

Biofilter & Fytobac in the Netherlands

Testing, demonstration & implementation

March 20th 2013, Rik de Werd



Outline presentation

- Goal & setup on farm tests
- Measuring results 2008 – 2012
- Practical implications
- Communication for implementation
- Implementation in regulation: update



Goal of our on farm tests

- Develop practical advise for bioremediation
- Demonstrate the possibilities to farmers and other stakeholders (farmers advisors, policy advisors)
- Generate (more) efficacy data under practical circumstances and over several years
- No in depth analysis



location	2008	2009	2010	2011	2012
HG	Biofilter			Fytobac	
RN		Biofilter			
GOY	Biofilter				
UT2			Biofilter		
NH				Biofilter	
FL				Biofilter	
VR	Fytobac			Fytobac	



Biofilter en Fytobac





Hermex Phytobac









Setup

- Extensive monitoring
- Sampling frequency:
 - +/- every 4-6 weeks
 - Gaps in measuring periods did occur at some locations
- Sampling:
 - Influent: from collection tanks
 - Effluent: from collection tank (most locations), or drainage water tapped straight from the last filter or evaporation unit



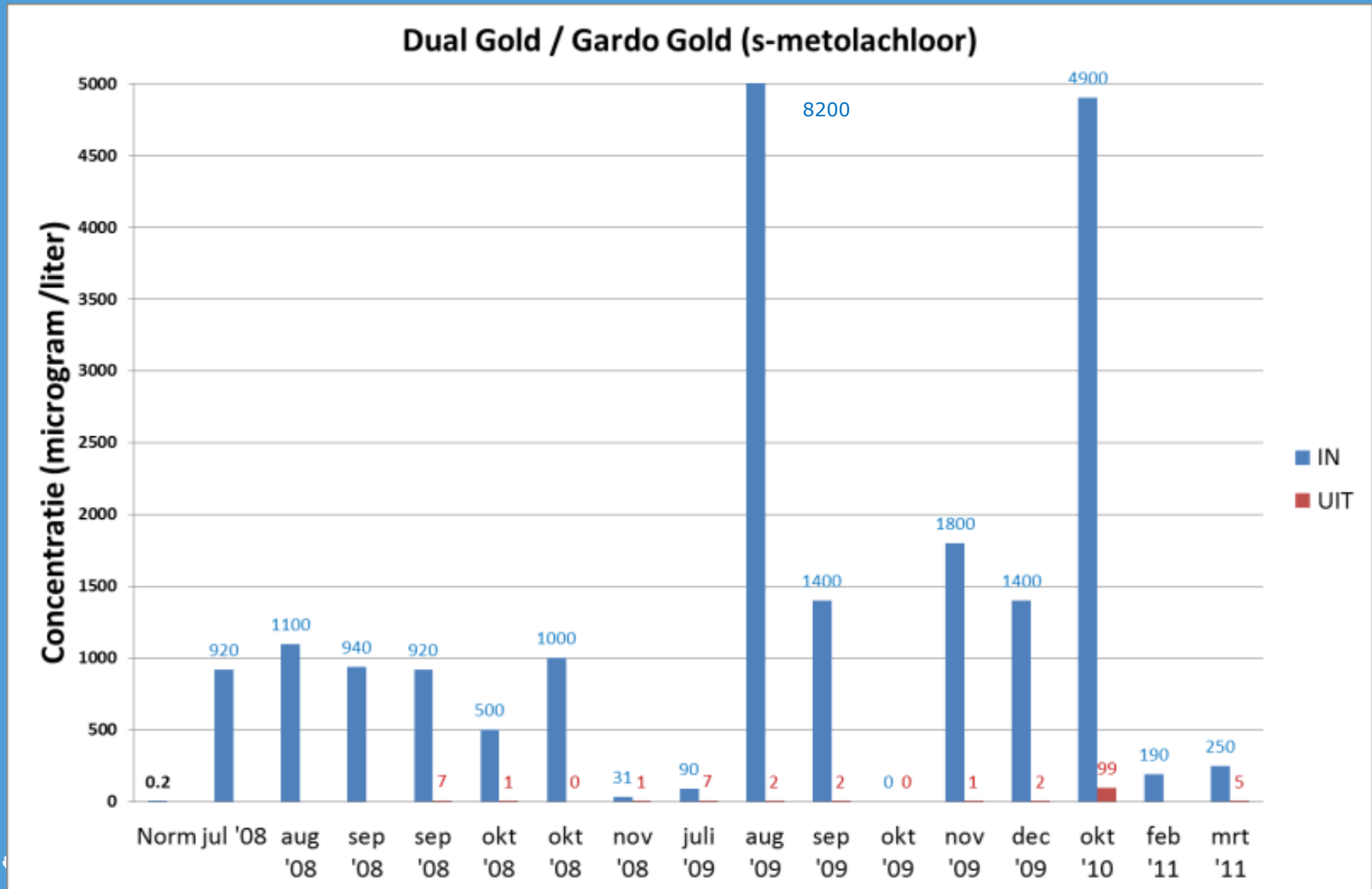
Setup

■ Influent:

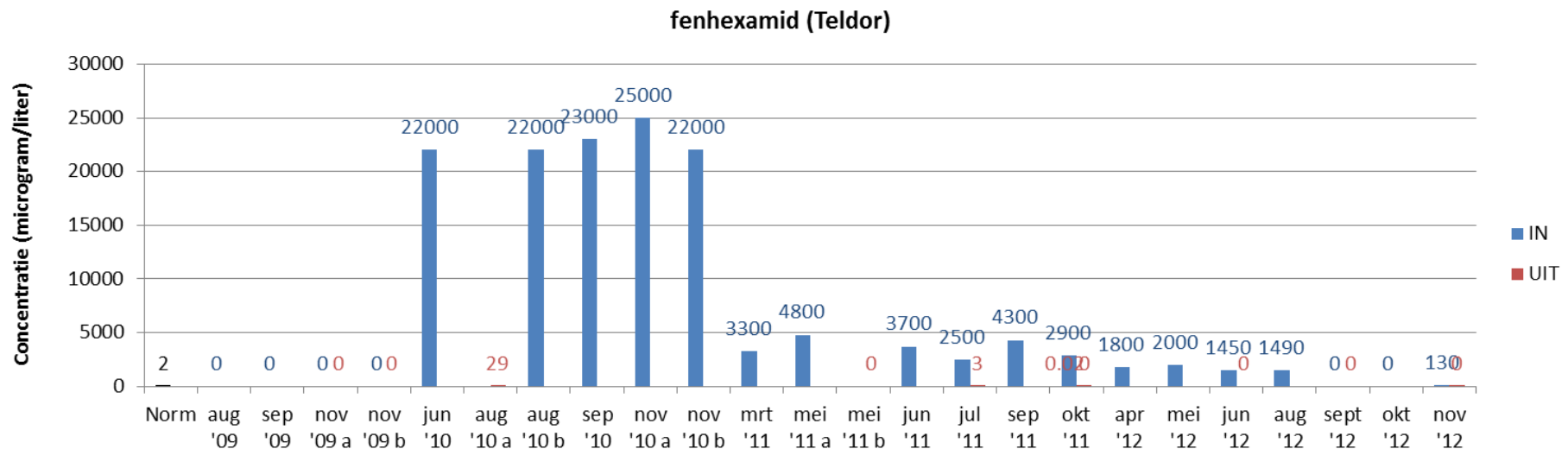
- Sprayer cleaning + remnant
- Spiked influent in 2009 (location GOY) and 2010 (location RN): 0,5 – 0,5-30 mg a.i. per litre



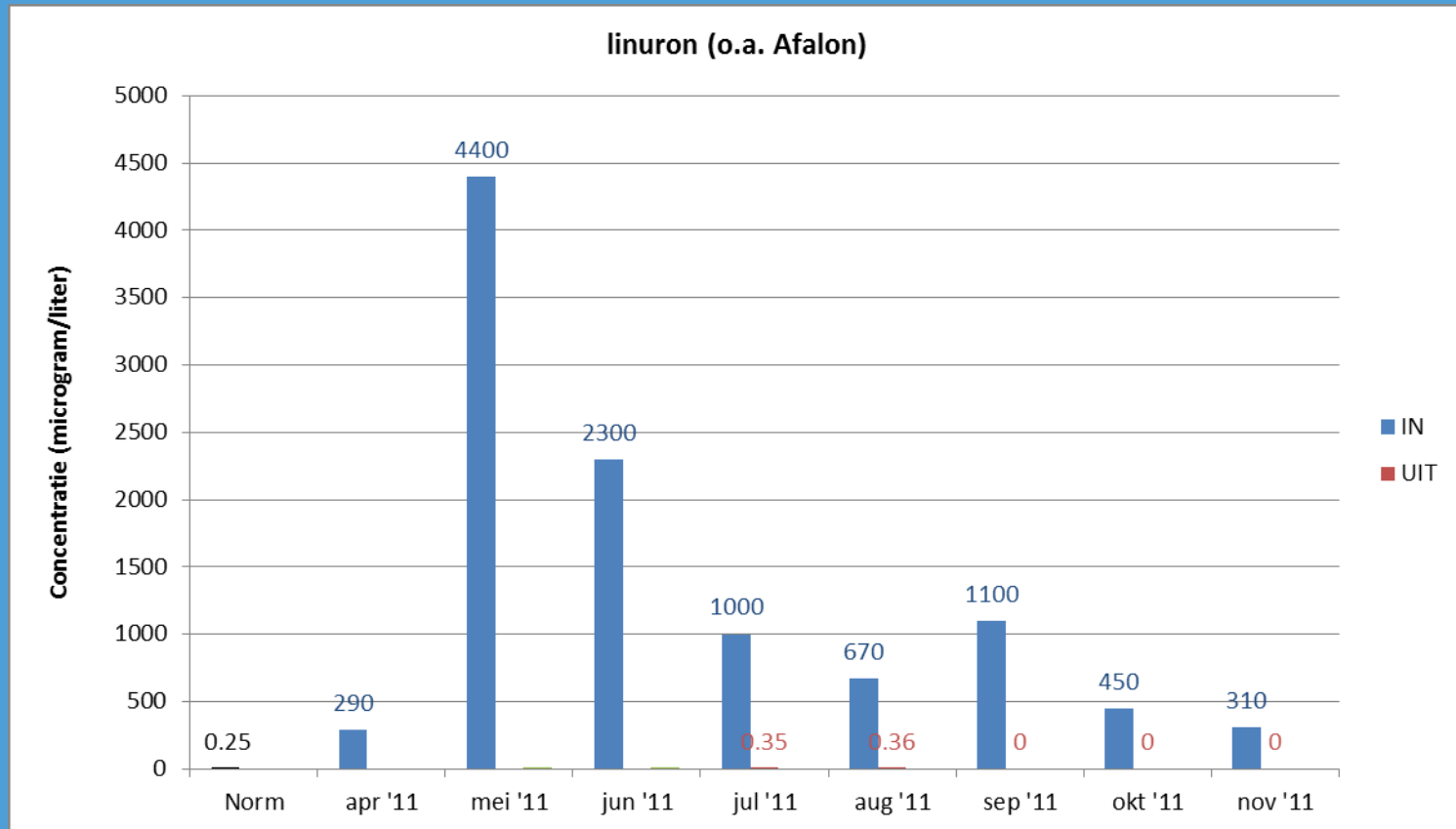
Concentration before and after purification (example, contract sprayer - Biofilter)



Example experimental fruit farm - Biofilter

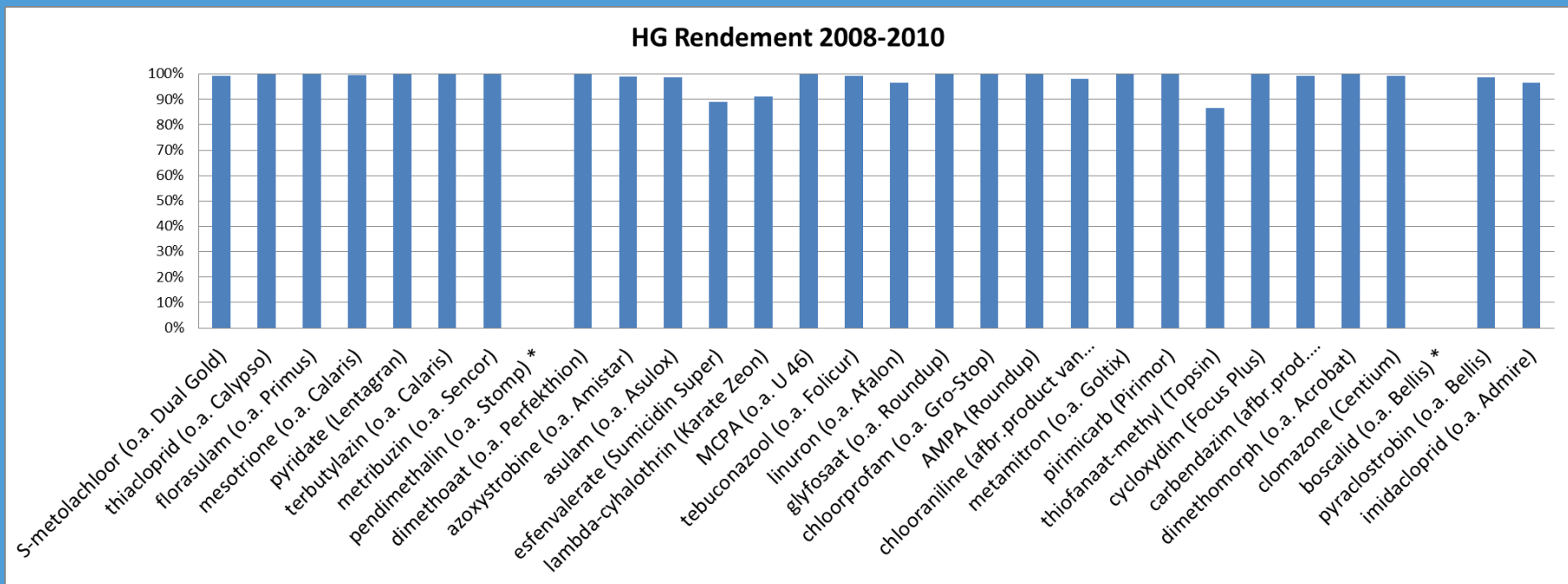


Example arable farm - Biofilter



$$\text{Efficacy (\%)} = ([\text{IN}] - [\text{OUT}]) / [\text{IN}] * 100$$

- For most relevant substances
- Ranking: max conc. / water quality standard
- Example for 1 location



Efficacy per substance per location

99-100%

90-98%

50-89%

0-49%

negatief

% verwijdering uit water op basis van gemiddelde concentraties in influent en effluent

			99-100%	90-98%	50-89%	0-49%	negatief			
	Locatie-jaar ->									
Stof	RN '09	RN '10-'11	GOY '09-'11	UT2 '10-'11	HG '08-'10	HG '11	NH2 '11	FL '11	VR '11	VR '08-'09
AMPA (afbraakproduct van glyfosaat)	93				100					
abamectine (o.a. Vertimec Gold)		100	97							
acetamiprid (Gazelle)				100				100		
aclonifen (Challenge)									100	
asulam (o.a. Asulox)					99	100			100	
azoxystrobine (o.a. Amistar)					99	100	100	94		
bentazon (o.a. Basagran)										88
bifenthrin (Bistar)									87	
boscalid (o.a. Bellis)	100	100	100	100	negatief			99		
carbendazim (afbraakproduct van thiofanaat-methyl)		100	99	100	99		100	negatief		
chlooraniline (afbraakproduct van chloorprofam)					98					
chloorprofam (o.a. Gro-Stop)					100	98			100	
clomazone (Centium)					99				100	
cyazofamid (Ranman)							100	100		
cycloxydim (Focus Plus)					100	99				
cyproconazool (o.a. Sphere)							100			
cyprodinil (o.a. Switch)	100	100	99	100						
deltamethrin (o.a. Decis)		100		100			100			
difenoconazool (o.a. Score)								100		
dimethenamid (o.a. Frontier Optima)							52	100	100	100
dimethoaat (o.a. Perfekthion)					100			100		
dimethomorph (o.a. Acrobat)					100					
dithianon (o.a. Delan)	100		100							
dodine (o.a. Syllit)		100								
esfenvalerate (Sumicidin Super)					89	99	98	88		
ethofumesate (o.a. Goltix)								100	100	
fenhexamid (Teldor)		100		100						
fenoxycarb (o.a. Insegar)	100	100	99	96		9	100			
fenpropimorph (o.a. Corbel)							100	100	100	
florasulam (o.a. Primus)				97	100	100				
fludioxonil (o.a. Switch)			39						negatief	
glyfosaat (o.a. Roundup)	99				100					
hexythiazox (Nissorun)				99						



Efficacy

location x measuring period

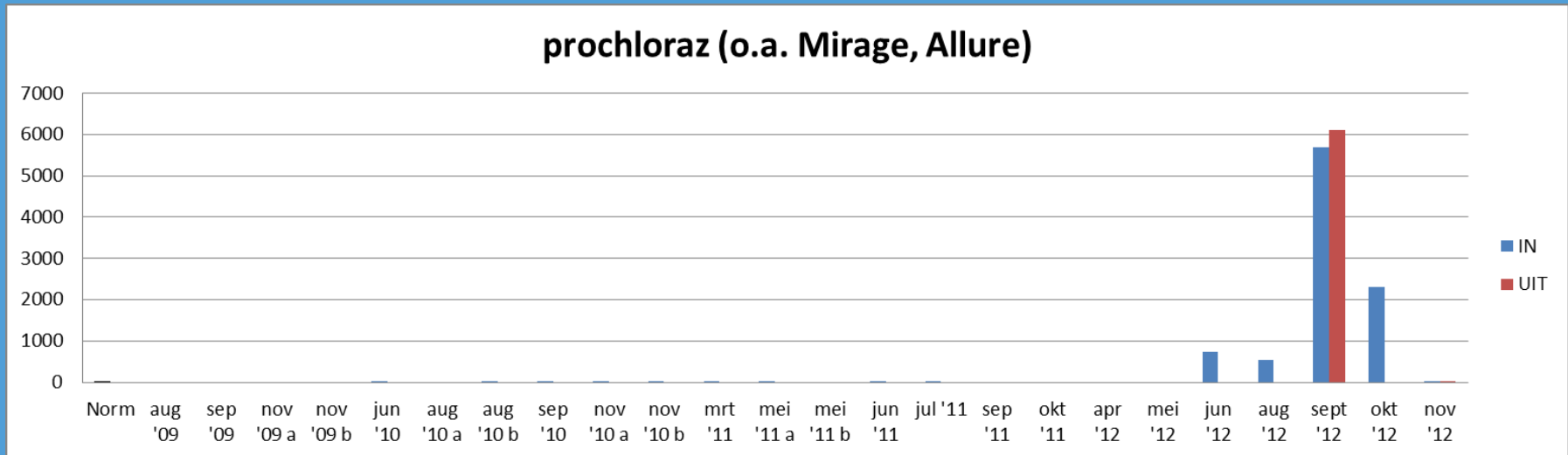
Locatie-jaar ->									
RN'09	RN '10-'11	GOY'09-'11	UT2 '10-'11	HG'08-'10	HG'11	NH2-'11	FL'11	VR'11	VR'08-'09
99	100	89	99	92	81	82	84	95	97

- Average: 95%
- If OUT > IN: calculated as efficacy '0'
- No correction for volume decline: actual efficacy may be higher
- Despite good overall result, low or negative calculated efficacy for a substance occurs frequently

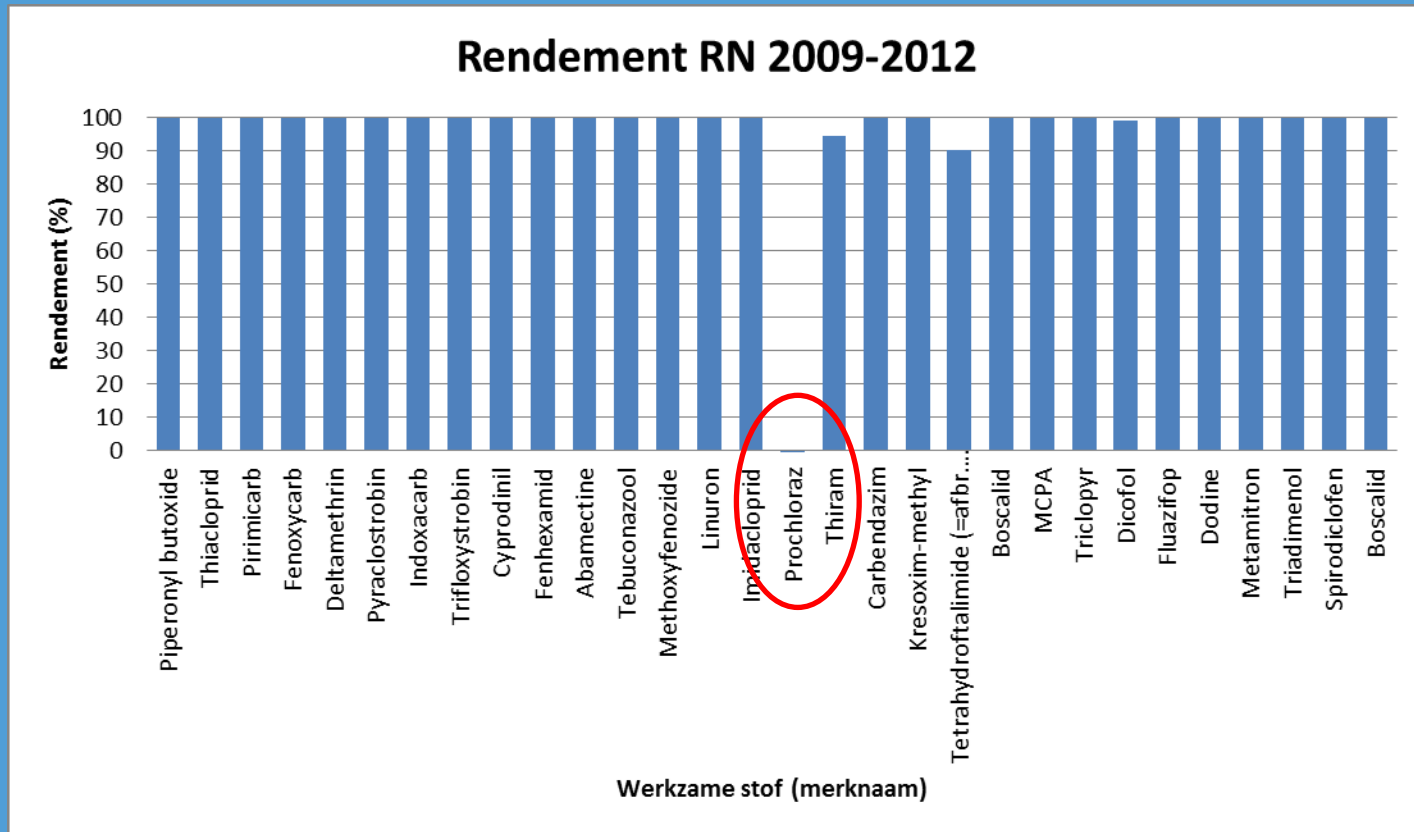
Reason for a closer look:



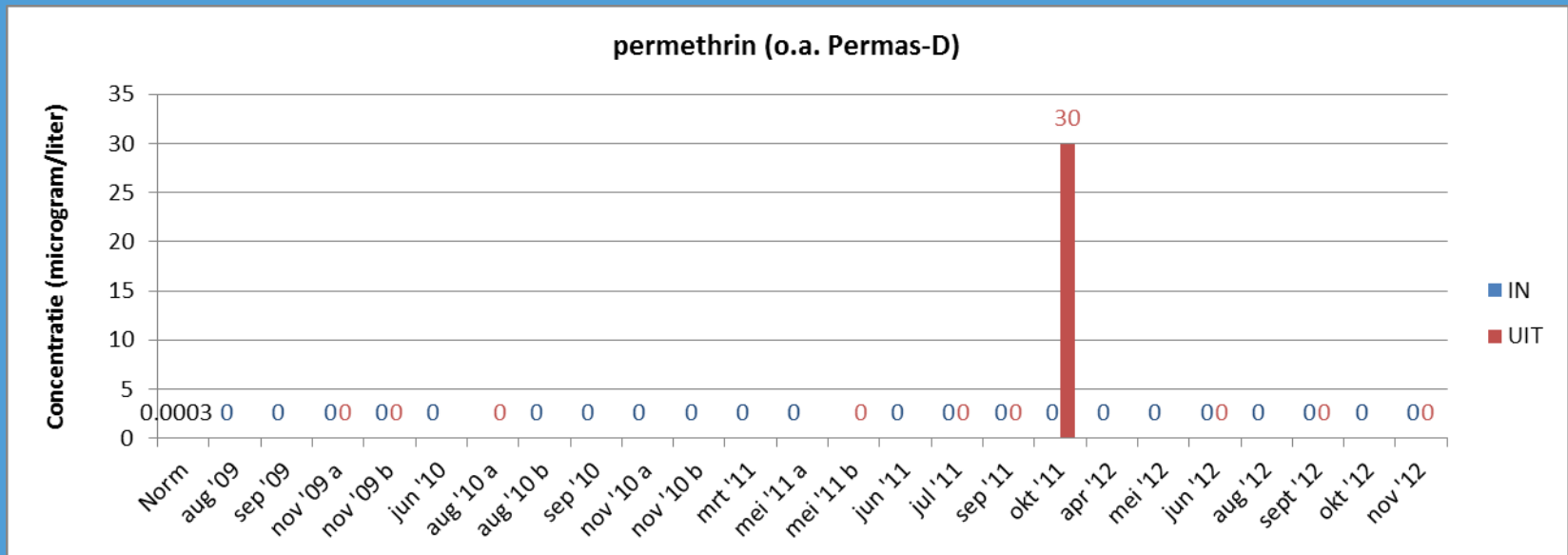
Labeling mistake duplo bottle?



Efficacy (%)



Negative efficacy: permethrin



Biocide not used in the orchard...

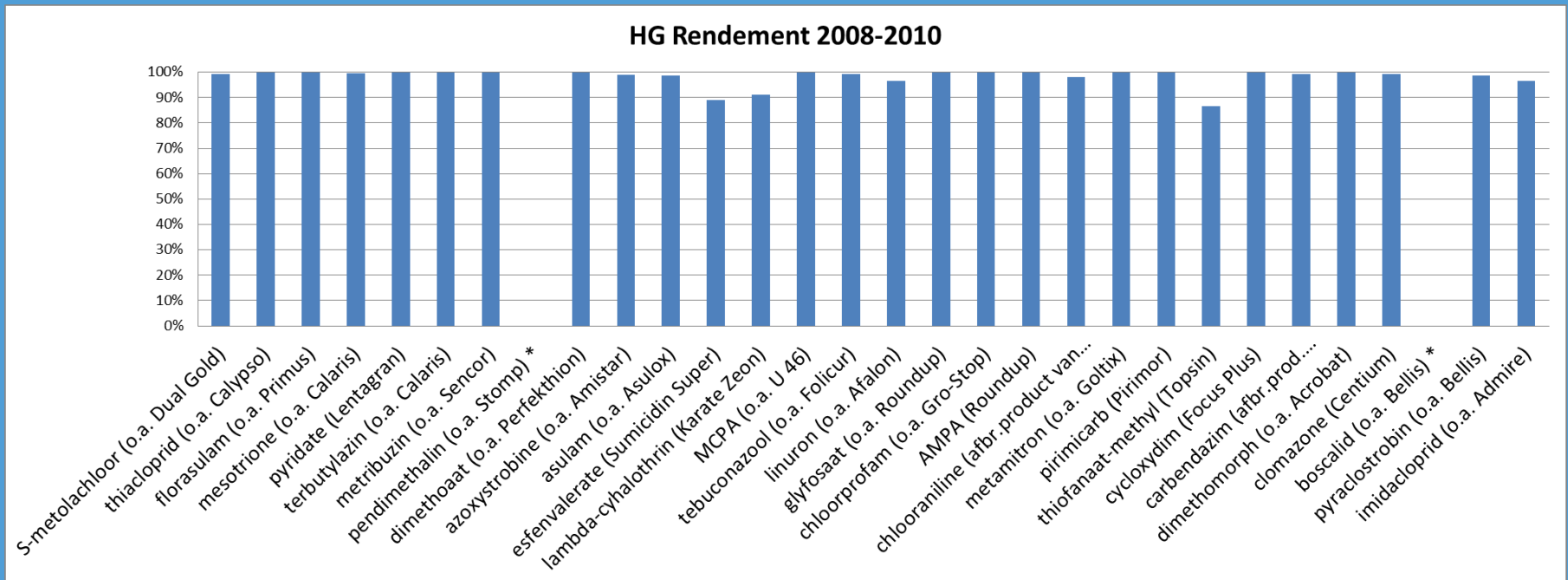


Expect the unexpected



Efficacy

- Overload? (water saturated substrate with heavy rainfall)



Efficacy: a closer look at exemptions

Locatie-jaar ->									
RN'09	RN '10-'11	GOY'09-'11	UT2 '10-'11	HG'08-'10	HG'11	NH2-'11	FL'11	VR'11	VR'08-'09
99	100	96	99	92	82	86	91	95	97

- No relation with substance properties (degradation or sorption properties)
- They seem random substances
- Cross contamination in most cases not plausible
- Substrate contamination not plausible
- New installations in practice (2011) less effective than multi-year measurements at experimental farms
- Possible relation with overload (concentration x volume) in the start up period

Practical conclusions

- Minimize the risk of obstructions in tubes and nozzles
 - Use in line filters for the waste water
 - Use aeration tubes between vessels
- Evaporation: often overestimated in NL
- Smaller Biofilters (less than 3 filter compartments) work well for small volumes
- Drainage water from Biofilter / Fytobac does not always meet water quality standards: no discharge to surface water
- Users are content with the installations!



Communication for implementation



Communication for implementation

- Numerous presentations, demonstrations and publications
- Stakeholders joined. Exposure boost.
 - Bayer Crop Science
 - Advisory organisations
 - Farmer suppliers
 - Farmers union
 - Water boards



Communication effects

- Bioremediation and remnant management included in many farmers' projects
- Inclusion in product certification schemes (market directed)
- Dutch Phytobac suppliers: Beutech, Horticoop / Agrifirm
- Raised point source pollution awareness
- Installation in practice (farmers and contract sprayers): slowly but surely
- Reference to guidelines bioremediation in regulation

Implementation in regulation

- Reference in legislation since January 2013
 - A measure to be able to emit cleaning water to the soil or public sewage system
 - If to soil: spread over field where PPPs are applied
 - No facilities needed for outside cleaning at farm yard if $\leq 2x$ per year



Implementation in regulation

- If emitting drainage water to soil or sewage:
 - System has to fit demands described in construction and user manual
 - Only for sprayer cleaning water
 - Water from internal tank rinsing: tank and booms need to be pre-rinsed in the field; no undiluted remnant
 - Substrate: Biomix (chopped straw, compost/peat, field soil, 45-45-10 vol.%)



Other fluids?

- Dipping fluid left overs:
 - Very high concentration of mainly fungicides
 - Bayer: on farm degradation monitoring
- Condensation water from storage cells?
- ?



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