Annex 1

Sustainable innovative practices in the central region of France: a focus on soil structure assessment in the field

Anne-Sophie Perrin, Gilles Sauzet, Thibaut Pruvot, Thierry Moulins and Anne-Marie Tremblay

ANNEXE 1 – Material & Method and main results

Innovative arable cropping
Berry case study
Central France

Innovative arable cropping (Berry, central France)

Production area
Historical rapeseed, wheat, barley rotation
Argilo-calcareous (stony) soils
100 to 500 hectares farms

Dynamic started in 2005
→ Decreasing/stagnating yields for 20 years
• Agronomic diagnosis 2005-2012 (500 parcels)
  Major problems: short rotation & weeds, pests
• A group of farmers “keen to change” & Terres Inovia (Gilles Sauzet)
  evolved gradually to simplified tillage, cover crops and crop diversification

French technical institute for agricultural research and development on the production and valorisation of oilseeds and protein crops: rapeseed, sunflower, soybean, oleaginous linseed, pea, faba bean, lupin, hemp... (financed by farmers through a compulsory tax on harvests)
Berry group: 15 farmers, 5 public & private advisors

Test of innovative practices for more productive & sustainable cropping systems
- Lengthening of crop rotations (protein crops)
- Combined crops in no tillage (oilseed rape in legumes cover, winter pea & barley/wheat)
- Adaptation of soil tilling practices, sowing dates

The most important in success with innovative practices: drilling/seeding (%germination, rooting, weeds, crop growth at beginning of winter)

→ Need to better assess soil structural state and risks before choosing the most adapted agricultural practices

Objective in Valerie
To accompany knowledge transfer and appropriation
To help farmers to decide on the most appropriate practice (soil management eg. no-till, cover crops, crop association, sowing dates, etc)

→ Create a decision support tool

Meeting 1 issues
Farmers questions
- Oilseed rape associated with which leguminous crops?
- What are the proper seeding techniques for our region?
- How to succeed drilling/seeding in a covered soil?
- Using strip-till for better soil structure?
- Which crop should be added to the rotation to improve its sustainability?
- How to manage intercropping?
- Cash crop or intercrop?
- Would it be beneficial to maintain permanent soil cover?
- Can good drilling limit the impact of pests? Has the intercrop impact on pest management?

Refined questions
1. What are the effects of agricultural practices such as direct sowing, cover crops and soil tillage on the nitrogen and organic matter cycles and availability?
2. “What does influence (trigger) the end of dormancy (the germination of the weeds)?”
3. “How can we evaluate in the field the properties of the soil (structure, texture, “health”)? What are the possible evaluation methods?”
4. “How can we best drill (sow) a crop through a soil cover (soil covered by a crop or crop residue)?”
5. “What are the practical impacts of the use of existing alternative plant controls and protections?”

Trial topics
20 stakeholders
Oilseed rape, wheat & protein crop plots according to farming practices:
- direct sowing
- cover crops
- ≠ land tillage
- association of crops etc.
Innovative arable cropping (Berry, central France)

Results 2016

10 farms

Crops of this study
- Oilseed rape: 19 parcels
- Wheat: 16 parcels
- Protein crops: 7 parcels (pea, faba bean)

Methods
Comparison in the same parcel
- Conventional practice
- Innovative practice

1. Revised trial proposals and actions
10 farms
Observations & recordings
4 key periods:
1. Soil structure (June 2015, May 16)
2. Crop residues (fallow period)
3. Crop growth structure, density (mid-Sept to mid-Oct 2015, 2016)
4. Quality of roots (length; biomass) in winter (mid-Nov to February 2015, 2016)

2. Trial topics
20 stakeholders
Rapeseed, wheat and protein crop plots according to farming practices:
- direct sowing
- cover crops
- ≠ land tillage
- association of crops etc.

3. Decision support tool (in 2017)
based on 4 steps
- Parcel characteristics & recent history (weed, pest risks etc.)
- Field assessment
  (soil structure, crop residues)
- Decision-making
  (use of innovative practice?)
- Assessment of the “success”

4. Soil structure evaluation guide
Quick, visual & descriptive assessment (simplified spade test)

Valerie

Innovative arable cropping (Berry, France)
List of the compared practices in 10 farms of the Berry farmers groups (2016)

<table>
<thead>
<tr>
<th>Farmers names</th>
<th>Soil type</th>
<th>Compared practices</th>
<th>Compared practices</th>
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<td>Agri BM</td>
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<td>Strip till/SD</td>
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<td>ACM</td>
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<td>Agri GT</td>
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<td>Agri PA</td>
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ON : strip in parcel without fertilisation

Perturbation of insect pests
Comparison between conventional and innovative oilseed rape

% healthy plants (flea beetles/ rape winter stem weevils)

Parcels number

Conventional oilseed rape
Colza classique

Oilseed rape in cover plants
Colza innovant
oilseed rape in cover plants (q/ha)

Results 2013-2015

Impact of innovative oilseed rape on the following wheat (in association or not)

<table>
<thead>
<tr>
<th>Farmer names</th>
<th>Parcels</th>
<th>Soil type</th>
<th>Crop</th>
<th>Previous crop</th>
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<tr>
<td>Agri BM</td>
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<td>wheat</td>
<td>Inn OSR (Inn. Oil Seed Rape)</td>
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<td>wheat in association</td>
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<td>wheat</td>
<td>Inn OSR, + IC faba beans.</td>
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<td>Faba beans</td>
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<td>ACM</td>
<td>wheat in association</td>
<td>Inn OSR, + IC faba beans</td>
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Inn OSR: Innovative oil seed Rape (i.e. oilseed rape in cover crop)
Innovative arable cropping (Berry, central France)

SYPPRE Project (2015 to >2030)
5 long-term experimental sites
(co-construction/innovation)
5 local networks of farmers
Observatory of farmers practices

10 farms
3 farmers in the SYPPRE steering group

Comparison of wheat yield after conventional or innovative oilseed rape