Environmental risk indicators for evaluating the Dutch policy on sustainable plant protection

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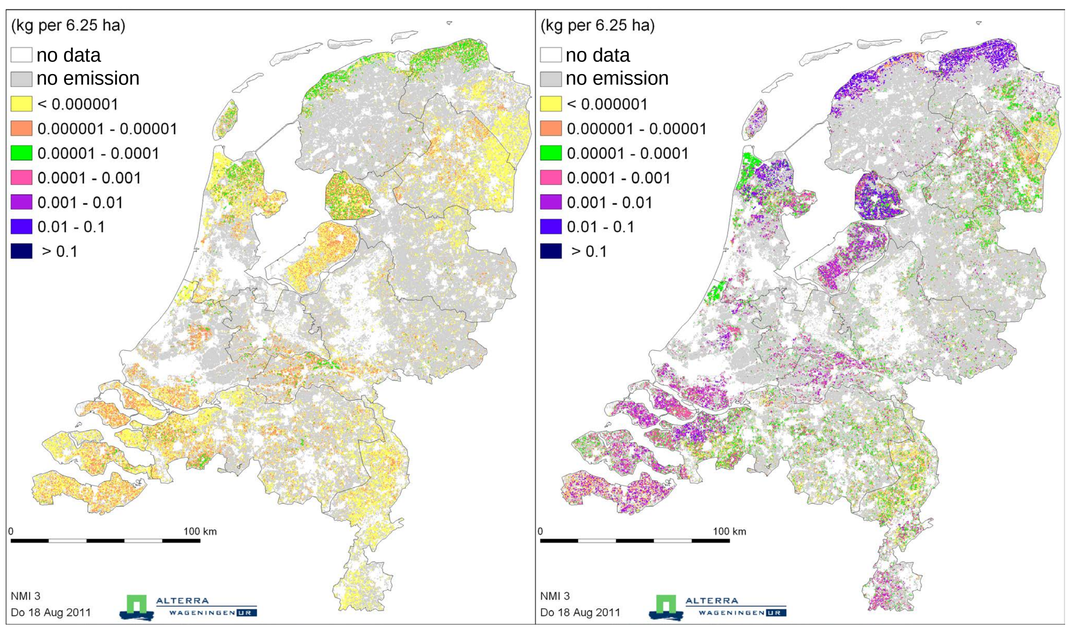
Background and problem

The environmental quality of Dutch surface waters does not meet the water quality standards. Operational targets for aquatic risk reduction were set in the 2nd Dutch National Action Plan for Sustainable Agriculture .

A new version of the Dutch Environmental Indicator for Pesticides (NMI 3) is developed to support the evaluation of the NAP.

Results for spraying applications to arable crops

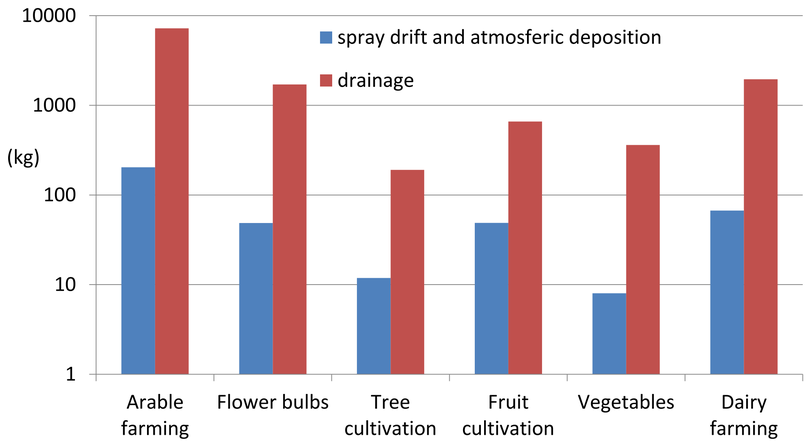
For spraying applications to arable crops loadings by spray drift, atmospheric deposition, and drainage are calculated.



Example of annual loadings to surface water by spray drift (left) and by drainage (right)

The drift process depends on the application technique and the crop free zone. Transport through cracks in macroporous, drained soils depends on the compound and the soil and weather conditions.

Loadings by spray drift occur at the application event, whereas loadings by drainage may occur at any drainage event during the year. Considering all compounds, annual loadings by drainage exceed loadings by spray drift with a factor 30.



Annual total loadings by spray drift and atmospheric deposition, and by drainage for 6 arable crop groups

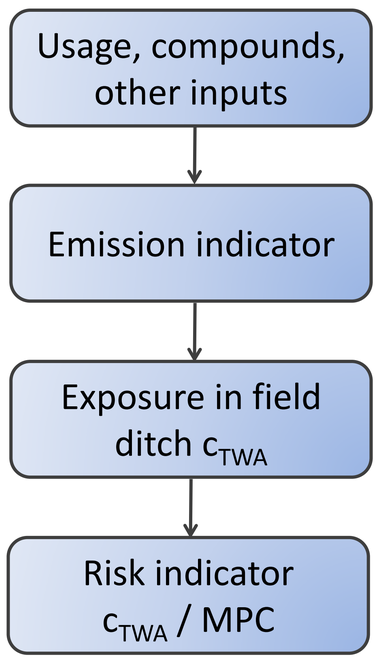
Procedure

National average applications of PPP are derived from farm survey data and annual sales figures. The compound properties are taken from Dutch registration dossiers.

Emission pathways towards field ditches may be spray drift, atmospheric deposition and drainage flow from arable fields, point source emissions from farm yards, or discharges from greenhouses.

Calculations are performed in each hydrological map unit contributing to the area of the crop treated. The loadings are converted into exposure concentrations.

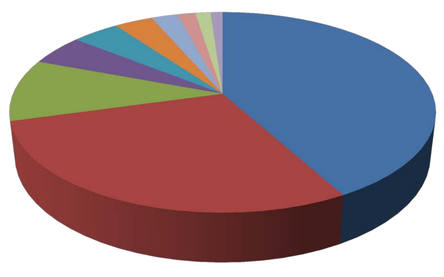
Risk is expressed by the ratio of the annual maximum 21-days Time Weighted Average exposure concentration and the Maximum Permissible Concentration (MPC).



What compounds and emission pathways contribute to aquatic risk?

In general, compounds for which the exposure by spray drift exceeds the exposure by drainage are compounds with high toxicity.

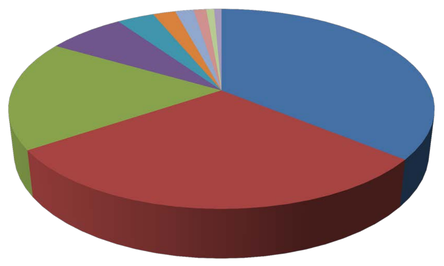
(% of all contributions by spray drift and atmospheric deposition)



compound	MPC (mg L-1)
teflubenzuron	1.0E-08
esfenvalerate	7.0E-08
abamectin	4.0E-08
deltamethrin	4.0E-07
cyhalothrin	2.9E-07
captan	1.1E-04
maneb	2.2E-05
mancozeb	2.2E-05
fenoxycarb	1.4E-06
metsulfuron methyl	3.6E-07

Due to the relatively high toxicity of these compounds, spray drift is the major pathway contributing to aquatic risk.

(% of all contributions by drainage)



compound	MPC (mg L-1)
metsulfuron methyl	3.6E-07
iodosulfuron-methyl-sodium	2.0E-01
imidacloprid	1.3E-05
metribuzine	5.2E-05
azoxystrobin-propyl	5.6E-05
dicamba	1.3E-04
mesotrion	7.7E-05
isoproturon	3.2E-04
florasulam	8.9E-06
terbuthylazine	1.9E-04

Conclusions

- Surface water loadings by drainage exceed those by spray drift.
- Risk caused by spray drift exceeds risk caused by drainage.

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References

Kruijne R, Linden AMA van der, Deneer J, Groenwold JG, Wipfler EL, 2011. Dutch Environmental Risk Indicator for Plant Protection Products – NMI 3. Report WUR-Alterra (*in prep.*)

Zande JC van de, Holterman HJ, Huijsmans JFM. 2011. Spray drift for the assessment of exposure of aquatic organisms to plant protection products in the Netherlands. Report WUR-PRI (*in prep.*)

Tiktak A, Adriaanse PI, Boesten JJTI, Delsman J, Griethuysen C van, Horst MMS ter, Linders JBHJ, Linden AMA van der, Zande JC van de. 2011. Edge-of field scenarios for exposure of water organisms in the Netherlands. Part 1: Field crops and downward spraying. RIVM report 607407002