The impact of overexploitation of groundwater resources on the resilience of agricultural farms in semi-arid zones

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Topic of research

- Water resources in Morocco are rather well known, but limited, irregular, and fragile.
- The expansion of irrigated agricultural land has increased the groundwater use, resulting in the overexploitation of local aquifers.
- Water scarcity is expected to have a negative impact on food production and threaten the resilience of the local agricultural system

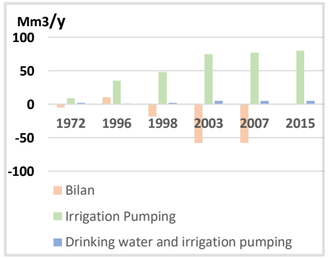


Figure 1 : Evolution of groundwater withdrawal and water balance

Objective

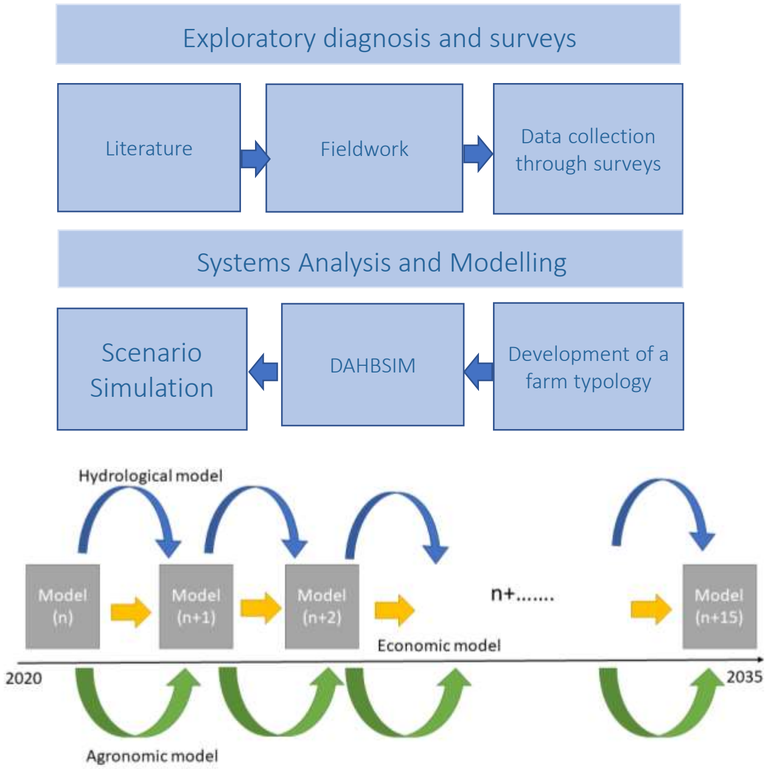
The main objective of the research is to evaluate the impact of groundwater overexploitation on the resilience of agricultural households in Morocco.

Case study :

- South of the Atlas mountains
- Semi-arid to arid climate
- Average rainfall of 200 to 250 mm/y
- Quasi-absence of surface water
- Importance of groundwater resources
- Water consuming activities

Methodology

Our approach, to analyze the resilience of farmers, focuses on the household level where the main decision-making is taking place.



In order to study the resilence of agricultural farms in the Souss Massa region (Morroco), we used DAHBSIM bio-economic model (Komarek et al. 2017). It is based on mathematical programming methods and maximizes the expected utility of household income.

Results

We identified 3 farm-types in the area; intensive production system based mainly on vegetables, semi-intensive cereal monoculture households and one perennial crops.

Table 1 : Farm income and pumping costs

	Indicator	Scenario of reference (Sc_REF) 2020	Business As Usual (BAU) (2035)	Average annual cost of degradation	Cost of degradation Sc_REF - BAU
Water cost(dh/m3)	26.57	61.93	40.85	43.7	**6,536,000,000**
Pumping costs (dh/m)	1827.53	2268.65	388.01	441.12	-
Farm incom (dh/farm)	34243.87	26871.14	3686.36	**7372.73**	**112,433,980**

Table 1 : Income variation with precipitation after simulation

Intensification level	Crop	Income (Dicrease or stable Dh/ha)
Intensive (Type 1)	Vegetables	- 2777,95
Semi-intensive(Type 2)	Cereal monoculture	- 980
Extensive (Type 3)	Perennial	+2050

References : Bouchaou et al., 2011/ Hssaisoune et al., 2020/ Komarek et al., 2017 / El Ansari et al., 2020/ Malki et al., 2017