



SPRINT

SUSTAINABLE PLANT PROTECTION TRANSITION



Rezultati analize vzorčenja agroekosistema

doc. dr. Matjaž Glavan, Biotehniška fakulteta, Univerza v Ljubljani

E-pošta: Matjaz.glavan@bf.uni-lj.si

Vera SILVA, Wageningen University, Scientific project manager SPRINT

E-pošta: Vera.felixdagracasilva@wur.nl

Connect with us:



sprint@wur.nl



European
Commission



SPRINT

SUSTAINABLE PLANT PROTECTION TRANSITION:
A GLOBAL HEALTH APPROACH

H2020 Project
2020-2025

28 partnerjev



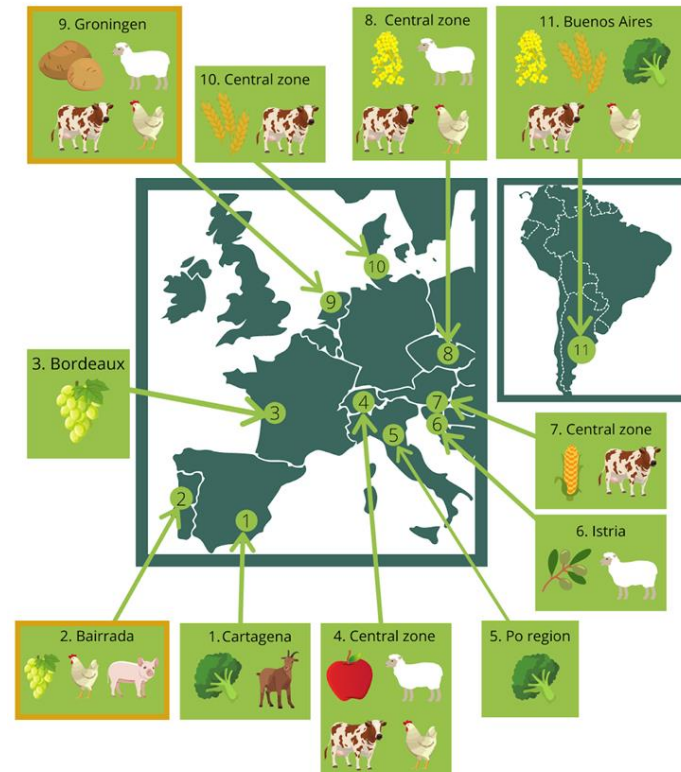
Uvod – projekt SPRINT

Cilj

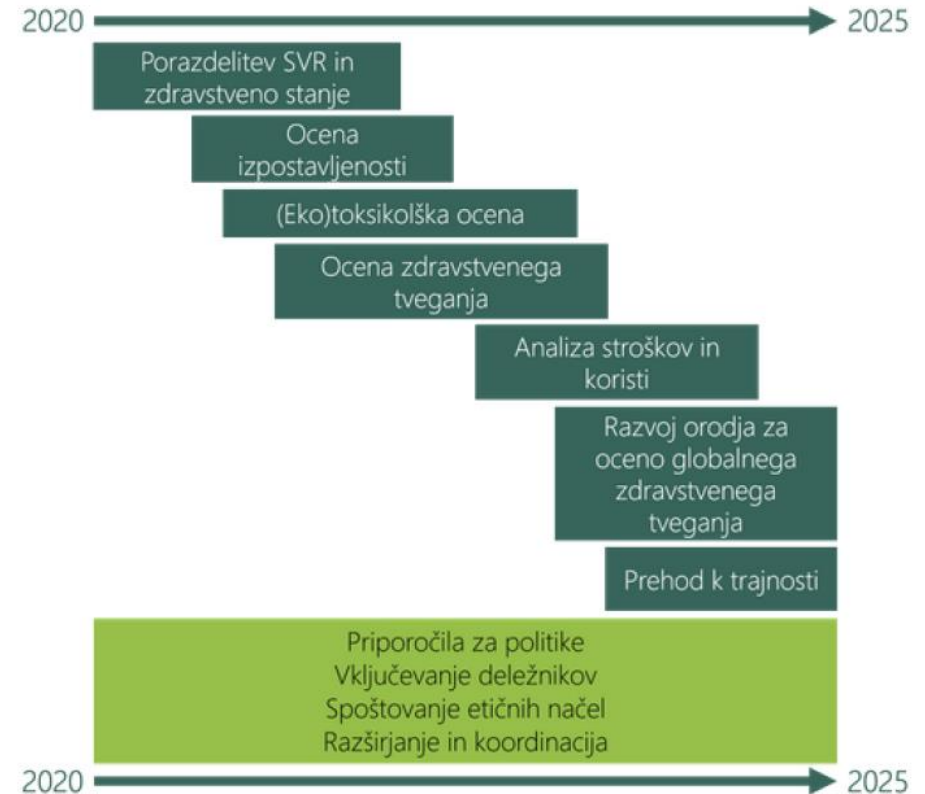
- Razviti orodje za oceno globalnega zdravstvenega tveganja (Global Health Risk Assessment Toolbox)
- Ocena učinkov FFS na okolje in zdravje ljudi
- Poti prehoda k trajnostnemu varstvu rastlin

Trajanje projekta 9/2020 – 8/2025

- 11 raziskovalnih območij
- terensko delo



ČASOVNICA KLJUČNIH REZULTATOV



SPRINT lista analiziranih FSS (junij 2021)

LC-MS/MS ESI pos	Acetamidiprid	Dimoxystrobin	Haloxyfop	Metolachlor (S)	Propamocarb	Spirotetramat
	<i>Acetamidiprid-N-desmethyl</i>	Dinotefuran	Imazalil	Metrafenone	Propaquizafop	<i>Spirotetramat-enol</i>
	Ametoctradin	Diuron	Imidacloprid	Metribuzin	Propiconazole	<i>Spirotetramat-enol-glucoside</i>
	Atrazine	Emamectin	<i>Imidacloprid (5-hydroxy)</i>	Metsulfuron-methyl	Propoxur	<i>Spirotetramat-keto-hydroxy</i>
	Azoxystrobin	Epoxiconazole	<i>Imidacloprid (desnitro-)</i>	Myclobutanil	Propyzamide	<i>Spirotetramat-mono-hydroxy</i>
	<i>Azoxystrobin-O-demethyl</i>	Ethofumesate	Indoxacarb	Napropamide (M)	Prosulfocarb	Spiroxamine
	Bixafen	Famoxadone	iprovalicarb	Nicosulfuron	<i>Prothioconazole desthio</i>	Tebuconazole
	Boscalid	Fenbuconazole	isoproturon	Oryzalin	Pymetrozine	Terbutylazine
	Carbendazim	Fenhexamid	Isoxaben	Oxadixyl	Pyraclostrobin	<i>Terbutylazine-desethyl</i>
	Chlorantraniliprole	Fenoxycarb	Isoxaflutole	Oxyfluorfen	Pyraflufen-ethyl	Terbutryn
	Chlorotoluron	Fenpropidin	Lenacil	Penconazole	Pyrethrin I	Tetraconazole
	Clomazone	Fenpropimorph	Linuron	Pencycuron	Pyrethrin II	Thiabendazole
	Clothianidin	Flazasulfuron	Mandipropamid	Pendimethalin	Pyrimethanil	Thiacloprid
	Cyantraniliprole	Fonicamid	Metalaxyl (M)	penoxulam	<i>Pyrimethanil_M605F002</i>	Thiamethoxam
	Cyflufenamide	Florasulam	<i>Metalaxyl CGA 62826</i>	Phosmet	Pyriofenone	Thiencarbazone-methyl
	cymoxanil	Flufenacet	Metamitron	<i>Phosmet oxon</i>	Pyriproxyfen	Thiophanate-methyl
	Cyproconazole	Fluopicolide	<i>Metamitron-desamino</i>	Phoxim	Pyroxsulam	<i>Tolyfluanid DMST</i>
	Cyprodinil	Fluopyram	Metazachlor	Piperonyl butoxide	Quinoxifen	Tri-allate
	<i>Cyprodinil CGA304075</i>	<i>Fluopyram benzamide</i>	Metconazole	Pirimicarb	Quizalofop	Tricyclazole
	Difenoconazole	Fluoxastrobin	Methabenzthiazuron	Pirimiphos-methyl	Rimsulfuron	Trifloxystrobin
Diflufenican	Flupyradifurone	Methiocarb	<i>Pirimiphos-methyl DEAMPY</i>	Sedaxane	<i>Trifloxystrobin CGA 321113</i>	
<i>Diflufenican AE-B107137</i>	Flusilazole	<i>Methiocarb sulfon</i>	<i>Pirimiphos-methyl-N-desethyl</i>	Spinetoram	zoxamid	
Dimethenamid (P)	Flutolanil	<i>Methiocarb sulfoxide</i>	Prochloraz	Spinosyn A		
Dimethoate	Fluxapyroxad	Methoxyfenozide	<i>Prochloraz BTS 44596</i>	Spinosyn D		
Dimethomorph	Foramsulfuron	Metobromuron	Prometryn			
LC-MS/MS ESI neg	2,4-D (free)	<i>Chlorothalonil 4-OH</i>	Fipronil	Fludioxonil	Meptyldinocap	<i>Pirimicarb desmethyl-</i>
	Bentazone	<i>Chlorpyrifos/-methyl: TCPy</i>	<i>Fipronil sulfone</i>	Fluroxypyr	<i>Meptyldinocap phenol</i>	<i>Pirimiphos-methyl-desmethyl</i>
	<i>Bixafen desmethyl</i>	<i>chlorpyrifos-methyl-desmethyl</i>	Fluazifop	MCPA	<i>Metolachlor ESA</i>	
	Bromoxynil		Fluazinam	Mecoprop	<i>Metolachlor OA</i>	
GC-MS/MS	bifenthrin	Cyfluthrin (beta-cyfluthrin)	DDE, o,p'	Dieldrin	lambda-Cyhalothrin	
	captan THPI (1,2,3,6-tetrahyd	Cypermethrin	DDT o,p'	Esfenvalerate	Lindane (gamma-HCH)	
	Chlorpropham	DDD o,p'	DDT p,p'	Fenvalerate	Permethrin	
	Chlorpyrifos	DDD p,p'	Deltamethrin	folpet PHI (Phthalimide, CAS: 85-4	tau-Fluvalinate	
	Chlorpyrifos-methyl	DDE p,p'	Dicloran	Hexachlorobenzene	Tetramethrin	
SRM	glyphosate	AMPA				

**v naboru
164 pesticidov
43 metabolitov**

Italic: metabolites

Vzorčevanje: poletje 2021

Study protocol: Silva et al. 2021



Environmental samples:

10 x conventional, 10 x organic fields (from 12-20 farms) per case study site

 Soil samples - 1 per field (20/CSS)	 Water samples - 3-6 per CSS	 Plant samples - 1 per field (20/CSS)
 Sediment samples - 3-6 per CSS	 House dust samples - 1 per farmer household (12-20/CSS)	 Outdoor dust samples - 2 per CSS
 Fish samples - 3-6 per CSS	 Macroinvertebrate samples - 3 per CSS	 Earthworm samples (10 per field) - 200 per CSS
 Insect traps (3 repetitions in 10 farms) = 30 per CSS	 Bat faecal samples 3-5 per CSS	 Flying insects (3 repetitions in 10 farms) = 30 per CSS

Biological samples:

6 x conventional, 6 x organic fields (from 12-20 farms) per case study site

	Sheep, cattle, dairy or goats:
 Urine samples - 3 per farm	 Faecal samples - 3 per farm
 Blood samples - 3 per farm	 Wristbands - 3 per farm
 Feed samples - 1 per farm	 Milk samples - 1 per farm
 Cats	 Faecal samples - 1 per farm

Human subjects:

Farmers:
12 conventional, 12 organic
Neighbours:
12 conventional, 12 organic
Consumers:
12 conventional, 12 organic

 Nasal swab - 1 per participant	 Blood samples - 1 per participant
 Urine samples - 1 per participant	 Stool samples - 1 per participant
 Food and drink sample - 1 per participant	 Wristbands - 1 per participant

Raziskovalno območje Osrednja Slovenija – Koruza

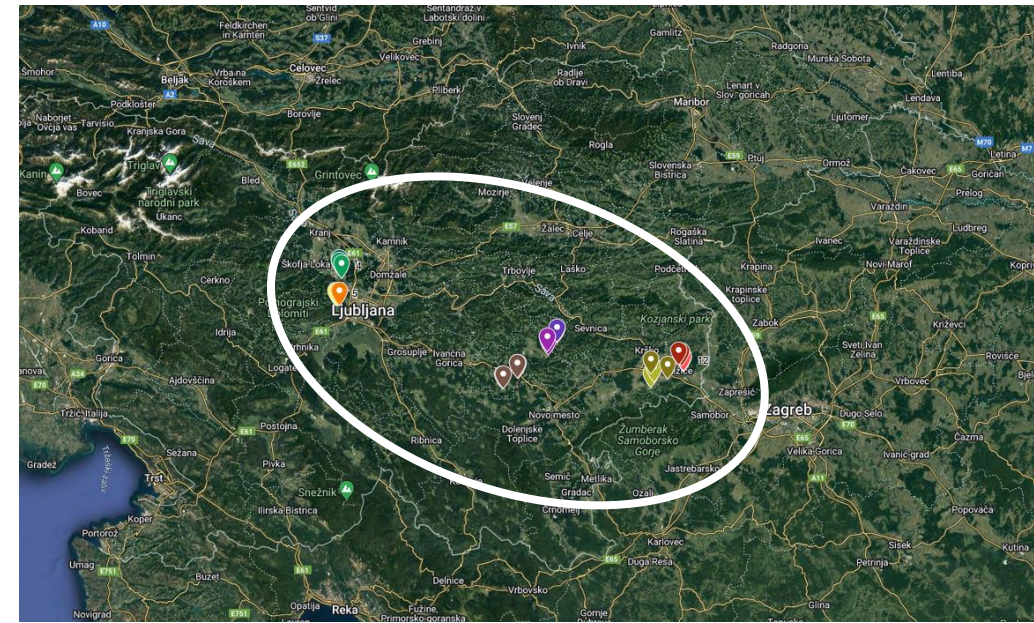


- 12 kmetij (6 konvencionalnih in 6 ekoloških)

- ✓ tla – sedimenti - voda – zrak
- ✓ krave – mačke – netopirji - insekti – ribe
- ✓ deževniki – nevretenčarji
- ✓ krma za krave
- ✓ pridelki

- Kmetje, sosedje, potrošniki (n=72, 36 moških in 36 žensk)

- ✓ kri – blato – urin – bris nosne sluznice – zapestnice
- ✓ Hišni prah
- ✓ hrana 24 ur (n=6)
- ✓ vprašalniki (obnašanje, prepričanja, delovanje)

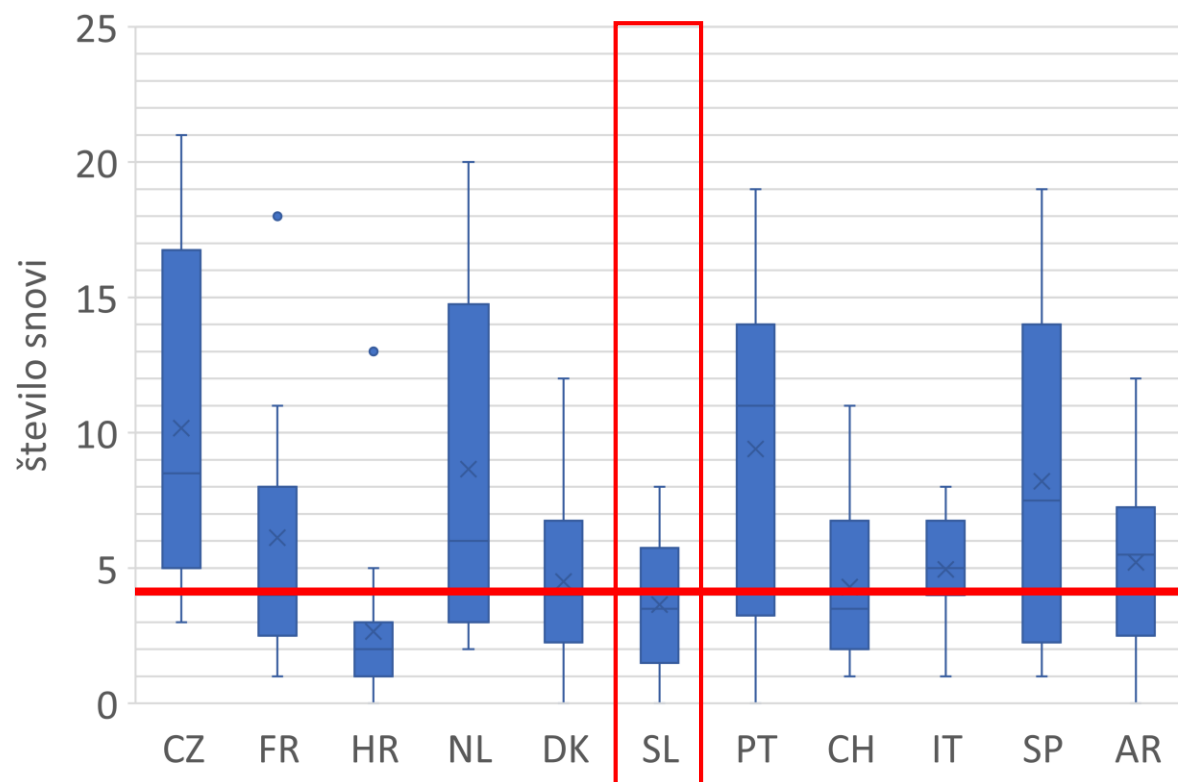


TLA – projekt SPRINT

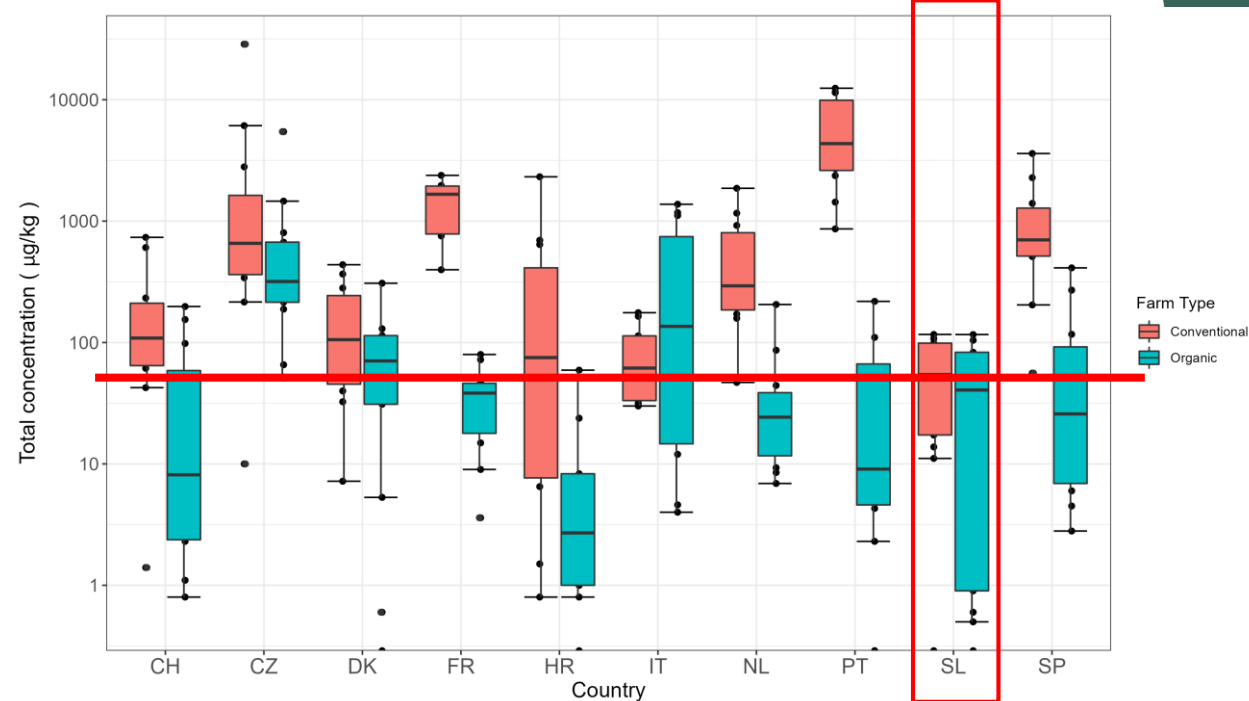
SLO: 0-8 snovi/vzorec

SPRINT: 0-21

Število snovi v tleh



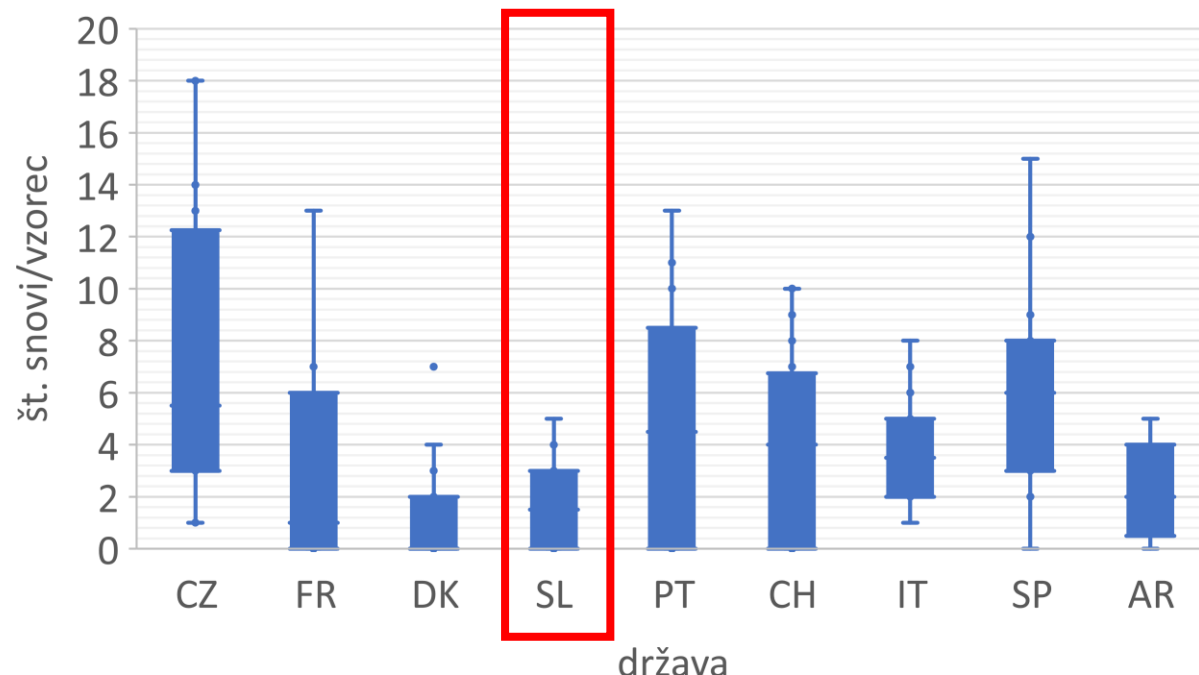
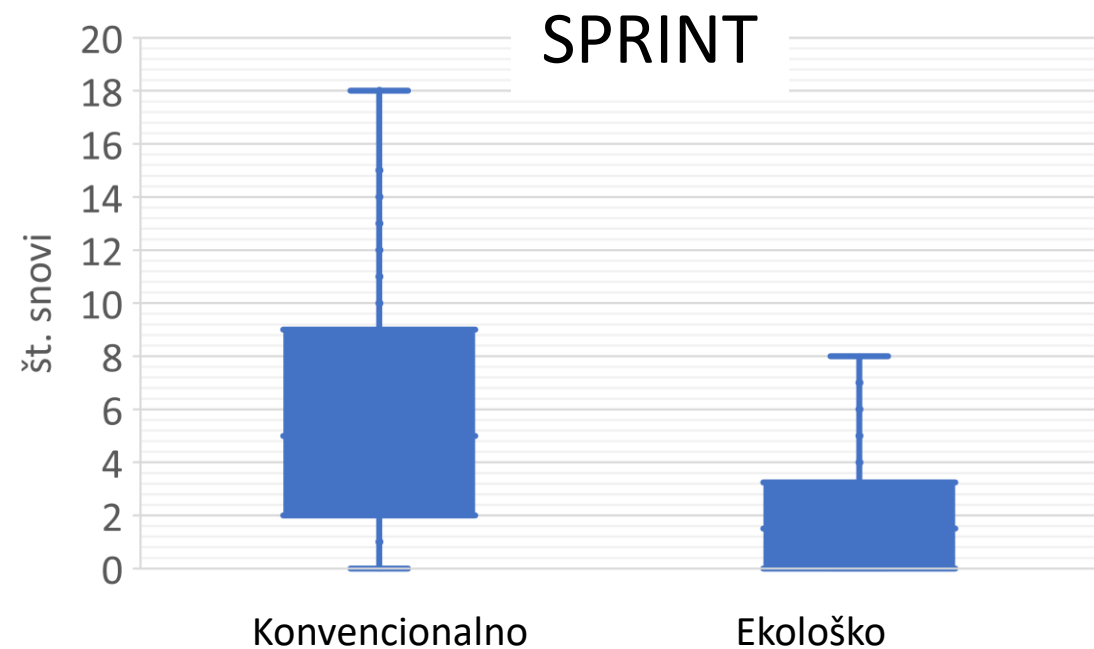
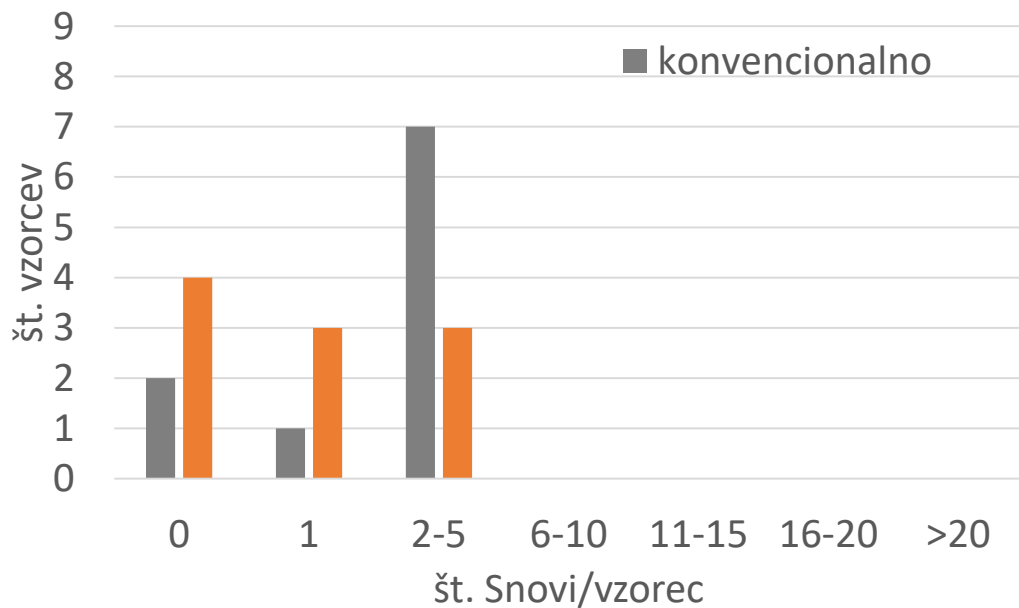
Skupna vsebnost snovi v tleh



Deževniki - Slovenija

ekološko : konvencionalno

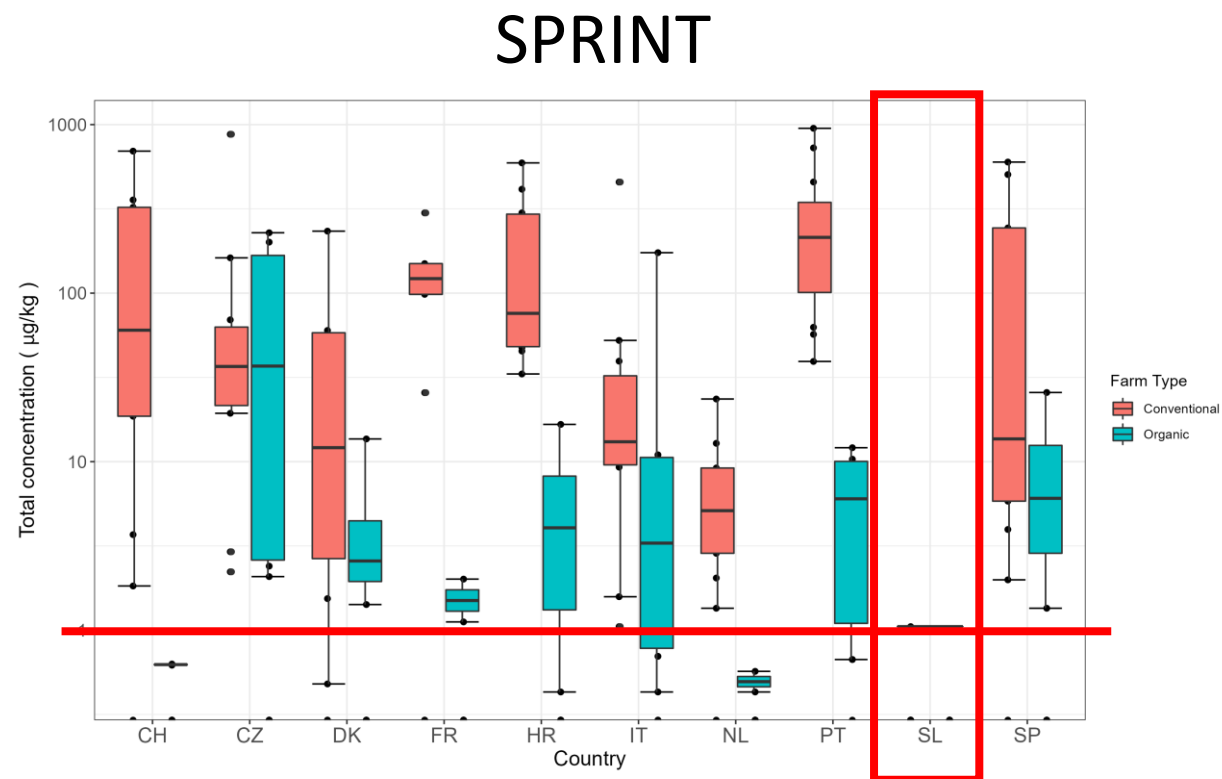
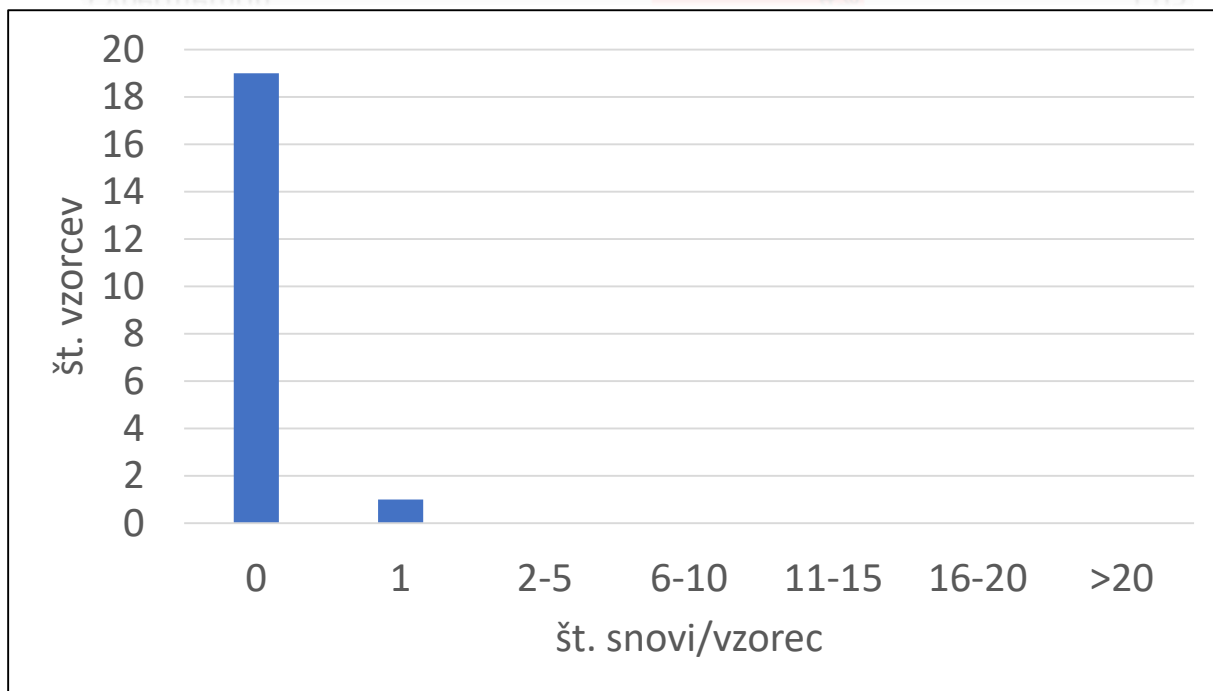
	KONV	EKO
Skupno število	10	4
Povprečno št. ostankov/vzorec	3	1
min št. ostankov/vzorec	0	0
max št. ostankov/vzorec	5	3



Rastline – Slovenija , projekt

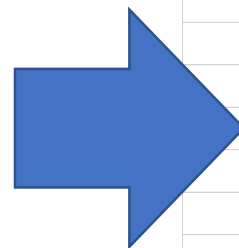
- 20 vzorcev koruzno zrnje
- **SLO: 1 snov zaznana**/192 testiranih (v konvencionalnem vzorcu)
- SPRINT: 0-18 snovi

compound	frequency (%)	concentration (ug/kg)
Cypermethrin	4%	1.05

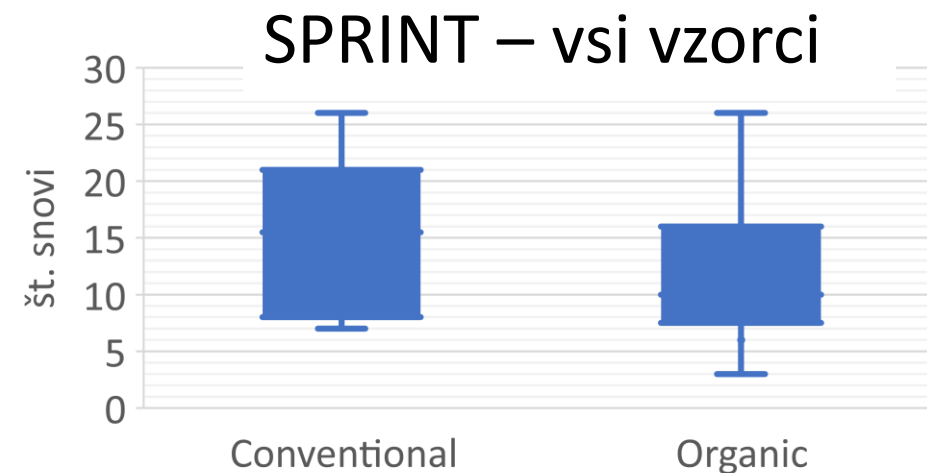
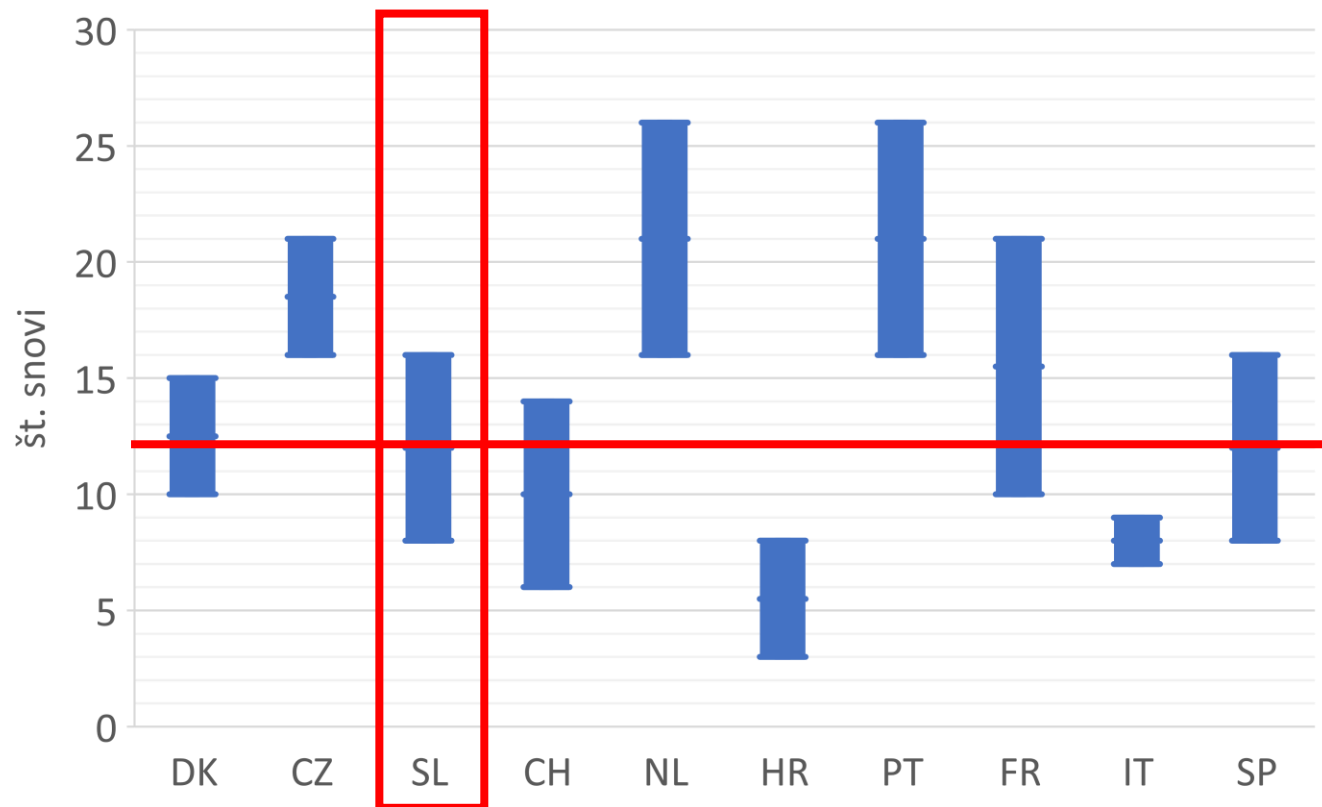


Delci v zraku – veter - TIEM

- 2 vzorčni mesti (postavljeni na njivah)
- 17 snovi zaznanih/160 testiranih
- SLO: Konv - 21 snovi; Eko: 16 snovi
- SPRINT: Konv: 6-26; Eko: 3-26



		Medvode	Brežice
		Konvencionalno	Ekološko
	compound	ng/sampler	ng/sampler
1	Terbutylazine_desethyl	12.5	15.7
2	Terbutylazine	22.4	21.9
3	Prosulfocarb	23.3	-
4	Pendimethalin	32.3	87.4
5	Folpet	36.1	189
6	Glyphosate	47.3	25
7	Folpet_PHI	77.5	92.2
8	Metolachlor_S	209.2	176.1
9	AMPA	-	8.1
10	Spirotetramat	-	12.3
11	Tetraconazole	-	13
12	Metalaxyl_M	-	14.6
13	Cyprodinil	-	21.4
14	Tebuconazole	-	24.2
15	Fenpropimorph	-	28.9
16	Pirimicarb	-	33.7
17	Prothioconazole_desthio	-	44.9

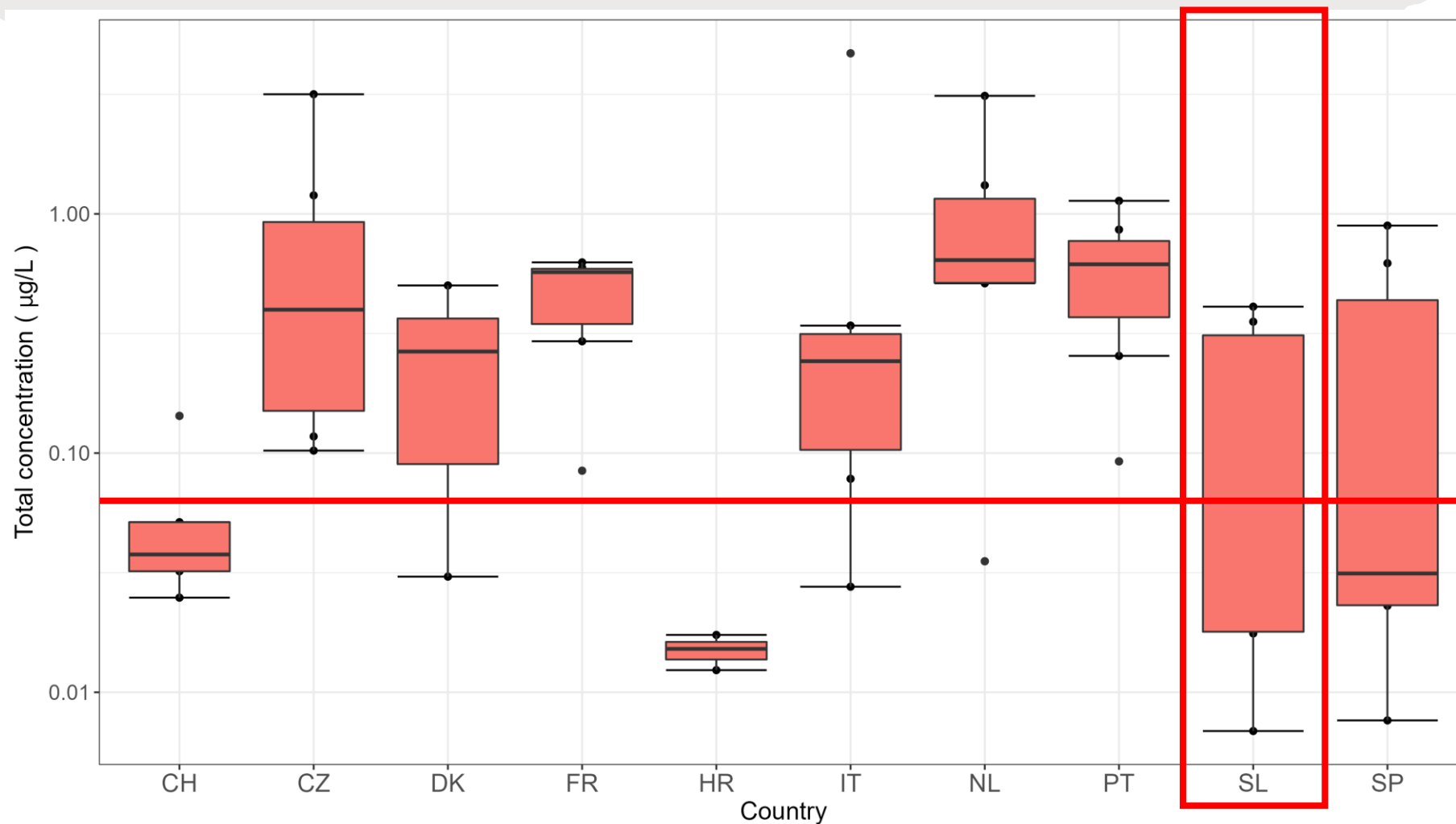


Površinske vode - SPRINT

SLO:

32 snovi zaznanih/193 analiziranih (17%)

Skupna vsebnost snovi (Total concentration—Water)



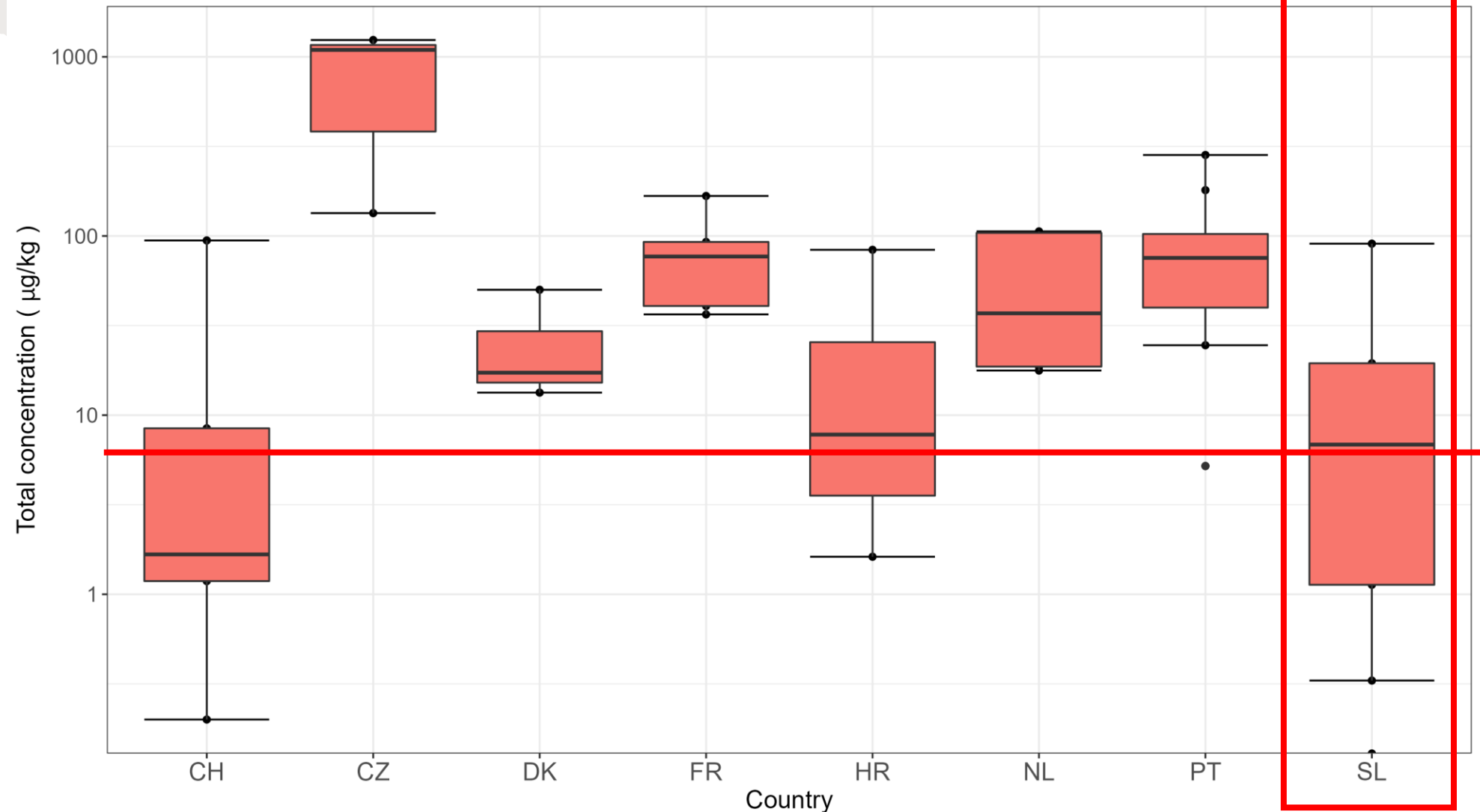
Sediment površinskih voda -

SLO: 8 snovi zaznanih/196 analiziranih (4%)

- SLO: 0-6 snovi/vzorec

- SPRINT: 0-48 snovi/vzorec

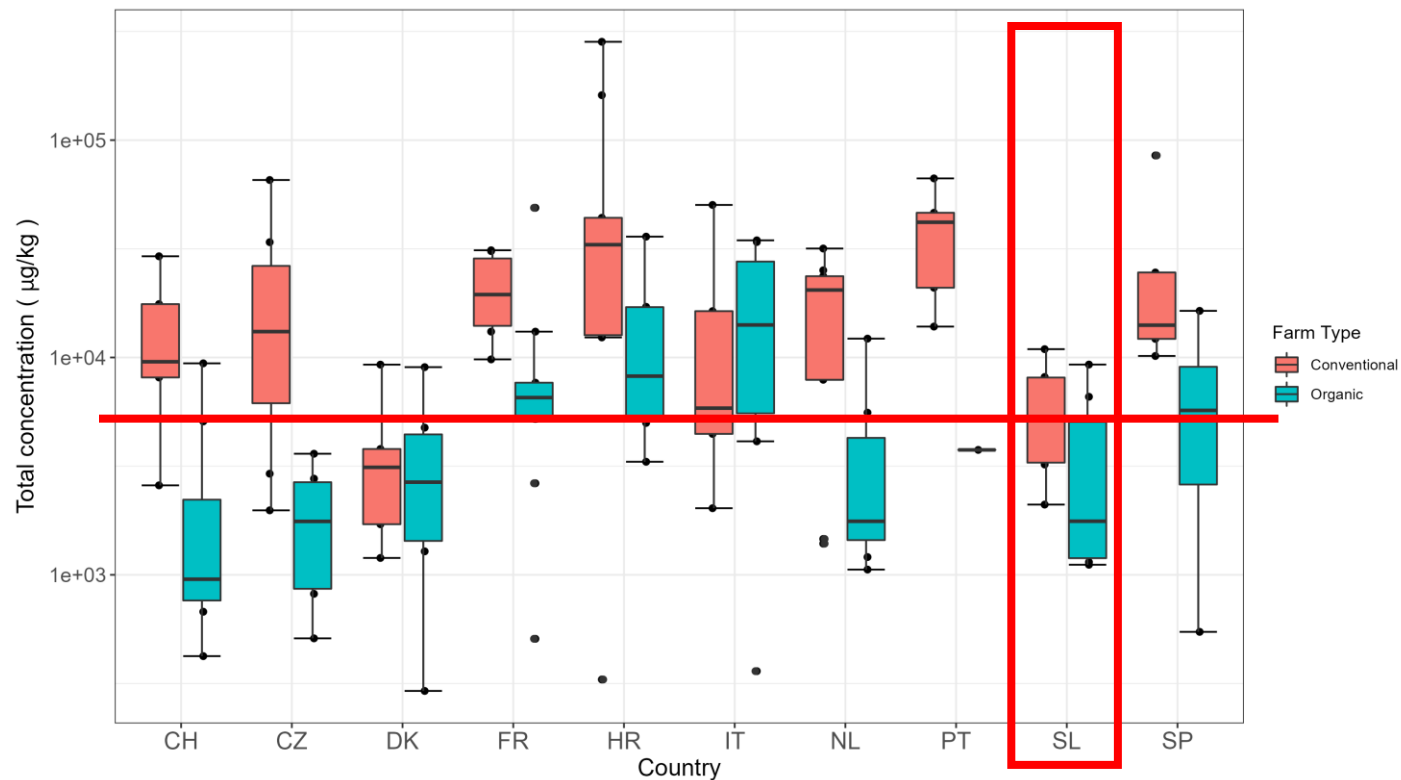
Skupna vsebnost (Total concentration—Sediment)



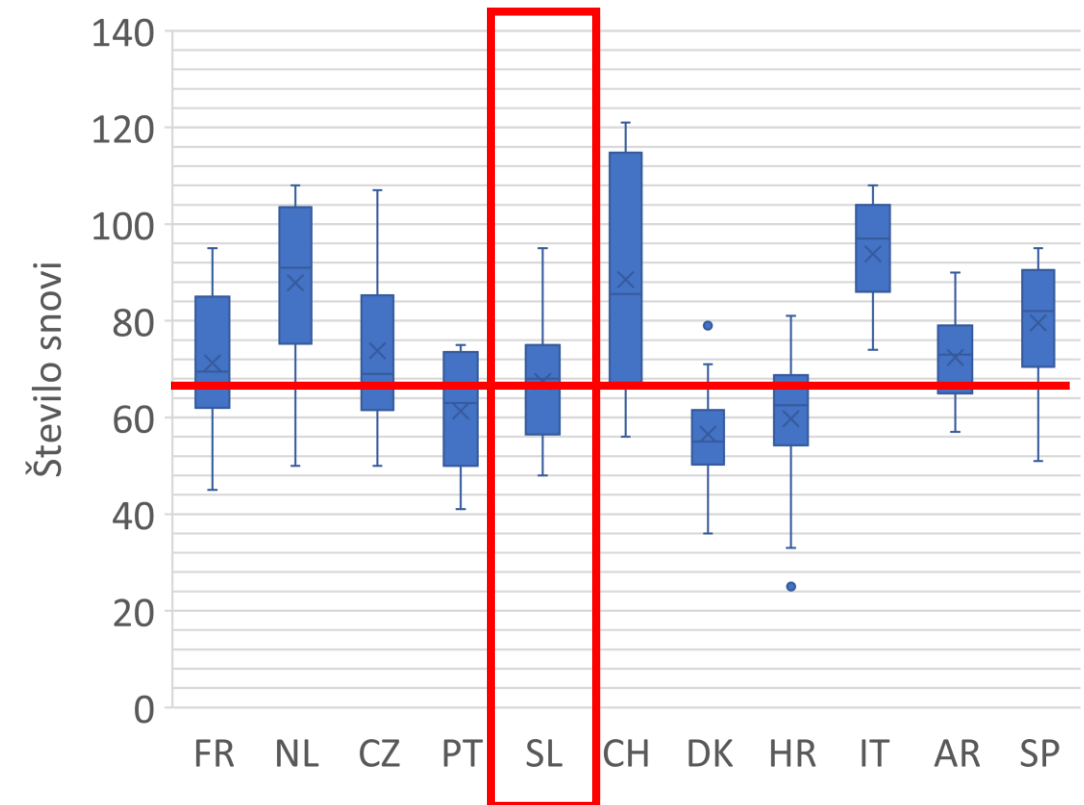
Hišni prah – kmetije - SPRINT

SLOVENIJA	KONV	EKO
Skupno število	141	105
Povprečno št. ostankov/vzorec	76	59
min št. ostankov/vzorec	68	48
max št. ostankov/vzorec	95	75

Skupna vsebnost snovi

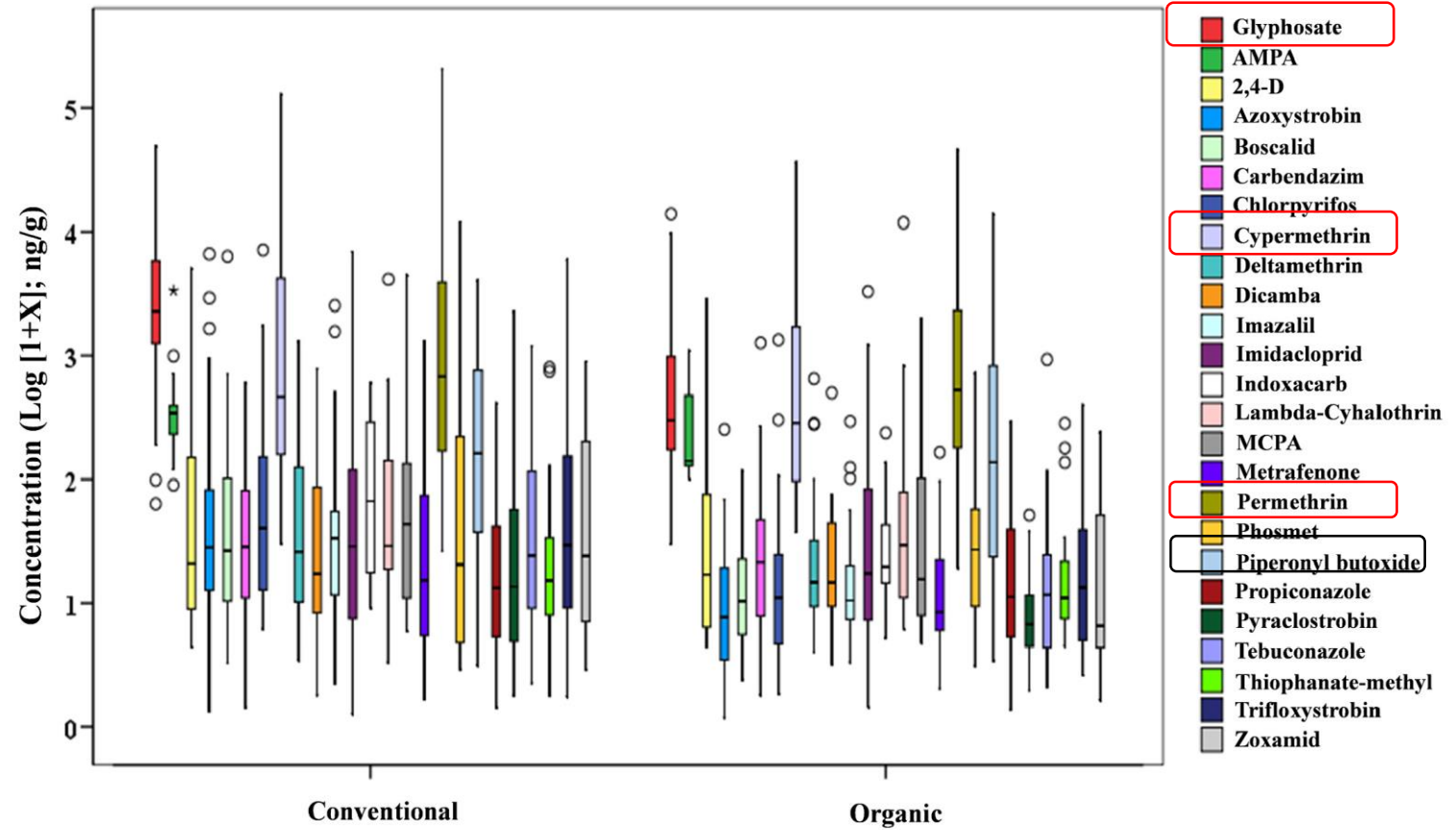
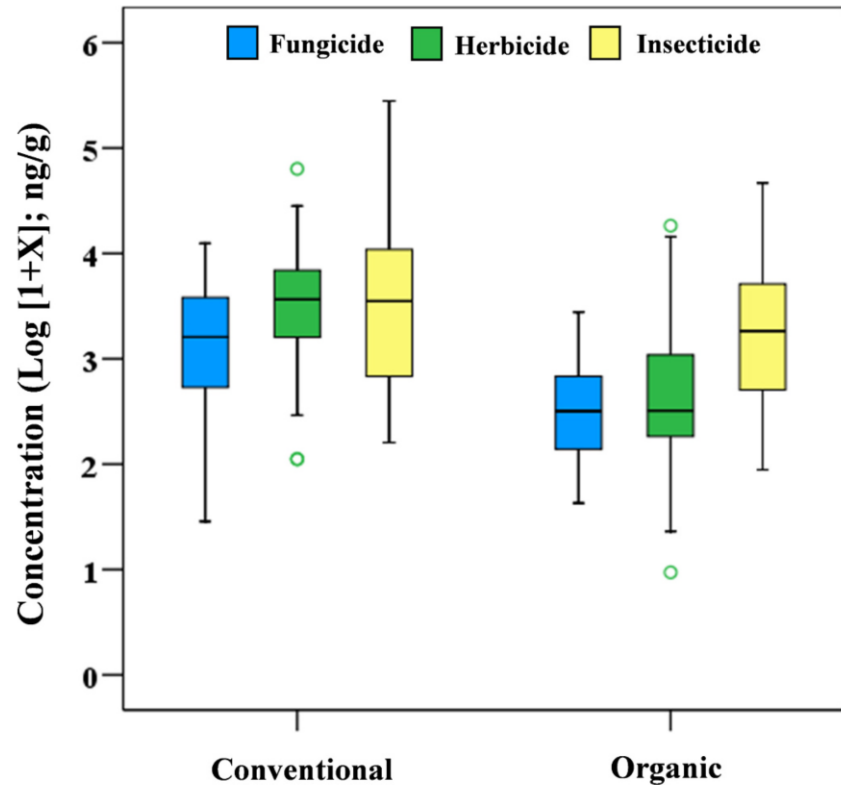


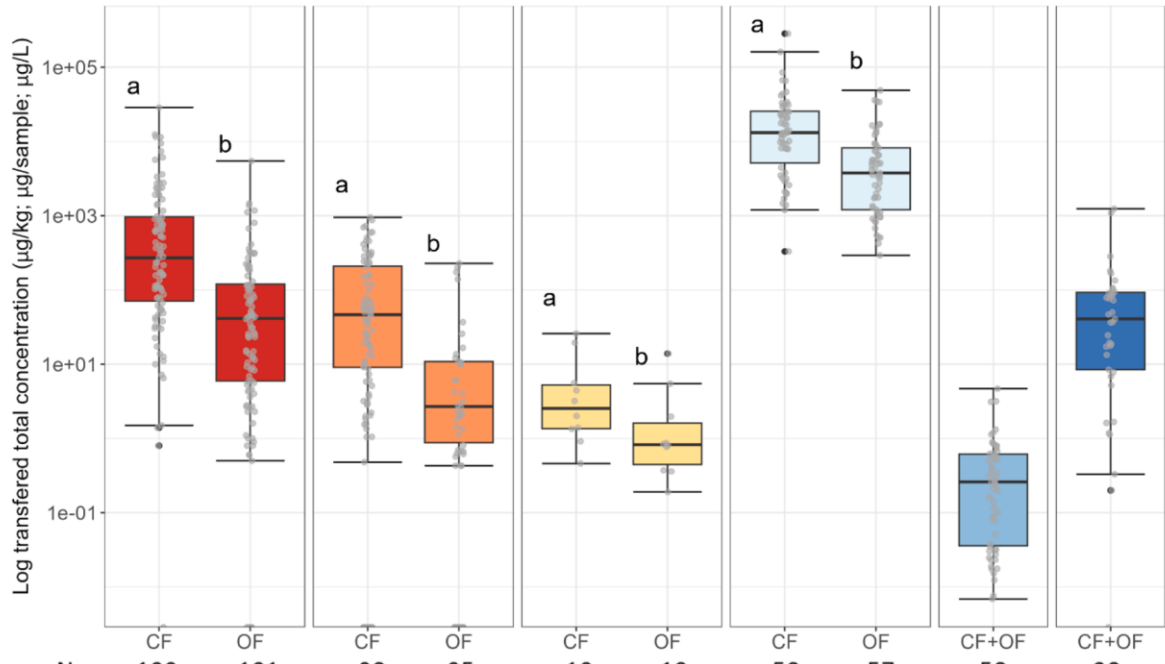
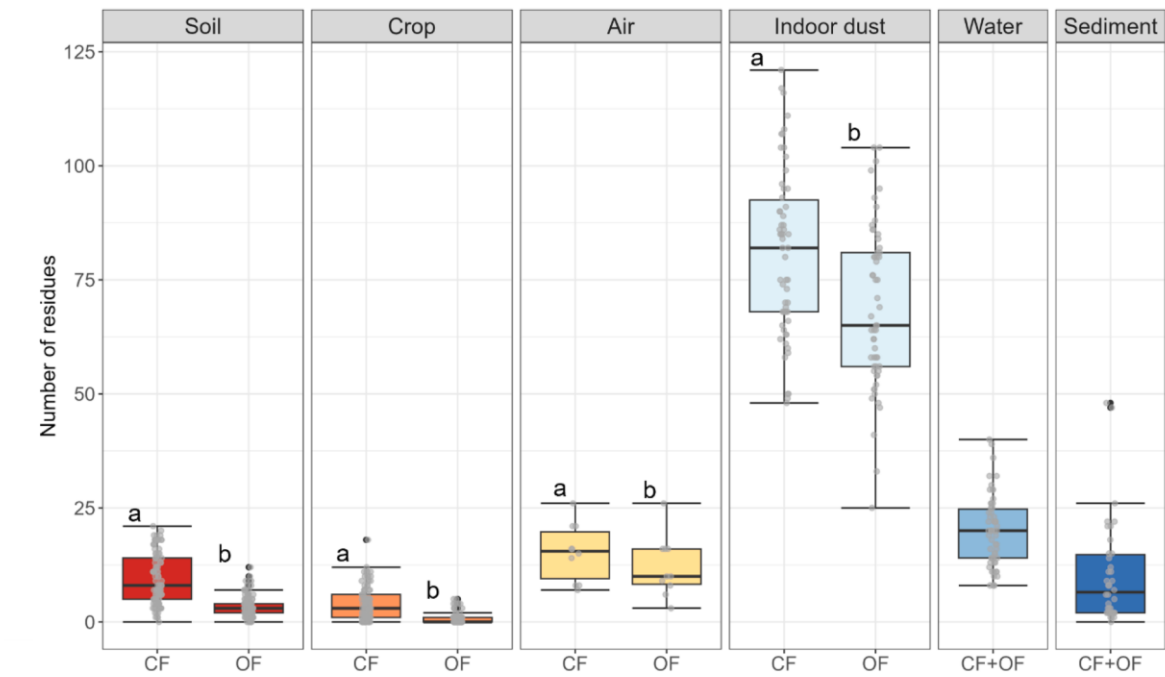
Število snovi



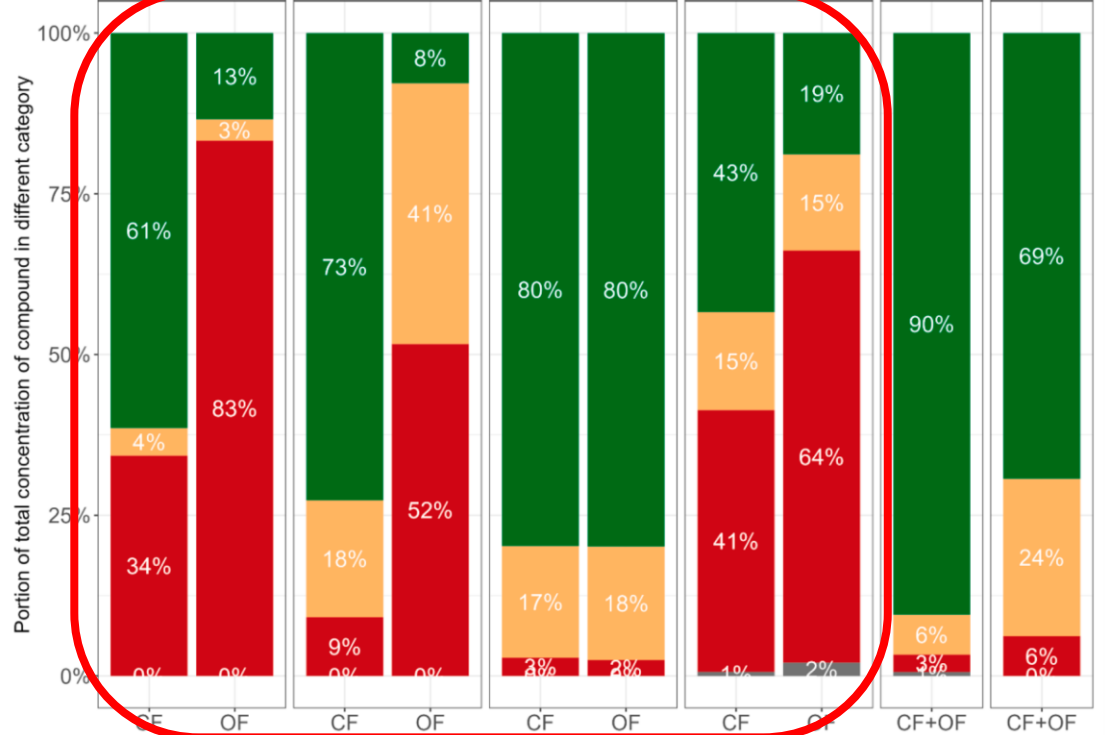
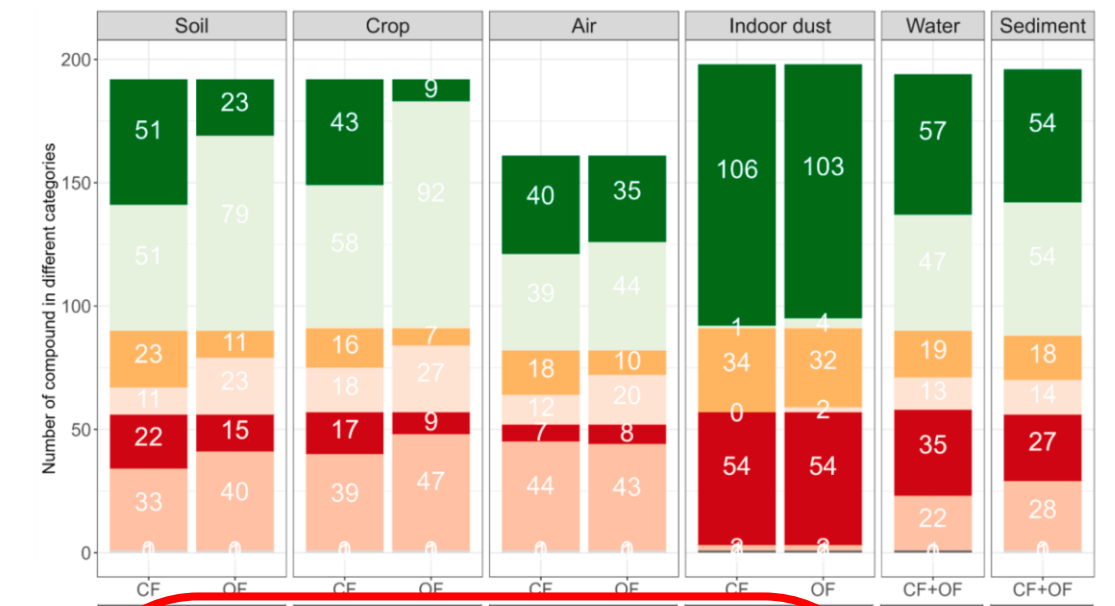
Hišni prah – kmetije - SPRINT

I. Navarro et al.





	CF	OF	CF	OF	CF	OF	CF	OF	CF+OF	CF+OF
N=	100	101	98	95	10	10	58	57	58	38
n=	192	192	192	192	161	161	198	198	193	196



Category

- Approved
- Approved_nd
- CFS
- CFS_nd
- Not approved
- Not approved_nd
- Synergist
- Synergist_nd

Slovenija

Uporabljene aktivne spojine za CSS-7 (Slovenija) – koruzna polja 2021
in če so bile te aktivne spojine odkrite v različnih izmerjenih matrikah.
Zaznano =”+”, Ni zaznano =”-“

C S S	Active compound applied	Type of product	Detected in soil	Detected in surface water	Detected in sediment	Detected in outdoor dust	Detected in Human - Blood	Detected in Human - Urine	Detected in Human - Faeces
S L	Metolachlor (S)	Herbicide	7/10 vzorcev (konv. njiva)	2/6 vzorca	-	2/2 vzorca	-	-	1/24 potrošnikov splošne populacije 1/24 sosedov
S L	Foramsulfuron	Herbicide	-	-	-	-	-	-	-
S L	2,4-D (free)	Herbicide	-	-	-	-	-	-	-
S L	Isoxaflutole	Herbicide	-	-	-	-	-	-	-

Živali – Slovenija

Kmetija

konvencionalno : ekološko

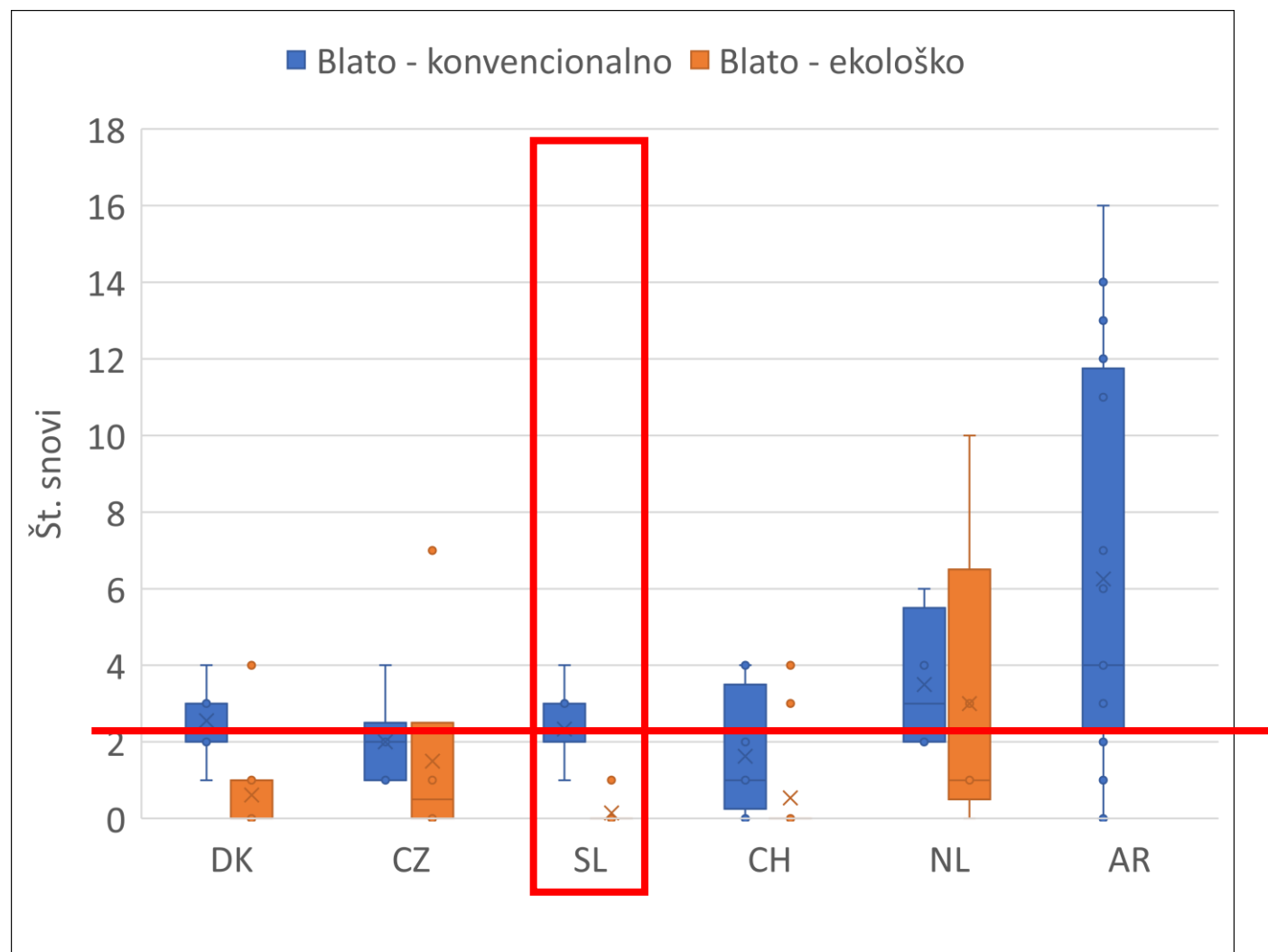
Krave - zapestnica								Krave - blato								Krave - mleko			
Konvencionalno				Ekološko				Konvencionalno				Ekološko				Vsi vzorci			
Matrix	count	frequency	median concentration (ug/kg)	Matrix	count	frequency	median concentration (ug/kg)	Matrix	count	frequency	median concentration (ug/kg)	Matrix	count	frequency	median concentration (ug/kg)	Matrix	count	frequency	median concentration (ug/kg)
Pendimethalin	6	100%	4.81	Pendimethalin	4	100%	2.60	AMPA	8	89%	10.51	DDE p,p'	1	14%	0.16	-	0	0	0
Piperonyl butoxide	4	67%	5.29	Piperonyl butoxide	3	75%	0.90	Glyphosate	6	67%	54.28								
Terbutylazine	4	67%	0.44	Sedaxane	3	75%	1.95	Cypermethrin	3	33%	0.72								
Dimethenamid_P	3	50%	0.37	Thiamethoxam	3	75%	0.44	Folpet_PHI	3	33%	5.42								
Metalaxyl_M	3	50%	1.18	Spirotetramat_keto_hydroxy	2	50%	6.67	Chlorpyrifos	1	11%	0.22								
Metolachlor_S	3	50%	2.71	Dimethenamid_P	1	25%	5.21												
Terbutylazine_desethyl	3	50%	0.29	Dimethomorph	1	25%	0.22												
Cymoxanil	2	33%	0.35	Fipronil	1	25%	1.08												
Fluopyram	2	33%	0.30	Metalaxyl_M	1	25%	0.40												
Pirimiphos-methyl	2	33%	0.29	Metolachlor_S	1	25%	1.96												
Sedaxane	2	33%	1.23	Propiconazole	1	25%	1.03												
Thiacloprid	2	33%	19.52	Terbutylazine	1	25%	0.57												
Thiamethoxam	2	33%	126.50	Terbutylazine_desethyl	1	25%	0.34												
Acetamiprid	1	17%	0.22	Terbutryn	1	25%	0.34												
Azoxystrobin	1	17%	0.74	Tolyfluanid metabolite DMST	1	25%	0.83												
Clothianidin	1	17%	0.25																
Dimethomorph	1	17%	0.20																
Haloxyfop_P	1	17%	3.77																
Methiocarb sulfoxide	1	17%	0.33																
Tolyfluanid metabolite DMST	1	17%	1.66																

Živali – SPRINT - Kmetija

konvencionalno : ekološko

Krave - blato

(81 konv, 49 eko vzorcev)

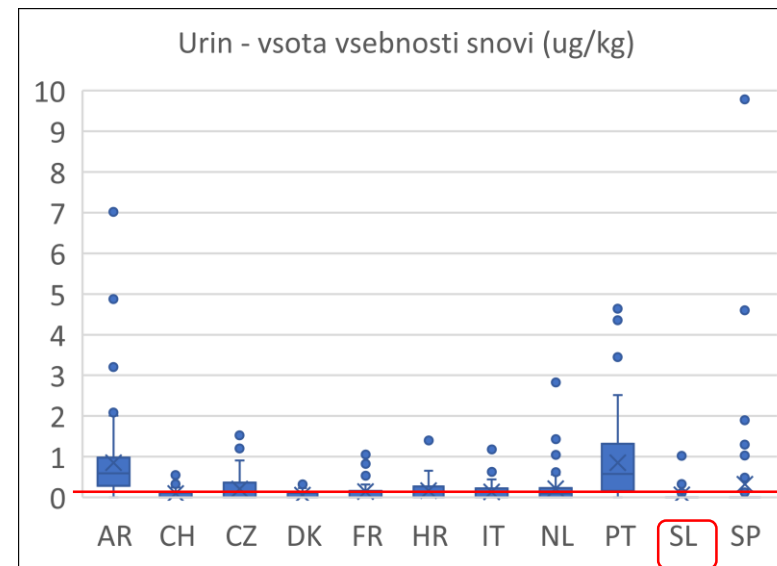
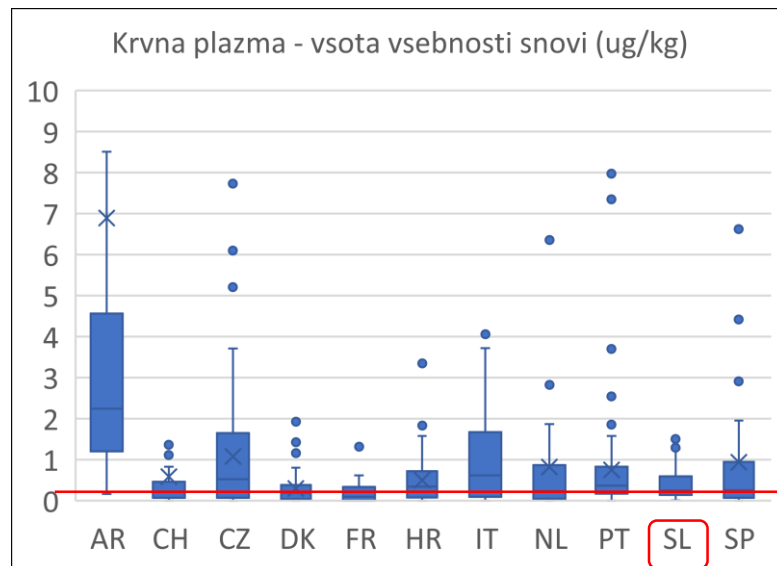
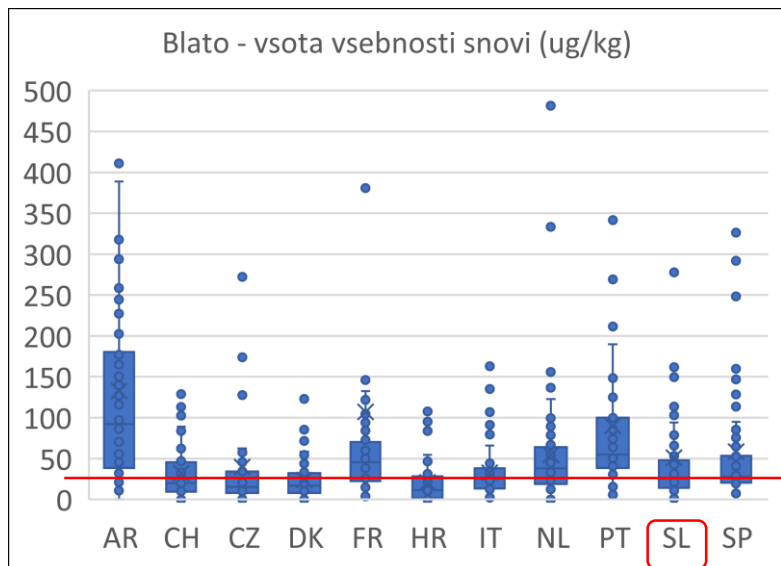
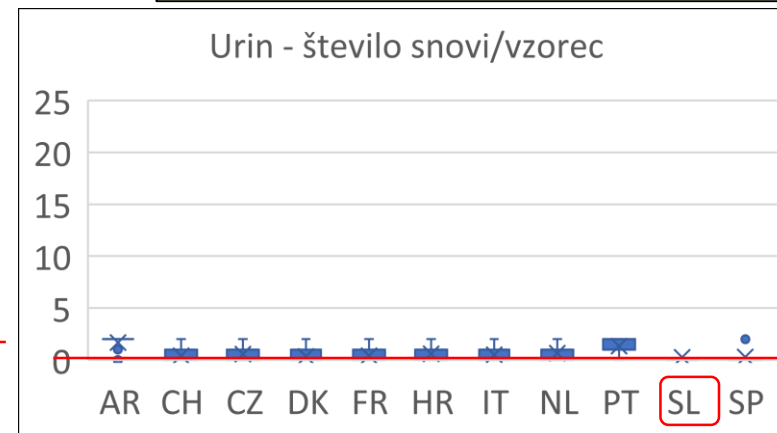
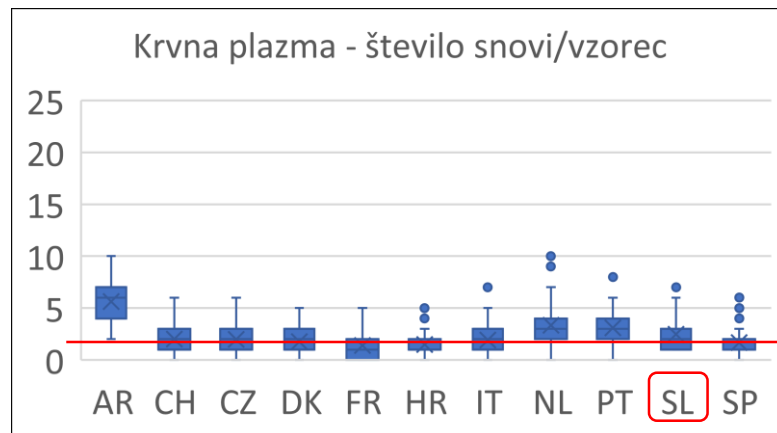
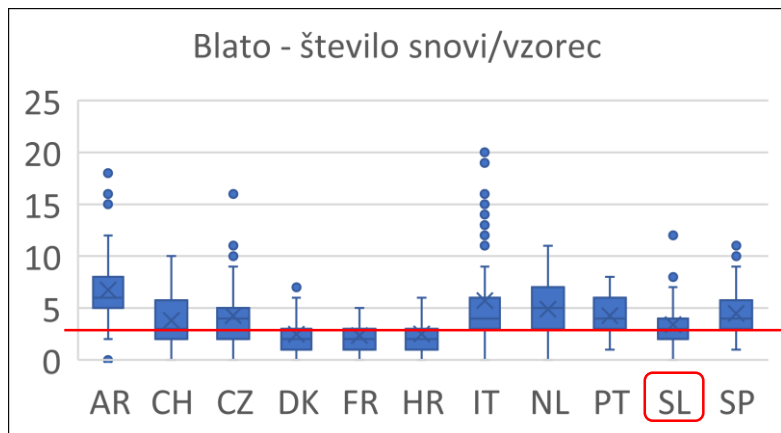


Človeški vzorci – SPRINT

Blato, Krvna plazma, Urin

vsi sodelujoči (715) (kmeti, sosedi, potrošniki)

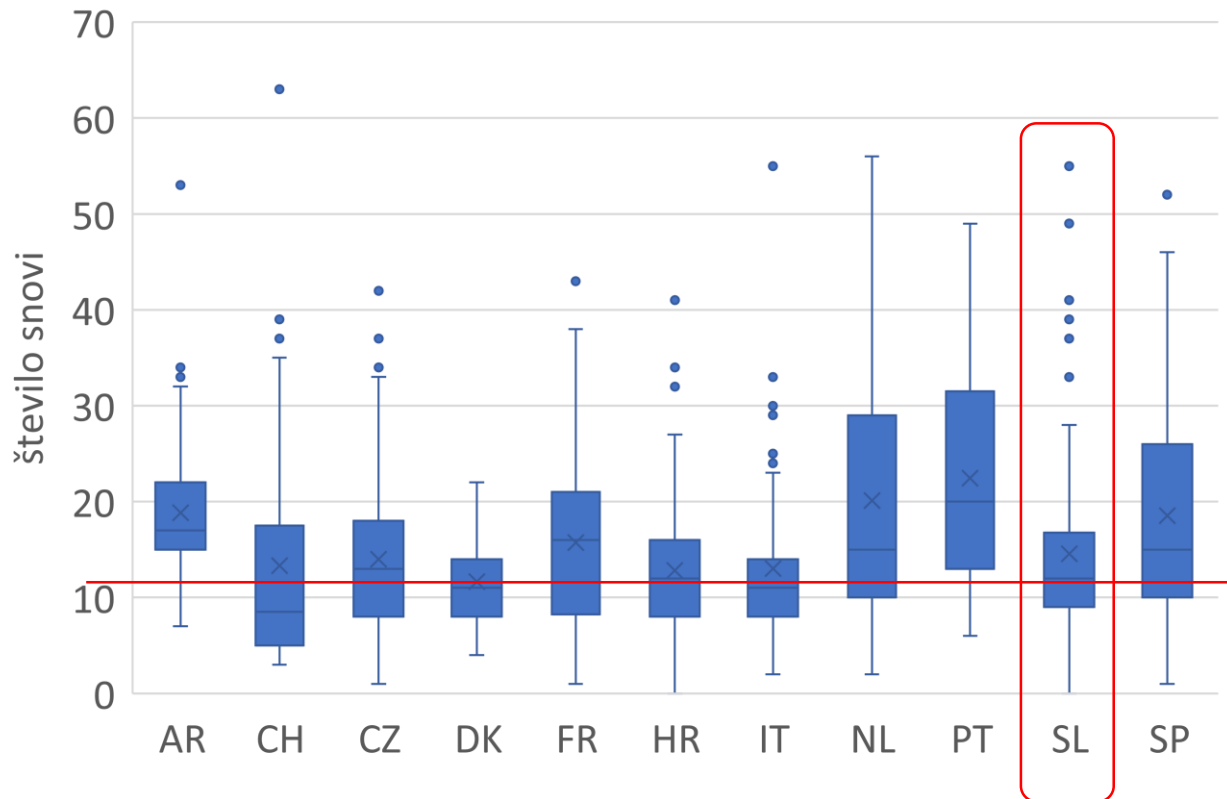
Urin
Izvedene samo meritve Glifosata in AMPA



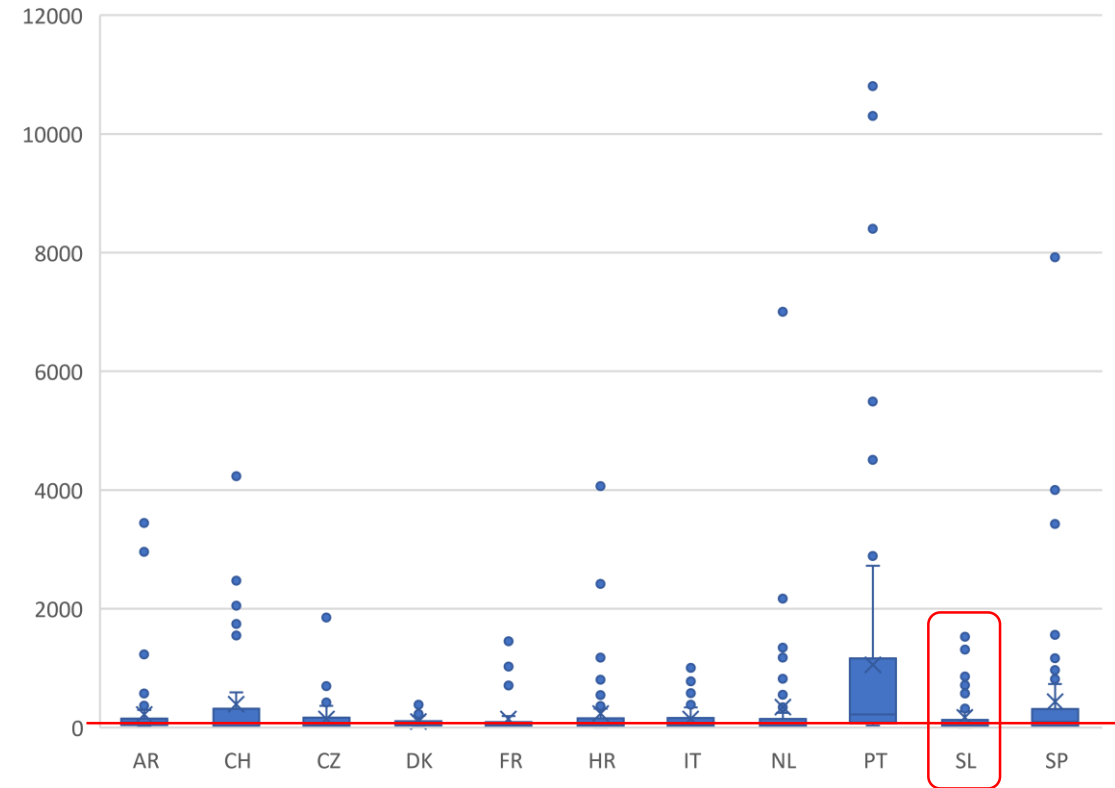
Človeški vzorci – SPRINT ZAPESTNICE

vsi sodelujoči (715) (kmeti, sosedi, potrošniki)

Število snovi zaznanih v analizi zapestnic



Vsota vsebnosti snovi (ug/kg)



Profil nevarnosti ostankov pesticidov odkritih v tleh, zunanjem zraku, vodi in sedimentih, za kopenske in vodne organizme.



EW = deževniki

CB = skakači

BB = čmrlji

HB = čebela

BI = Koristne žuželke - plenilska pršica

Carbon = organizmi mineralizacije ogljika

Nitrogen = organizmi mineralizacije dušika

Birds = ptiči

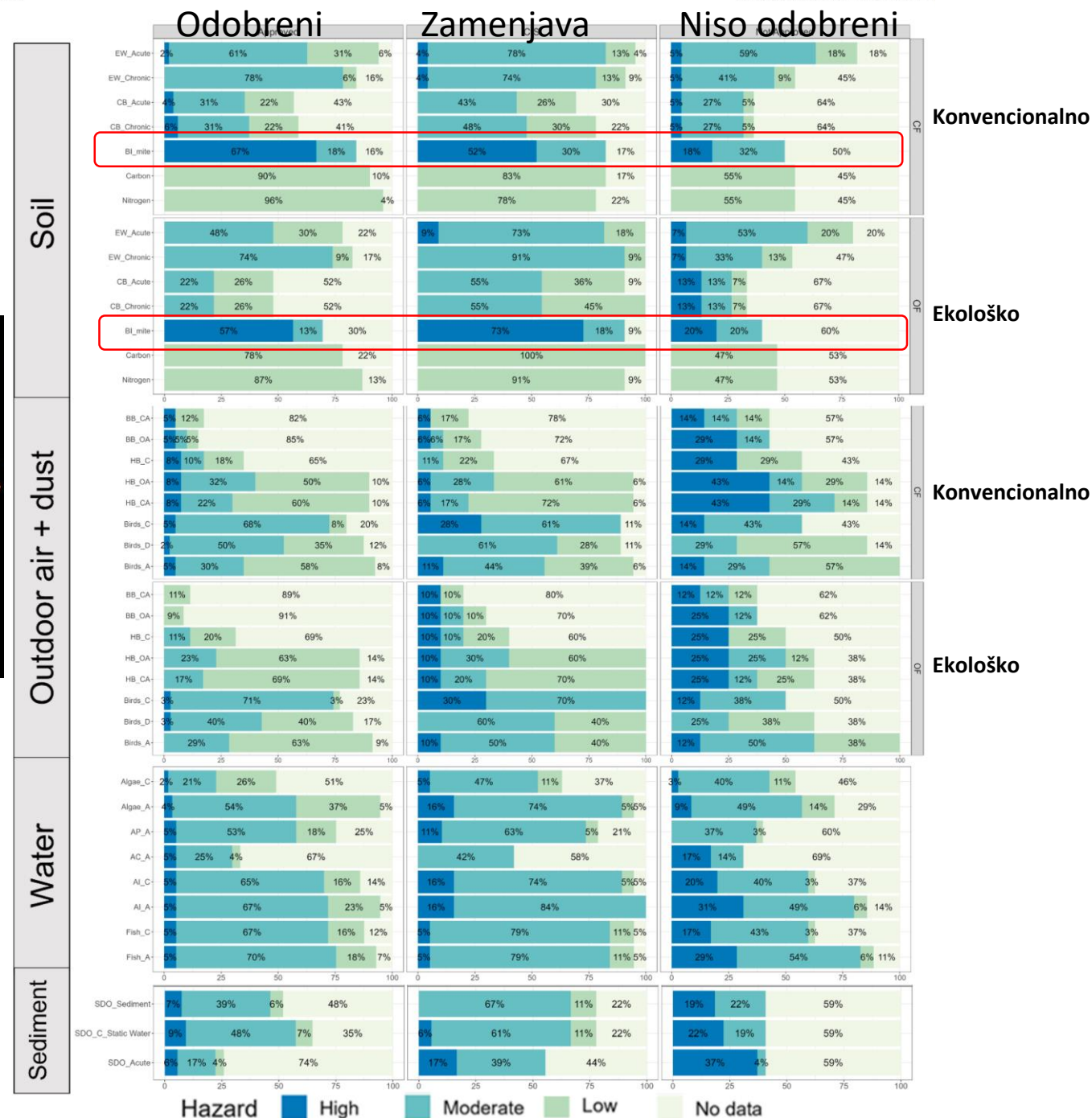
Fish = ribe

Algae = alge

Al = vodni nevretenčarji

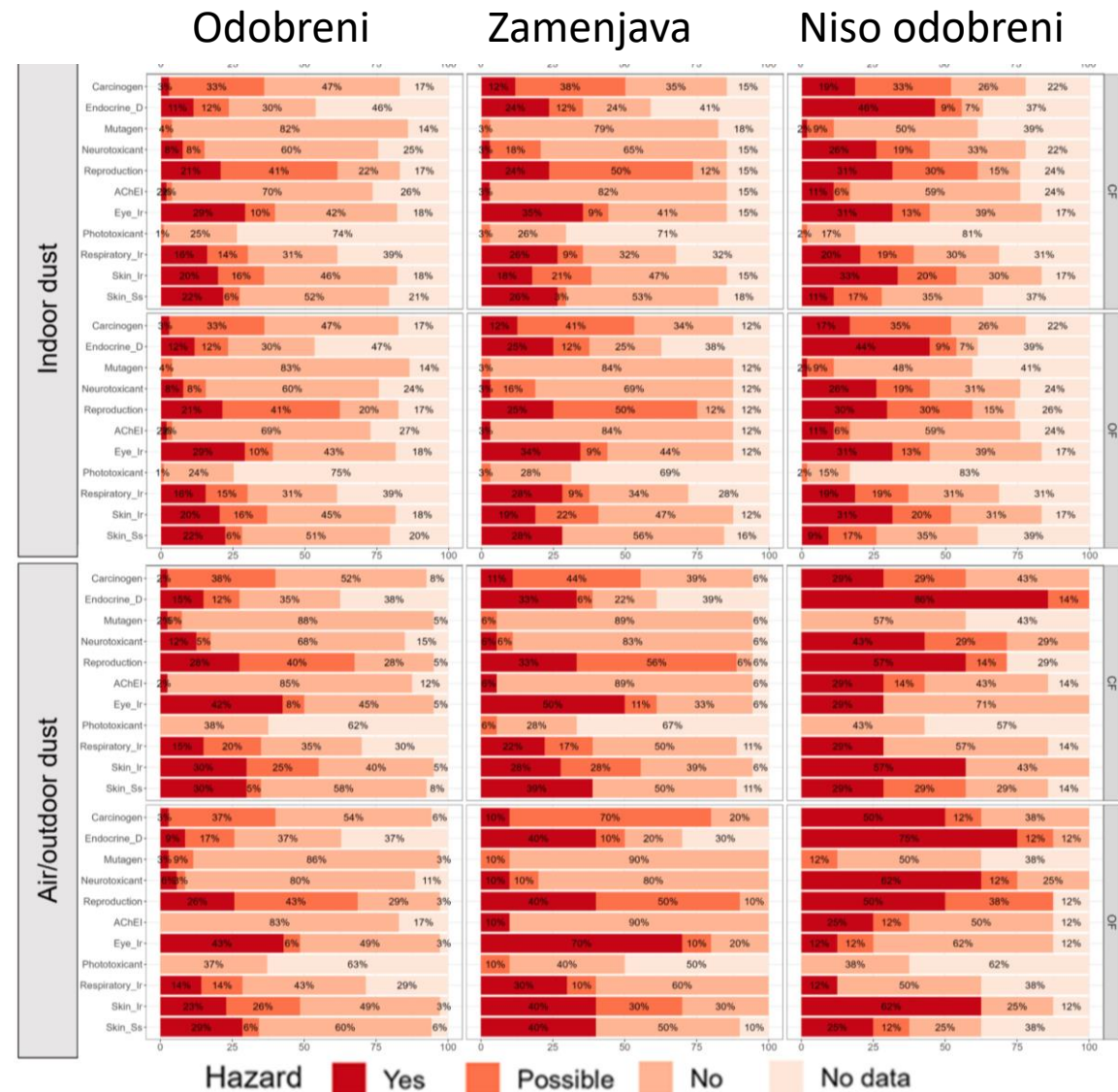
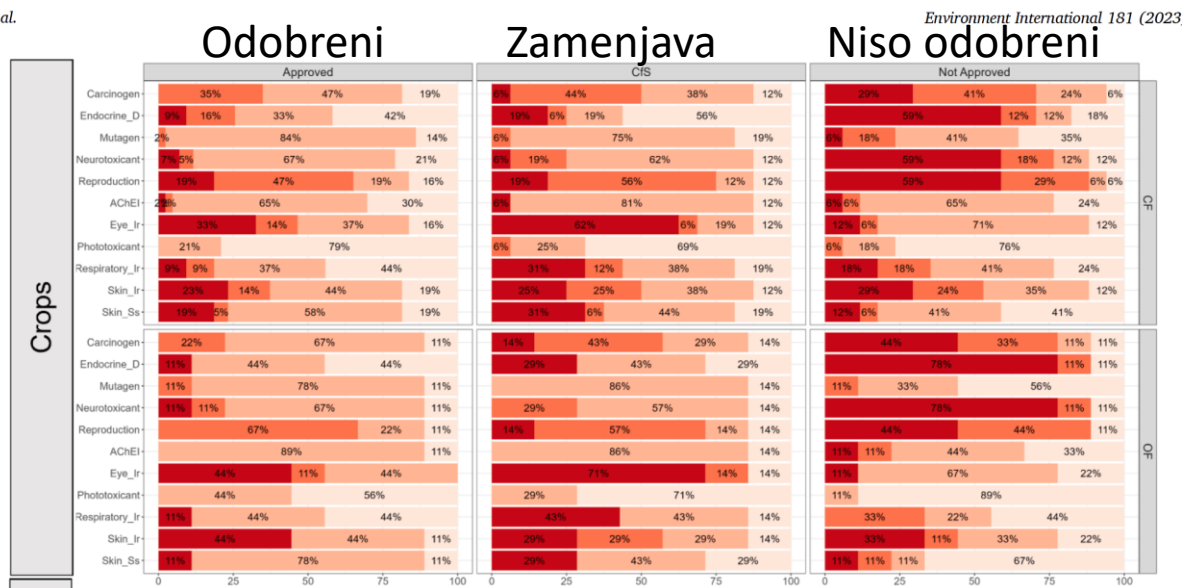
SDO = organizmi sedimentov

CsF = aktivne snovi kandidati za zamenjavo



Profil nevarnosti snovi, najdenih v pridelkih, zunanjem zraku in vzorcih prahu v zaprtih prostorih, za ljudi.

V. Silva et al.



Hazard ■ Yes ■ Possible ■ No ■ No data

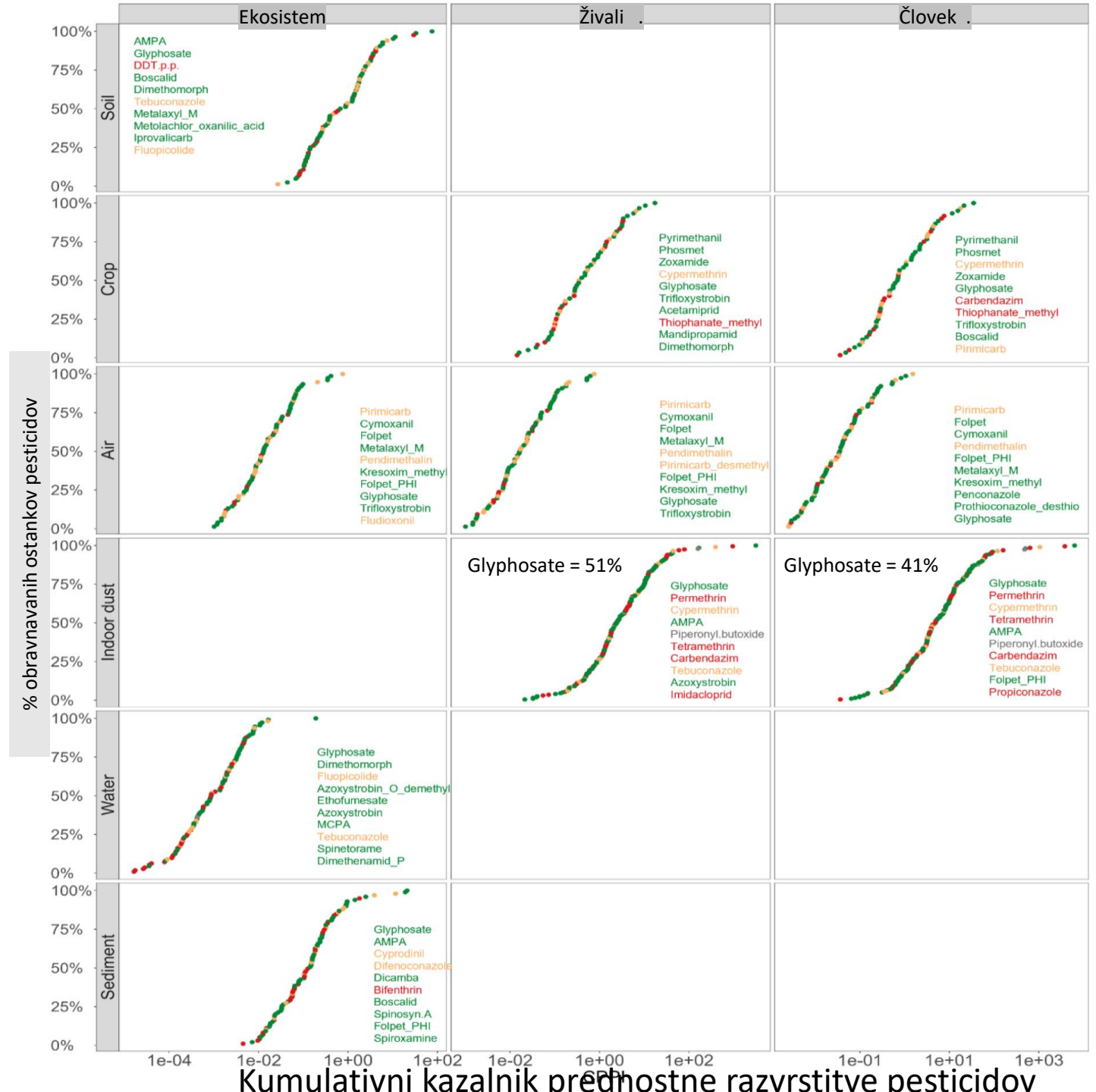
Pesticide prioritization indicator (PPI)

Indikator prednostnega razvrščanja pesticidov

Združeni podatki o nevarnosti in rezultatih analize.

kar 202 od 209 ostankov pesticidov, zajetih v tej študiji, predstavlja določeno nevarnost za ekosisteme in/ali zdravje ljudi.

- Odobreni
- Kandidati za zamenjavo
- Niso odobreni
- Sinergisti



T6.3: CSS Slovenia – maize silage production

Ranking of farm activities with respect to toxicity, crop rotation and profit.

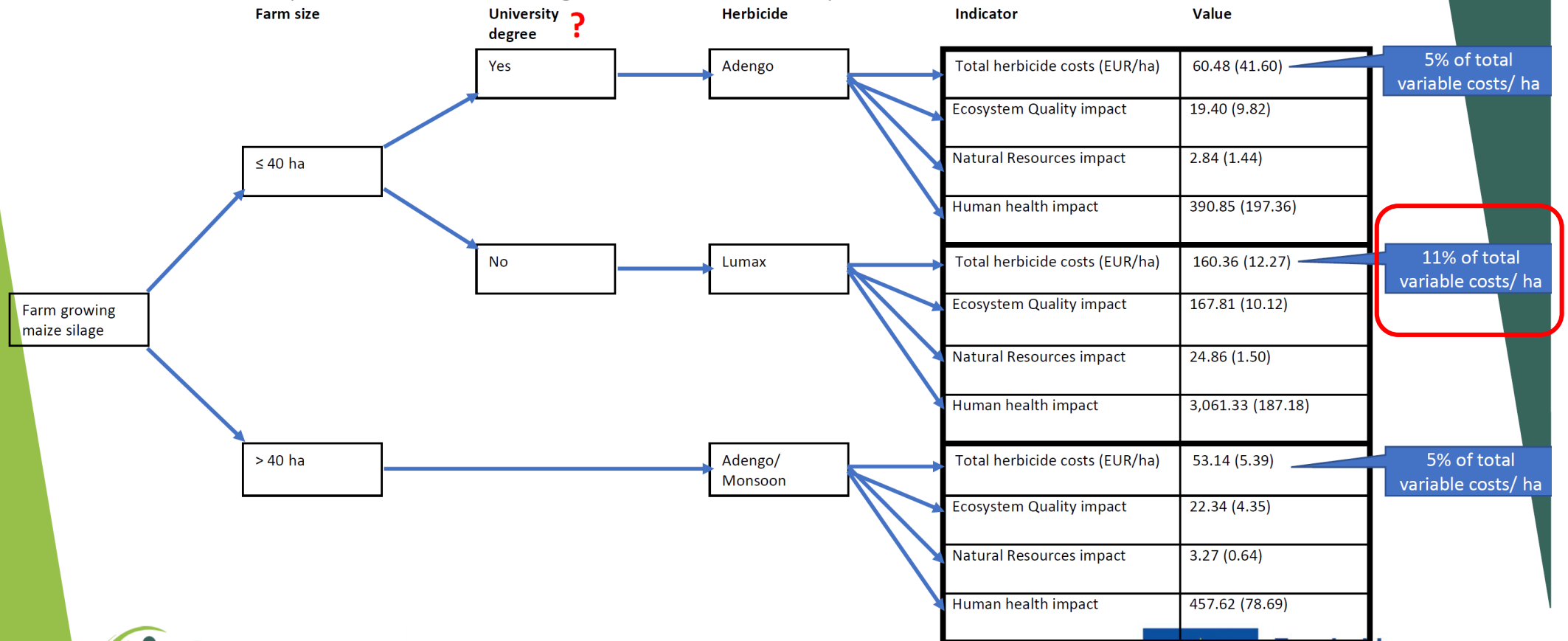
Organic	Maize	Legumes	CropRotScore	Herbicide	HighTox	Var_costsHA	Herb_costsHA	YieldHA	ProfitHA	Farm_size	Uni degree
yes	1	3	1	None	0	951.5	0	35	378.5	40	0
no	2	3	2	ADENGO	0	1516.25	56.25	25	-566.25	65	1
no	1	2	3	ADENGO	0	602.25	56.25	55	1487.75	90	0
no	1	2	3	ADENGO	0	931.75	43.75	60	1348.25	40	0
no	1	2	3	ADENGO	0	1222.25	56.25	37.5	202.75	60	1
no	2	2	4	ADENGO	0	1388.25	41.25	40	131.75	55	0
no	3	2	5	ADENGO	0	865	55	54	1187	65	1
no	2	1	6	ADENGO	0	1354	55	65	1116	25	1
no	2	1	6	ADENGO& BANVEL	0	1807	85	45	-97	18	0
no	3	1	7	ADENGO& TEMSA	0	1373.16	124.16	50	526.84	41	1
no	3	1	7	ADENGO	0	1630	55	50	270	39	1
no	1	0	8	MONSOON& HERBOCID	0	904	53	30	236	80	0
no	1	0	8	MONSOON ACTIVE	0	1182	54	35	148	86	1
no	2	3	2	LUMAX	1	913	161	37.5	512	25	0
no	2	2	4	LUMAX	1	1582	161	50	318	33	0
no	2	2	4	LUMAX	1	2235.2	161	60	44.8	22	0
no	3	2	5	LUMAX& PEAK	1	1526.88	165.98	55	563.12	22	0
no	2	1	6	LUMAX	1	883	138	50	1017	30	0
no	2	1	6	LUMAX	1	1227	138	35	103	70	1
no	2	1	6	LUMAX&PEAK	1	1727.08	175.18	35	-397.08	30	0

Ekonomska analiza

Case study: Slovenia

T6.3: CSS Slovenia – maize silage production

Two dominant pest control strategies, moderated by farm size and education.



Ekonomska analiza

Na podlagi podatkov, ki smo jih zbrali na spletnem mestu študije primera:

- Različne prakse zatiranja škodljivcev na majhnih (≤ 40 ha) in velikih kmetijah (> 40 ha), kar vodi do znatno **višjih stopenj toksičnosti in višjih stroškov herbicidov na majhnih kmetijah**.

- **VELIKE KMETIJE:**

- vsi nosilci uporabljajo herbicide Adengo ali Monsoon (z eno izjemo, ki uporablja Lumax). Uporabljene količine so približno enake.

- **MALE KMETIJE**

- 50 % nosilcev uporablja herbicid Lumax, z bistveno višjimi stopnjami toksičnosti in stroški izdelka.

- Uporabljene količine so približno enake. Nihče od njih nima visokošoske izobrazbe.

- 50 % nosilcev uporablja Adengo. Uporabljene količine so približno enake. Vsi imajo visokošolsko izobrazbo.

- Različne prakse zatiranja škodljivcev ne vplivajo bistveno na druge variabilne stroške (tj. stroške za osebje, stroje, gnojila).
- Velike kmetije imajo bistveno večjo likvidnost kot male kmetije zaradi višjih skupnih subvencij, ki jih prejemajo. **Subvencije se ne razlikujejo glede na prakso zatiranja škodljivcev** (Opomba: Subvencije so bile navedene za celotno kmetijo, ne posebej za proizvodnjo koruzne silaže).

Hvala za pozornost

Vprašanja

???



28. avgust 2023



SPRINT
SUSTAINABLE PLANT PROTECTION TRANSITION

Več informacij:

Project introduction: <https://youtu.be/Ym0qL8lLiGE>

Different WPs in CSS: <https://www.youtube.com/channel/UCW-gORRBq50KJtpopkfvTCw>

Field work: <https://sprint-h2020.eu/index.php/resources/interactive-monitoring-plan> AND

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0259748>

Website - <https://www.sprint-h2020.eu/>

Email: sprint@wur.nl

BF-web: <https://www.bf.uni-lj.si/sl/raziskave/raziskovalni-projekti/183/sustainable-plant-protection-transition:-a-global-health-approach>



European
Commission