



HAL
open science

MoBiDiv - Mobilizing and Breeding Intra and inter-specific crop DIVERSity for a systemic change towards pesticide-free agriculture

Aline Fugerey-Scarbel, Jérôme Enjalbert, Myriam Tisserand

► To cite this version:

Aline Fugerey-Scarbel, Jérôme Enjalbert, Myriam Tisserand. MoBiDiv - Mobilizing and Breeding Intra and inter-specific crop DIVERSity for a systemic change towards pesticide-free agriculture. Quelle recherche pour répondre aux objectifs de réduction des pesticides inscrits dans le Green Deal européen, Jun 2022, Dijon, France. hal-04081107

HAL Id: hal-04081107

<https://hal.inrae.fr/hal-04081107v1>

Submitted on 25 Apr 2023

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

GROWING PROTECTING differently



• **MO**obilizing and **B**reeding Intra and inter-specific crop **DIV**ersity for a systemic change towards pesticide-free agriculture

• Coordinators: Jérôme Enjalbert & Aline Fugerey-Scarbel

• jerome.enjalbert@inrae.fr & aline.fugerey-scarbel@inrae.fr

CONTEXT

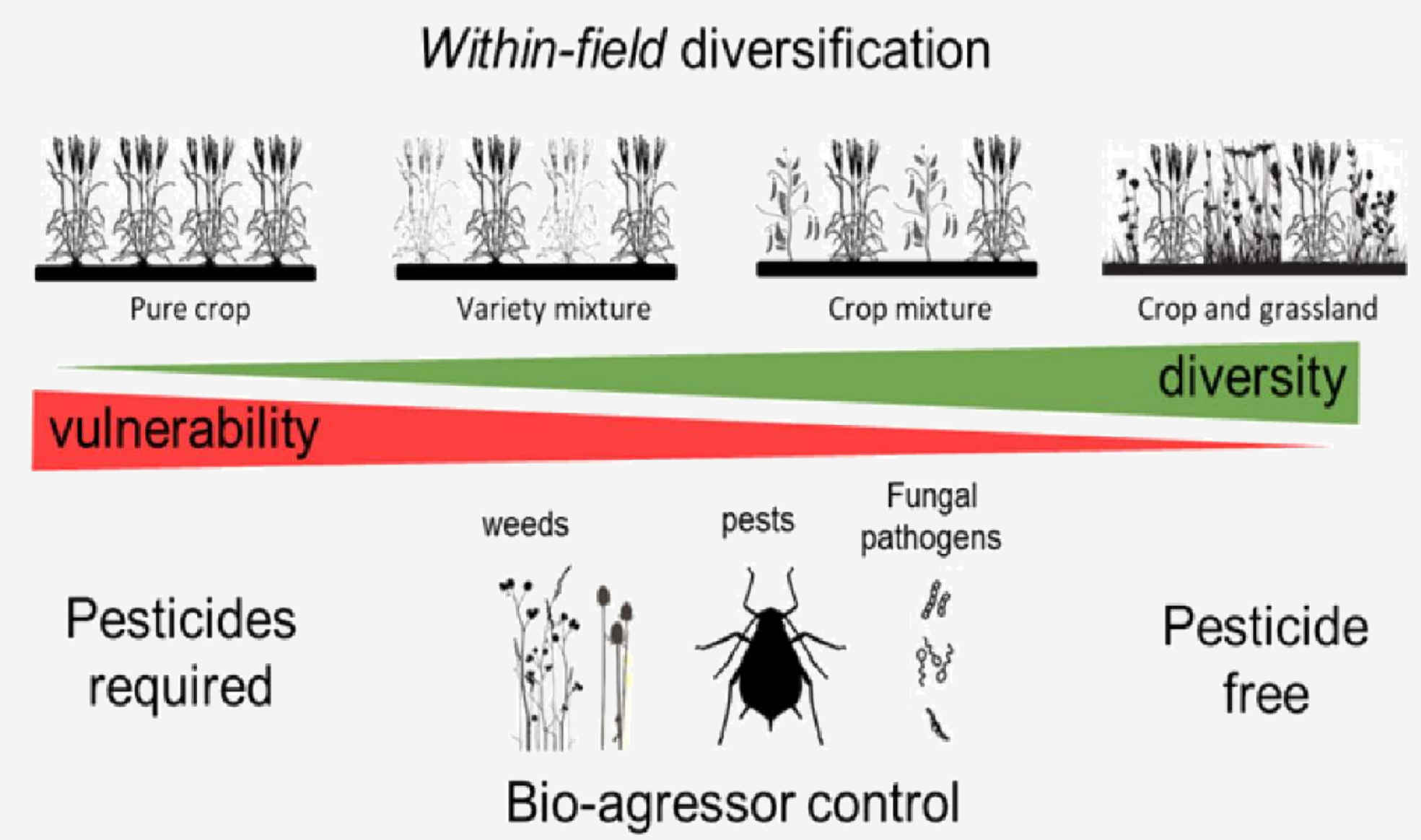
Current situation: A system focused on the paradigm of (varietal) homogeneity:

- Breeding schemes for homogeneous varieties (lines/hybrids)
- Royalty-based research concentrates research on dominant crops
- Knowledge and advice focused on pure crops
- Varietal evaluation in pure crops
- Pure crop based market standards
- Seed sector mostly selling pure varieties to farmers

Increasing within-field diversity reduces pesticide use:

- Known effect on pest, disease and weed control (eg., Borg et al. 2018)
- A recognized effect of diversification on crop stability (Li, ..., van der Werf 2020; Paut et al. 2020)

Mobilizing intra-plot diversity with gradients boosts natural regulation and reduces dependence on pesticides:



OBJECTIVES AND ORGANISATION

Outlines & outputs:



WP1 - National data

Analysis of intra-field diversification dynamics in France, impact on biotic pressures, biodiversity and pesticide use

Methodology: Statistics, Data analysis



WP2 - In lab

Identification of plant-plant interaction mechanisms and impact on pest, weeds and diseases control

Methodology: Modelling, Genetics and molecular approaches



WP3 - In field

Evaluation of the impact of diversification on pest control

Methodology: Field trials



WP4 - In firms and farms

Design of methods that can be used to select and design varieties and species mixtures

Methodology: Modelling, data analysis in farmers networks and experimental stations



WP5 - In the seed sector

Design of tools and policies to encourage the involvement of economic actors in a diversification strategy

Methodology: Participatory approaches, qualitative surveys, micro-economic modelling

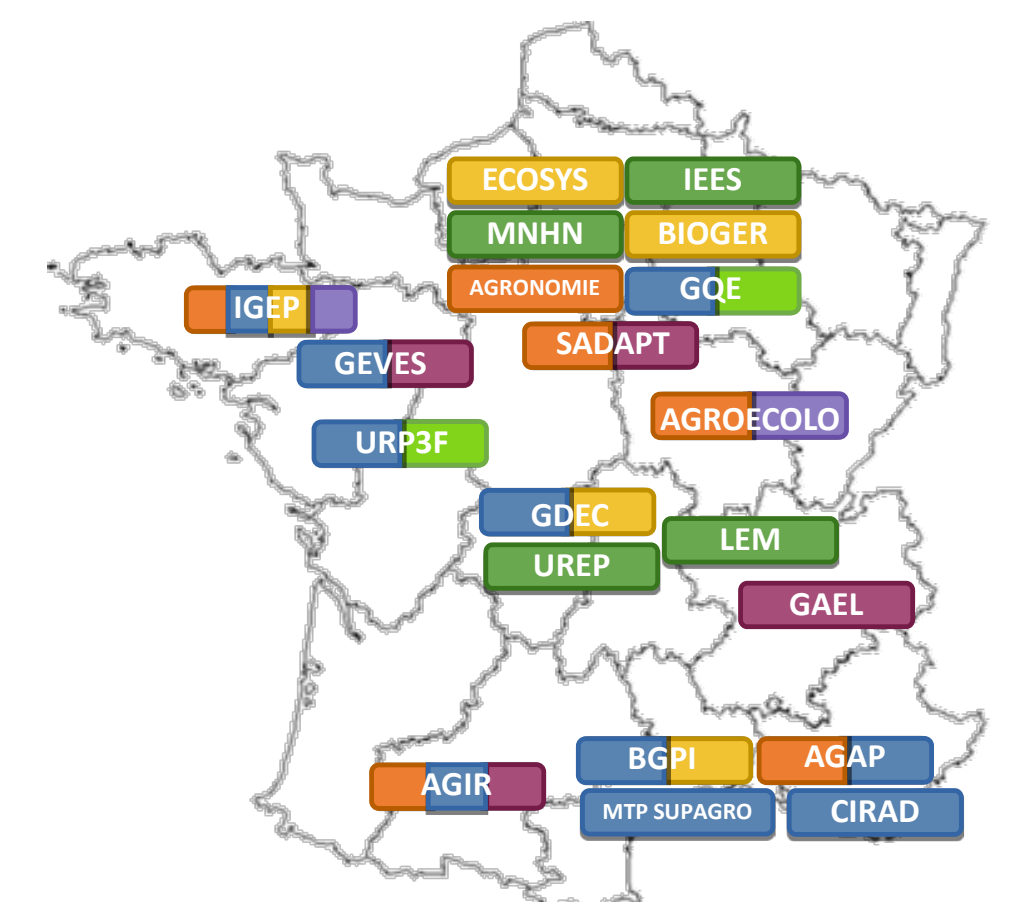
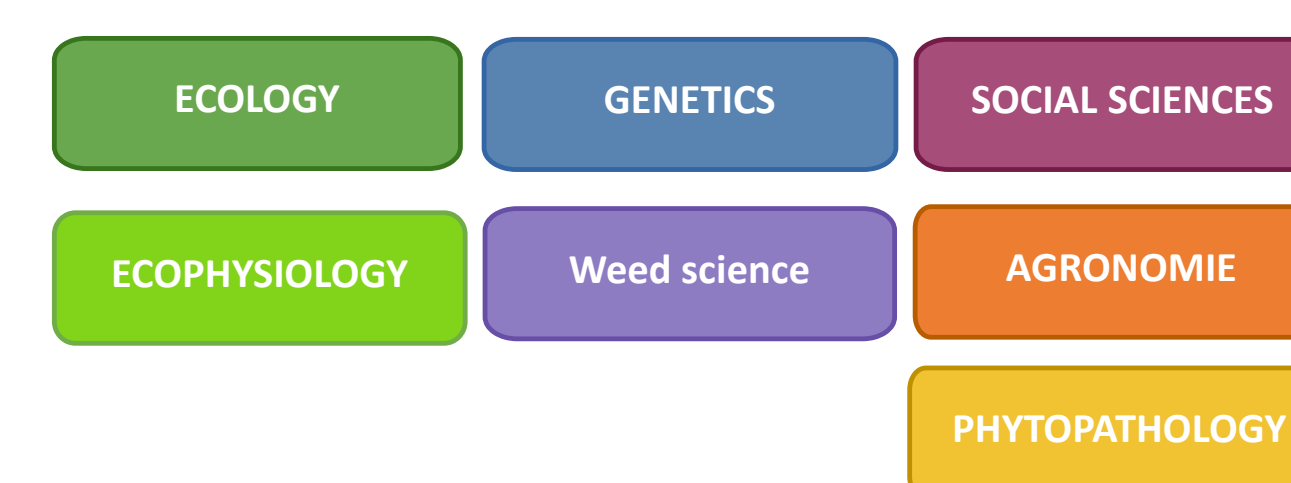
With 3 model crops:

- Wheat, main player of pesticides in France
- Peas, a good legume partner
- Fodder crops & grassland, emblematic for biodiversity and ecosystem services

Multi-actors at multiple scales of the agroecosystem:



Multi- and transdisciplinary approaches:



EXPECTED RESULTS

- Demonstration of the benefits of mixtures in pests regulation and in pesticides reduction
- Co-designed decision support tools for mixtures design
- Identification of traits and genomic regions driving mixing ability
- Plant ideotypes adapted to mixtures
- Co-designed tools for breeders and farmers (breeding schemes, models, markers, phenotyping strategies)
- Methods and know-how for participatory breeding and evaluation of mixtures
- Regulatory and financing tools for diversification
- Scenarios for relaxing upstream and downstream quality standards

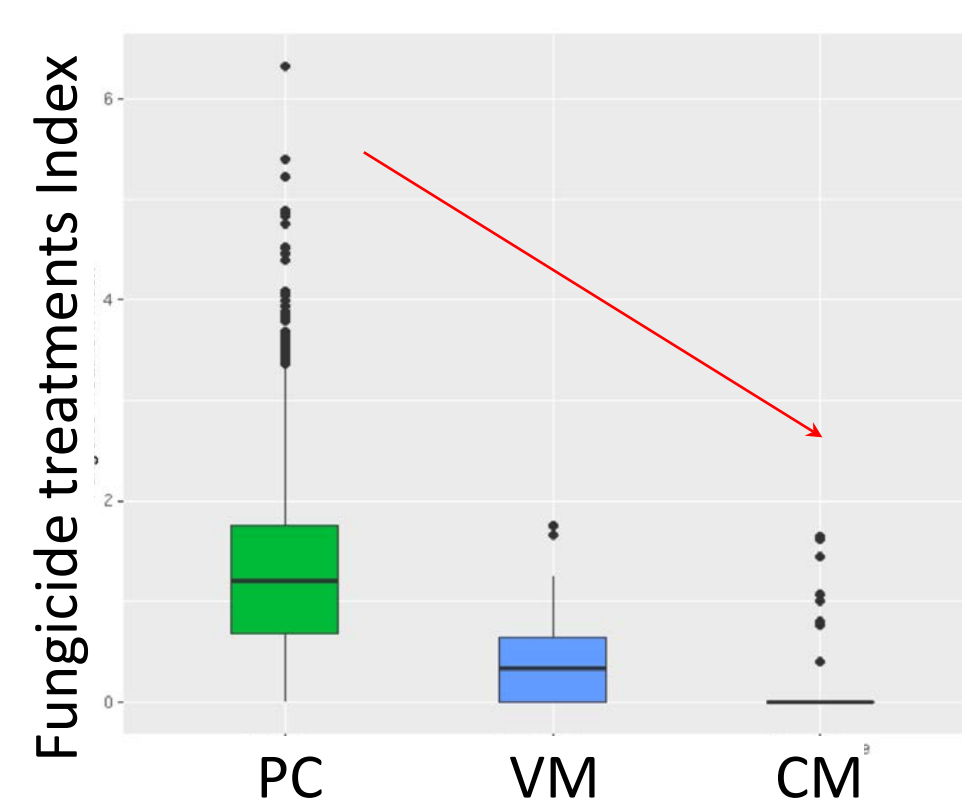


Fig1. An effective decrease in pesticide use with PC : (Wheat) Pure crop; VM : Variety mixture; CM : Crop mixture

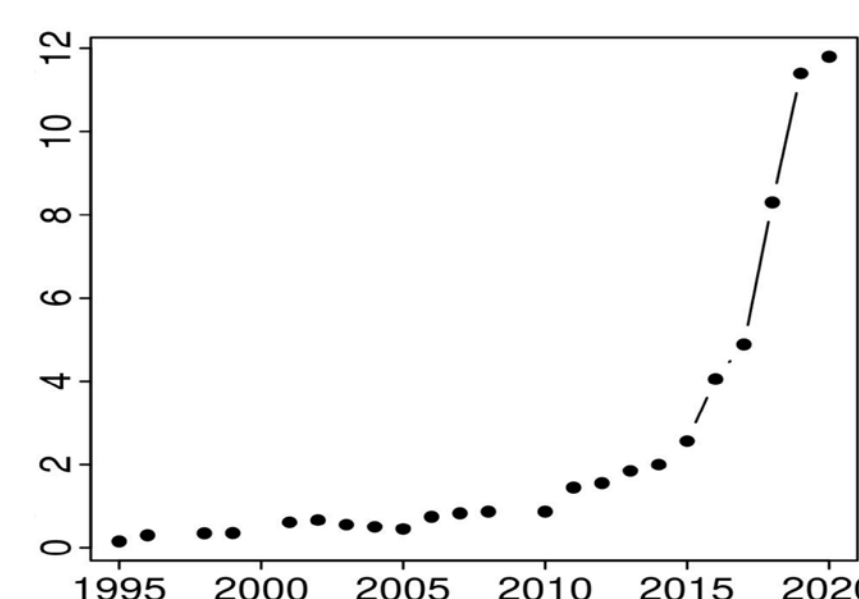
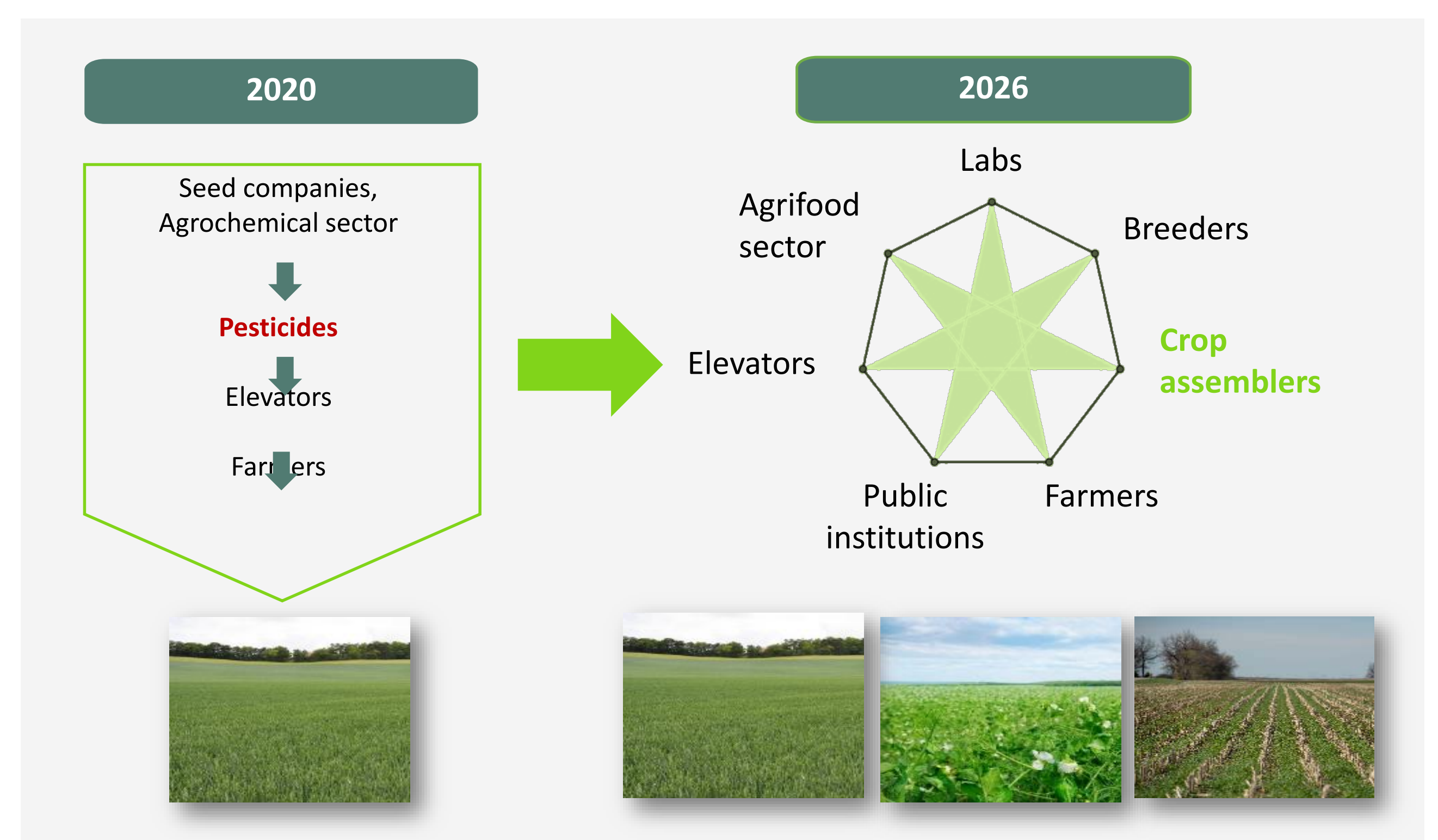


Fig 2. Progression of mixture use in farms

& PERSPECTIVES

Transformation and diversification of the seed sector:



CONCLUSION

MOBIDIV aims at creating methods and tools to select, assemble, register and evaluate varieties for zero-pesticide agriculture.

- ✓ Breeding programmes for the production of mixtures
- ✓ Changing regulations on variety registration
- ✓ Ready-to-use mixtures available to farmers
- ✓ Organisations providing specific advice on mixtures
- ✓ Increasing adoption of mixtures
- ✓ Cooperatives accepting deliveries of mixtures



www.inrae.fr/mobidiv