CO-DESIGN OF A DECISION SUPPORT SYSTEM FOR INTEGRATED WEED MANAGEMENT

F. COLAS[1], S. CORDEAU[1], W. QUEYREL[1], A. RODRIGUEZ[2], J. VILLERD[3] AND N. COLBACH[1]

[1]Agroécologie, AgroSup Dijon, INRA, Univ. Bourgogne Franche-Comté , F-21000 Dijon, France ; [2]Acta, 31450, Baziège, France ; [3]INRA-Nancy Université-INPL, UMR 1121 LAE, F-54505 Vandœuvre lès Nancy, France

Context & objective

Cropping system design is complex because it needs to take into account:

- Long term effect
- Reduced herbicide use
- Many techniques and combinations of techniques

Services and disservices of weeds

⇒ **Design Decision Support System (DSS) with future users[1] from a research model to support cropping system design**

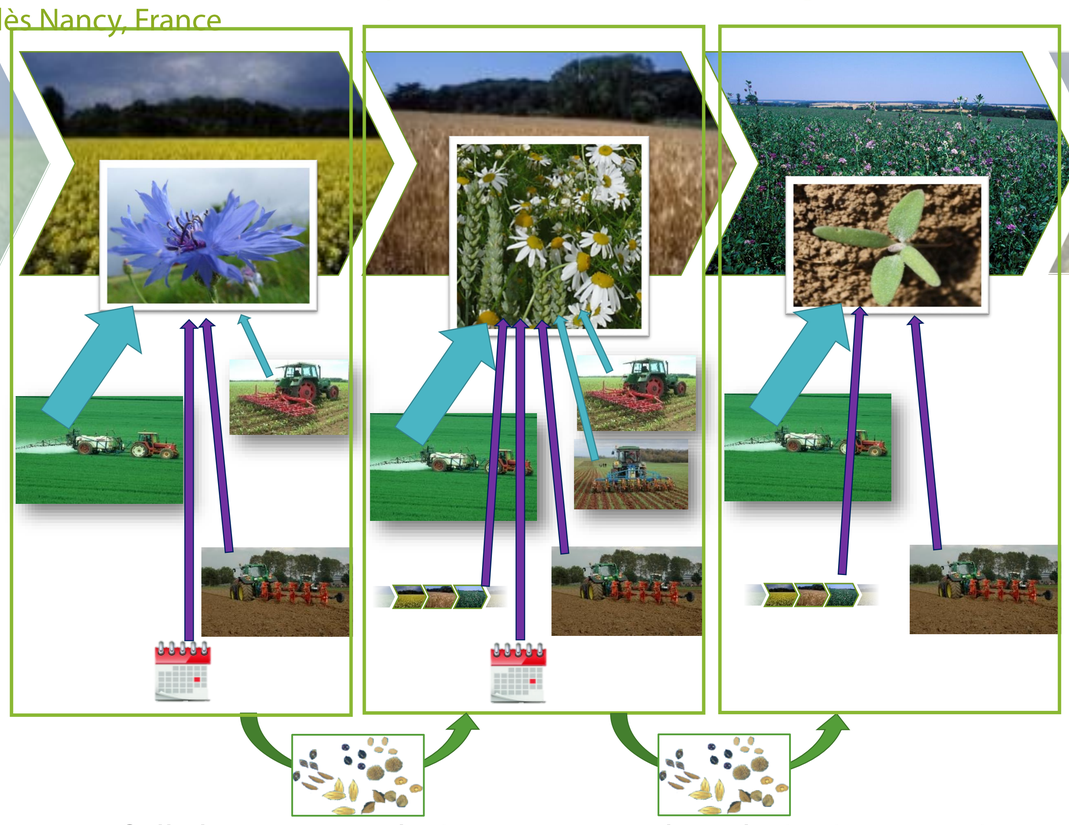


Diagram of all elements to take into account when designing cropping systems

Methodology and results of the DSS design

Identify users' needs

Two types of DSS:

- Detailed tool for adjusting the cropping system
- Synthetic tool for radical changes in the cropping system

- Choose structure → Decision tree
- Choose Outputs → Weed impact indicators
- Choose output format → Table with colour gradients = f(indicator value)
- Add inputs to better describe the cropping system

Simplify the weed dynamics model

FLORSYS[2], a "virtual field" model
→ simulates weed dynamics
→ tests cropping systems

BUT:

- Slow
- Complex to use

Inputs: meta-decision rules → synthetic description of the cropping system

Outputs:

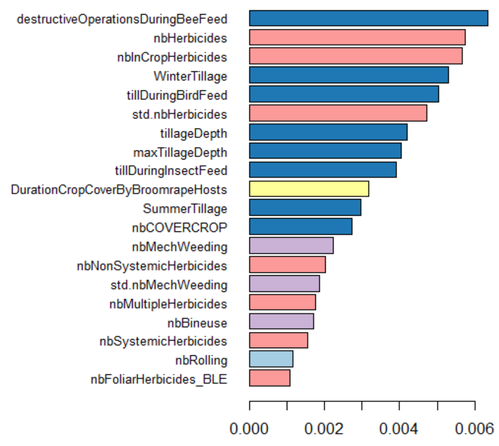
- Rank techniques = f(impacts on weeds)
- Effect of combination of cropping techniques quantified
- Fast prediction tool to evaluate cropping systems

DSS prototype tests

Decision Support System for designing ecological weed management strategies

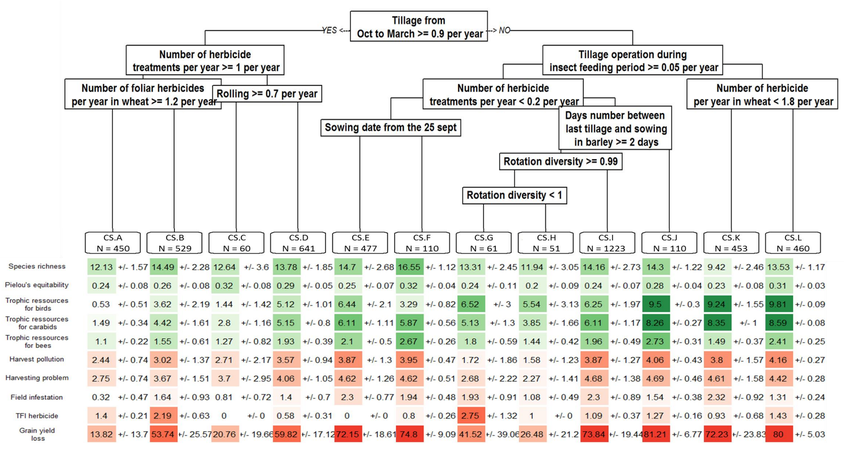
Design guides

Choose structure key techniques



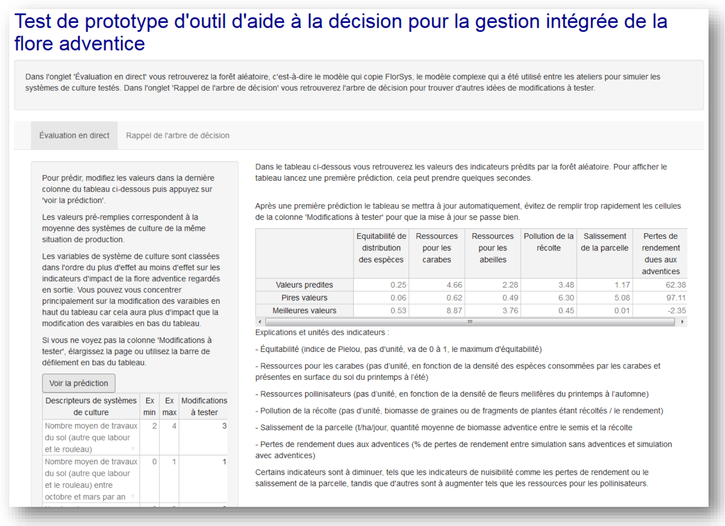
Most important cropping techniques on weed impacts. VIP from random forest

Choose combination of techniques



Decision tree to identify effects of combinations of cropping techniques on weed impacts, based on the CART methodology

Fast prediction tool



R-shiny online application, hosting the random forest model used as a predictor

Discussion

Compromises are needed between modelling possibilities and users' needs

Many tests are needed in different contexts and cropping systems to improve the DSS

[1] Cerf, M., Jeuffroy, M.-H., Prost, L., Meynard, J. M., 2012. Participatory design of agricultural decision support tools: taking account of the use situations. Agronomy for Sustainable Development, 32 (4), 899-910.

[2] Colbach N., Biju-Duval L., Gardarin A., Granger S., Guyot S.H.M., Mézière D., Munier-Jolain N.M., Petit S., 2014. The role of models for multicriteria evaluation and multiobjective design of cropping systems for managing weeds. Weed Research 54, 541–555.

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Floriane COLAS,
floriane.colas@inra.fr
UMR 1347 Agroecologie
17 rue sully, BP 86510
21065 Dijon cedex
Phone: (+33) 3 80 69 33 29