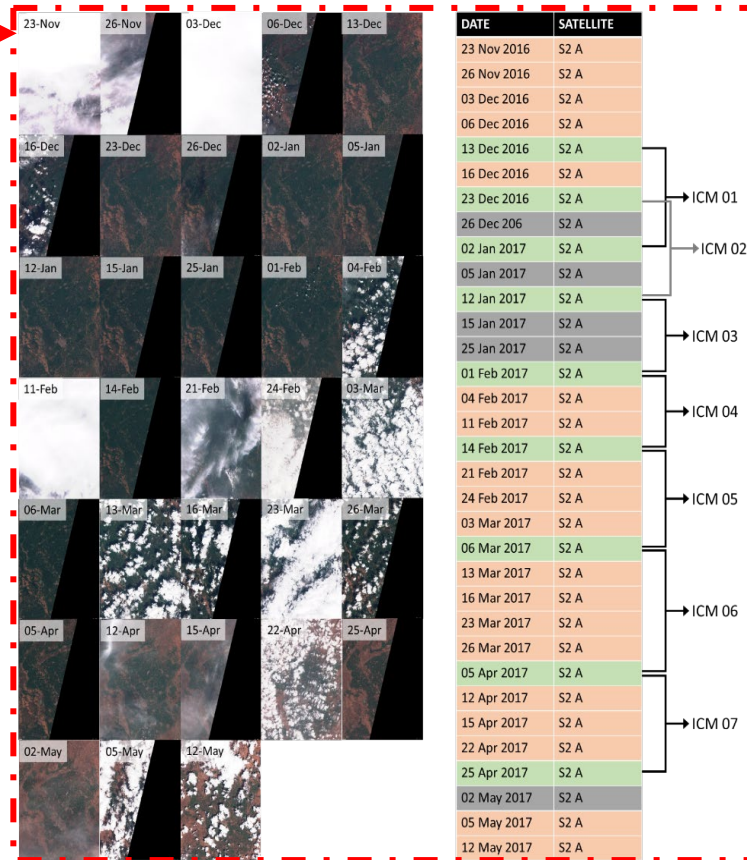
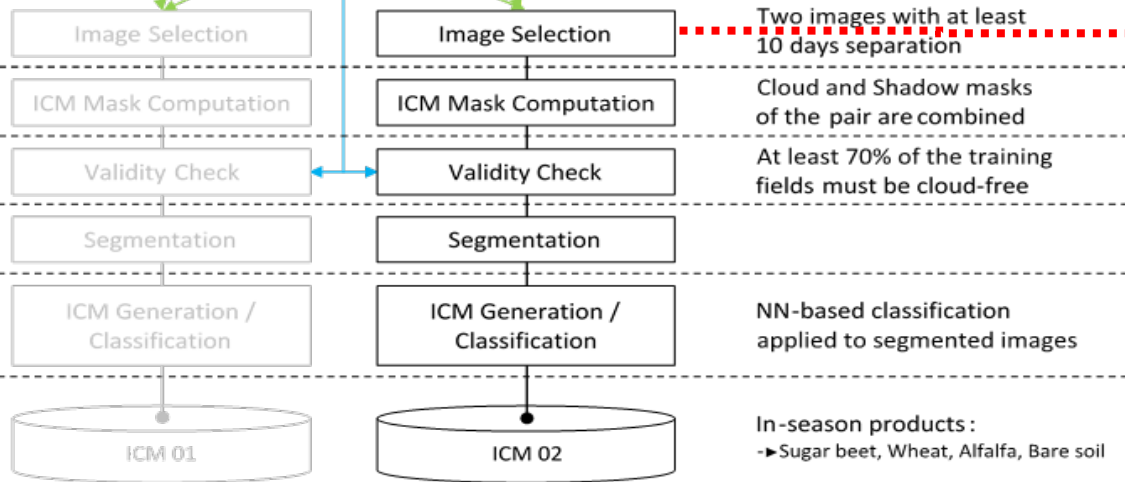


# IN SEASON CROP MAPPING (ICM)



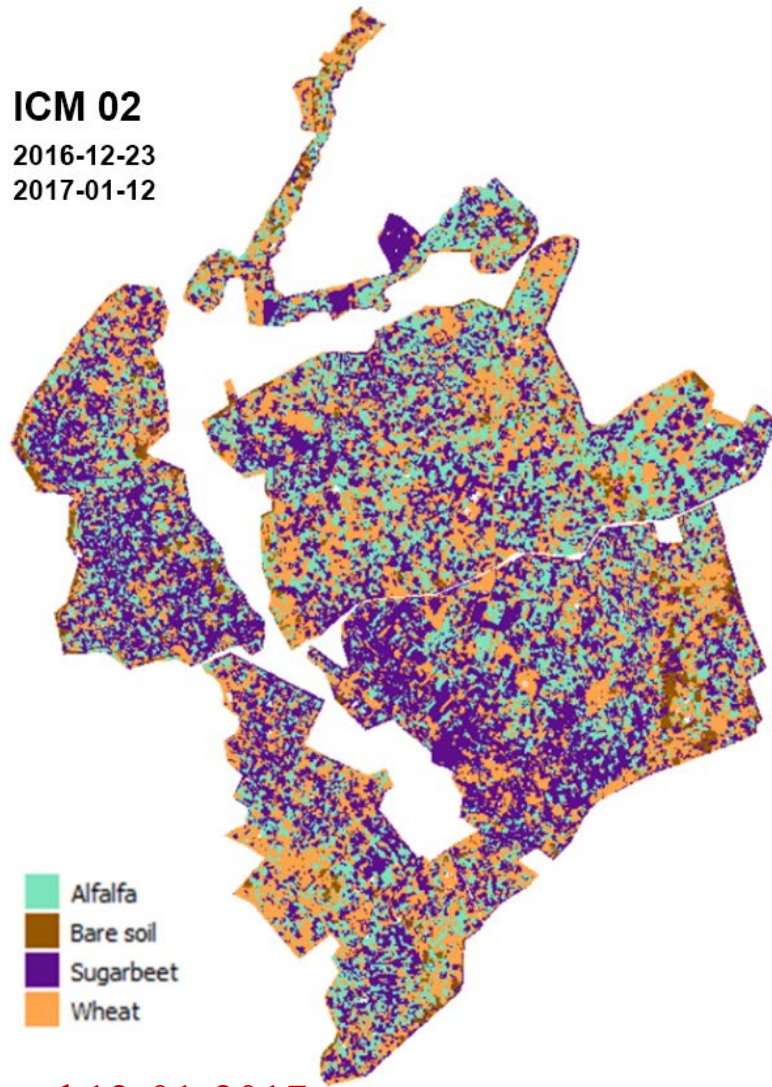


# METHODOLOGY



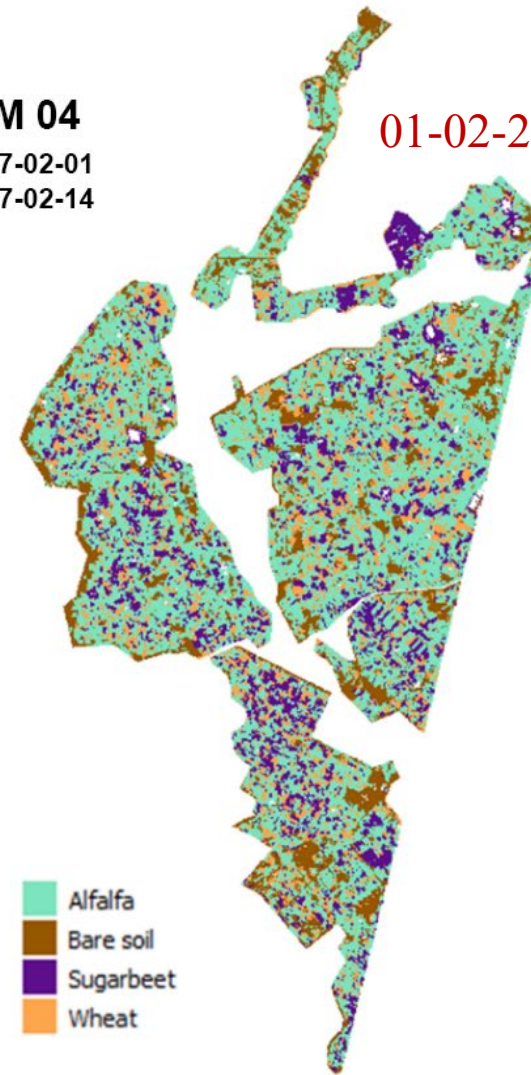
# RESULTS & DISCUSSION

**ICM 02**  
2016-12-23  
2017-01-12



23-12-2016 and 12-01-2017

**ICM 04**  
2017-02-01  
2017-02-14



01-02-2017 and 14-02-2017

ICM products for two different image pairs



# RESULTS & DISCUSSION

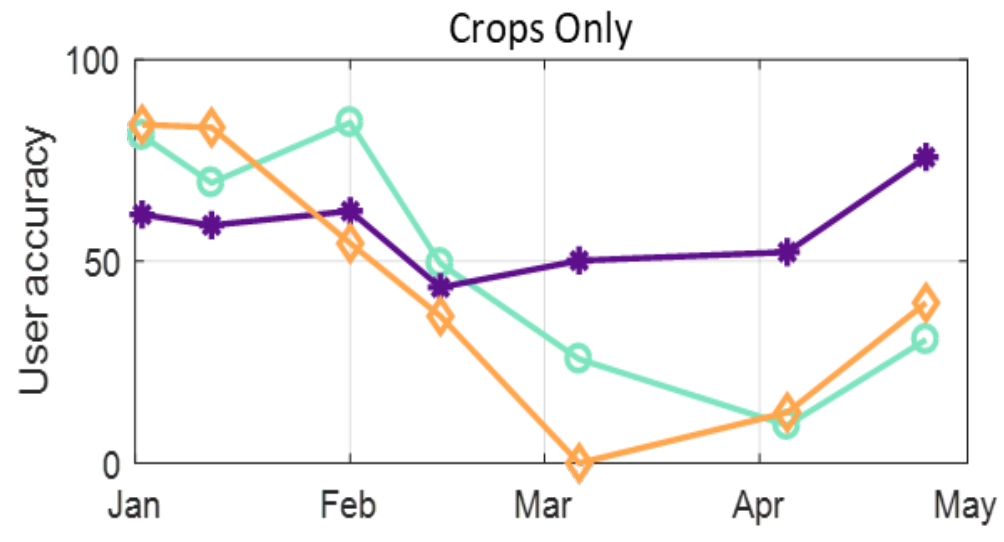
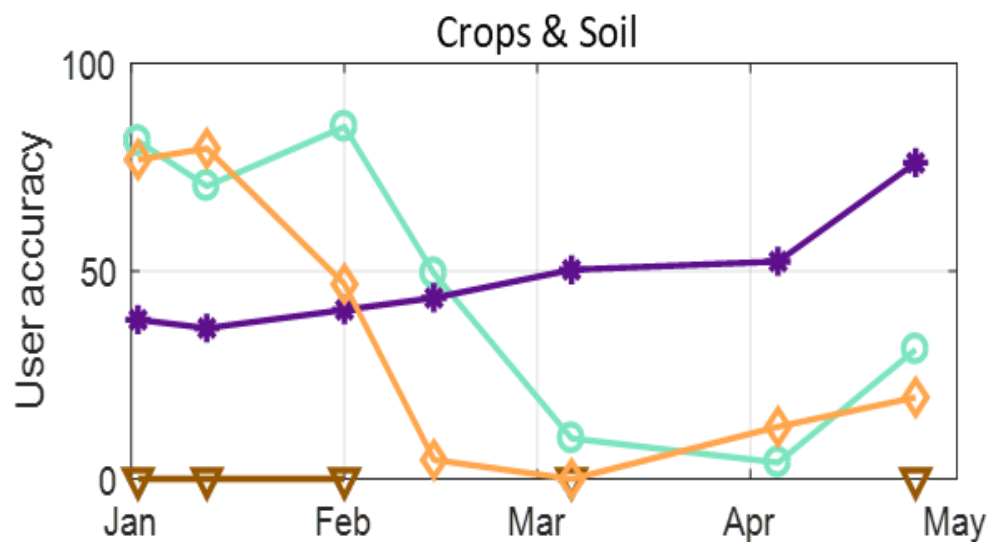
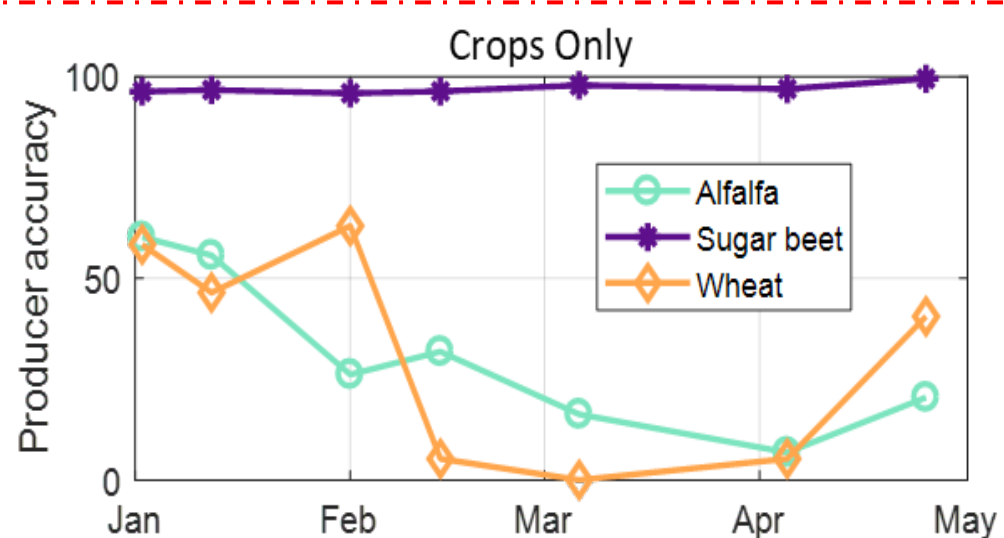
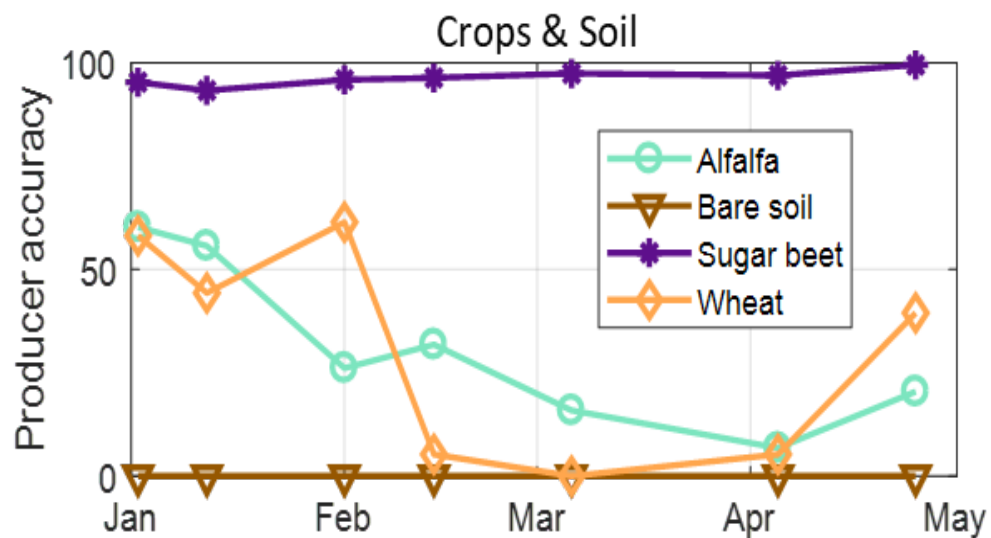
		Classified				Producer accuracy
		Alfalfa	Bare soil	Sugarbeet	Wheat	
2016-12-13						
2017-01-02						
Truth	Alfalfa	60,2	0	30,7	9,1	60,2
	Bare soil	0	0	93,6	6,4	0
	Sugarbeet	1,6	1,0	95,3	2,1	95,3
	Wheat	12,3	0,3	29,2	58,2	58,2
User accuracy		81,2	0,0	38,3	76,8	

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

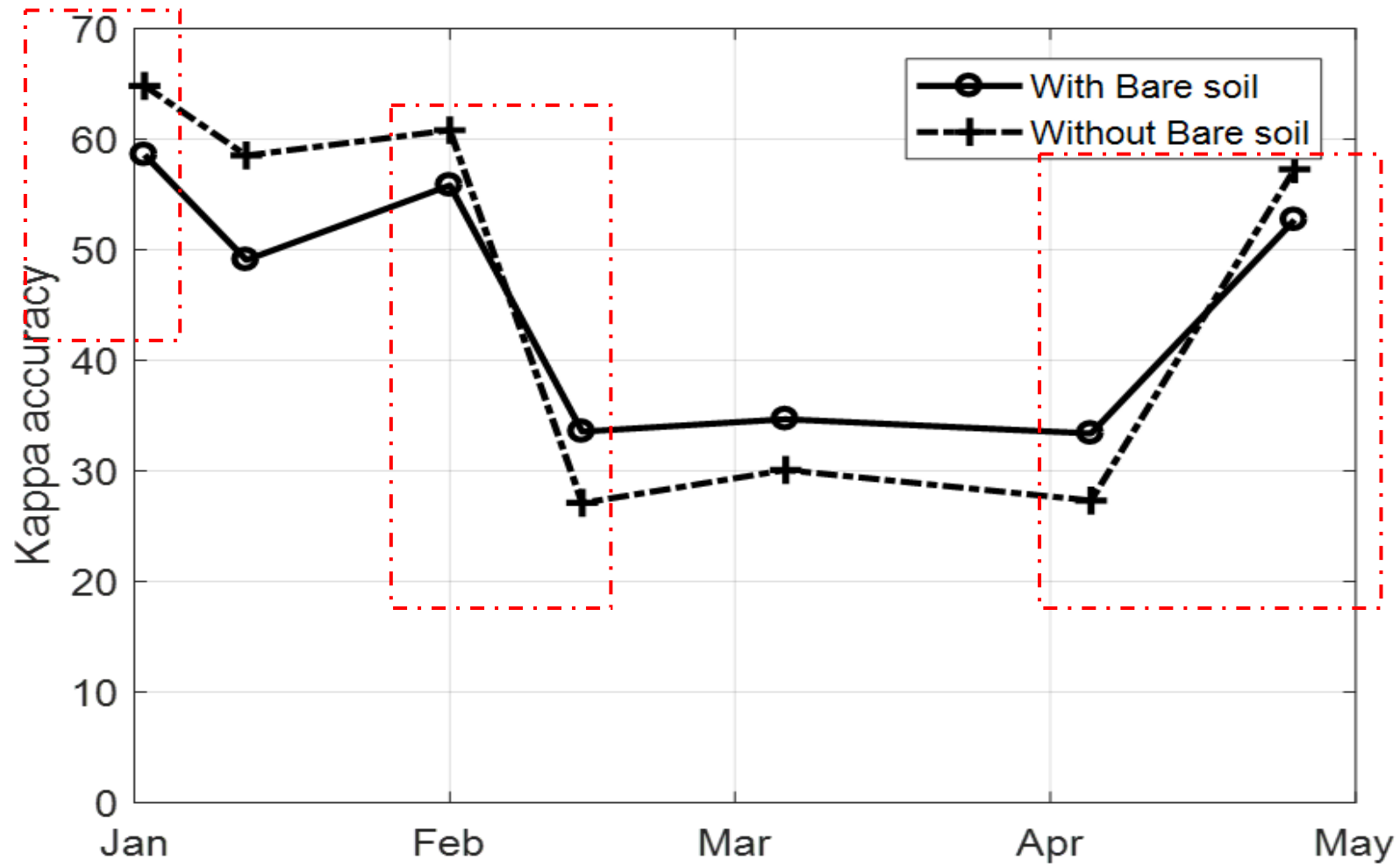
		Classified				Producer accuracy
		Alfalfa	Bare soil	Sugarbeet	Wheat	
2017-01-12						
2017-02-01						
Truth	Alfalfa	26,1	0,0	25,0	48,9	26,1
	Bare soil	0,0	0,0	83,0	17,0	0
	Sugarbeet	0,4	0,0	95,9	3,7	95,9
	Wheat	4,3	2,5	31,8	61,4	61,4
User accuracy		84,7	0,0	40,7	46,9	

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

# RESULTS & DISCUSSION



# RESULTS & DISCUSSION



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***

