

Tillage strategies to optimize rapeseed establishment: a method to support decision making

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Context

- Rapeseed in France = 2nd arable crop for :
 - ✓ Cultivated area \approx 1,5 Mha
 - ✓ TFI = 5.6 on average (AGRESTE 2014)
- Ability of rapeseed to withstand the presence of pests provided a successful establishment (see Robert *et al.*, this conference: pest control, Monday 15h30-17h15)
- Key role of tillage but antagonistic effects:
 - ☺ Improves soil structure, controls soil pests and residues
 - ☹ Dries the soil, increases sensitivity to slaking, stimulates weed germination

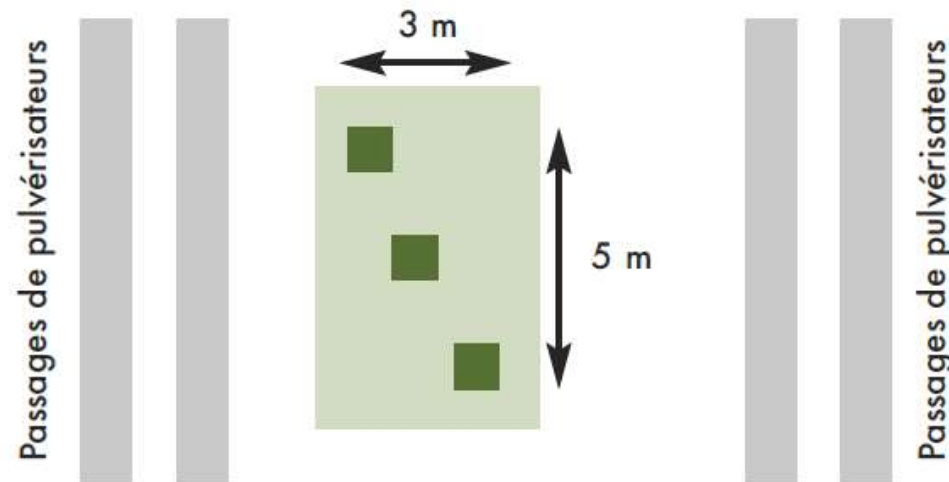


Aim and approach

- Aim: to develop a method to support farmers in choosing adapted tillage practices
- Based on:
 - ✓ A **soil structure diagnosis** using a spade method derived from ISARA-Lyon (2016), updated for soil structure description (Boizard *et al.* 2017) and simplified for a quick use by farmers
 - ✓ Completed by expertise to integrate and prioritize the other criteria to be considered in tillage decision-making and propose a **decision tree**
 - ✓ Approach tested and improved over 4 years with a group of 15 farmers in the Berry region, Central France

Soil sampling

- When: in **spring in the preceding crop**
- How: **3 samples** per homogeneous area



Soil sampling

- Removal of the soil block (20*20*25cm):






Soil structure diagnosis




- Two steps:
 - 1- Morphological description of the soil block
 - 2- Description of the dominant type of porosity of clods defined after breaking morphological units



1-Morphological description

Behaviour of the block	Corresponding state	Visual example
Fine aggregates that do not hold on the spade	Open (O)	
Separation into decimetric clods	Block (B)	
Massive soil block	Continuous (C)	

2-Type of porosity of clods

Clods description	Corresponding state	Visual example
high structural porosity with visible aggregates and rough surface	Gamma (Γ)	
no visible macropores (resulting from delta structure) with cracks and sharp edges	Phy (Φ)	
no visible macropores and smooth surface	Delta (Δ)	

Tillage advice regarding soil structure

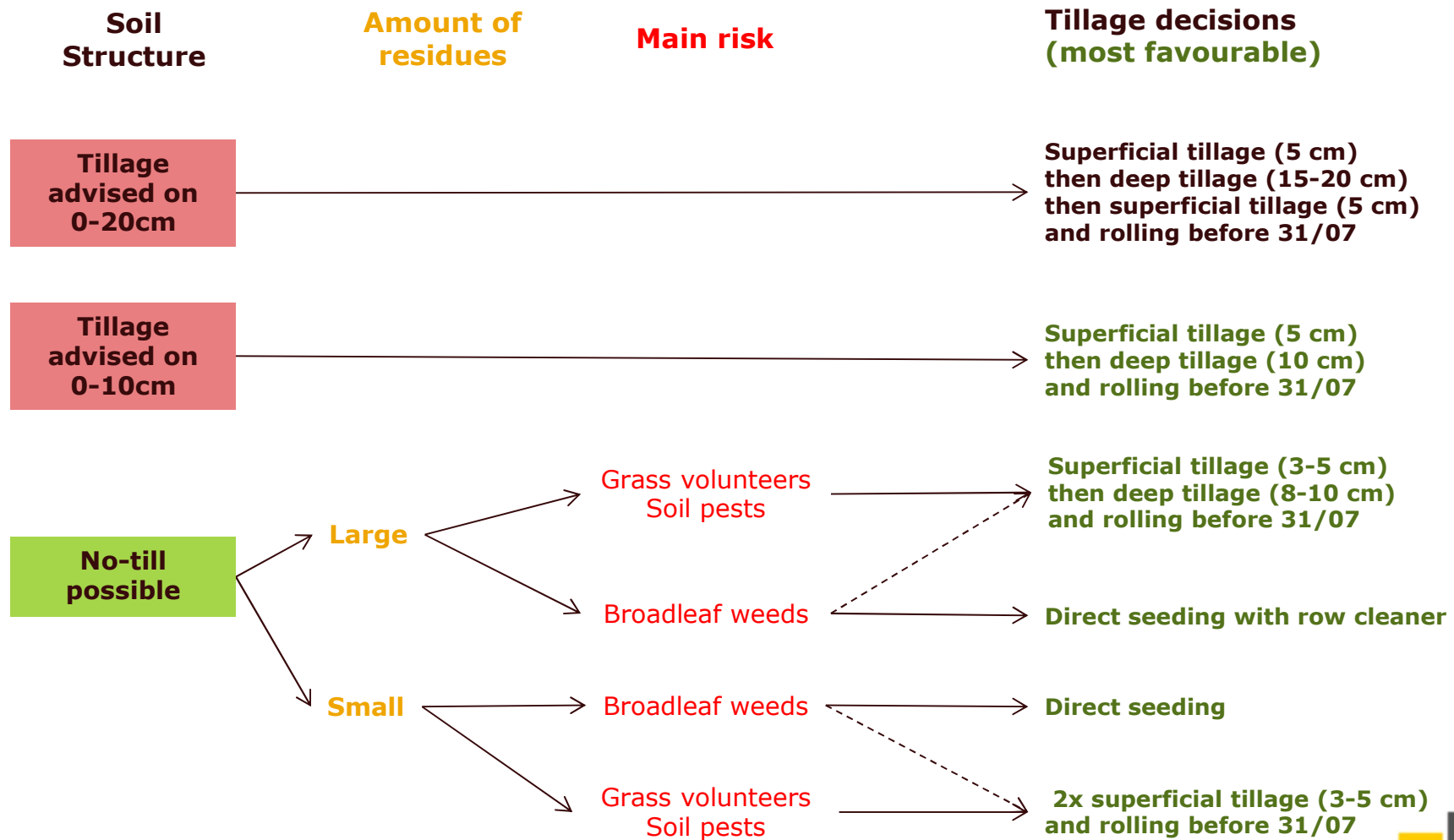
		Type of porosity of clods		
		Γ	Φ	Δ
State of the soil block	O	No-till possible	No-till possible	unlikely to occur
	B	No-till possible	-On 10-20cm only => No-till possible	- On 0-10cm only => Tillage advised on 0-10cm -On 10-20cm => Tillage advised on 0-20cm
			- On 0-10cm => Tillage advised on 0-10cm	
	C	No-till possible	- On 0-10cm only => Tillage advised on 0-10cm -On 10-20cm => Tillage advised on 0-20cm	

Building decision trees

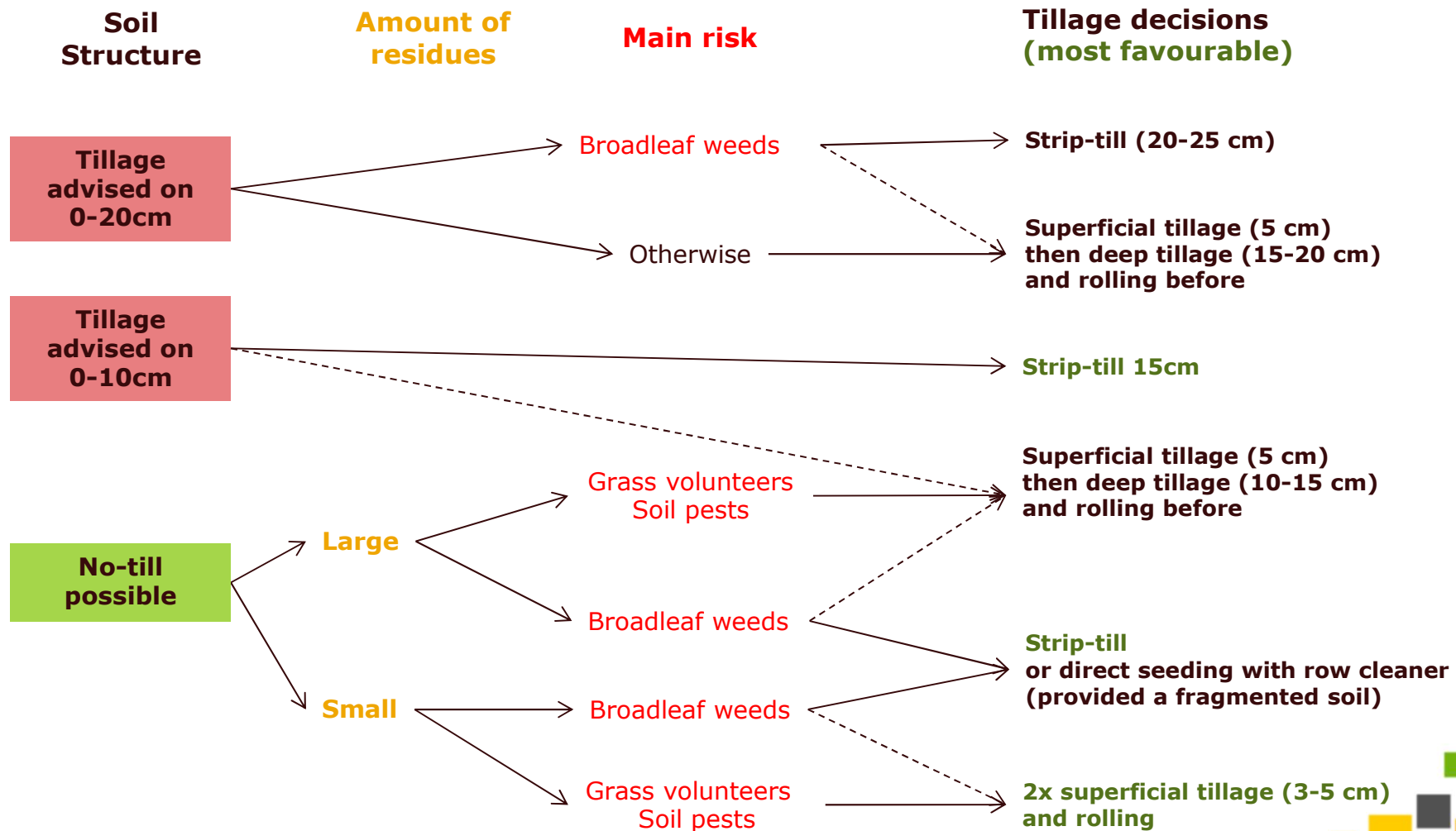
- 2 other criteria than soil structure considered
 - ✓ Amount of **residues** from the preceding crop:
 - small
 - or large
 - ✓ **Main weed/pest risk** to be managed by tillage:
 - broadleaf weeds
 - or grass volunteers / slugs / small rodents
- 2 trees for 2 soil types with distinct problems
 - ✓ Clayey soils (risk of clods being created)
 - ✓ Other soils



Decision tree (clay > 22-25%)

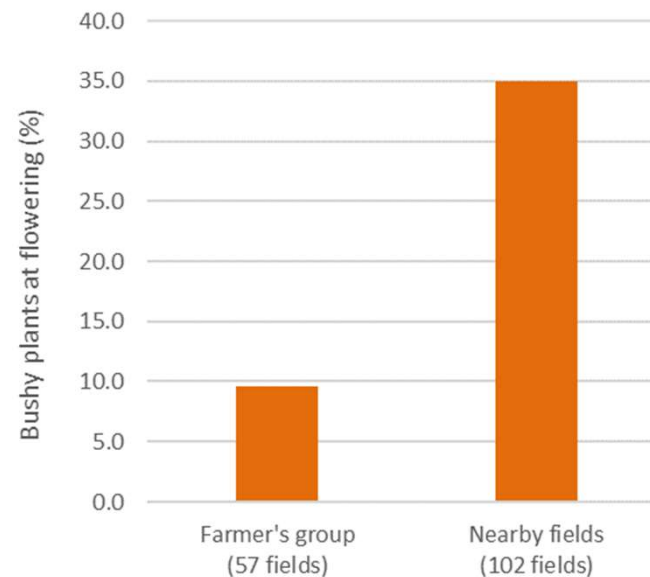


Decision tree (clay < 22-25%)



Results of implementation

- Implemented since 2016 with a group of farmers
- In 2018 comparison of results with nearby fields:
=> Better establishment and less damage caused by autumn insects in the fields of the farmer's group

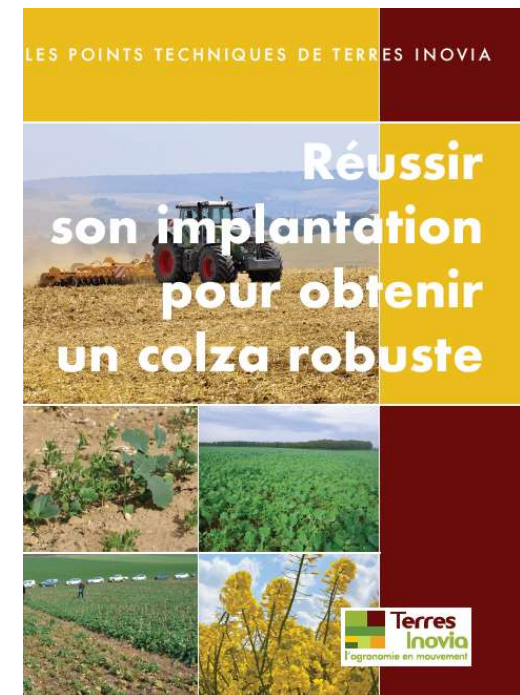


Conclusion

- An expert method co-designed with farmers and bringing them positive results
- Formalized in a technical guide for French farmers and advisors on how to successfully establish rapeseed to make it robust (www.terresinovia.fr)

References:

- ISARA Lyon, 2016. Test Bêche, guide d'utilisation
- Boizard *et al.* 2017. *Soil Tillage Res.* 173, 92-103
- Robert *et al.* 2019. This conference (311).



Thank you for your attention!

