Overview of oilseed rape cultivation in France: cultivation and pest control.

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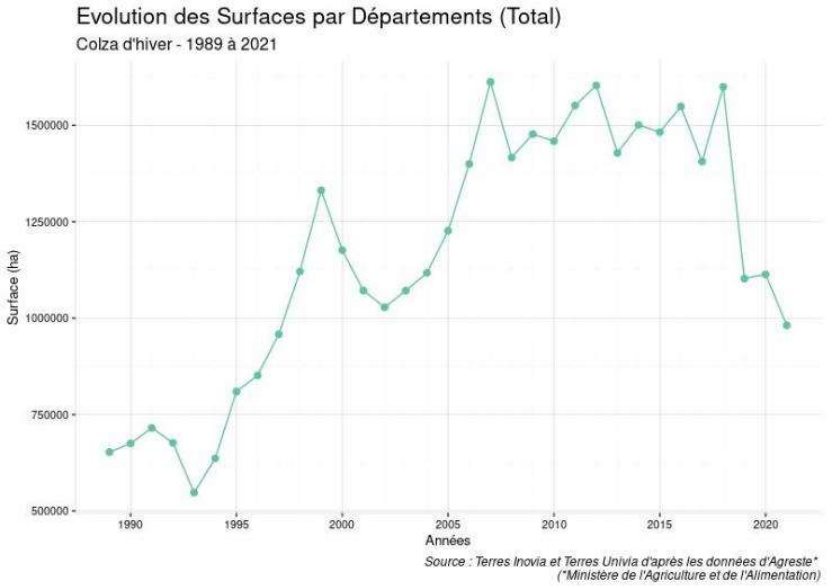
Rapeseed in France : 50 years at the forefront of modern agricultural policy

(JC Sabin, farmer, founder of Sofiprotéol, photo credit Avril website)

1973 : US Soy embargo → French Protein Plan



Growth to ~1.5 Mha driven by biodiesel growth → French protein autonomy for animal feed = 55% compared to 35% in Europe

Recent years :

1) Protein & energy sovereignty, climate change and deforestation mitigation → rapeseed more relevant than ever
2) Perfect storm of difficulties for production : climate change & crop protection regulation

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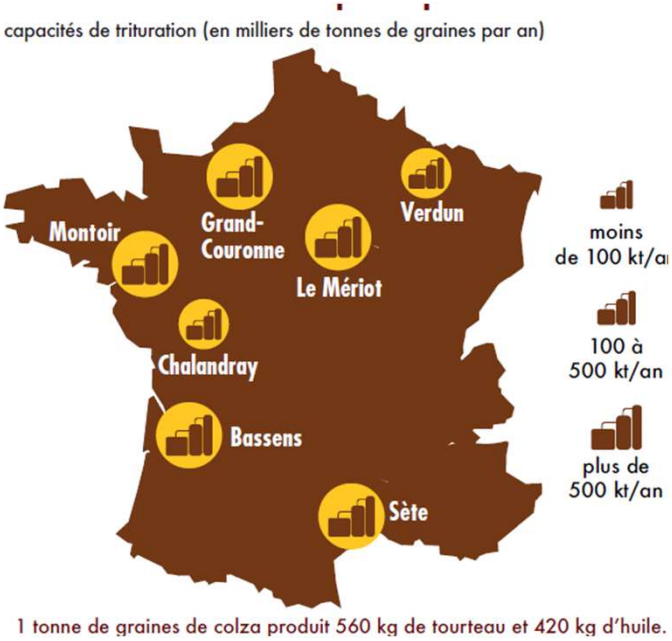
Rapeseed crush and downstream present & future



The rapeseed downstream equation =
1) Techical performance of cake to substitute soy imports → currently attained for ruminants and swine
2) Volume & Value for oil → food = 1/3 volume, nutritional value ; fuel = 2/3 volume

Future of the rapeseed downstream equation looks bright
1) Genetics & process innovations → potential to improve performance to substitute more soy imports
2) 100% biodiesel « B100 » for high power engines + value creation for verly low GHG rapeseed

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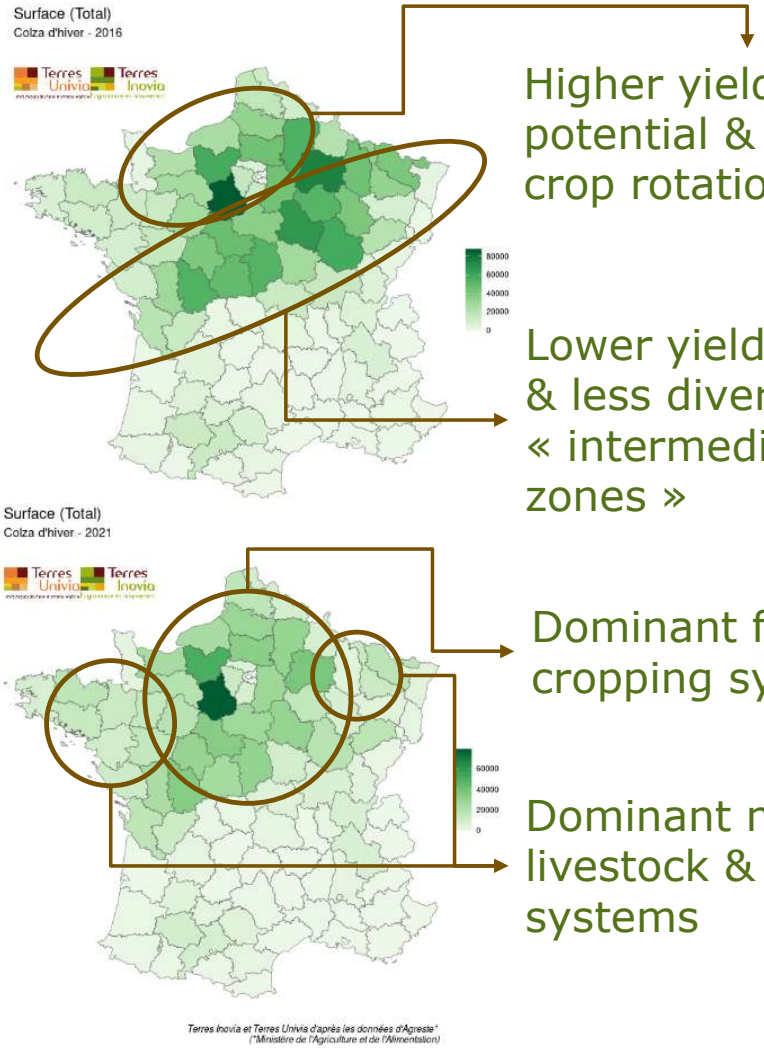
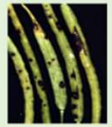
Rapeseed in French cropping systems



- The main break crop in cereal-based french cropping systems
- 3/4 of rapeseed area in 3 year wheat-barley-rapeseed successions in 2010-2015, down to 2/3 in 2020
- « Intermediate zones » = shallow soils, no irrigation → rapeseed = dominant/only broadleaf break crop with robust economic results for ~2 decades

Crop protection overview : what's working

- Weed management : agronomy & recent innovations (post émergence herbicides) → stable to improving
- Diseases : subject of massive R&D for 50 years → under control
  - **Genetics :** (Pinochet & Renard 2012, OCL) for blackleg example ; recently TuYV (Ruck et al., 2018, IOBC)
  - Fungicides
  - Agronomy

Diseases	Blackleg	Sclerotinia stem rot	Light leaf spot	Mycosphaerella ring spot	Alternaria spots	Clubroot	Verticillium wilt	Virus TuYV
								
Frequency Rare -> very frequent **Harmfulness** (note 1->5)	 (5)	 (5)	 (4)	 (5)	 (4)	 (4)	 (2)	Very common
Genetic								
Agronomy								
Fungicides								aphicides
Biocontrol								

Lever efficacy :
high, intermediate, low
Lack of solutions

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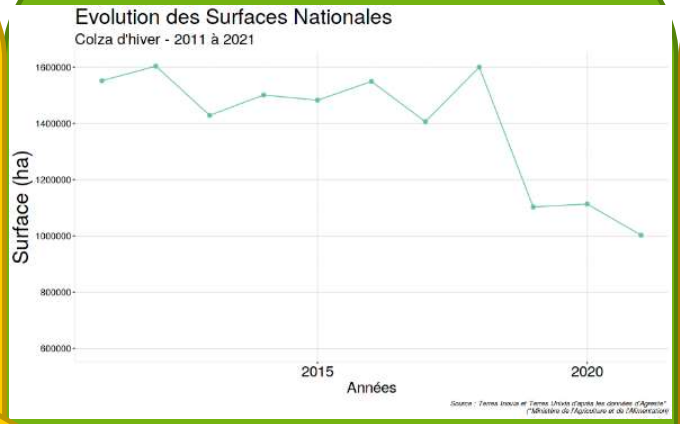
Crop protection overview : pests are the challenge

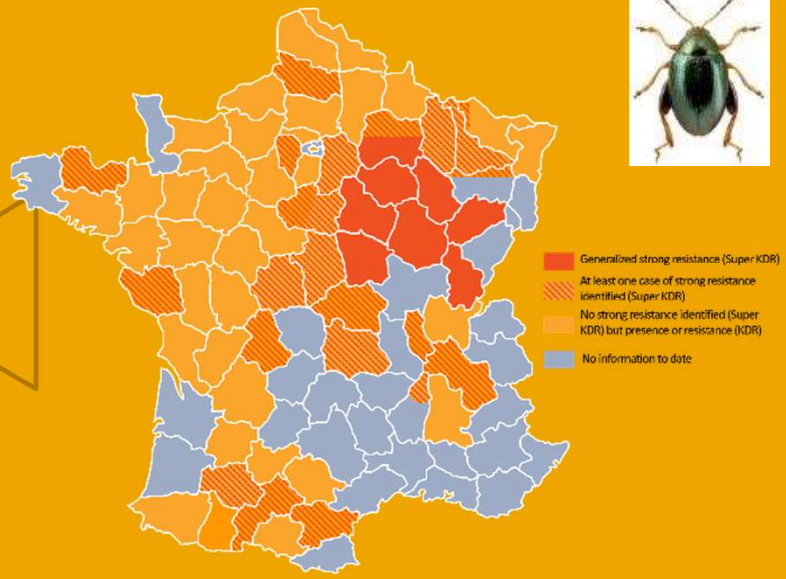
“rape will however be seriously affected by droughts in early life, particularly at sowing. This aspect is its weakest feature
faced with climate change. These autumn droughts threaten not only the establishment
of the crop but also its nitrogen absorption during the vegetative phase” (Climator project, 2010)



« Perfect storm » → loss of 1/3 cropping area in 2-3 years

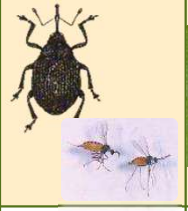
- No highly succesfull replacement
- Many fields with 3 consecutive cereal crops

CSFB resistance situation (see Ruck et al., S1-1, this meeting)



Pest management in France

Lever efficacy : high, intermediate, low — Lack of solutions

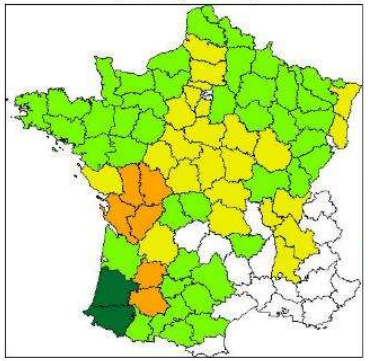
Pests	*Phyllotreta* sp.	*Psyliodes chrysocephala* (adults)	*Psyliodes chrysocephala* (larvae)	*Ceutorhynchus picitarsis*	*Mysus persicae*	*Ceutorhynchus napi*	*C. pallidactylus*	*Brassicogethes* sp.	*C. assimilis* / *Dasineura brassicae*	*Brevicoryne brassicae*
										
Frequency Rare -> very frequent **Harmfulness 0->3**	 (3)	 (3)	 (3)	 (3)	 (2)	 (2-3)	 (0)	 (1-2)	 (1-2)	 (2)
Varietal choice										
Agronomy									/	/
Insecticides : number of active ingredients without resistance in the fields	1	0-1	0-1	0-1	1	1		1	1	3
Biocontrol										

Historical evolutions

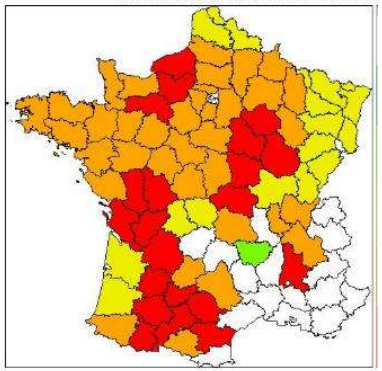
- Strong growth of CSFB populations

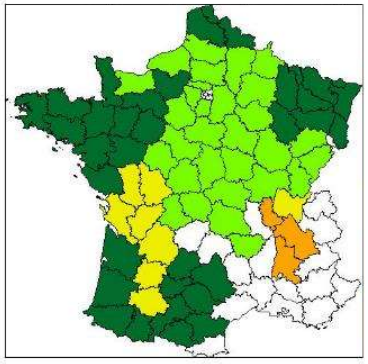
-> pest n°1

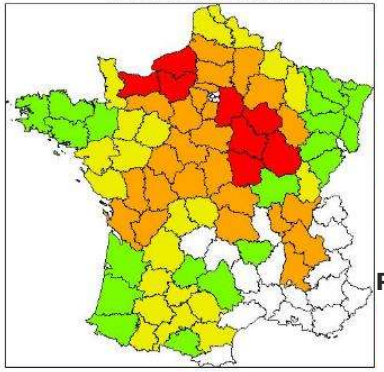
20 years ago



End of 2010s



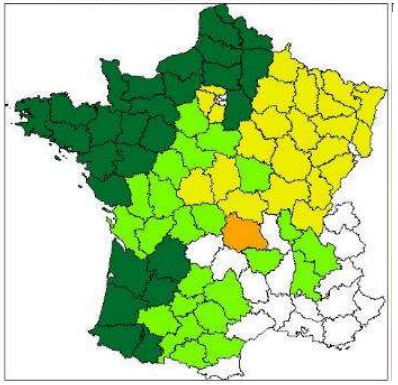




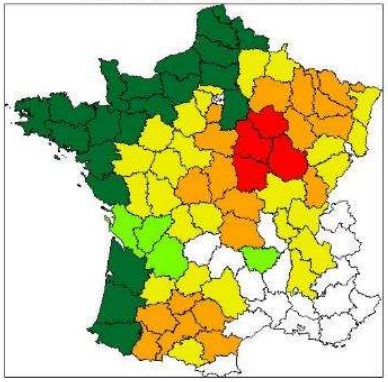
Rare -> very frequent

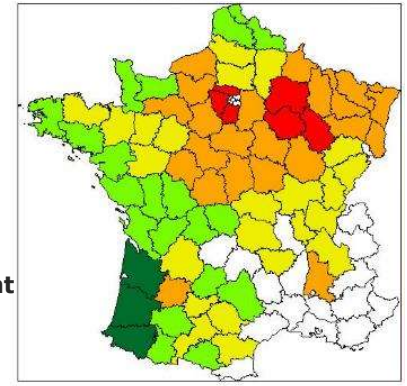
- Strong growth of RWSW in the historical area
- Uneven evolution of pollen beetle populations

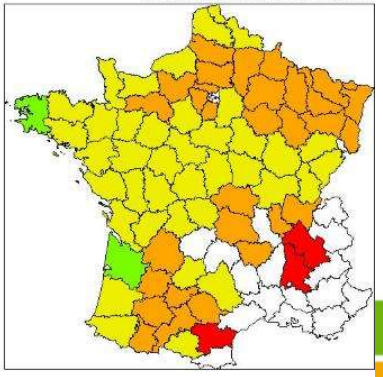
20 years ago



End of 2010s







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Emergence of some new pests - polyphagous species - (ex: *Agrostis* sp., *Nysius cymoides, Calliptamus italicus…)*

Insecticide ban schedule – a major driver

2022 **Organophosphate : phosmet (beetles)**
Oxadiazine : indoxacarb (pollen beetle)

2021

2020 **Organophosphate : chlorpyrifos-methyl (beetles)**

2019 **Pyridine-azomethine : pymetrozine (pollen beetle)**

2018 **Neonicotinoids : thiacloprid, acetamiprid (beetles, aphids)**

2017 **Organophosphate : chlorpyrifos-ethyl (beetles)**

2016

2015 Carbamate : pirimicarb (aphids) – only available in association with pyrethroids

+ ban of different pyrethroids

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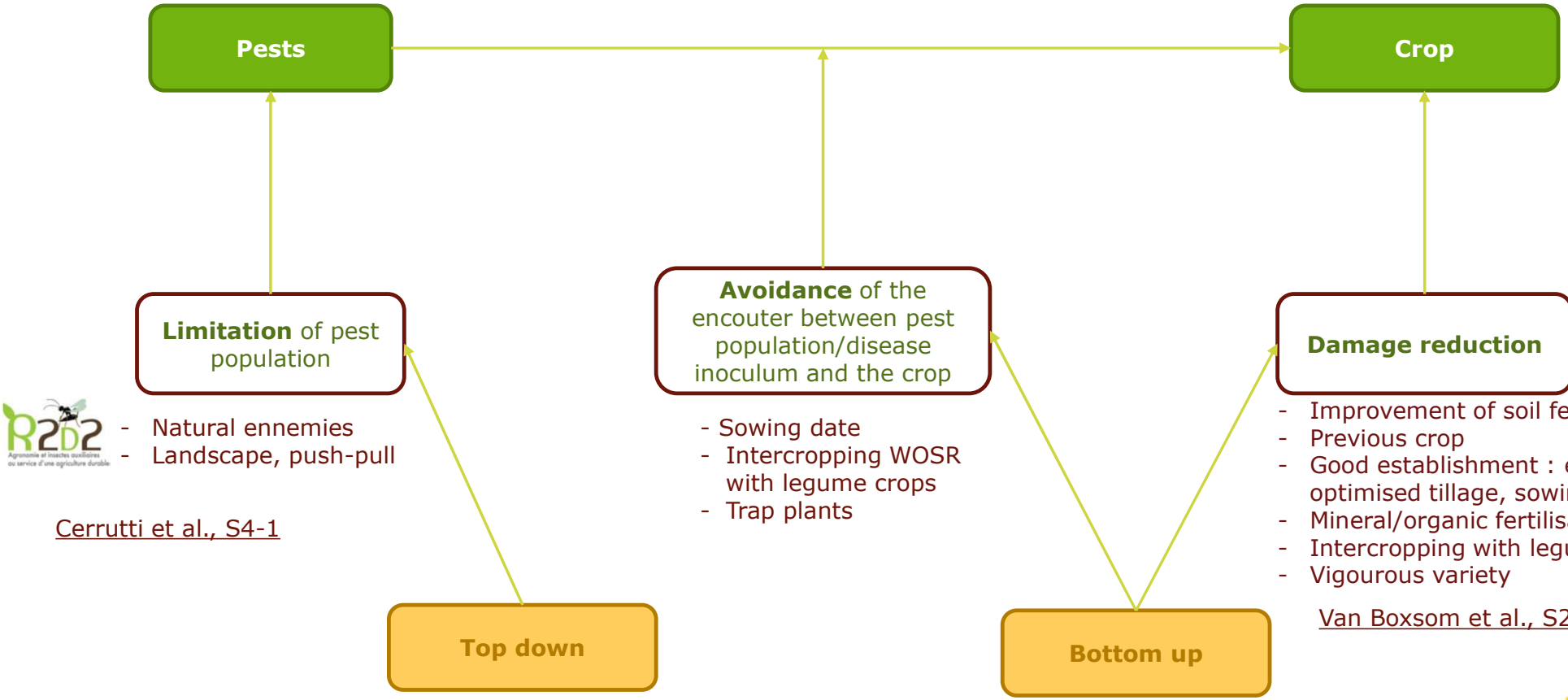
Applied agroecological pest management of RWSW and CSFB

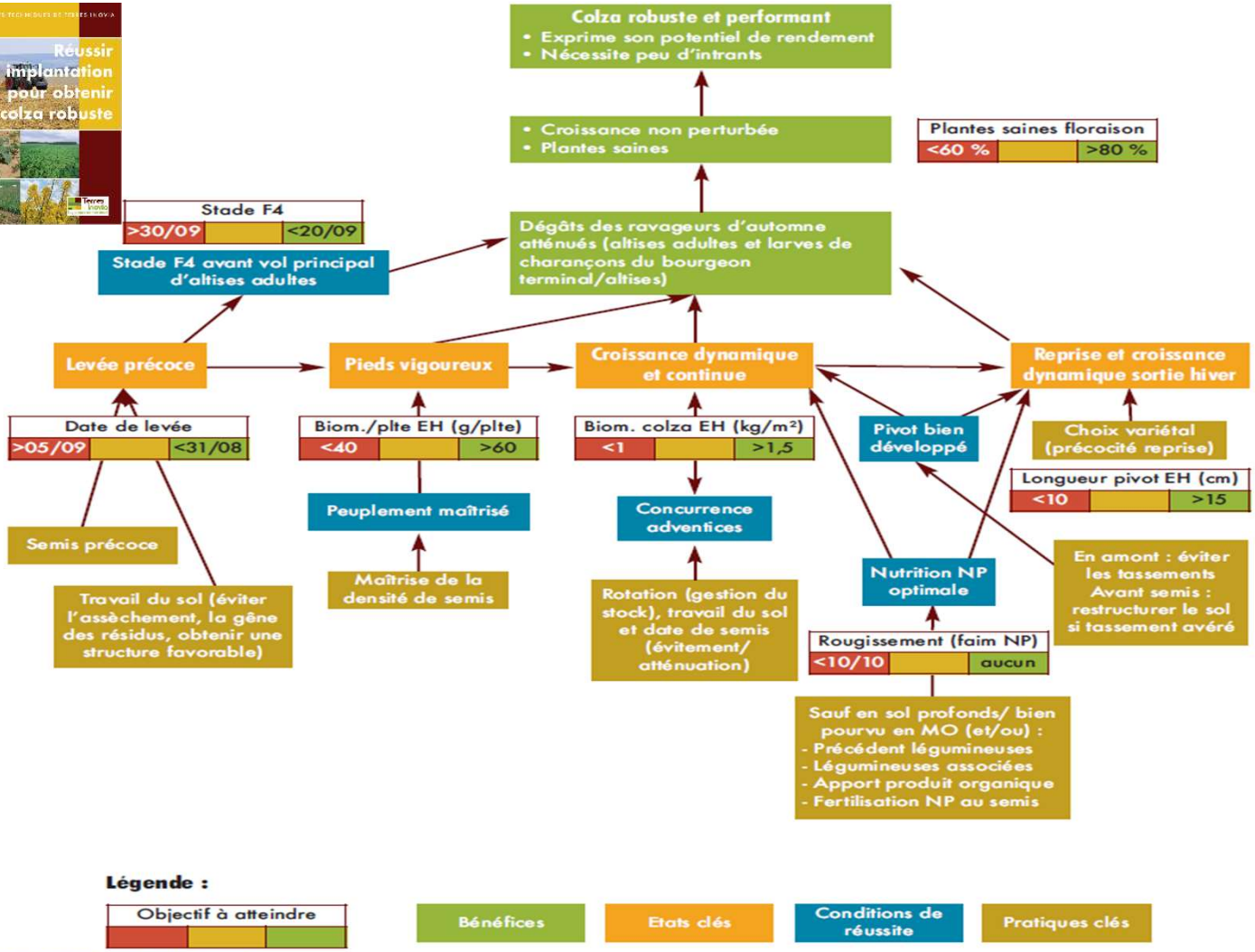


Proof of concept

Established results → massive dissemination

Robert et al., S3-5

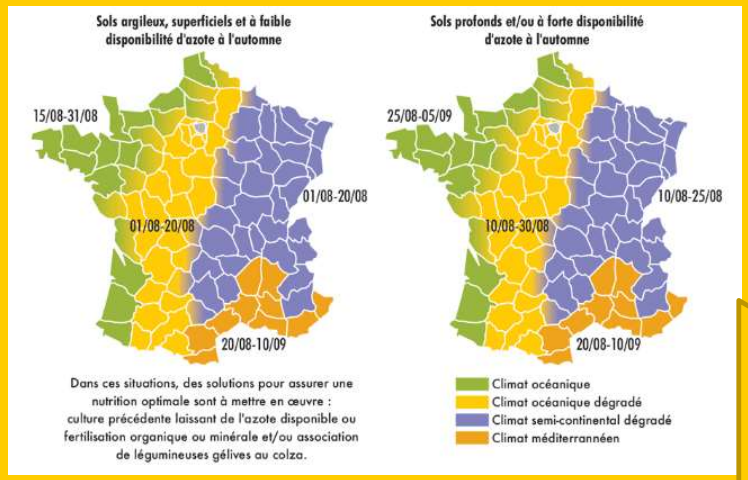
Rapeseed KPIs for bottom-up control



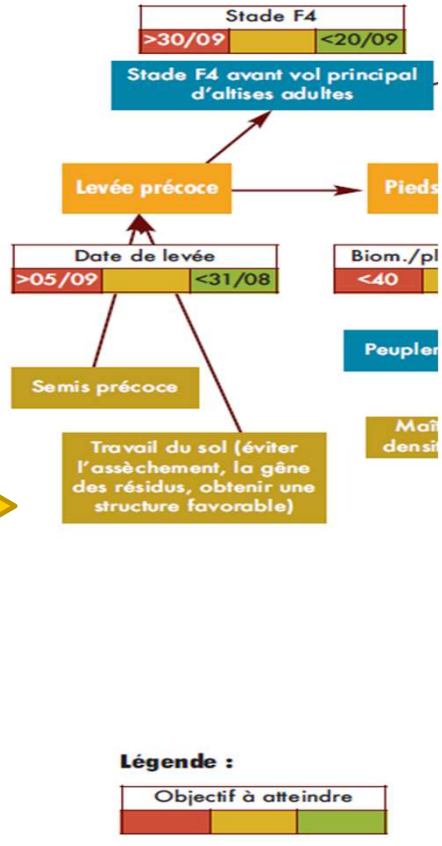
- Established through ~10 years of on farm experiments and specific trials

Rapeseed KPIs for bottom-up control : crop establishment

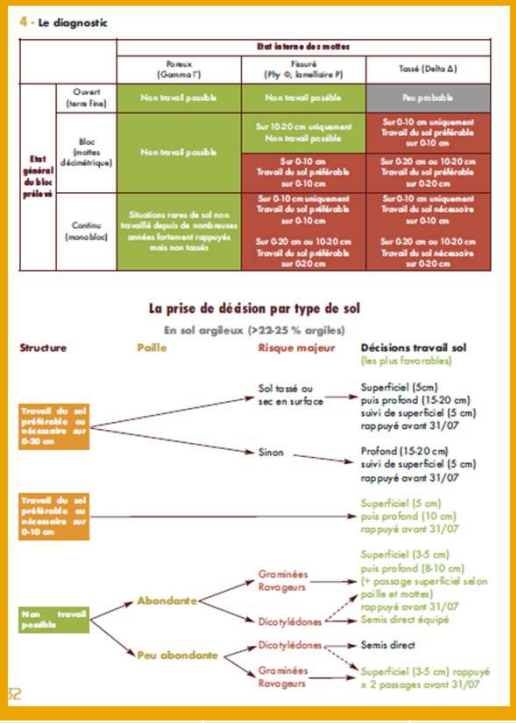
New sowing date advice



Date of X% sowing (national)	2008	2020
80%	5 sept	27 août
20%	25 août	13 août



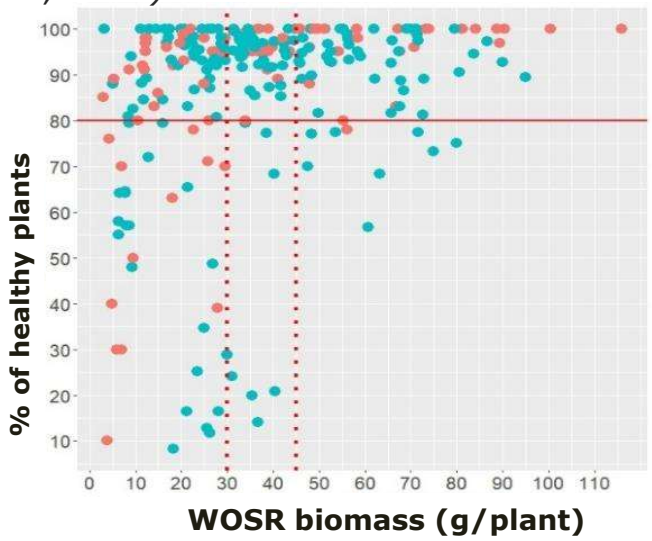
Decision scheme to improve soil structure

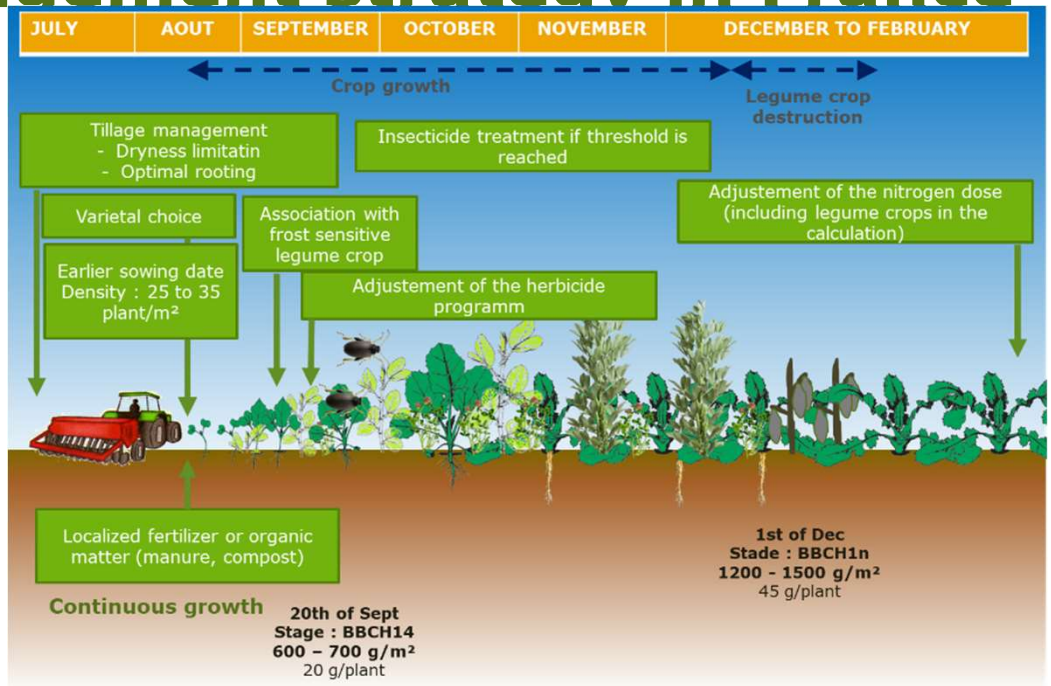


% plowing (national)	2008	2018
	54%	21%

Rapeseed KPIs : agronomic levers and observations, at the heart of the pest management strategy in France

(Robert et al., 2019)





COLZA RISQUES *larve de grosse altise*

COLZA RISQUES *charançon du bourgeon terminal*

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- To reduce pest harmfulness, plant must have **an important biomass** in November/December, **grow in a continuous way** in the autumn and **start growing again** early at the end of winter.
- Agronomical levers are chosen to reach this goal

Rapeseed KPIs : agronomic levers and observations, at the heart of the pest management strategy in France

- To be fully operationnal, agronomic levers need to be integrated into tactical decision making (Robert et al S3-5)
- Foundation of observations = plant health bulletin « bulletin de santé du végétal »

→Weekly communication to growers on pest & crop status

→Encouragement to carry out observations

- Data base for evaluating new decision rules : 375 plots from 2018

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Perspectives : stringent regulation → need to go even further, faster

- Phosmet ban → ~400 kha at risk
- Short term :
  - Integrate atleast one new insecticidal mode of action to preserve efficacy
  - Mobilize farmers & advisors to implement all possible agronomic options
  - Push natural regulation proof of concept
- Massive investment in R&D needed, including fundamental knowledge of biological cycles

→ 2.5 M€ plan announced by French Minister to increase on-going actions from the industry (~2 M€/year)

Thanks…

- For your attention
- Multiple, numerous colleagues within Terres Inovia and beyond !

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