



**HAL**  
open science

## **Innovative IPM for Winter Wheat-based Rotations: First Results of ex post Sustainability Assessment of Cropping Systems Tested at INRA (France)**

Caroline Colnenne-David, Gilles Grandeau, Véronique Tanneau, Maud Bénézit, Frédérique Angevin, Lucie Lefèvre, Thierry Doré

► **To cite this version:**

Caroline Colnenne-David, Gilles Grandeau, Véronique Tanneau, Maud Bénézit, Frédérique Angevin, et al.. Innovative IPM for Winter Wheat-based Rotations: First Results of ex post Sustainability Assessment of Cropping Systems Tested at INRA (France). PURE Congress 2015: IPM innovation in Europe, Jan 2015, Poznan, Poland. hal-01359106

**HAL Id: hal-01359106**

**<https://agroparistech.hal.science/hal-01359106>**

Submitted on 1 Sep 2016

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



# Innovative IPM for Winter Wheat-based Rotations: First Results of *ex post* Sustainability Assessment of Cropping Systems Tested at INRA (France)

Colnenne-David C.<sup>1,2</sup>, Grandeau G.<sup>1,2</sup>, Tanneau V.<sup>1,2</sup>, Bénézit M.<sup>3</sup>, Angevin F.<sup>3</sup>, Lefèvre L.<sup>1,2</sup>, Doré T.<sup>2,1</sup>

<sup>1</sup> INRA, UMR 211, 78850 Thiverval-Grignon, France ([caroline.colnenne@grignon.inra.fr](mailto:caroline.colnenne@grignon.inra.fr)), <sup>2</sup> AgroParisTech, UMR 211, 78850 Thiverval-Grignon, France, <sup>3</sup> INRA, UAR 1240, 78850 Thiverval-Grignon, France

## OBJECTIVE

- Within the context of the PURE project (WP2), innovative IPM cropping systems were designed for winter wheat-based rotations in the Paris basin area, at INRA in France. We used a three-step prototyping method to design the cropping systems: (1) crop successions and agricultural practices were defined for each system, (2) the prototypes were *ex ante* assessed and, (3) the most promising systems were tested in field trials and *ex post* assessed.
- Here, we presented results of the *ex post* sustainability assessment after one complete rotation.

## METHODOLOGY

- Three cropping systems were designed according to a gradient of pesticide use intensity: (1) current agricultural practices (C.S.) with a conventional use of pesticides, (2) intermediate level of IPM (I.S.) with a reduction in pesticide use and (3) advanced level of IPM (A.S.) where no pesticides are allowed (*for more details, see the poster of Colnenne-David et al., 2015*).
- *Ex post* sustainability assessment was performed with DEXiPM (Pelzer et al., 2012) on these systems after one complete rotation.



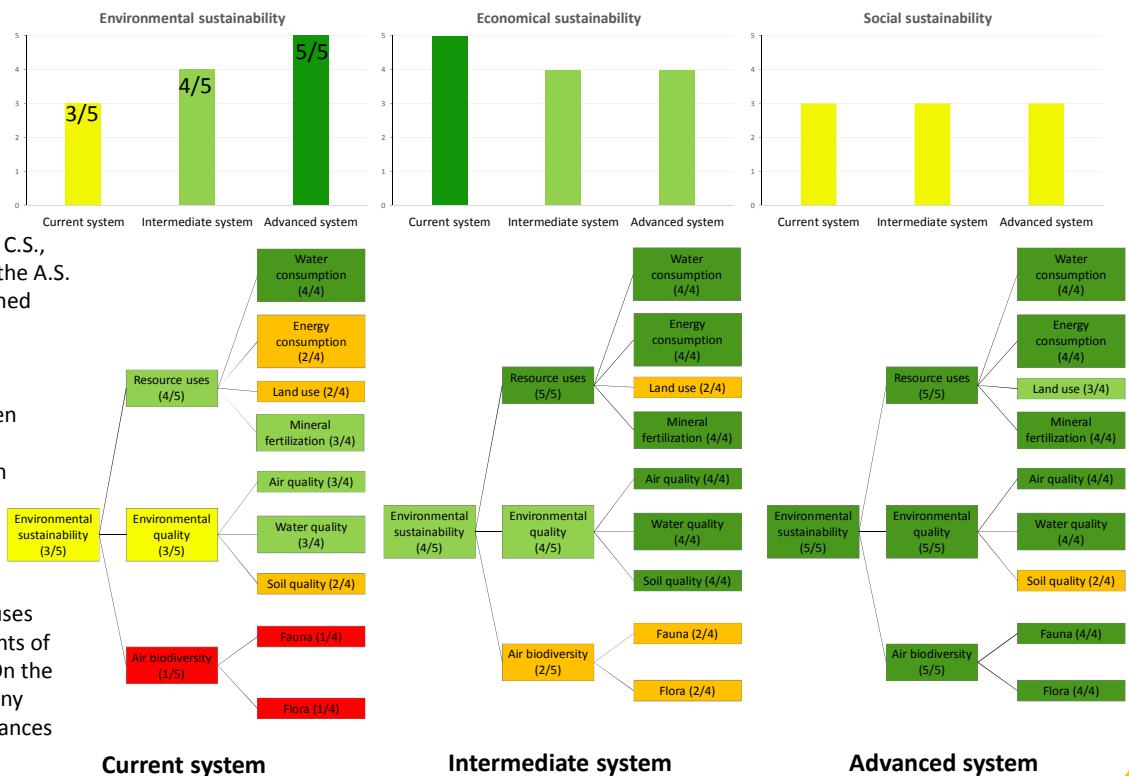
## RESULTS

- After one complete rotation, all cropping systems achieve a “high” score (4/5) in terms of overall sustainability. However, this result is obtained by very different combinations of performances on the three sustainability pillars:

- ✓ economical pillar is higher in the C.S.,
  - ✓ environmental pillar is higher in the A.S.
- The social sustainability has remained medium (3/5) for all systems.

- There is a clear hierarchy between these systems in terms of the environmental sustainability, which can be explained by various uses of pesticides. TFI are as follows: C.S. = 4.7 < I.S. = 1.8 < A.S. = 0.0

In the C.S., high level of pesticide uses led to a decline in all subcomponents of the environmental sustainability. On the contrary, in the A.S. (*i.e.* without any pesticide), environmental performances are judged very high.



## DISCUSSION – CONCLUSION

- Combining innovative strategies in the I.S. and A.S. (*i.e.* high diversity of species sown in the rotation, the use of resistant variety mixtures, high seed density and delayed sowing dates) led to a decrease of pesticide applications and to an improvement of the environmental performances.
- Performance results show that it is difficult to meet various objectives. In the C.S., economical performances are high (*i.e.* high yields, and good produce quality) while environmental performances are judged as medium (*i.e.* high pesticide use). In the A.S., the performances are the opposite of the C.S. results and are explained by medium yields, with low produce quality, and no pesticide use.
- Main results of *ex ante* and *ex post* sustainability assessments of the three cropping systems are close to each other. Therefore, DEXiPM seems to be a relevant tool to perform initial assessments required during the innovative cropping system design processes.

### REFERENCES

Pelzer E., Fortino G., Bockstaller C., Lamine C., Angevin F., Guérin D., Guichard L., Reau R., Messéan A., 2012. Assessing innovative cropping systems with DEXiPM, a qualitative multi-criteria assessment tool derived from DEXi. *Ecological Indicators*, 18, 171-182

Colnenne-David C., Grandeau G., Tanneau V., Lefèvre L., Doré T., 2015. Innovative IPM solutions for winter wheat-based rotations (WP2): Cropping systems assessed in the INRA trials (France). PURE congress 2015, Poznan (Poland)

**ACKNOWLEDGEMENTS:** The PURE project is supported by the European commission through the seventh framework program (FP7/2011-2014) under contract number 265865

