



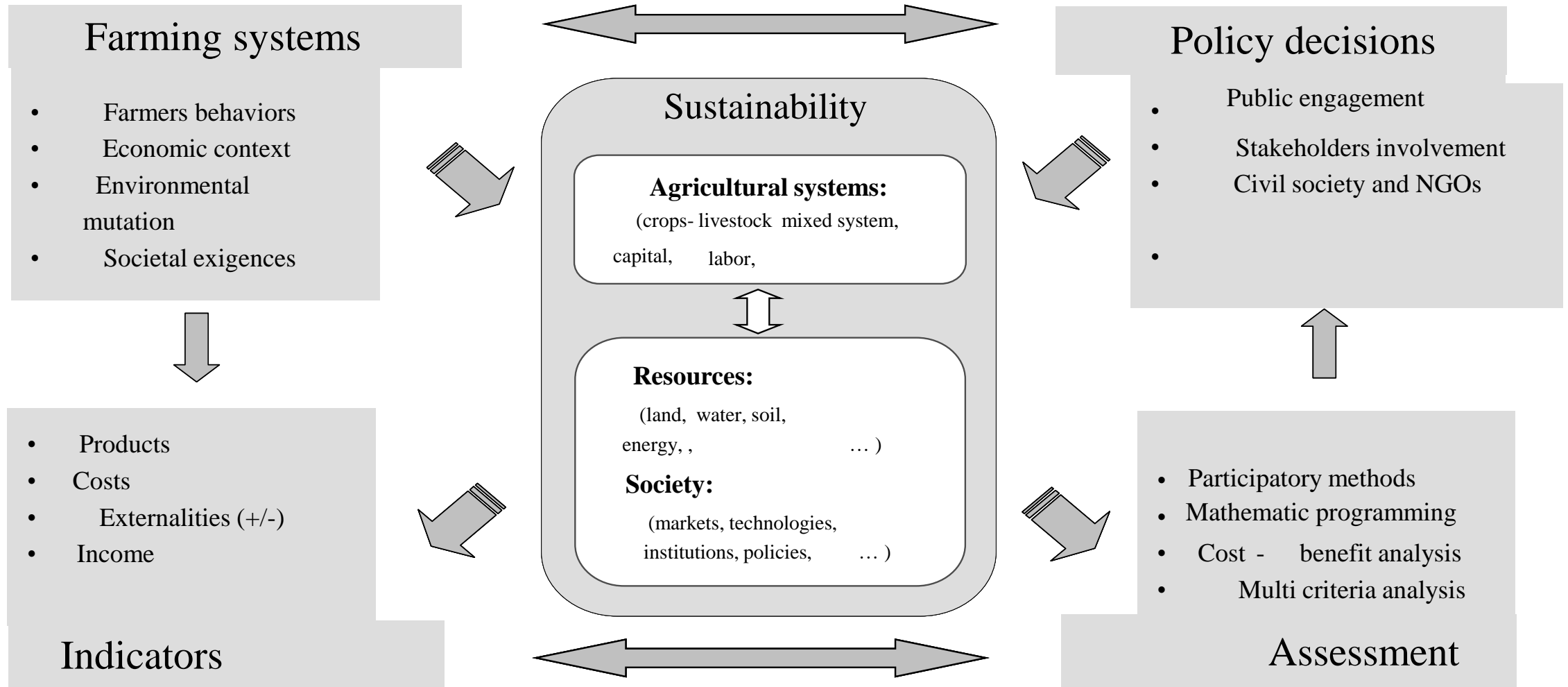
Use of Conservation Agriculture in Crop-Livestock Systems (CLCA) in the Drylands for Enhanced Water Use Efficiency, Soil Fertility and Productivity in NEN and LAC Countries

Tunisia CLCA Project: Socio-economic activities

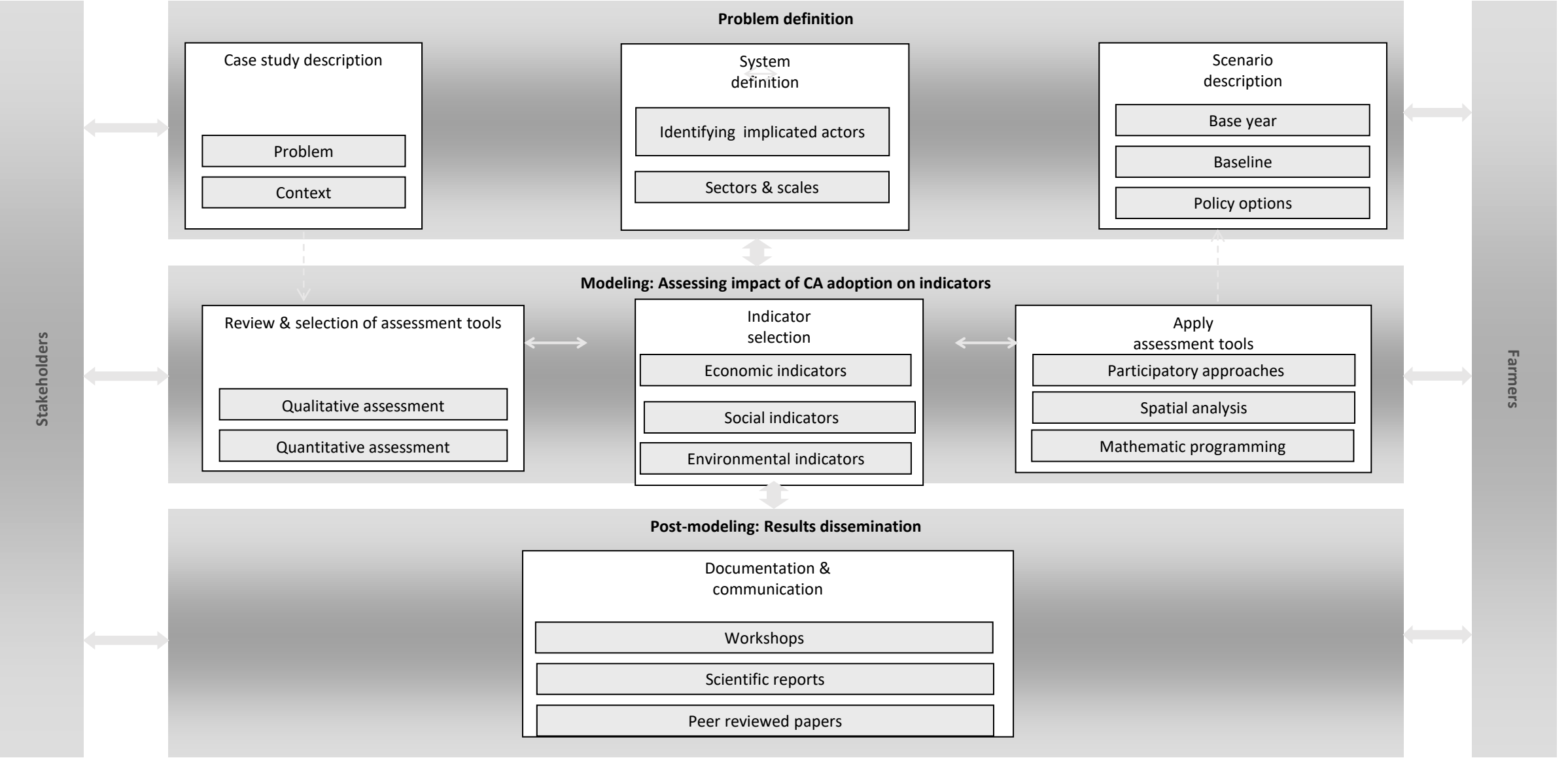
Tunis, March 5th, 2020



How to deal with complex systems ?



Conceptual framework



Where we are right now ?

- **Achievement:**


- Assessment of constraints to the Adoption of Conservation Agriculture
- Assessment of farmers perceptions of extension services
- Quantification of crops residues + BBN model + typology of crop residues patterns.
- Cost benefit assessment 79 ha... methodology + some results.
- Presentation of Farm Design model,

- **Ongoing activities:**

- Stakeholders perception of extension services
- Spatial Extended cost benefit assessment .
- Suitability map for sustainable CA adoption


Activities of socioeconomic teams

- Participatory approach & Socio-economic surveys → stakeholders & farmers perception on CA adoption/ extension techniques (20 surveys with farmers & 16 with researchers)
- Socio economic survey→ mathematical programming & optimization (farm typology (150 surveys and 5 farm type surveys)
- Socio economic survey→ Spatial extended cost benefit analysis (survey design and testing)
- Spatial analysis → Generation of suitability map for sustainable CA adoption



Science for resilient livelihoods in dry areas

Survey on:
Spatial Cost Benefit Analysis of Conservation Agriculture Adoption



Science for resilient livelihoods in dry areas

Survey instrument tool for assessing the effectiveness of agricultural extension service delivery

An application to the CLCA technologies transfer methods

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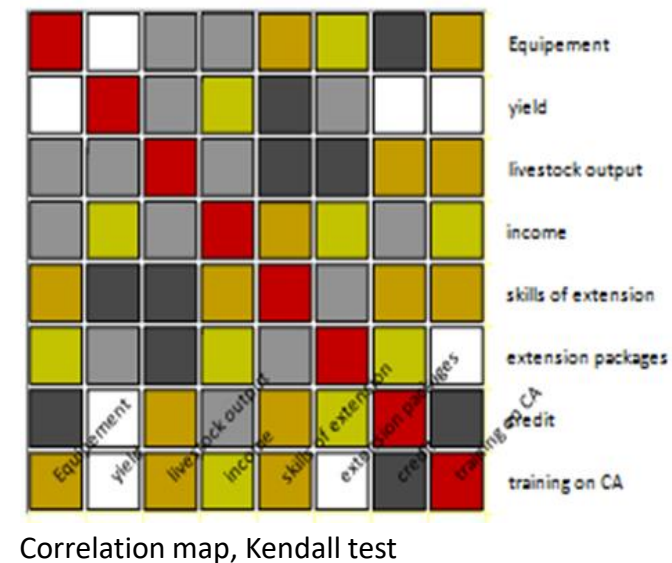
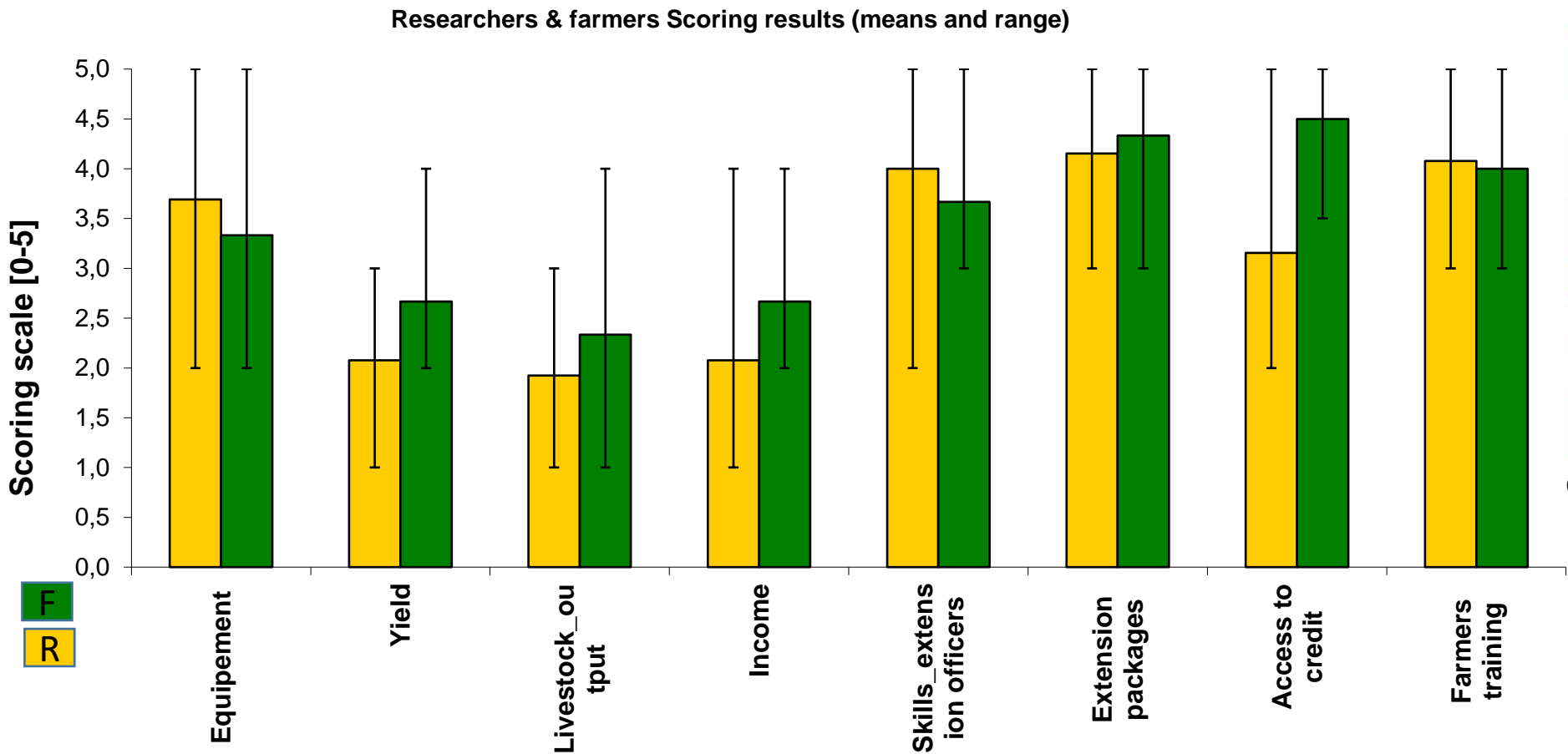
...capacity of extension system please determine the priority of the following

	I Priority (1)	II Medium (2)	III Low (3)	IV Not necessary (4)
Capacity of extension agents	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Experts and subject matter specialists working in extension management and agents on participatory approaches	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Experts and subject matter specialists working in extension management and agents on inclusion of beneficiaries/participants in extension programs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Extension personnel on marketing, value chain and post-harvest	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
to community and/or NGO groups	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Extension agents	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Information and communication technology for farmers (e.g. online discussion, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Policy toward more decentralization	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Policy toward more market oriented approaches	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
to and conduct on-farm research and demonstration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Connections with universities, research and development institutions (NGOs, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Training facilities and equipment at the regional and sub-regional level (e.g. extension schools, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Facilities available for extension activities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Government of agricultural input companies in extension	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Private advisory services to serve medium to large association against direct payments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Policy to deliver extension services to all farmers under extension control	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

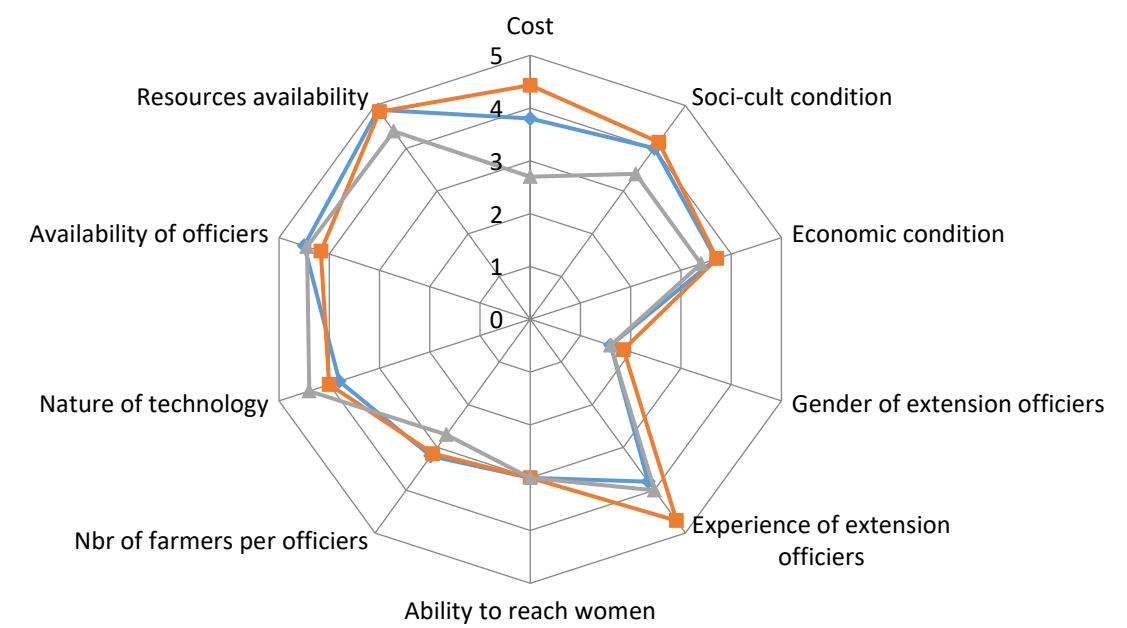
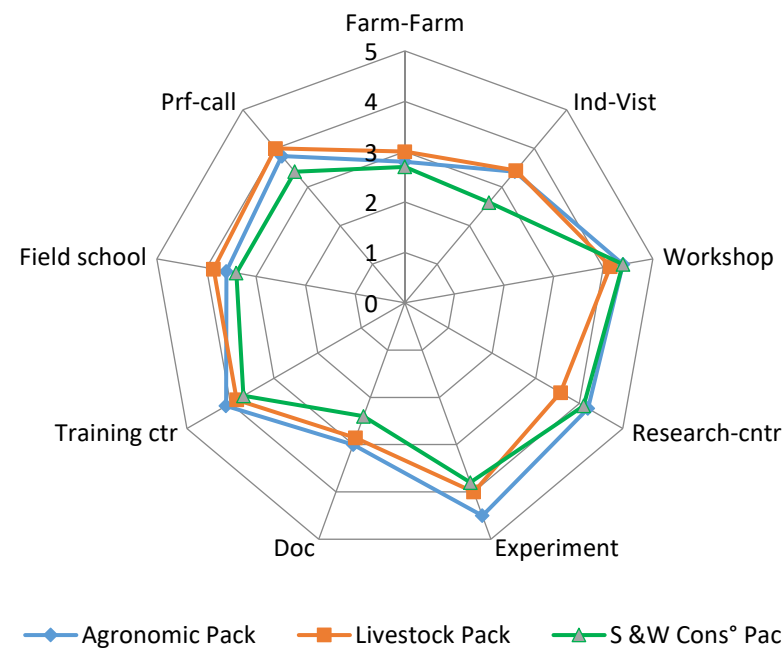
...effectiveness of the agricultural technology transfer methods for improved technologies

III.2.1. Agricultural technology transfer methods: General perceived effectiveness
Would you please score (on a scale of 1 to 5) the effectiveness of the following technology transfer methods used to transmit information (diffusion of the information) on CLCA improved technologies to you and other farmers in your region?

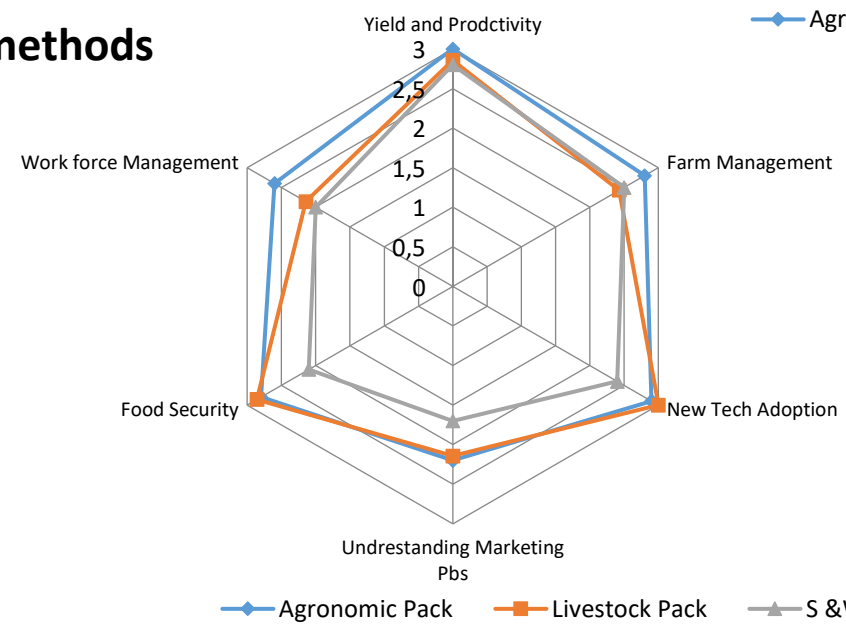
Perception of constraints on CA adoption



Effectiveness of agricultural extension



Effectiveness of the Extension methods



Factors influencing effectiveness of Extension methods

Potential impacts of Extension on the Livelihood of CA adopters

Assessment of trade-offs (1)

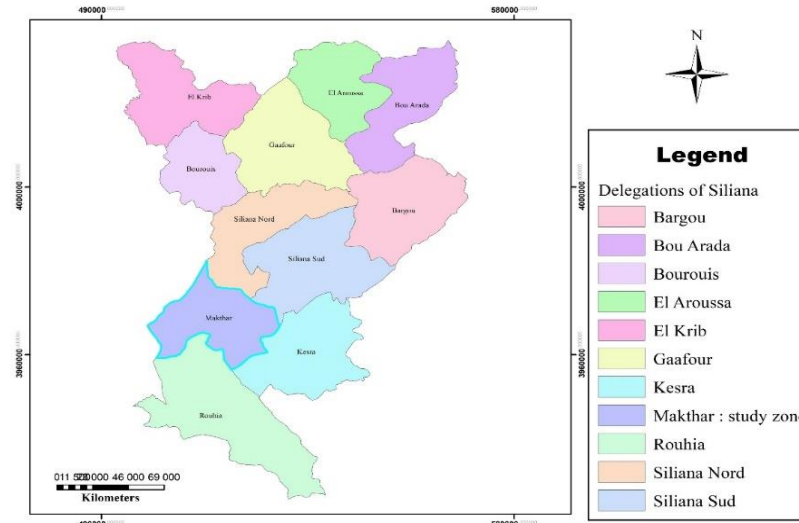
- **The objective** is to characterize trade-offs related to the use of crop residues in the small cereal-sheep farms of North West Tunisia (152 farms of the region of Siliana).
 - *Calculated the quantity of cereal residues left on the soil after the harvest and the summer grazing (HI).*
 - *Analyzed the complex relationships of factors influencing farmer's choices regarding crop residues allocation using a Bayesian Belief Network (BBN) model.*
 - *Typology analysis of farms based on their patterns of residue management in addition to other structural variables.*

CR left on the soil:

$$CRS_{ij} = AGM_{ij} - (TQG_{ij} + SS_{ij} + GY_{ij})$$

*Conditional probability for
CR patterns drivers:*

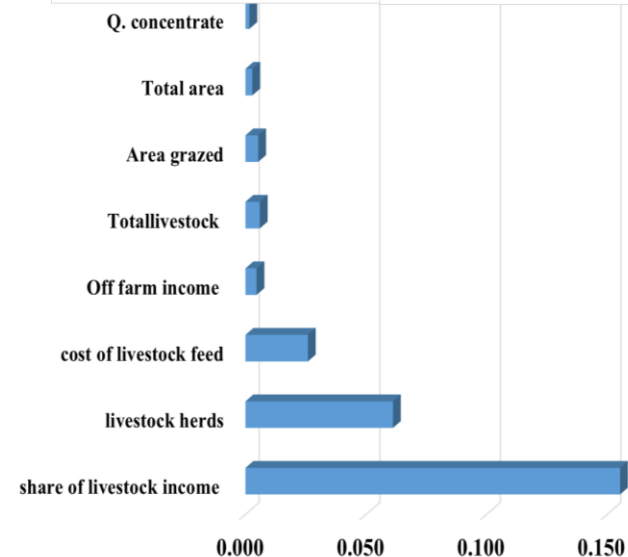
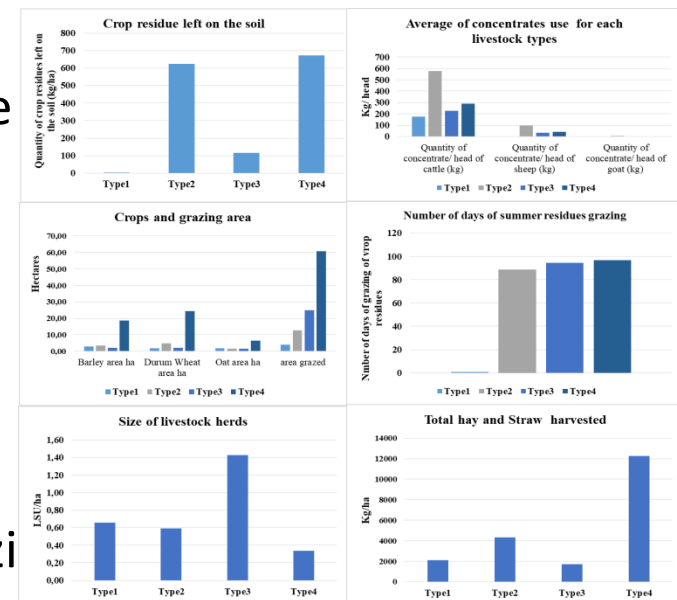
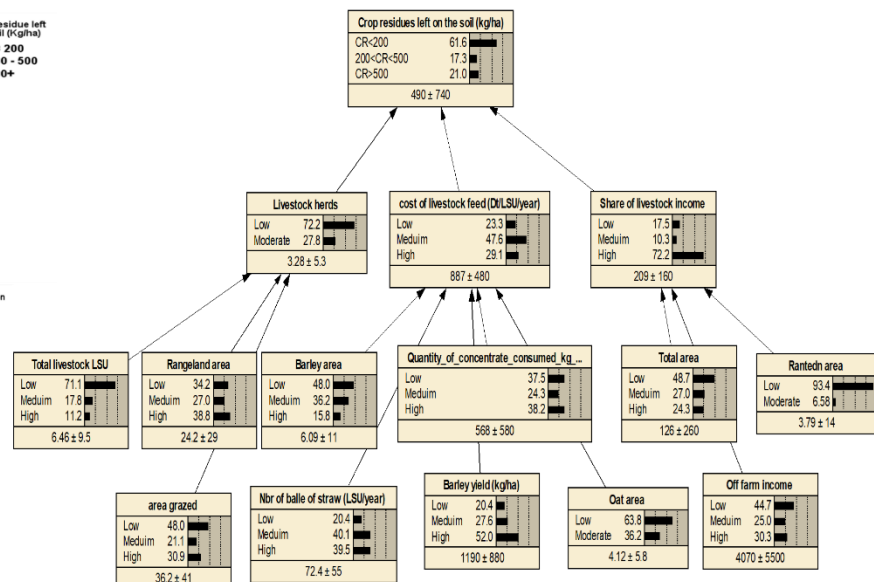
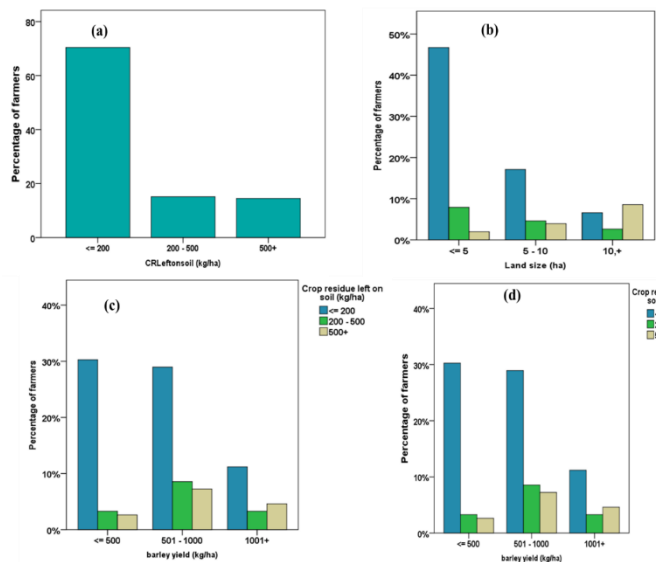
$$P(X_1, \dots, X_n) = \prod P\left(\frac{X_i}{\Pi_i}\right)$$



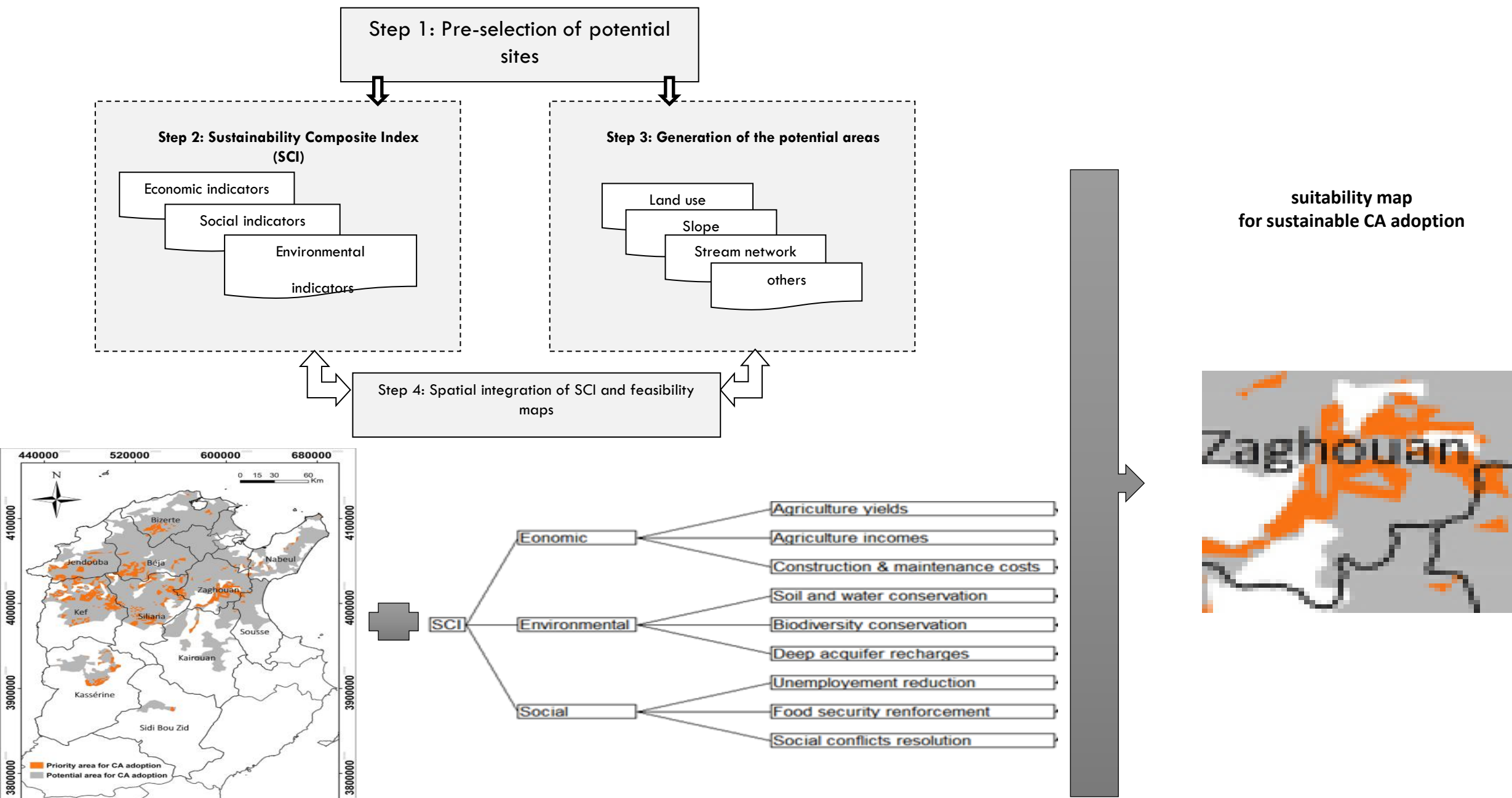
Assessment of trade-offs (2)

Results:

- 74% of farmers in our sample are keeping less than 200 kg/ha of crop residue as mulch.
- This is especially relevant for the smallest farms with limited grazing opportunities and financial capacities to complement their animals with concentrates feed
- The residue management is especially influenced by the share of livestock income, livestock herds, cost of livestock feed, barley area, and available grazi



Generation of suitability map for sustainable CA adoption

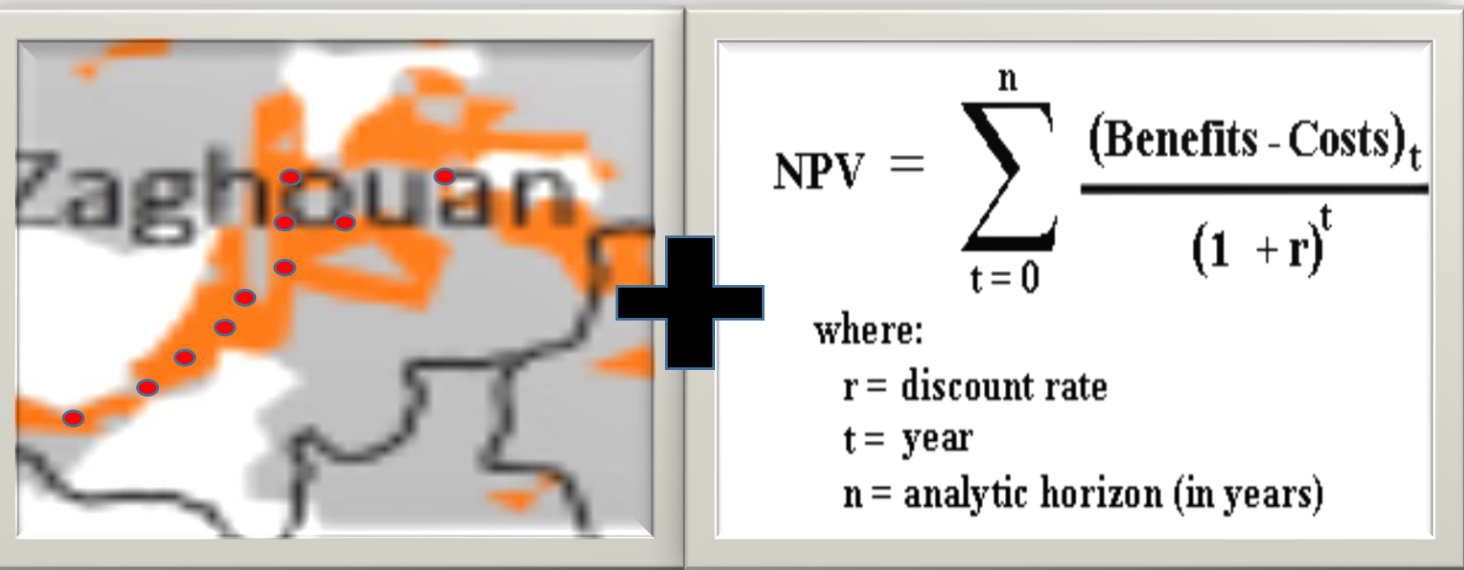


Source : Bahri et al, 2019

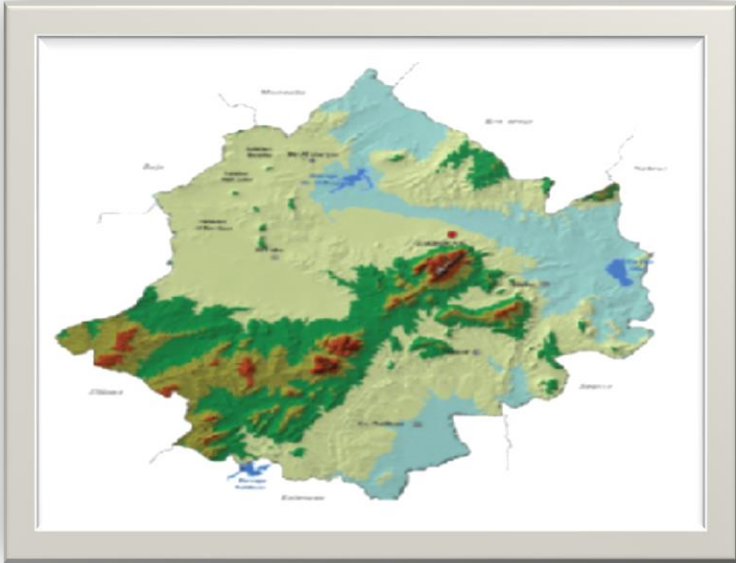
Extended spatial Cost Benefit Analysis

Potential suitable map for sustainable CA adoption
Net Present value of CA on different locations

Financial aspects (cost & benefit)
and environmental aspects (preventing water erosion and enhancing soil fertility)



EXTRAPOLATION (under condition, slopes and markets proximity)



Preliminary results

	Financial CBA (12%)	Extended CBA (12%)
NPV/Ha	374 DNT	746 DNT
IRR	16.15%	20.40%

Farm area: 73 ha
Investment cost : Seeder,Tractor and land preparation

Thank you !