

# Pre-cropping effects from grain legumes on wheat and oilseed rape : nitrogen fluxes and productivity

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## Objectives



1. Characterise grain legume pre-cropping effects

2. Explore the factors explaining their variability



Strategic criteria

for crop diversification with legumes & protein production

## Means

Jeuffroy et al.  
In: Schneider et Huyghe  
(60 experts, 470 pages)  
QUAE Ed 2015



Terres Inovia trials



PhD theses incl. Cernay 2018 & Guinet 2019

Meta-analysis

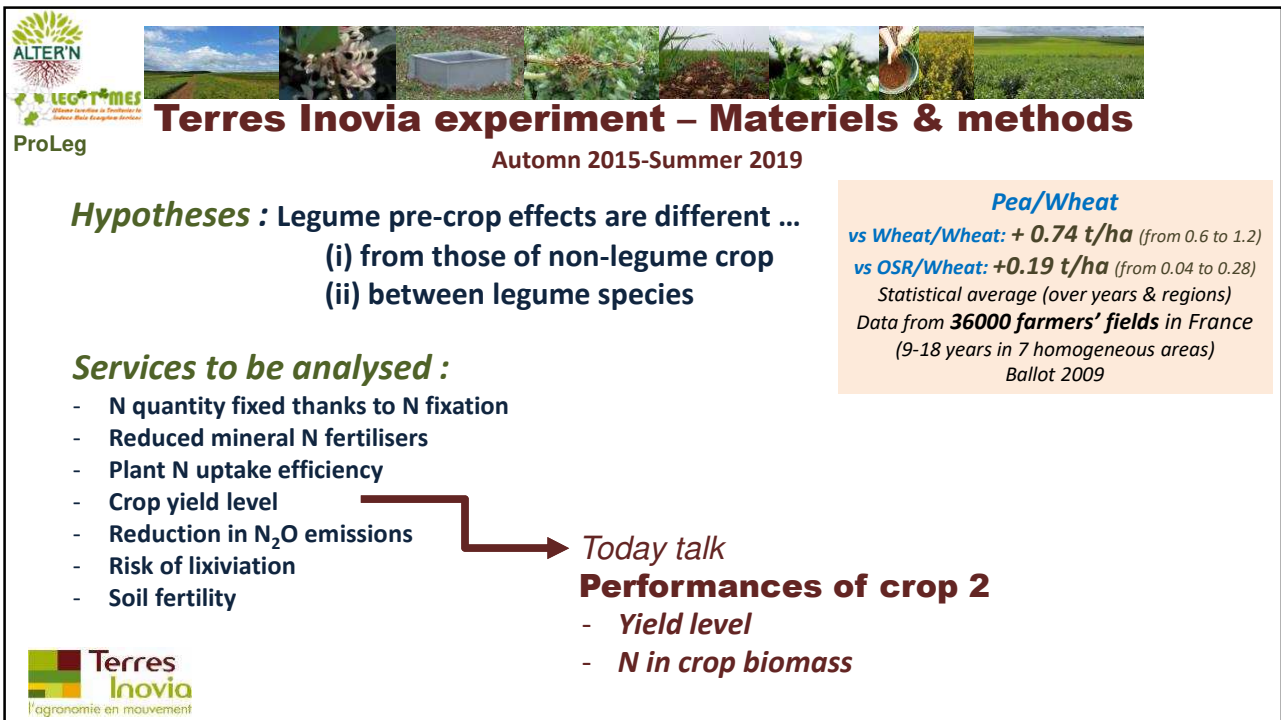
Crop system experiments

Data from farmers' networks



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**ALTER'N**  
**LEGTIMES**  
ProLeg

## Terres Inovia experiment – Materiels & methods

Autumn 2015-Summer 2019

**Hypotheses :** Legume pre-crop effects are different ...  
 (i) from those of non-legume crop  
 (ii) between legume species

**Services to be analysed :**

- N quantity fixed thanks to N fixation
- Reduced mineral N fertilisers
- Plant N uptake efficiency
- Crop yield level
- Reduction in N<sub>2</sub>O emissions
- Risk of lixiviation
- Soil fertility

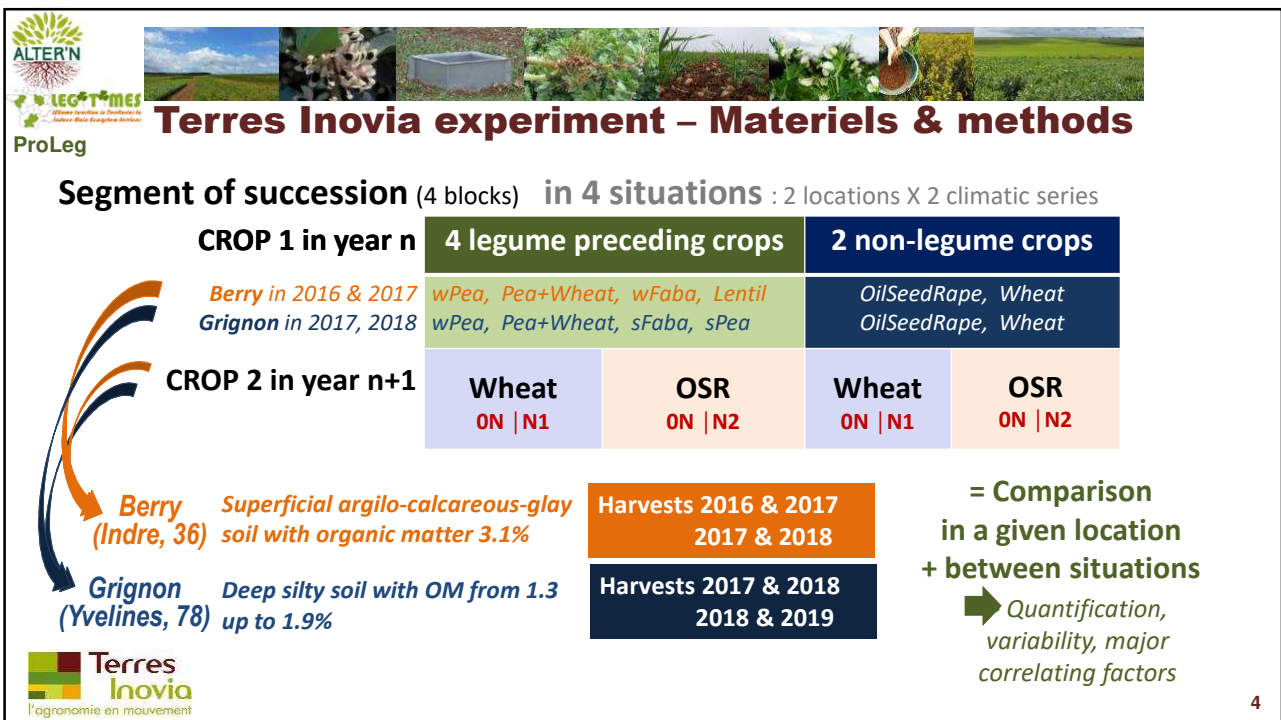
**Pea/Wheat**  
 vs Wheat/Wheat: + 0.74 t/ha (from 0.6 to 1.2)  
 vs OSR/Wheat: +0.19 t/ha (from 0.04 to 0.28)  
 Statistical average (over years & regions)  
 Data from **36000 farmers' fields** in France  
 (9-18 years in 7 homogeneous areas)  
 Ballot 2009

**Today talk**  
**Performances of crop 2**

- Yield level
- N in crop biomass

**Terres Inovia**  
l'agronomie en mouvement

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**ALTER'N**  
**LEGTIMES**  
ProLeg

## Terres Inovia experiment – Materiels & methods

Segment of succession (4 blocks) in 4 situations : 2 locations X 2 climatic series

CROP 1 in year n	4 legume preceding crops		2 non-legume crops	
	Berry in 2016 & 2017 Grignon in 2017, 2018	wPea, Pea+Wheat, wFaba, Lentil	OilSeedRape, Wheat	OilSeedRape, Wheat
CROP 2 in year n+1	Wheat ON   N1	OSR ON   N2	Wheat ON   N1	OSR ON   N2

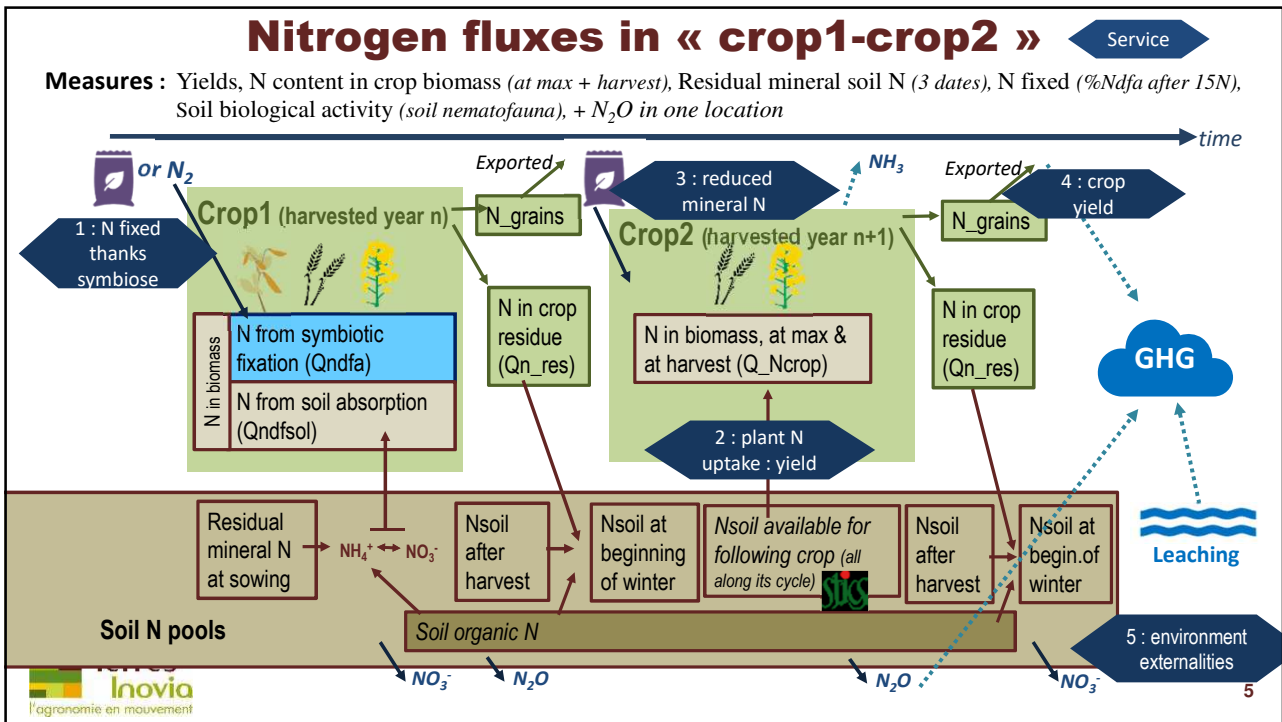
**Berry (Indre, 36)** Superficial argilo-calcareous-glay soil with organic matter 3.1%  
**Grignon (Yvelines, 78)** Deep silty soil with OM from 1.3 up to 1.9%

Harvests 2016 & 2017 / 2017 & 2018  
 Harvests 2017 & 2018 / 2018 & 2019

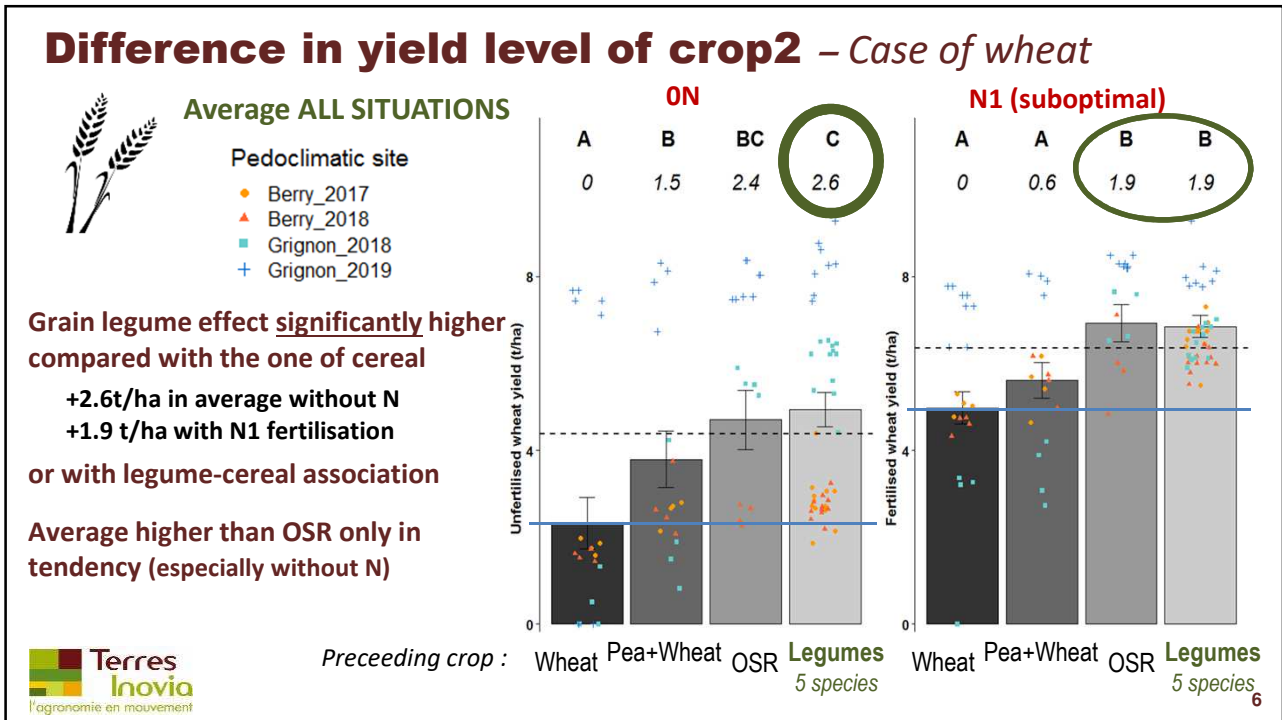
= Comparison in a given location + between situations  
 Quantification, variability, major correlating factors

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l'agronomie en mouvement

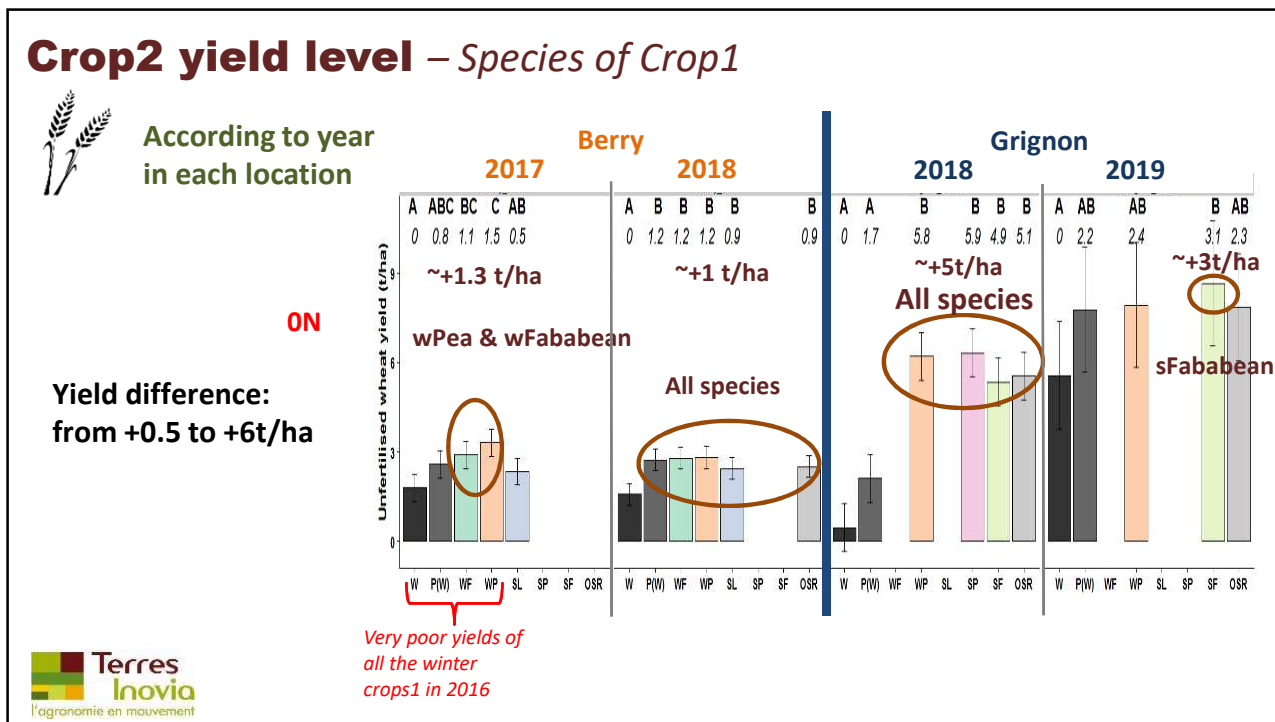
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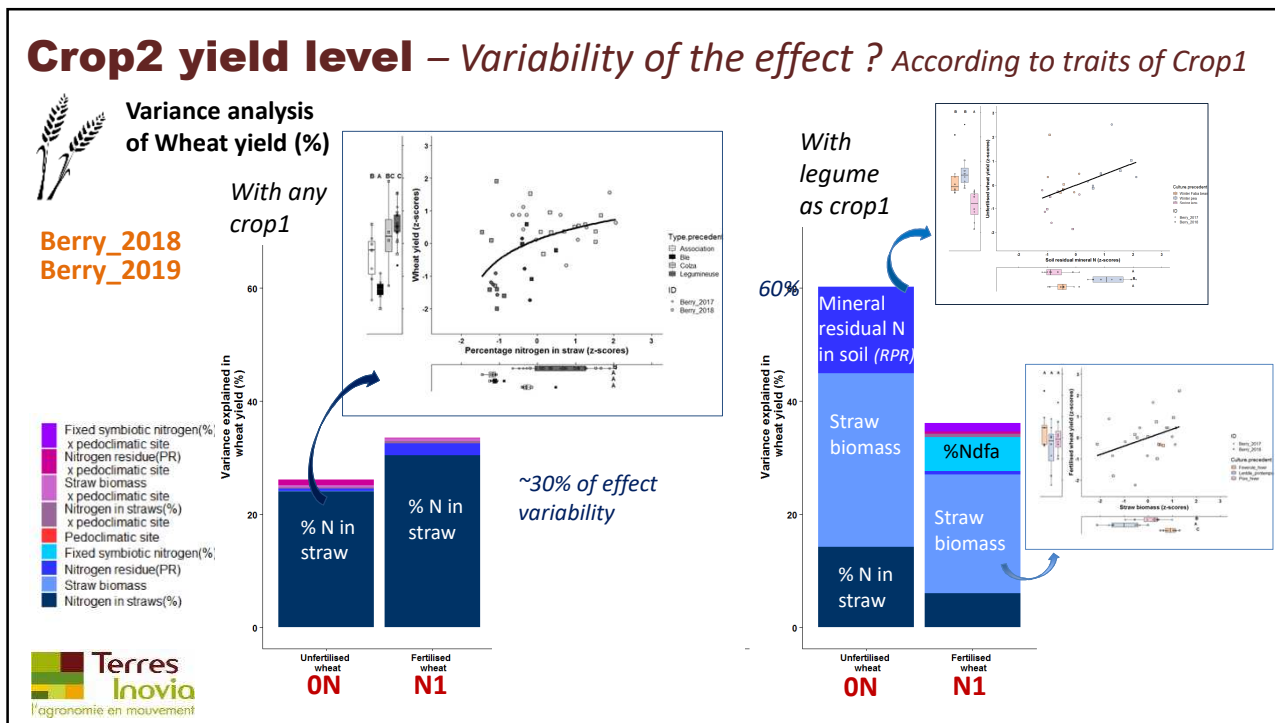
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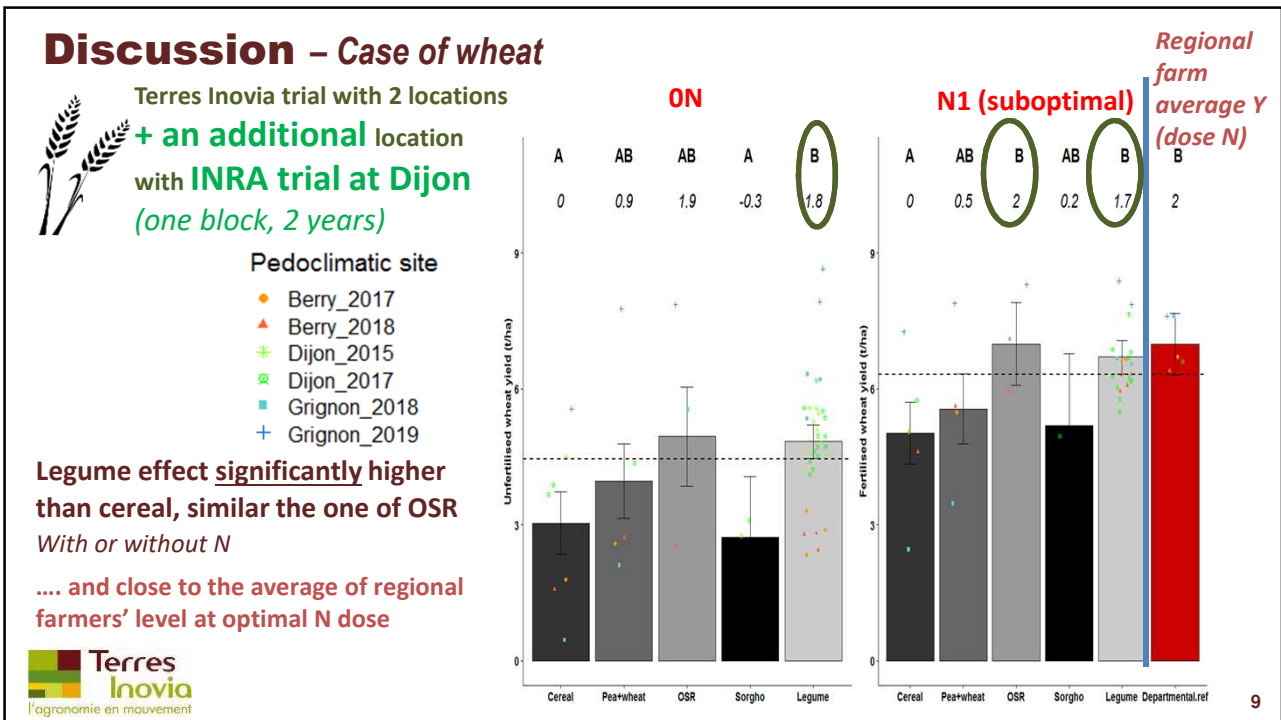
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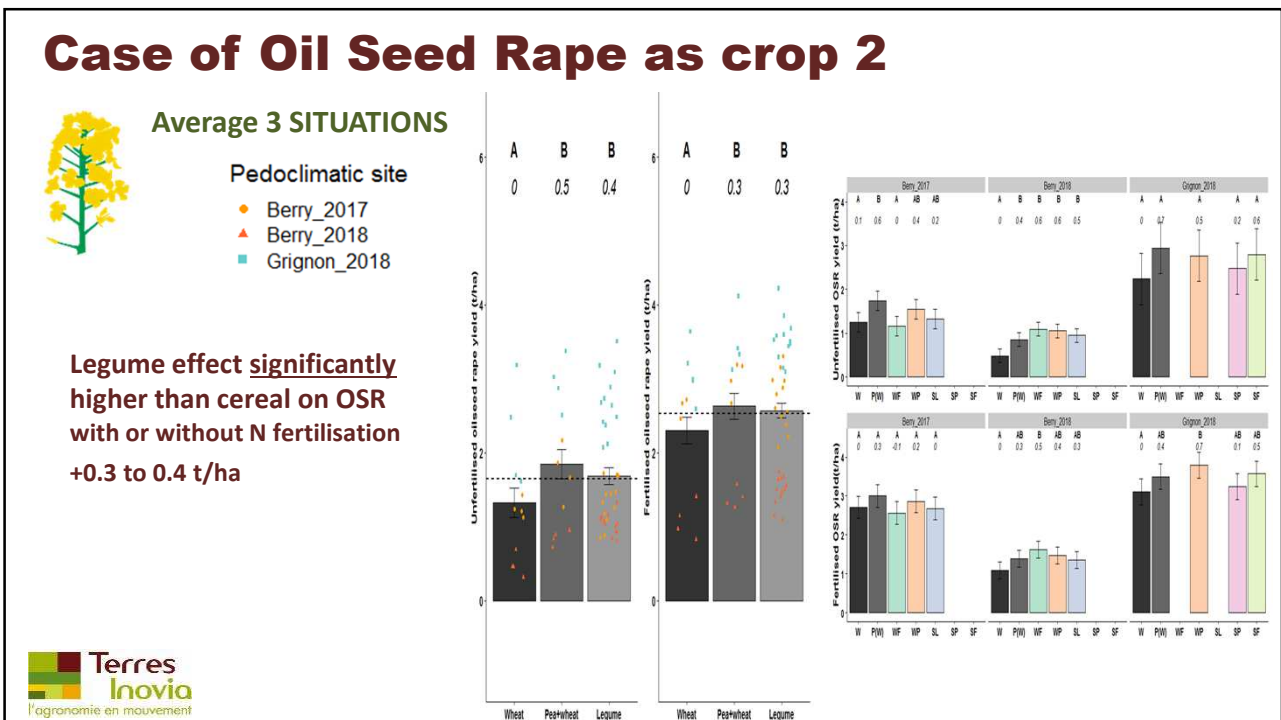
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# Perspectives - To up date economic assessment including legume ES

## 1. Rotation margin when inserting Peas before Wheat or OSR

- Results for similar analysis in 4 regional situations French study:

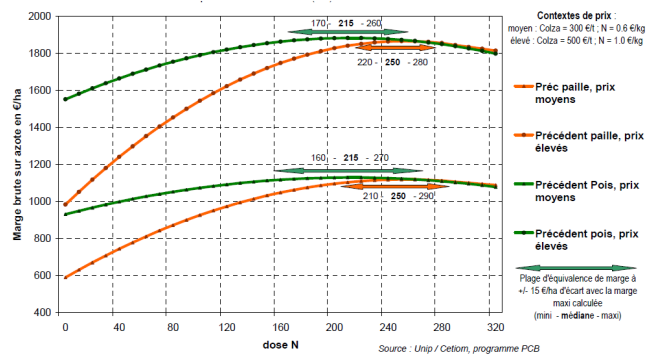
Margin difference compared with each specific referece succession	entre 2 blés: C-B-(P)-B-O	avant colza C-B-O-(P)-C-B-O
<b>Beauce</b> with spring barley, winter pea, durum wheat	😊	neutral
<b>Thymerais</b> with spring pea, winter barley for bier or Spring barley	neutral	😞
<b>Bourgogne</b> with winter barley for forage, winter pea	😊	neutral
<b>Plateau lorrain</b> avec OH fourr., PP	😊	neutral

From Carrouée et al., 2012



## 2. Optimal OSR raw margin with 50 kgN/ha less

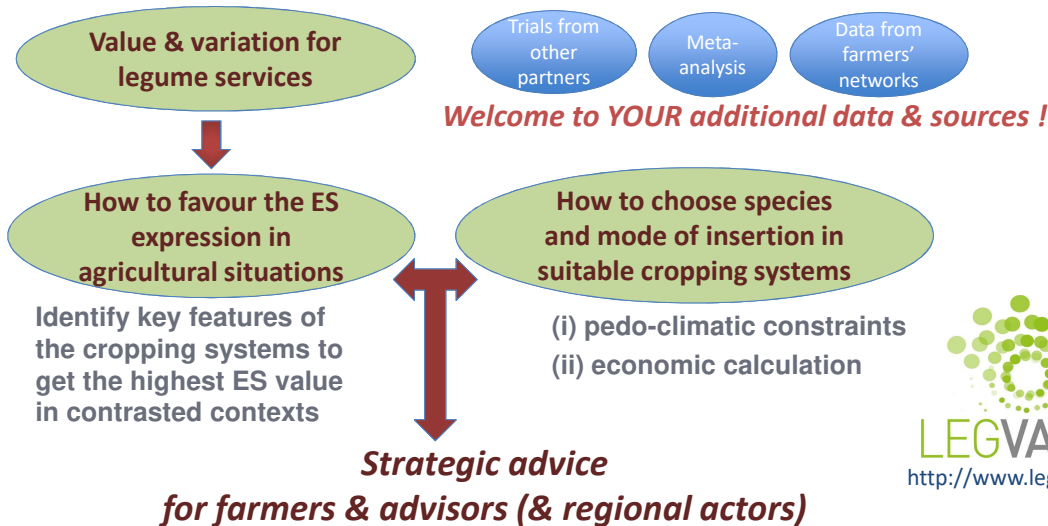
+ lower risks when unput reduction (larger zones for similar margins) Pea (green) compared to cereal (red) whatever the price context is



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# Perspectives



Decision Support System (T1.4 & T3.4)  
LegValue deliverable 1.6

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**... and thanks for YOUR attention**

