ALTOS: Managing water resources within Mediterranean agrosystems by accounting for spatial structures and connectivities.

WP4: Simulating fluxes and storages for structure modulations

Task 4.1: Setting up scenarios

25-26 / 05 / 2021

Case studies:

- Tensift catchment(UCA, Morocco)
- Merguellil catchment (INAT, Tunisia)
- Lebna catchment (INRGREF & LISAH, Tunisia)
- Senarios & pesticide impacts

Summary of the WP 4:

Simulating fluxes and storages for different scenarios of structure modulations

Site	Partners	Modelling schemes	Structures to be modulated						Services				
			Land use	Reservoirs	Benches	Irrigation	Pest management	Climate	Yield & WUE	Catchment outflow	Aquifer refill	Silting	Mitigating pollution
Cap Bon	INRGREF LISAH CERTE INAT	MHYDAS & SAFY (1)	X	X				X	X	X	X		
		SWAT	X		X		X	X	X	X	X	X	X
Merguellil	CESBIO INAT CERTE	SWAT	X		X			X	X	X	X	X	
		WEAP	X			X		X	X	X	X	X	
Tensift	UCAM CESBIO	SWM (2) SIM (3)	X			X			X	X	X		
Litani	CNRS-L LARI CESBIO	WEAP SWAT	X						X	X	X	X	

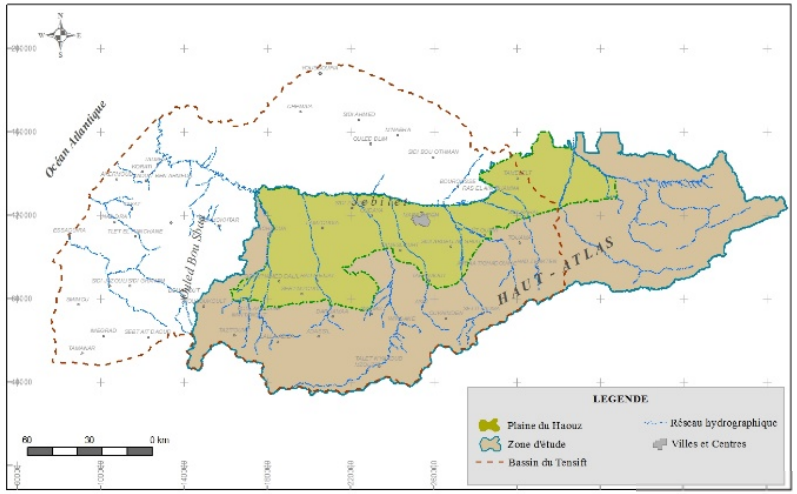
(1) Refers to the coupling of MHYDAS and SAFY within the OpenFLUID platform.
(2) SWM stands for SAMIR-WEAP-MODFLOW.
(3) SIM stands for SAFRAN-ISBA-MODCOU.

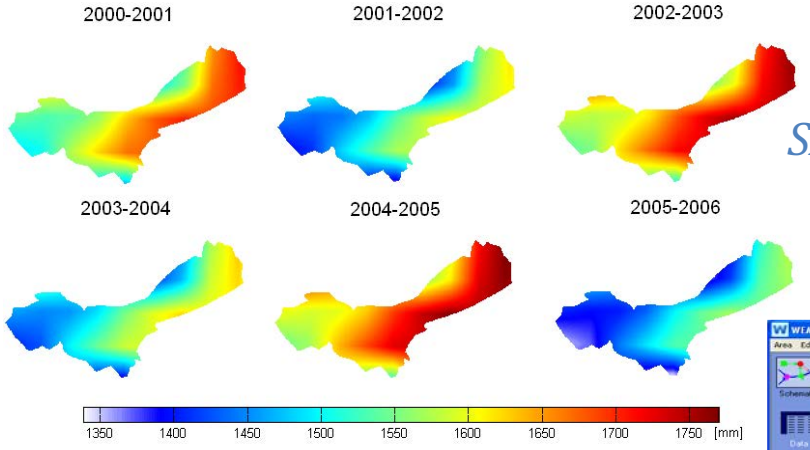
WUE stands for water use efficiency.

Task 4.1: Setting up scenarios

- Modulation scenarios on land use & irrigation conversion
- Modulation scenarios on water fluxes and matter fluxes (various reservoirs)
- Exploratory & Realistic scenarios

SAMIR-WEAP-MODFLOW monthly modeling 2001-2011

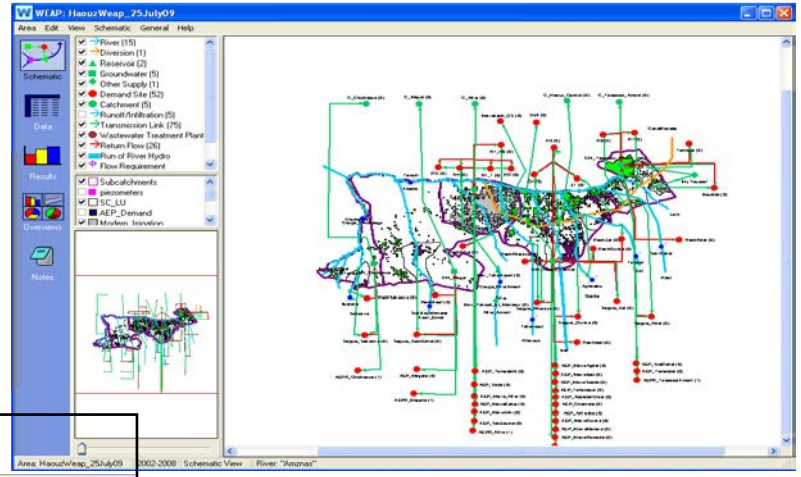


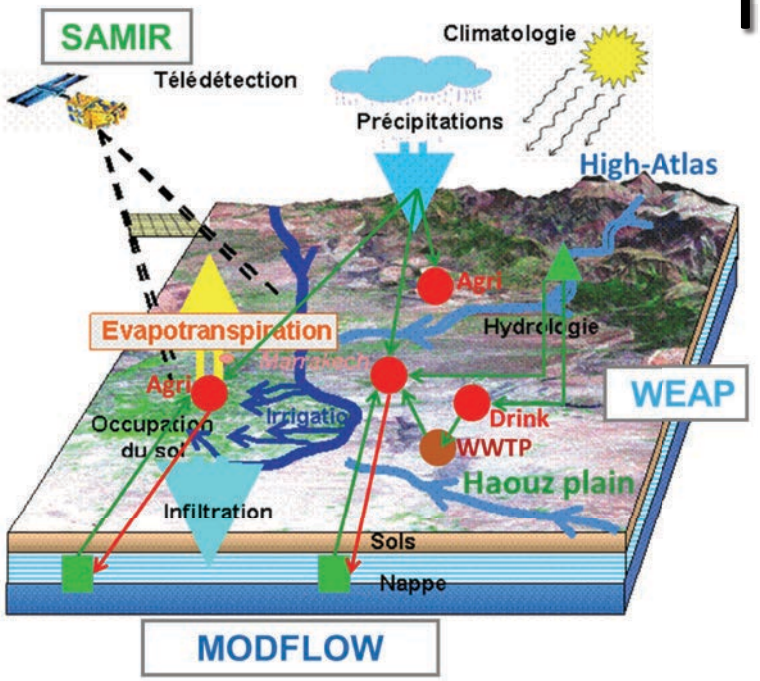


SAMIR

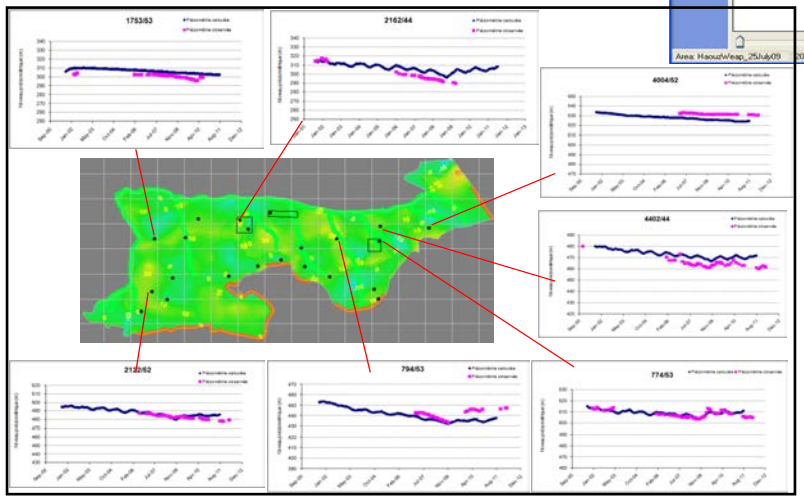
Tensift basin / UCA

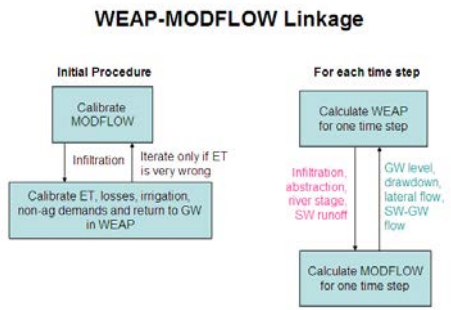
WEAP



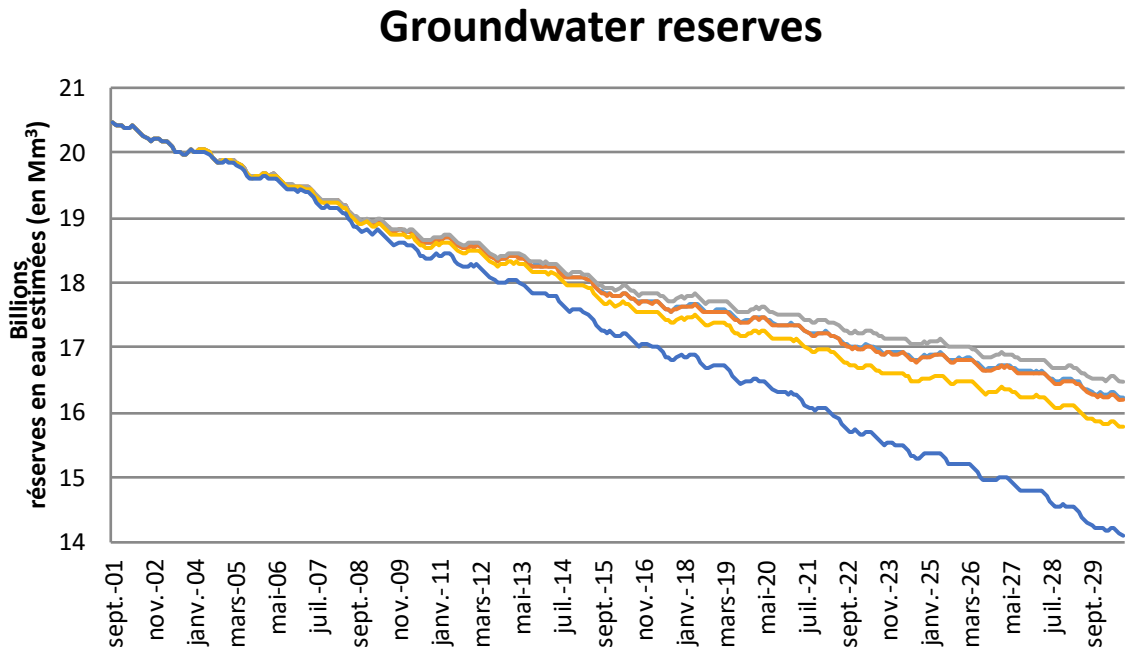


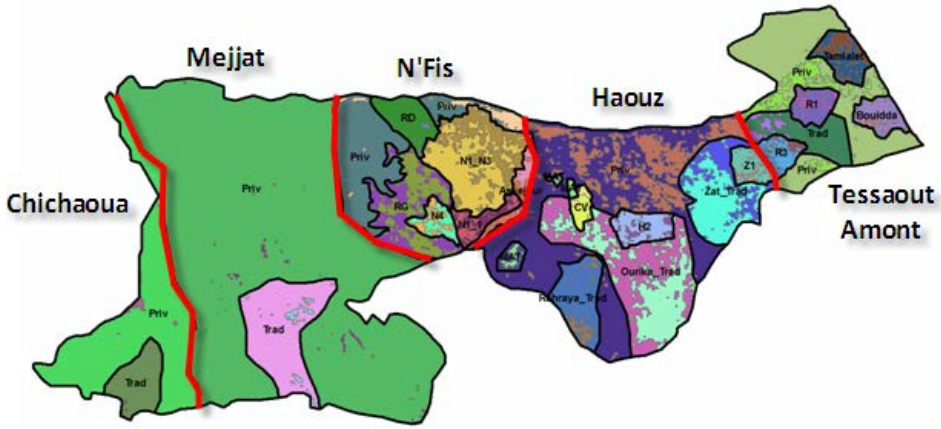
MODFLOW

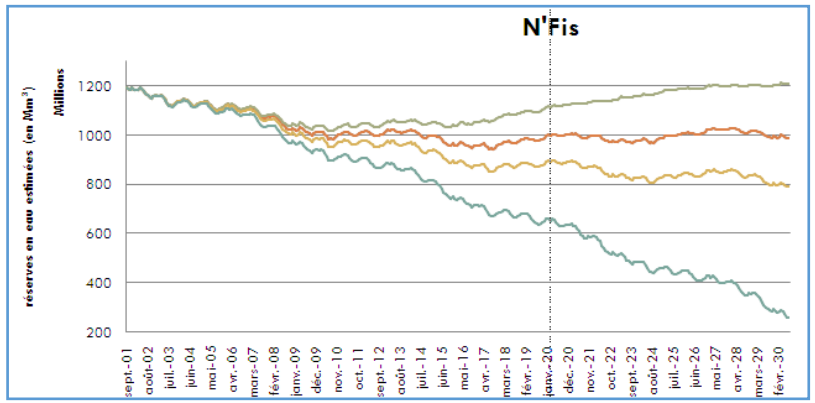


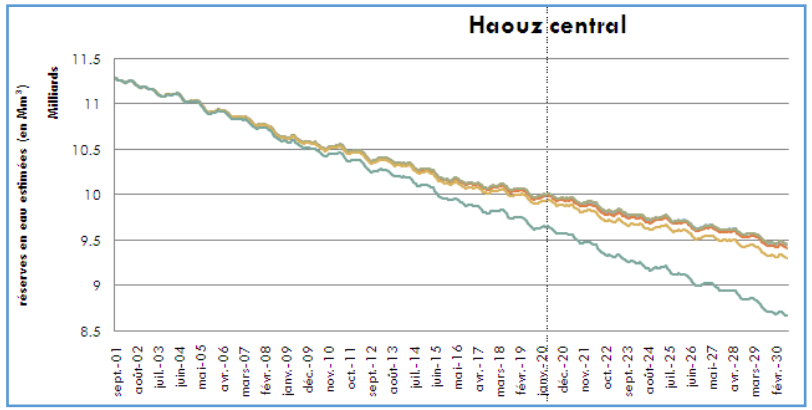


PRELIMANARY EXPLORATORY TRENDING SCENARIO (ABHT)



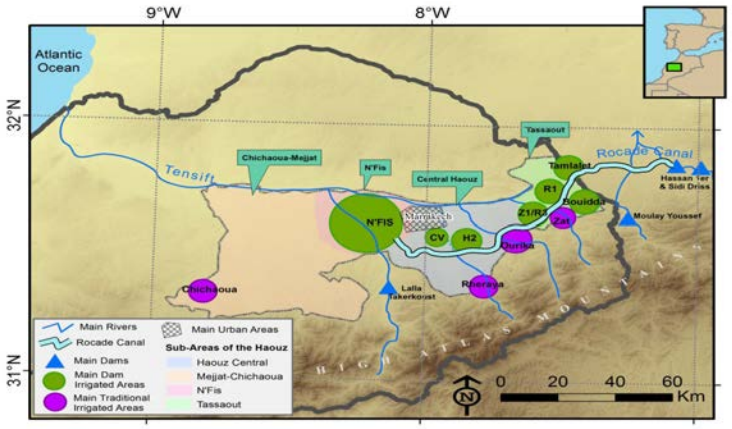


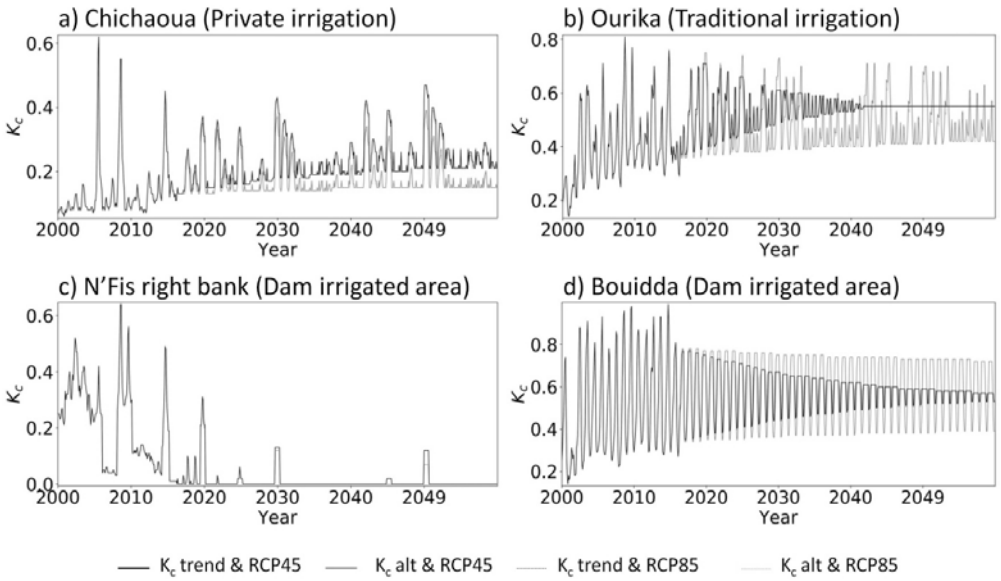




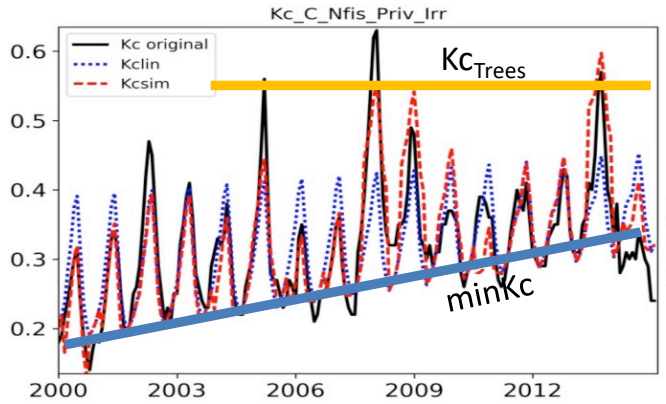
A Kc REALISTIC SCENARIO

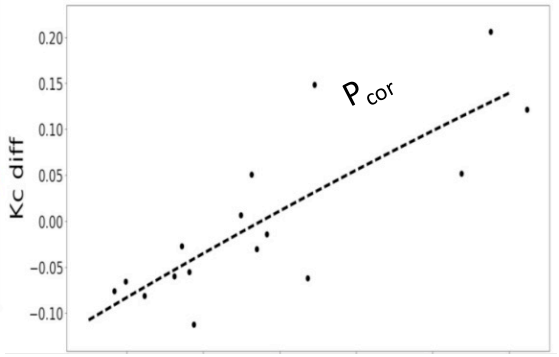
Le Page, M., Fakir, Y., Jarlan, L., Boone, A., Berjamy, B., Khabba, S., and Zribi, M. (2021). Projection of irrigation water demand based on the simulation of synthetic crop coefficients and climate change, Hydrol. Earth Syst. Sci., 25, 637–651, https://doi.org/10.5194/hess-25-637-2021

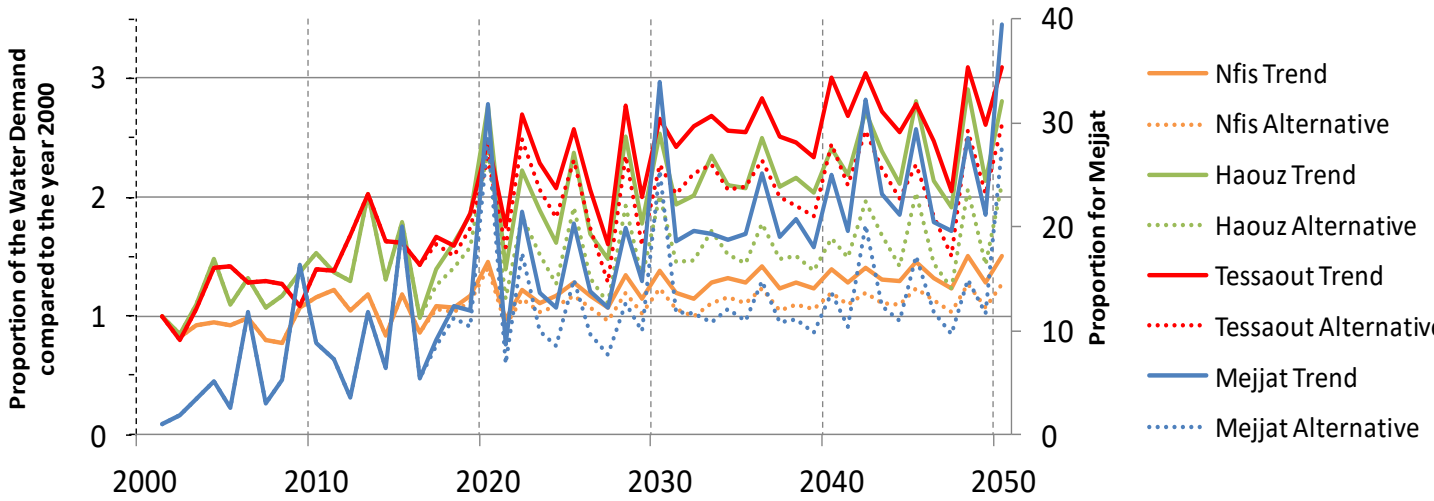




Examples of long-term simulation of K_c in four different irrigated areas with the trendy and alternative scenarios of K_c and the RCP4.5 and RCP8.5 climatic scenarios.







Trend and alternative scenarios for irrigation-water demand in the four planning areas of the Tensift with RCP8.5

Perspective for Tensift basin 2021-2022:

- Developing other scenarios
- Implementing the scenarios

Task 4.1: designing scenarios (leader: UCAM)

Activities:

-Realistic scenarios about land use change within Merguellil for 2020-2050, with upstream reforestation and downstream irrigation extension in the context of conversion to olive growing.

-Bench modulation within upstream Merguellil, to be designed via participative seminars with stakeholders (e.g., national directorate for soil and water conservation)

Land use change scenarios for an agro-hydrological model within Merguellil

- Change from rainfed to irrigated land (due to climate change) (Historic and multi temporal Land-use maps) in Merguellil downstream

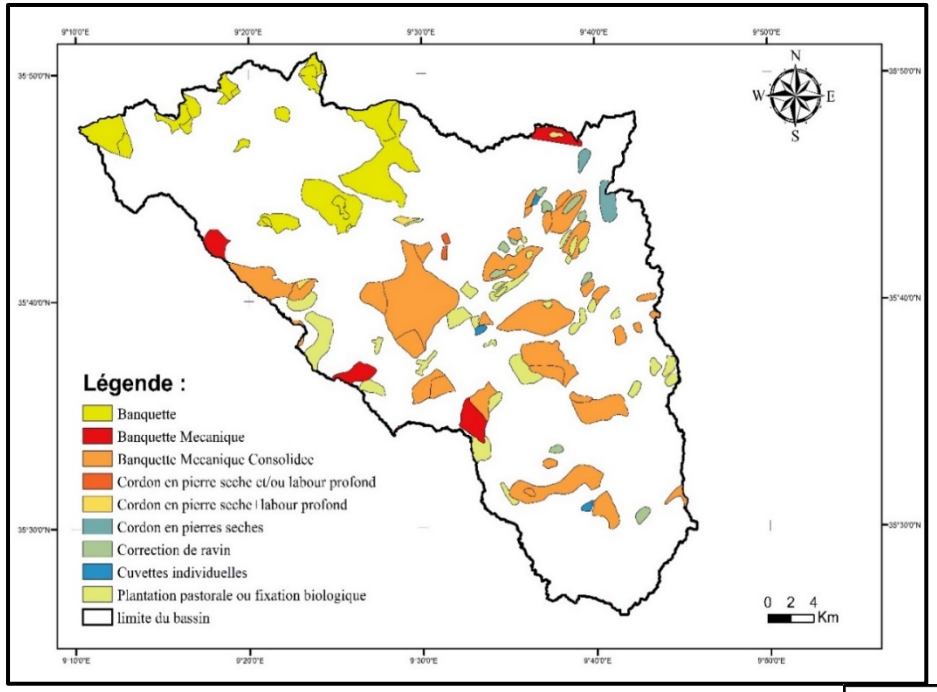
- Difference case of agroforestry area augmentation (olive trees extension) and non agroforestry system (only market crops) or only cereals (seasonal and interanual Land-use map) in Merguellil upstream

- mutation to agroecologic practices (living the soil on not till) or Minimum tillage (tillage map and period);

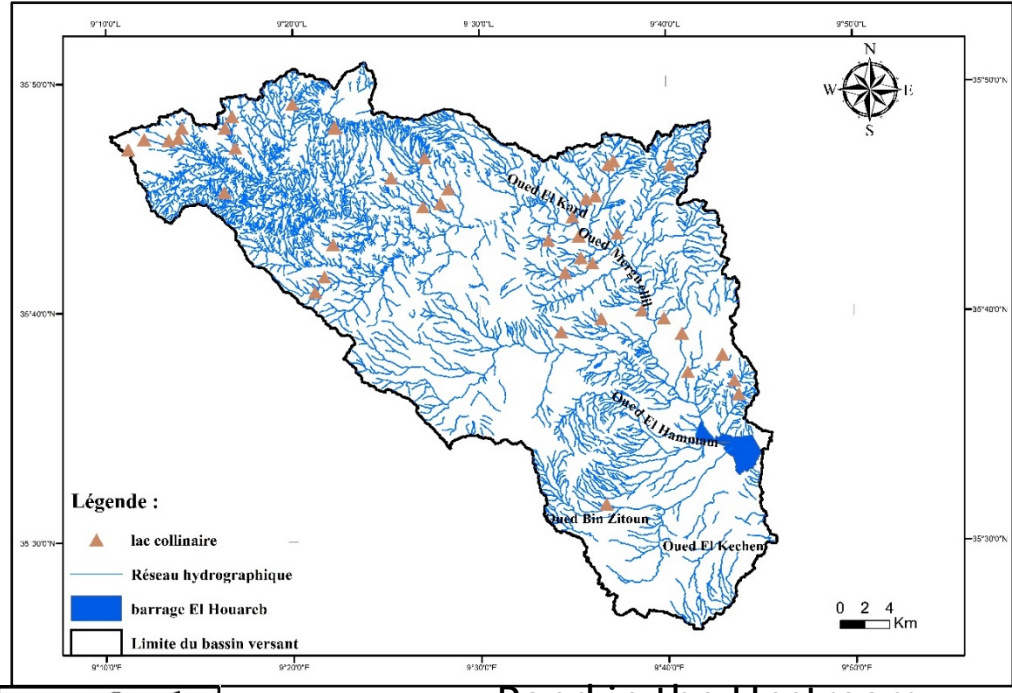
- All scenarios will be approved within the stakeholder workshop

PhD student Ines Gharnouki is in progress for this Task (complementary with Task 1.2)

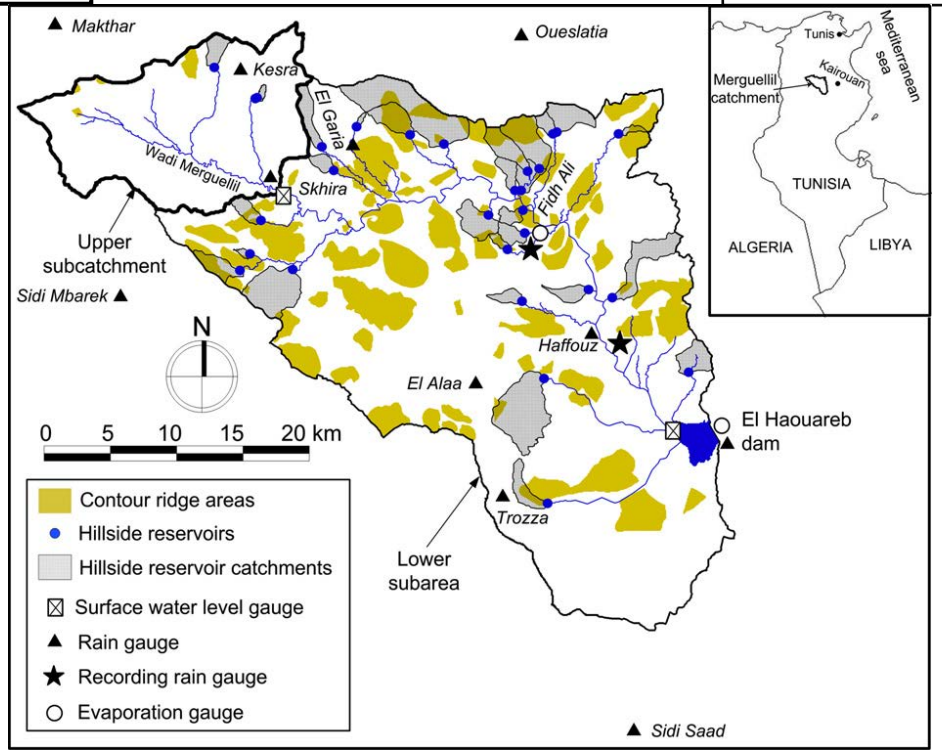
Bench modulation



Soil Water Conservation Works (SWCWs)

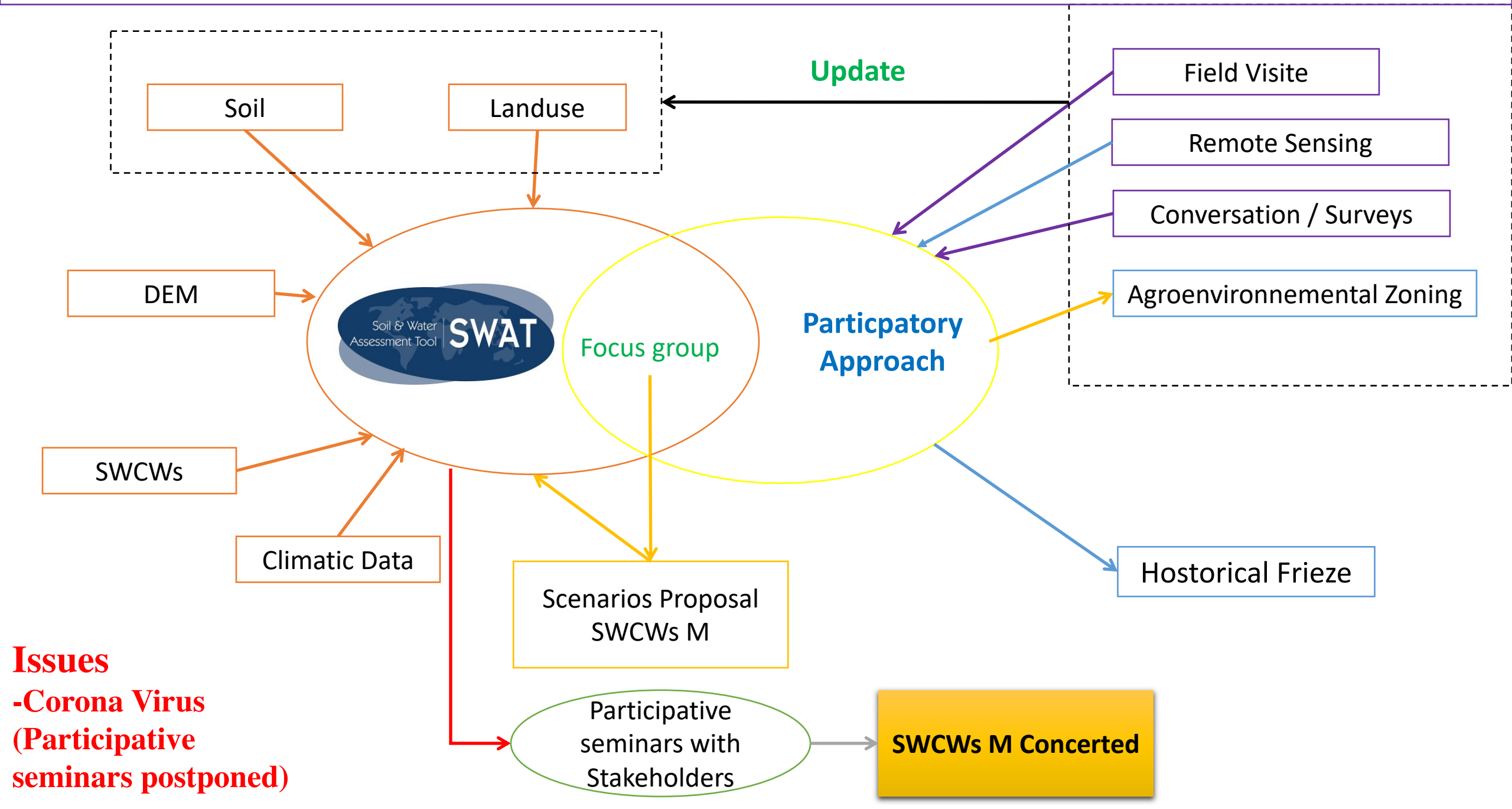


Pond in the Upstream Merguellil Watershed



Hydro-meteorological stations and WSCW built in the Merguellil catchment between 1989 and 2005 (Lacombe et al., 2008)

Task 4.1 **Designing scenarios for an Agro-hydrological modelling**



Issues

-Corona Virus (Participative seminars postponed)

Managing water ressources within Mediterranean agrosystems bu accounting for spatial structures and connectivities - ALTOS

KOM ALTOS

INRGREF & LISAH

WP4: Task 4.1 : Setting up scenarios (leader: UCAM)

May 25-26, 2021

Crops distribution evolution scenarios

Objectives

Use of landscape evolution scenarios (projections 2040 developed within the framework of Transmed Almira) to evaluate the impacts on provisioning and regulating services; yields of water, sediments transport, and agricultural production (crop biomass, yield) in the context of the Lebna catchment.

Consider the decisions made by farmers about annual crop allocation within the collective contexts in which farmers operate by using acquired data on the site from 2016 to 2018. (LMI Naila, ANR ALMIRA).

Set up realistic crop distribution scenarios

Crops distribution evolution scenarios

3 approaches:

1. Identification of crops clusters classified according to crops successions and individual/collective crop allocation rules

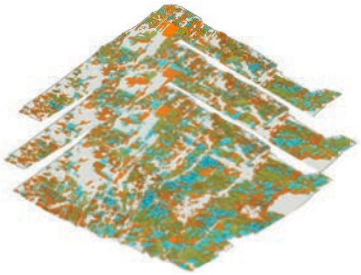
2. Identification of physical linear elements of the landscape impacting the crops clusters

3. Individual or collective interviews of actors to validate the identified crops distribution rules

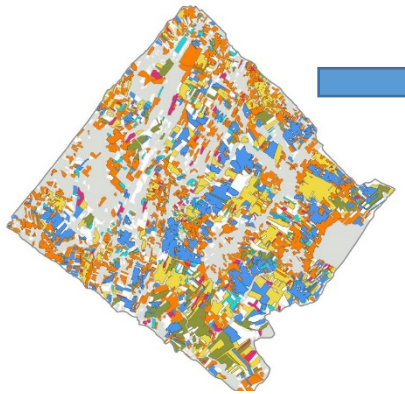
1. Identification of crops clusters classified according to crops successions and individual/collective crop allocation rules

Spatio-temporal distribution of crops at the landscape level as indicator of collective crop rotations

Mapping of annual crops at agricultural field resolution over 3 successive cycles, images classification

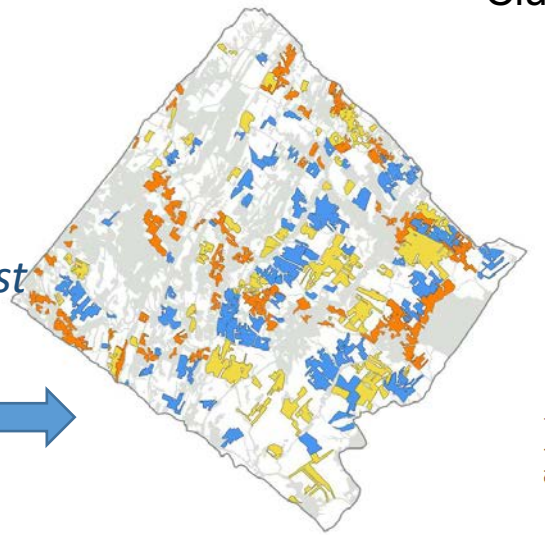


Identification of clusters

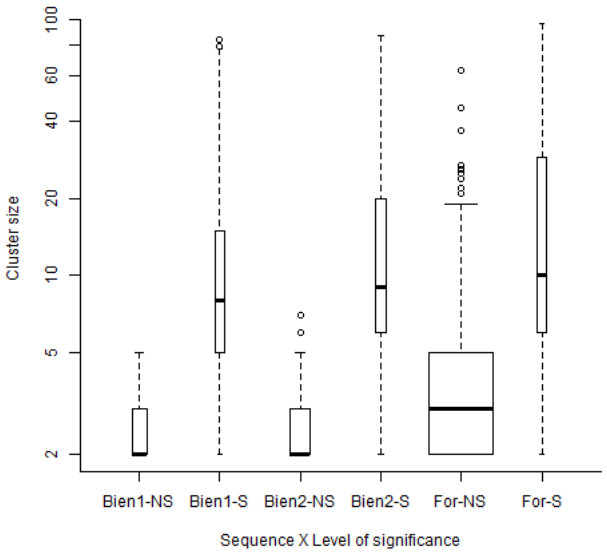


Clusters of adjacent fields with same type of crop sequences (eg. Biennal (Bien 1, 2,…)

Spatial statistical test



Clusters resulting from collective crop rotations



Biarnes et al., Submitted to Agricultural Systems journal

Perspectives

2021-2022

- Characterize the clusters of crops at the landscape scale

  - *Identification of physical linear elements of the landscape impacting the crops clusters*

  - *Scientific papers*

- Individual or collective interviews with actors to validate the identified crops distribution rules

- Present, debate, qualitative evaluation of landscape evolution scenarios with stakeholders

Task 4.1 : designing scenarios (leader: UCAM)

Objective : use of existing cultivation scenarios at watershed level to evaluate corresponding pesticides environmental pressure in rainfed and irrigated agro-Hydro-systems

- In pluvial context :
  - Correlating phytosanitary practices to existing scenarii for landscape evolution, in order to determine pesticides predicable phytosanitary pressure (qualitative recommendations)
  Deliverables: recommendations=> end 2022
- In irrigated zones :
  Correlating phytosanitary practices to existing scenarii for landscape evolution of irrigated areas in order to determine pesticides predicable phytosanitary pressure. (qualitative recommendations taking in account salinity status)
  Deliverables: recommendations => end 2022