



@DGouache_AgRnD
@terresinovia

Developing protein crop production in Europe – why & how ?

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Terres Inovia – applied research & technology transfer of the French oilseeds & grain legumes sector

- Board majority = representatives of growers & industry of the oilseeds & grain legumes sector :
- 16 M€/year budget : 60-65% levy on each ton produced
 - +5 M€/year 2021 & 2022 : French National Plant Protein Strategy
- Collective R&D and transfer spanning from inputs to production to 1st transformation of grains
- Terres Inovia = 2015 merger between CETIOM (oilseeds) and UNIP (protein rich crops)



Strategic alignment industry sector & public policy



Oil & proteins
prospective
EU project



Sector
boards &
commissions



Plant Protein
working
groups



10 year national strategy

La stratégie nationale
protéines végétales

2 year R&I / AKIS program / post-Covid

À court terme, dans le cadre de l'ensemble des actions du plan de relance, les filières s'engagent à mobiliser tous les leviers possibles (appui technique, mobilisation des opérateurs dans les territoires, aide à la contractualisation...) pour les 3 prochaines années :

- ▶ la hausse des surfaces cultivées avec des espèces légumineuses, à hauteur de 40% (le doublement des surfaces étant envisagé sur 10 ans);
- ▶ la préservation des surfaces oléagineuses (tournesol et colza) à hauteur de 2 Mha pour leur contribution essentielle à l'indépendance protéinique face aux imports de soja.



Plant proteins – what are the issues

Type of feeding stuff 2021/2022 forecast	Mt crude protein	EU source
Low - Pro < 15% protein content	48,91	97%
Medium – Pro 15% to 30% protein content	3,99	87%
High – Pro 30% to 50% protein content	19,64	28%
Super- Pro > 50% protein content	1,93	85%

- Feedstuffs dependence : medium/high protein contents
 - Including non-GMO Soy despite the fact that anti-GMO policy = EU specificity !
- Extends to grain legumes for human consumption like lentils & chickpea (~50% import in France)

- Historically, only major success to counterbalance this = oilseed meals via rapeseed & sunflower
- Why should we worry about difficulties/failure so far regarding legumes (including soybean) & what needs to be done ?
- What can we learn from what worked ?



The European grain legume deficit in numbers

How did this happen ?

- Policy : Blair Housse accords – Uruguay Round
- Technology trajectories : massive investments (R&D, logistics, etc.) for grain legumes in Americas vs for wheat & barley in EU

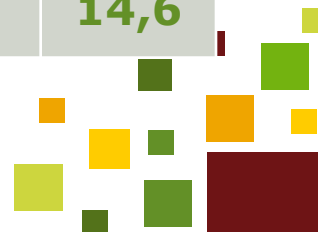
What is the “right amount” of grain legumes ?

- 10-15% = agronomic balance in both modern and “non-Ricardian” agricultures

World area cropped with major grain legumes (kha)

Species	North America	South & Central America	Europe	Africa	Asia	Oceania	Total
Pea	1634	152	1723	812	1875	181	6377
Field beans	616	5957	260	5695	14237	62	26827
Soybean	32523	52106	3176	1797	20629	41	111272
Lentils	1095	20	84	178	2820	146	4343
Chickpea	158	161	74	483	12079	574	13529
Broad bean	0	163	238	570	964	112	2047
Lupine	0	34	153	14	0	450	651
Peanuts	421	686	11	12405	11871	14	25408
Cowpea	16	16	7	11075	160	0	11274
TOTAL GRAIN LEGUMES	36463	60295	5726	33029	64635	1580	201728
TOTAL ARABLE	341496		273660	239640	495429	32243	1382469
LEGUMES/ARABLE (%)	28,3		2,1	13,8	13,0	4,9	14,6

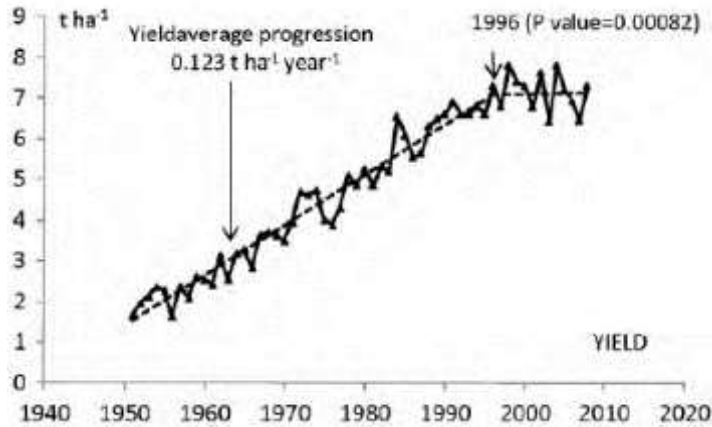
Sources : Roman et al. 2016 & FAOSTAT



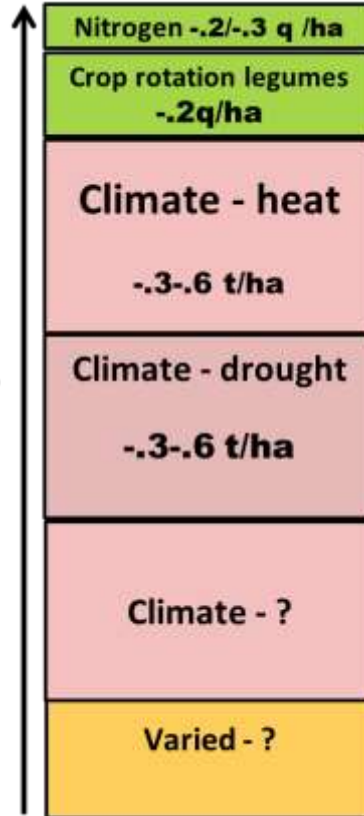
EU grain legume deficit – why should we care ?

Why are wheat yields stagnating in Europe? A comprehensive data analysis for France

Nadine Brisson^{a,*}, Philippe Gate^b, David Gouache^b, Gilles Charmet^c, François-Xavier Oury^c, Frédéric Huard^a

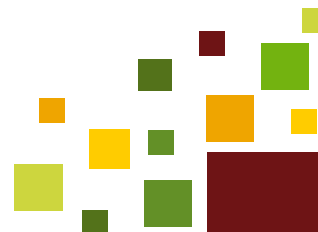


2 decades (1995-2015)
= 2 t/ha lost

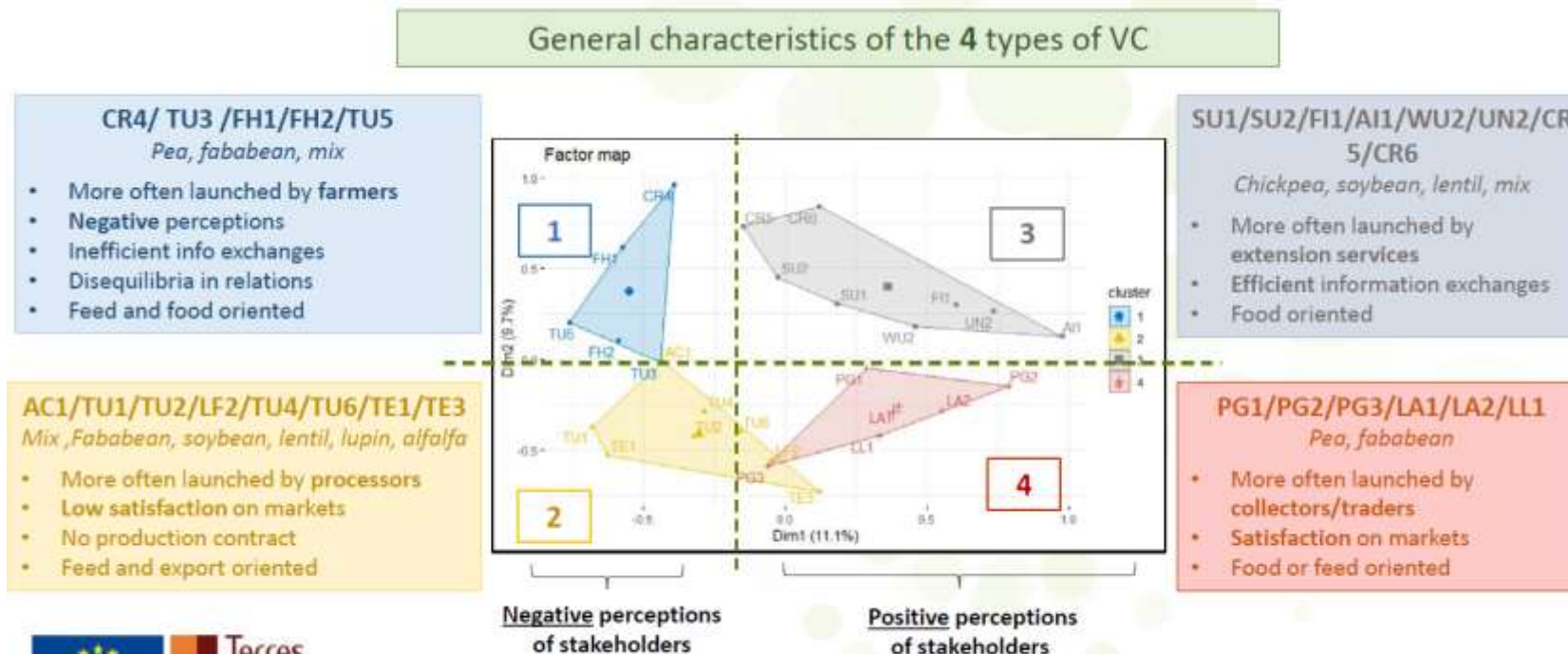


- ~ 20-25% of national cereal yield loss can be countered by increasing grain legumes in EU crop rotations
- Grain legumes = key to reduce climate change by limiting N₂O emissions from synthetic nitrogen fertilizer
 - 265 x more warming than CO₂
 - Can not be sequestered

Bringing EU back to the 10-15% benchmark for legume area = both short & long term fix for competitiveness & environmental impact of our major commodities (cereals)



Success factors from 27 EU legume value chains



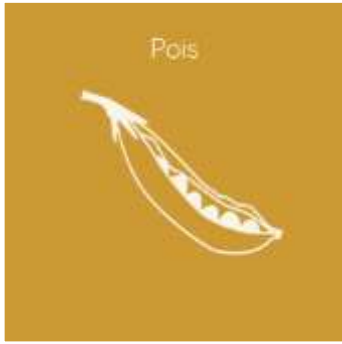
LegValue Second Annual Meeting, Soest, 3-5 of June 2019 Smadja 2019

<http://www.legvalue.eu/industry-studies/industry-studies-by-country/>

- Balance : shared project along the whole VC
- Trust : low information asymmetry
- Economically : contracts, value sharing
- Sociologically : shared learning, shared risks during innovation/scale phase

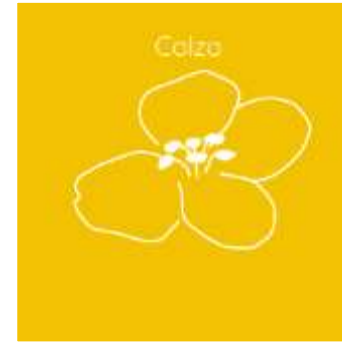


Rapeseed vs. field pea – what can we learn ?



Pea

- Steady decline 800 kha → 200kha
- Root diseases, instability of subsidy regime
- Low investment downstream : animal feed incorporation
- Low investment upstream : farm saved seed
- Value : major industry players @ world market price
- → Hope ?
 - Industry investment & value : human food ingredients (but beware Gartner hype cycle !)
 - Value sharing : contracts increasing !
 - Include farm saved seed in funding breeding



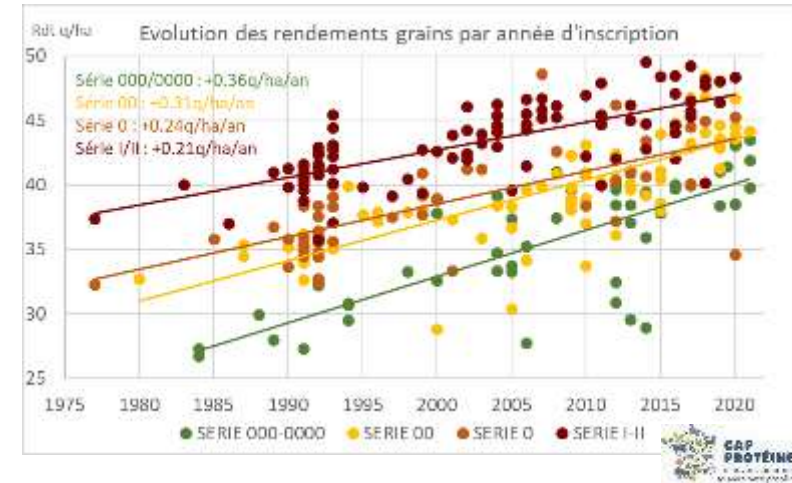
Rapeseed

- Massive decline 1.5 Mha → 0.95 Mha in 3 years followed by rapide rebound to 1.2 Mha
- Perfect storm of climate change (drought @ sowing) + pest pressure / pesticide bans
- High investment downstream industry (meals, biofuels, oils, green chemistry)
- High investment upstream industry (>20 years R&D to create hybrid seed)
- Value :
 - Multiple streams → resilient & high
 - Shared : leading industry pays price for French grains > world market
- → Resilience :
 - Innovation : virus & insect tolerant varieties, companion cropping, strategic tillage,...
 - Value : B100 biofuel, low emissions biofuels (Oleoze platform)



Case of soy : sharing the innovation burden

- 20 kha → 150 kha → hopefully 250 kha
- 100-200 k€/year financing private breeding by oilseed board for > 20 years :
 - +0.2-0.36 t/ha yield / 10 years
 - +0.5 protein content (%) / 10 years
- Specific “lower volume” seed crush model
 - Collaboration with Olexa (Mécanique Moderne)
 - 50% French soy crush equipped

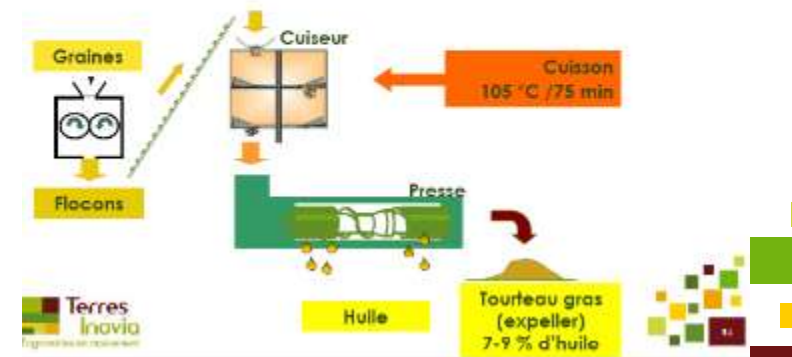


15 – 500 t/j (sans extraction à l'hexane)

Procédé = Cuisson-pression

Polyvalent : Colza, Tournesol, Soja

Exemples : EXTRUSEL, SOJALIM, Centre Ouest Céréales

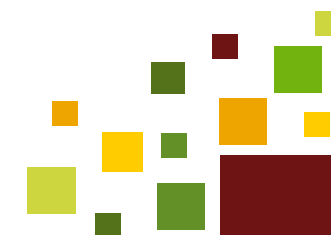
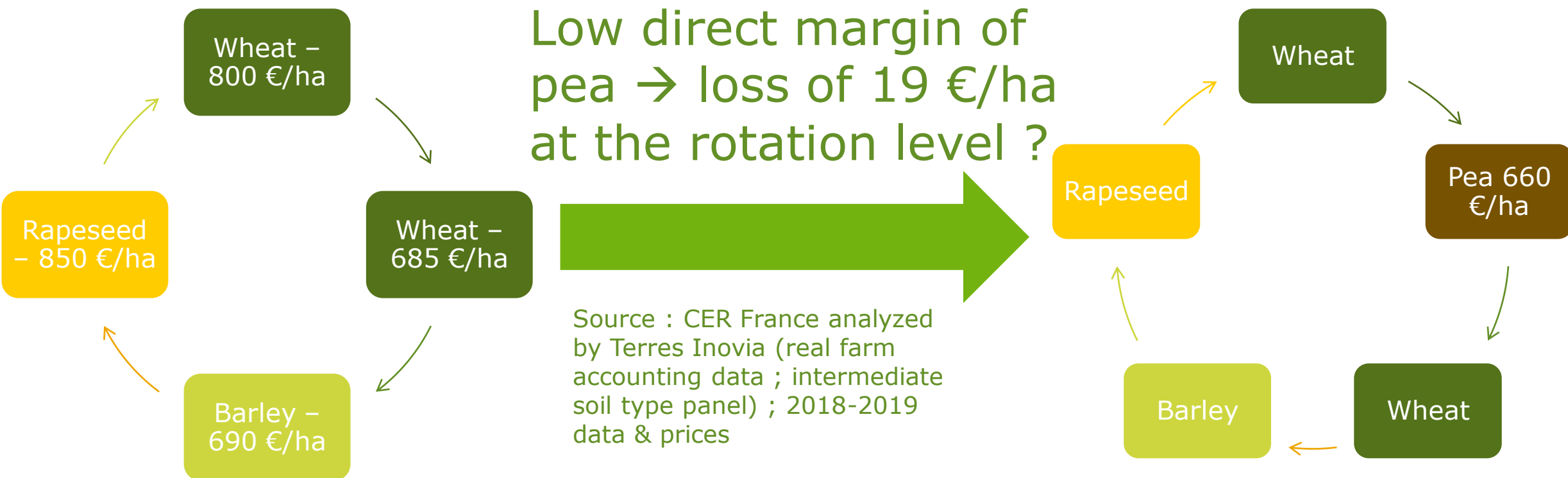


On-farm economics of grain legumes

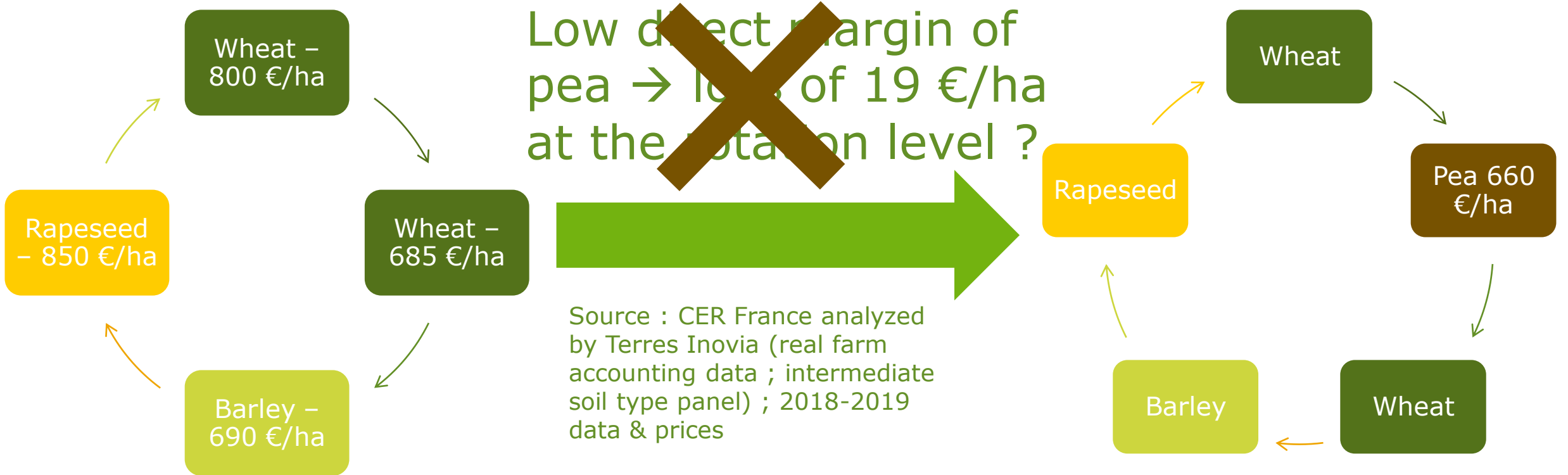
Low direct margin of pea → loss of 19 €/ha at the rotation level ?



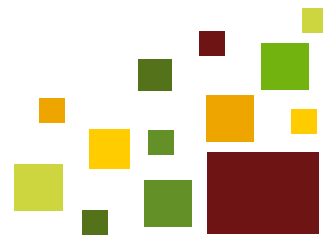
Source : CER France analyzed by Terres Inovia (real farm accounting data ; intermediate soil type panel) ; 2018-2019 data & prices



On-farm economics of grain legumes



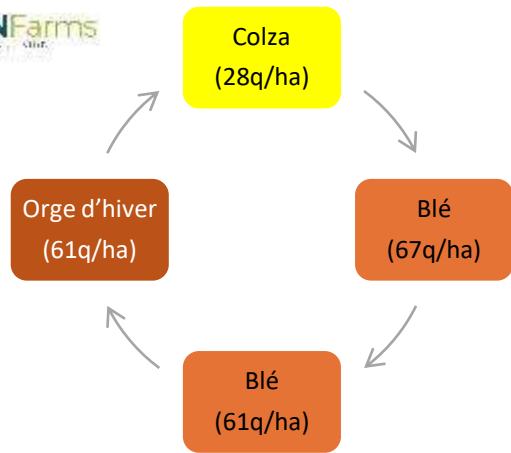
- + 0.75 t/ha following wheat & - 30 kg N/ha following wheat → +37 €/ha at the rotation level
- Reduced herbicides → + 28 €/ha at the rotation level



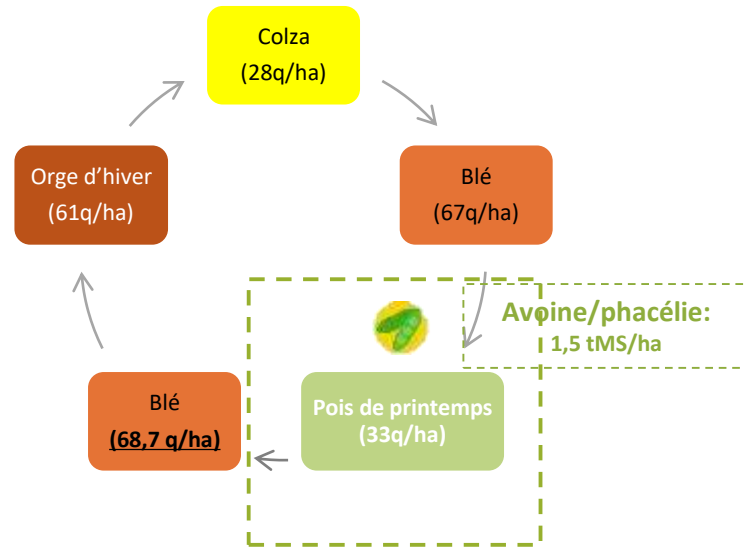
On-farm economics of grain legumes : pushing further



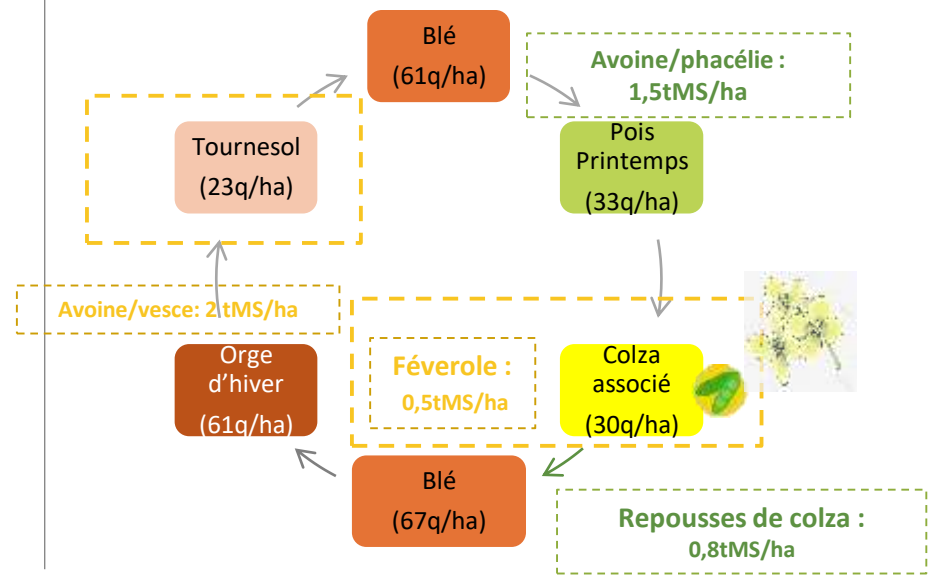
Current reference



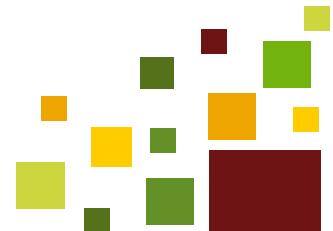
Inserting field pea



Field pea + cover crops + sunflower + companion crop rapeseed



- Rotation margin (16-20 price context) : +55-82 €/ha
- Rotation margin (21-23 price context) : +55-130 €/ha
- Carbon value (30 €/teqCO2) : + 20 €/ha
- Carbon value (100 €/teqCO2) : +67 €/ha

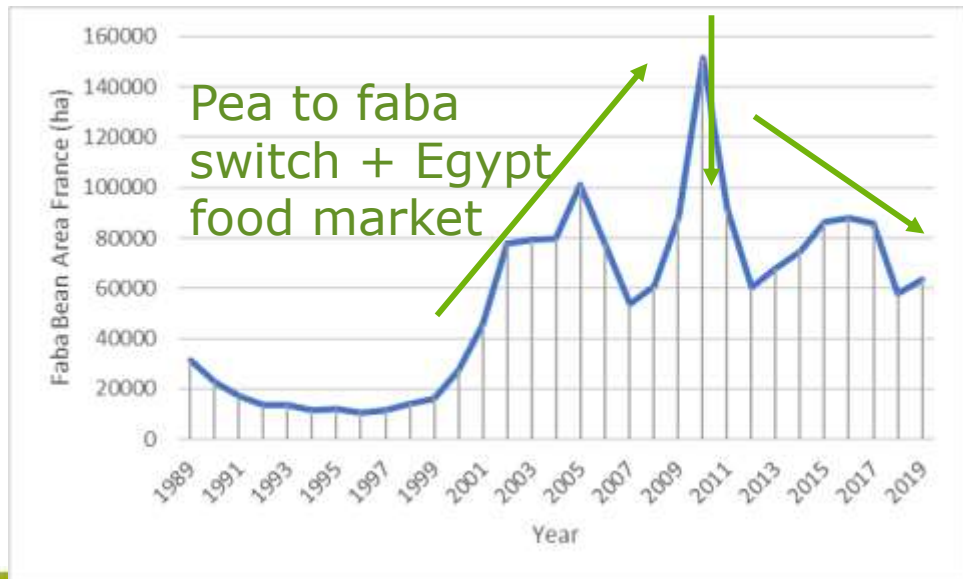


But beware : how to « kill » a diversification crop in a few minutes, and what it costs to try to save it

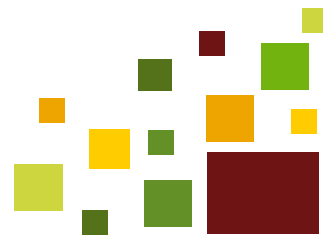


Bruchus rufimanus -

Bifenthrine
withdrawn

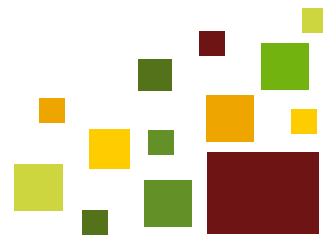
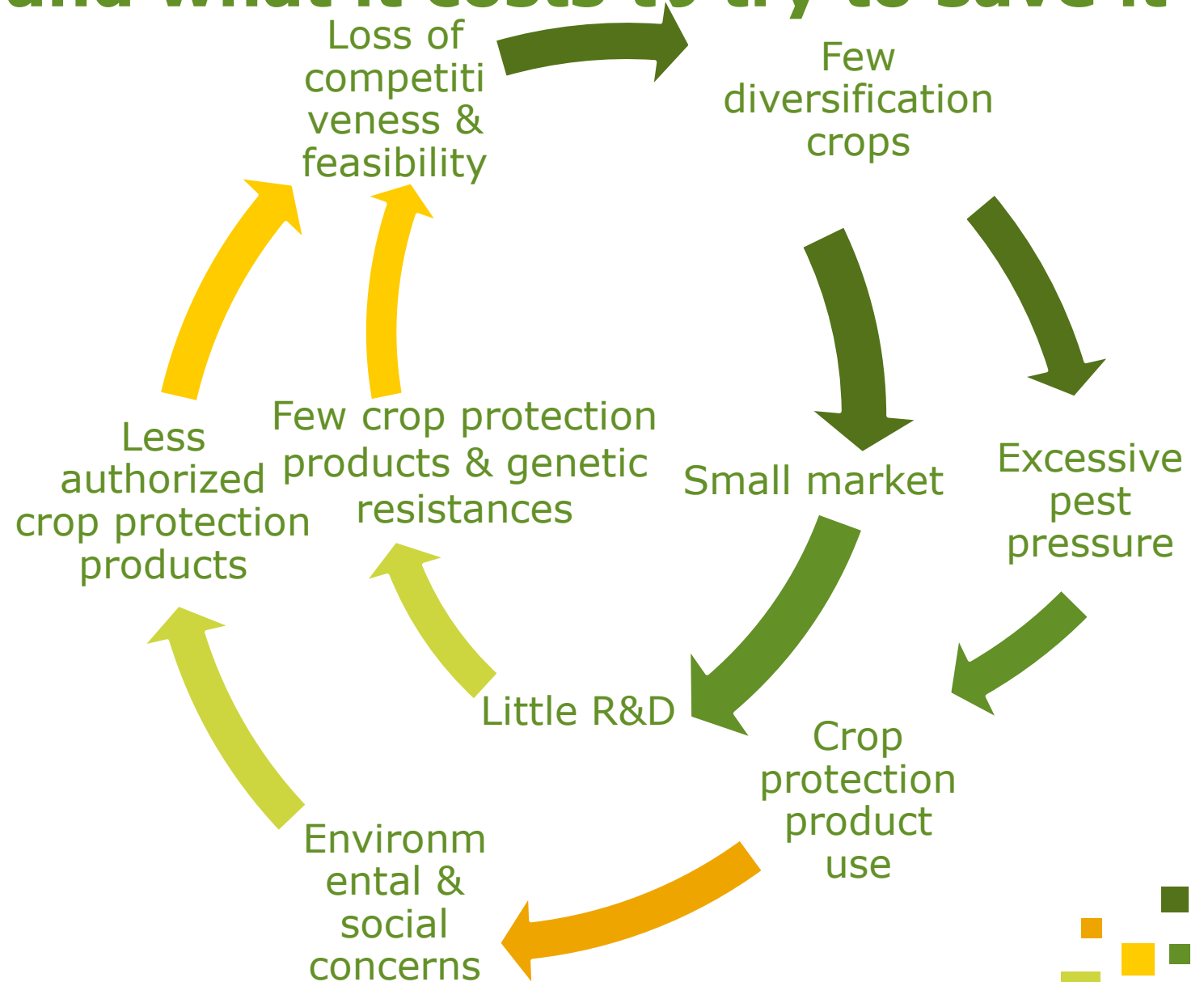


- Faba bean weevil : bores grain → improper for direct human consumption markets
- High value export food market lost
- Insecticide option lost
- 50-200 k€/year R&D → nowhere closer to a solution



But beware : how to « kill » a diversification crop in a few minutes, and what it costs to try to save it

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



Take home messages

- The issue is med-high protein crops
- Oilseeds : a good example of stabilizing an ag industry to meet strategic sovereignty & environment objectives → to be cherished and supported
- Grain legume cropping in EU needs to increase x7-8 to reach the sensible worldwide benchmark
- In France = changing only 5% of cereals + corn to grain legumes → not a revolution, just an evolution
- Small shift but big step to sustaining competitiveness of EU agriculture
- Small shift but big step for all players in agricultural industry : technical innovation, value chain innovation all require time and collective efforts
- Innovation for legumes needs to be protected & stimulated, not thwarted by regulations



Thanks... for your attention, & to :

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