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# ANALYZING SOCIOTECHNICAL BARRIERS AND FOSTERING INNOVATION TO DIVERSIFY CROP ROTATIONS. EXAMPLE IN VEGETABLE CROPPING SYSTEMS IN SOUTH-EASTERN FRANCE

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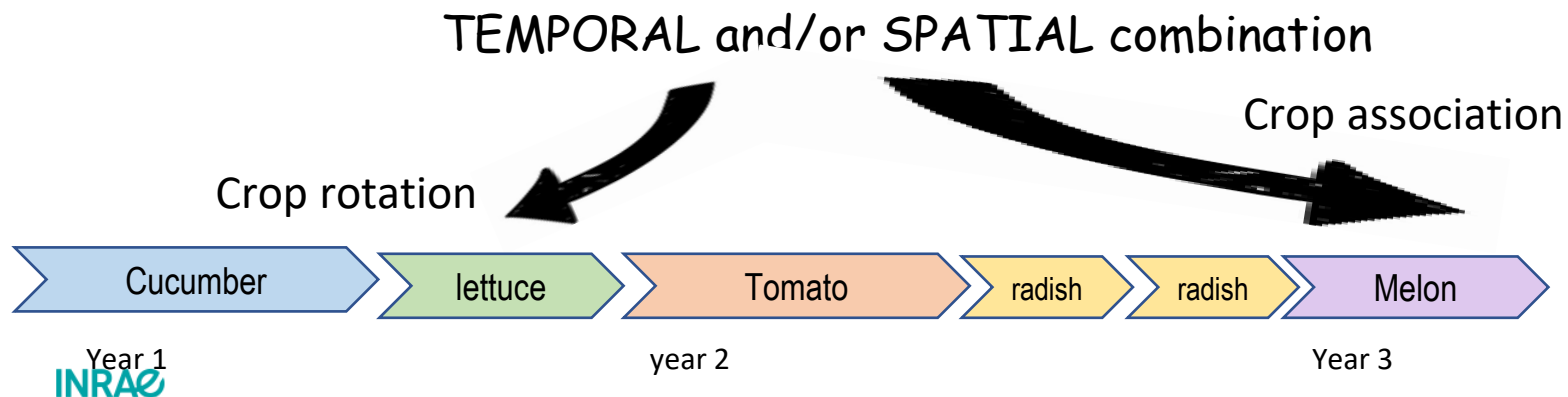
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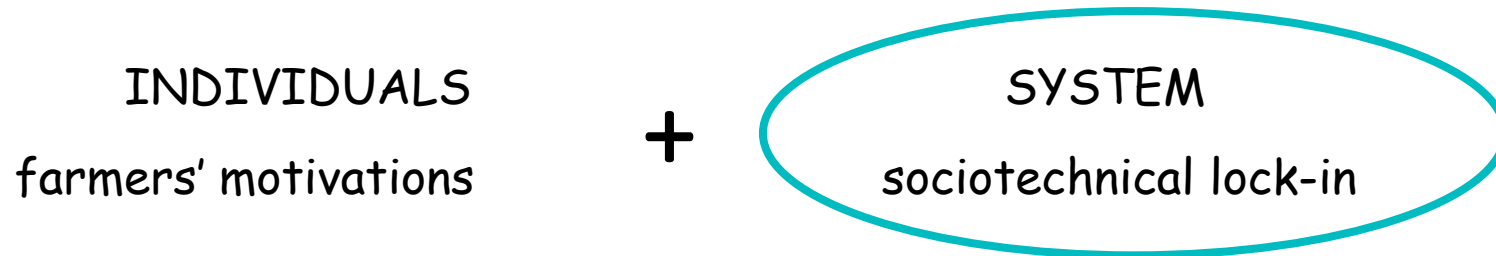
## ➤ Socio-economic context and state of the art

- **Agroecology** (AE) : A transformative way to preserve human and environment health
- **Crop diversification** : a large potential to lower pest and disease damages + other ecosystemic services (Kremen *et al* 2012, Vialatte *et al* 2023)
- **Various levers** to manage pests and diseases with crop diversification
  - ↗ **number of species** (introduce resistant or tolerant species/cv and ↘ crop return time of most frequent species)
  - ↘ **number of pesticide-intensive crops/species**
  - Introduce commercial or service **species with pest control effects** (e.g. allelopathic effects, biofumigation)



## ➤ Sociotechnical lock-in (concepts and theory)

- Crop diversification requires a **deep redesign of cropping and farming systems** (Altieri, 1999; Morel et al., 2020)
- Difficulties in changing practices in the farms :

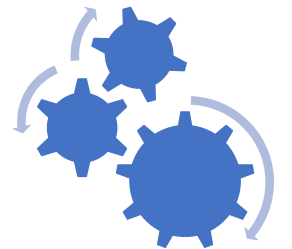


**Sociotechnical lock-in** (Vanloqueren and Baret 2009, Meynard *et al* 2018, Della Rossa *et al* 2020, Boulestreau *et al* 2021)

Complex relationships between upstream chain, farmers, advisory actors, downstream chain

Each may create a barrier to crop diversification

The different barriers to crop diversification reinforce one another in a systemic way



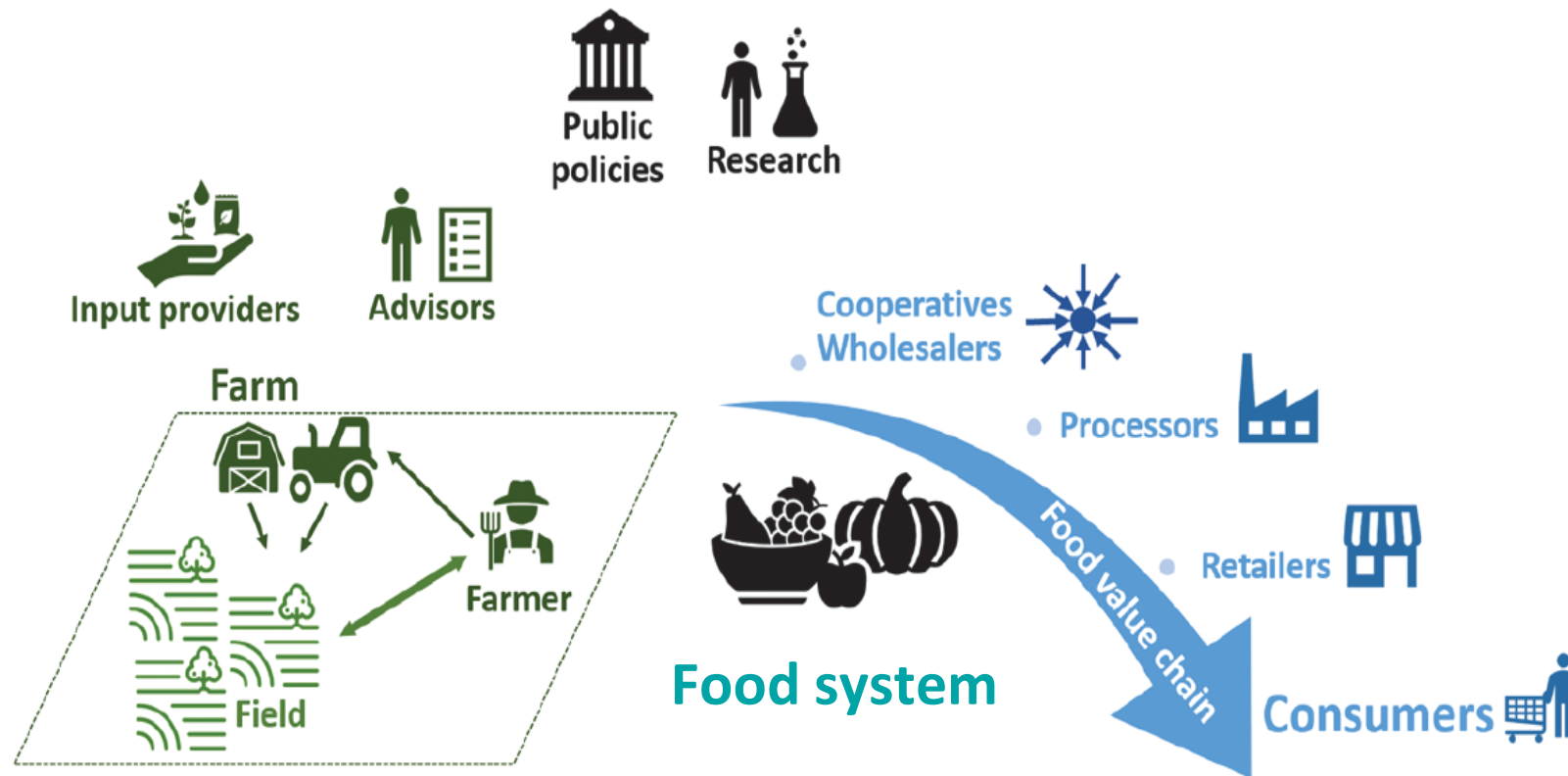
My presentation : **focus on crop diversification** at farm level (crop rotation, crop association)

1. Which farmers' barriers and how the other actors reinforce or alleviate them ?
2. Which innovation at agrifood systems level to unlock the socio-technical system and promote crop diversification



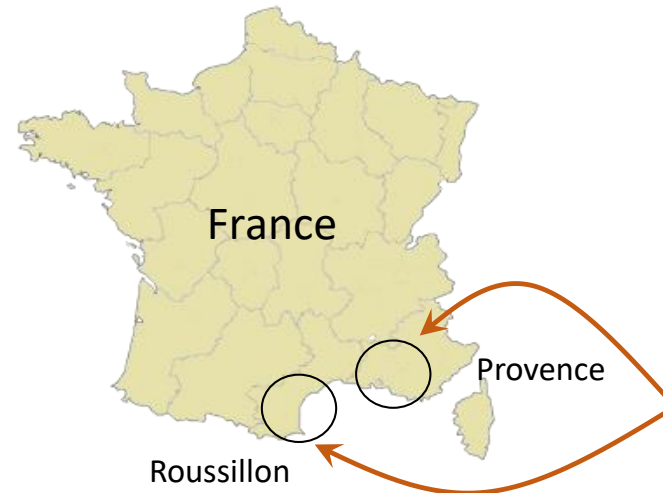
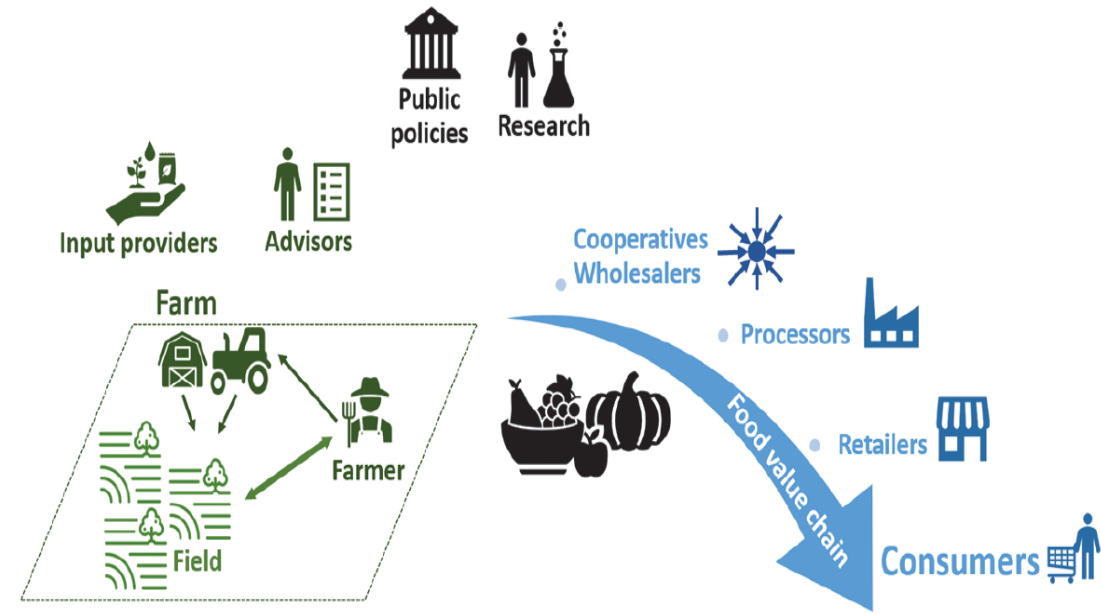
## ➤ Methods : An empirical survey with semi-directive questionnaires

Different categories of actors likely to hinder the adoption of diversified crop rotations in market-gardening systems



## ➤ Methods : An empirical survey with semi-directive questionnaires

- Mapping the actors concerned by the diversification of crop rotation
- Empirical surveys to understand the **determinants of actors' practices** in relation to crop diversification (N=49)
- Characterizing the **obstacles** and **levers** to the innovation process



*2 major market-gardening production basins in France*

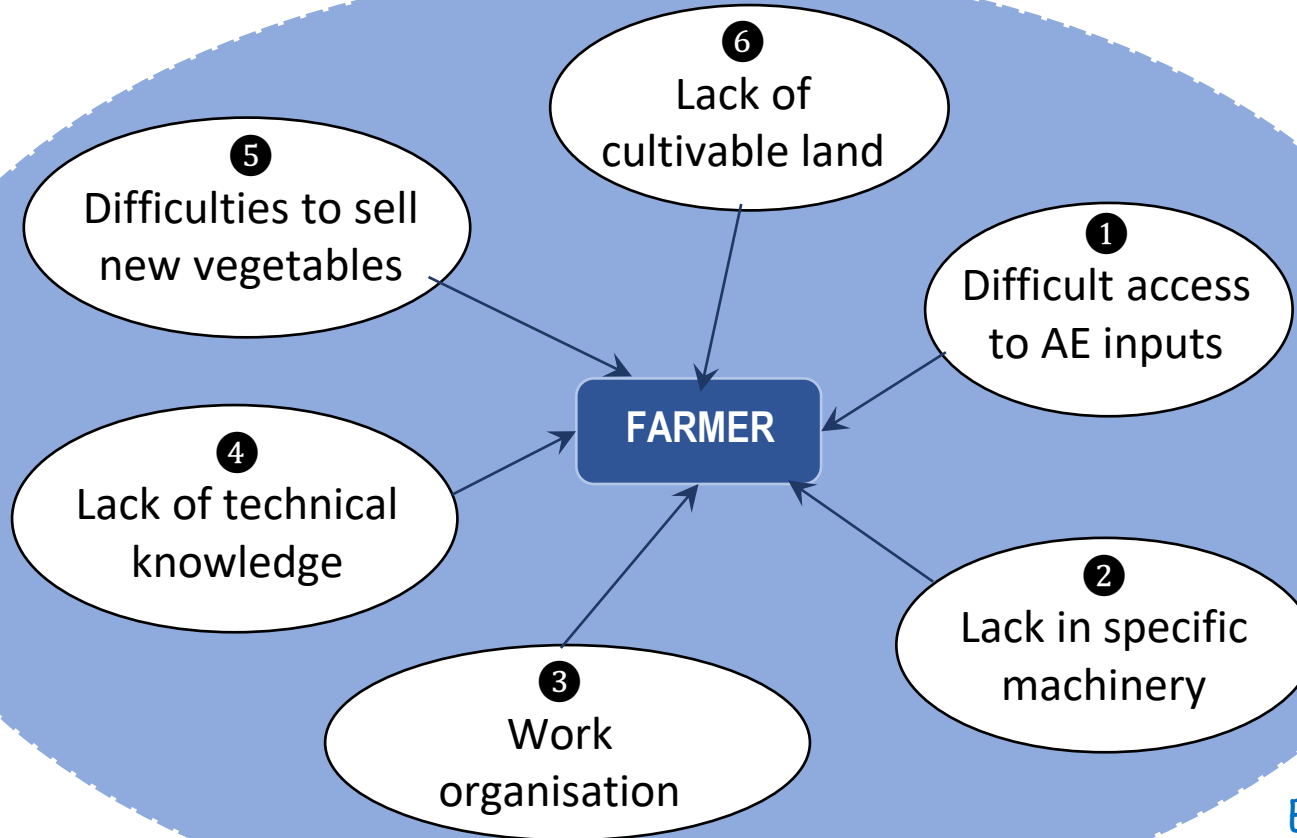
# ➤ Results : brakes for crop diversification to reduce pesticide use

## 6 categories of brakes related to farmers

Ex: to remain competitive when diversifying

Ex: Seeds and plantlets with resistant genes for niche species

Ex: narrow and uncertain outlets



Ex: for sowing or harvesting niche species

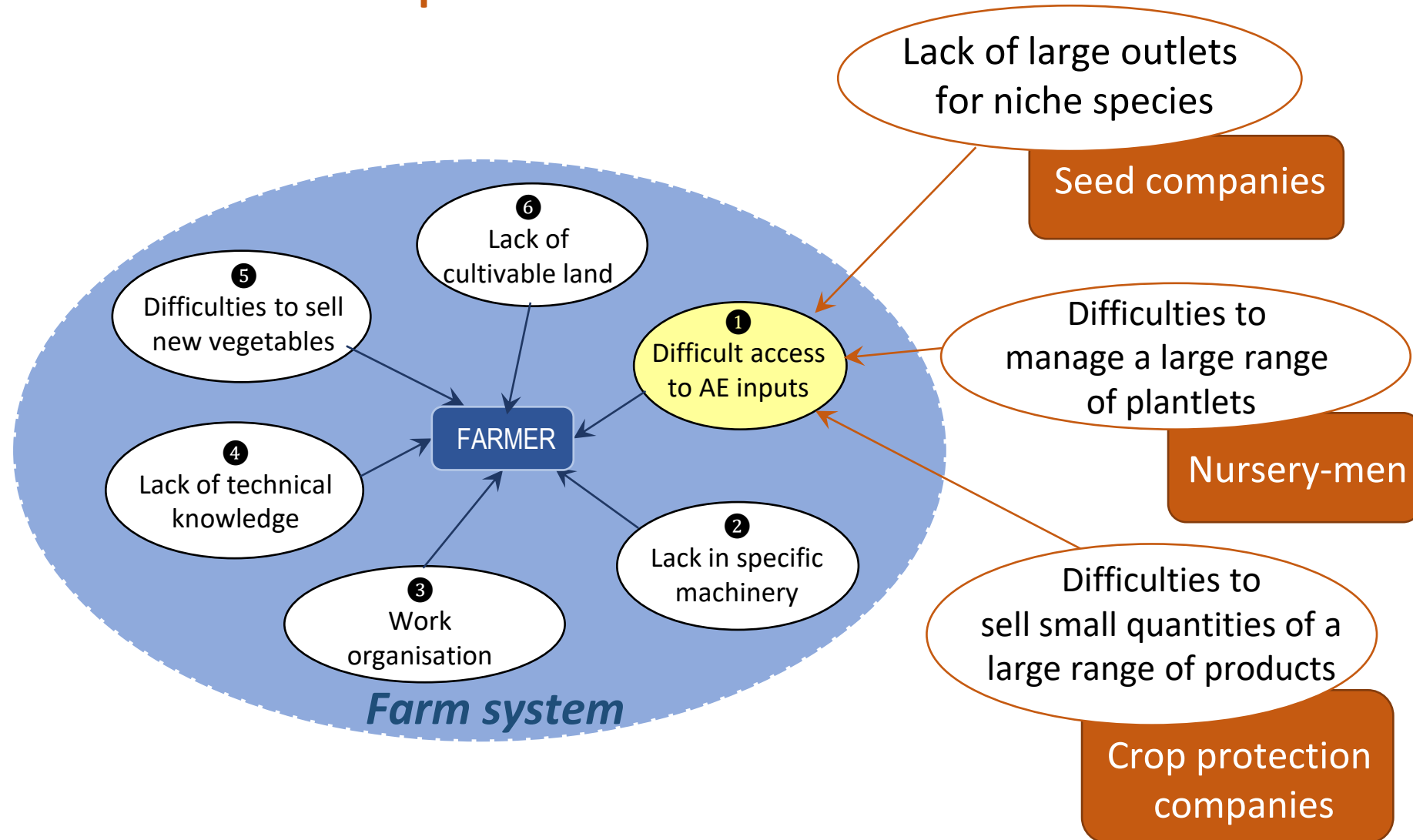
Ex: knowledge and know-how on new species

Ex: Organisation of tasks on an increased number of species



## ➤ Results : brakes for crop diversification to reduce pesticide use

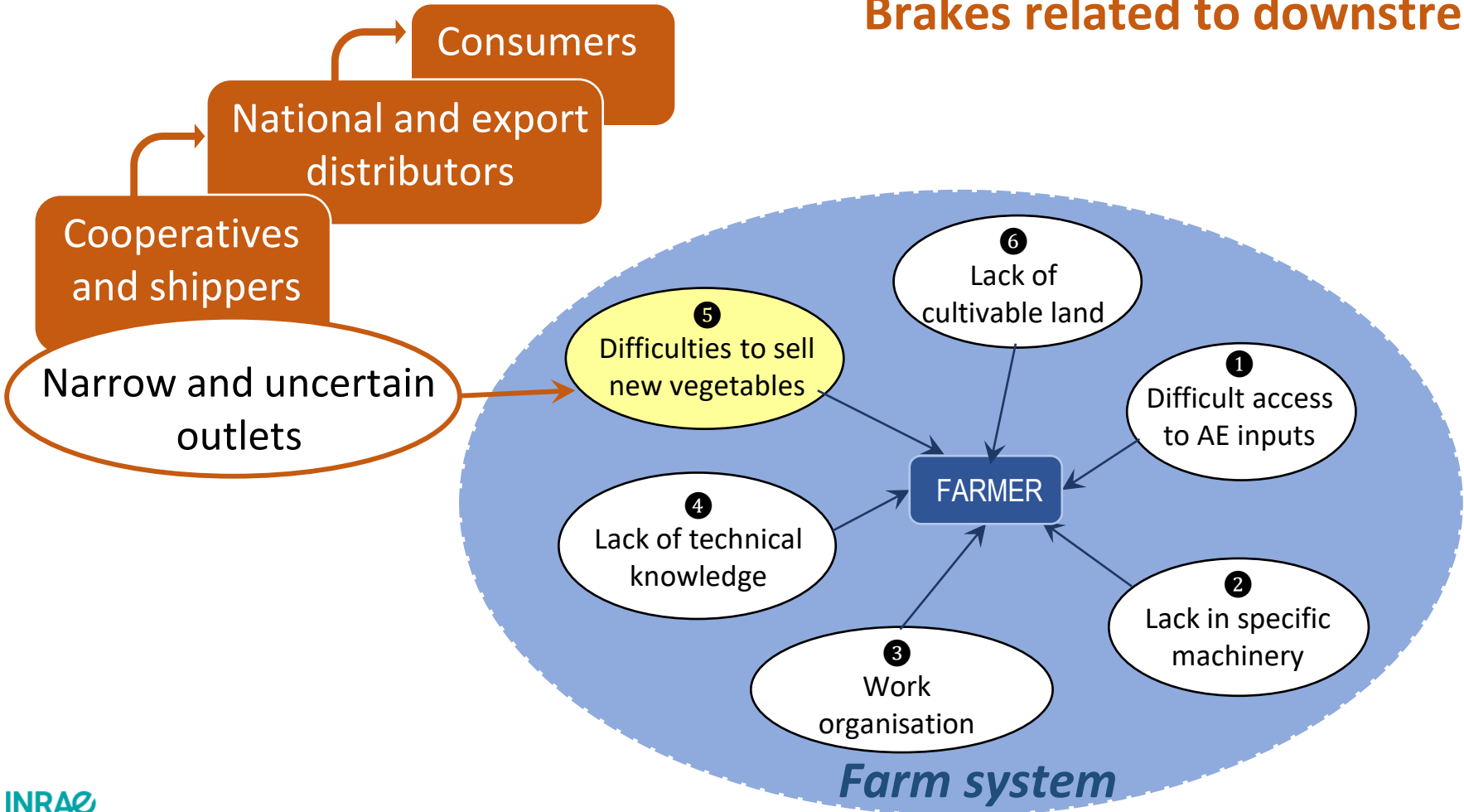
### Brakes related to upstream actors





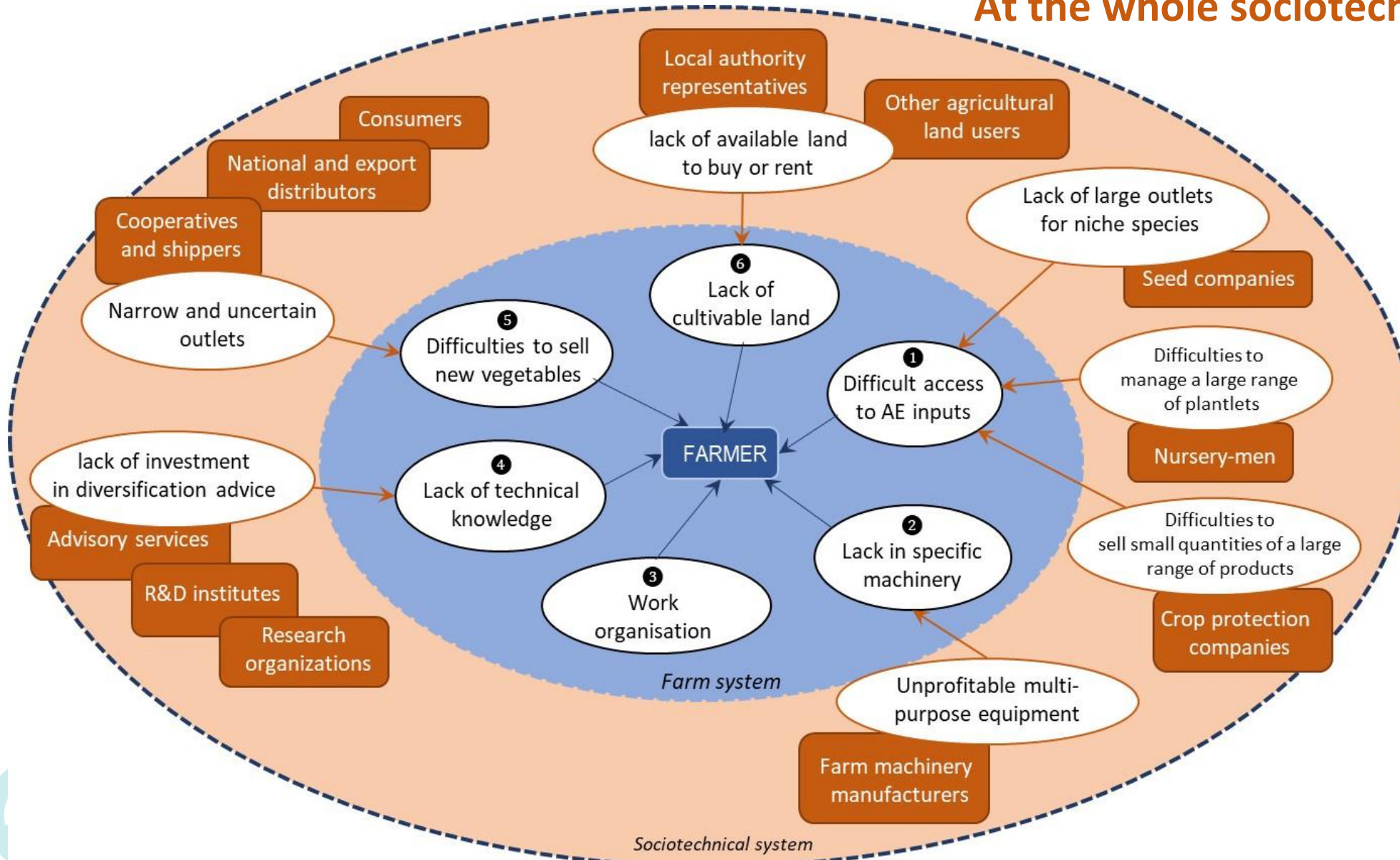
➤ Results : brakes for crop diversification to reduce pesticide use

**Brakes related to downstream actors**



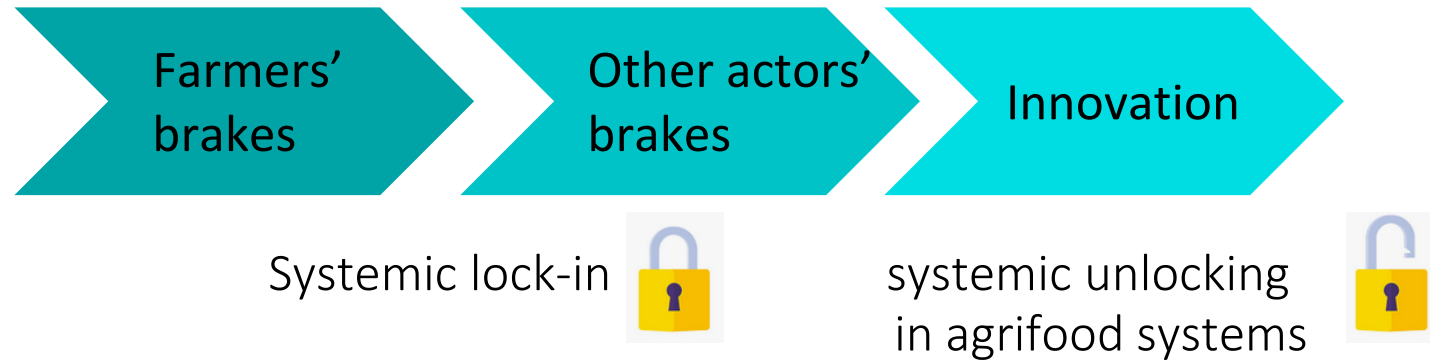
# ➤ Results : brakes for crop diversification to reduce pesticide use

At the whole sociotechnical level system



## ➤ Coupled innovations lock-in (concepts and theory)

From sociotechnical lock-in ... to coupled innovation

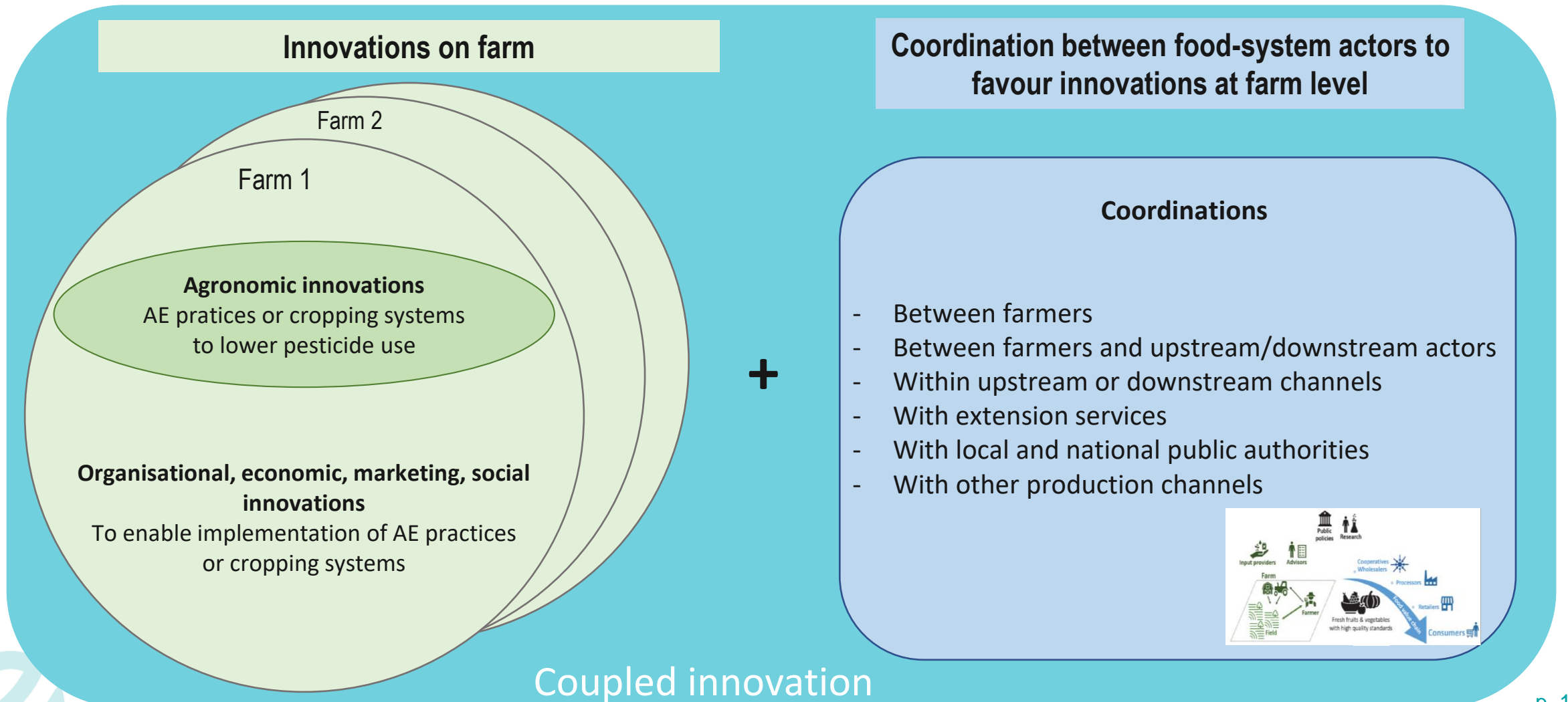


### Coupled innovation :

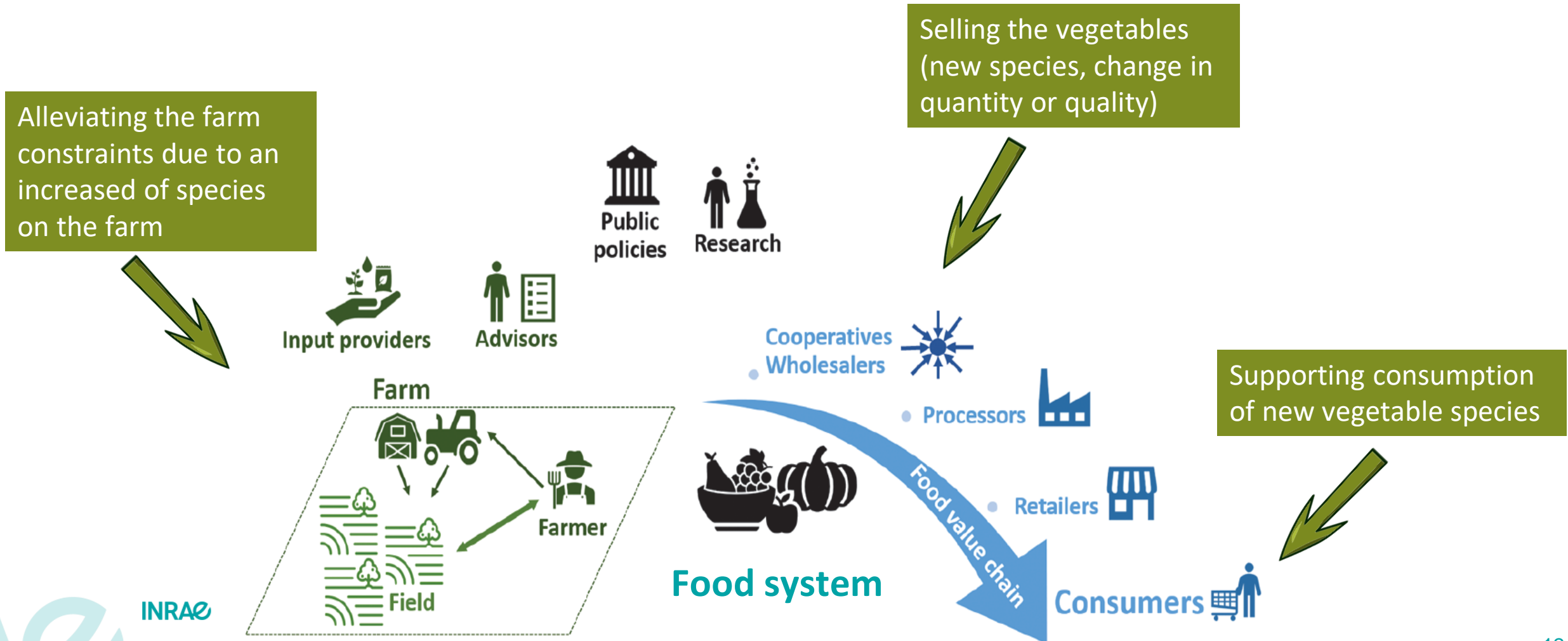
Coordination of innovation processes of different natures (technical, organizational, regulatory, institutional, social), driven by different actors and generally apprehended independently of each other

(Meynard et al. 2017; Boulestreau et al. 2023)

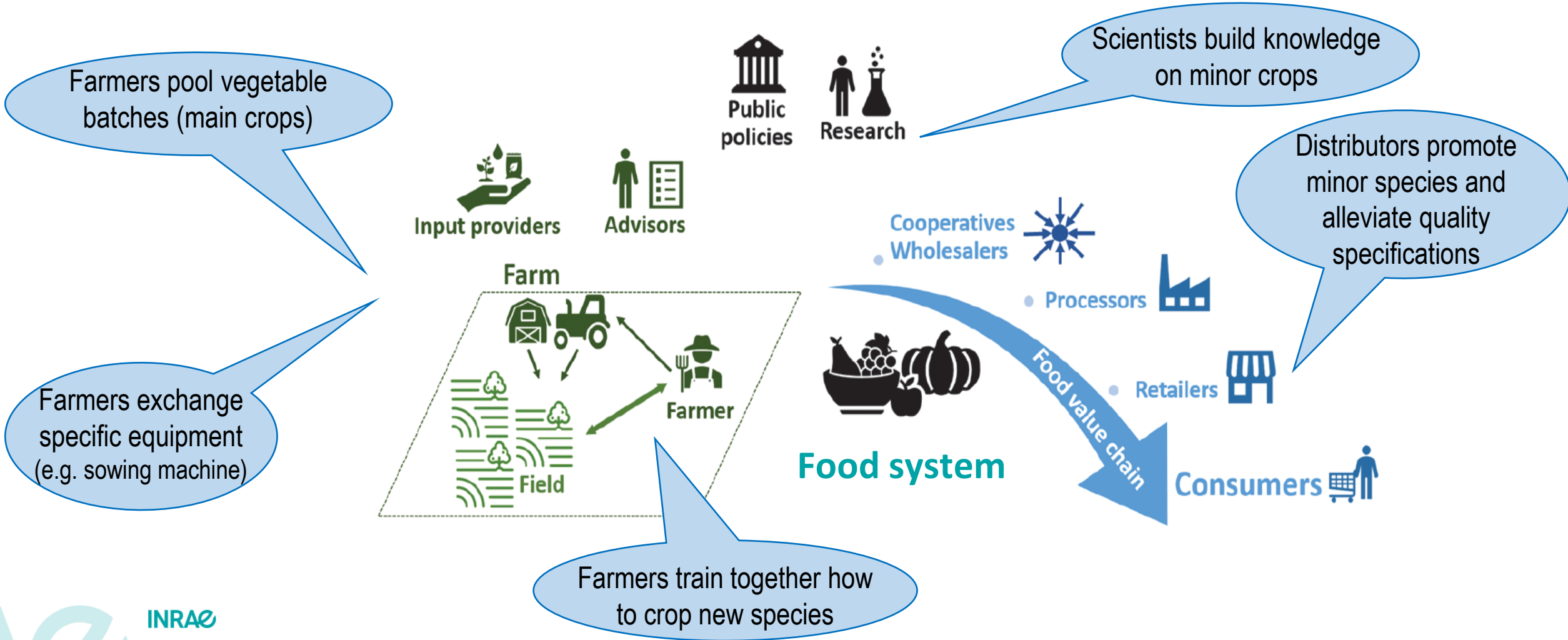
# ➤ Coupled innovation to support crop diversification : theoretical framework



# ➤ Coupled innovation to support crop diversification : a example of prototype from the case study



# ➤ Coupled innovation to support crop diversification : example of a prototype coming from the case study





# > Literature

## **Crop diversification**

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## **Analysis of brakes and levers in sociotechnical systems**

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➤ Thanks for your attention !

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