An aerial photograph showing a coastline. On the left is the ocean with turquoise water and white waves crashing against a rocky shore. A road runs parallel to the coast, with a small red car visible on it. To the right of the road is a lush green forested area.

Risks of PFAS in crops near a fluorochemical plant

Ensur conference

Tessa Pancras – Arcadis Netherlands

21 october 2022

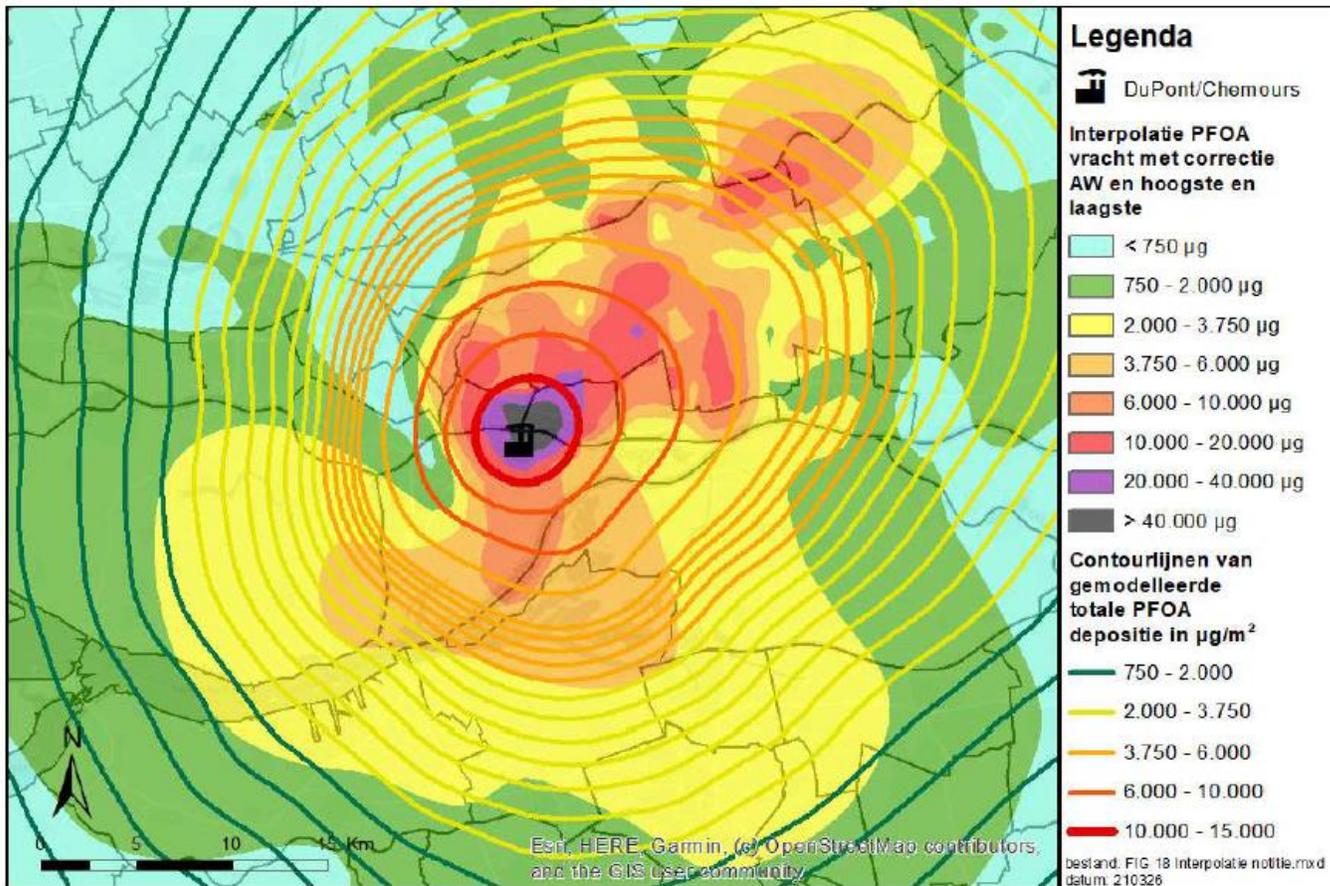
Fluorochemical plant NL

- Chemours (Du Pont) Dordrecht – production Teflon
- Custom Powders Helmond – drying Teflon for Chemours
- 3M site in Antwerp/Zwijndrecht

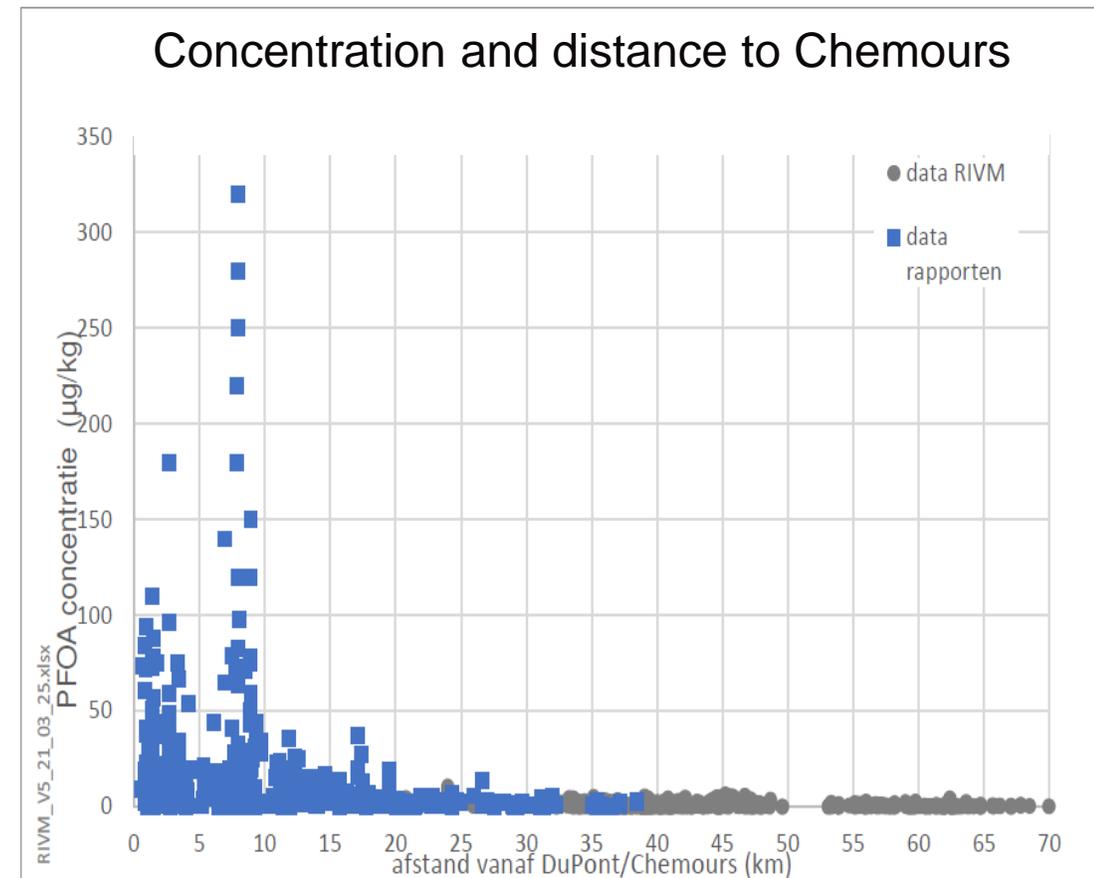


Impact Atmospheric deposition PFOA emission Dordrecht

Modelled (contours) and measured PFOA load $\mu\text{g}/\text{m}^2$

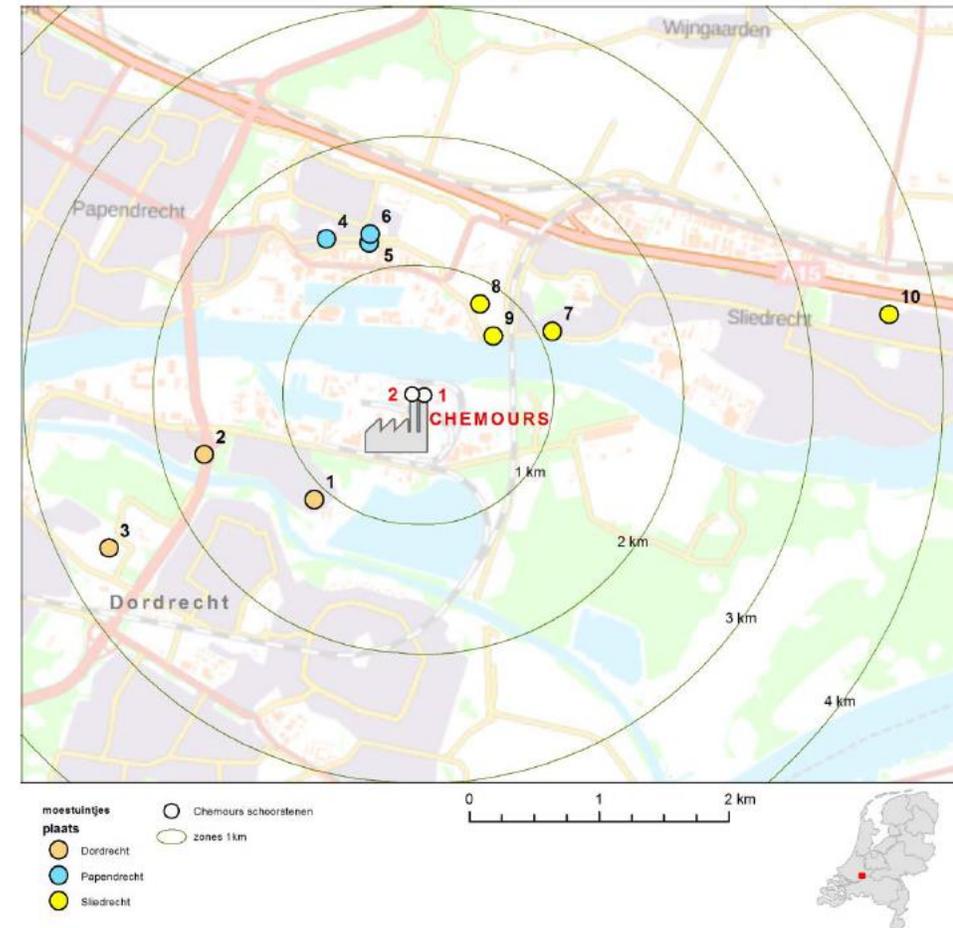


PFOA in Soil $\mu\text{g}/\text{kgdw}$



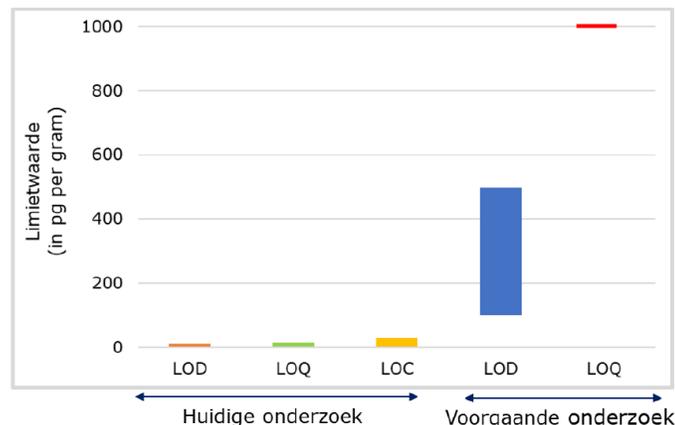
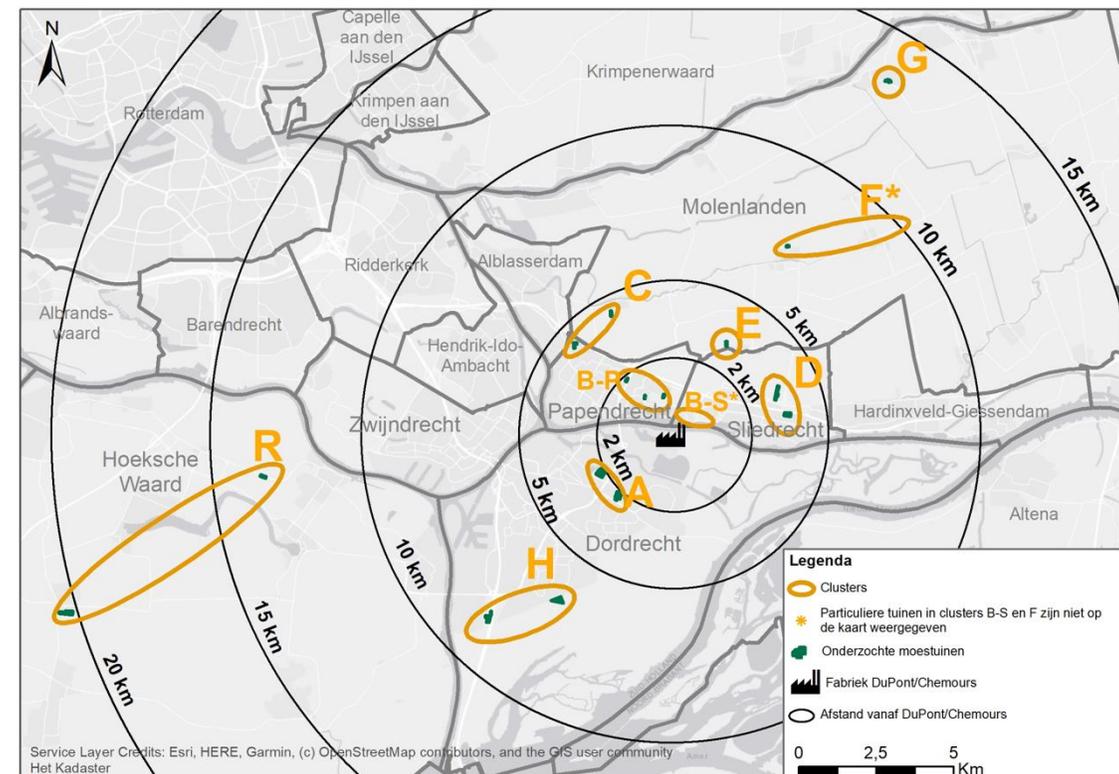
Vegetable gardens evaluated

- First evaluation in 2017 (RIVM report 2018-0017)
- Conclusion:
 - < 1 km from factory; moderate consumption of vegetable garden crops (not too often or too much);
 - Outside this area; no restrictions;
 - PFOA and GenX evaluated
 - TDI's:
 - PFOA: 12.5 ng/kg bw/day;
 - GenX: 21 ng/kg bw/day.
- Re-evaluated in 2021 (RIVM report 2021-0064) based on new TDI
- Conclusion:
 - < 1 km; do not eat vegetable garden crops
 - > 1 km; insufficient information for evaluation



New investigation 2021/2022

- 21 vegetable garden complexes
- 9 clusters upwind and downwind from the factory
- 1 reference cluster
- 25 different types of vegetables and fruit sampled
- 1500 samples taken
- 750 analyses
- 17 PFAS (PFSA's, PFCA's and GenX)
- Latest analytical technology with the lowest detection levels
 - LOD; 0.25-12.5 ng/kg (pg/g)
 - LOQ; 0.5-15 ng/kg
 - LOC; 1.0-30 ng/kg



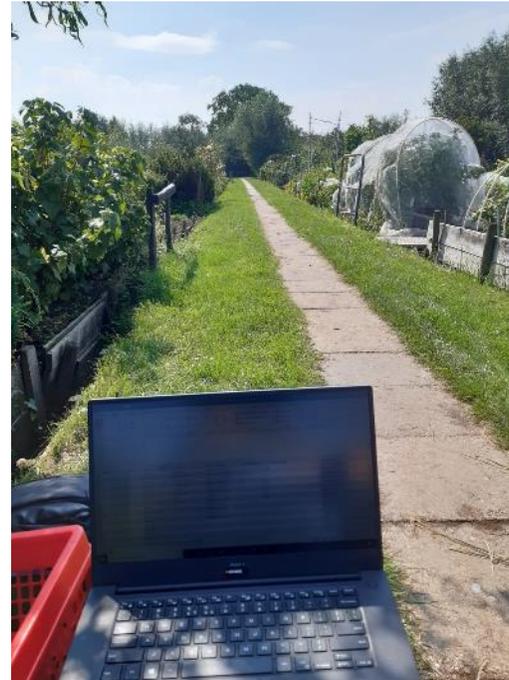
New investigation 2021/2022

Municipalities of Dordrecht, Sliedrecht, Papendrecht, Molenlanden

- Strategy: Arcadis
- Sampling: Tritium
- Analyses: WFSR
- Evaluation: RIVM

Advisory group:

- Municipality of Dordrecht
- Municipality of Helmond
- OZHZ
- GGD Zuid-Holland Zuid
- GGD Brabant

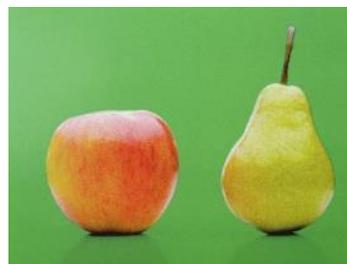


Calculations (RIVM)

- Concentrations in crops (ng/kg)
- Dutch food consumption survey
- Relative potency factors → PEQ (PFOA equivalents)

- Concentration in crop:
- PFOA x 1 + PFOS x 2 + PFNA x 10 + PFHxA x 0.01... etc.
- All PFAS summed up with relative potency factors

- Low concentration; LOD = 0
- High concentration; LOD = LOD



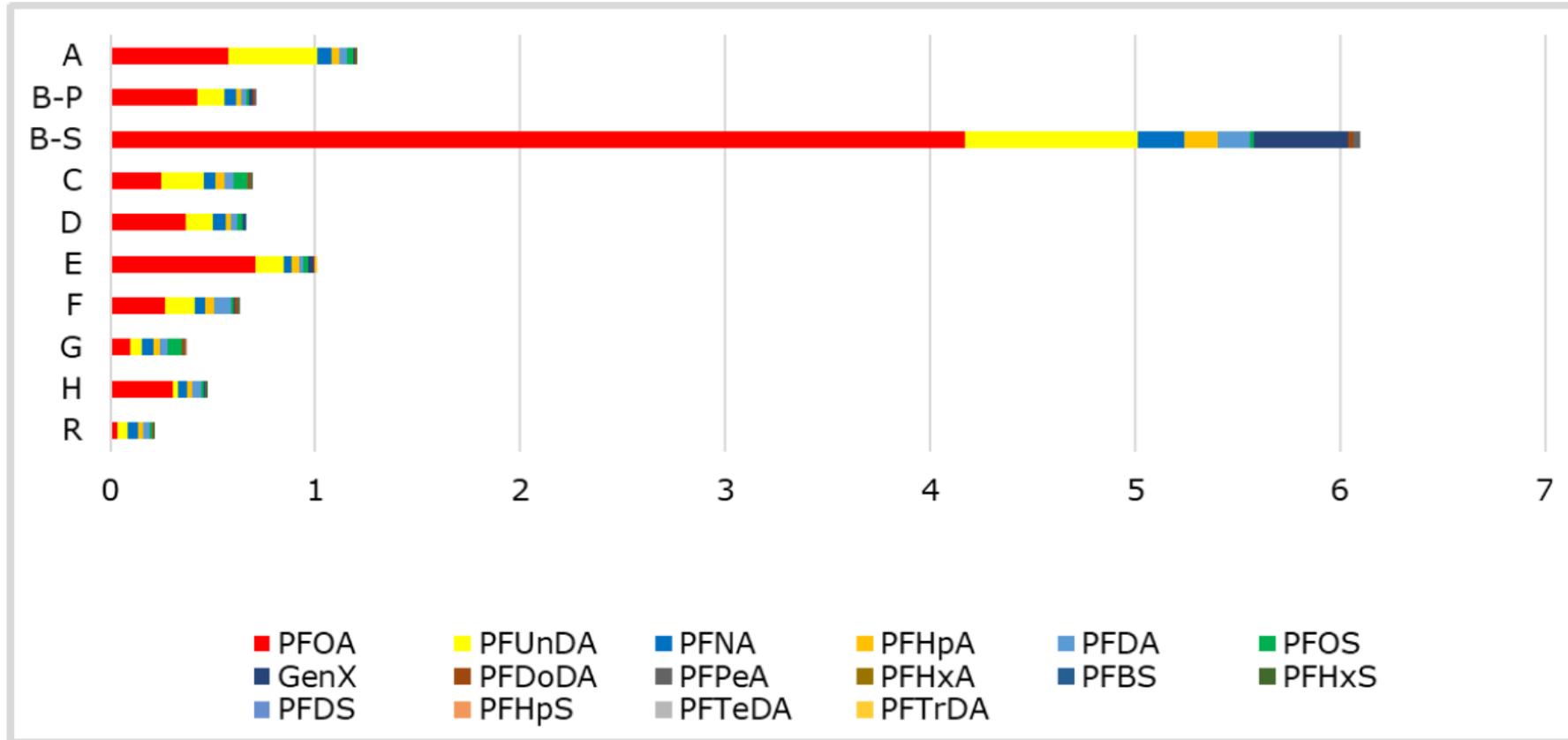
Tabel 6 Relatieve potentie factoren van 23 PFAS (EFSA-4 in blauw)

PFAS	PFAS afkorting	CAS nummer van lineaire PFAS	RPF
Sulfonzuren			
Perfluorbutaansulfonzuur	PFBS	375-73-5	0,001
Perfluorpentaansulfonzuur *	PFPeS	2706-91-4	0,6
Perfluorhexaansulfonzuur	PFHxS	355-46-4	0,6
Perfluorheptaansulfonzuur *	PFHpS	375-92-8	2
perfluoroctaansulfonzuur	PFOS	1763-23-1	2
Perfluordecaansulfonzuur	PFDS	335-77-3	2
Carbonzuren			
perfluorbutaanzuur	PFBA	375-22-4	0,05
Perfluorpentaanzuur *	PFPeA	2706-90-3	0,05
perfluorhexaanzuur	PFHxA	307-24-4	0,01
Perfluorheptaanzuur *	PFHpA	375-85-9	1
perfluoroctaanzuur	PFOA	335-67-1	1
perfluornonaanzuur	PFNA	375-95-1	10
Perfluordecaanzuur *	PFDA	335-76-2	10
perfluorundecaanzuur	PFUnDA	2058-94-8	4
perfluordodecaanzuur	PFDoDA	307-06-7	3
Perfluortridecaanzuur *	PFTTrDA	72629-94-8	3
perfluortetradecaanzuur	PFTeDA	376-06-7	0,3
perfluorhexadecaanzuur	PFHxDA	67905-19-5	0,02
perfluoroctadecaanzuur	PFODA	16517-11-6	0,02
Ether carbonzuren			
2,3,3,3-tetrafluor-2-(heptafluorpropoxy)propionzuur	HFPO-DA (~GenX)	13252-13-6	0,06
ammonium 4,8-dioxa-3H-perfluornonanoaat	ADONA	958445-44-8	0,03
Telomeer alcoholen			
1H,1H,2H,2H-perfluoroctanol	6:2 FTOH	647-42-7	0,02
1H,1H,2H,2H-perfluordecanol	8:2FTOH	678-39-7	0,04

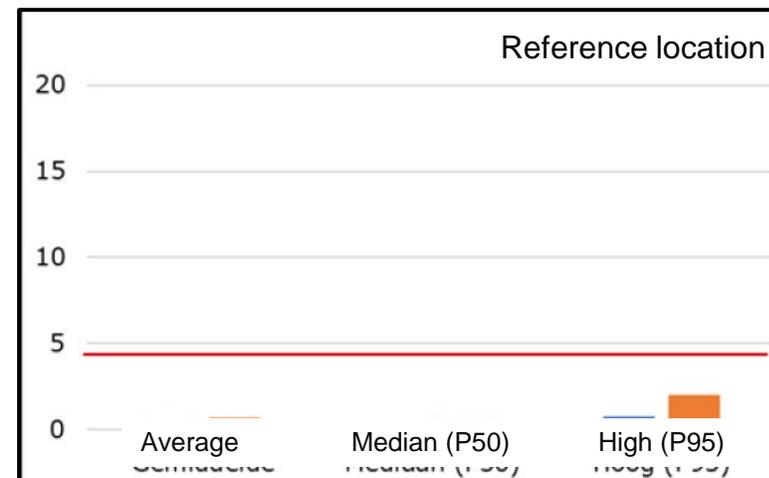
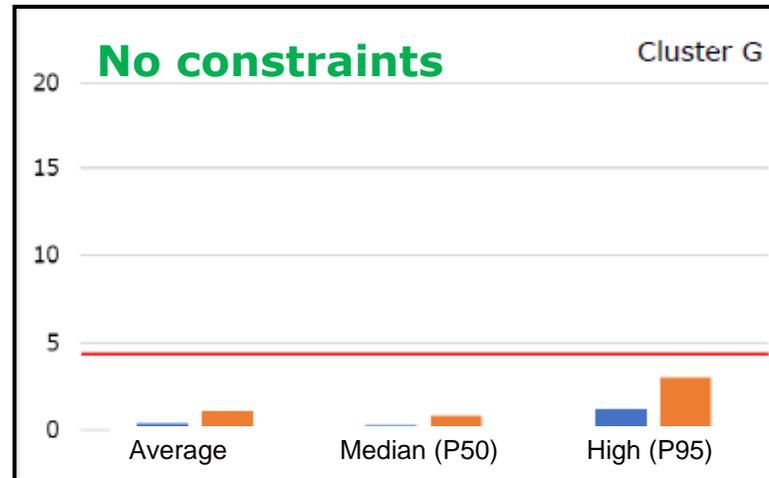
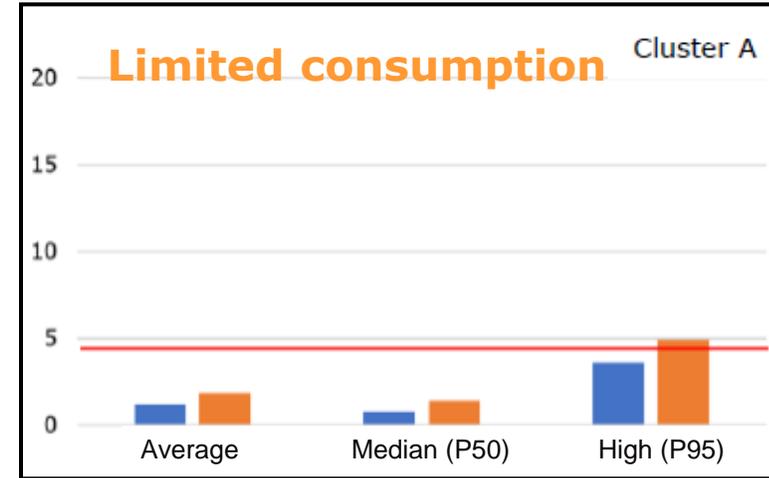
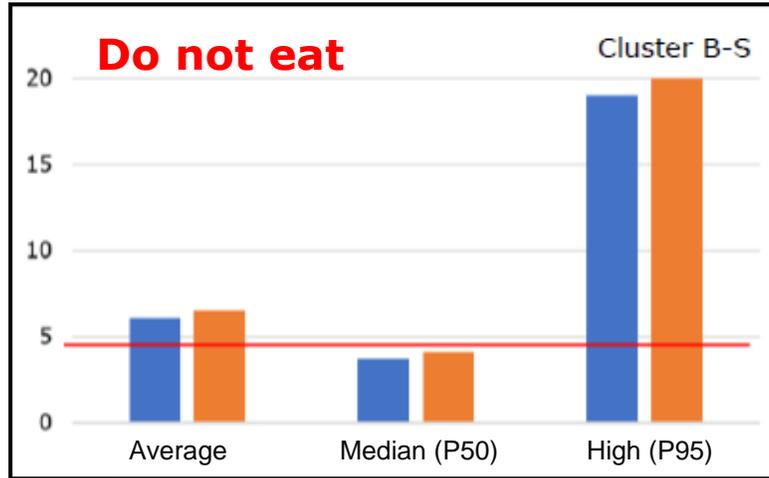
* In Bil et al. (2021) is de RPF afgeleid als interval op basis van read-across.

Results (1)

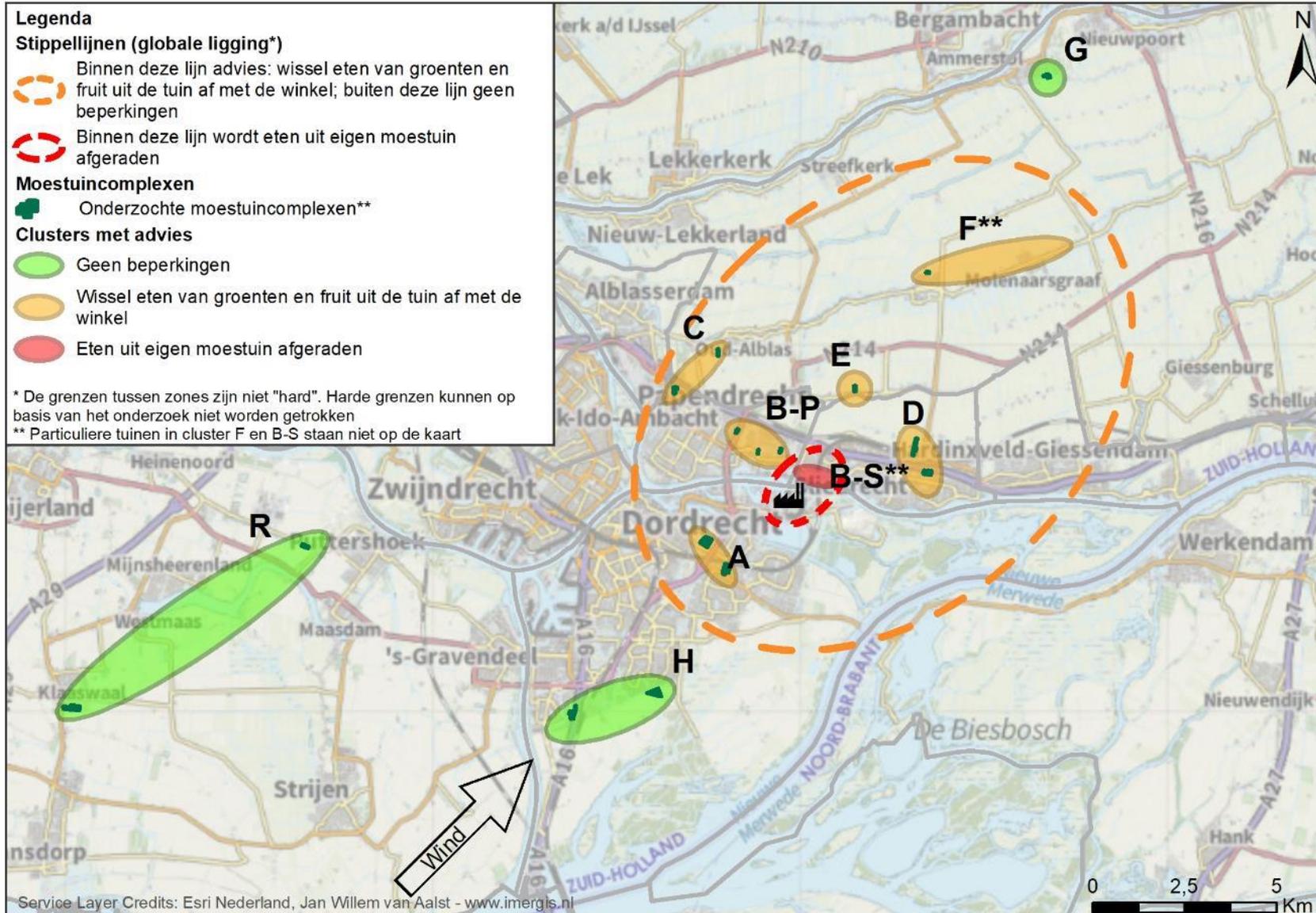
Average consumption PFAS per cluster (ng/kg bw/week)



Results (2)

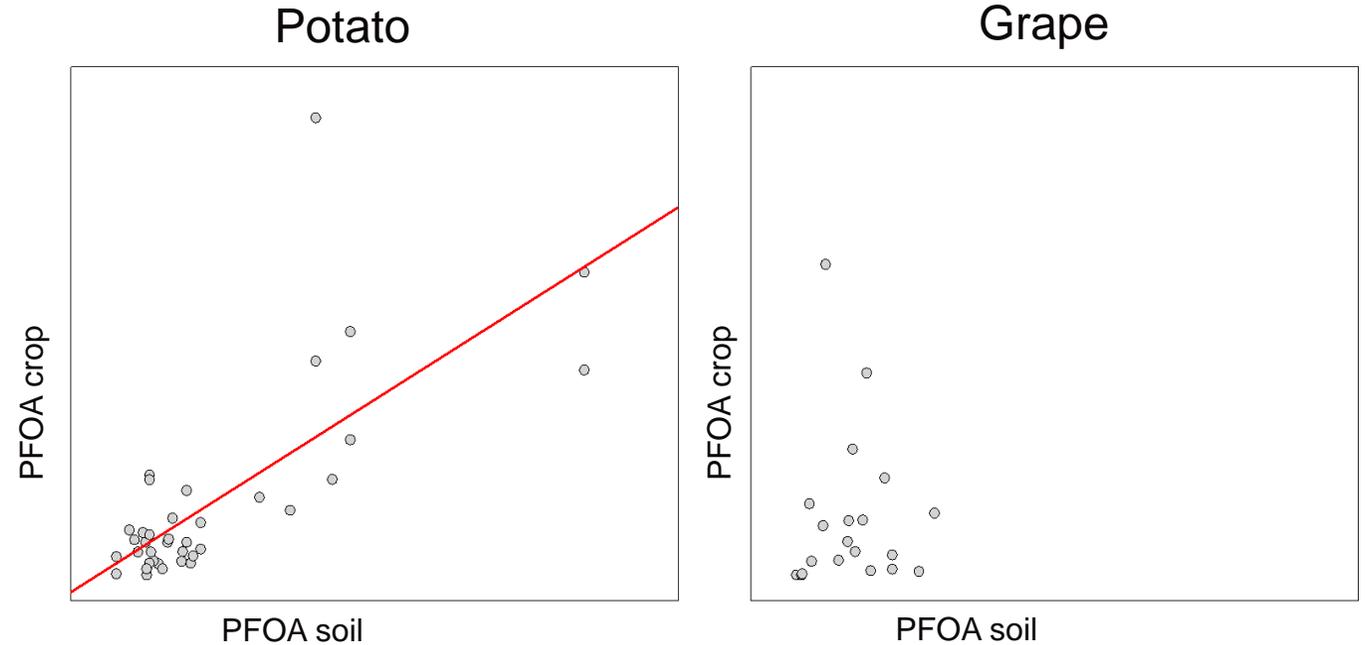


Recommendations



Soil – plant relations under field conditions

- Not always a good correlation
- Good correlation for crops that grow in the soil
- Less correlation for other vegetables and fruit
- In general; BCF under field conditions is lower than the ones used for calculations





<https://eu.pnj.com/story/opinion/2021/08/08/marlette-cartoon-pfas-pandemic/5497246001/>



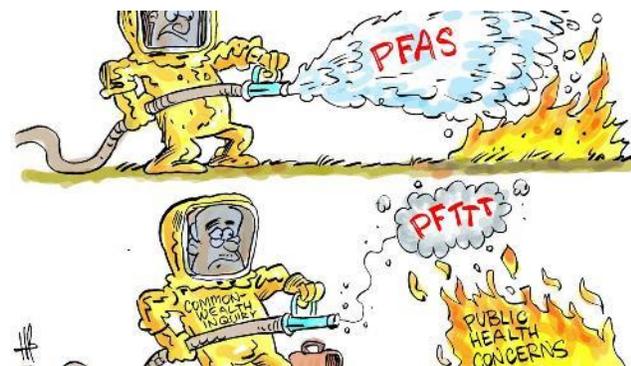
<https://www.lokocartoons.nl/cartoonjournaal/page/54/>

Questions?

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