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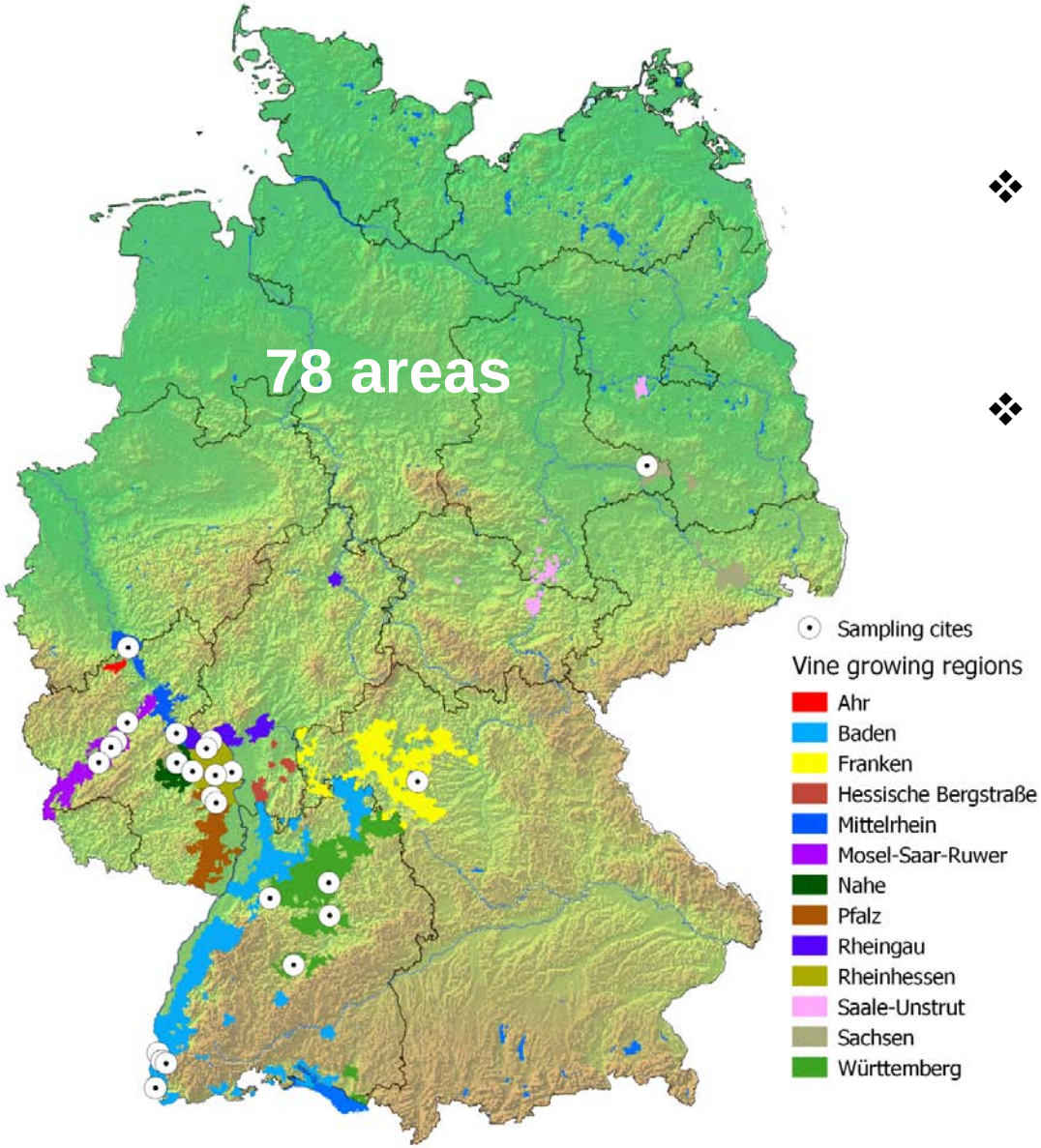
„Gibt die langjährige Anwendung von Kupfer im Rebschutz Anlass zur Sorge für Bodenorganismen?“

"Is the longstanding application of copper in vineyard protection a cause for concern for soil organisms?”

Nadine Herwig, Dieter Felgentreu & Bernd Hommel

Copper research at JKI-ÖPV



- **fate, exposition and impact** of Cu in vineyards to provide field data
- **assessment of risks of Cu on soil organisms**

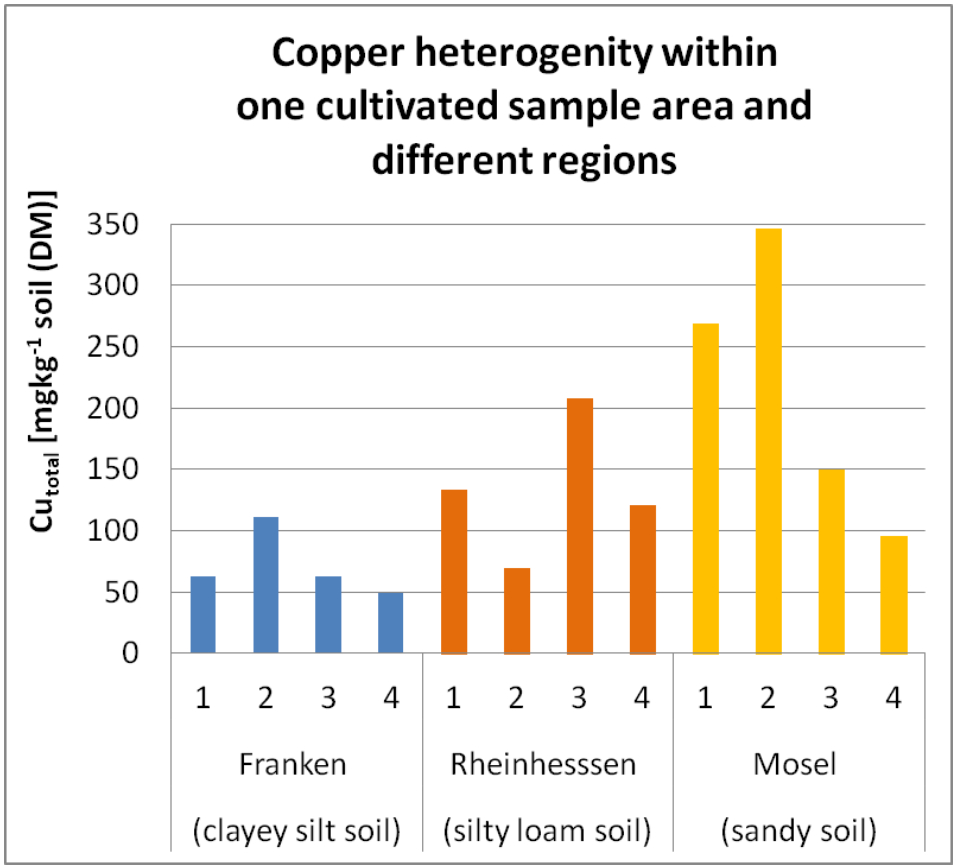
Ivestigated parameters

Soil
(pedological parameter,
metal content and mobility)

Earthworm comunities
(habitat, diversity, copper accumulation)

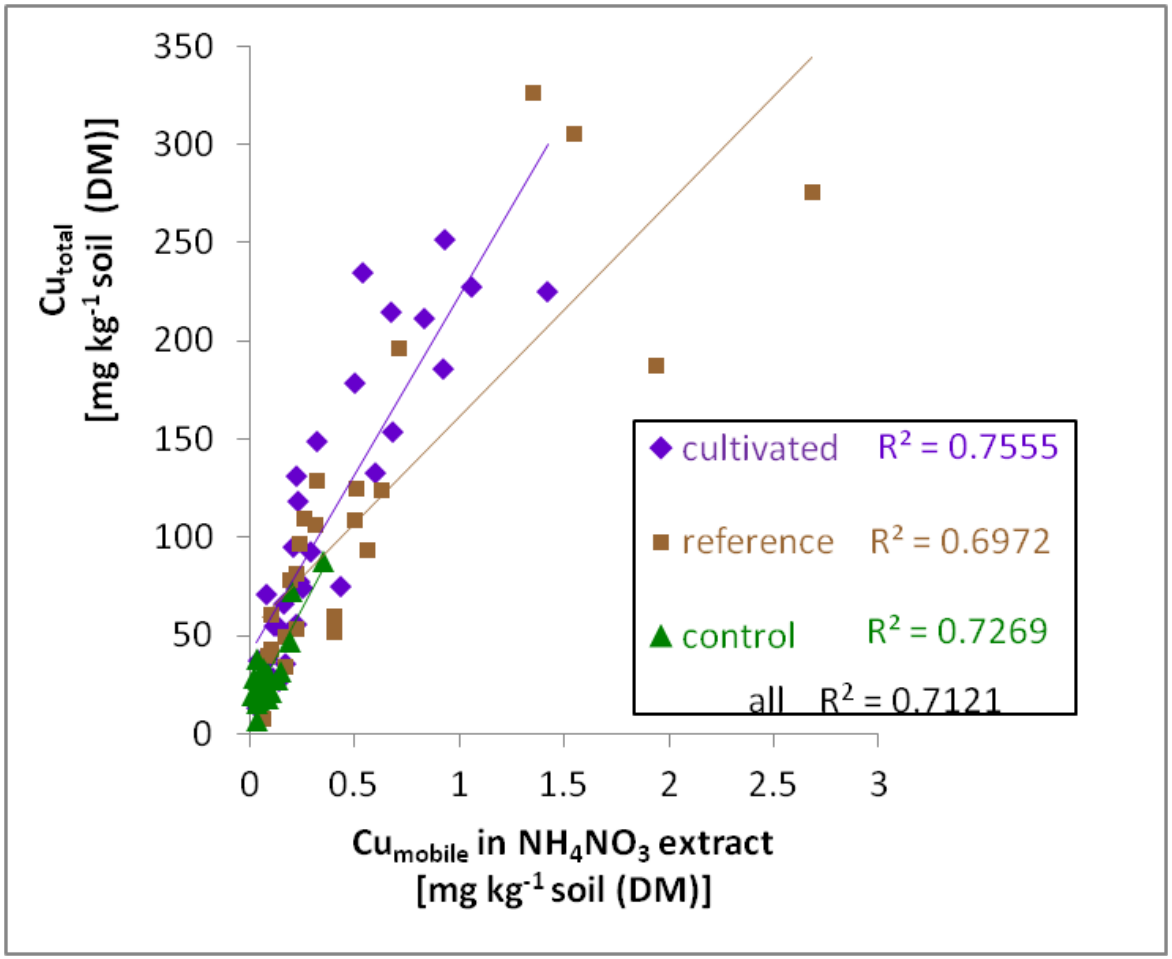
Microorganism
(sum and activity parameters)

Results of the field study - FATE



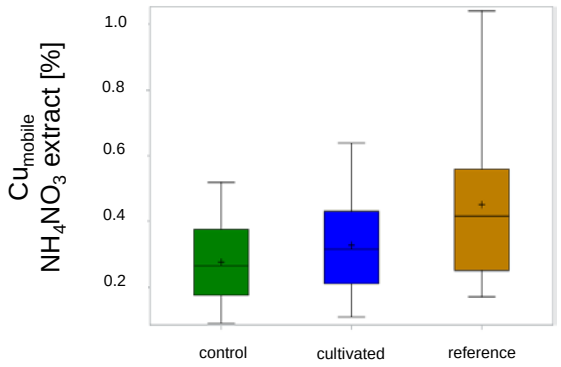
Heterogenaous copper distribution within a sampling area and between different wine growing regions

Results of the field study – Exposition

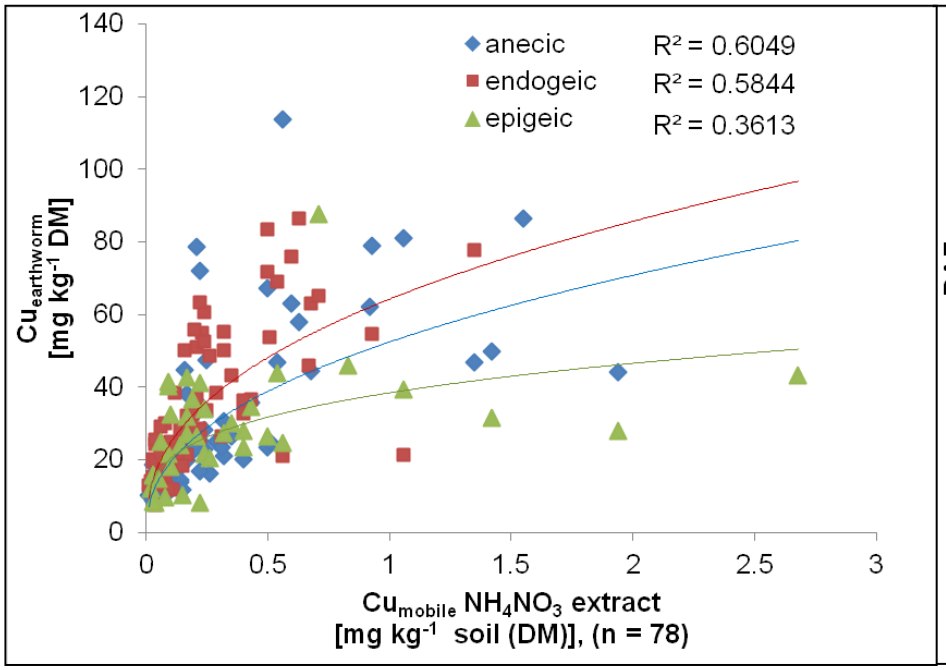


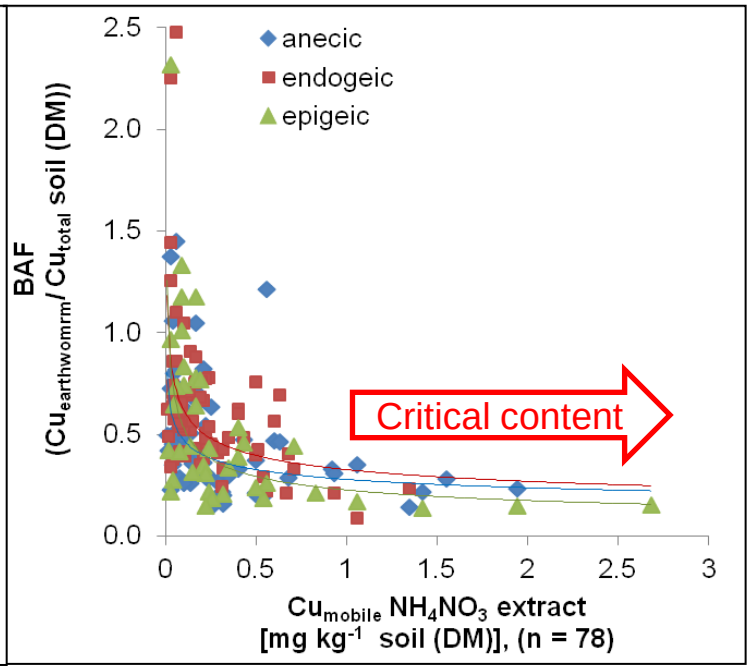
- A higher Cu_{total} content lead to higher Cu_{mobile} content in soil
- The percentage Cu_{mobile} content is less than 1%

Multifunctional relations!



Results of the field study – Impact on earthworms





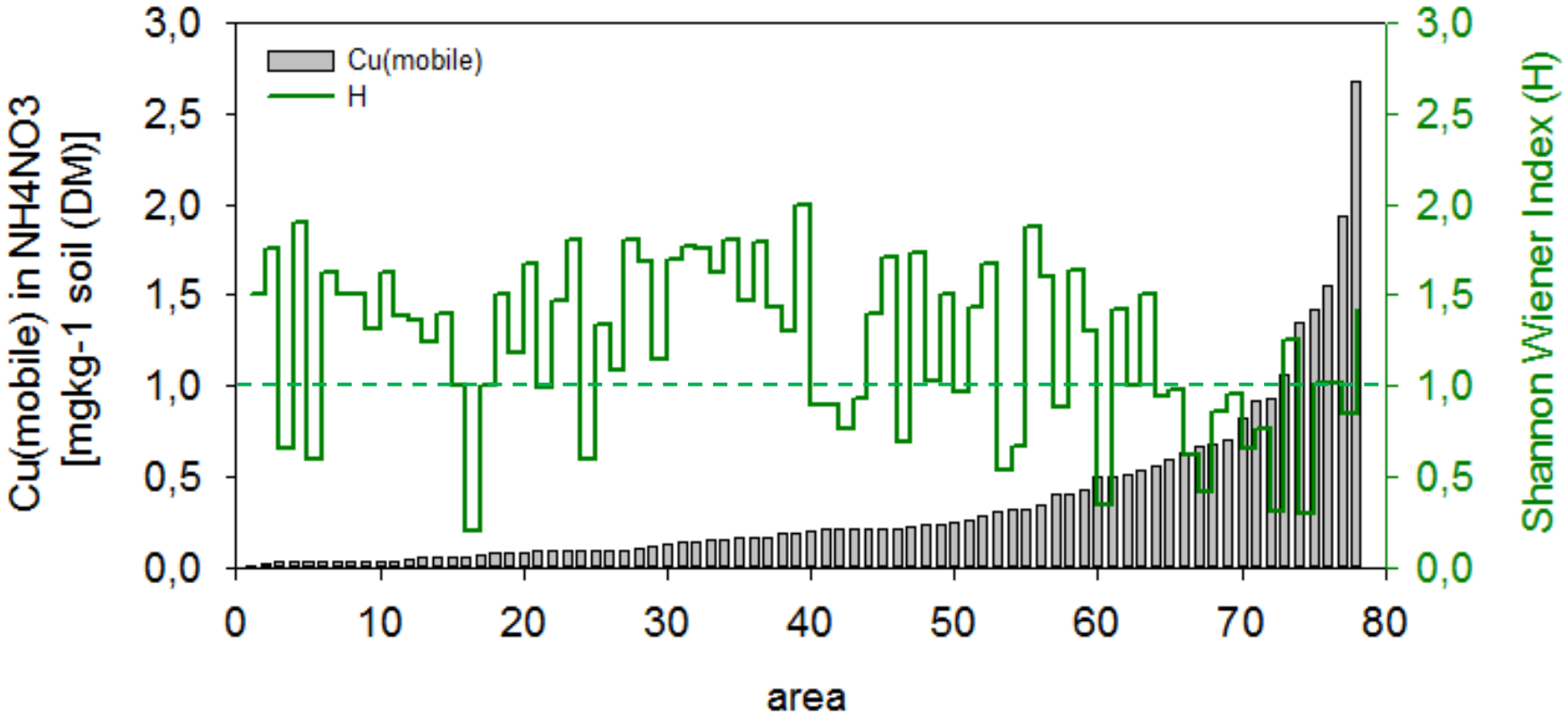
- A higer Cu_{mobile} content in soil leads to higher $Cu_{earthworm}$ content and decreasing BAF for all life forms

„LIMIT“ $Cu_{earthworm} < 87$ mg kg^{-1} DM

„critical value“ $Cu_{mobile} \geq 1$ mg kg^{-1} DM (in NH_4NO_3 extract)

Results of the field study – Impact on earthworms

Earthworm diversitiy in dependence of the Cu mobility



- Earthwom diversity (H) is independent from Cu_{mobile} in soil

Results of the field study
- Total impacts

Spearman Correlation

high		significant		moderate		low		moderate		significant		high
-1		-0.8		-0.5		-0.2		0.2		0.5		0.8	1

			Pedological parameter										Element contents									
			pH	C	N	C/N	org.S	H_2O	CEC	sand	clay	silt	Cu_{total}	Cu_{mobile}	Zn_{total}	Zn_{mobile}	Cd_{total}	Cd_{mobile}	V_{total}	V_{mobile}	Mo_{total}	Mo_{mobile}
Earthworms	epigeic	biomass																				
		abundance																				
		species number																				
	anecic	biomass																				
		abundance																				
		species number																				
	endogeic	biomass																				
		abundance																				
		species number																				
	species number (total)																					
	abundance (total)																					
	SW-Index (H)																					
Micro-organisms	qCO_2																					
	C_{mic}																					
	DHA																					

Are there any concerns of the future application of Cu PPPs?

NO!

Because our results show:

- Low Cu_{mobile} contents (< 1% of Cu_{total})
- Adapation of soil organisms (coevolutin, tolerance, resistence) in Cu altered areas
- Heterogenous copper distribution within a sampling area supports resilience of soil organism population

- Impacts due to other parameters (e.g. pedological, management, and toxic elements)

- The none-application of Cu-PPPs on contaminated areas would not lead to an ecological improvement

BUT under conditions of:

- Chemical and biological monitoring strategies for areas of concern need to be improved

- Management measures should developed to compensate negative effects of copper pesticides to soil organism

JKI

BÖLN
Bundesprogramm Ökologischer Landbau
und andere Formen nachhaltiger
Landwirtschaft

ptble
Projektträger Bundesanstalt
für Landwirtschaft und Ernährung