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Integrating sustainability criteria into performance testing

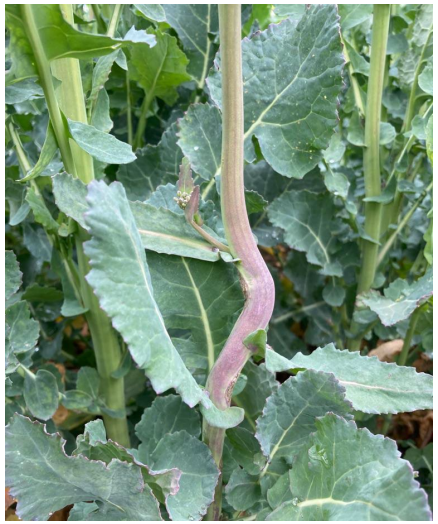
New criteria under study for rapeseed to assess pest tolerance

26.09.2023

Variety testing: Findings

Main challenges facing variety testing

Political framework	Phenotyping complexity	
Availability of insecticides	*Plant damage parameters*	*Insect performance*



Variety testing: Main issues

New scientific insights into insect and rapeseed varieties interactions

Identify varietal specificity toward insect damages

Implementing sustainability criteria into performance testing

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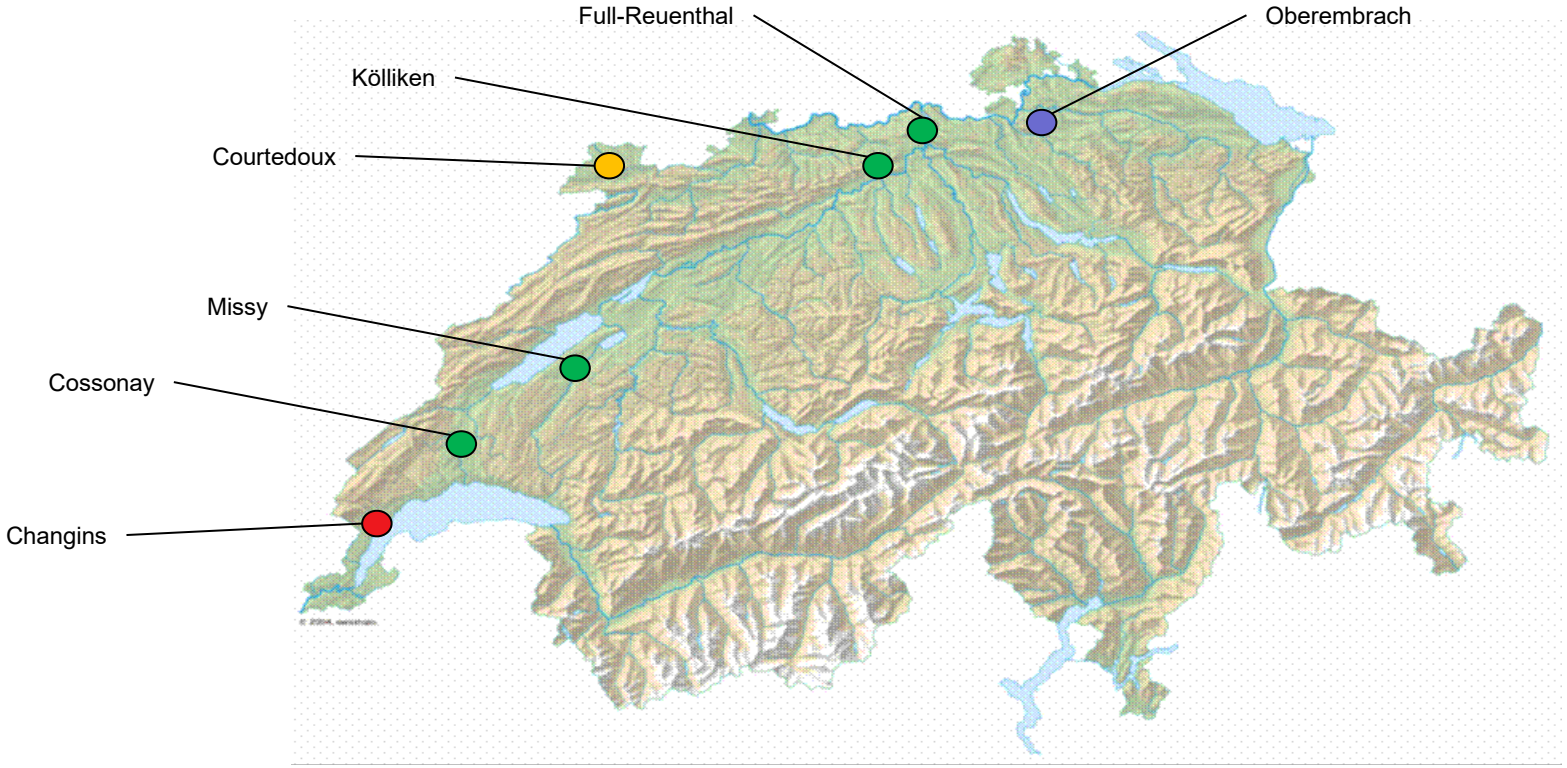
Purpose of this study

What have been the recent developments in Switzerland?

Trial network including hybrid, non-hybrid and HOLL varieties



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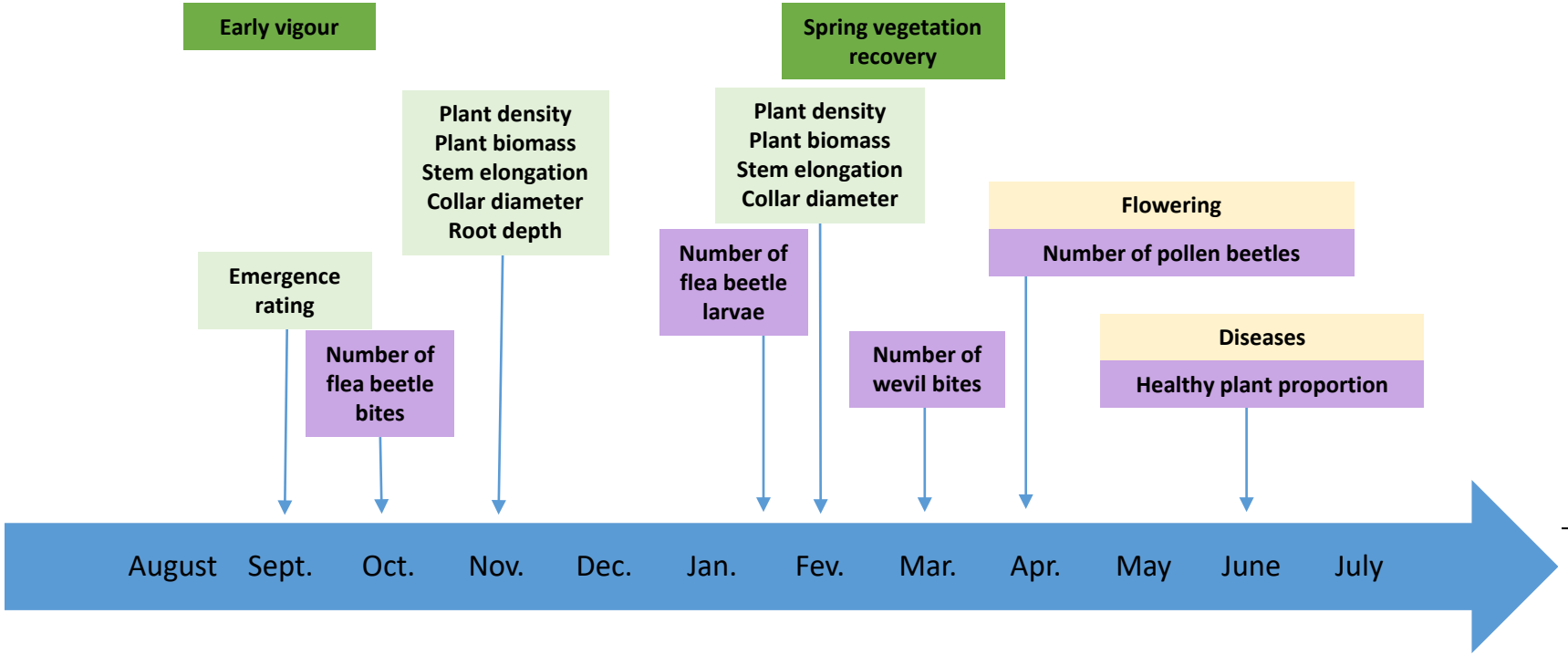
Purpose of this study

Experimental approach

On-farm research network

- Trials were analyzed together and not individually, which provides a better understanding of the specific characteristics of each variety
- Consistency of data collection methods



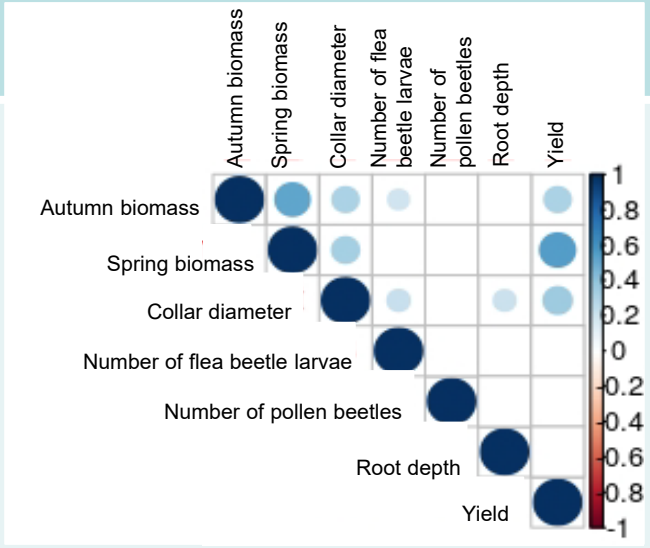
Correlations between variables

Sites :Cossonay 2022, Full 2022, Kölliken 2022, Oberembrach 2022, Full 2023, Missy 2023

Varieties : Picasso, Exlibris, V316, V386, Sammy, Vision

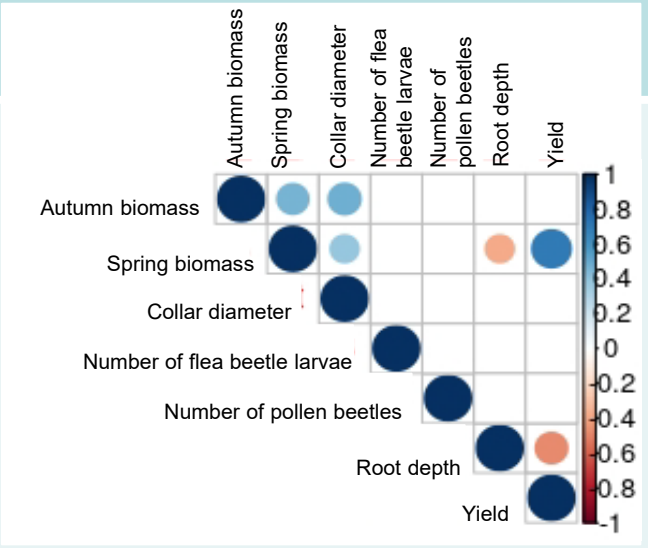
ALL VARIETIES

No correlation between plant parameters and pest numbers



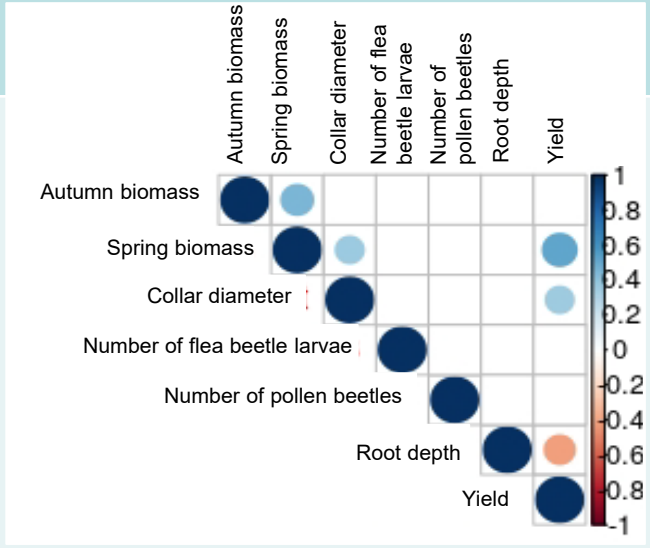
HYBRID

No correlation between plant parameters and pest numbers



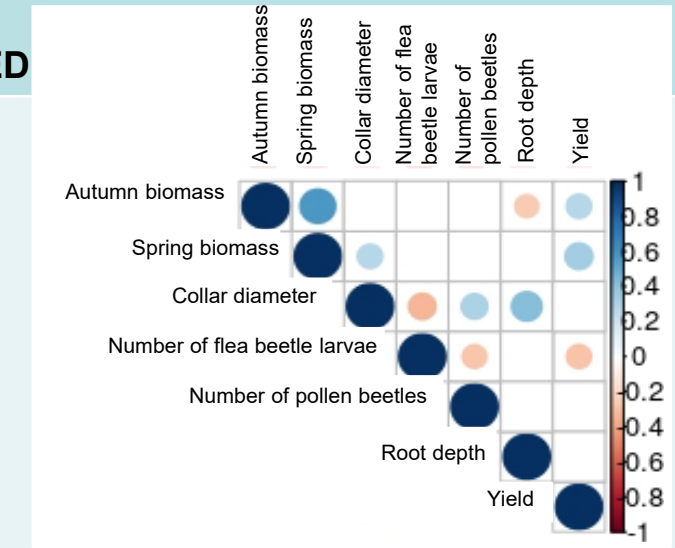
HOLL

No correlation between plant parameters and pest numbers



OPEN POLLINATED

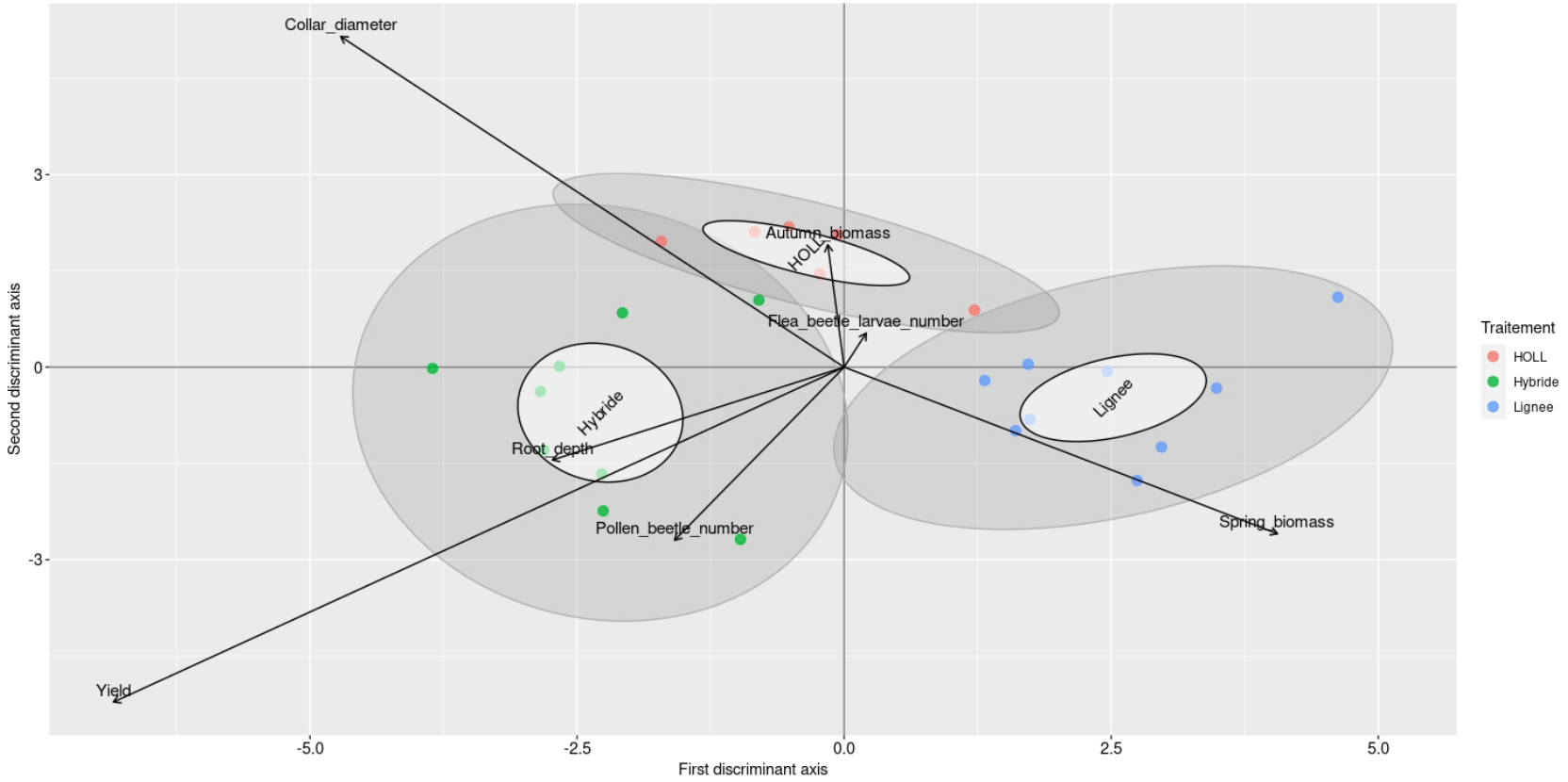
Correlations between plant parameters and pest numbers



Distinct correlations between plant parameters and pest numbers for the different type of varieties

Is it possible to discriminate groups on the basis of variety type?

Multivariate data discrimination: LDA



All types of varieties were correctly classified (proportion of corrected classification > 0.8)
Hybrid, OP and HOLL varieties are classified in distinct groups based on the measured variables

Variability within groups : site effect?
Variables with the most important effect on pest numbers?

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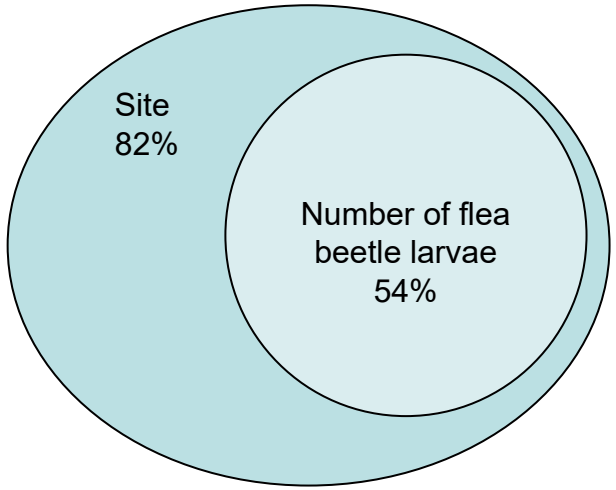
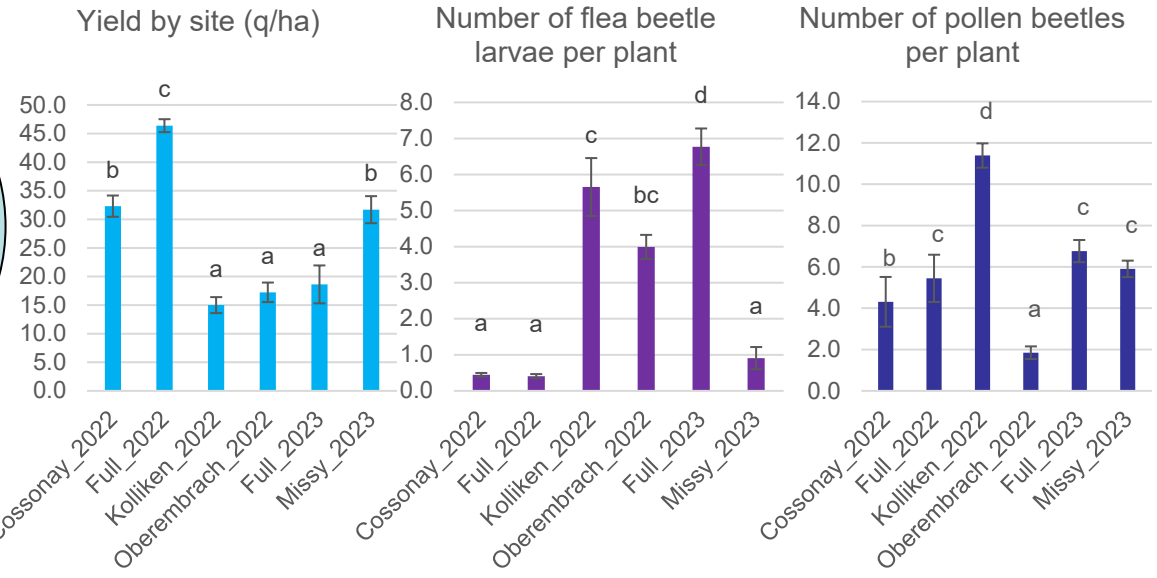
Site and pest numbers effect on yield?

Redundancy analysis: RDA





The site significantly explains 82% (p-value<0.05) of the variation in yield, of which 54% is explained by the number of flea beetle larvae (0% by the number of pollen beetles).

Variables with the most important effect on pest numbers?

Selection of explanatory variables: forward.sel

	Hybrid + HOLL + OP	Hybrid	HOLL	OP
Effect on the number of flea beetles larvae	-	-	1 - Number of pollen beetles 2 - Autumn biomass	1 - Number of pollen beetles 2 - Root depth
Effect on the number of pollen beetles	-	1 - Number of flea beetle larvae 2 - Spring biomass	1 - Number of flea beetle larvae 2 – Yield	1 - Number of flea beetle larvae 2 - Root depth

No highlighted variable for Hybrid + HOLL + OP
Distinct highlighted variables for the type of pest and the type of variety

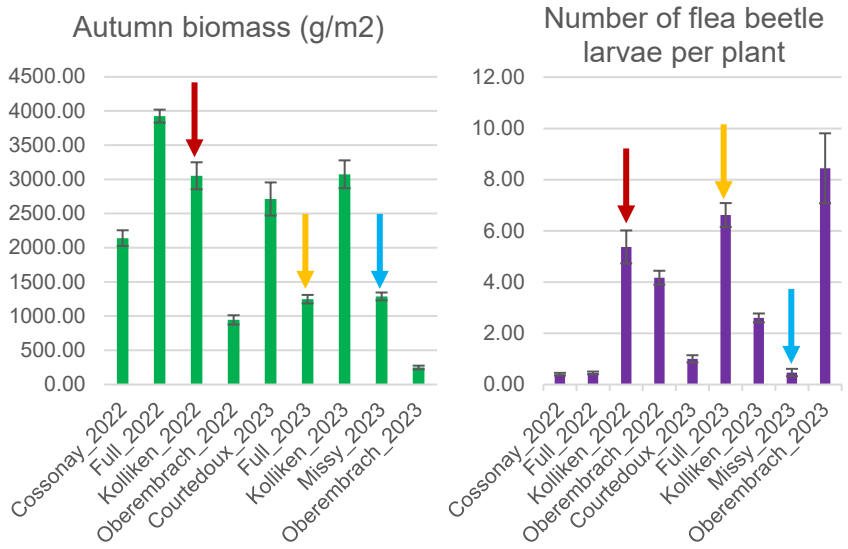
Impact of autumn biomass and root depth on the number of flea beetle larvae?
Impact of spring biomass and root depth on the number of pollen beetles?

Effect of autumn and spring biomass on pest numbers for each site?

Analysis of variance : ANOVA

Number of flea beetle larvae ~ Type of variety *Autumn biomass

Type of variety		Cossonay 2022	Full 2022	Kölliken 2022	Oberembrach 2022	Courtedoux 2023	Full 2023	Kölliken 2023	Missy 2023	Oberembrach 2023
HOLL		a	a	a	a	a	a	a	ab	a
Hybrid		a	a	ab	a	a	a	a	b	a
OP		a	a	b	a	a	a	a	a	a
Homogeneity of variance		0.601	0.713	0.069	0.348	0.114	0.341	0.116	0.076	0.114
Residuals normality		0.091	0.141	0.324	0.48	0.131	0.269	0.404	0.1	0.131
p-value	Type of variety	ns	ns	*	ns	ns	0.065	ns	**	ns
	Autumn biomass	ns	ns	ns	ns	ns	*	ns	*	ns
	Type of variety x Autumn biomass	ns	ns	ns	ns	ns	0.103	ns	*	ns

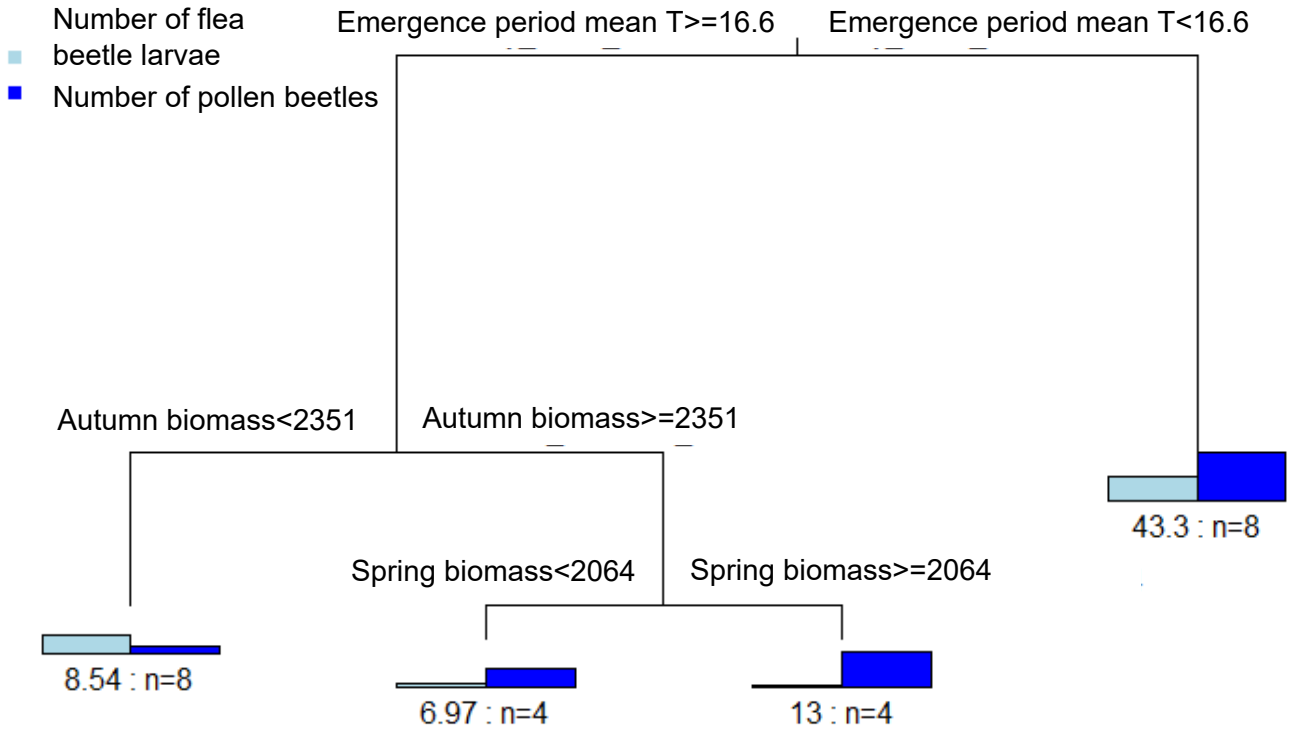


Number of pollen beetles ~ Type of variety * Spring biomass → **No significant effect**

Difficult to draw conclusions about the influence of biomass on pest numbers.

Are there any threshold effect explaining the differences between sites?

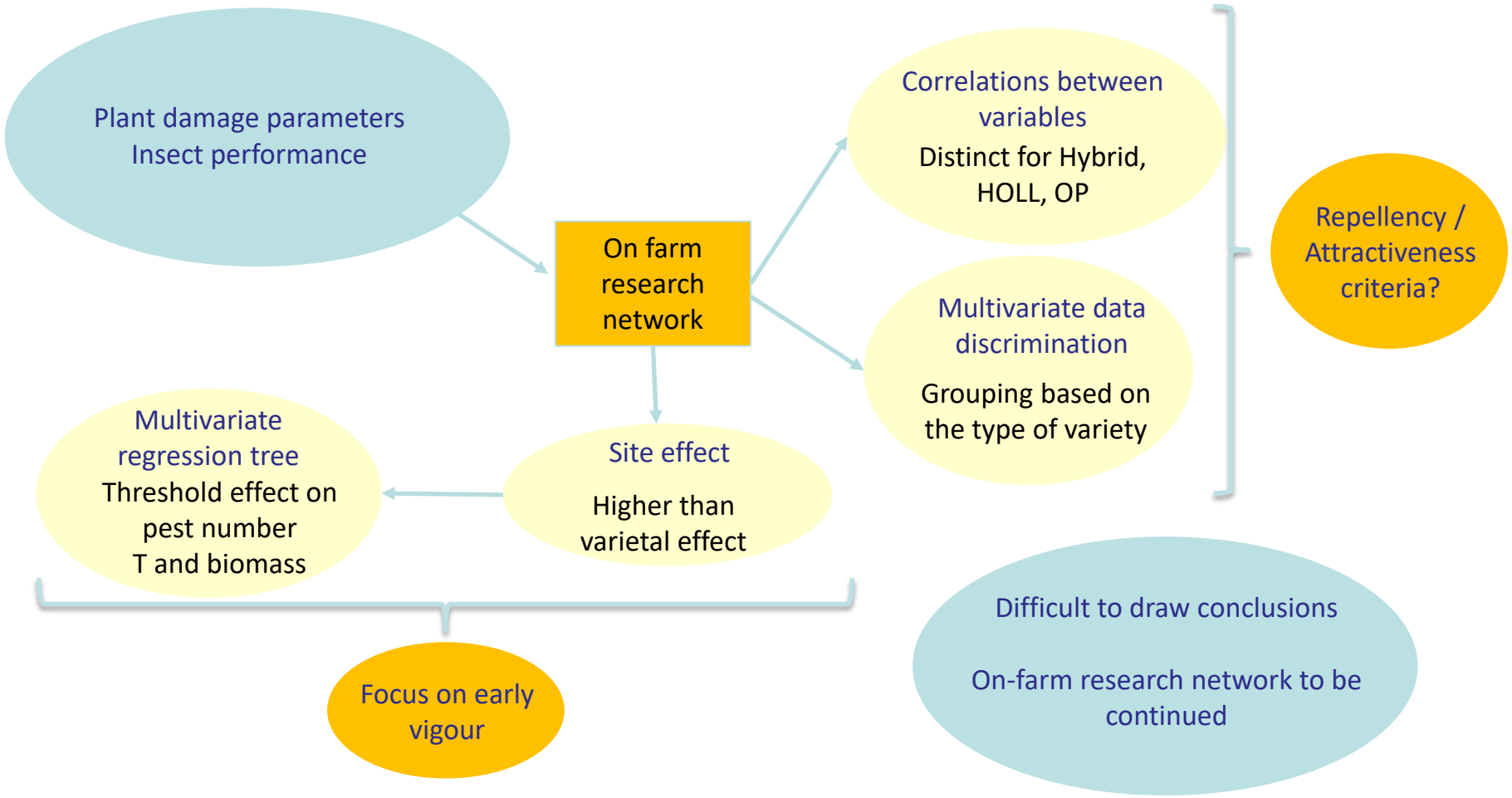
Multivariate regression tree



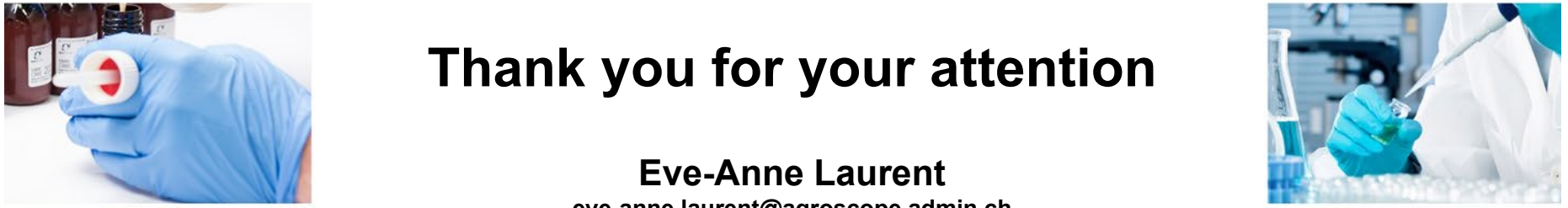
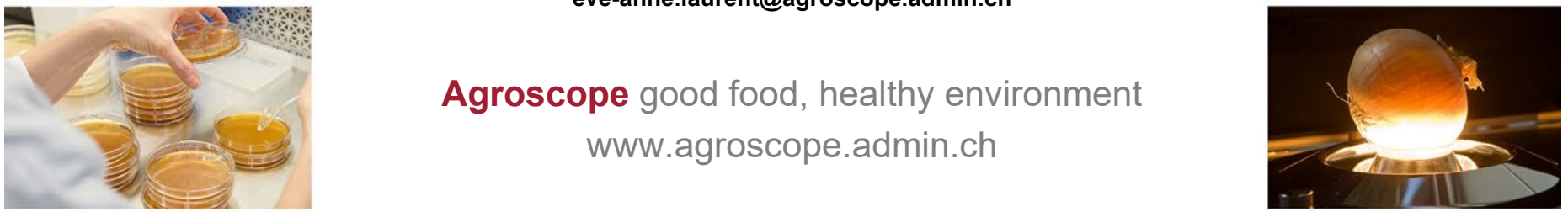
R^2=0.87

High influence of the temperature during the emergence period
Reduced number of flea beetle larvae with higher autumn biomass
Increased number of pollen beetles with higher autumn and spring biomass

Implementing sustainability criteria into performance testing





Thank you for your attention

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