Tendency towards higher complexity in environmental risk assessment of Plant Protection Products: to accept or to avoid?

Key messages from an NGO perspective

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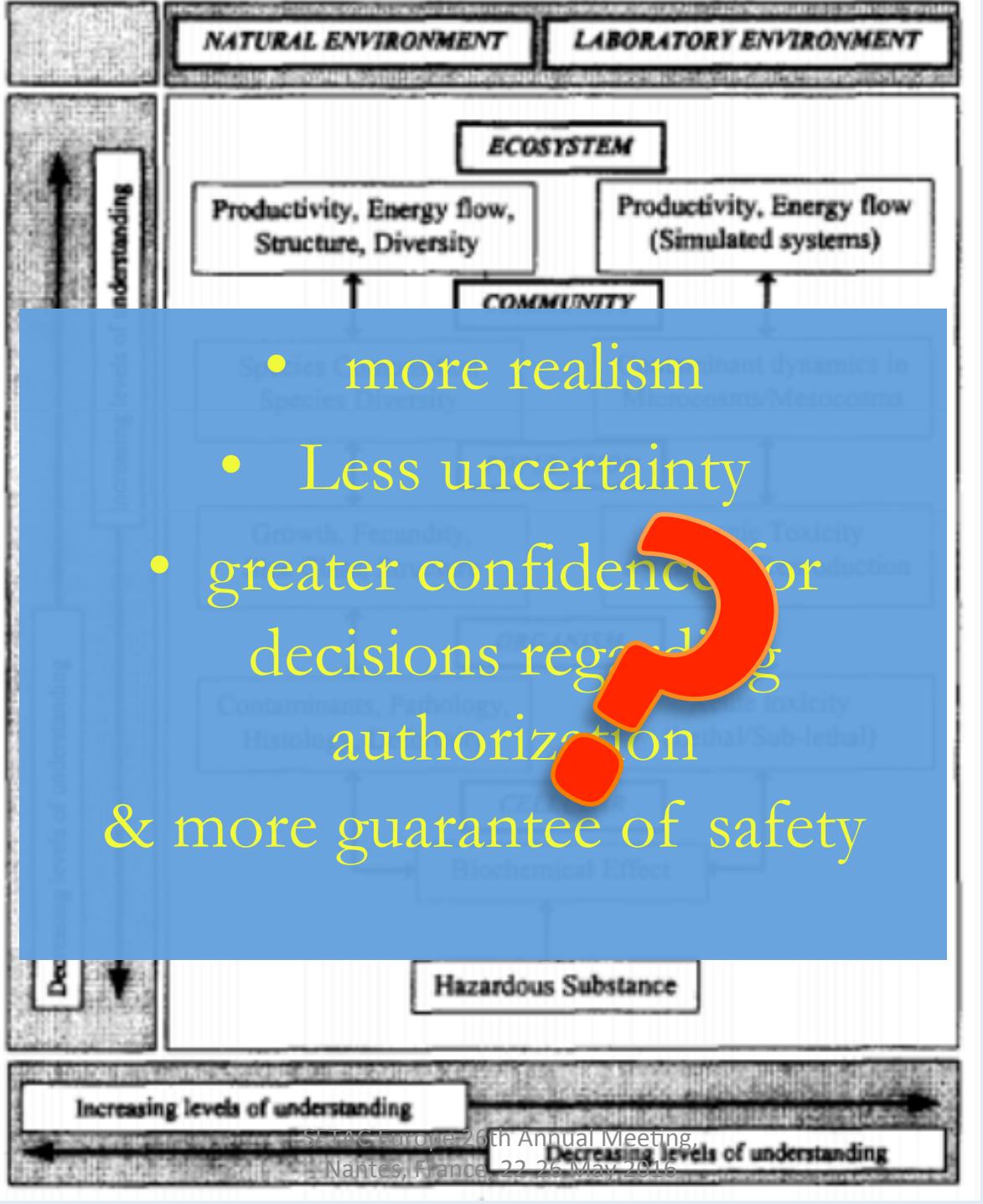
"NO authorization shall be granted [if Tier 1 risk is indicated]

unless it is clearly established

through an appropriate (higher tier) risk assessment that under field conditions no unacceptable impact occurs after use of the plant protection product in accordance with the proposed conditions of use"

Increasing ecological or field relevance

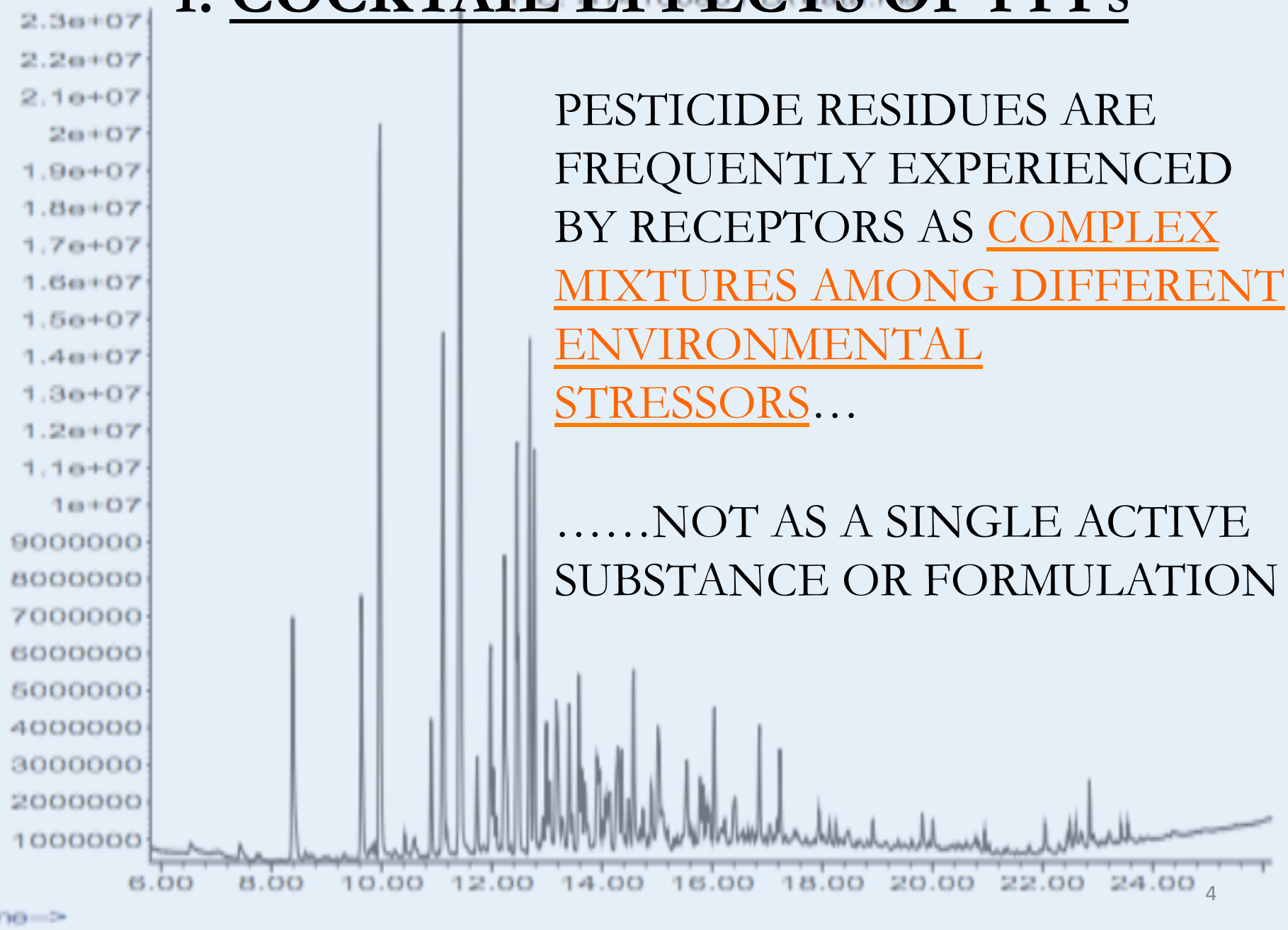


- more realism
- Less uncertainty
- greater confidence for decisions regarding authorization

& more guarantee of safety

Increasing complexity and uncertainty

1. COCKTAIL EFFECTS OF PPPs



PESTICIDE RESIDUES ARE FREQUENTLY EXPERIENCED BY RECEPTORS AS COMPLEX MIXTURES AMONG DIFFERENT ENVIRONMENTAL STRESSORS…

……NOT AS A SINGLE ACTIVE SUBSTANCE OR FORMULATION

Pesticides in European apples, 2015 (39)

Table 1: Number of residues found in samples from each country

			Number of residues found in conventionally grown apples								
	No. of samples	Organic samples (without residues)	0	1	2	3	4	5	6	7	8
Austria	10	1	1	1	1	3	2	1	0	0	0
Belgium	4	1	0	0	1	0	2	0	0	0	0
Bulgaria	5	2	0	0	2	0	0	0	0	0	1
Switzerland	8	2	1	3	0	1	0	1	0	0	0
Germany	39	6	4	12	7	5	3	1	0	1	0
France	13	1	6	3	0	0	3	0	0	0	0
Italy	10	1	1	5	2	1	0	0	0	0	0
Nether-lands	5	0	0	0	1	2	1	1	0	0	0
Poland	10	0	0	3	2	2	1	2	0	0	0
Slovakia	8	0	0	3	2	1	0	2	0	0	0
Spain	14	3	0	1	0	3	3	1	1	2	0

Table 4: Highest aquatic toxicity values of the pesticides found in the apples

Pesticide	Algae toxicity	Fish & *Daphnia spp.* toxicity	No. of samples in which found

Table 5: Highest bee and beneficial toxic values of the pesticides found in the apples

Pesticide	Bee toxicity	Toxicity to beneficial insects	No. of samples in which found
Acetamiprid	5	10	2
Captan			

Table 6: Pesticides with very high persistence

Pesticide	Very high persistence	No. of samples in which found

Taken together with the known hazards, the information gaps on impacts of single substances and of mixtures represent critical failings of the current regulatory regime for pesticides.

Pesticide	Very high bioaccumulating potential	No. of samples in which found
Chlorpyrifos-ethyl	10	15
Chlorpyrifos-methyl	10	3
Cypermethrin	10	1
Fenpyroximate	10	1
Indoxacarb	10	2
Lambda-Cyhalothrin	10	1
Pyraclostrobin	10	12

German Toxic Load Indicator database

Pesticides in 12 conventionally managed European apple orchards (2015)

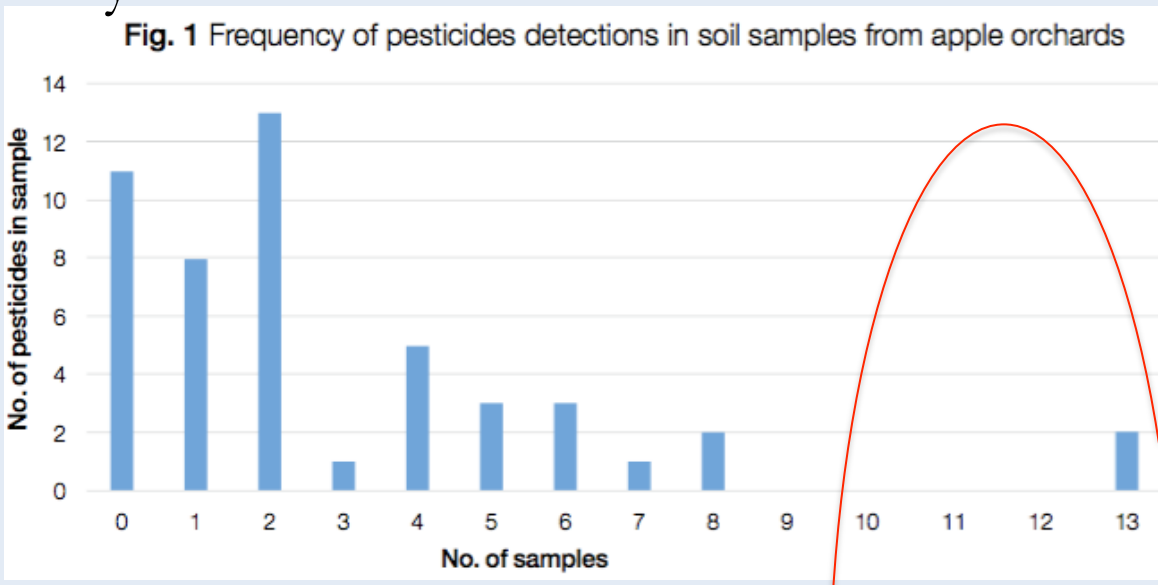
…types of PPP residues (53)

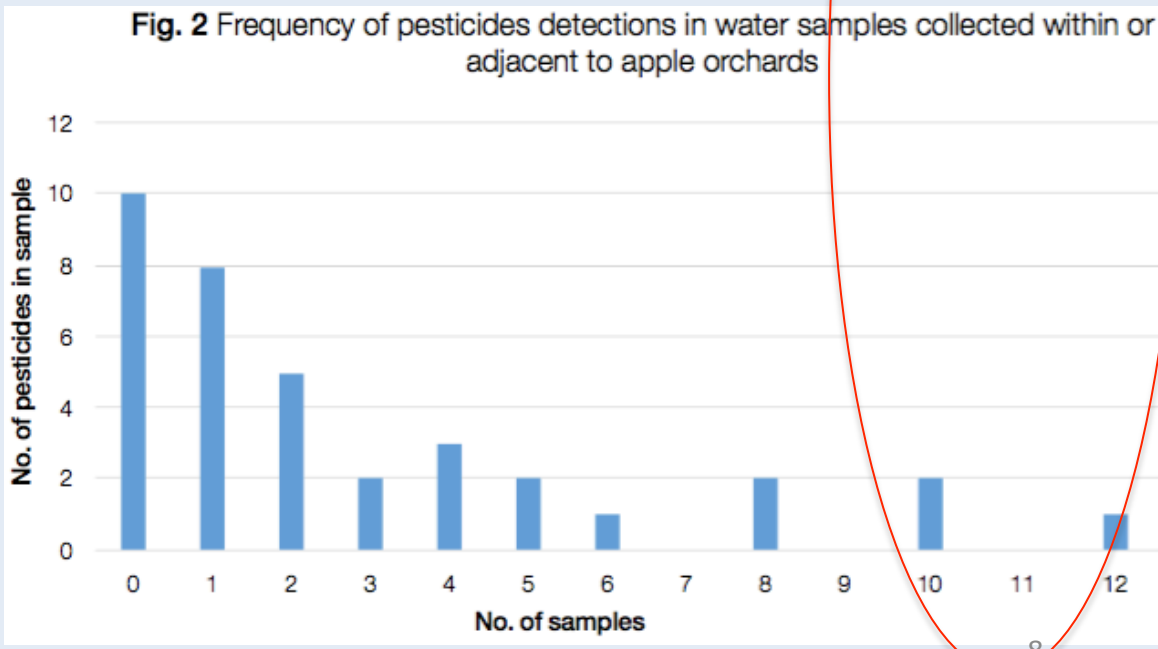
Pesticide	Class/ type	Frequency of detection in soil samples		Countries in which detected (number of samples) [concentration range in mg/kg]
		No. of samples	% samples	
2,4-D	H	1	2	Switzerland (1) [0.084]
Boscalid	F	19	38	Austria (1) [0.14], Belgium (3) [1.4-3.6], France (4) [0.28-0.72], Greece (1) [0.073], Italy (2) [0.16-3.1], Netherlands (3) [0.12-0.25], Poland (3) [0.11-0.31], Slovakia (2) [0.11-0.35].
Carbendazim	F	4	8	Belgium (1) [0.11], Germany (2) [0.072-0.13], Italy (1) [0.57]
Chlorantraniliprole	I	9	18	Belgium (3) [0.083-0.14], France (2) [0.05-0.057], Germany (2) [0.1-0.16], Greece (1) [0.089], Italy (1) [0.062]
Chlorpyrifos-ethyl	I (op)	10	20	Austria (1) [0.077], France (4) [0.02-0.26], Italy (1) [2.1], Switzerland (4) [0.03-0.21]
Cyprodinil	F	4	8	Belgium (1) [0.11], France (1) [0.23], Germany (2) [0.077-0.099]
DDT (as DDD and DDE)	I	13	26	France (2) [0.015-0.023], Germany (2) [0.083-0.184], Hungary (3) [0.015-0.11], Netherlands (4) [0.036-0.4], Poland (2) [0.019-0.092]
Deltamethrin	I	1	2	Italy (1) [0.07]
Dieldrin	I	1	2	Greece (1) [0.072]
Difenoconazole	I	8	16	Belgium (2) [0.2-0.26], France (2) [0.073-0.096], Italy (1) [0.23], Poland (1) [0.095], Switzerland (2) [0.083-0.14]
Diflufenican	H	2	4	Belgium (2) [0.36-0.53]
Endosulfan (as Endosulfan sulphate)	I	3	6	Austria (1) [0.076], Italy (1) [0.03], Switzerland (1) [0.03]
Endrin	I	1	2	Austria (1) [0.04]
Etofenprox	I	1	2	Italy (1) [0.29]
Fenbuconazol	F	1	2	France (1) [0.061]
Fenhexamid	F	1	2	Italy (1) [0.18]
Fludioxonil	F	6	12	France (4) [0.069-0.33], Germany (1) [0.07], Italy (1) [0.069]
Fluquinconazole	F	2	4	Austria (1) [0.11], Germany (1) [0.03]
Flusilazol	F	2	4	Poland (2) [0.05-0.23]
Imidacloprid	I (neo)	1	2	Italy (1) [0.081]
Indoxacarb	I	4	8	Belgium (2) [0.018-0.061], Italy (1) [0.32], Slovakia (1) [0.02]
Iprodione	F	1	2	Italy (1) [1.8]
Linuron	H	1	2	Belgium (1) [0.06]
Methoxyfenozide	I	3	6	Germany (2) [0.062-0.091], Poland (1) [0.18]
Mecoprop (MCPP)	H	1	2	Switzerland (1) [0.098]
Myclobutanil	F	3	6	Belgium (2) [0.018-0.1], Switzerland (1) [0.023]
Oxadiazon	H	1	2	France (1) [0.041]
Oxyfluorfen	H	4	8	France (2) [0.035-0.1], Italy (2) [0.055-0.21]
Penconazole	F	7	14	Belgium (2) [0.082-0.12], Germany (2) [0.05-0.11], Italy (1) [0.15], Switzerland (2) [0.053-0.1]
Pendimethalin	H	3	6	Austria (1) [0.25], Belgium (1) [0.13], France (1) [0.16]
Pirimicarb	I	3	6	Belgium (1) [0.076], Germany (1) [0.052], Italy (1) [0.15]
Pyraclostrobin	F	3	6	Belgium (2) [0.1-0.16], Italy (1) [0.19]
tau-Fluvalinate	I, Ar	3	6	France (3) [0.018-0.047]
Tebuconazole	F, P	8	16	Germany (2) [0.075-0.077], Hungary (5) [0.056-0.079], Italy (1) [2.2]
Tetraconazole	F	2	4	France (1) [0.087], Hungary (1) [0.064]
Thiabendazole	F	1	2	Belgium (1) [0.12]
Triadimenol	F	1	2	Belgium (1) [0.21]

Key

Al = algicide, Ar = acaricide, F = fungicide, H = herbicide, I = insecticide, M = microbiocide, P = plant growth regulator, op = organophosphate, neo = neonicintinoid

Pesticides in 12 conventionally managed European apple orchards (2015) …numbers of PPP residues





Pesticides in 12 conven
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orchards (2015)
…numbers of PPP
residu

Table 7: Highest aquatic toxic values of the pesticides found in the water samples (from TLI pesticide database) Toxicity is scored out of 10 points on a 5-tiered scale.

Pesticide	Algae Toxicity	Fish & Water Flea Toxicity	No. of samples
Diflufenican	10	10	1
Pendimethalin	10	8	1
Chlorantraniliprole	5	10	14
Chlorpyrifos-ethyl	5	10	4

Table 8. Highest bee toxic values (10 points out of 10 points) of the pesticides found in soil and water samples (from TLI pesticide database)

Pesticide
Chlorpyrifos-ethyl
Chlorpyrifos-methyl
Deltamethrin
Dieldrin
Endrin
Etofenprox
Imidacloprid
Indoxacarb

Table 9: Pesticides found in soil samples from apple orchards with very high persistence (10 out of 10 points from the TLI pesticide database)

Substance	
Boscalid	Flusilazole
Chlorantraniliprole	Imidacloprid
Cyprodinil	Methoxyfenozide
DDT	Myclobutanil
Dieldrin	Oxadiazon
Difenoconazole	Penconazole
Diflufenican	Pirimicarb
Endrin	Tebuconazole
Fludioxonil	Tetraconazole
Fluquinconazole	Thiabendazole

Table 10: Pesticides found in soil samples from apple orchards with very high leaching potential (10 out of 10 points from the TLI pesticide database)

Pesticide
Boscalid
Chlorantraniliprole
Imidacloprid
Methoxyfenozide
Myclobutanil

Pesticides in pollen & beebread from European hives, 2013 (56)

Country	Sampling period, 2013	Number of samples	Key pesticides (banned neonicotinoids and other frequently encountered pesticides*) (Number of samples in which found) [Contentration range in µg/kg]
Austria	May	3	Clothianidin (1) [4.7], Thiacloprid (1) [24], Tebuconazole (1) [30]
France	Apr-Sep	12	Boscalid (2) [48-269], Folpet (1) [11], Tebuconazole (1) [159], Thiophanate-methyl (1) [24]
Germany	May-Jun	15	Thiacloprid (8) [10-250], Amitraz (incl. metabolites) (1) [11],

To achieve realism - potential for <u>combination effects</u> in mixtures will remain particularly hard to account for, especially <u>in higher tier testing</u>

e.g. taking the <u>17 pesticides</u> in one single pollen sample

- if tested only <u>in pairs</u>, would already require <u>136</u> different combinations
- in <u>groups of 3</u>, this rises to <u>680</u> combinations …

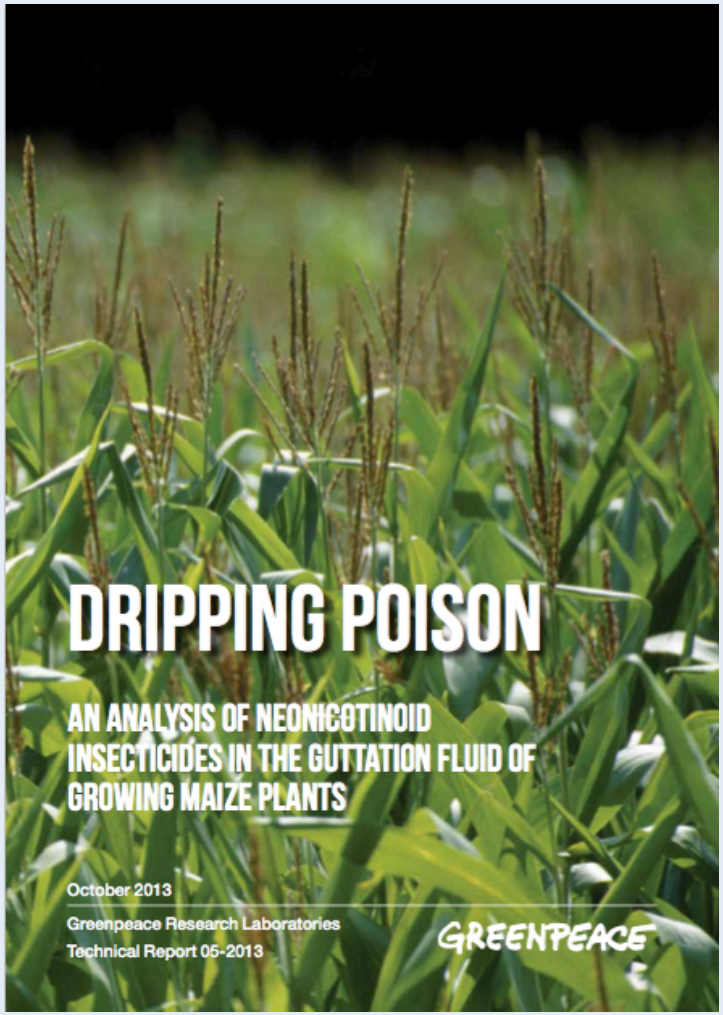
- 17 pesticides (14 fungicides & 3 insecticides/ acaricides) in pollen near vineyards in Valle S Matteo, Italy (2013)
- 7 pesticides (6 insecticides/acaricides & 1 fungicide) in beebread from Gilena, Andalucia (stored from 2012)

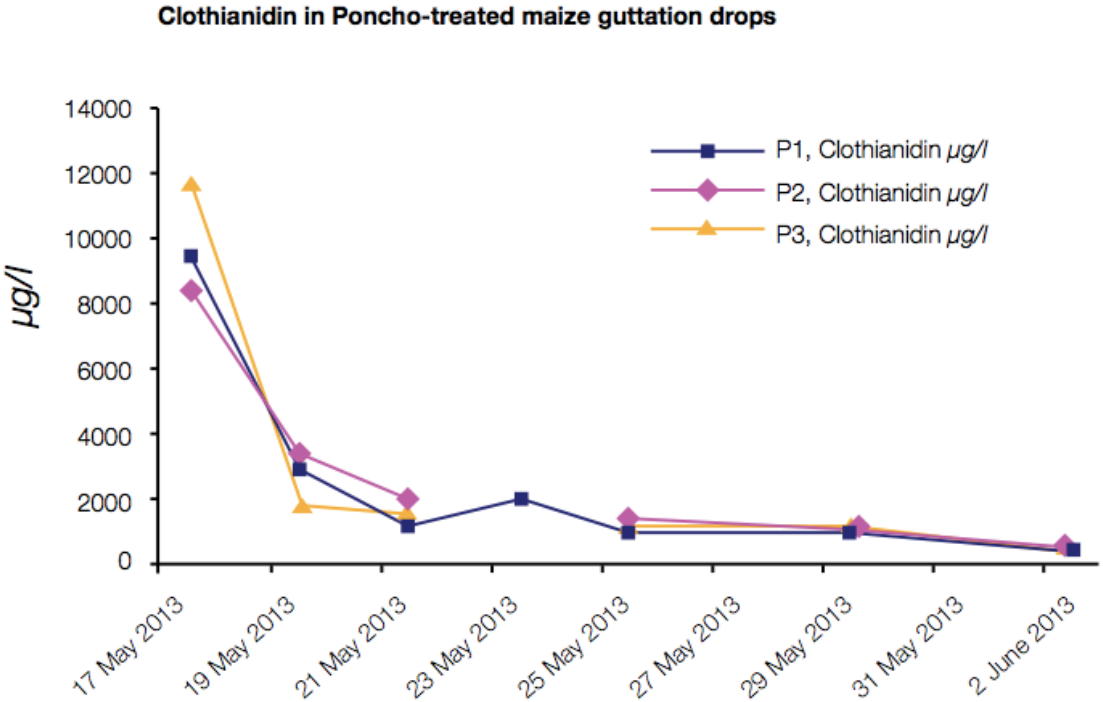
2. MULTIPLE EXPOSURE PATHWAYS

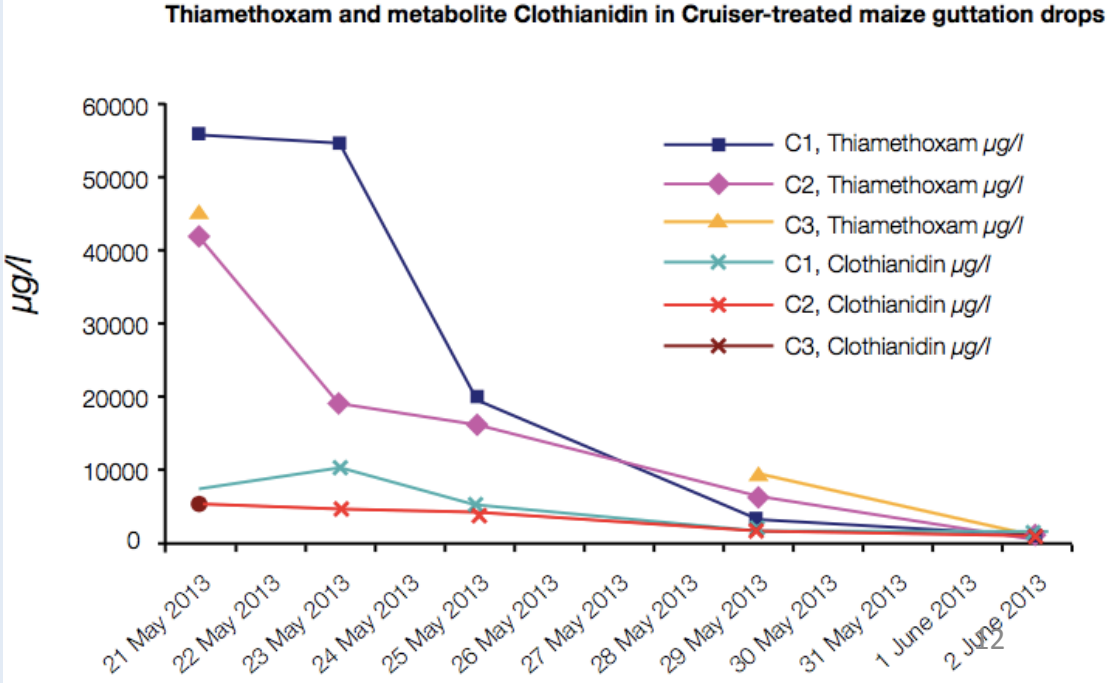
EXPOSURE PATHWAYS MAY BE MORE COMPLICATED AND DIVERSE THAN THEY FIRST SEEM…

…FOR EXAMPLE, SYSTEMIC PESTICIDES IN GUTTATION FLUID

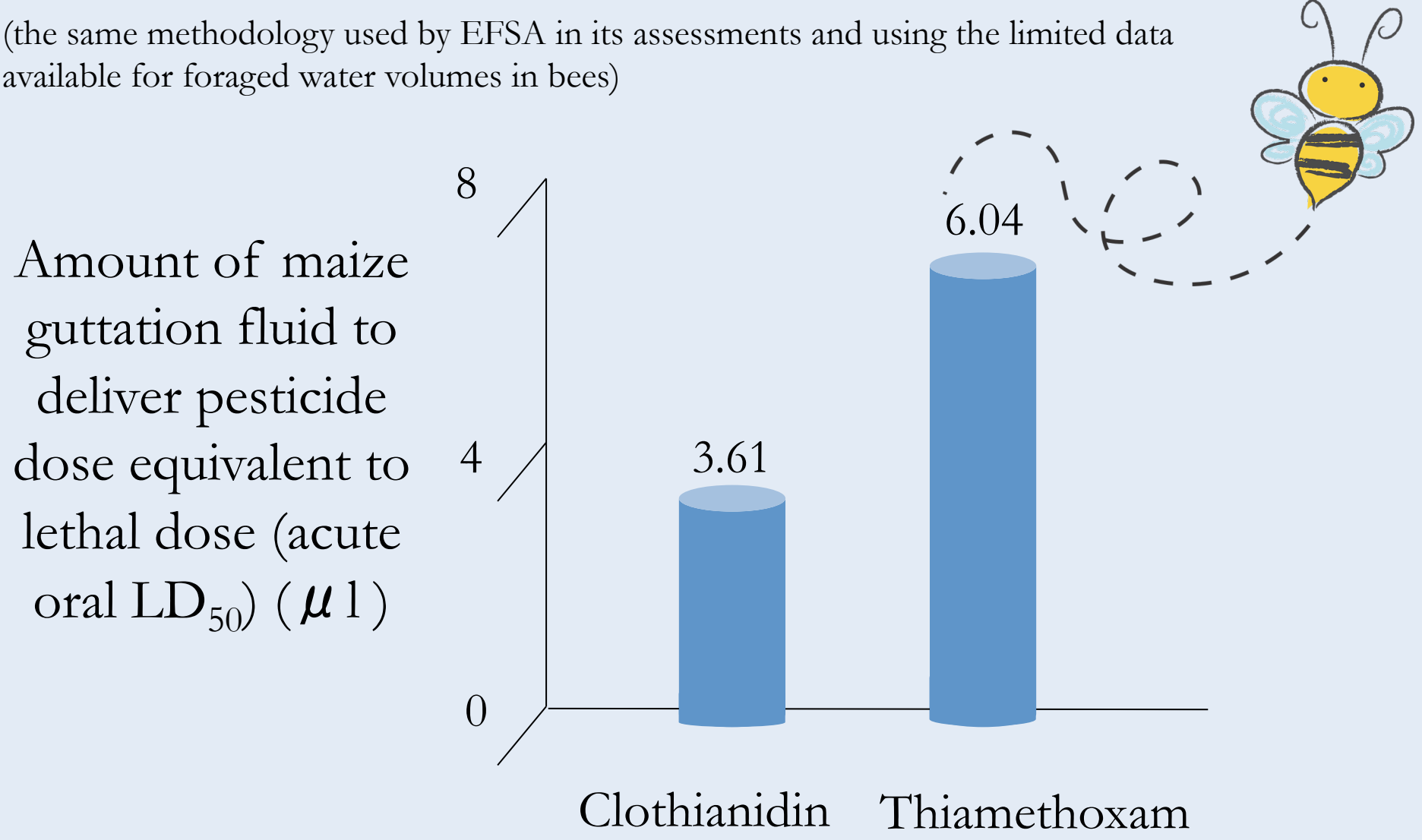
Neonicotinoid systemic pesticides in maize guttation fluid, Hungary, spring 2013





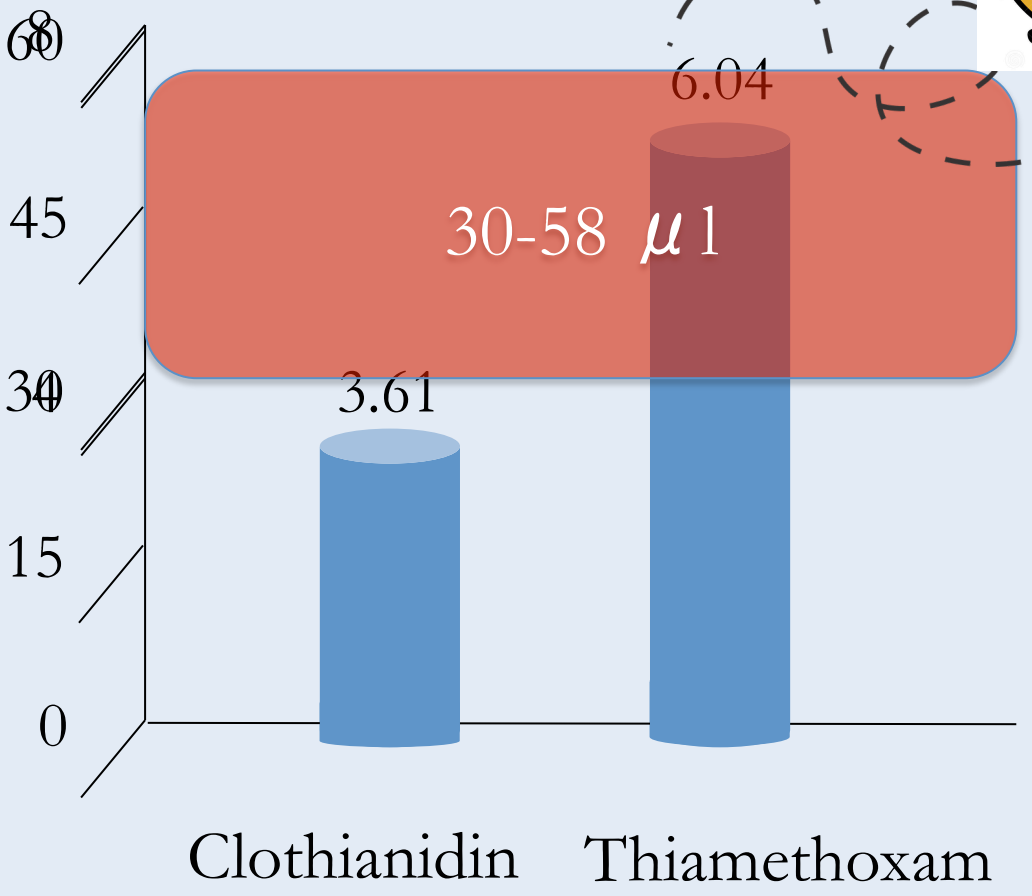


(the same methodology used by EFSA in its assessments and using the limited data available for foraged water volumes in bees)



- Approx. 1 month after sowing, maize guttation fluid could still deliver pesticide dose equivalent to lethal dose (acute oral LD_{50}) in only 3.61 - 6.04 μl (for clothianidin & thiamethoxam respectively)

Amount of maize guttation fluid to deliver pesticide dose equivalent to lethal dose (acute oral LD_{50}) (μl)



- An individual bee can ingest 30-58 μl fluid per foraging trip

Field relevance or spurious confidence?

- Combination effects in mixtures
- Multiple exposure pathways
- ……

- In higher tier risk assessment, gaps in understanding and assessment may be less explicitly acknowledged
- --- Although higher tier testing may appear to yield greater rigour and relevance, it also leads to less humility and precaution

Remember the 'precaution' in Regulation 1107/2009

"**The provisions of this Regulation are underpinned by the precautionary principle** in order to ensure that active substances or products placed on the market **do not adversely affect human or animal health or the environment**."

Hazard based regulation!

as to the risks with regard to human or animal health or the environment posed by the plant protection products to be authorised in their territory."

Higher complexity: to accept or avoid?

DO ASSUME:

- that the use of pesticides in the field will lead to exposure (to non-target species and, possibly, humans)
- that wildlife and humans will experience exposure to pesticides as mixtures of active substances (and of other ingredients) through a multiple of exposure pathways

DON'T ASSUME:

- that under higher tier testing and assessment, all bases will be covered
- that there will be no surprises

EU 1107/2009 :

"The purpose of this regulation is to **ensure a high level of protection of both human and animal health and the environment** and at the same time to safeguard the competitiveness of community agriculture"

And above all, don't forget…

…**there is another way**

Greenpeace's vision for Ecological Farming: the seven principles

1. Food sovereignty
2. Benefitting farmers and rural communities
3. Smart food production and yields
4. Biodiversity and diverse seed systems
5. Sustainable soil health and cleaner water
6. Ecological pest protection
7. Climate resilient food production