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

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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.**

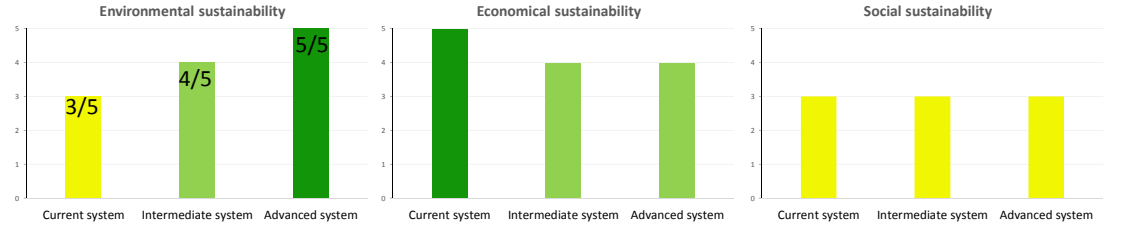
METHODOLOGY

- 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

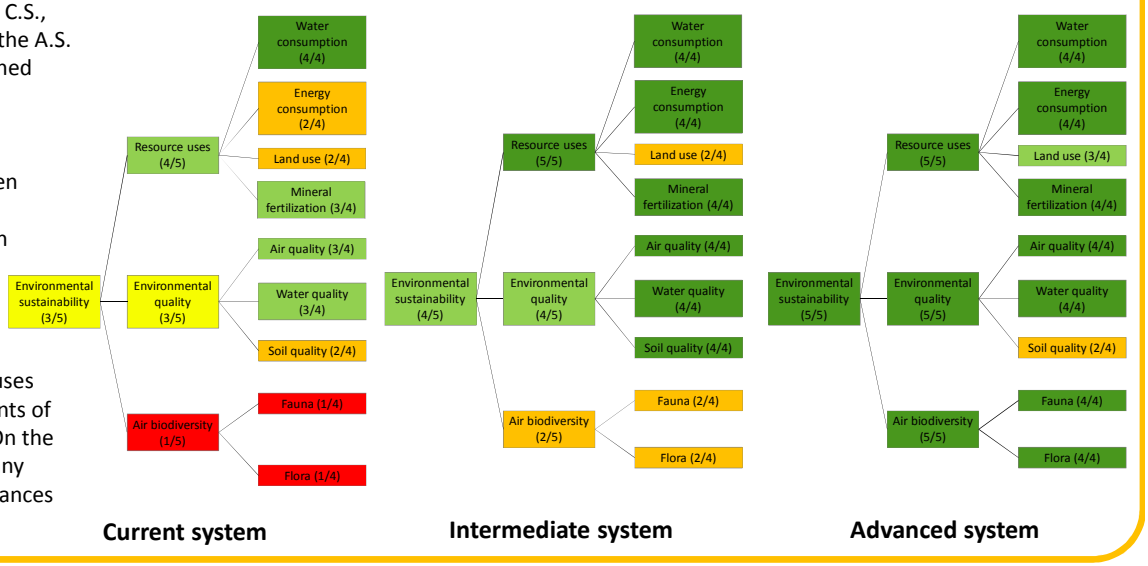
- After one complete rotation, all cropping systems achieve a "high" score (4/5) in terms of overall sustainability. However, this result is obtained by very different combinations of performances on the three sustainability pillars:
  - ✓economical pillar is higher in the C.S.,
  - ✓environmental pillar 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 t hat 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.

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