S10-O2. A Bayesian network model based on knowledge expert elicitation for integrated weed management assessment in cropping systems

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Integrated weed management (IWM) is the combination of mechanical, cultural, chemical and biological levers to control weeds at cropping-system (CS) scale and reduce the reliance on one farming practice.This combinatorial, multi-crop approach makes it difficult to predict the outcomes of the IWM strategy. Primary knowledge on IWM in arable land is fragmented, and there are few examples of expertise being mutualized at CS level. In the present work, we use expert-based elicitation to build a Bayesian network (BN) model aiming to assess IWM strategies. The BN is composed of a directed acyclic graph that represents qualitative variables, whose interdependencies are linked by probabilistic values. Fifteen weed management experts from French and Swiss research organizations, specialized in various crops and farming practices, set up the foundations of the model during 20 design workshops over 18 months. The inputs are farming practices divided in four groups: crop diversification (e.g. crop type, intercropping), pre-sowing interventions (e.g. soil tillage, delayed sowing date), curative weeding (e.g. mechanical and chemical) and pre-harvest weeding (e.g. weed seed exportation). Weed variables (e.g. soil seedbank, early density before weeding, late biomass after weeding) are calculated according to the effect of farming practices through tables of probability. The model computes the probability for CS to generate weed harmfulness such as yield loss, harvest difficulties (percentage of surface non harvested because of weeds) and weed seed production. The model was evaluated by the same experts using fictitious CS and confronting the output to the expectations. The model was also evaluated using observed data from CS experiments of the partners involved in the project. Validation with fictitious CS was done in a top-down and progressive manner by creating strategies to endorse the levers one by one. Once tested, the lever was approved when the result corresponds to the upstream expertise or corrected if there is a deviation from the expected result (e.g. overestimation of the chemical weeding efficiency of weed grass resistance). Comparison with experimental data showed discrepancies between observed and predicted results, because few data sets from CS trials exist over several rotations.

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