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l'agronomie en mouvement

R2D2
Agronomie et insectes auxiliaires au service d'une agriculture durable

R2D2: a territorial project to prevent pests damages on winter oilseed rape combining agronomy and conservation biological control

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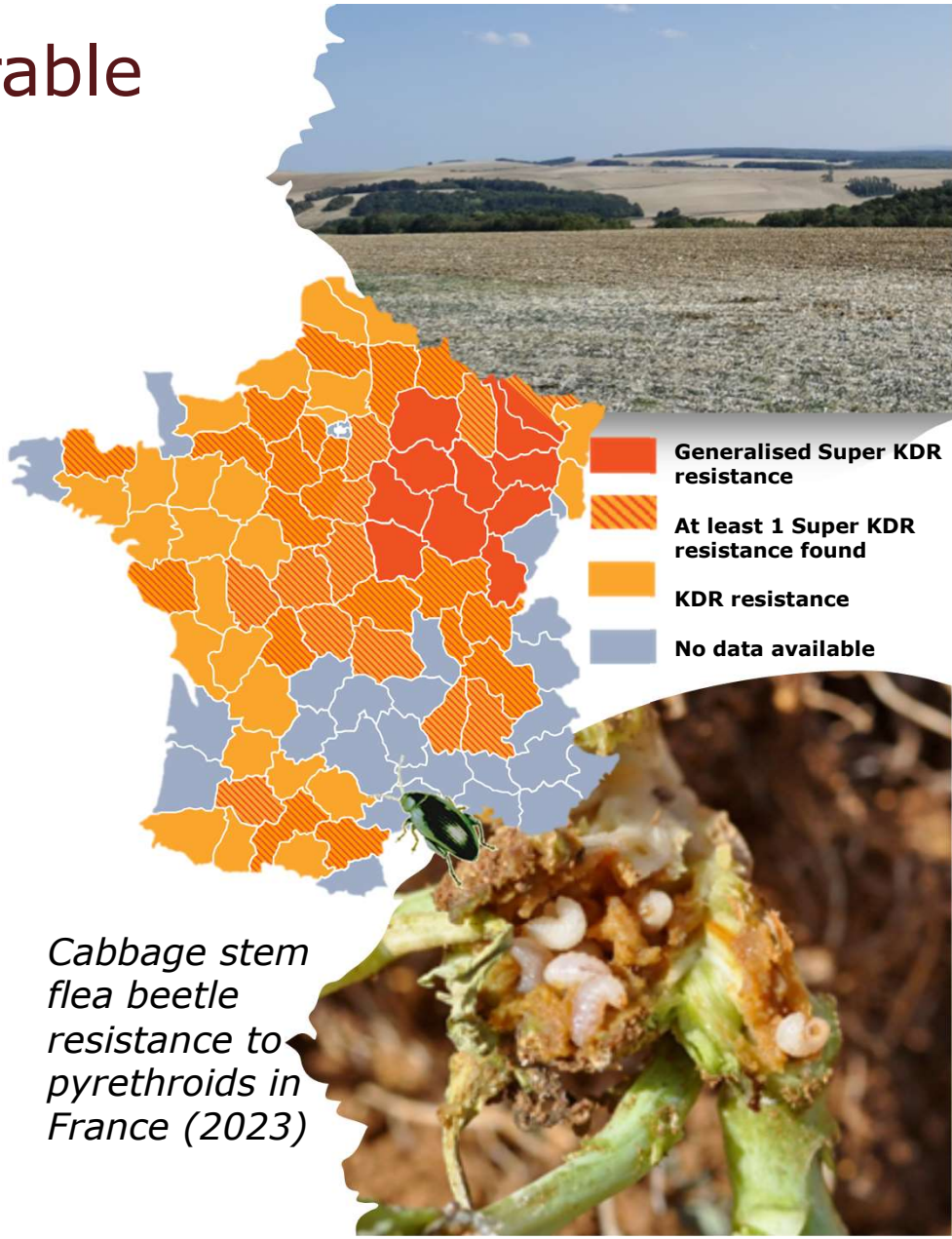
A context of uncertainties favourable for integrative approaches

- European political will to reduce insecticide use
- Key molecules withdrawal (phosmet, neonics)
- Climate change (pest outbreaks, drought episodes)
- Insect resistance on winter oilseed rape (WOSR)
- On WOSR, farmers are facing difficulties with cabbage stem flea beetle and rape winter stem weevil management: strong reduction in acreage
- Technical Institute Terres Inovia, focused on the search for solutions to combine at different scales
- R2D2 is a territorial project implemented on the burgundy plateaus where all research advances are combined and tested in real-life conditions :

  -on a 1300 hectares territory

  -with 10 farmers Involved



Cabbage stem flea beetle resistance to pyrethroids in France (2023)

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R2D2: a territorial project based on innovative design and generative experimentation

- Co-innovation workshops with farmers

✓ Defining a common ambitious target

-**At cropping system scale**:
Insecticide Treatment Frequency Index (TFI) = 0
Herbicide TFI = 1
-**For OSR specifically**:
acreage ≈ 1/6 of crop rotation;
stable yield ≈ 3 tons per hectare

✓ Designing an agroecological pest management strategy for the territory to be tested and improved

- Farmers support and scientific monitoring:

✓ progressing step by step towards the target

✓ Assessing the strategy effectiveness through the monitoring of key variables (pest pressure, damages on crops, levels of biological control…)

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An agroecological strategy based on 3 lines of work

1 Enhancing biological control of pests (territorial scale)

- Increase nectar/pollen resources
- Increase undisturbed habitats area, their diversity and connectivity
- Reduce insecticide applications
- Reduce soil tillage

- ✓ Combinatorial approach
- ✓ From field to landscape scale
- ✓ Considering cultivated AND uncultivated areas
- ✓ Working in concertation and with coordination

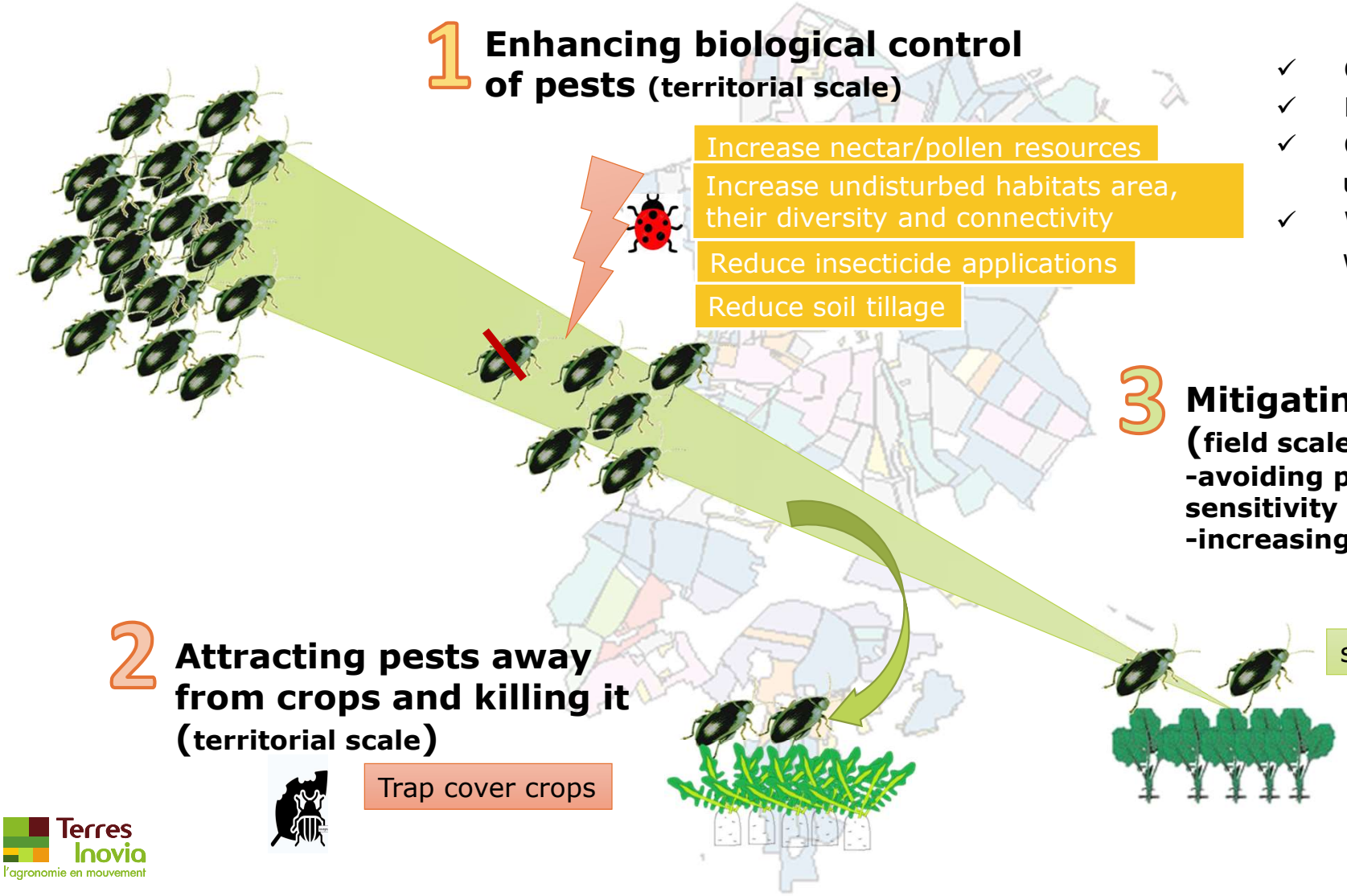
2 Attracting pests away from crops and killing it (territorial scale)

- Trap cover crops

3 Mitigating plant damages (field scale):

-avoiding pests' presence during sensitivity stages
-increasing plant "robustness"

- species/varieties intercropping
- Soil fertility/Crop nutrition
- Tolerant varieties
- Sowing dates



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Significant changes at territorial scale

Attracting pests away from crops and killing it: behaviour manipulations

Each year: 250 ha Chinese radish-based trap cover crops to attract cabbage stem flea beetles outside OSR field and kill it with cover crop mechanical destruction during winter

Currently under assessment, first results are encouraging

Enhancing biological control of pests

- 8 ha of multispecies flower strips sown to boost natural regulation processes
- 3 project for hedgerows plantation

Multispecies flower strip

Cabbage stem flea beetle trap cover crop

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Significant changes at field scale

Mitigating plant damages

- **On OSR** between 2019 and 2021 :
  - ✓ Farming practices intending to increase crop robustness toward pests' attacks strongly increased
  - ✓ Decision making for insecticide treatments much more based on decision rules

Practices on OSR	2019	2021
intercropping with Faba bean	33%	65%
sowing before 10th august	0%	46%
fertilisation at sowing	94%	100%
Systematic insecticides treatments	60%	0%
Insecticides treatments based on decision rules	40%	100%

➢ **Insecticide TFI on OSR was reduced from 51% between 2019 and 2021**

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Parasitism rates

- *Brassicogethes aeneus:* 

Moderate levels of infestation: Between 2020 and 2022, from 5 to 8 adults per plants in mean in the peak of presence (not shown)

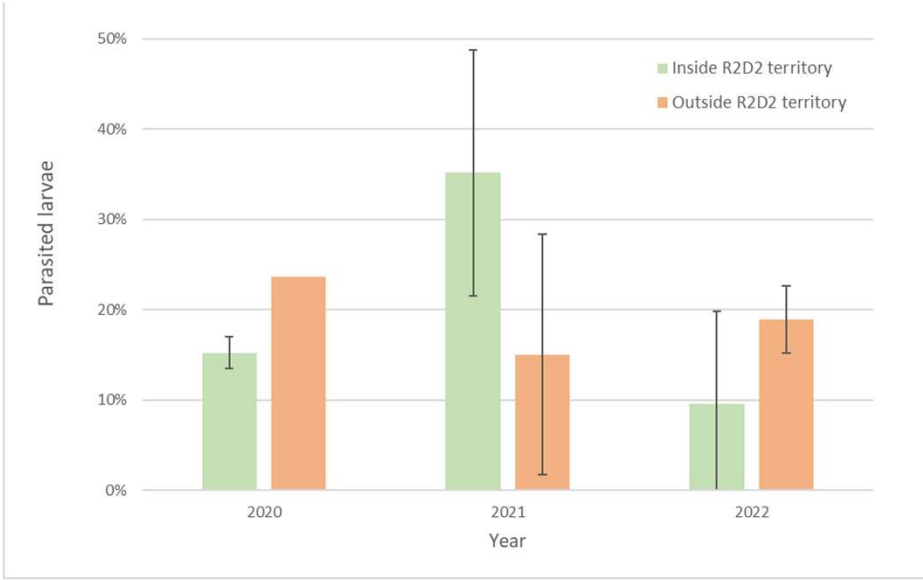
Relatively low parasitism rates values:
Strong variability, no changes over two years

- *Psylliodes chrysocephala:* 

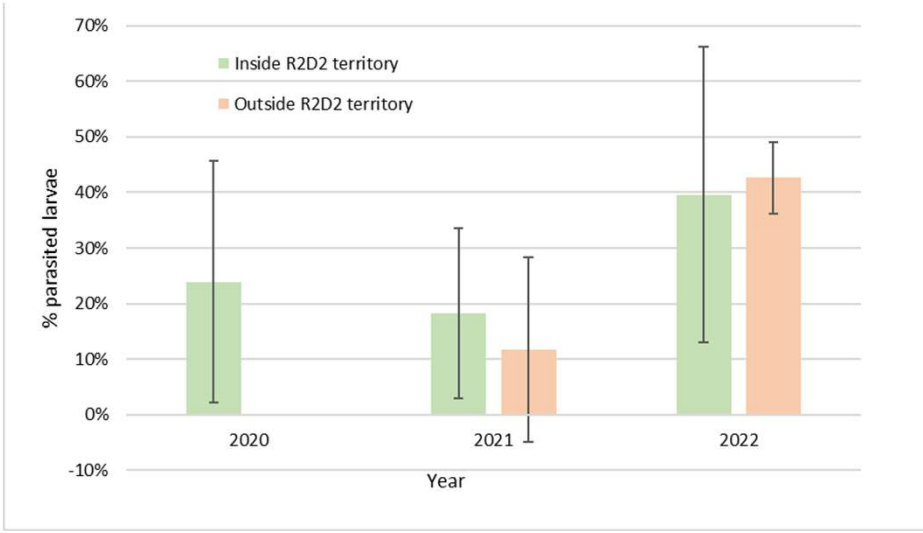
Low levels of infestation: 2 larvae per plant in winter 2021 and 2022 (not shown)

Higher values of parasitism rates in 2022, maximum around 40% inside and outside the project territory

Maximum values for *Brassicogethes aeneus*



Maximum values for *Psylliodes chrysocephala*



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Discussion/prospects

Over 2 years,

- Major changes have occurred in both farmers decision-making processes and farming practices at territorial scale
- In OSR, it led to a significant reduction of systematic insecticide applications and TFI was strongly reduced
- Natural regulation of OSR pests did not increase and remained below the 70-80% reported by Jourdheuil (1954)

  -Probably need for deeper changes and increase in acreage concerned

  -More time is probably needed for changes in practices to show measurable results

Prospects

- Strengthening support for farmers and providing them with adapted tools to encourage the implementation of innovations
- Overcoming barriers linked to the risk of economic losses in the case of a reduction in the use of insecticides or an increase in unproductive areas

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Thanks a lot for your attention !

R2D2 Project: « **R**estaurer la **R**égulation naturelle et améliorer la robustesse des cultures pour réduire **D**urablement la **D**épendance aux insecticides sur les plateaux de Bourgogne »

Many thanks to :

- **Farmers**

- **Partners** :

- **Financial support** :

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