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## Development of an assessment method for vulnerability to climate change of maize farming systems

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ESA Conference, August 2022

VACCARM !



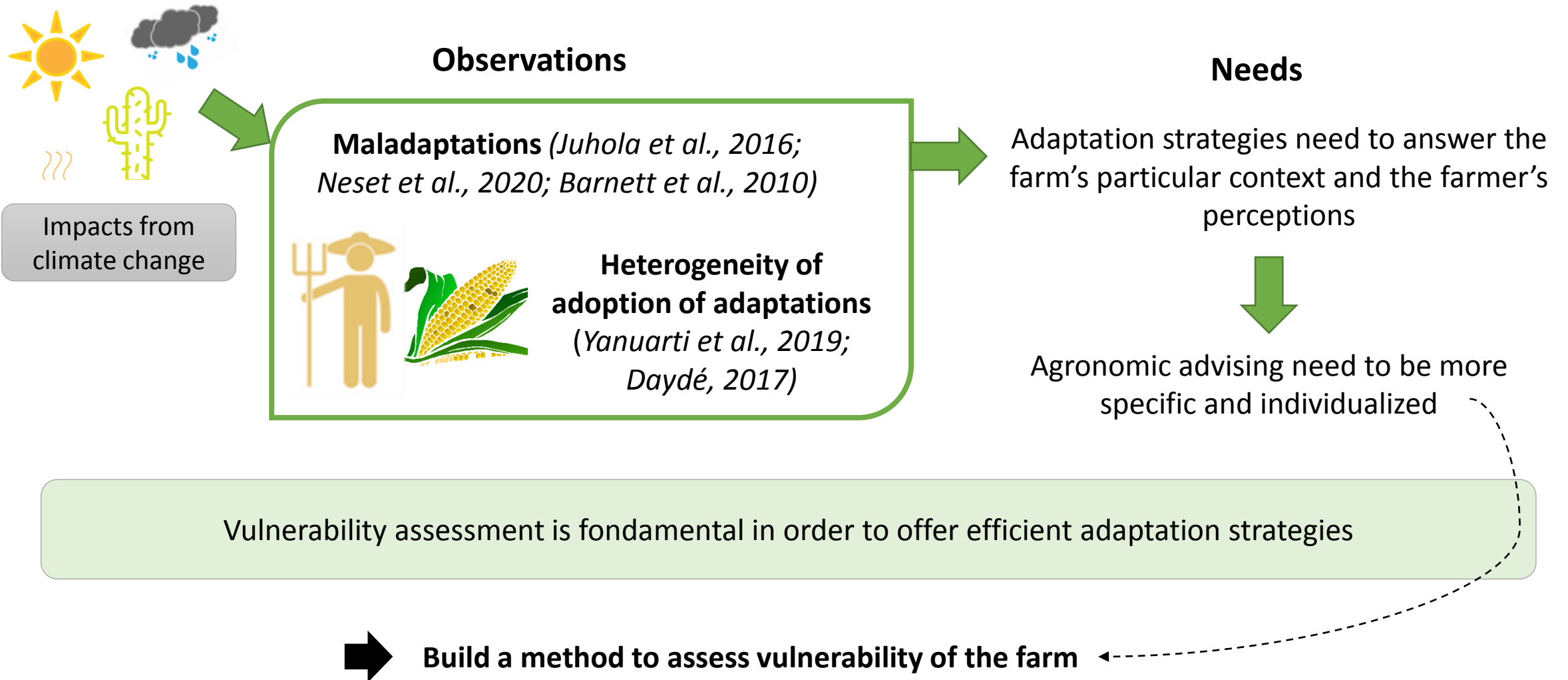
# Development of an assessment method for vulnerability to climate change of maize farming systems

**Marine Albert, PhD student at INRAE UMR AGIR**

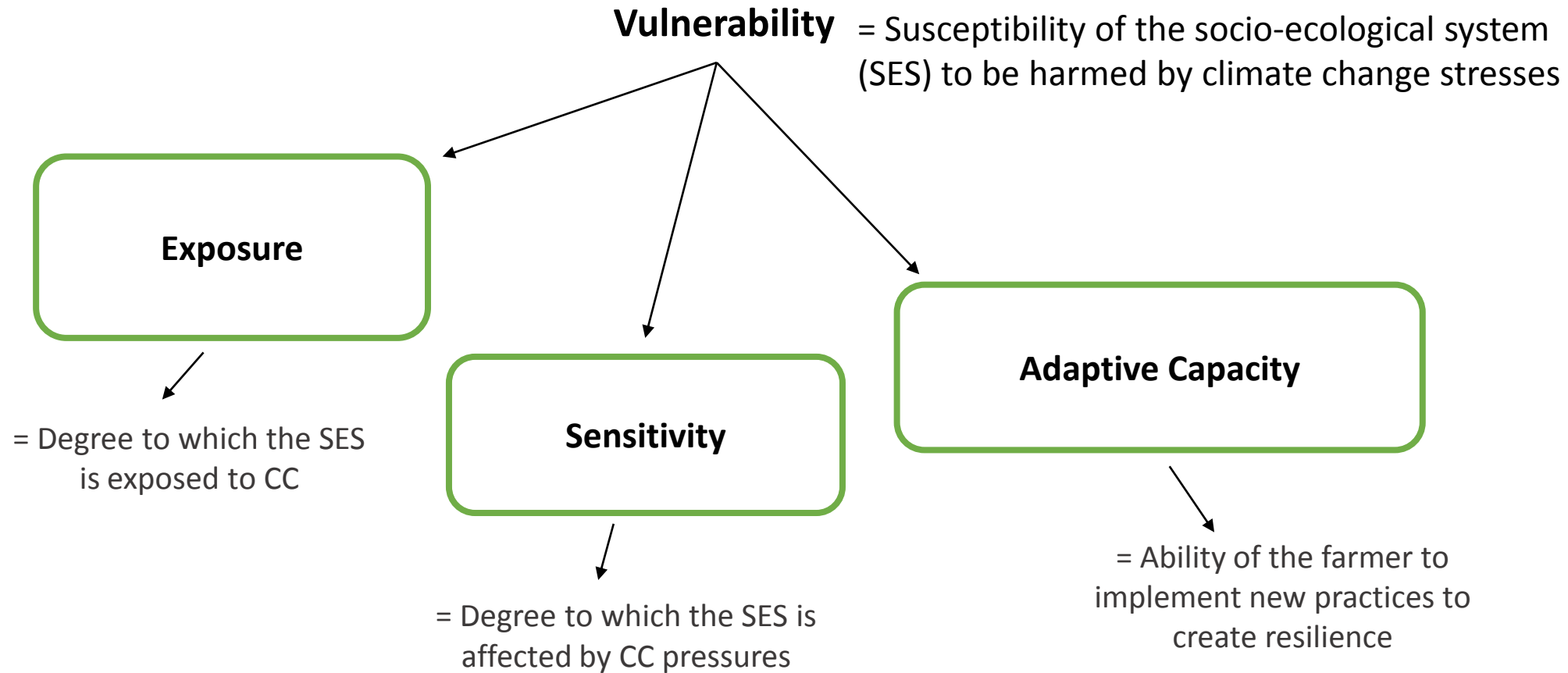
**Jacques-Eric Bergez, Stéphane Couture, Magali Willaume, Johanna Alkan-Olsson**



# Need for Vulnerability assessment



# Concept of Vulnerability



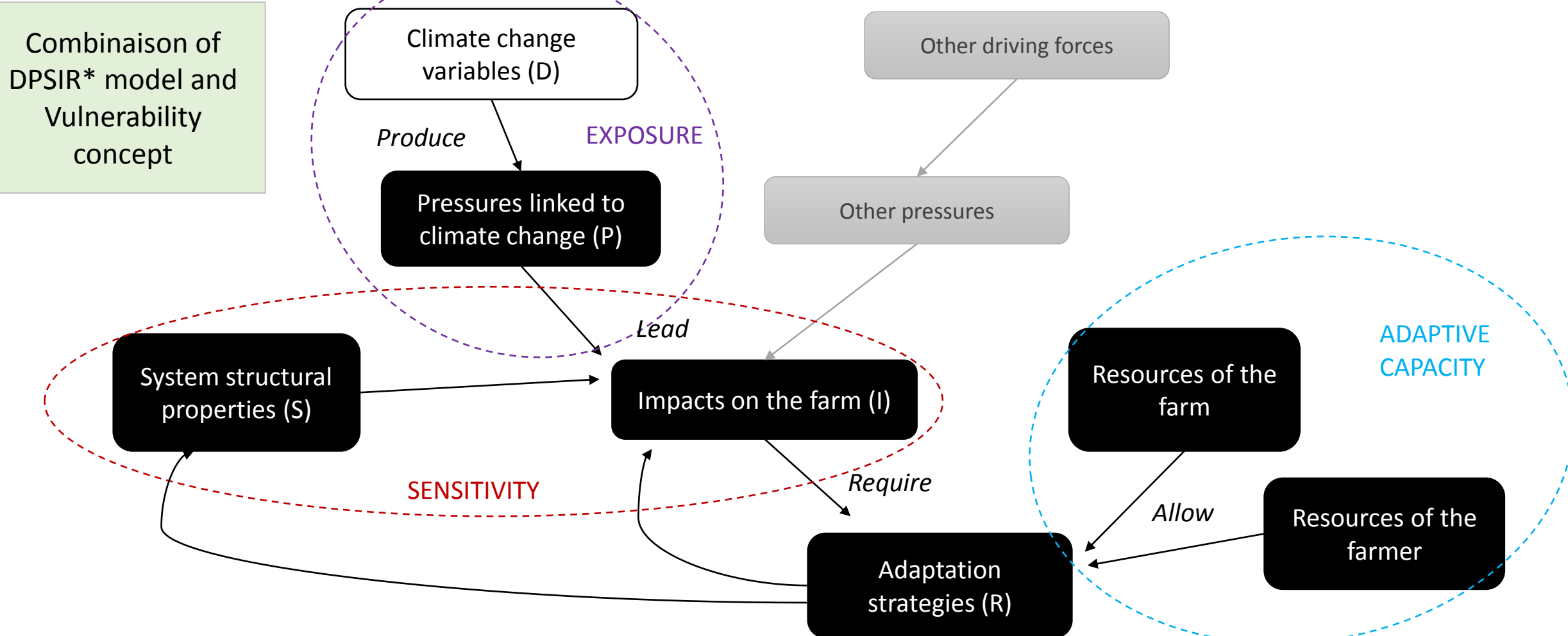
# Overview of our method

*Dardonville et al., 2021; Urruty et al., 2016; Gil et al., 2017; Durham et al., 2010*

- **A participative, systemic and interdisciplinary approach**
  - **Predefined properties based on expert perceptions**

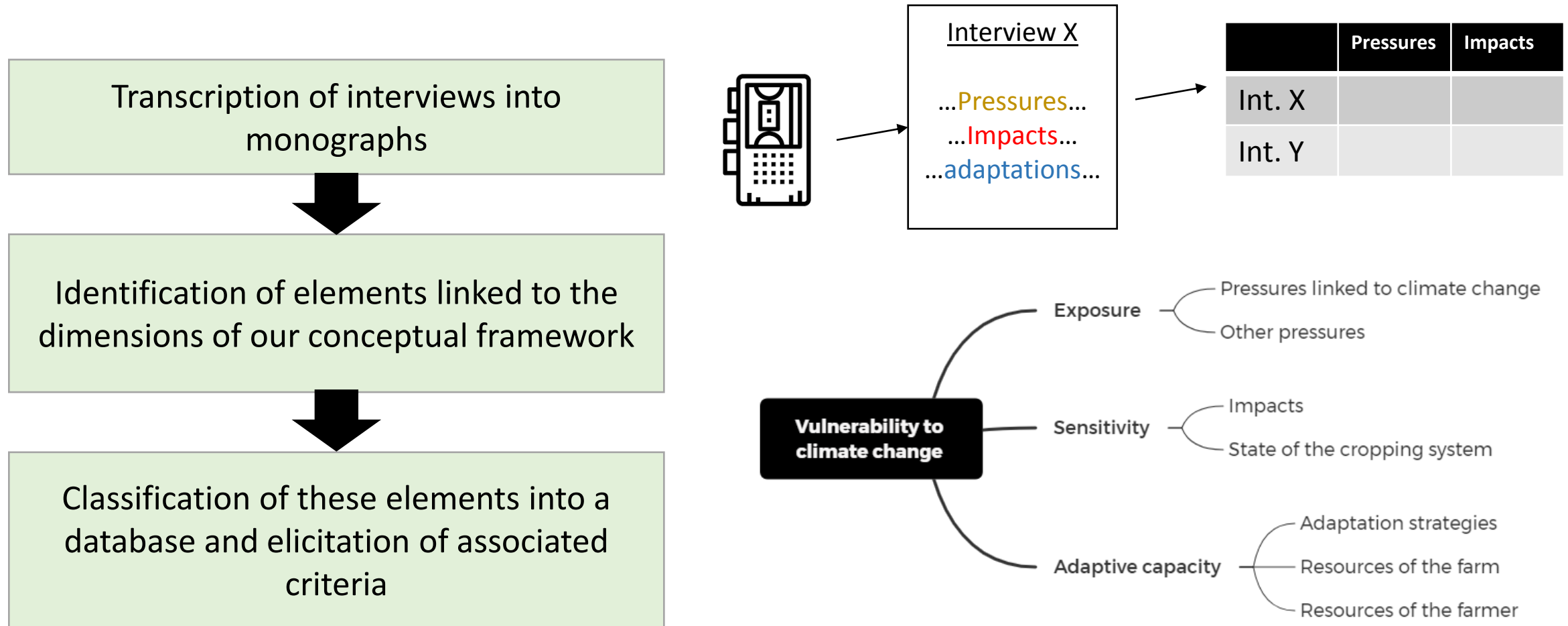
1. Build the conceptual framework
2. Elicitation of indicators
3. Selection of indicators
4. Design the tool

# 1. Our conceptual framework



\*Driving forces, Pressures, State, Impacts, Response

## 2. Elicitation of indicators from maize farmers

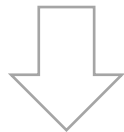


## 2. Add indicators from literature

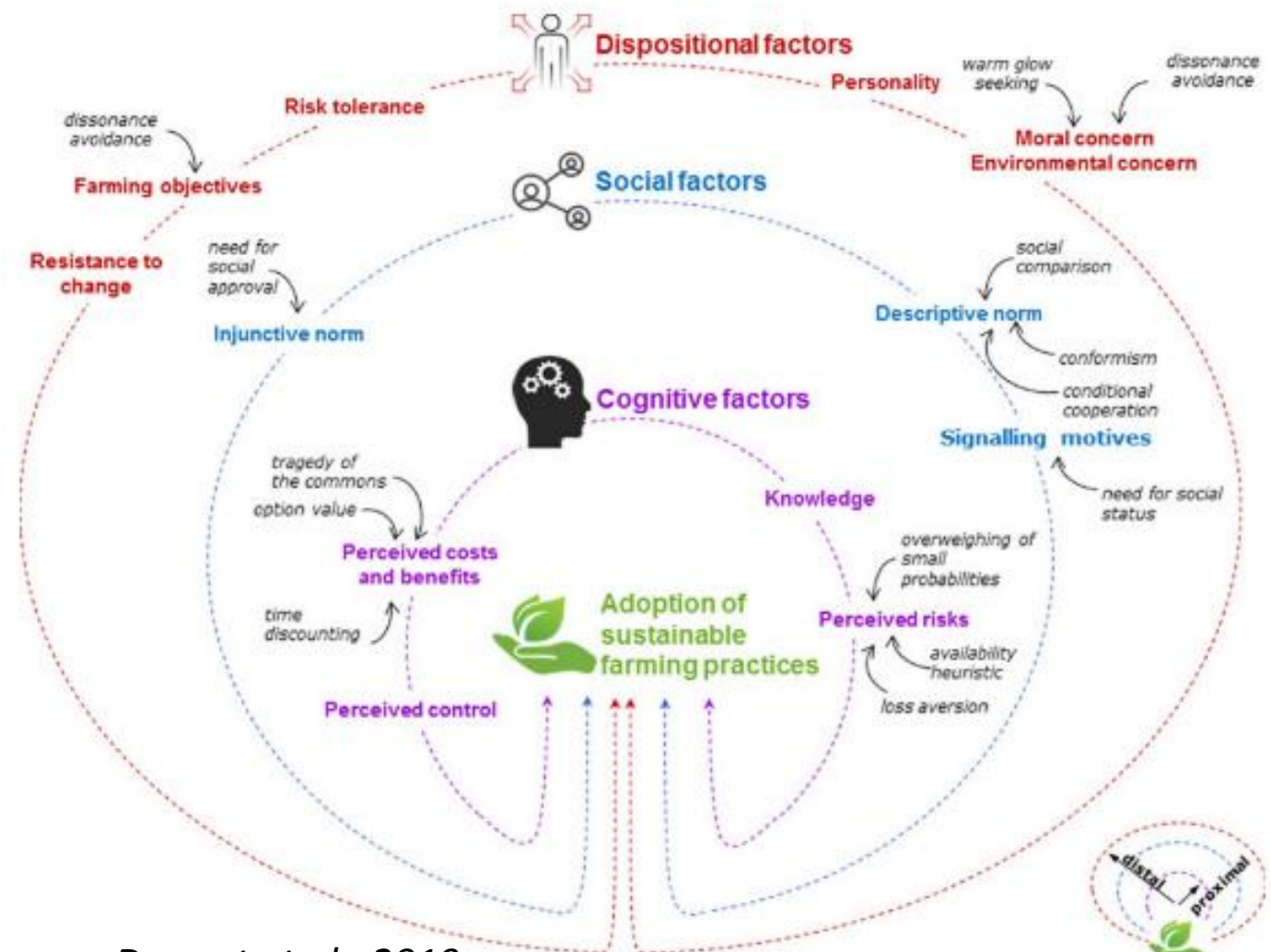
Literature on behavioural factors influencing adoption of practices

X

Maize growers interviews



- Farmers' characteristics
- Information sources
- Cognitive factors
- Dispositional factors



Dessart et al., 2019

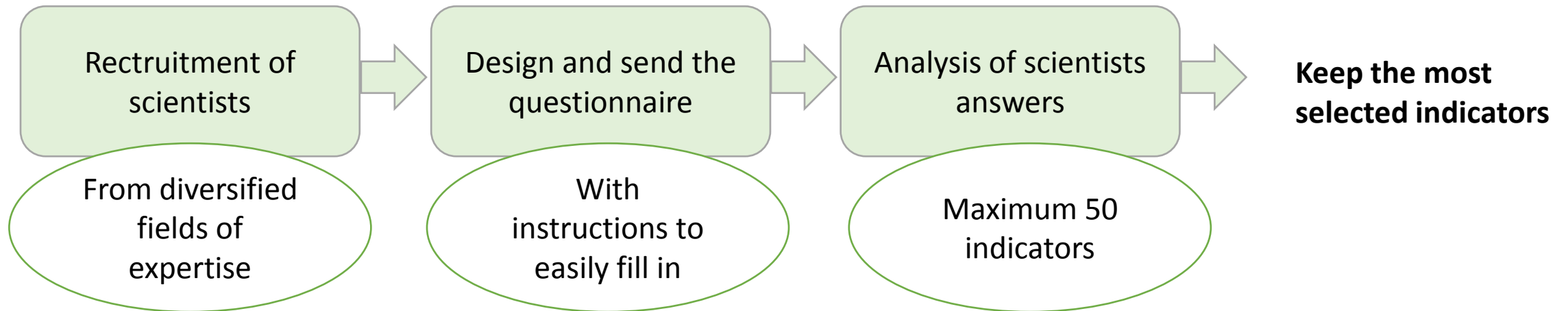


# 3. Selection of indicators by scientists



Need to reduce the number of indicators in order to build an operational tool

**SMART criteria of selection (Doran et al., 1981)**  
→ **Specific, Measurable, Achievable, Relevant, Timely**



# 4. Design the tool

## Part 1

Set of indicators → qualitative assessment by the farmer and his advisor

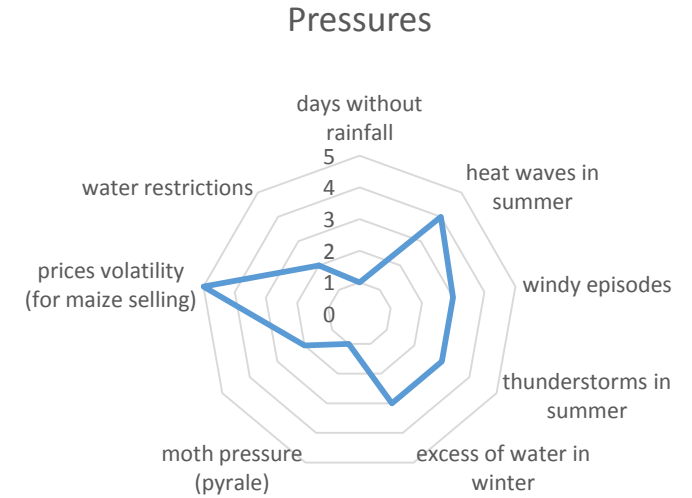
### Userform

Indicators	Qualitative assessment
Excess of water in winter	High pressure
Compaction of soil	Very high impact

## Diagnosis of Vulnerability of the farm

## Part 2

Results → radar graphs for each dimension of vulnerability



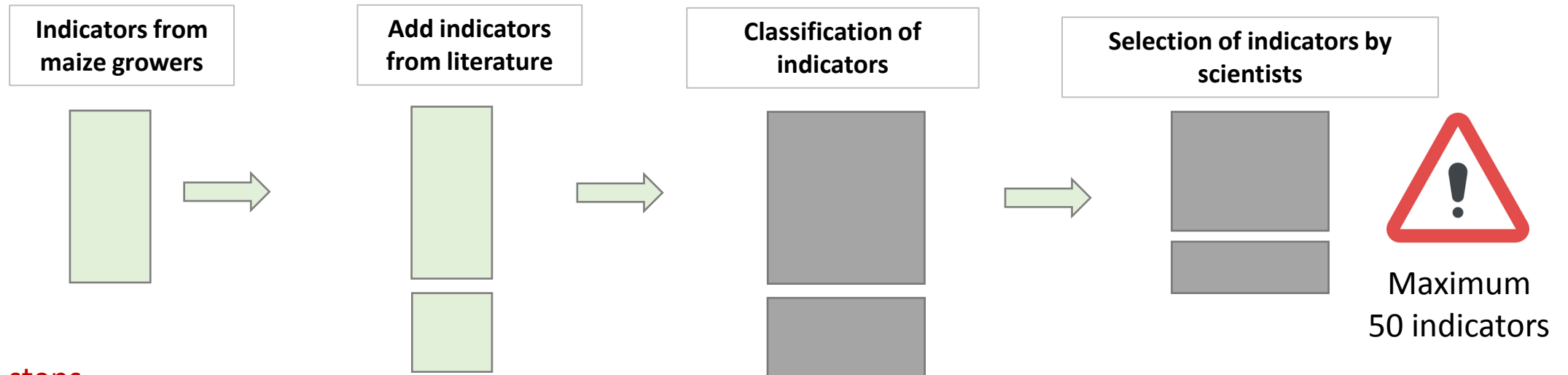
## Part 3

Adaptations → The farmer choses adaptation strategies within a list

Modification of initial graphs thanks to adaptations

Test of adaptations to reduce Vulnerability of the farm

# Recap of the process

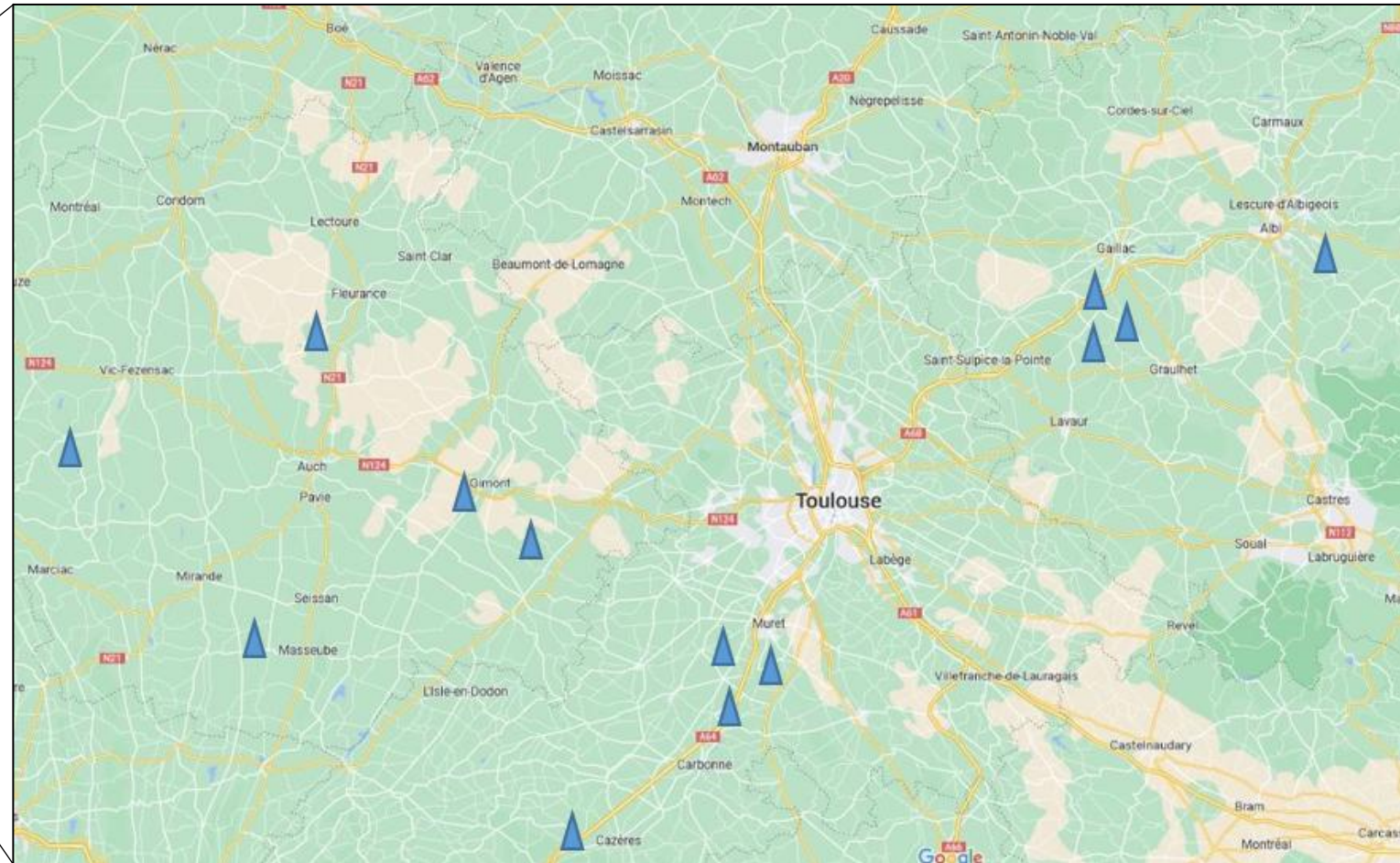


## Next steps



# Case study

## Maize farming systems of SouthWestern France



### Pressures

days without rainfall  
heat waves in summer  
windy episodes  
thunderstorms in summer  
excess of water in winter  
moth pressure (pyrale)  
increase in input and material prices  
prices volatility (for maize selling)  
water restrictions in summer

### Impacts

Autan wind hinders irrigation  
soil too dry to sow summer crops  
soil too wet to sow winter crops  
compaction of soils  
erosion of soils  
decrease irrigation capacity  
yield decrease  
hydric stress due to low humidity  
water scarcity

### Structural properties

watercourses management  
topography  
intra-plot heterogeneity (type of soil)  
organic matter  
porosity of soils  
soil hydromorphy

### Farm resources

diversification of buyers to spread risks  
presence of on-farm storage facilities  
cooperative for sharing equipment  
intensity of work  
irrigation capacity  
weakness of water source  
financial situation - debt  
economic specialisation rate  
irrigation costs

**A set of 48 indicators  
distributed in the conceptual  
framework**

### Farmer resources

experience  
farmer's network - collective  
decision-aid tools  
websites wheater consultation  
learning - tests  
observation of fields (crop, fauna, flora, soil)  
risks preferences  
perception of risks linked to climate change  
resistance to change

# Issues in the methodology

- Modeling requires simplification
  - Reducing the number of indicators
  - Simplify effects of adaptations on the diagnosis of vulnerability
- Need for SMART indicators → conflicts between experts
- Subjectivity in selection and weight of indicators

# Toward a usefull tool for stakeholders

- **For farmers**

- Better knowledge of their farm, awareness of climate change and adaptations

- **For advisors**

- Awareness of farmers internal resources influencing adaptive capacity

- **For public policies**

- Provide data of practices implemented by farmers at a regional scale





Thank you for your attention

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