

# Combining the pesticide usage in an agricultural catchment to pesticide occurrence in river waters

EU directives oblige national action plans for pesticide risk reduction, and the national pesticide usage has to be reported to EU every 5<sup>th</sup> year. However, there is little information available for scientists and policymakers about the pesticide usage in any specific catchment or river basin in Finland.

The catchment based data on pesticide usage is useful in the planning of monitoring programs and interpreting the results. It is also essential in the evaluation of risks and in upscaling small area results into larger areas.

Here the quantities of pesticides used in the catchment area of a small stream Savijoki in Finland are compared to pesticide occurrence in stream water during years 2016–2018.

## Material and methods

- The study area is an agricultural catchment of a small stream Savijoki located in SW Finland.
- Pesticide usage in the area was investigated through annual inquiries targeted on ca. 80 farmers in years 2016–2018 as a part of the SAVE project.
- Ca. 40% of the 82 km<sup>2</sup> catchment is cultivated.
- In the stream Savijoki, concentrations of 240 pesticides have been monitored twice a month from spring to autumn and once a month during winter since 2016.



Photo: Jouko Lehmuskallio  
 Ympäristöhallinnon kuvapankki

Pesticides used in the study area in 2016–2018	Mean of pesticide used in 2016–2018 (kg)	Mean of pesticide used in 2016–2018 (g/ha) <sup>a</sup>	Pesticide mean concentration in water 2016–2018 (µg/l)
2,4-D	12	206	< 0.01
Acetamiprid	0.3	12	< 0.01 ***
Aclonifen	29	834	< 0.01 ***
Alpha-cypermethrin	0.7	17	not monitored
Amdisulfuron	0.6	10	< 0.01
Ametopyralid	0.1	6	< 0.05 ***
Azoxystrobin	5	85	< 0.005
Bentazone	4	348	0.012
Beta-cyfluthrin	0.2	9	< 0.005 ***
Bifenthrin	11	100	< 0.01
Carfentrazone ethyl	0.5	20	< 0.01 ***
Chloromequat chloride	173	1 017	not monitored
Clopyralid	13	67	< 0.05
Clothianidin	1	49	< 0.01
Cyprodinil	2	300	< 0.005 ***
Deltamethrin	0.3	8	< 0.005 ***
Desmedipham	0.7	45	< 0.01 ***
Dichlorprop-P	120	464	0.02
Difenoconazole	0.3	2	< 0.01 ***
Dinethion	2	120	< 0.01
Esfenvalerate	0.1	14	< 0.05 ***
Ethephon	2	138	not monitored
Ethofumesate	7	523	< 0.005
Fenpropiid	8	197	not monitored
Florasulam	4	1	< 0.01
Fludioxonil	0.5	7	< 0.01 ***
Fluroxypyr	21	78	< 0.01
Fluxapyroxad	0.6	31	not monitored
Fuberidazole	?	?	not monitored
Glyphosate	847	1 209	0.119 (0.082)**
Halosulfuron-methyl	0.2	3	not monitored
Imazalil	1	9	not monitored
Imazamox	0.3	21	< 0.01 ***
Imidacloprid	0.1	4	< 0.03 ***
Indoxacarb	1	26	not monitored
Isosulfuron-methyl-sodium	0.2	11	< 0.01 ***
Ioxynil	11	100	not monitored
Lambdacyhalothrin	0.7	11	< 0.01 ***
MCPA	400	594	0.085
Mecoprop-P	40	198	0.012
Mepiquat chloride	3	273	not monitored
Metamitron	32	2 427	< 0.01
Metazachlor	0.5	24	< 0.01 ***
Metconazole	0.1	4	< 0.01 ***
Metsulfuron methyl	4	300	< 0.01 ***
Phenmedipham	13	913	< 0.01 ***
Phenoxaprop P ethyl	2	115	< 0.01 ***
Piploram	2	26	< 0.02
Picoxystrobin	2	113	< 0.01
Pinoxaden	5	42	< 0.01 ***
Prochloraz	2	225	< 0.2 ***
Prothioconazole	0.6	13	not monitored
Propiconazole	9	76	< 0.01
Prothioconazole	26	52	not monitored
Pyraclostrobin	4	73	< 0.01 ***
Pyridate	?	?	< 0.01 ***
Pyrosulium	0.4	6	< 0.01 ***
Quinmerac	3	174	< 0.01
Quizalofop-P-ethyl	0.3	75	< 0.01 ***
Rimsulfuron	0.001	20	< 0.01 ***
Sodium propoxycarbazon	2	42	< 0.01
Tebuconazole	23	46	< 0.01
Thiadiazinon	2	72	< 0.01
Thifensulfuron methyl	0.6	4	< 0.01
Triadimenol	10	63	< 0.01 ***
Triasulfuron	0.6	3	< 0.01
Tribenuron methyl	2	5	not monitored
Tribostyrolin	3	87	< 0.01 ***
Triflusaluron methyl	0.2	15	< 0.01
Trinexapac-ethyl	6	70	< 0.01
Tritosulfuron	4	29	0.02

<sup>a</sup> Only those fields where the pesticide was used. \*\* Detected as AMPA, degradation product of glyphosate \*\*\* Under the limit of quantification

## Results

- On average 50 farmers (68%) of the 80 who got the inquiry reported their pesticide usage yearly (55 farmers in 2016, 48 in 2017, and 47 in 2018).
- The responses covered on average 2 099 ha (60%) of the agricultural land in the study area.
- Farmers used 130 different pesticide products during the years 2016–2018.
- These products contained 71 different active ingredients of which 57 were monitored.
- During the 3-year monitoring period the concentrations of 29 compounds remained under the limits of quantification.
- All the concentrations were low compared to the environmental quality standards (EQS).
- Low but detectable values were recorded e.g. bentazone, glyphosate, clopyralid, dichlorprop-P, MCPA, mecoprop-P, picoxystrobin, propiconazole, sodium propoxycarbonate, thifensulfuron-methyl, trinexapac-ethyl and tritosulfuron.

## Conclusions

- Although the concentrations detected were low, it is important to develop the monitoring procedures.
- Combining of crop protection usage and surface water monitoring results offers opportunities to study more about the fate of pesticides in Finnish conditions.

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<https://blogs.helsinki.fi/save-kipsihanke/?lang=en>

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## References

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