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Implementing applied research and development approaches for crop diversification in French arable farming: a strategic view from the French oil and protein farmers' applied research institute Terres Inovia

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European Conference on Crop Diversification, Budapest

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What is Terres Inovia & why do we care about crop diversification ?

- « Institut technique agricole » :
  - late 1950s, French field crop farmers create their own R&D capability to drive & adapt both public & private research towards their needs
  - Funded on commodity based levy : x €/T → numerous institutes, each with specific crops in its mandate
- Terres Inovia :
  - 2015 merger between CETIOM (oilseeds) and UNIP (protein rich crops)

  →Merger = a crop diversification for everyone in the institute, board included

  →Terres Inovia holds the mandate for the majority of crops that diversify French arable cropping

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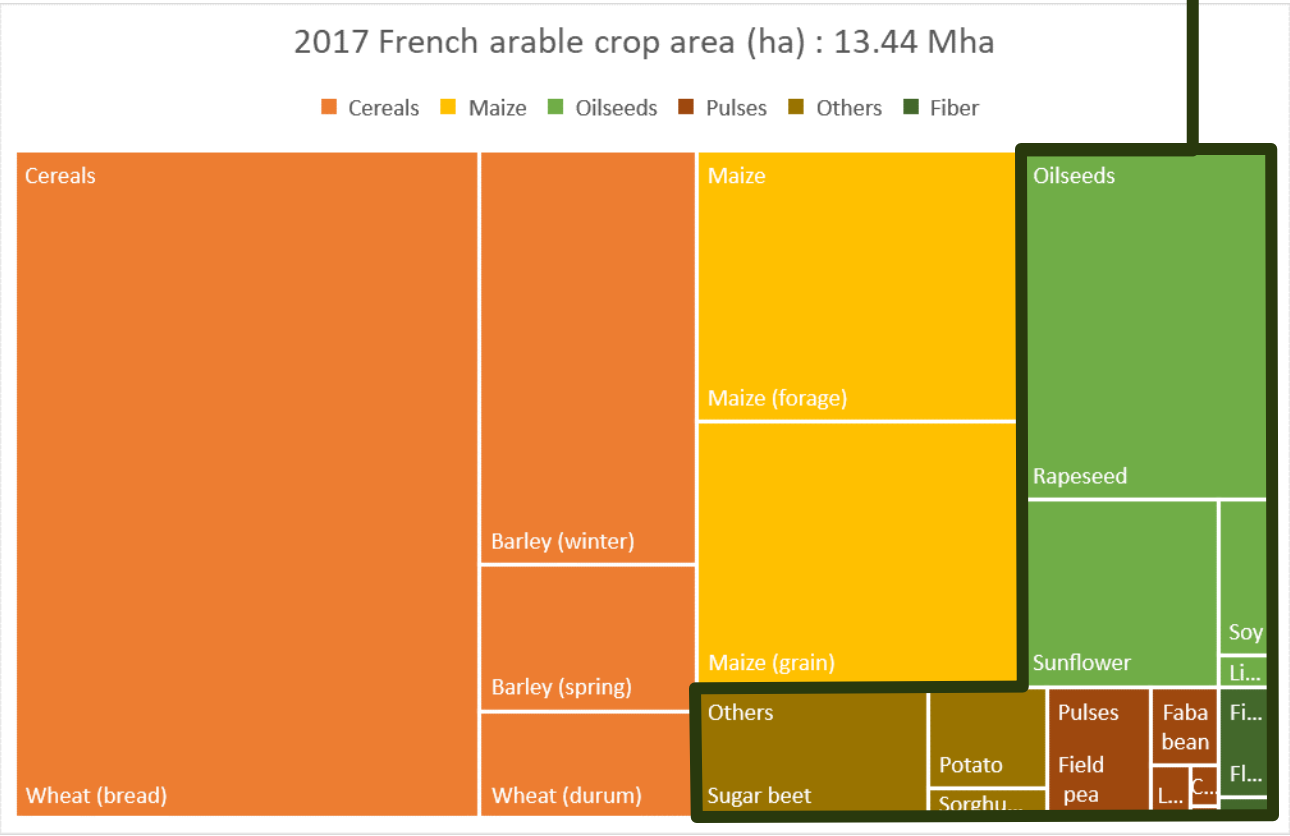
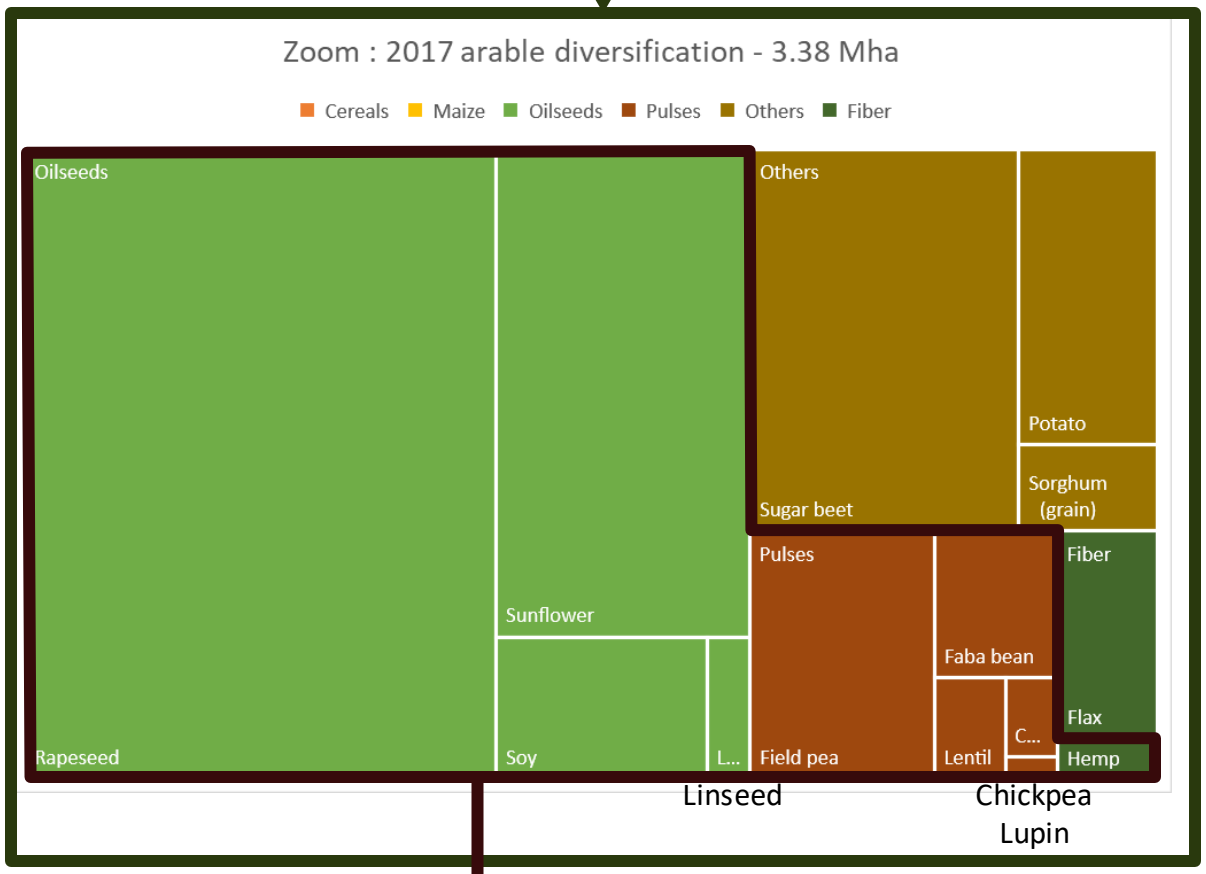
What is Terres Inovia & why do we care about crop diversification ?





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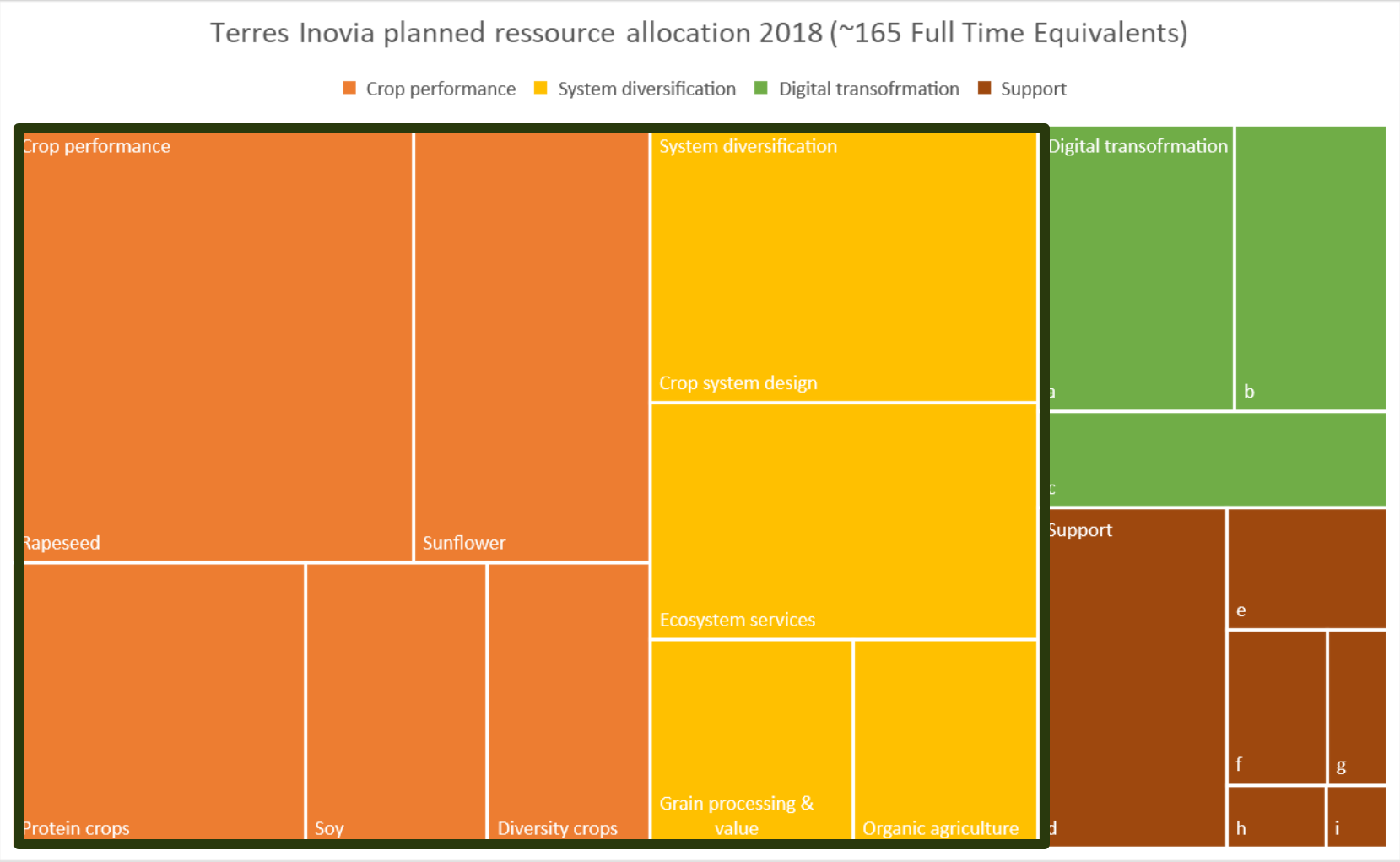
What will I talk about ?

- Results :
  - Wide view : what does Terres Inovia's project portfolio look like after 4 years of diversification ?
  - Specific examples : to illustrate
    - Projects that contribute to improving diversification as a systemic process
    - Projects that tackle the specific barriers of a given diversification crop
- Methodology : how did we manage our transition ?
- Discussion : remaining challenges and next steps



55% R&D on crop performance / 45% R&D on diversification at the system scale → because smaller crops suffer from a lack of R&D, generating technical barriers to diversification

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Sustaining diversification crops' individual performance

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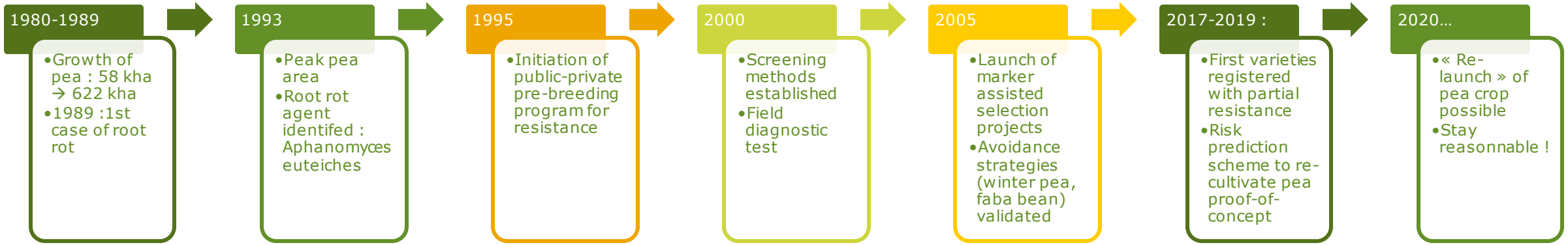
Advancing grain legume breeding : >20 years investment to (re)start a crop

- Pea root rot (Aphanomyces) : **30 years**



- Soy : 100-200 k€/year to sustain pre-breeding by private sector → + 0.3 t/ha, +1.5% protein in **20 years** → paved the way to increase area from 20 kha to 150 kha in the last decade

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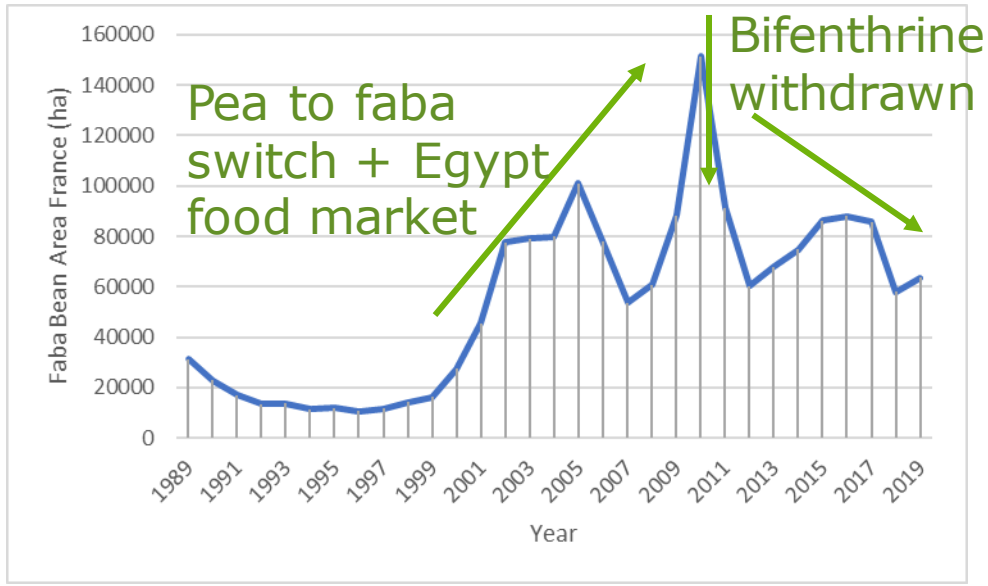
How to « kill » a diversification crop in a few minutes, and what it costs to try to save it

- Faba bean weevil



  - High value export food market lost
  - Legume option lost
  - 50-200 k€/year R&D →nowhere closer to a solution

- Linseed & weed control
  - Linseed : exemplary value-chain aimed at diversifying animal feed for ω3 enriched animal products → economic surplus for growers
  - Spéléo (metsulfuron-methyl + flupyrsulfuron-methyl), = anti-dicot for 90% of crops : withdrawn 2018 ; no derogation for alternative given
  - Could induce loss of 30% of winter linseed area
  - 5 page guide as « damage control »

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Accompanying & capitalising the diversification process

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Diversification as a process – the SYPPRE project (see Cadoux et al. ; Tauvel et. al, this conference)

- 5 sites with :
  - Experimental platform to co-design & test innovative cropping system
  - Farmer network to challenge & adapt innovations
- Objectives : Experimental platforms mirror policy objectives
  - Increase profitability
  - Reduce GHG emissions
  - Reduce pesticides
- Consequence of system design → diversification

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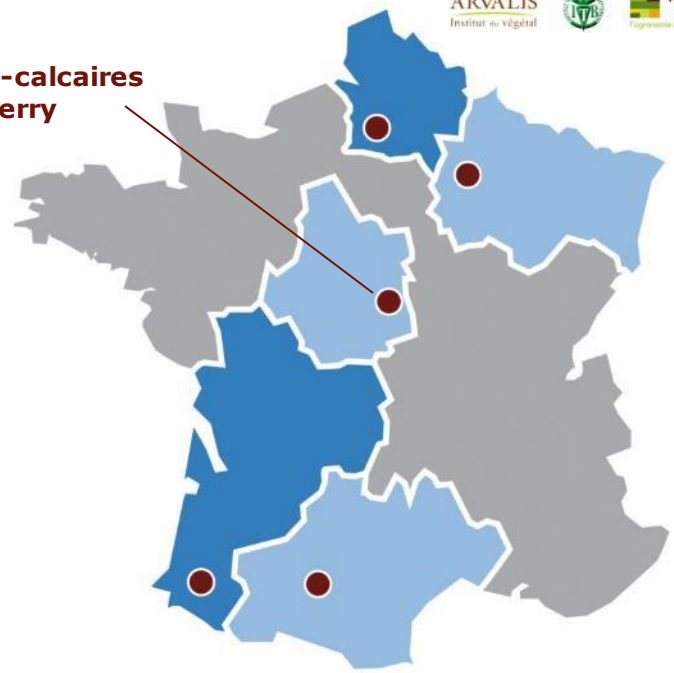
Number of crops	Reference system	Innovative system
Picardie	5	8
Champagne	4	7-8
Berry	3	9
Lauragais	2	8
Béarn	1	1-5

Diversification as a process – the SYPPRE project (see Cadoux et al., this conference)

- Farmer network - Grower objectives : Berry region
  - Reverse declining yield trends
  - Regain soil fertility
  - Manage rapeseed insect populations
- Result → diversification
  - Legume as a cash crop : lentil
  - Legume as a companion crop w/ rapeseed
  - Cover crops
- 2016-17 results



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% Difference (Innovative / Reference	Platform	Grower network
Product (€/ha)	+1%	+8%
Direct margin w/ aids (€/ha)	+23%	+76%
Treatment frequency index	-49%	-34%
Applied mineal N (kg/ha)	-35%	-26%

Diversification as a process – the SYPPRE project (see Cadoux et al., this conference)

- SYPPRE = local co-design with growers → local success because we adress their specific issues
- Can it / does it scale up ? → YES !
- Companion cropping legumes w/ rapeseed : widespread dissemination of methodology → national survey results
  - 7 → 12 % overall rapeseed area between 2014 & 2018
  - Companion croppers save 0.8 insecticide treatment & 10 kg N/ha
- Rapeseed establishment = key to robust, low input crop
  - New method just released
  - Allows strategic tillage
  - Objective : aid reduced tillage to improve establishment (especially w/ drought)
- New networks, projects & ambitions

Co-design of farming systems weakly dependent on insecticides at a territory scale


1000 ha area in Burgundy region

Context: difficulties in growing rapeseed

- Project area: heart of the French zone affected by cabbage stem flee beetle and rape winter stem weevil resistance to pyrethroids
- Shallow clay-limestone soils with low potential
- Short rotations: winter oilseed rape, wheat, barley
- Oilseed rape surface reduced by 48% between 2000 and 2019 (Agreste)

R2D2: an innovative project to support farmers in managing pests without insecticides

- 7 farmers in a 1000 hectares' territory
- A 6 year project involving 8 local partners
- Data collection: pest pressure, natural enemies, natural regulation efficacy, crop damages and yield

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Diversification as a process – from growers to value chains

- Agronomists + farmers know how to innovate & redesign their systems
- Success/failure factor is availability-economics of downstream value chain for new crops
- How to push/facilitate this ?

https://www.fileg.org/

@FILEG_Occitanie

FILEG-PHASE 1

STRUCTURATION D'UNE FILIÈRE TERRITORIALE EN OCCITANIE, DE PRODUCTION ET DE VALORISATION DE LÉGUMINEUSES À GRAINES

LEGVALUE

(see Smadja et al. & Schenider et al., this conference)

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Discussion & conclusion

Discussion – how do we scale up our efforts ?

- Plant breeding : support grain legumes
  - Double private sector investement : incentivize certified seed & reduce farm-saved seed
    - Legume biology is not helpful : low multiplication rate, self-pollinating → expensive cetified seed vs. cheap farm-saved
    - Public policy incentive to growers would increase breeder investment and contribute to a « positive » lock-in
  - Support to pre-breeding/breeding : 0.5 M€/year →2 M€/year necessary in France
- Crop specific R&D requires transfer from big crops to small :
  - Terres Inovia : 1 € legume levy generates 3.2 € oilseed levy dedicated to legumes
    - only 0.8 € from French government
    - 0 € from cereals & maize
  - Need for some form of solidarity mecanism

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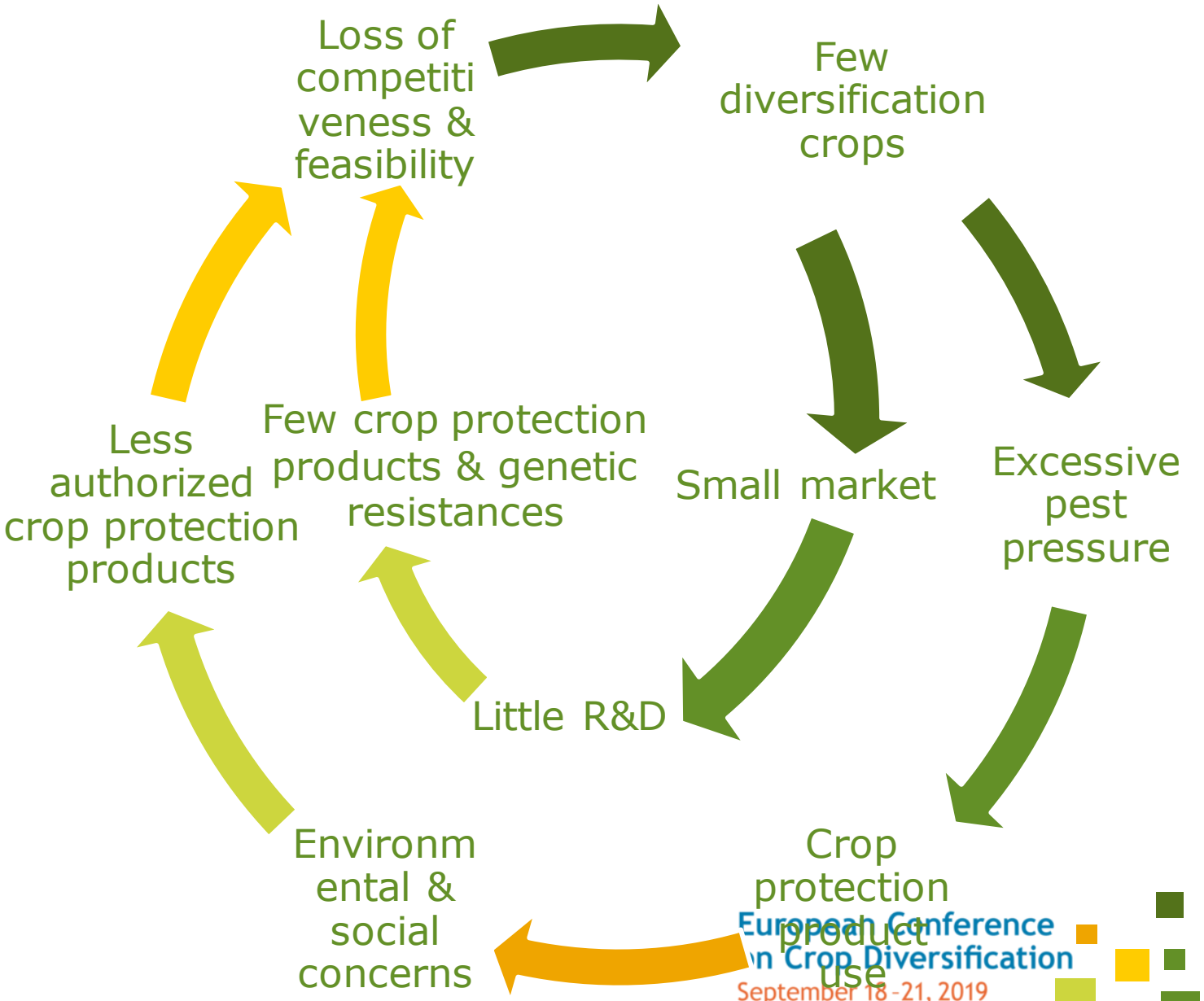
Discussion – how do we scale up our efforts ?

- Regulatory policy : adopt a systemic view in terms of crop protection product risk assessments
- Break the current vicious circle
- Current approach increases exposure to remaining crop protection products by hindering crop diversification
- Diversification crops highly susceptible to the « critical transition phase » exposed by Pablo Tittonell earlier



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Discussion – how do we scale up our efforts ?

- Accompanying diversification working with farmers :
  - as a means to
    - Find solutions to technical difficulties in their system
    - Increase revenue
  - can & has been done succesfully
  - still requires a massive training effort of advisors
    - Agronomic methods & tools
    - Change management, soft skills
- Accompanying diversification at the value chain :
  - Brilliant examples exist in many companies & cooperatives : strong dependance on visionary strategies and individuals
  - Challenge = synchronize vision & readiness to change at all levels of the value chain
  - Huge intermediation costs (time = money)

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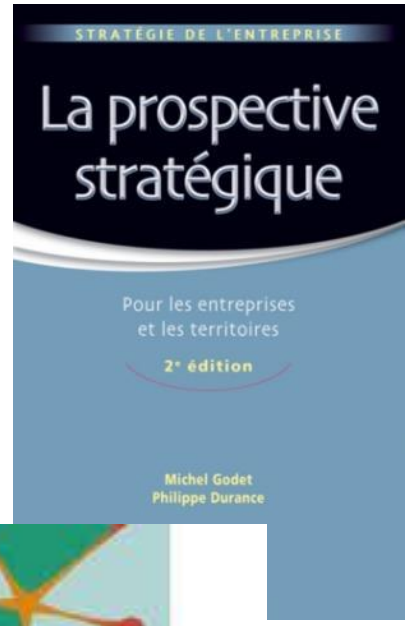
Final thoughts – change management

- How did we manage our own diversification process @ Terres Inovia ?
- Strategic analysis
  - Takes time : 18 months !
  - Involve widely ~ 90 % collaborators
- Common vision
- Re-think organizatinnal schemes



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Thanks… for your attention, & to :

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Our many project partners, too many to cite

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