Katri Siimes, Emmi Vähä, Pia Högmander, Matti Joukola

Finnish Environment Institute SYKE, P.O. Box 140, FI-00251 Helsinki, Finland
E-mail: **katri.siimes@ymparisto.fi**

A CATCHMENT BASED PESTICIDE RISK INDICATOR

The environmental monitoring of contaminants should be connected to the loading. Distributed (e.g. catchment based) pesticide usage statistics do not exist in Finland. A method to estimate pesticide loading was needed.

We developed a pesticide loading risk indicator. It estimates typical pesticide usage based on cultivated crops within each catchment (A ≥10 km²). The indicator calculates pesticide loading risk from the used pesticide active ingredient amounts and the properties.

The indicator will be used in the selection of sampling sites for pesticide surface water monitoring. It will be utilized in the evaluation of the monitoring results (since 2007), too.

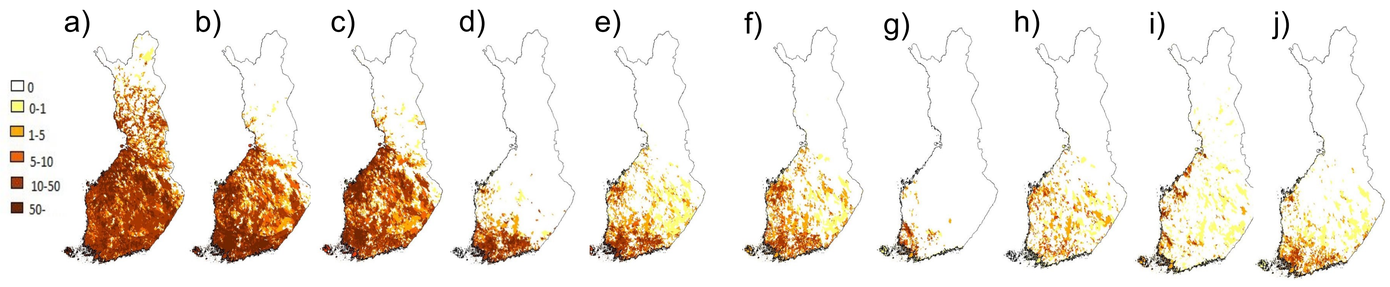


Fig. 1. The cultivation area of the main crop groups in 2015 given as ‰ of the catchment land area: a) grass, b) spring cereals excluding barley, c) barley excluding malting barley, d) malting barley, e) winter cereals, f) spring oil-crops, g) sugar beet, h) caraway i) potato and j) peas & beans

Risk value (R_v) in catchment v was calculated:

$$R_v = \frac{\sum_{k=1}^{21} R_k \cdot A_k}{A_v - A_j}$$

- R_k is the risk value of the crop group k (21 groups) (see Fig. 2)
- A_k is the cultivation area of the crop k, excluding organic fields (see Fig. 1)
- A_v is the area of the catchment v
- A_j is the lake area in the catchment v

Risk value of the crop group (R_k) is based on typically used pesticide active ingredients (130 compounds; g/ha) and their properties: scaled aquatic ecotoxicity, bioaccumulation, persistence and mobility.

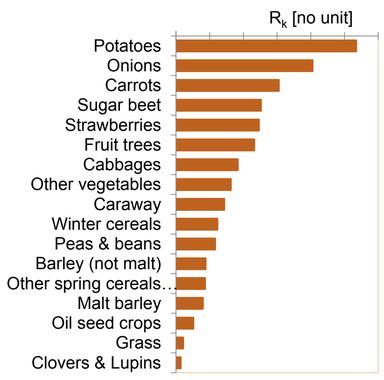


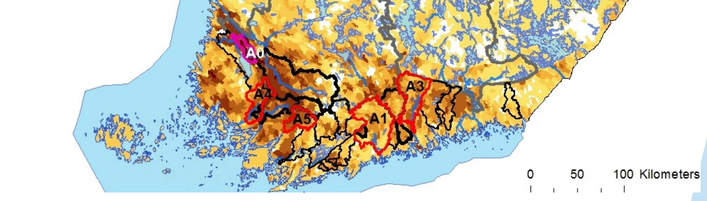
Fig. 2. Risk indicator value (R_k) for selected crop groups

Conclusions

The indicator combines data from different sources and offers a holistic overview of possible pesticide loading. The indicator shows highest pesticide risks in intensively cultivated agricultural areas, where the main crops are other than grasses or cereals.

The current version doesn't take into account risk reducing measures and the coefficients describing pesticide use in different crops may need further adjusting.

Even with its limitations, the indicator has shown to be a useful tool. Köyliönjoki is the first river selected by the indicator for pesticide monitoring.



Note: The indicator is scaled for Finland, where pesticide usage is lower than EU average.

Fig. 3. Pesticide risk indicator for Finland and the catchments monitored for pesticides (2007-2018). © SYKE (Finnish Environment Institute), MAVI (Agency of Rural Affairs) and MML (National Land Survey of Finland)

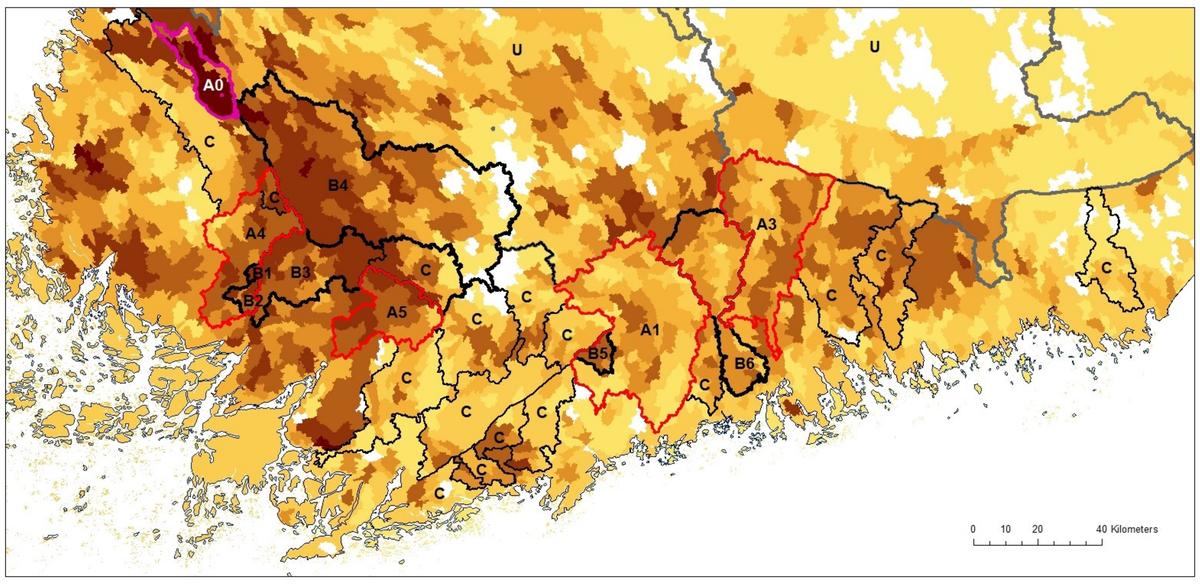


Fig. 4. Pesticide risk indicator for the Southern Finland and the catchments monitored for pesticides (2007-2018). The labels are the same as in Fig. 3. © SYKE, MAVI and MML

Table 1. The number of pesticide samples in selected sites (see Fig. 3 & 4.)

Label	Name	Map	Area (km2)	2007 - 2010	2011 - 2015	2016 - 2017	2018
A0	River Köyliönjoki	Fig. 4	272	0	0	0	started
A1	River Vantaanjoki	Fig. 4	1668	45	22	9	
A2	River Kyröjoki	Fig. 3	4812	43	17	9	
A3	River Porvoonjoki	Fig. 4	1138	45	11	11	
A4	River Aurajoki	Fig. 4	735	30	12	14	continues
A5	River Uskelanjoki	Fig. 4	514	0	33	13	
B1	River Savijoki A	Fig. 4	15	0	0	39	continues
B2	River Savijoki B	Fig. 4	82	0	0	31	continues
B3	River Paimionjoki	Fig. 4	981	28	11	0	re-started
B4	River Loimijoki	Fig. 4	2666	0	33	5	
B5	River Lepsämänjoki	Fig. 4	80	33	0	0	
B6	River Mustijoki	Fig. 4	766	0	24	0	
B7	River Lehmäjoki	Fig. 3	148	11	11	0	
B8	River Myllykanava	Fig. 3	1046	0	22	0	

Thank you

The indicator was developed in a project financied by the ministry of agriculture and forestry. The project homepage: http://www.syke.fi/hankkeet/maamet

We want to thank Finnish Safety and Chemicals Agency (Tukes) / Mervi Savela for the statistics on pesticide sales and Natural resources Instutute (Luke) / Pasi Mattila for the national statistics of pesticide use in 2013 and Ville Junttila and Katri Lautala for their help in SYKE.