EWACC 2012 BUILDING BRIDGES

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Evaluation of water Irrigation Management at an irrigated district

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General Context of the Study

National Context

- Mobilization of the available water resources
- Increase of the Demand from the other Sectors
- Importance of Irrigation in the Food Security Context

Recommended Solutions

- Use of non conventional water resources
- Adaptation of Sustainable Development Concepts
- Implementation of the Integrative Water Resource Management
- Enhancing the use of water in the irrigation Sector

Objective of the Study

Main Objective

Enhancing the water irrigation managment at the Irrigated district Level

Specific Objective

Diagonostic analysis of the actual water use at the levele of the irrigated district

- **Caracterization of different parameters related to the irrigation practice : crop, climate, soil, water use**
- **caracterization of the water irrigation requirement**
- **Quantification of the irrigation practice at different level of space and time**
- **Analysis of water irrigation management by comparison between the real amount of water applied and actual water crop requirements**

Presentation of the Irrigation District

+ North of Tunis, 30 km
+ Location :
  - Latitude 36°57’ N
  - Longitude 10°02’E
  - Elevation 8 m

Presentation of the Irrigation District

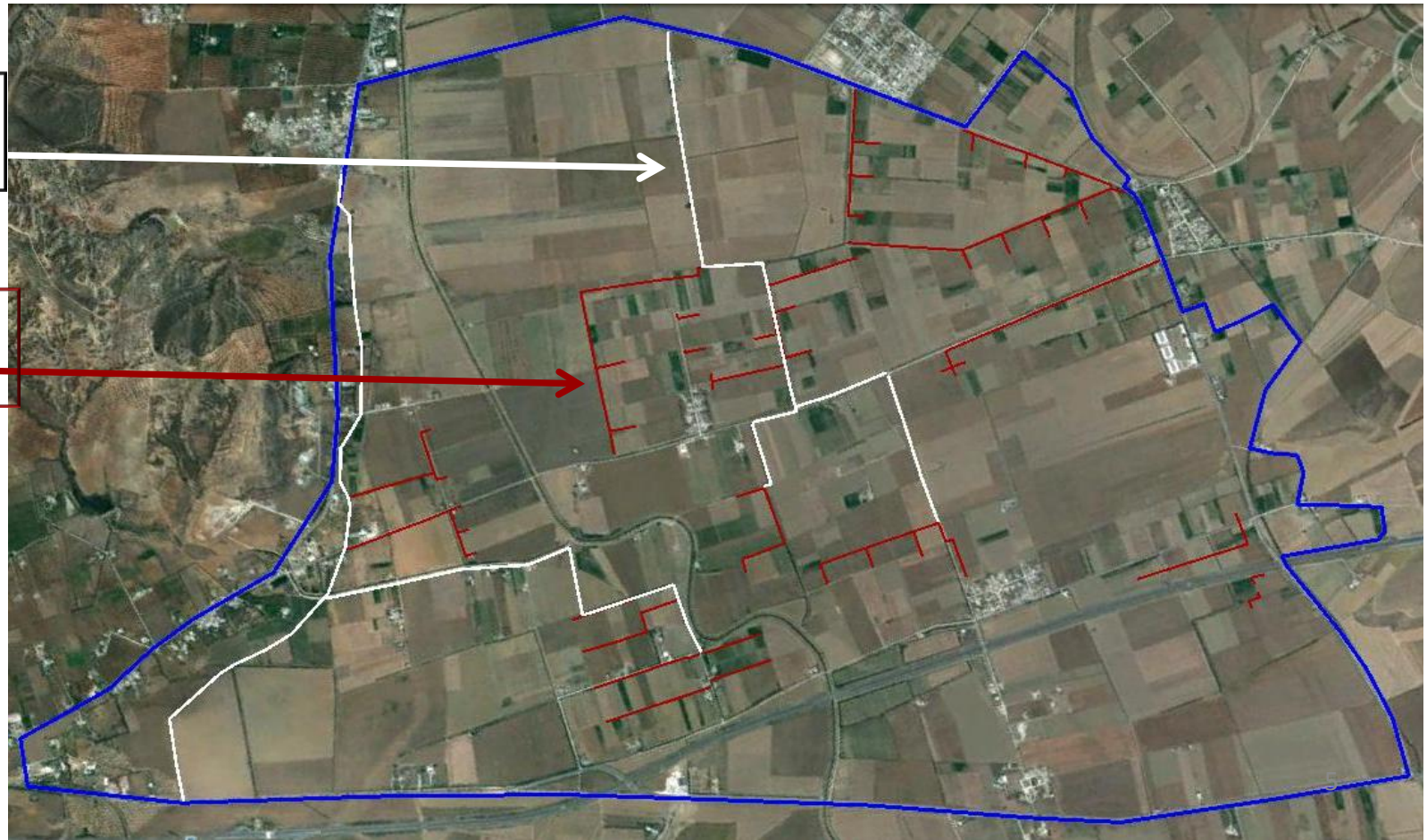
Irrigation district : 2022 ha

Hydraulic Sectors : 22

Number of farms : 127

Primary network

Secondary Network



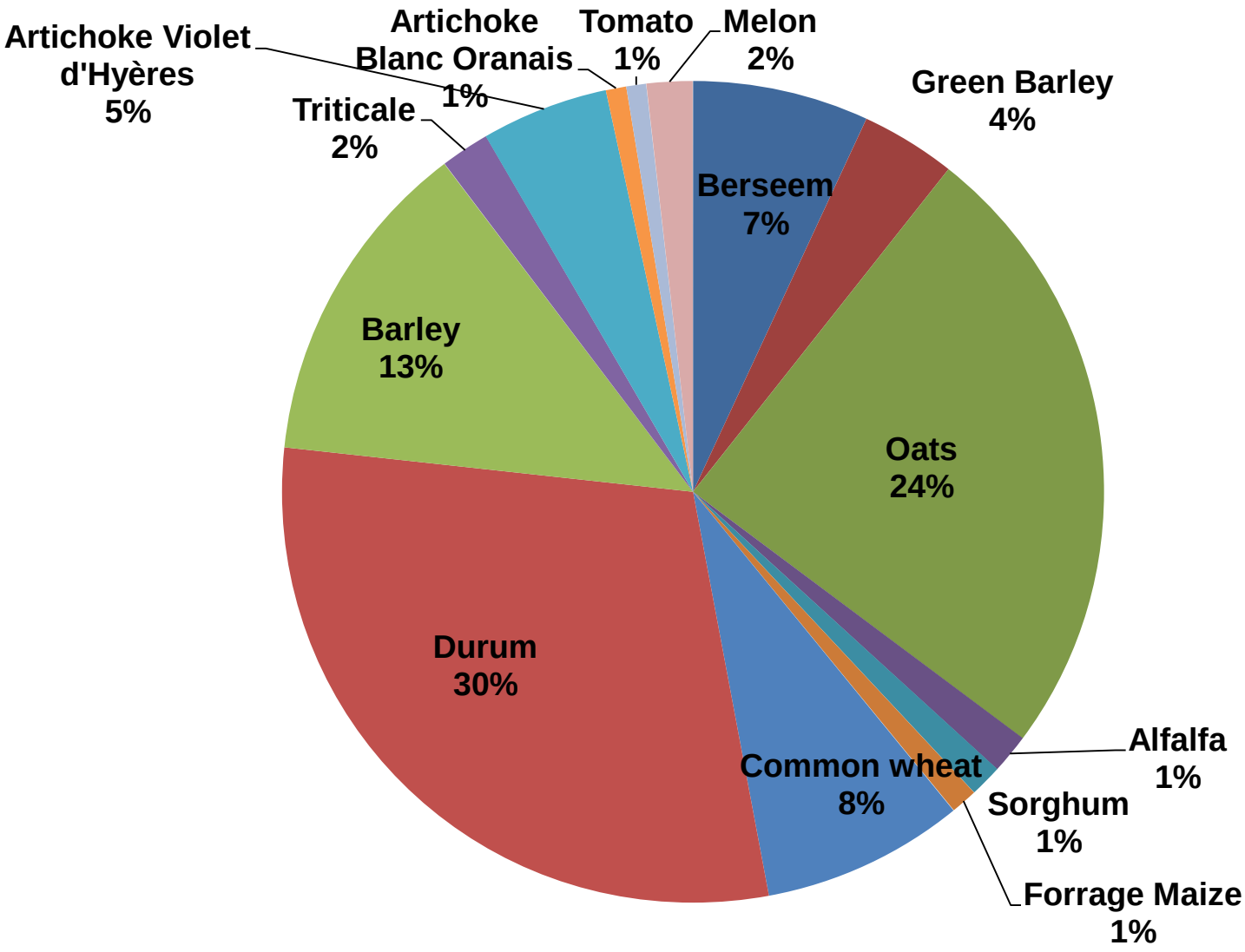
Presentation of the Irrigation District

- **Soil Type :** Silty Clay

- **Typology of Farms:**

Strate N°	Area (ha)	Number of farms
1	0.8-5	23
2	5-10	28
3	10-20	53
4	20 et plus	23

Average distribution of main crops



Approach and tools used

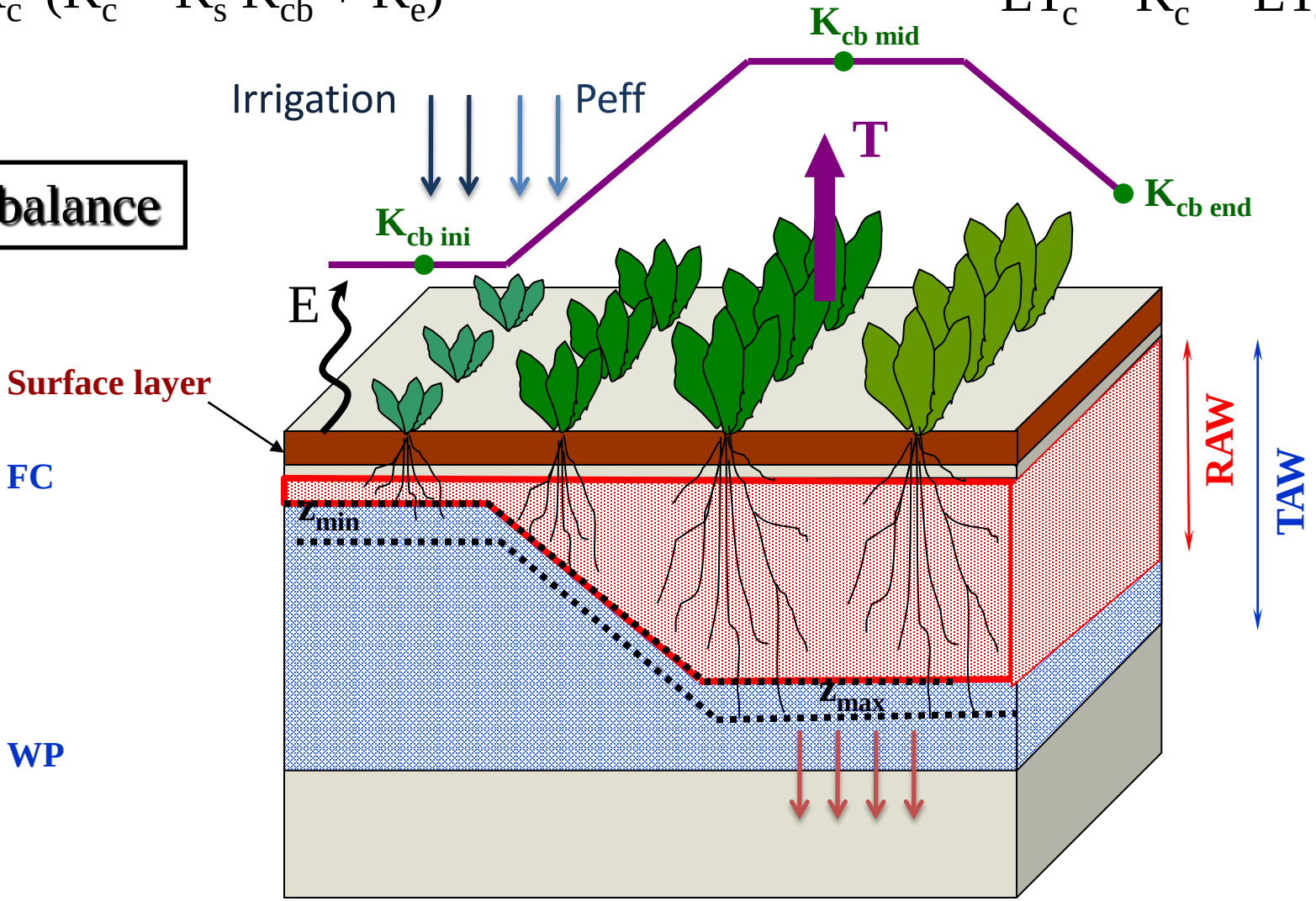
Transpiration

Evaporation

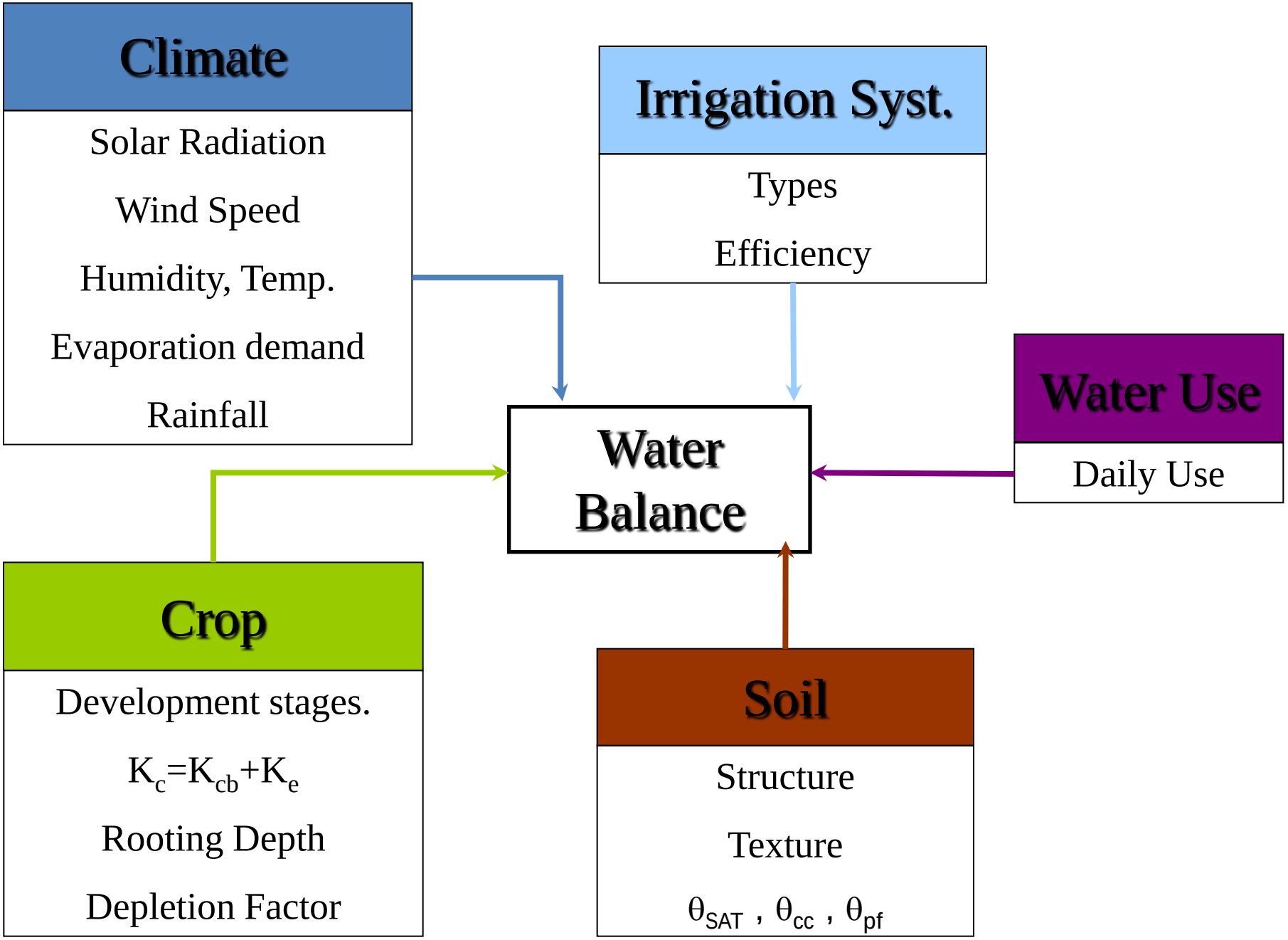
Dual K_c ($K_c = K_s K_{cb} + K_e$)

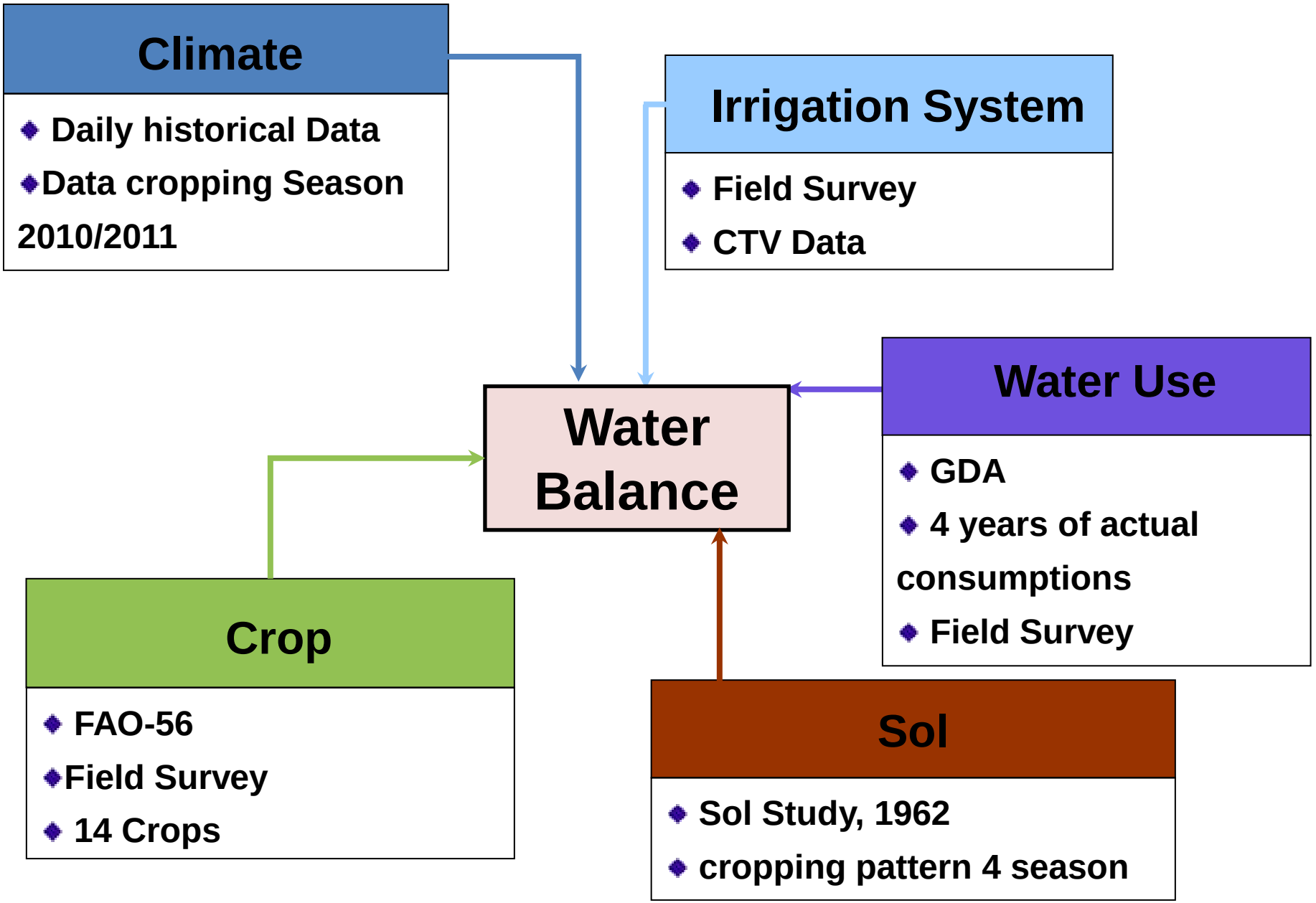
$ET_c = K_c * ET_o$

Water balance

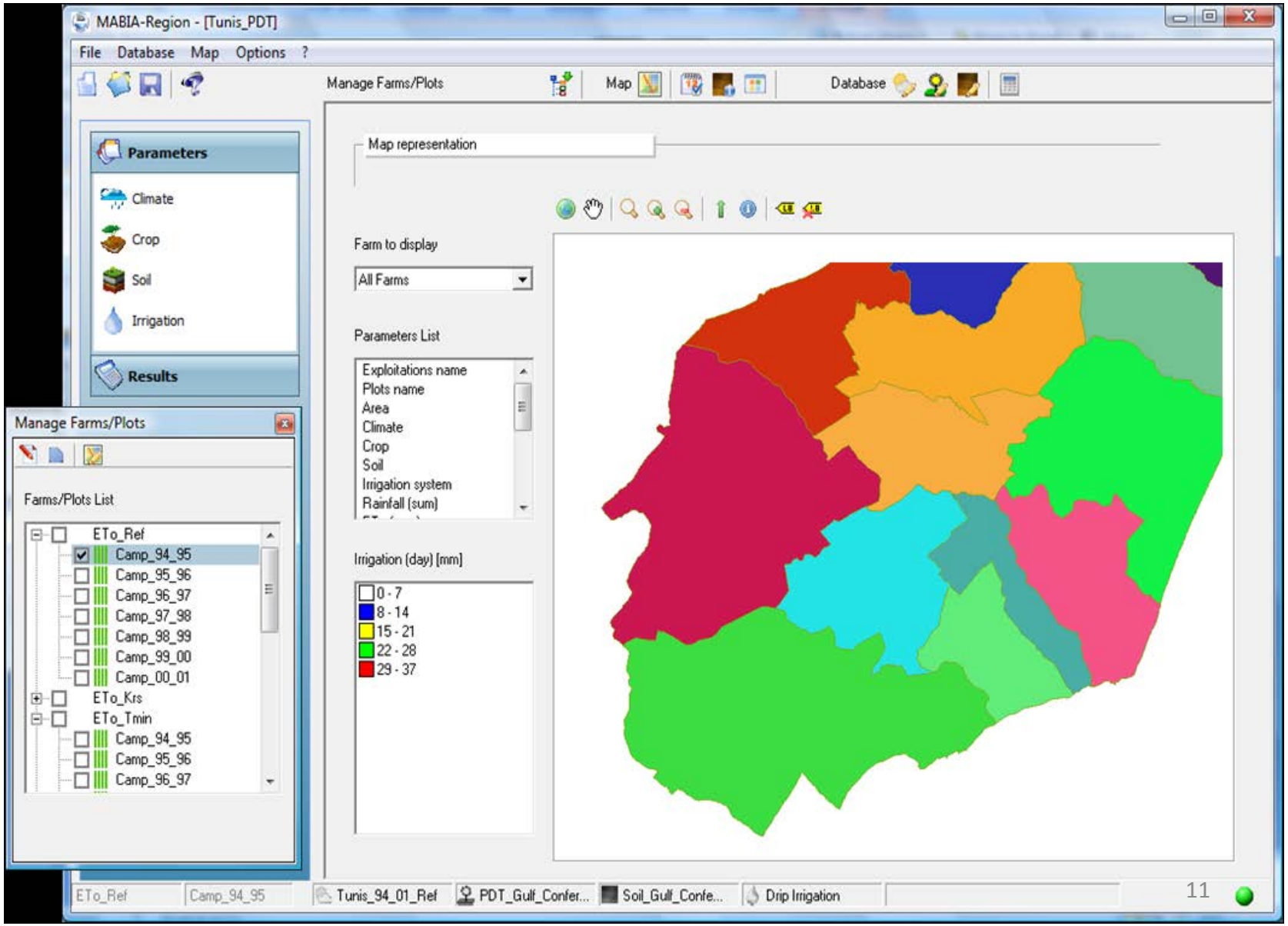


Soil Reservoir


Climate
Solar Radiation
Wind Speed
Humidity, Temp.
Evaporation demand
Rainfall
Irrigation Syst.
Types
Efficiency
Water Use
Daily Use
Water Balance
Crop
Development stages.
$K_c=K_{cb}+K_e$
Rooting Depth
Depletion Factor
Soil
Structure
Texture
θ_{SAT} , θ_{cc} , θ_{pf}


Climate
Daily historical Data
Data cropping Season 2010/2011
Irrigation System
Field Survey
CTV Data
Water Use
GDA
4 years of actual consumptions
Field Survey
Water Balance
Crop
FAO-56
Field Survey
14 Crops
Sol
Sol Study, 1962
cropping pattern 4 season

MABIA-Région



Presentation of the Study

- The Impact of Climatic conditions on the WIR at the Level of the ID

- Presentation of the degree of concordance between Real Water Consumption and WIR for 4 Cropping Seasons

Part 1 : Characterization of the inter-annual variability of crop and irrigation requirements at the level of the irrigation district

Objective

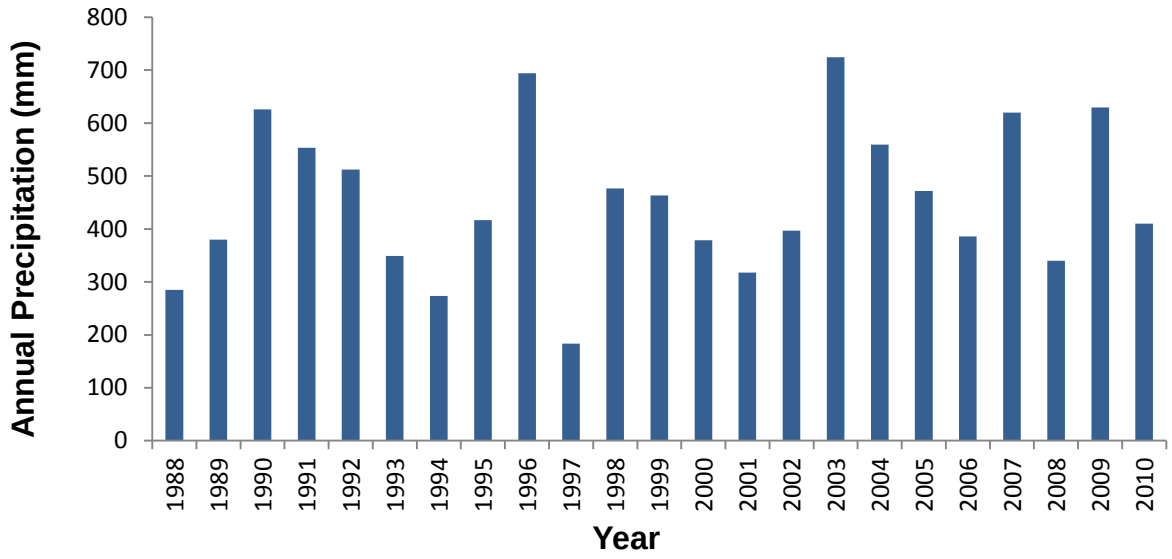
Determination of the impact of the climatic data on the variability of the water crop requirement at the irrigation district Level

Methodology

- Characterization of the climate for the period 1988 - 2011
- Characterization of the Land use

- Estimation of Crop Water requirement
- Estimation of Water irrigation requirement
- Estimation of water Irrigation requirement of the irrigation district

Characterization of the Climate

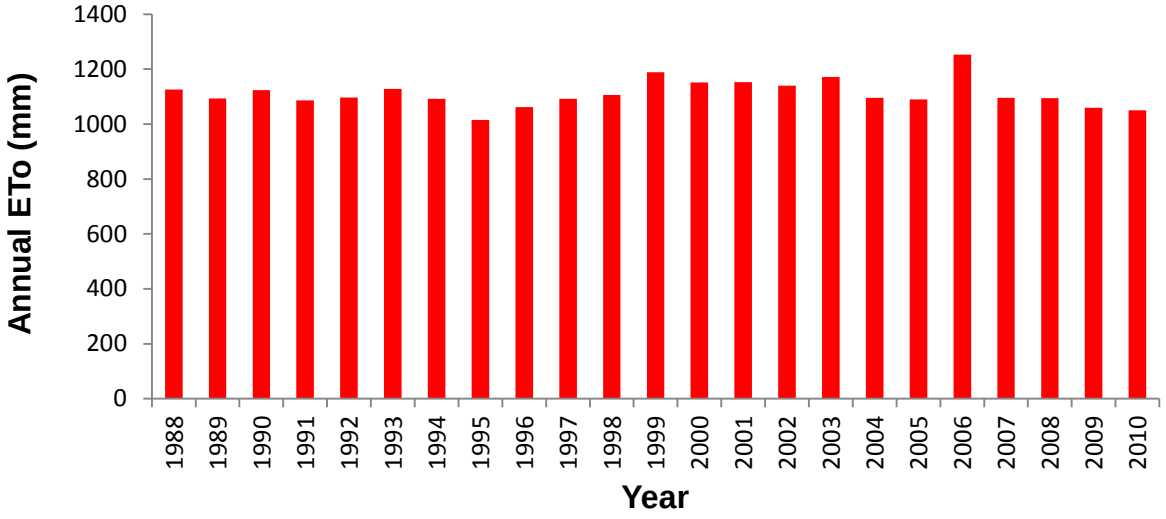


Min = 183 mm

Max = 724 mm

Avg = 450 mm

CV= 31.3 %



Min = 1016 mm

Max = 1253 mm

Avg = 1112 mm

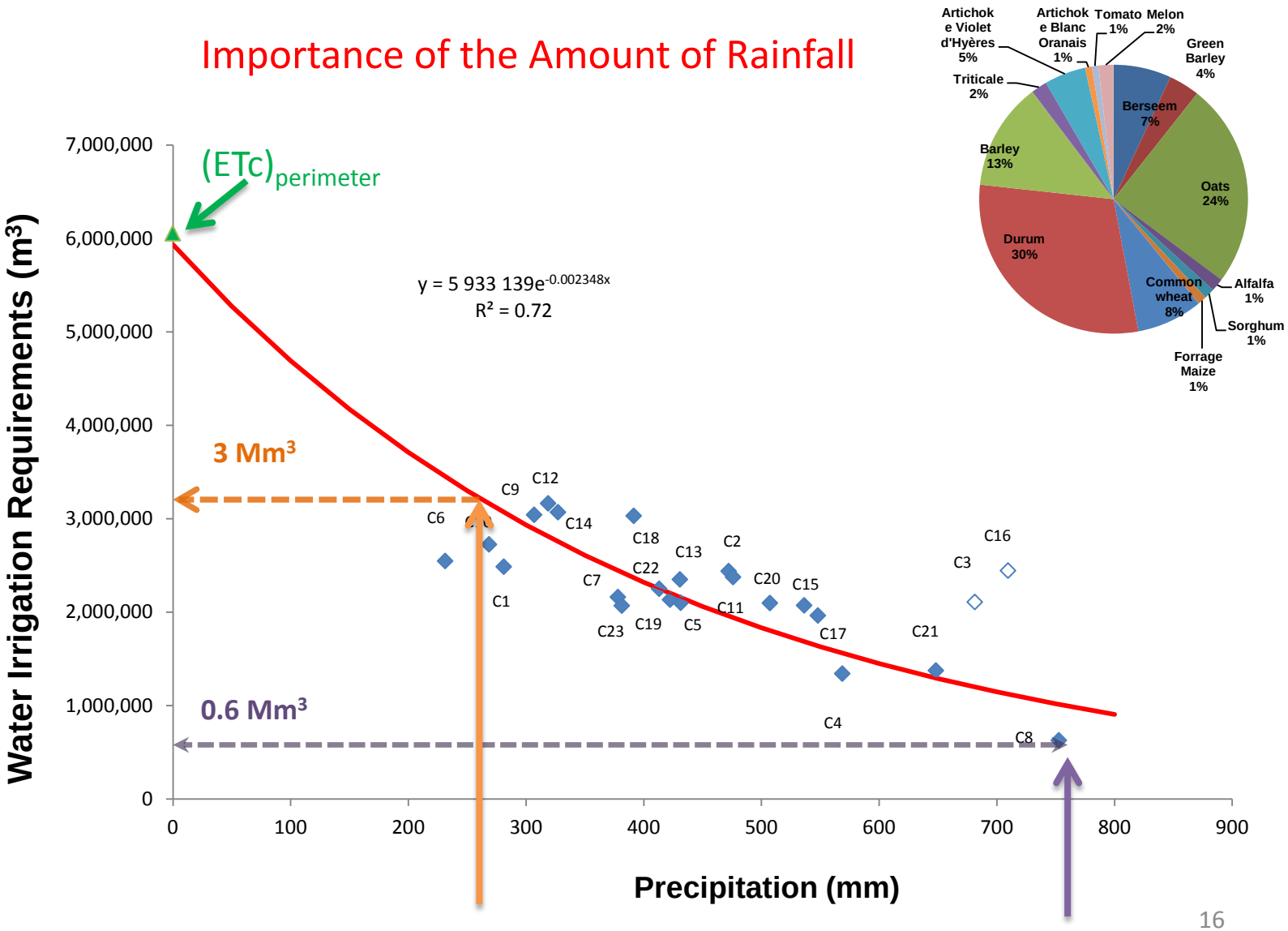
CV= 4.5 %

Variability of ETc, precipitations and water irrigation requirements for during 23 Cropping Season

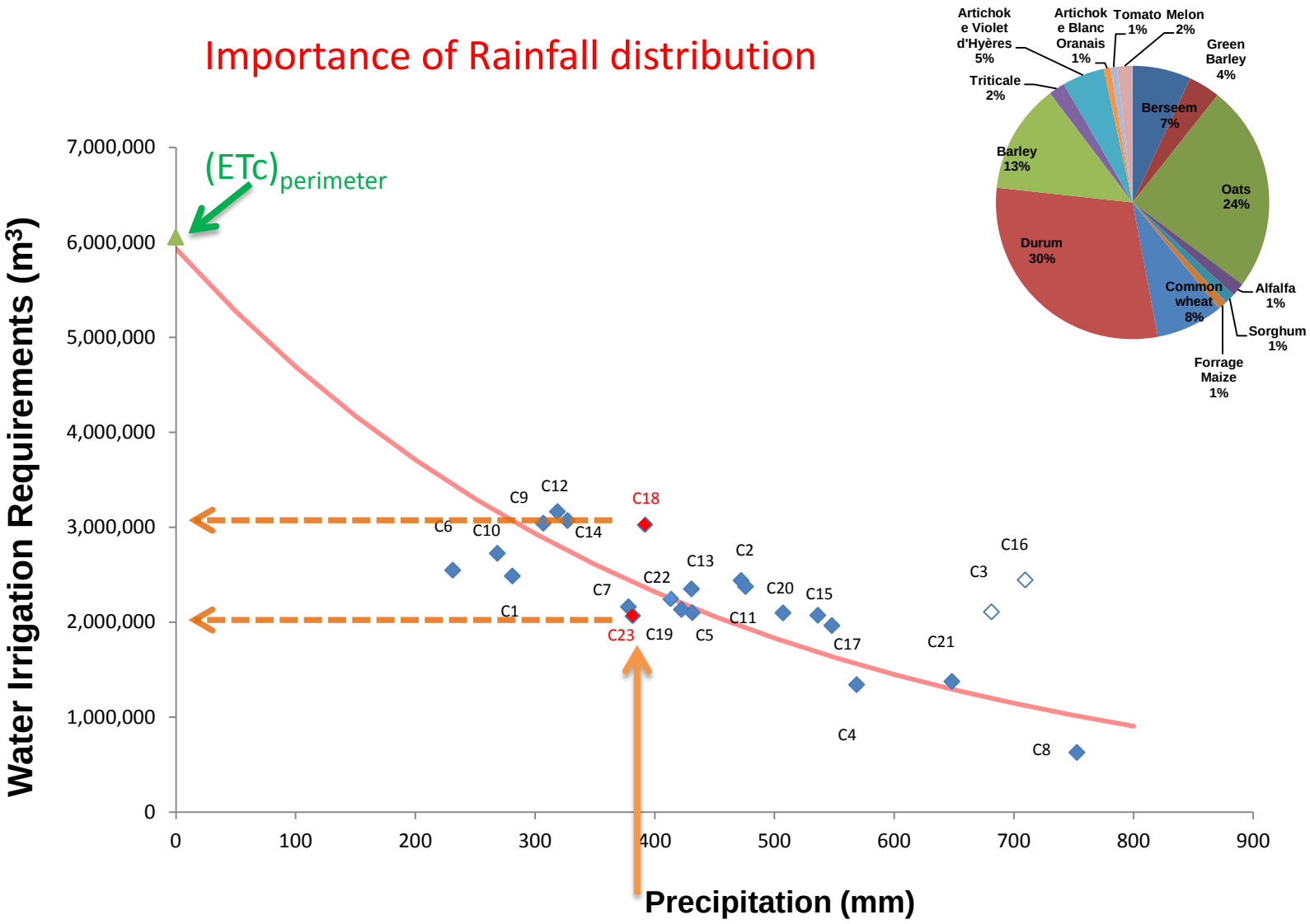
	Triticale			Durum			Common wheat			Artichoke Blanc			Artichoke Violet			Tomato			Melon		
	ETc	Pluie	BEI	ETc	Pluie	BEI	ETc	Pluie	BEI	ETc	Pluie	BEI	ETc	Pluie	BEI	ETc	Pluie	BEI	ETc	Pluie	!BEI
Min	425	185	0	444	185	0	479	155	0	569	113	234	550	116	235	612	28	548	441	19	375
Max	543	593	130	566	593	347	629	587	286	703	622	429	691	650	457	827	236	765	616	181	544
Avg	500	341	78	510	341	227	566	313	194	626	369	316	615	390	333	737	107	646	525	58	466
CV%	5.5	35.5	70.8	5.6	35.5	32.9	5.7	38.0	30.2	5.2	34.3	16.3	6.0	35.5	21.6	6.8	53.7	8.2	7.8	78.1	10.8

	Berseem			Green Barley			Oats			Alfalfa			Sorghum			Maize Forrage			Barley		
	ETc	Pluie	BEI	ETc	Pluie	BEI	ETc	Pluie	BEI	ETc	Pluie	BEI	ETc	Pluie	BEI	ETc	Pluie	BEI	ETc	Pluie	BEI
Min	298	108	0	379	188	18	197	100	0	646	28	456	598	28	373	192	5	12	312	177	0
Max	386	612	185	518	675	228	261	579	38	845	272	862	761	244	640	264	174	165	435	577	141
AVG	344	343	91	471	413	98	224	286	19	762	117	637	676	101	542	231	47	134	395	331	75
CV%	7.0	35.9	70.5	6.2	33.0	69.0	6.9	38.9	60.4	6.1	52.6	13.0	6.5	61.1	12.9	8.1	76.2	28.3	6.5	34.8	78.1

Variability Of water irrigation requirements in term of precipitation at the irrigation district Level



Variability Of water irrigation requirements in term of precipitation at the irrigation district Level



Conclusion of Part 1

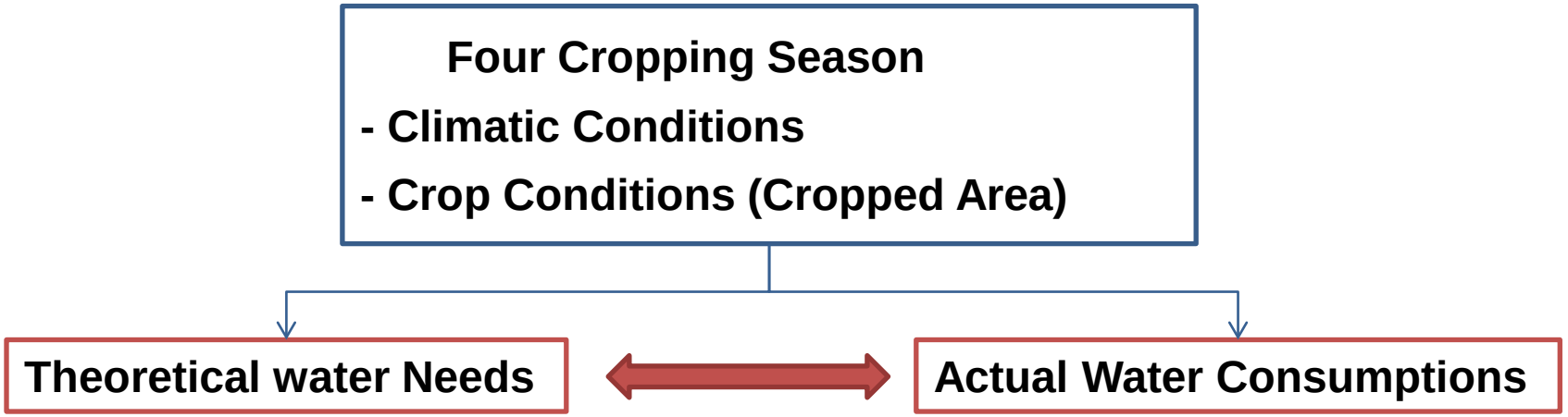
This Theoretical study show that Water Irrigation Requirements are strongly determined by climatic conditions

Question

At this point of the Study the question is :

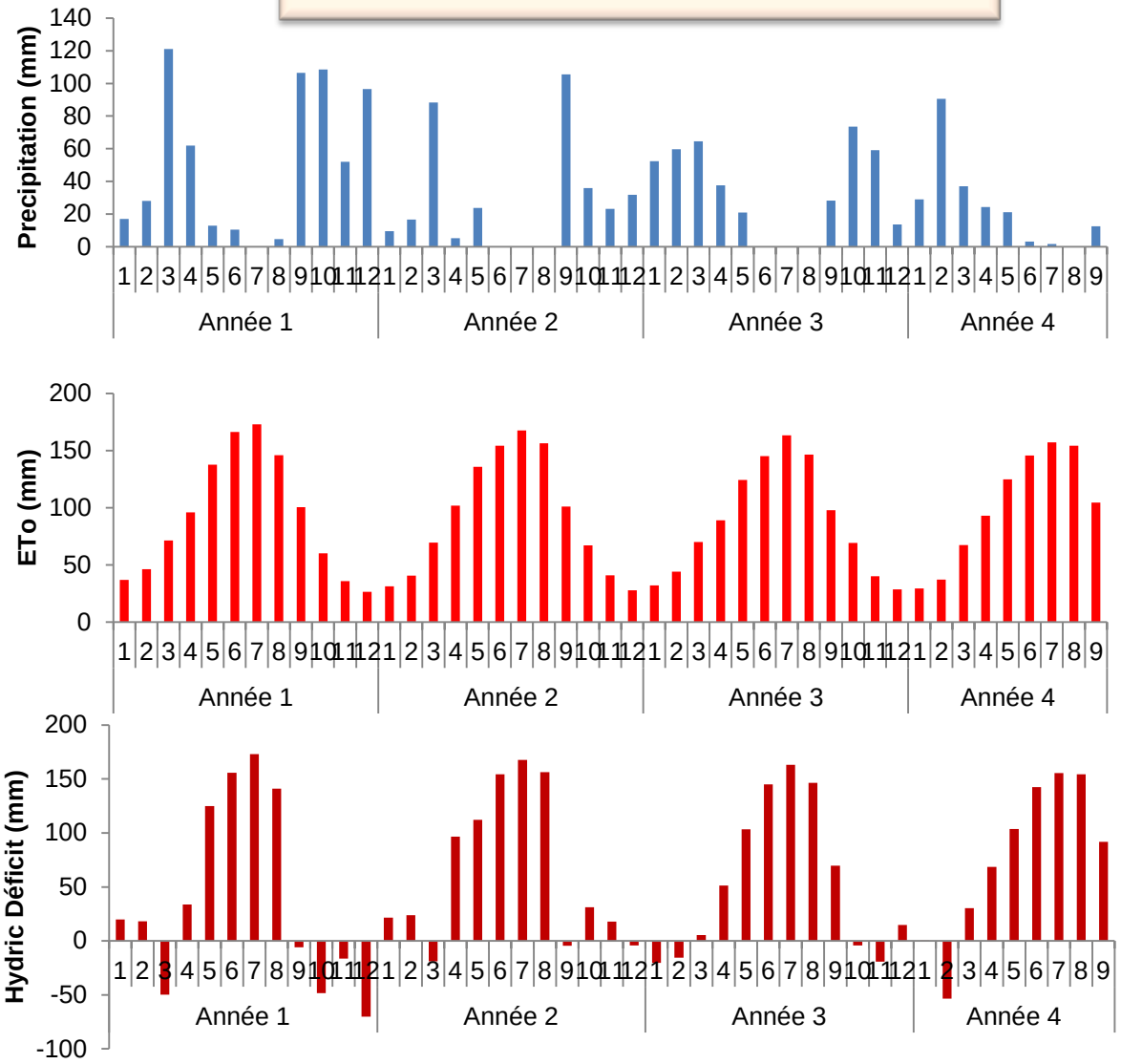
Is the variability is well reflected in the irrigation practice of farmers?

Methodolgy

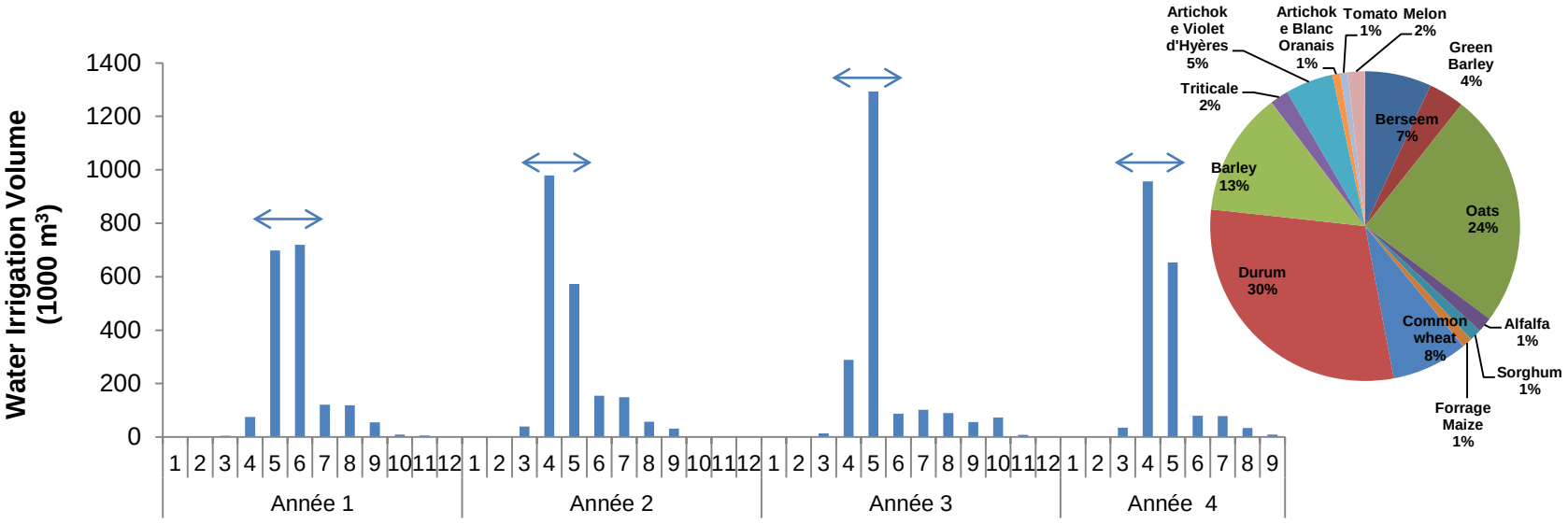


Part 2 : Characterization of water irrigation consumption at the level of the irrigation district

Climate Characterization



Characterization of Water Irrigation Requirements



WIR Variability Between Years

High demand during the months of April & May

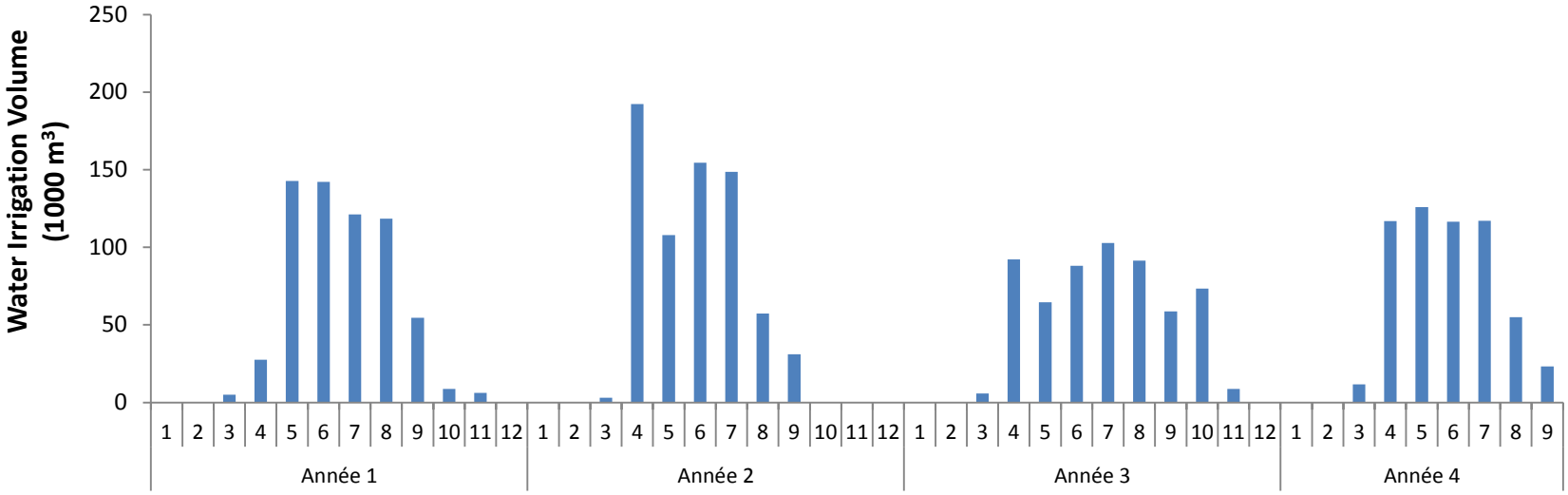
Cereals :

- **Require an important amout of water during this period**
- **occupy 54% of the total cropped area**

The Demand Represent 70 % of the Water Irrigation Requirement

Characterization of Water Irrigation Requirements

Without Considering WIR of Cereals



- WIR almost inexistent during December, January and February

- WIR greatly varying during March, April and May

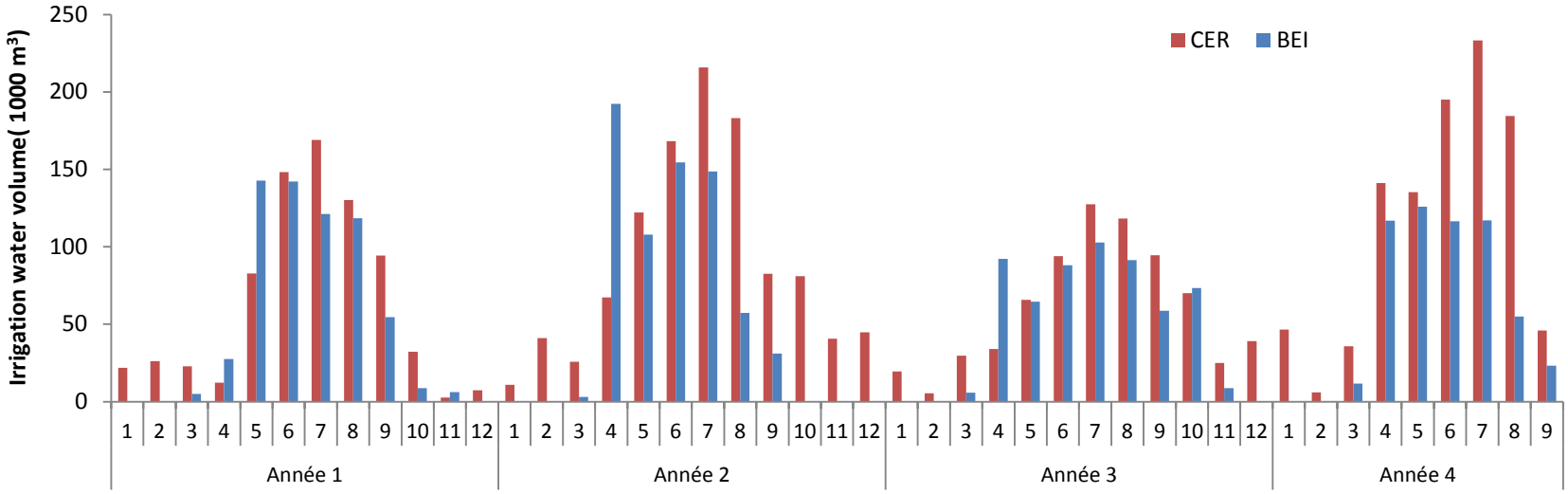
- High WIR during June, July and August

Inter-annual fluctuation dependent on cropped Area

Year 2 > Year 3 110 ha > 65 ha

Year 1 ≈ year 4 Area ≈ 92.5 ha

Compared with the actual consumption



Year	S (ha)	P (mm)	AC (1000 m³)	WIR (1000 m³)	CRN* (%)
Year 1	1389	620	750	1 807	41
Year 2	1391	340	1 083	1 983	55
Year 3	1461	410	723	2 012	36
Year 4**	1391	220	1 024	1 846	55

(*) CRN=AC/WIR x 100 ; (**) Only for the period from the 01/01 to the 30/09

- ✓ **Lack of knowledge of Water Crop Requirement and their degree of satisfaction by the rainfall input**
- ✓ **Limited or no irrigation of cereals during the Spring**

Conclusion of the Part 2

- ✓ **The importance of rainfall in the decision of the irrigation farmers**
- ✓ **A coverage rate of WIR in the order of 50%**
- ✓ **The lack of irrigation of cereal during the spring**

Conclusion

This study consisted of the evaluation of the water use at the scale of an irrigation

The divergence between the practice of irrigation farmers and the optimal program of irrigation in terms of doses and frequencies has been demonstrated

Next Steps

Thus, in order to ensure effective and efficient use of water, it would be wise to implement a local Irrigation Advisory Service using MABIA-Region Tool in order to improve the water local governance and to assist farmers in their day to day irrigation scheduling.

Rethink the Based Community Water management and Governance at the level of the irrigated district in order to improve Social and Economical Aspects with an Integrative Water Resource Management approach.