

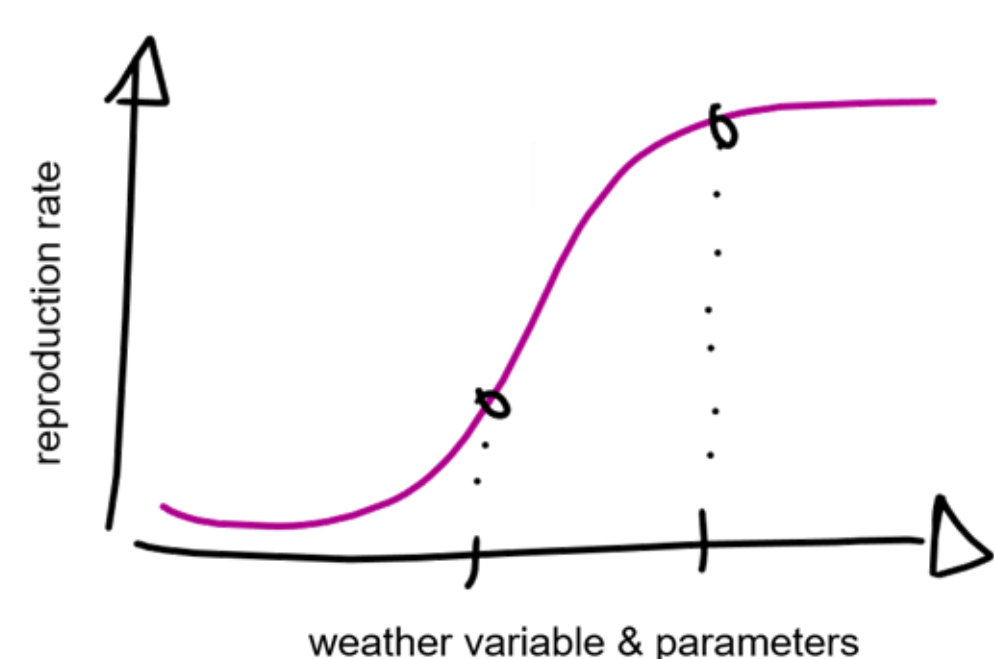


Using Artificial Intelligence in Agronomy

JOUDELAT François^{ITB}

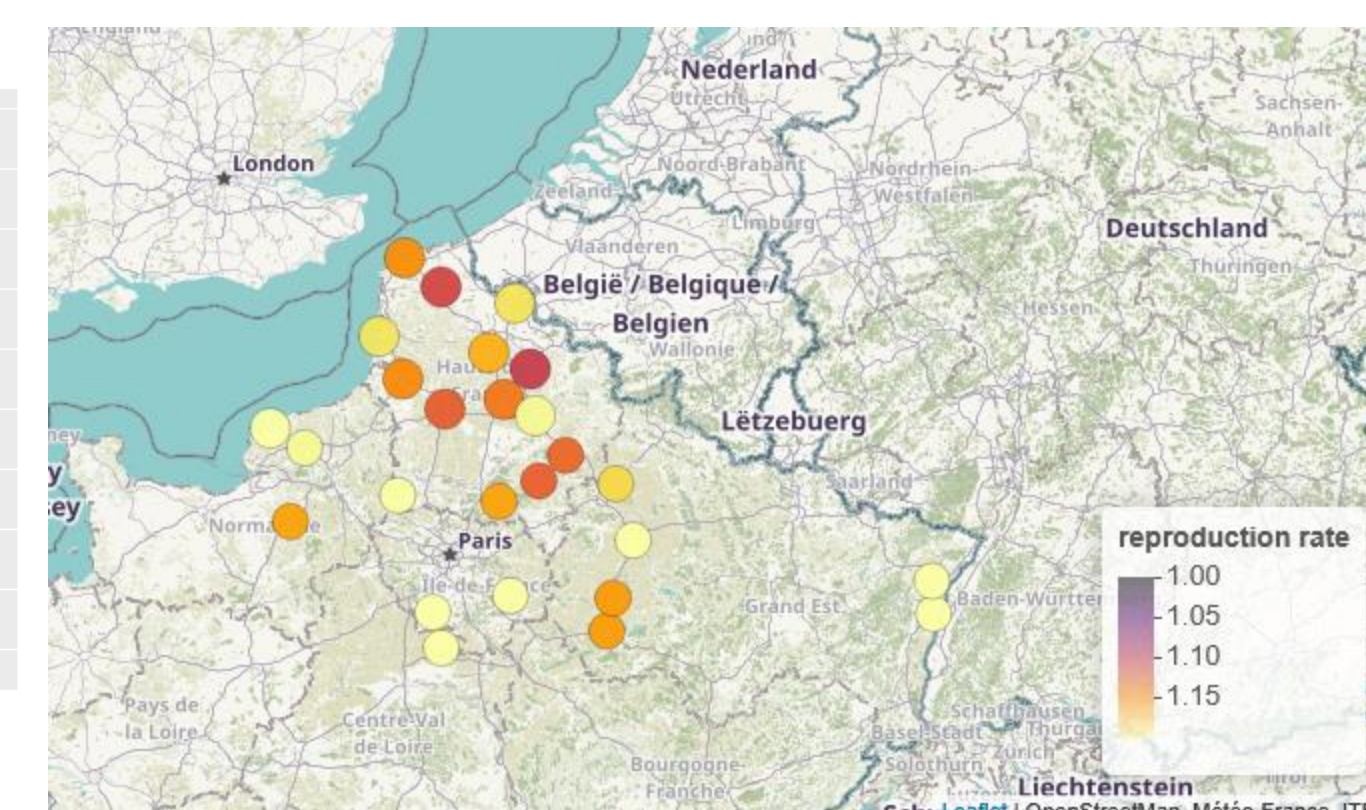
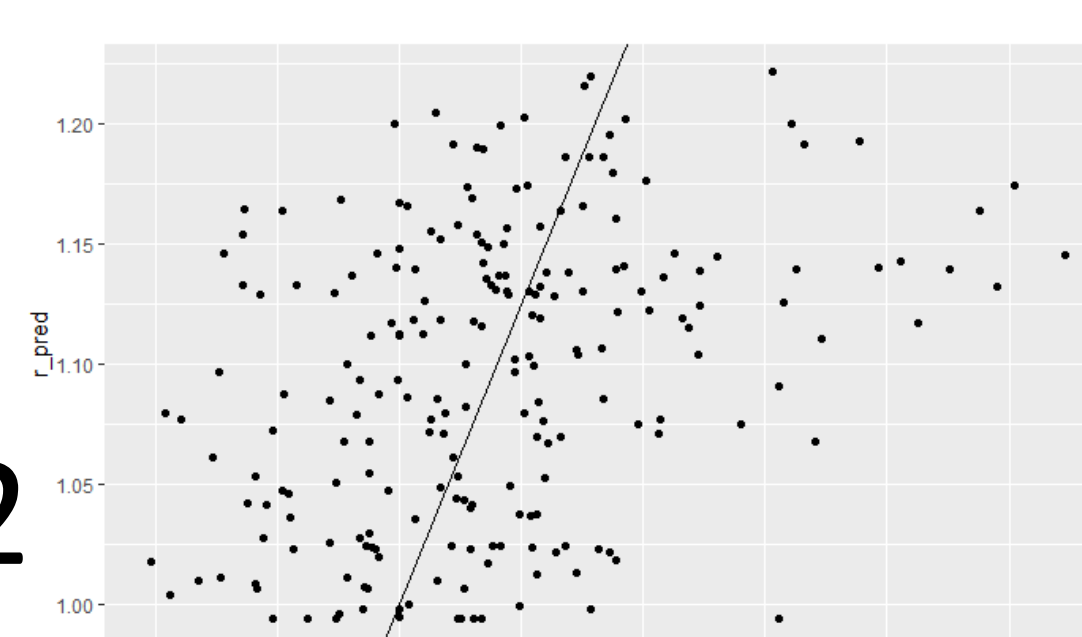


- 8 years of trials with aphid growth measured along time
- classic approach : experts make assumptions about the causal relations and fit parameters with data



model with logistic transform on weather and agronomic information (mainly temperature, precipitations and vegetation stage)

- expert validation before potential widespread use
reproduction rate modeled with $r = 0.36$, $MAE = 0.12$



Simple mechanistical aphid model

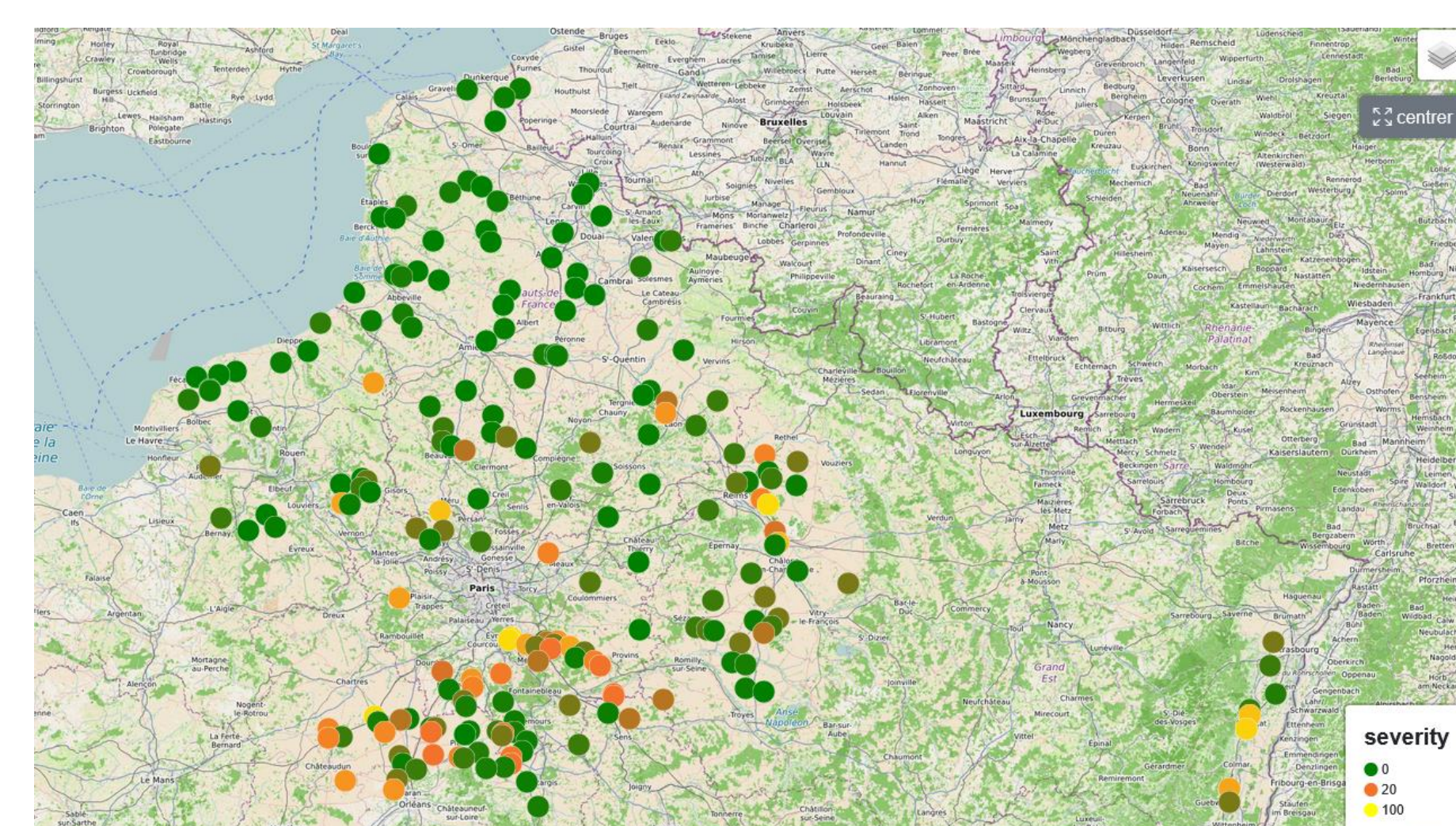
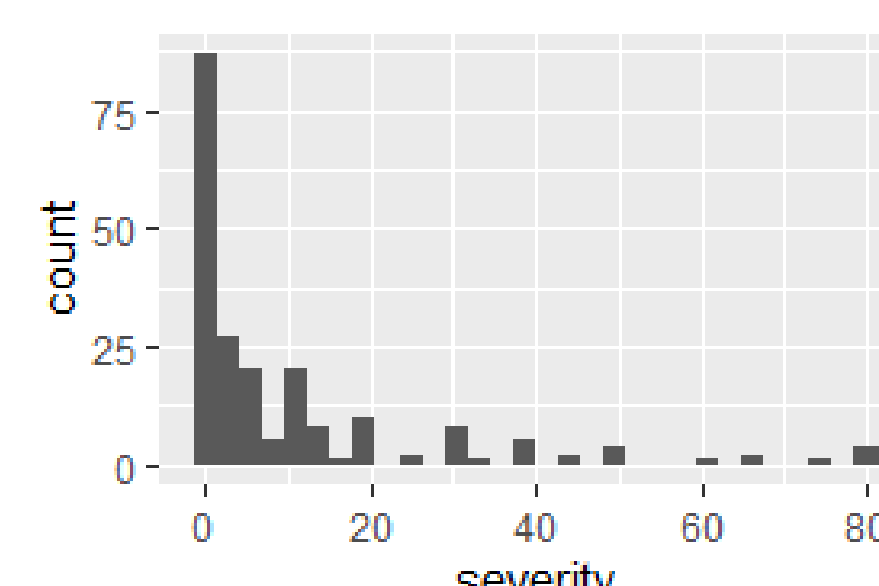
VS

Explain virus yellows with AI model

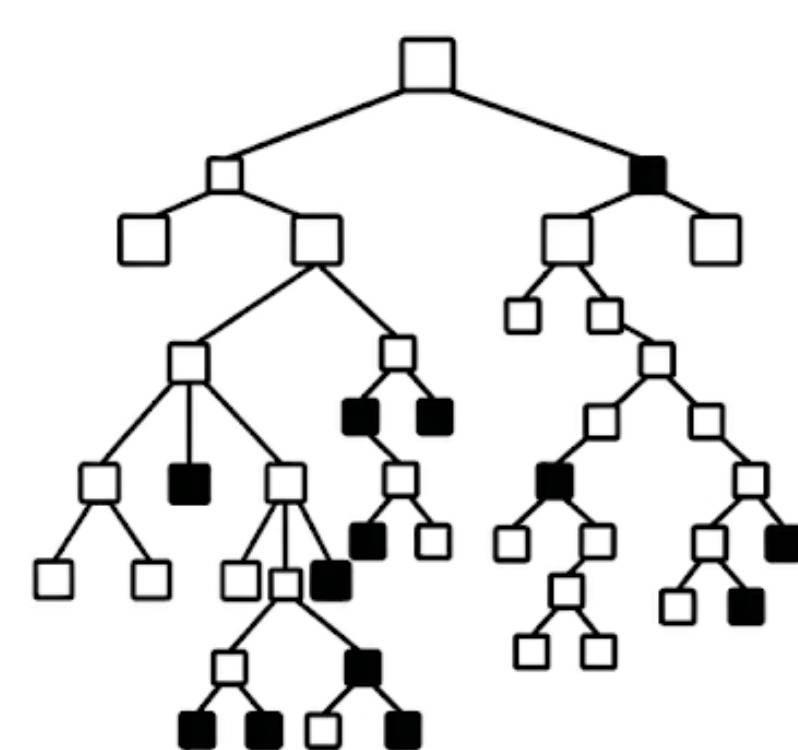
- materials :

208 real farmers' plots assessed for virus yellows in 2025

18 cofactors : location, sowing date, aphids presence, spraying dates with **missing values**

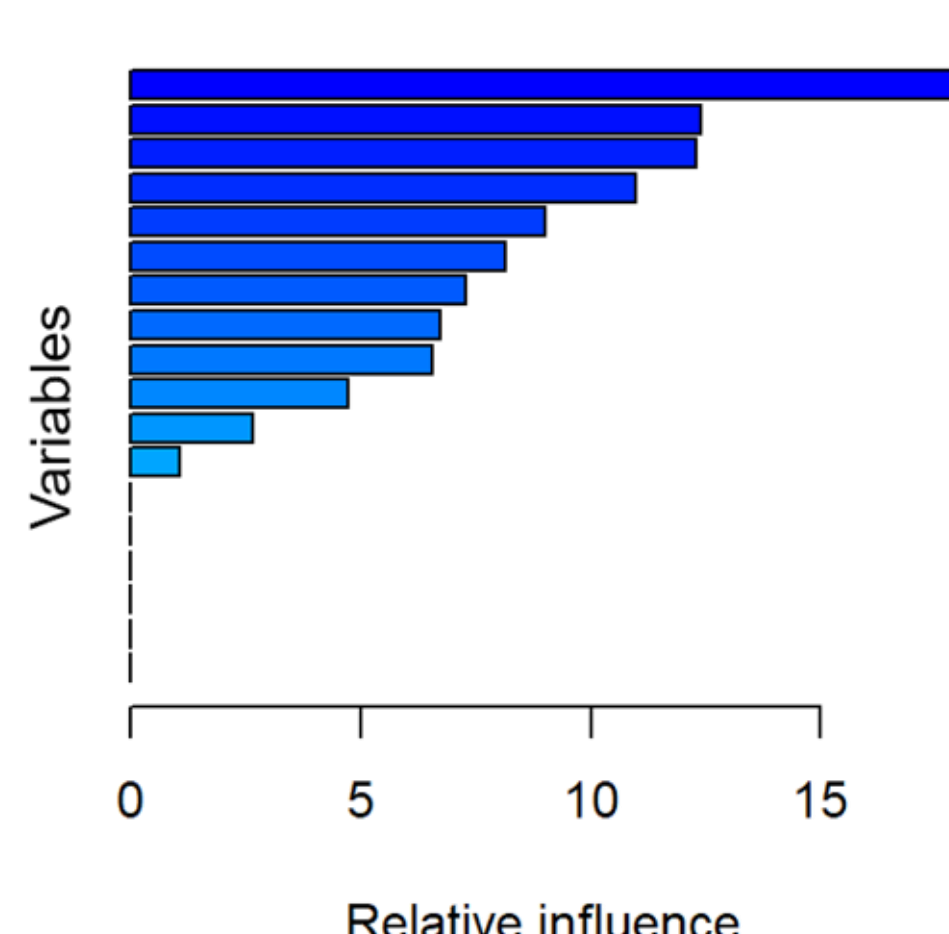


- method :



Gradient Boosting = stacked regression trees to explain residuals, each node is a condition on a cofactor

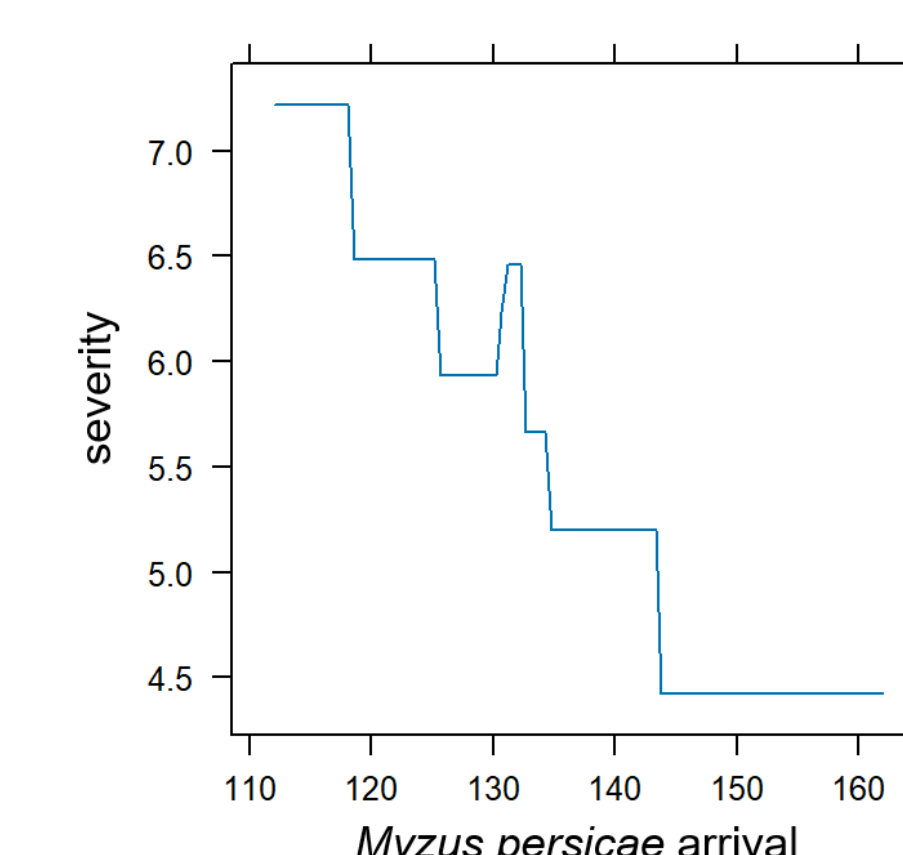
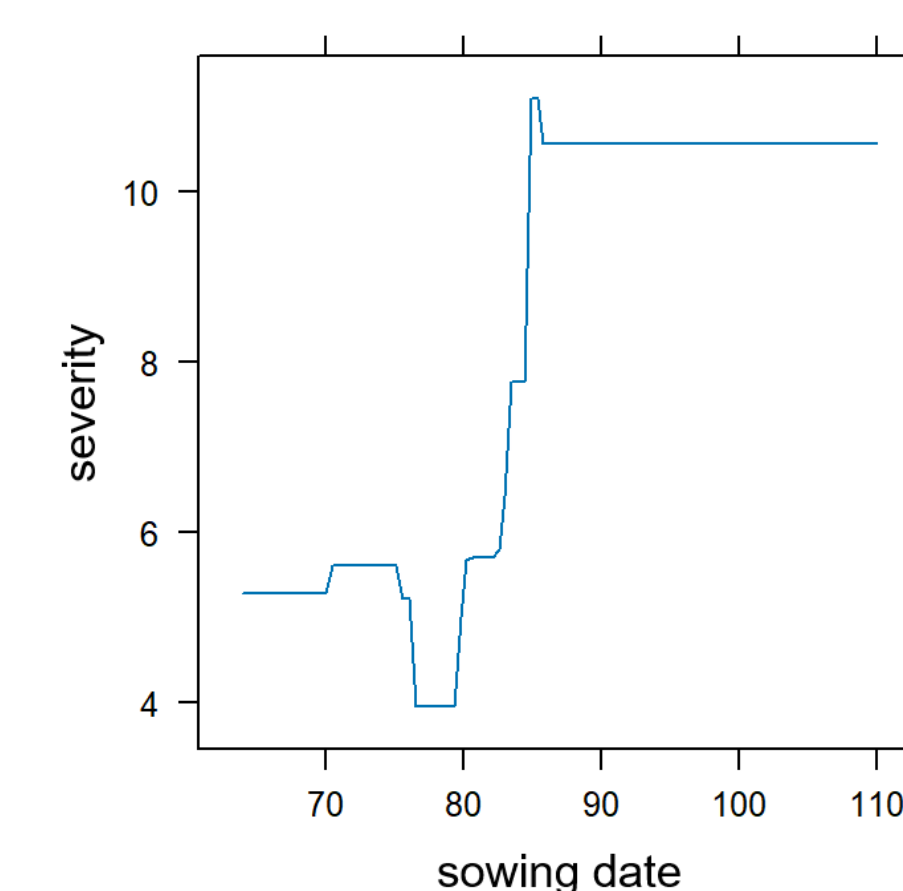
- results :



Explainable by computation of relative influence and partial dependency plot

Critical factors of 2025 :

- Known locations with higher risk
- Plots sowed late are more susceptible
- Aphis fabae spread yellows



➔ AI helps explaining data, but too few observations and factors can be confounded, need human expertise