

Adaptation of winter oilseed rape to Coleopteran pests in a context of climate change and Phosmet withdrawal.

Focus on the Adaptacol² project



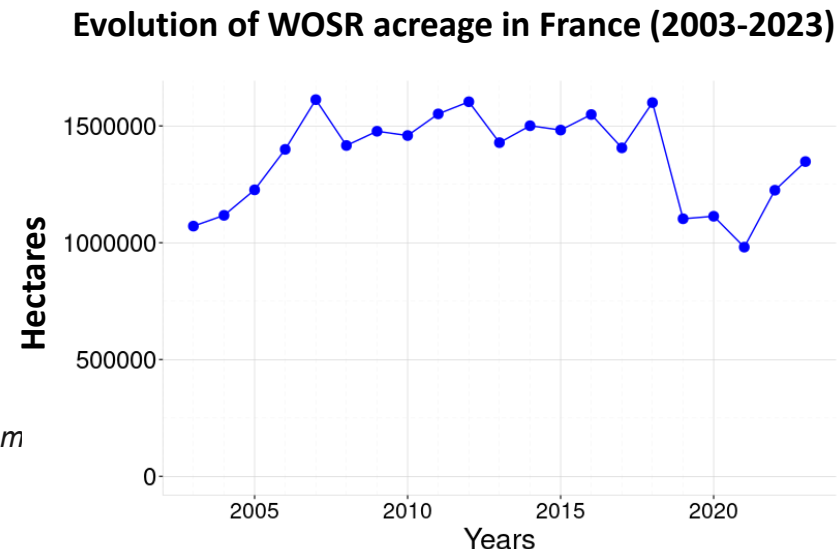
Céline Robert, Laurine Brillault, Laurent Ruck, Arnaud Van Boxsom, Michael Geloën

Financed par :

Context in France

- **Dryness at sowing (August)** -> difficulties in the establishment of winter oilseed rape WOSR.
- **Outbreak of some pests**, in particular cabbage stem flea beetle (*Psylliodes chrysocephala*) and rape winter stem weevil (*Ceutorhynchus picitarsis*).

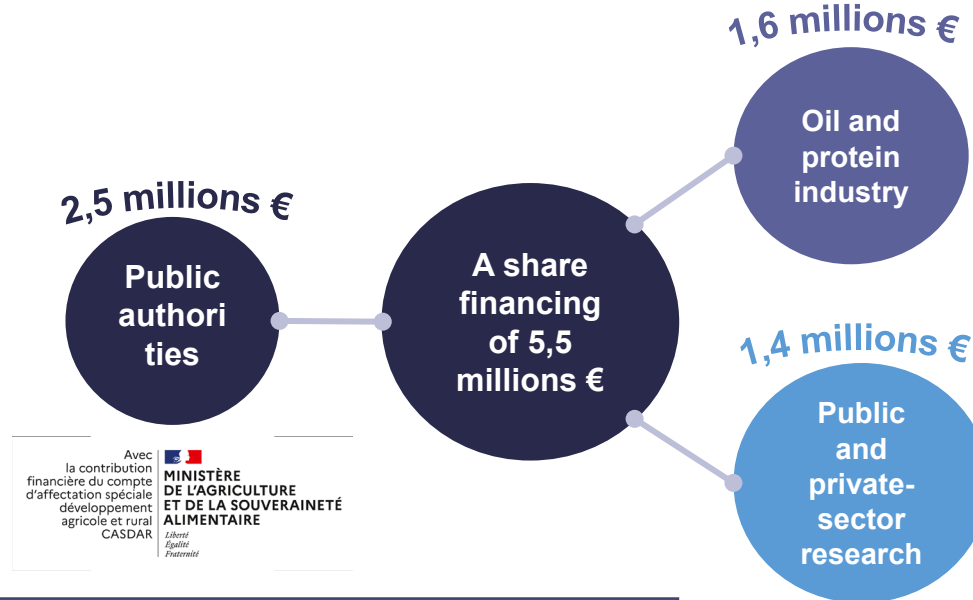
➔ **WOSR is more exposed and susceptible to pests**



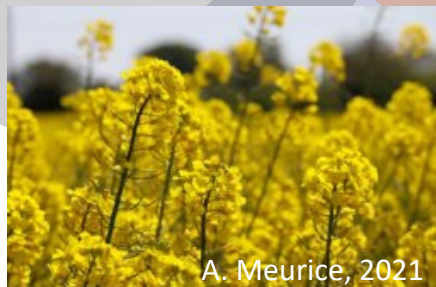
- **A more and more complex management :**
 - Development of strong resistance to pyrethroids (*Bothorel et al., 2018*)
 - Non-registration of active substances : in 2023, Phosmet withdrawal.

➔ **Heavy losses of oilseed rape yield and acreage**

➔ **More than ever, pest management requires a combination of agro-ecological levers.**



A massive 3-year (2022-2025) financing plan to find new operational alternative strategies to reduce attacks and harmfulness caused by these pests



8 projects working on 4 axes



Improving knowledge about pests and their natural enemies

AdaptaCol² (Terres Inovia)
Epidemiology, biology of RWSW and natural enemies

AltisOr (INRAE)
Characterisation of CSFB olfactory receptors

LEGO (INRAE)
CSFB intensive breeding



Deploying solutions to farmers

AdaptaCol² (Terres Inovia)

- ▶ Leading regional committees
- ▶ Support for the "Robust Rapeseed" initiative
- ▶ Updating decision rules and developing forecasting tools



Identify solutions at plant level

Biocontrol

Development

Colzactise (De Sangosse)
Formulation of a deterrent product

Ctrl-alt (INRAE)
Identification of attractive VOC*

Optimisation

Projet (Certis)
Outils technologiques associés à un produit de biocontrôle

VELCO-A (BASF)
Conditions for using an entomopathogenic fungus

AdaptaCol² (Terres Inovia)
Evaluating the effectiveness and conditions of use of new solutions

Genetics

RESALT (INRAE)
Resources for building CSFB-resistant varieties

AdaptaCol² (Terres Inovia)
Varietal classification of tolerance to pests

Agronomy

- AdaptaCol² (Terres Inovia)**
- ▶ Evaluation of levers to promote robustness in WOSR
 - ▶ Varietal mixtures



Identify solutions at field and landscape level

AdaptaCol² (Terres Inovia)
Evaluation of territorial strategies

Ctrl-alt (INRAE)
Development of a Push and Pull strategy using service plants and VOC*

VOC = Volatile Organic Compounds*

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The Adaptacol² approach

Supporting farmers and agricultural technicians to find and adopt as quickly as possible new agroecological strategies at different time and space scales.

- Acquiring references on alternative levers
- Mobilising research and development stakeholders to provide coordinated support for farmers



Information sharing through regional meetings:

- More than 100 stakeholders involved (distribution, advisers, agricultural education, plant protection and seed companies)
- Presentation of technical results and feedbacks
- Co-construction of:
 - New management strategies
 - Protocols and trial networks
 - Concerted communication actions

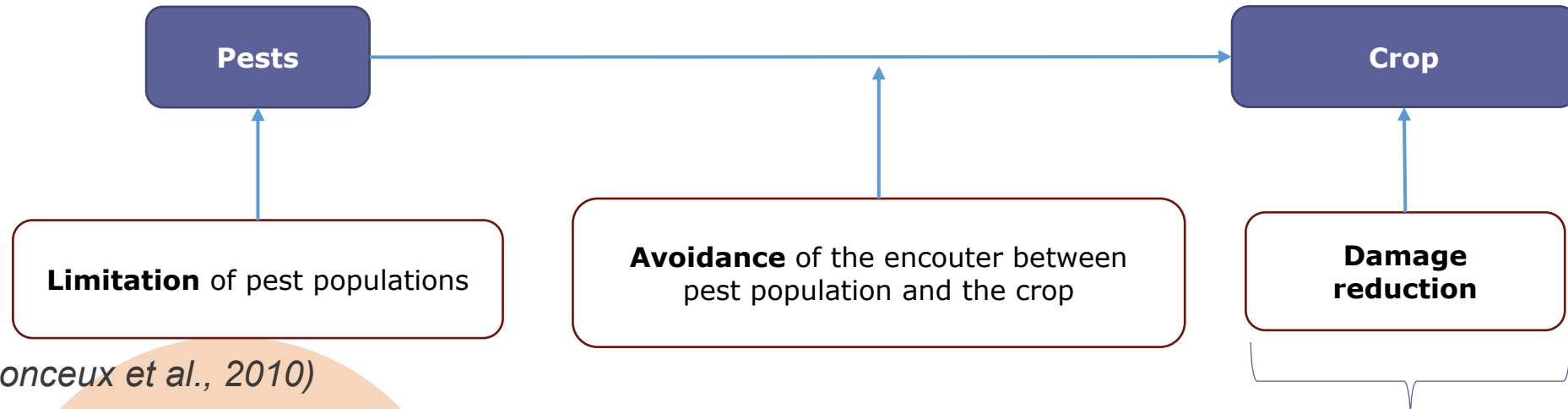


With the participation for the equipment needed for experimentation:

- **Seeds** : Brevant, DSV, KWS Mais France, KWS Momont, LG Semences, LIDEA, Mas Seeds, RAGT Semences, Semences de France
- **Crop protection products and biostimulants** : Syngenta, Corteva, Sumi-Agro, UPL, ViaVegetale, Adama, Gaiago.



Support for the "Robust WOSR" initiative

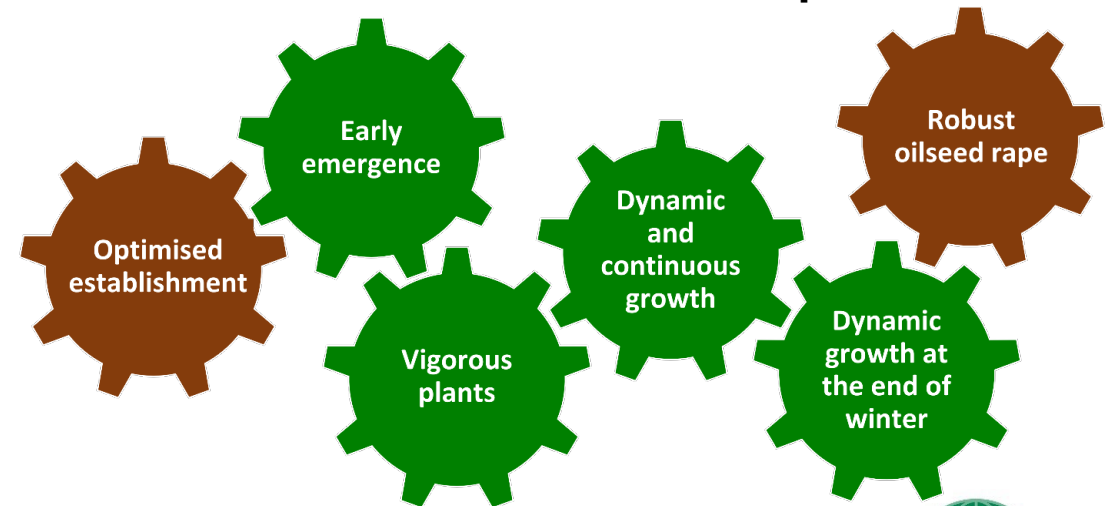


(Attoumani-Ronceux et al., 2010)

« Robust WOSR » initiative (Sauzet and Cadoux, 2019) :

An approach developed by Terres Inovia to understand and adapt the most favorable practices to the context of the field, based on plot observatories and support tools.

A robust oilseed rape

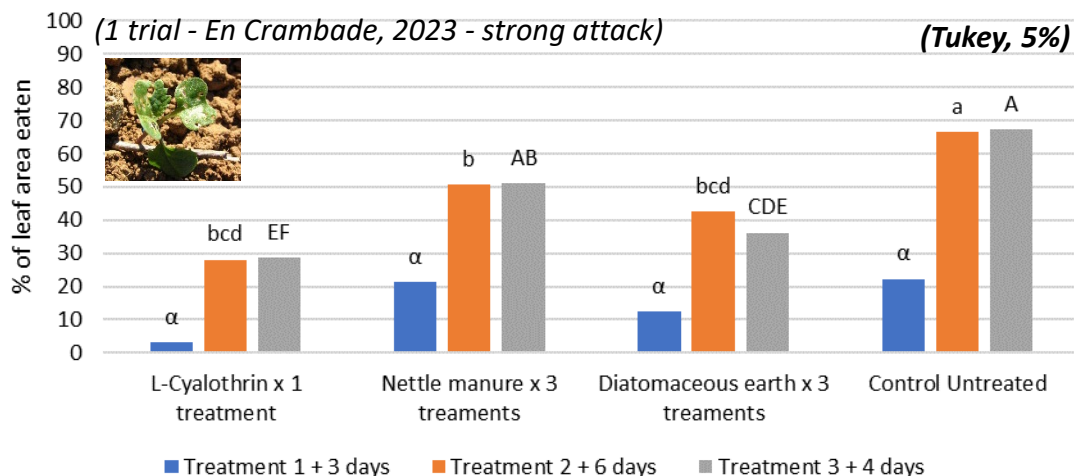




Evaluating the efficacy and conditions of use of new solutions

Since 2017/18, Terres Inovia tested more than 20 alternatives to insecticides against Coleoptera pests : macroorganisms, natural substances, ...

LS means of the % of leaf area eaten by CSFB

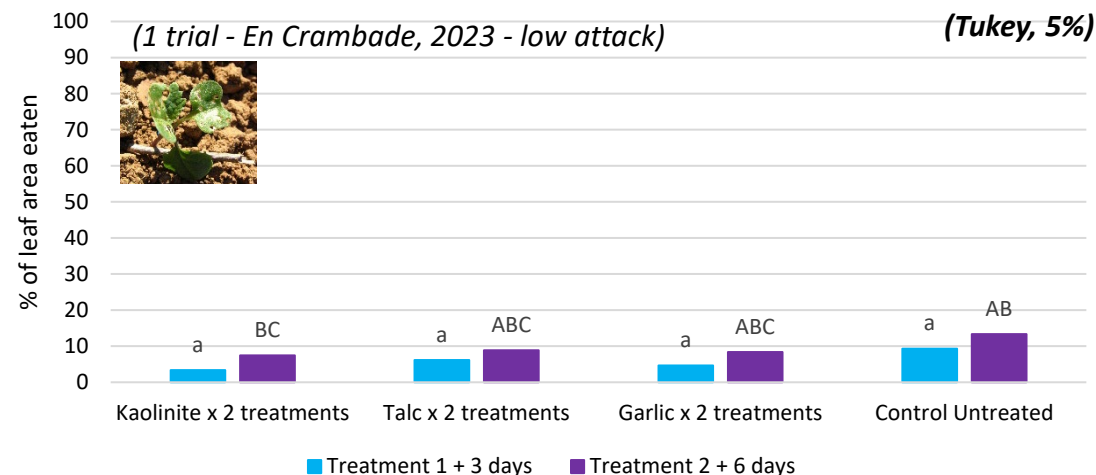


Only 1 treatment of Karate Zeon (0.05L/ha). 3 applications for others modalities. Efficacy evaluated after each treatment.

Good efficacy of **diatomaceous earth**, similar to L-Cyhalothrin (no strong pyrethroid resistance).

- The efficacy is often limited, and conditions of use need to be defined.
 - Protocols must be adapted and applications must be repeated.

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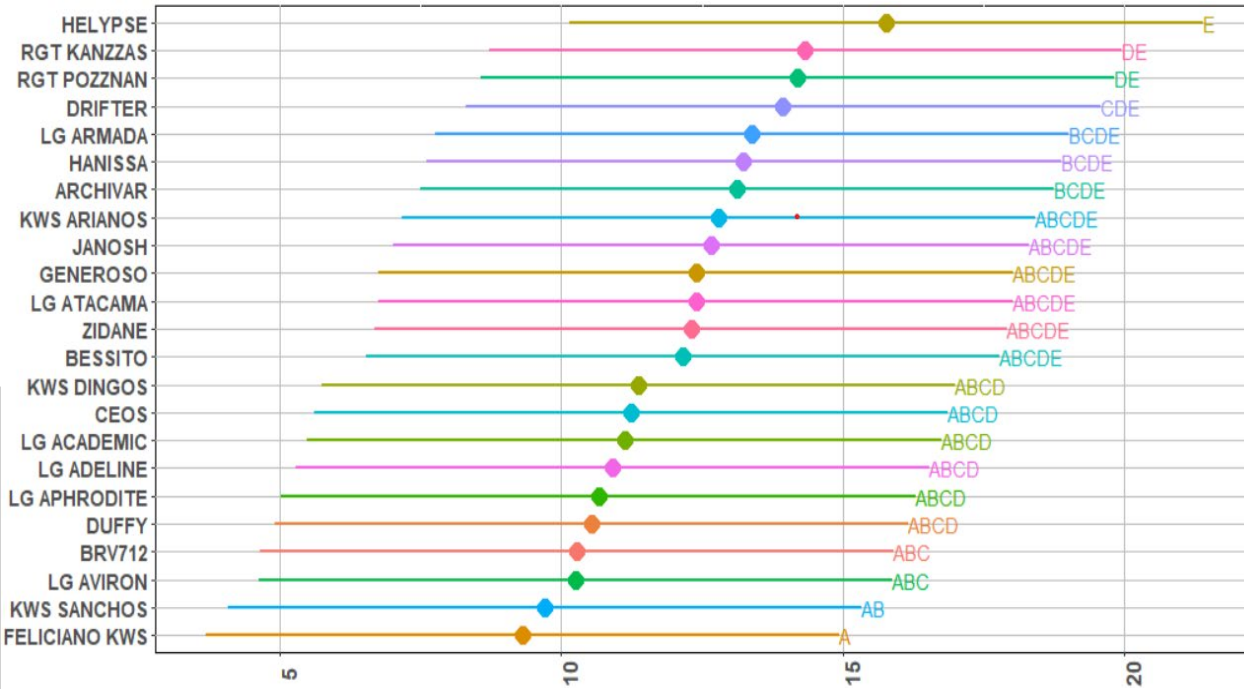
2 applications for each modality. Efficacy evaluated after each treatment.

Good efficacy of **kaolinite** after 1 or 2 applications in a low attack context.



Varietal classification of tolerance to pests

17 trials, 2023 – Tukey test – $\alpha=10\%$

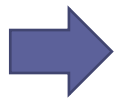


Number of larvae per plant (adjusted and weighted average)

		Number of larvae per plant				
		1 : low	2	3 : medium	4	5 : high
% of plants with symptoms	1 : low	FELICIANO KWS		LG ARMADA	KWS ARIANOS KWS WIKOS	
	2		LG ATLAS	ZIDANE	HANNELI	RGT KANZZAS
	3 : medium	KWS SANCHOS LG AVIRON	KWS DINGOS LG ACADEMIC LG AUSTIN RGT OZZONE	BESSITO GENEROSO LG ATACAMA	HANNISSA RGT POZZNAM RGT SWAZZI	HELYPSE
	4	HELIOTT ATTICA	BRV712 CEOS	JANOSH DUFFY HELLEKIS	BRV714 ARCHIVAR	
	5 : high				DRIFTER	LID ULTIMO

Varietal differences highlighted among marketed varieties (*Van Boxsom et Robert, 2022*) :

- Vigour
- Presence of CSFB larvae
- Insect damage



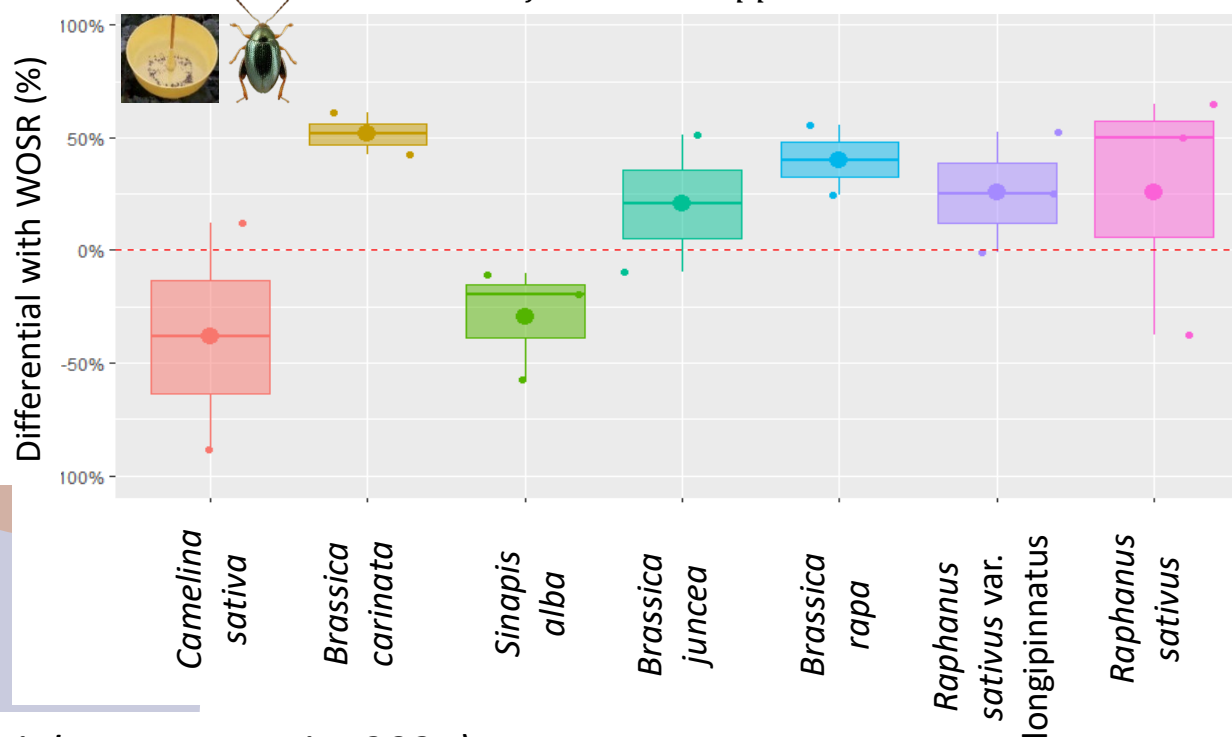
Provide an advice adapted to
farmers



Evaluation of a territorial strategy

- Several cruciferous species are more attractive than *Brassica napus* for feeding and egg laying (Williams and Cook, 2010)
- Several studies have demonstrated the interest of using cruciferous plants at the field scale (mainly *Brassica rapa*) to manage CSFB (Buechi, 1990; Büchi, 1995; Barari *et al.*, 2005).

$\frac{\text{Number of insect trapped in the plot} - \text{Number of insects trapped in WOSR}}{\text{Number of insects trapped in WOSR}}$



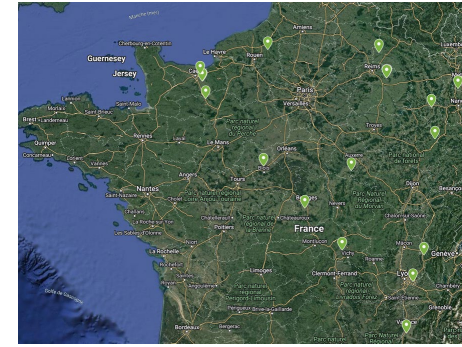
(3 field trials Terres Inovia, 2021)



Raphanus sativus var.
longipinnatus



Evaluation of a territorial strategy




Divert CSFB (and RWSW) away from WOSR fields during flight periods by using crucifers that are more attractive than oilseed rape.

Raphanus sativus var. *longipinnatus* + other species



A strong mobilisation of stakeholders to test this strategy :

- In 2023 -> at least 17 networks of fields monitored (WOSR + trap crops), including 
- In 2024 -> the evaluation is ongoing.

Conclusion

- **Le project Adaptacol² aims to:**
 - Built with development and research stakeholders agricultural strategies at the field and regional level.
 - To support the deployment of solutions so that they can be rapidly adopted by all.
 - Incorporate the results of the other Plan projects as soon as possible.
- **A very strong mobilisation of partners ... and collaborators of all professions of Terres Inovia. Many thanks to all!**

Thank you for your attention.

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