

Carnica vereniging Oost Nederland.
Bornebroek, zaterdag 7 april 2012

Systemische insecticiden en Bijensterfte

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www.jvds.nl

Copernicus Institute, Utrecht University

&



Recherches en Economie-Ecologie, Eco-innovation et ingénierie du
Développement Soutenable (REEDS)
Université de Versailles Saint-Quentin-en-Yvelines, France



Universiteit Utrecht



European Research project ALARM:

The trend of world wide pollinator loss is a major threat to biodiversity

Causes include: new pesticides, land use change and climate change

<http://www.alarmproject.net>



Universiteit Utrecht



United States
Department of Agriculture
Agricultural Research Service

2010 Colony Collapse Disorder Progress Report

CCD Steering Committee
June 2010



Patterns of widespread decline in North American bumble bees

Sydney A. Cameron^{a,1}, Jeffrey D. Lozier^a, James P. Strange^b, Jonathan B. Koch^{b,c}, Nils Cordes^{a,2}, Leellen F. Solter^d, and Terry L. Griswold^b

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Edited^a by Gene E. Robinson, University of Illinois, Urbana, IL, and approved November 24, 2010 (received for review October 3, 2010)

Bumble bees (*Bombus*) are vitally important pollinators of wild study in the United States identified lower genetic diversity and

2011

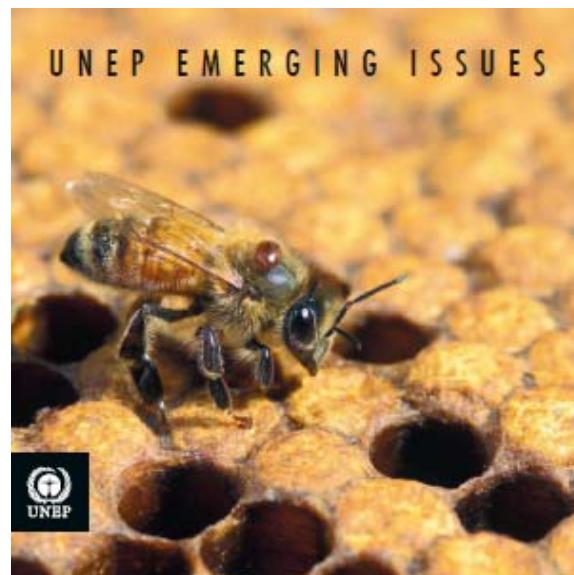
intensive nationwide surveys of >16,000 specimens. We show that the relative abundances of four species have declined by up to 96% and that their surveyed geographic ranges have contracted by 23–87%, some within the last 20 y. We also show that declining populations have significantly higher infection levels of the microsporidian pathogen *Nosema bombi* and lower genetic diversity compared

Parallel Declines in Pollinators and Insect-Pollinated Plants in Britain and the Netherlands

2006

J. C. Biesmeijer,^{1*} S. P. M. Roberts,² M. Reemer,³ R. Ohlemüller,⁴ M. Edwards,⁵ T. Peeters,^{3,6} A. P. Schaffers,⁷ S. G. Potts,² R. Kleukers,³ C. D. Thomas,⁴ J. Settele,⁸ W. E. Kunin¹

Despite widespread concern about declines in pollination services, little is known about the patterns of change in most pollinator assemblages. By studying bee and hoverfly assemblages in Britain and the Netherlands, we found evidence of declines (pre- versus post-1980) in local bee diversity in both countries; however, divergent trends were observed in hoverflies. Depending on the assemblage and location, pollinator declines were most frequent in habitat and flower specialists, in univoltine species, and/or in nonmigrants. In conjunction with this evidence, outcrossing plant species that are reliant on the declining pollinators have themselves declined relative to other plant species. Taken together, these findings strongly suggest a causal connection between local extinctions of functionally linked plant and pollinator species.

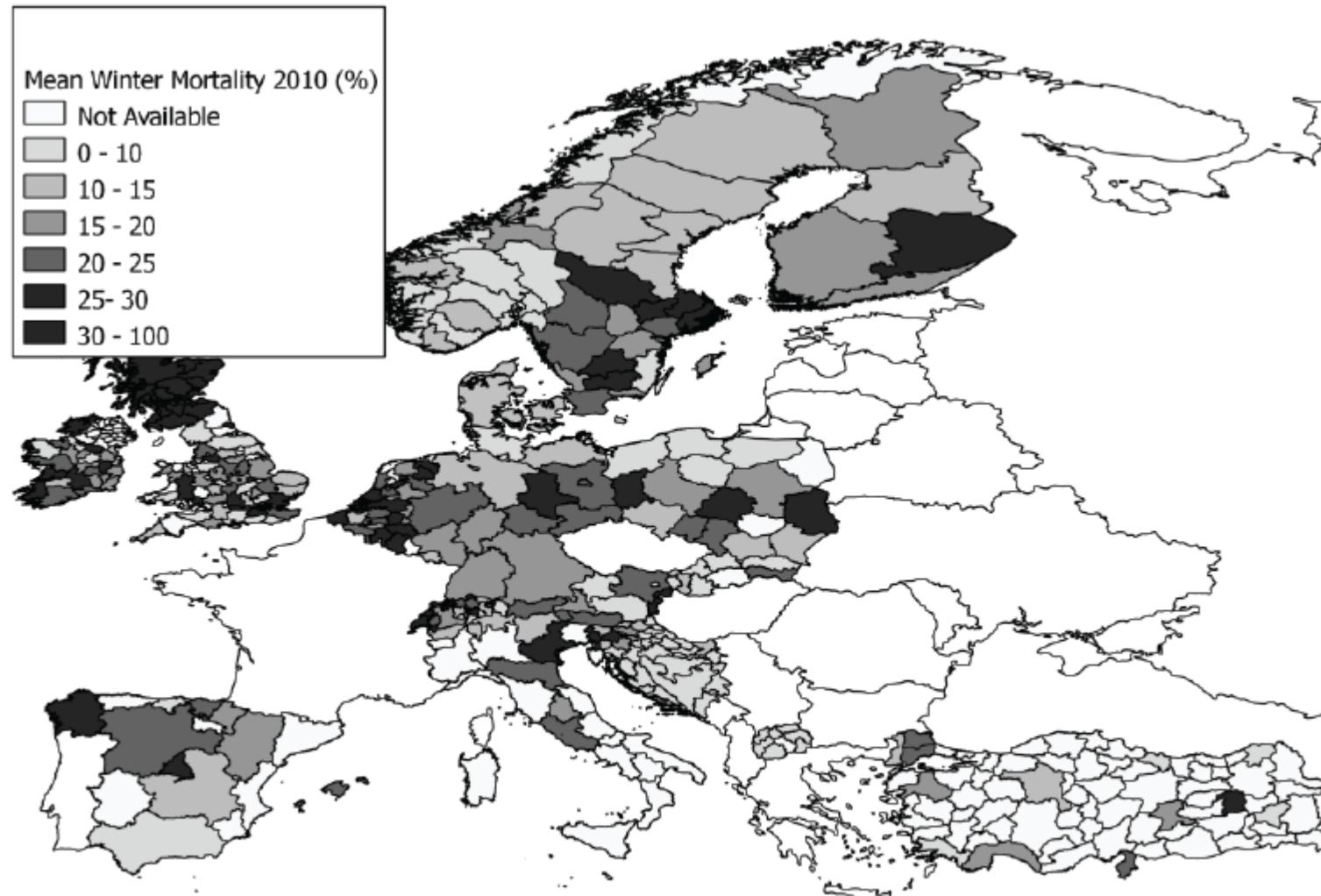


GLOBAL HONEY
BEE COLONY
DISORDERS
AND OTHER
THREATS
TO INSECT
POLLINATORS

2011



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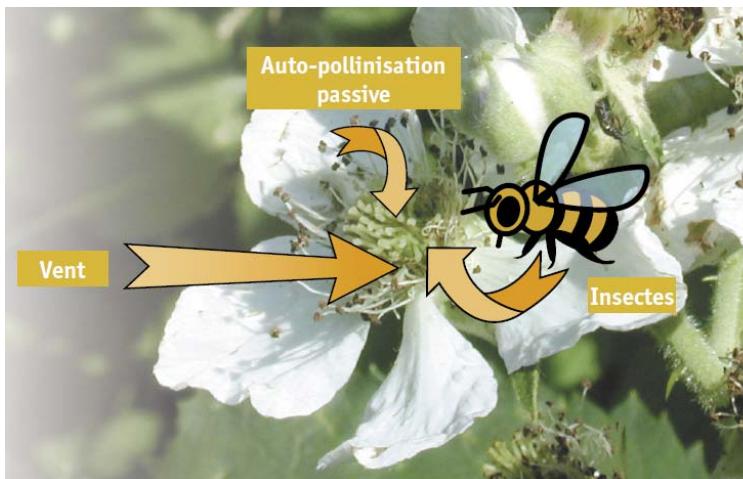
Gemiddelde wintersterfte 2009-10 Europa,
Turkije en Israel (Van der Zee e.a., 2012; Coloss)

<http://dx.doi.org/10.3896/IBRA.1.51.1.12>



Het belang van bestuivers

- 90 belangrijke voedselgewassen (35% wereld voedsel productie; >90% voedseldiversiteit) heeft dierlijke bestuiving nodig.
- Europa: 14,2 miljard Euro / jaar
- 80% van bloeiende planten: dierlijke bestuiving voor voortplanting en evolutie



Some crops pollinated by bees³

Cabbage	Kale	Raspberry
Cacao	Kola nut	Sapote
Cantaloupe	Leek	Squash
Carrot	Lychee	Sunflower
Cashew	Macadamia	Tangerine
Cauliflower	Mango	Tea
Celery	Mustard	Watermelon
Cherry	Nutmeg	
Citrus	Onion	
Dill	Passion fruit	
Eggplant/ Aubergine	Peach	
Fennel	Pear	
Garlic	Plum	
	Pumpkin	





Wereldwijd ca. 25000 bijensoorten

NL: ca. 350 waarvan 181 op rode lijst



Oorzaken bijensterfte

Bijensterfte is samenspel van:

- Monoculturen (te eenzijdig stuifmeelaanbod)
- Verlies biodiversiteit (stuifmeeltekort + eenzijdig)
- Ziekteverwekkers (Varroa, virussen, Nosema)
- Chronische blootstelling aan neonic-pesticiden
- Imkerpraktijken
- Wereldmarkt van bijenkoninginnen
- Klimaatverandering: watergebrek en pollenseizoen



Bijensterfte is multicausaal

PPP

- Pollen
- Pathogenen
- Pesticiden

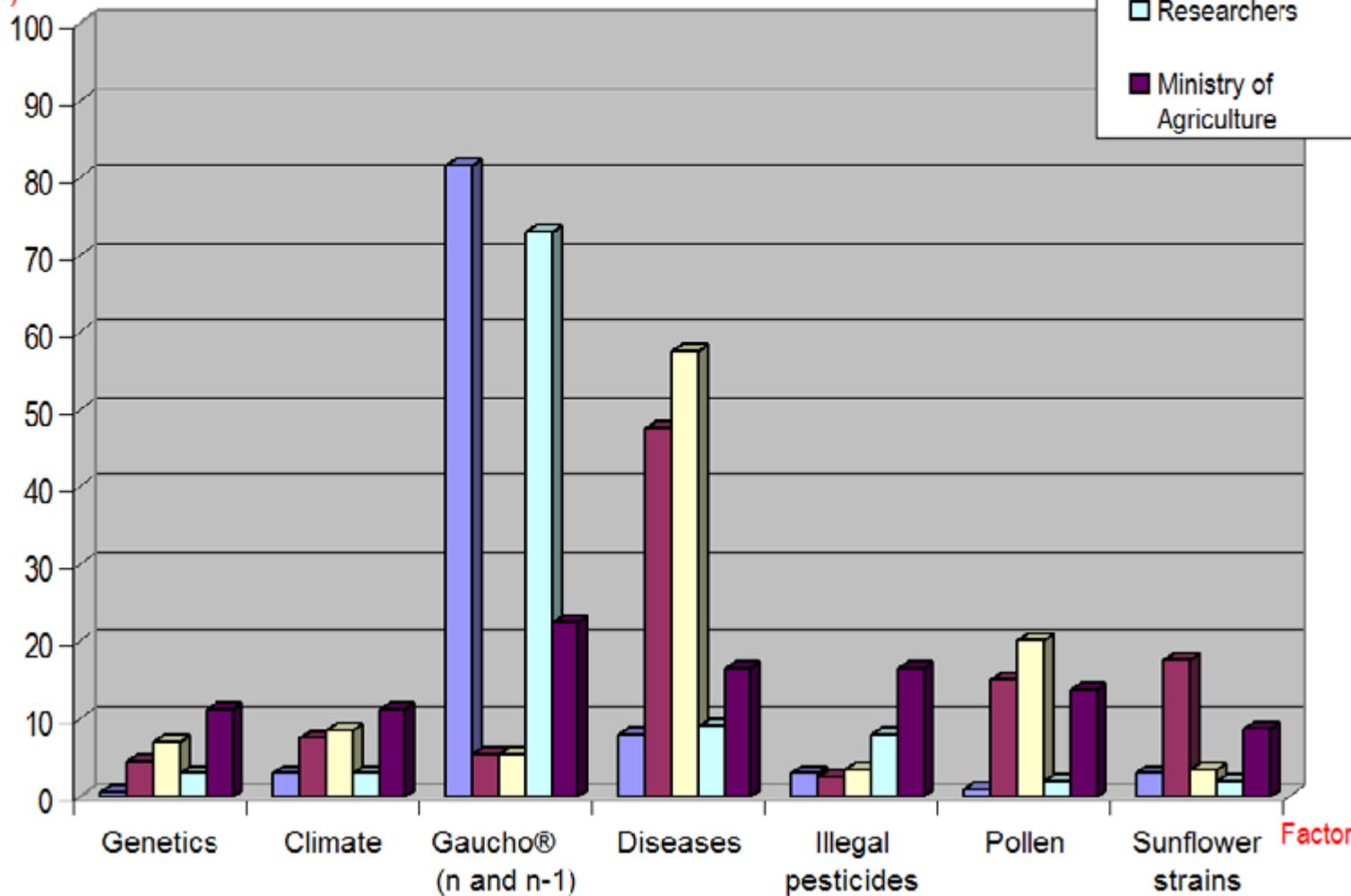
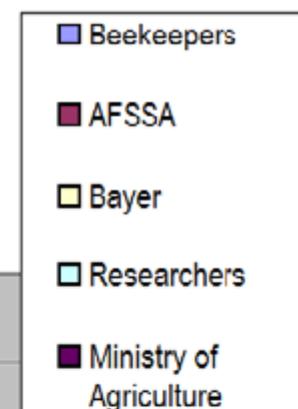


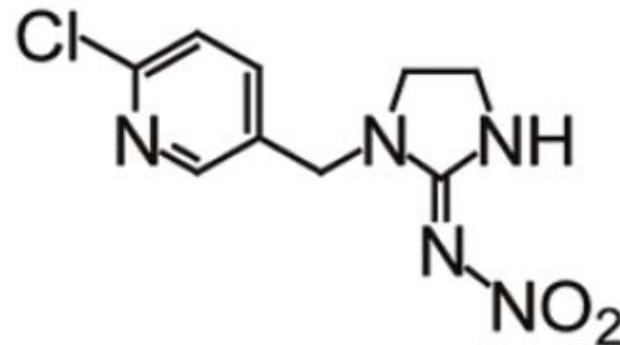
Expert explanations local French bee losses 1994-2004

Statements about the contribution of each factor in the final effect

(%)

Contribution of each cause to the final effect: by actor



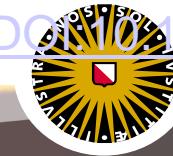


imidacloprid (1991)

Shinzo Kagabu

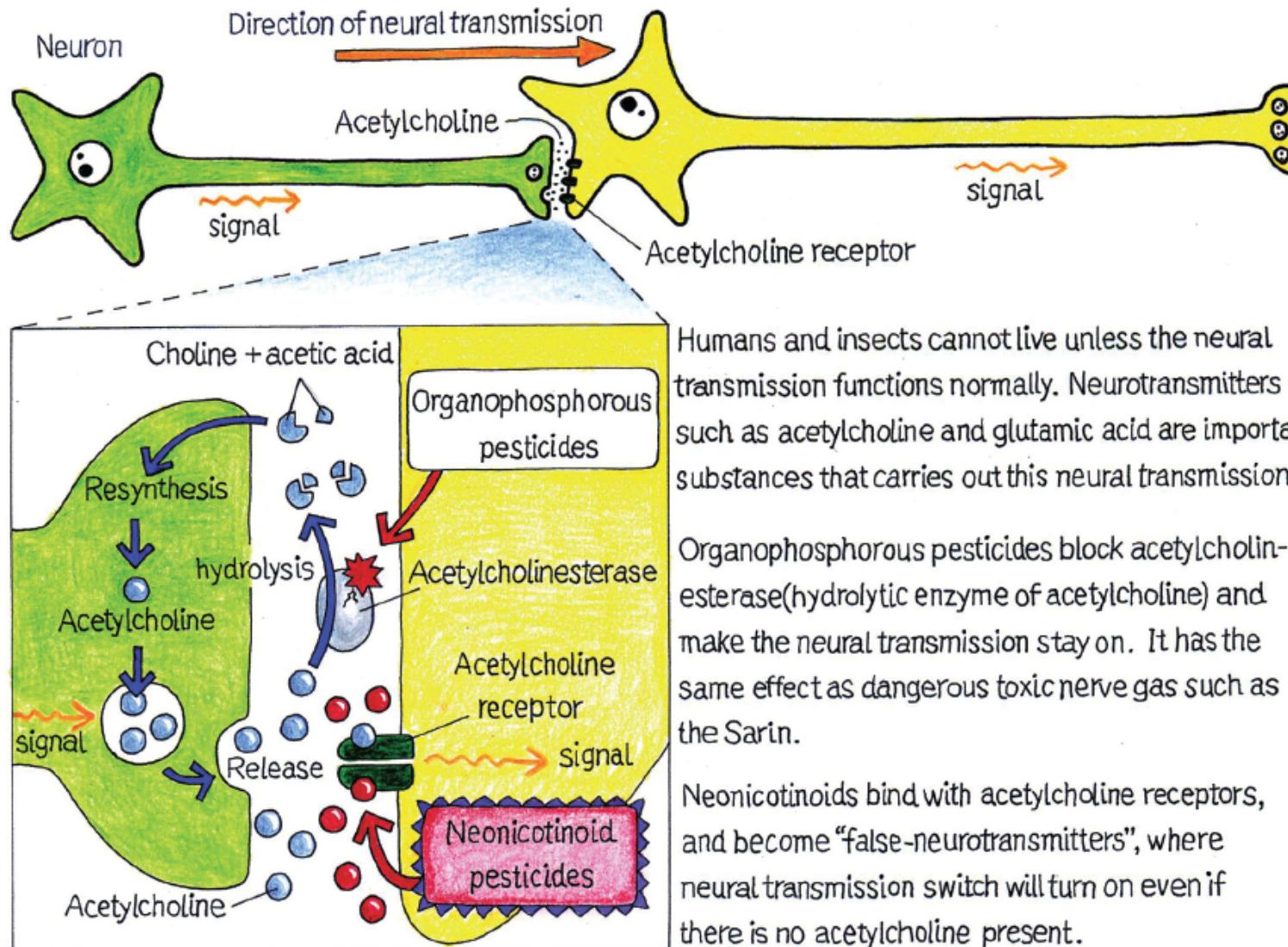
Professor Shinzo Kagabu received the **2010 American Chemical Society International Award for Research in Agrochemicals** in recognition of his discovery of imidacloprid (IMI) and thiacloprid, which opened the neonicotinoid era of pest management.

(Tomizawa & Casida, 2010, [DOI 10.1021/jf103856c](https://doi.org/10.1021/jf103856c))



Neonicotinoid/Organophosphorous pesticides disrupt the neural transmission

Neural transmission mechanism through acetylcholine



Systemic insecticides

- Very high toxicity for honeybees
- Contamination of flowers, nectar and pollen
- A long persistence in soils ($t_{1/2} = 9$ months) and water (160 days)
- Main metabolites as toxic as imidacloprid for bees
- Acute effects (overdosing, sowing...)
- Sublethal effects and chronic exposure
- Synergies with other pesticides
- Synergies with other pathogens (Nosema, Wing Deform Virus)
- Risks in fields : PEC/PNEC $>> 1$
- Major weakening factor of bee colonies



Toxicity of neonicotinoids

Pesticide	®	Use	LD50 (ng/honeybee)	Toxicity index relative to DDT
DDT	Dinocide	insecticide	27000	1
Amitraz	Apivar	insecticide / acaricide	12000	2
Coumaphos	Perizin	insecticide / acaricide	3000	9
Tau-fluvalinate	Apistan	insecticide / acaricide	2000	13.5
Methiocarb	Mesurol	insecticide	230	117
Carbofuran	Curater	insecticide	160	169
λ-cyhalothrin	Karate	insecticide	38	711
Deltamethrine	Decis	insecticide	10	2700
Thiamethoxam	Cruise	insecticide	5	5400
Fipronil	Regent	Insecticide	4.2	6475
Clothianidine	Poncho	Insecticide	4.0	6750
Imidacloprid	Gaucho	Insecticide	3.7	7297

Toxicity of insecticides to honeybees compared to DDT. The final column expresses the toxicity relative to DDT. (Source: Bonmatin, 2009)

<http://www.bijensterfte.nl/images/Bonmatin-conclusions-sentinelle-gb-2009.pdf>

Mais gecoat met imidacloprid

75 gram imidacloprid / ha mais

100000 zaden per ha

0.00075 gram imidacloprid/zaad

3.7 nanogram is dodelijk voor een bij

202702 dodelijke doses per maiszaadje



Table 3.1 Half-life in Soil of Neonicotinoids

Neonicotinoid	Half-life in Soil (aerobic soil metabolism)
Acetamiprid	1–8 days ¹
Clothianidin	148–1,155 days ²
Dinotefuran	138 days ³
Imidacloprid	40–997 days ⁴
Thiacloprid	1–27 days ⁵
Thiamethoxam (See note below)	25–100 days ⁶

Note: Clothianidin is a primary metabolite of thiamethoxam.

<http://goo.gl/3HnYI>



Neonicotinen: “From zero to hero”

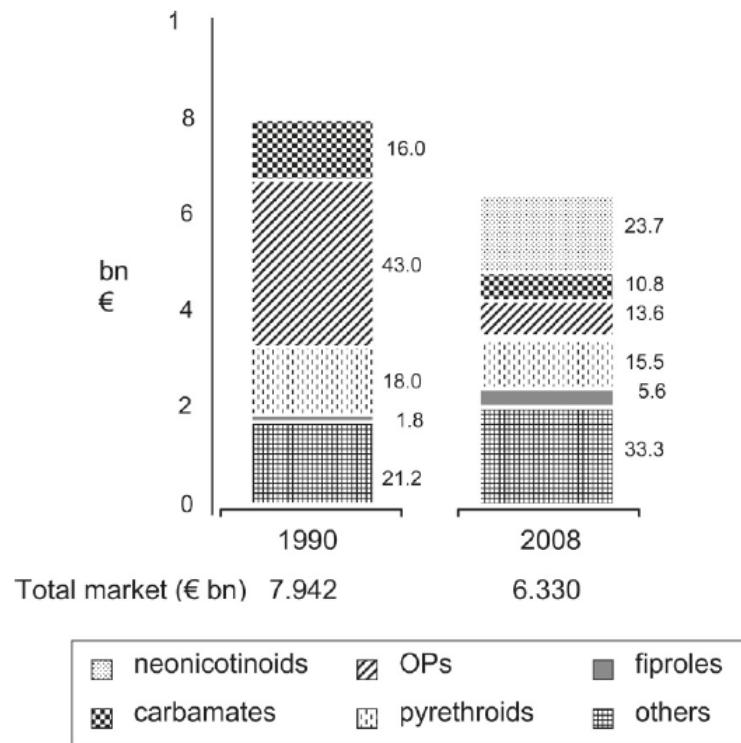


Figure 1. Development of insecticide classes in modern crop protection 1990–2008, expressed as percentage of total.

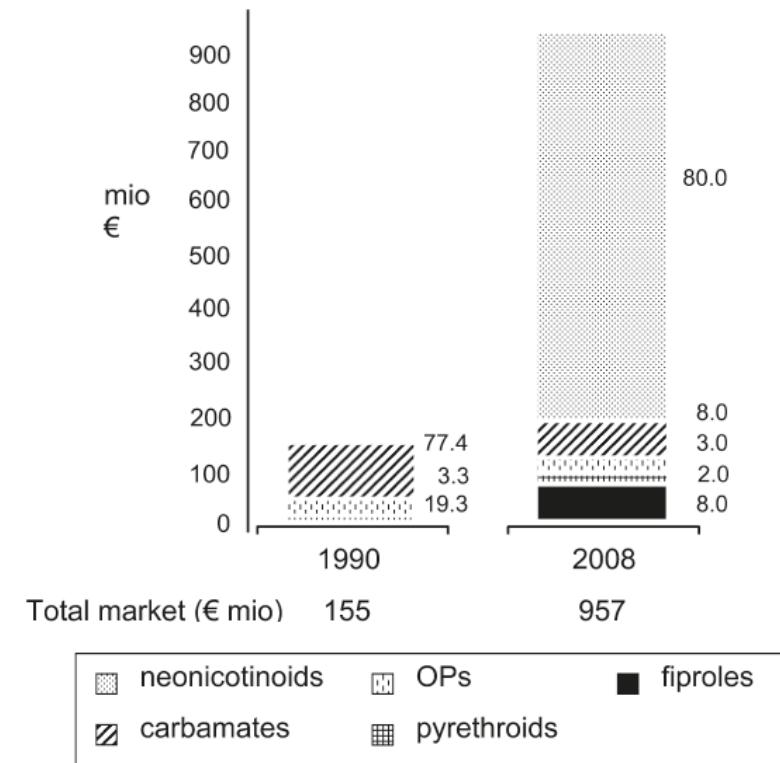


Figure 2. Development of insecticide classes in seed treatment, 1990–2008, expressed as percentage of total.

Jeschke et al., 2011
<http://dx.doi.org/10.1021/jf101303g>



TABLE 11.6 Top 10 Agrochemicals/Key Data

Brand	Active Ingredient	Company	Application	Sales 2008	
				\$ billion ^a	MT
Round-up	Glyphosate (I)	Monsanto	Herbicide	8.30	620,000
Admire, Gaucho	Imidacloprid (II)	Bayer CropScience.	Insecticide	1.28	5450
Heritage	Azoxystrobin (III)	Syngenta	Fungicide	1.16	7000
F 500	Pyraclostrobin (IV)	BASF	Herbicide	1.10	7200
Flagship	Thiemethoxam (V)	Syngenta	Insecticide	0.73	1895
Callisto	Mesotrione (VI)	Syngenta	Herbicide	0.62	2040
Gramoxone	Paraquat-dichloride (VII)	Syngenta	Herbicide	0.60	26,000
Flint	Trifloxystrobin (VIII)	Bayer CropScience.	Fungicide	0.60	3405
Horizon, Folicur	Tebuconazole (IX)	Bayer CropScience.	Fungicide	0.55	2860
Regent MG, Frontline	Fipronil (X)	BASF	Insecticide	0.53	1375

^a Ex-factory.

11–20: (Figures in \$ million/MT) clothienidin (509/546); chlorpyrifos (482/34,945); chlorothalonil (475/48,559); lambda-cyanhalothrin (454/1085); 2,4-D (453/64,725); prothioconazole (417/1550); mesosulfuron-methyl (414/530); kresoxym-methyl (409/3450); acetochlor (400/39,000); glufosinate-ammonium (399/3990).

Source: Cropnosis Ltd—Agranova.

<http://goo.gl/gLMNK>

Production and Market of Imidacloprid in China

"Imidacloprid, as the largest application amount of neonicotinoid insecticide in the world, is embracing a rapid development and becoming a hot spot in China. China records 13,620 tonnes of imidacloprid technical output in 2010, accounting for more than 50% of **world's total**, which is **20,000 tonnes.**" (*CCM International Ltd, March 2011*)

Source: http://www.researchandmarkets.com/reportinfo.asp?report_id=649028&t=d&cat_id=

- (compare to DDT peak-use of 80,000 tonnes in 1959 and remember that imidacloprid is 7297x more toxic to insects)



Bayer Cropscience Facts & Figures 2007

Top 10 Products 2007

Active Ingredient*	Major Brands	Application	Sales (€ million)
Imidacloprid	Confidor®, Admire®, Gaucho®, Merit®	Insecticide, Seed Treatment, Environmental Science	556
Trifloxystrobin	Flint®, Stratego®, Sphere®	Fungicide	243
Glufosinate	Basta®, Liberty®	Herbicide	241
Clothianidin	Poncho®	Seed Treatment	237
Tebuconazole	Folicur®, Raxil®	Fungicide, Seed Treatment	235
Mesosulfuron-methyl	Atlantis®	Herbicide	207
Fenoxaprop-P-ethyl	Puma®	Herbicide	187
Deltamethrin	Decis®, K-Othrine®	Insecticide, Environmental Science	178
Prothioconazole	Proline®	Fungicide	175
Ethofumesate/PMP/DMP	Betanal®	Herbicide	127

Emissie via drift

(g/ha)

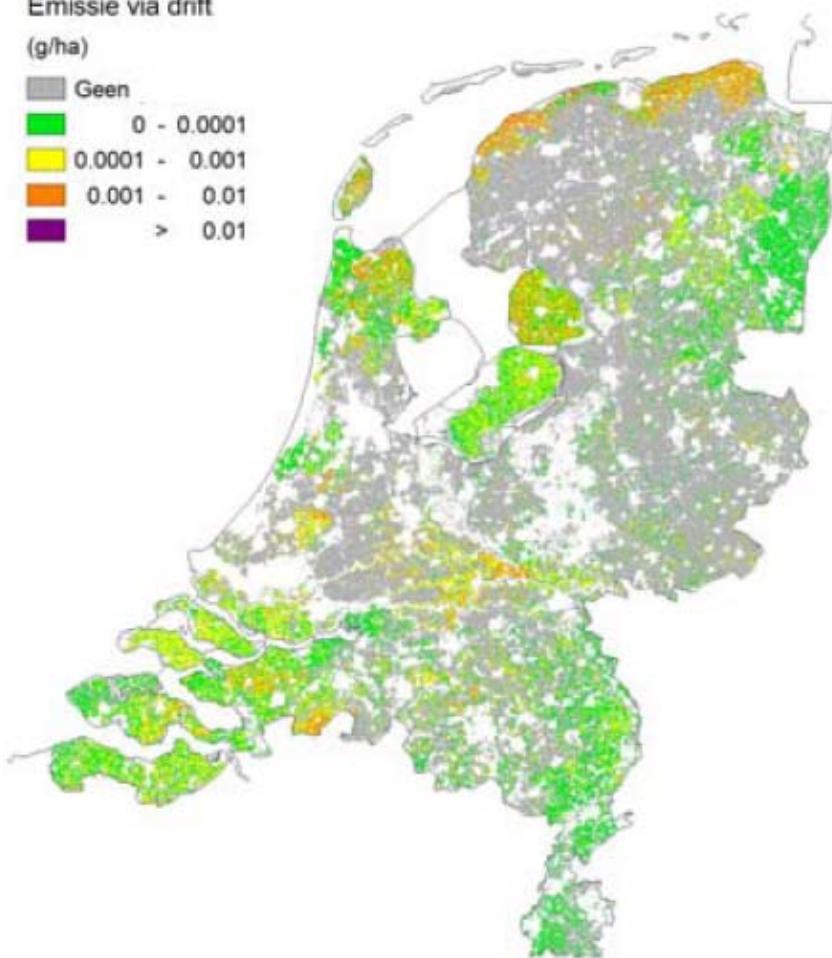
Geen

0 - 0.0001

0.0001 - 0.001

0.001 - 0.01

> 0.01



Emissie via drainage

(g/ha)

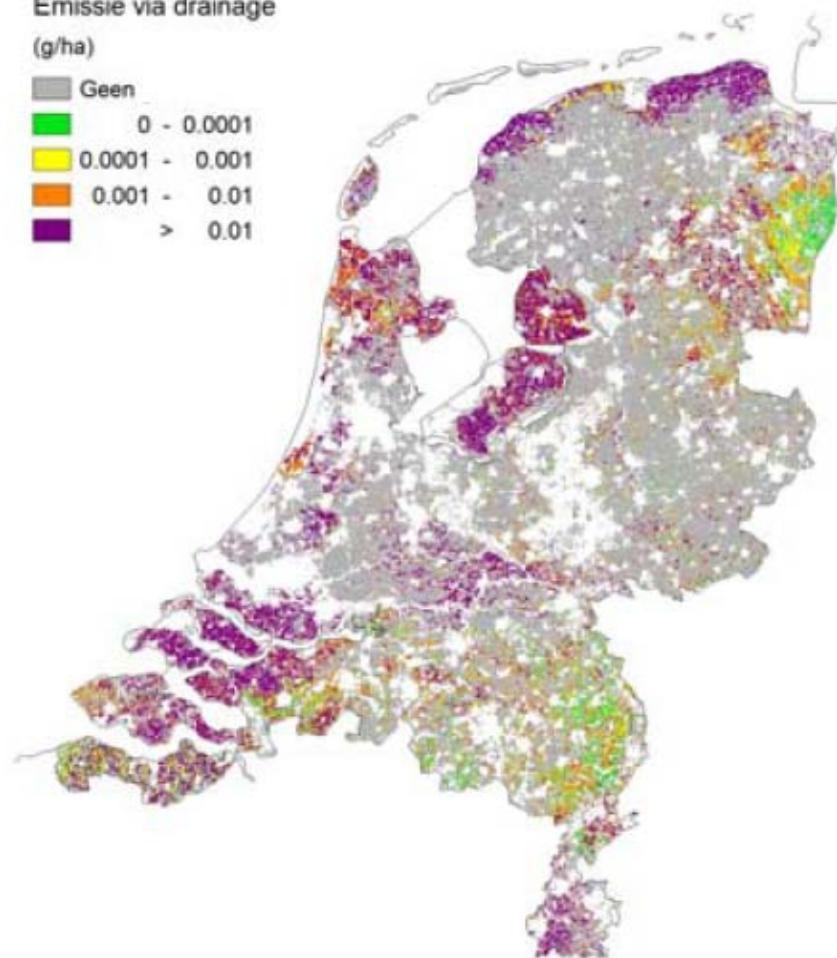
Geen

0 - 0.0001

0.0001 - 0.001

0.001 - 0.01

> 0.01



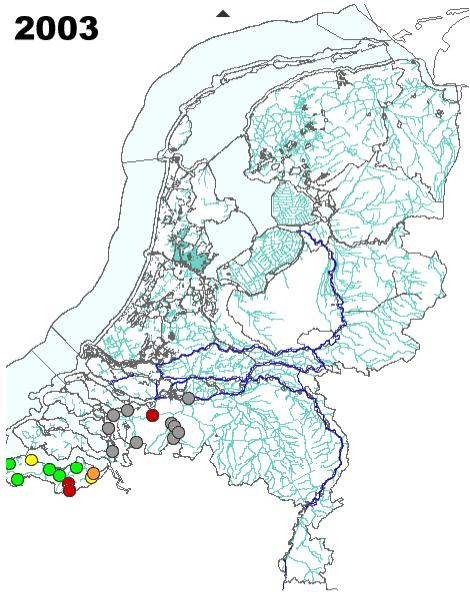
Figuur 4.1 Kaartbeeld van de berekende emissies imidacloprid, met toepassingen zonder emissie als gevolg van drift en/of drainage. Wit zijn de gebieden zonder toepassingen.

Bron: Evaluatie van de nota Duurzame gewasbescherming : Deelrapport Milieu, 2012

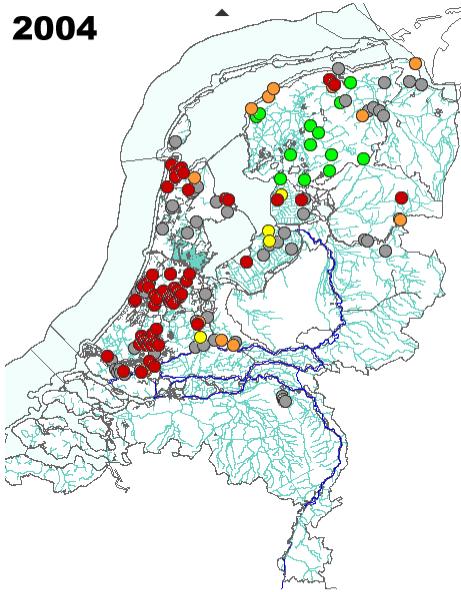
<http://www.rivm.nl/bibliotheek/rapporten/607059001.pdf#page=47>



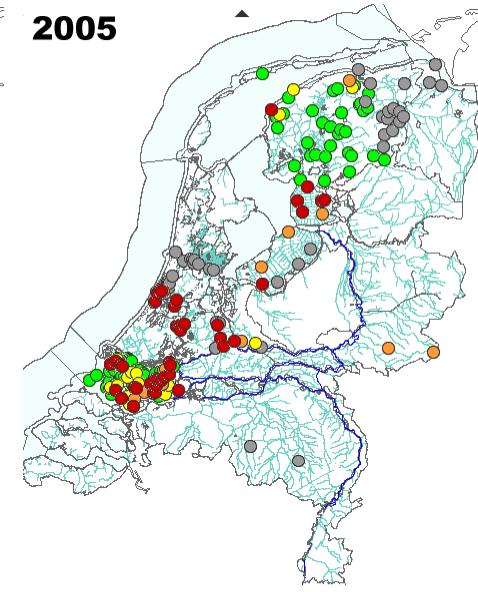
2003



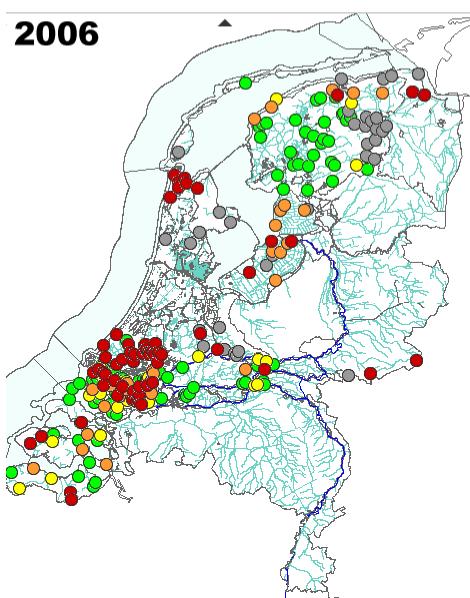
2004



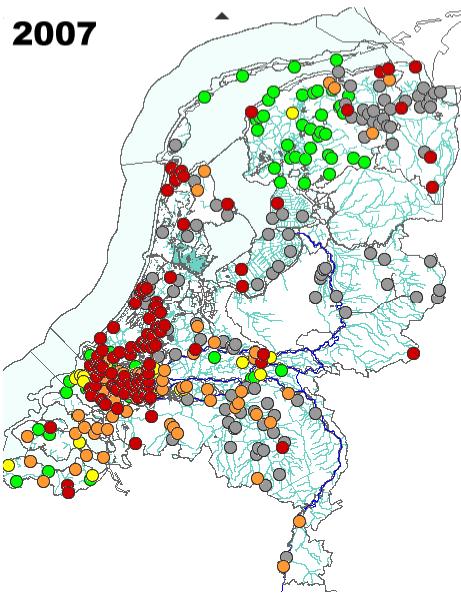
2005



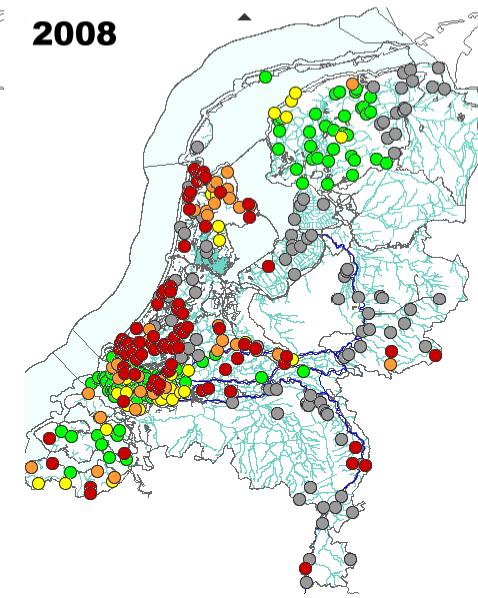
2006



2007



2008



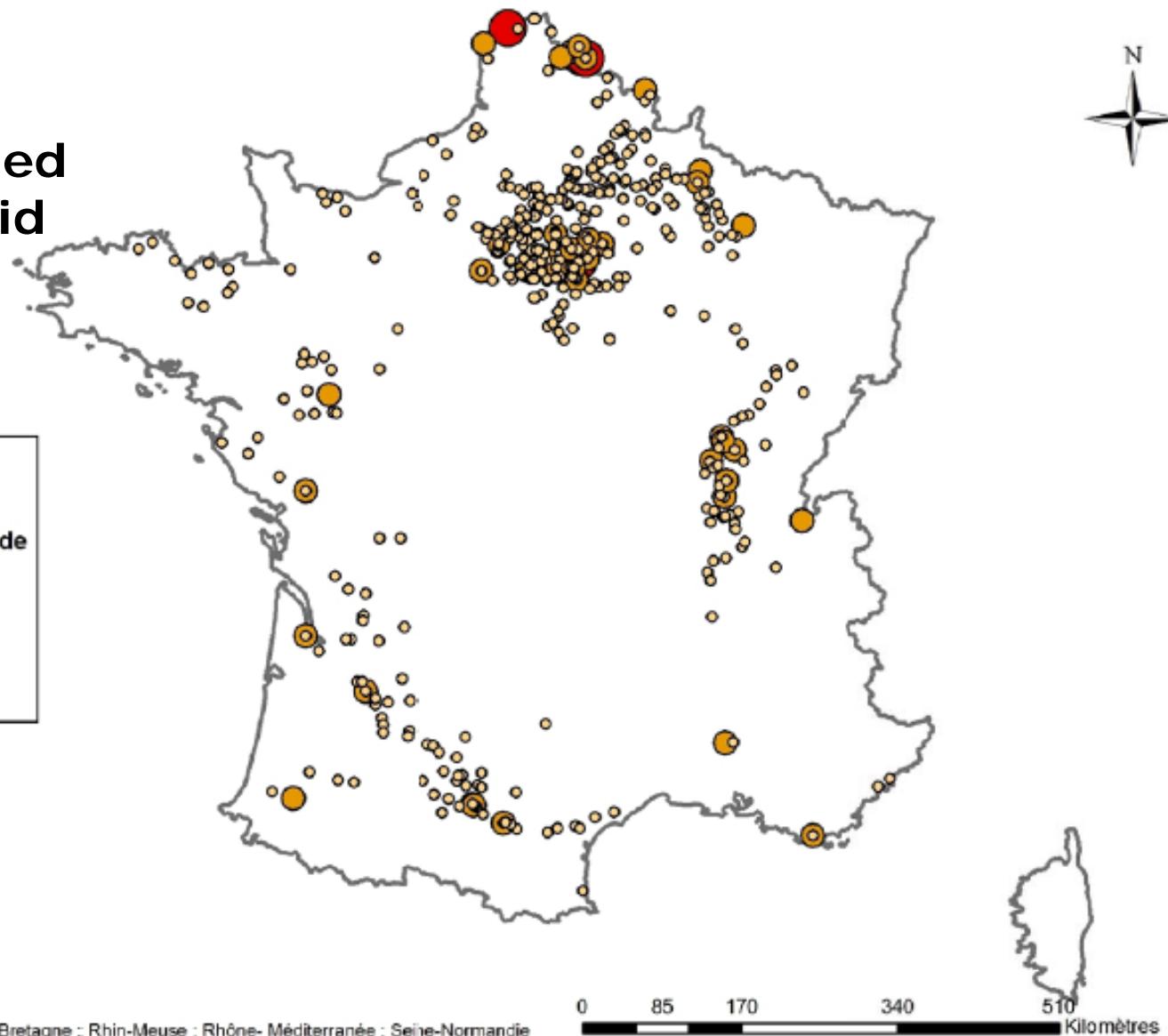
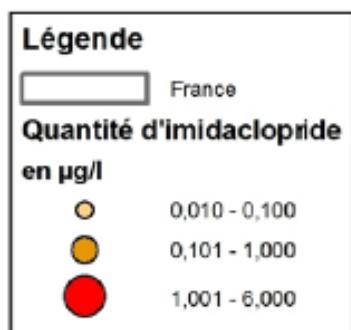
Since 2004,
Netherlands
surface
water is
heavily
polluted with
Imidacloprid

- > Target value, <= MTR
- < detection limit
- > MTR
- >2x MTR
- >5x MTR

Imidacloprid in Dutch surface water 2003-2008
Exceedances of the Maximum Tolerable Risk standard
MTR = 13 nanogram / liter

Imidaclopride. Contamination des cours d'eau quantifiée selon des seuils variés
Données brutes 2007 - 2010.

In France the surface water is heavily polluted with imidacloprid



Effects on honeybees

- Acute intoxication
- Chronic intoxication
- Sublethal effects
- Synergy effects



Neonicotinoid Pesticide Reduces Bumble Bee Colony Growth and Queen Production



Penelope R. Whitehorn,¹ Stephanie O'Connor,¹ Felix L. Wackers,² Dave Goulson^{1*}

¹School Natural Sciences, University of Stirling, Stirling FK9 4LA, UK. ²Lancaster University, LEC, Lancaster LA1 4YQ, UK.

*To whom correspondence should be addressed. E-mail: dave.goulson@stir.ac.uk

Growing evidence for declines in bee populations has caused great concern due to the valuable ecosystem services they provide. Neonicotinoid insecticides have been implicated in these declines as they occur at trace levels in the nectar and pollen of crop plants. We exposed colonies of the bumble bee *Bombus terrestris* in the lab to field-realistic levels of the neonicotinoid imidacloprid, then allowed them to develop naturally under field conditions. Treated colonies had a significantly reduced growth rate and suffered an 85% reduction in production of new queens compared to control colonies. Given the scale of use of neonicotinoids, we suggest that they may be having a considerable negative impact on wild bumble bee populations across the developed world.

Lu e.a. 2012 Harvard University- 5 Apr 2012

In situ replication of honey bee colony collapse disorder

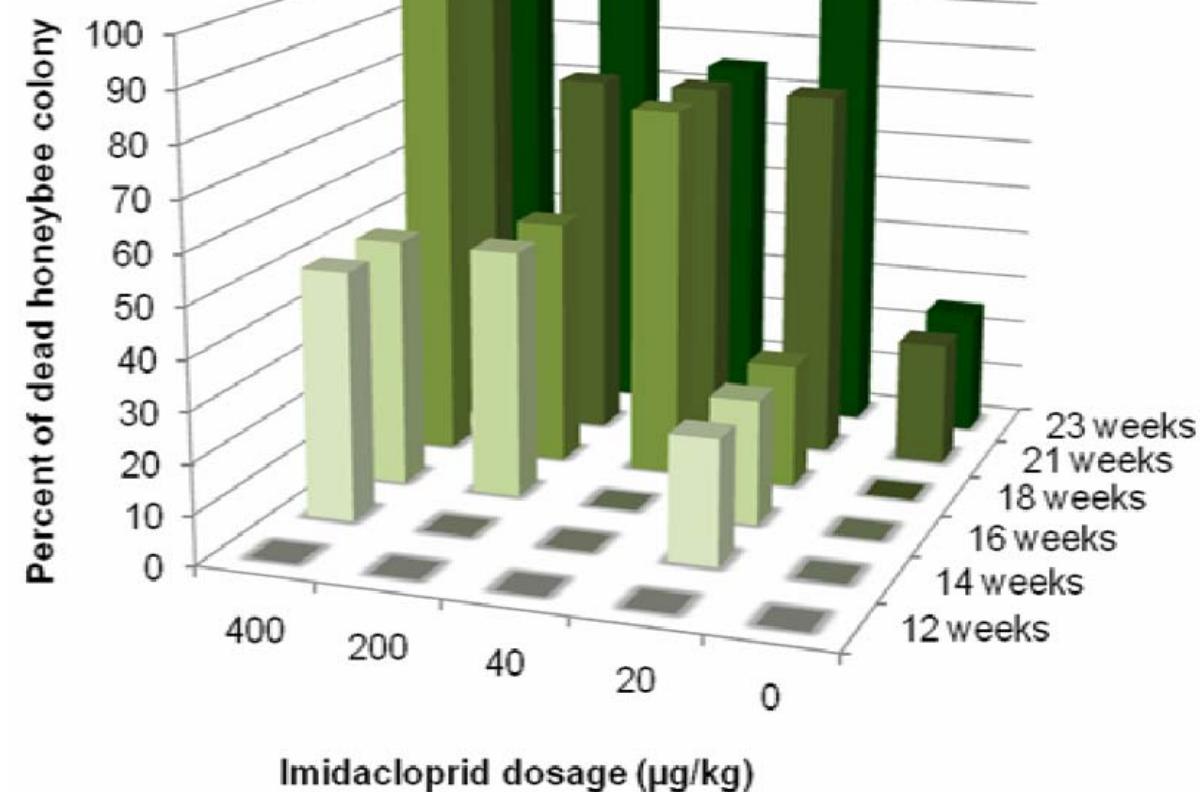


Figure 3. Dead hive (ID[#] 4-4) treated with 20 $\mu\text{g}/\text{kg}$ of imidacloprid which shows the abundance of stored honey and some pollen, but no sealed brood or honey bees. Photo was taken on February 24th, 2011.

<http://goo.gl/1a0Aa>



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Complexity of a colony

- Specialisation in the hive
- Bees with different roles in the hive have different diets
- Bees in different life stages have different diet
- Bees with different roles have different critical sensitivities to different sub-lethal effects
- Etc.

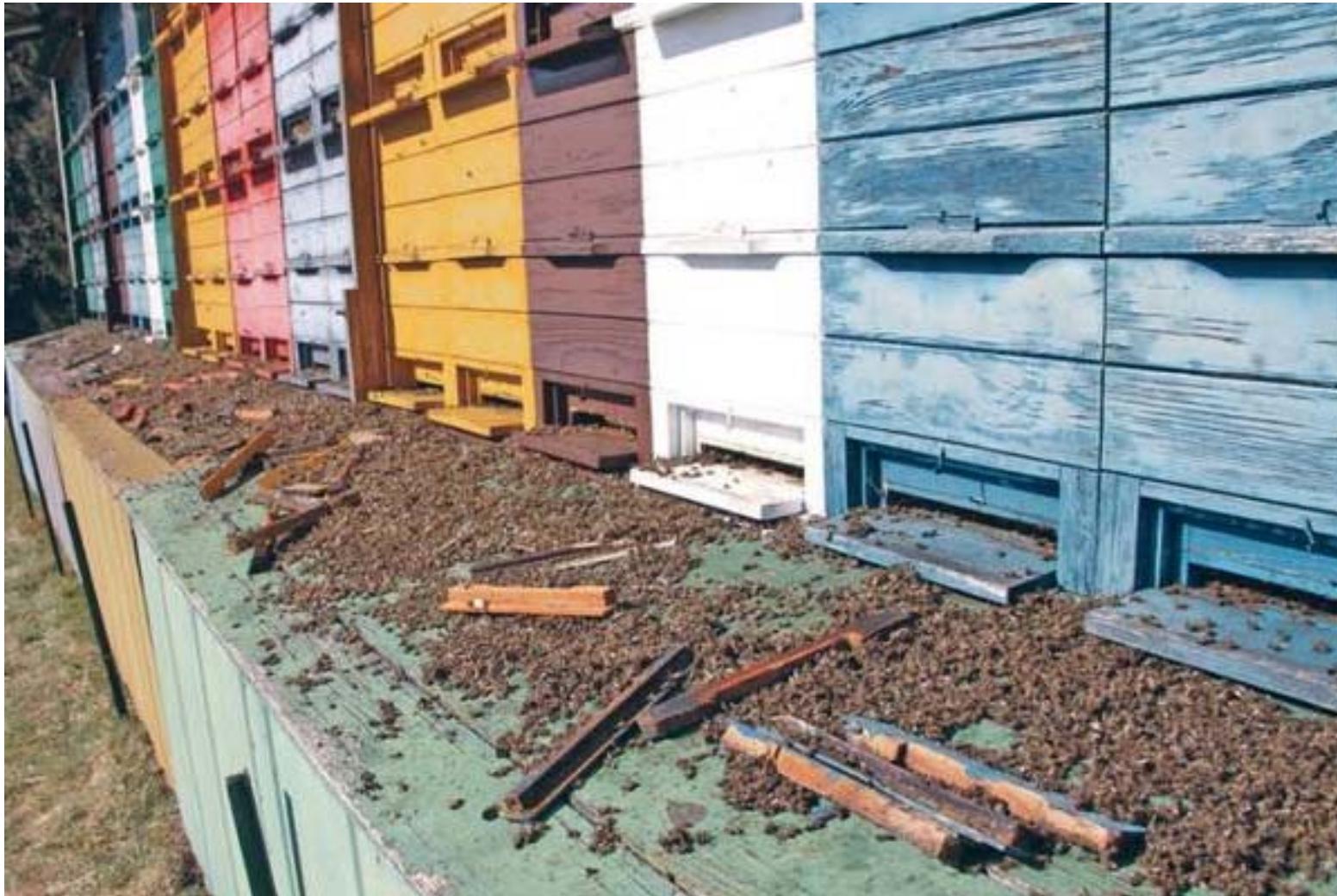


What are exposure pathways?

- Treated crops
 - Contact
 - Pollen (delayed consumption!, Bee bread etc.)
 - Nectar (delayed consumption!, honey)
 - Extrafloral nectar
 - Honey-dew (from aphids)
 - Guttation (waterdrops origination from inside the plant)
 - Dew/rain (waterdrops from the atmosphere)
 - Sweet remains of e.g. sugarbeets, etc.
- Systemic uptake by untreated wild plants and trees on same soil
- Systemic uptake of contaminated water by wild plants and trees
- Spray drift / dust drift to flowering fields
- Direct contact with dust (flying through the dust cloud)
- Foraging on polluted surface water (for drinking and COOLING!)
- Residues in sugar used for sugar syrup supplementary feeding
- Residues in water used by beekeepers to make sugar syrup (violation of drinkingwater norm in NL > 100 ng/liter)
- Can it travel trough the air? On PM2.5? On diessel soot/black carbon? On airosol-water?
- Brabant, NL scandal 2011: Waste-sand from treated Lilly bulbs used for trails in protected nature area
- Etc...



Pomurje, Slovenie april 2011, zaaiperiode clothianidine mais



Schade
2500
volken
dood

Ca. 100
miljoen
bijen



Veldproef in Padua

Dodelijke stofwolk

< 30 seconden 10m afstand:
300 tot 4000 ng imidacloprid
per bij.



Krupke e.a. 2012 studie



Table 6. Pesticide concentrations found in unplanted fields near apiary during planting period in 2011, all concentrations shown are expressed as parts per billion.¹

SAMPLE TYPE	Sample wt. (g)	THIAMETHOXAM LOD = 1.0	CLOTHIANIDIN LOD = 1.0	METOLACHLOR LOD = 0.5	ATRAZINE LOD = 0.2	AZOXYSTROBIN LOD = 0.2	COUMAPHOS LOD = 1.0
Soil, unplanted field 1, Soybeans 2010 (2 samples)	5.15, 5.01	ND	6.0±0.3	1014±14	771±170	0.2±0.1	ND
Soil, unplanted field 2, Soybeans 2010 (2 samples)	5.28, 5.43	ND	8.9±0.1	8.3±0.7	160±15	26±17	ND
Dandelions near maize field	2.96	ND	1.4	49	677	ND	ND
Dandelions near maize field	3.81	1.6	5.9	64	1133	ND	ND
Dandelions near maize field	4.51	1.3	3.1	28	522	ND	ND
Dandelions near maize field	4.05	2.9	1.1	60	269	ND	ND
Dandelions near maize field	3.10	1.1	1.6	5.7	125	ND	ND
Dandelions near maize field	3.44	ND	9.4	295	1004	ND	ND
Dandelion, CAES (non-agricultural area)	3.93	ND	ND	ND	0.3	ND	ND

When two aliquots of the same sample were analyzed the results are expressed as ± the standard deviation of the two analyses.

¹ND = Not detected.

doi:10.1371/journal.pone.0029268.t006

Krupke e.a. 2012. Multiple Routes of Pesticide Exposure for Honey Bees Living Near Agricultural Fields. <http://dx.doi.org/10.1371/journal.pone.0029268>



Krupke e.a. 2012 studie

Table 5. Pesticide concentrations found in/near apiary colonies during planting period in 2011, all concentrations shown are expressed as parts per billion.¹

SAMPLE TYPE	Sample wt. (g)	THIAMETHOXAM LOD = 0.5	CLOTHIANIDIN LOD = 1.0	METOLACHLOR LOD = 2.0	ATRAZINE LOD = 0.5	AZOXYSTROBIN LOD = 0.5	COUMAPHOS LOD = 1.0
Dead/dying bees	2.96	ND	6.9	3.0	6.5	ND	ND
Dead/dying bees	2.47	ND	10.8	1.7	3.9	ND	ND
Dead/dying bees	1.32	ND	3.8	5.5	9.5	ND	ND
Dead/dying bees	2.57	ND	4.9	0.8	4.6	ND	ND
Dead/dying bees	1.62	ND	13.3	1.1	3.9	ND	ND
Healthy bees	0.59	ND	ND	ND	5.9	ND	ND
Nectar hive 1 (healthy)	5.78	ND	ND	ND	0.5	0.6	1.1
Nectar hive 2 (sick)	5.72	ND	ND	ND	ND	0.3	4.7
Pollen hive 1 (healthy, 2 samples)	5.05	6.2±4.9	2.9±1.3	28.5±3.5	16±1.4	28.5±3.5	1.3±0.4
Pollen hive 2 (sick, 2 samples)	5.08	20.4±2.7	10.7±2.3	81.5±0.7	36.5±3.5	0.8±0.3	2.7±0.3

When two aliquots of the same sample were analyzed the results are expressed as \pm the standard deviation of the two analyses.

¹ND = Not detected.

doi:10.1371/journal.pone.0029268.t005

Krupke e.a. 2012. Multiple Routes of Pesticide Exposure for Honey Bees Living Near Agricultural Fields. <http://dx.doi.org/10.1371/journal.pone.0029268>

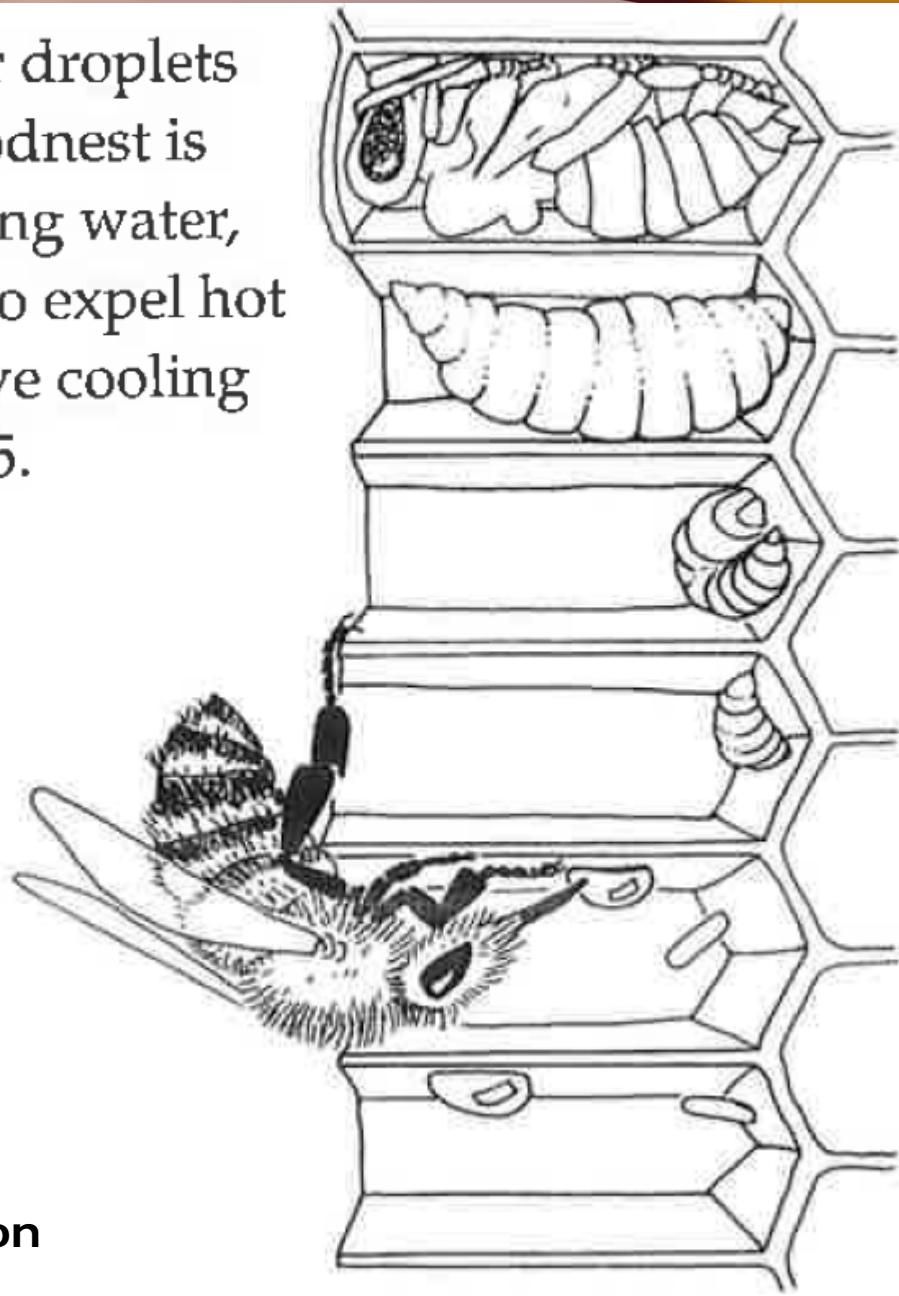


Bee drinking guttation drop

They do
drink it!
Collect and
consume



Figure 9.1 The spreading of water droplets by nurse bees when a colony's broodnest is threatened by overheating. Spreading water, combined with fanning the wings to expel hot air from the hive, causes evaporative cooling of the brood combs. After Park 1925.

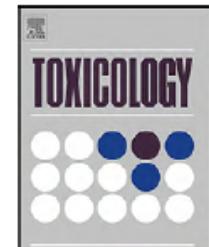


T. Seeley
The wisdom of the hive
Chapter 9 regulation of water collection



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Toxicology

journal homepage: www.elsevier.com/locate/toxcol

News and views

The significance of the Druckrey–Küpfmüller equation for risk assessment—The toxicity of neonicotinoid insecticides to arthropods is reinforced by exposure time

2010

Henk A. Tennekes*

http://www.boerenlandvogels.nl/sites/default/files/Tennekes_2010_Toxicology_17.pdf

Environmental & Analytical
Toxicology

Tennekes and Sánchez-Bayo, J Environment Analytic Toxicol 2011, S:4
<http://dx.doi.org/10.4172/2161-0525.S4-001>

Review Article

Open Access

Time-Dependent Toxicity of Neonicotinoids and Other Toxicants:
Implications for a New Approach to Risk Assessment

2011

Henk A. Tennekes* and Francisco Sánchez-Bayo

http://www.boerenlandvogels.nl/sites/default/files/Tennekes_Sánchez-Bayo_JEAT_2011_Review%20Article_7.pdf

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Chronic toxicity imidacloprid for bumblebees

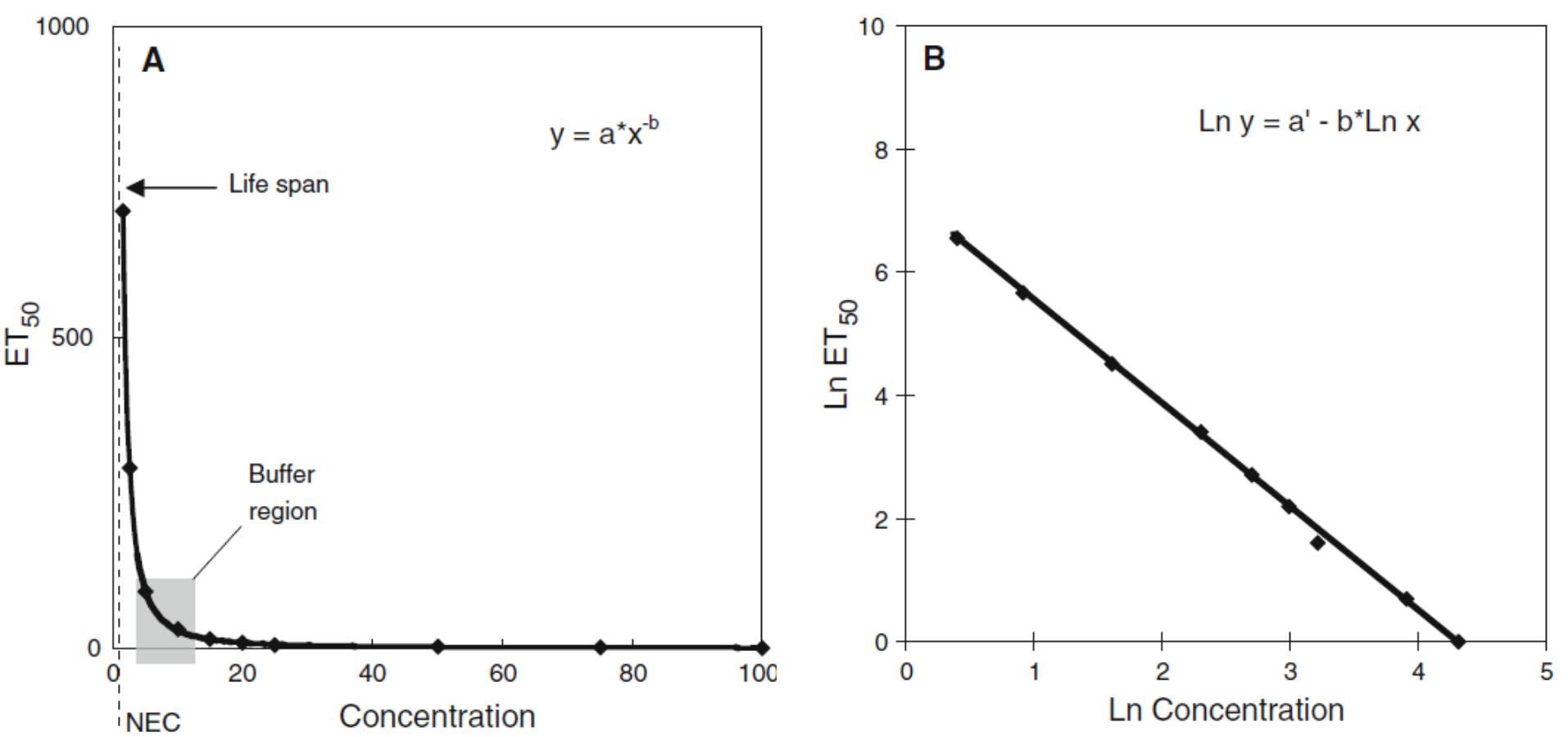
Micro colonies fed with imidacloprid at

- 200 ppm 100% mortality few hours
- 20 ppm 100% mortality 14 days
- 2 ppm 100% mortality 28 days
- 0.2 ppm 100% mortality 49 days,
- 20 ppb 15% mortality (77 days)
- 10 ppb 0% mortality (77 days)

NOEC reproduction <2.5 ppb

<http://dx.doi.org/10.1007/s10646-009-0406-2> Mommaerts e.a. 2010





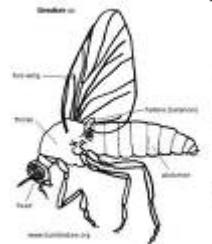
Relationship between neonicotinoid concentration and time to 50% effect (ET₅₀) in the organisms exposed follows a hyperbolic curve asymptotic on the y axis; in reality, this asymptote is determined by the no-effect concentration (NEC), while the upper limit of the curve is determined by the life span of the organism. (Sanchez-Bayo, 2009)

<http://dx.doi.org/10.1080/03601230701229239>

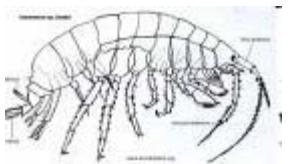




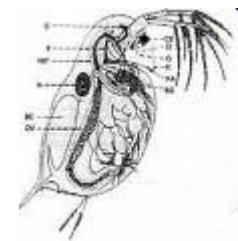
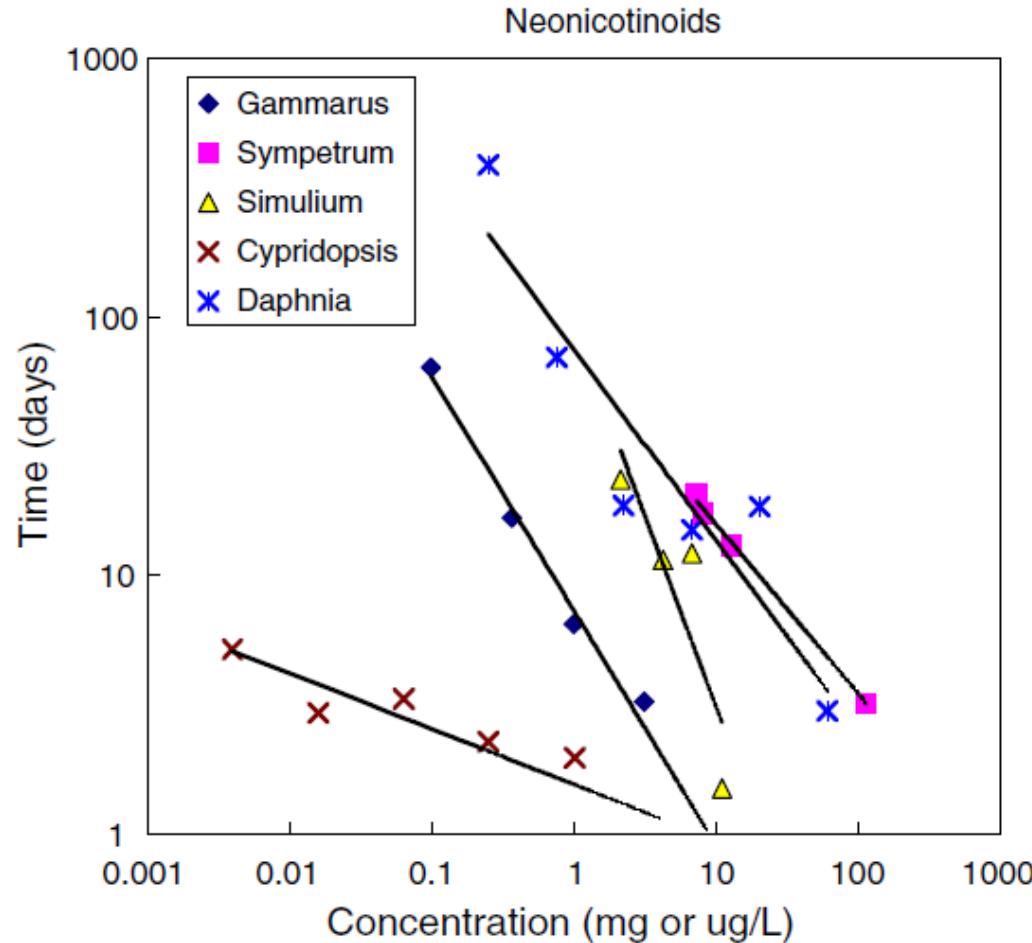
Symptetrum



Simulium



Gammarus



Daphnia



Cypridopsis

Time to 50% mortality for several arthropod species imidacloprid (Cypridopsis vidua and Daphnia magna) and thiacloprid (other species). Concentrations for Symptetrum and Simulium species are in $\mu\text{g/l}$; for all other species in mg/l .

<http://dx.doi.org/10.1080/03601230701229239>



Ligt de bootstelling boven of onder de het laagste bekende schadelijke blootstellingsnivo?

Dosis per bij:

Laagste dosis die tot dood leidt in het lab: 0.012 nanogram per bij. (Suchail e.a., 2001)

Hoogste gerapporteerde dosis die een bij opgelopen heeft in het veld: 4000 nanogram per bij (Girolami e.a., 2012)

$$4000/0.012 = 333333$$

Veilig? 333333 >> 1 Nee dus

Concentratie in het voer:

Laagste dodelijke concentratie uit labstudies 0.1 ppb (Blacquiere e.a. 2012, tabel 2 - Suchail 2001 young bees 10 days)

Hoogste waarde gevonden in stuifmeel in het veld: 912 ppb (Blacquiere e.a. 2012, tabel 1 Mullin e.a. 2010)

$$912/0.1 = 9120$$

Veilig? 9120 >> 1 Nee dus

Bij normstelling voor mensen toetsen we niet > 1 maar veiligheidsfactor 100 dus vanaf > 0.01 is het onveilig.



Sublethal effects

- Foraging behaviour / navigation
- Task differentiation in the hive
- Grooming
- Immune system
- Brood
- Larval development
- etc/.



Sublethal effects imidacloprid

Reflex of proboscis extension	0.1 – 0.4 ng/bee
Frequentation of the feeding source	0.075-0,21 ng/bee
Recognition of the related honeybees	0.25-0.7 ng/bee
Knockdown effect & locomotion coordination	0.0022 ng/bee
Precision of angle appreciation	0.5-1.4 ng/bee
Trembling dances	
Wagging dances	
Precision of distance appreciation	2.5-7 ng/bee

CTS 2003,

<http://nws.chem.uu.nl/research/risk/bijensterfte/rapportfin%201.pdf>



Synergie-effect aangetoond

Pesticide exposure in honey bees results in increased levels of the gut pathogen *Nosema*

Jeffery S. Pettis • Dennis vanEngelsdorp •
Josephine Johnson • Galen Dively

- We exposed honey bee colonies during three brood generations to sub-lethal doses of ... imidacloprid, and then subsequently challenged newly emerged bees with the gut parasite, *Nosema* spp.
- The pesticide dosages used were below levels demonstrated to cause effects on longevity or foraging in adult honey bees.
- *Nosema* infections increased significantly in the bees from pesticide-treated hives when compared to bees from control hives demonstrating an indirect effect of pesticides on pathogen growth in honey bees.

<http://dx.doi.org/10.1007/s00114-011-0881-1>



Advertisement “NEW - Premise 200SC”

What is Premise 200SC plus Nature?

- Low doses of Premise 200SC, such as the edge of the Treated Zone, disoriented the termites and cause them to cease their natural grooming behaviour. Grooming is important for termites to protect them against pathogenic soil fungi. When termites stop grooming, the naturally occurring fungi in the soil attack and kill the termites. Premise 200SC makes fungi 10,000 times more dangerous to termites. Nature assists Premise in giving unsurpassed control. This control is called Premise 200SC plus Nature.
- Premise 200SC containing the active ingredient imidacloprid, belong to new chloronicotinyl group of chemicals.”

http://www.elitepest.com.sg/brochure/Premise_200SC.pdf



Effecten op regenwormen

- Kreuzweizer et al., 2008: Neonic residues remaining in the soil after application in tree pest control were found to cause **adverse effects on earthworms** leading to a **reduction of decomposition of leaf litter** on forest floors
- Decomposition is a **critical ecosystem process** contributing to organic matter breakdown and nutrient cycling.
- Wang e.a. 2012: Earthworms are more susceptible to neonicotinoids than to any other modern synthetic insecticide.



Is the future of bees in the hands of the pesticide lobby?

European Commission allows
corporations to shape the pesticide rules.



Corporate Europe Observatory and the European Beekeeping Coordination
November 2010



- Sterke invloed agro-chemische industrie op toelatingsprotocollen
- Slager keurt eigen vlees & ontwerpt keuringsprotocol!
- Samenstelling ICPBR werkgroep protocol invloed landbouwgif op bijenbroed:
1x Bayer,
1x BASF,
1x industrie-consultant,
3x toelatingsautoriteit

**Veel onderzoek bijensterfte
gefinancierd door Bayer**



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Een greep uit het repertoire

- Eenzijdig financieren van welgevallige vraagstellingen;
- Belangrijke aspecten buiten de vraagstelling houden;
- Aannames maken en deze retorisch ipv feitelijk onderbouwen;
- Opzettelijk foutieve proefopzet kiezen om gewenst resultaat te krijgen;
- Opzettelijk verkeerd toepassen van statistiek;
- Wegmoffelen onzekerheden;
- Ongeoorloofde generalisatie;
- Weglaten van ongewenste uitkomsten, negeren onwelkome kennis;
- Verbod op openbaarmaking uitkomsten of langdurig embargo (IPR);
- Vervalsen gegevens literatuuronderzoek, waarneming of experiment;
- Bewust verkeerd of tendentieus weergeven van onderzoek van anderen;
- Onderzoeksgegevens uit de duim zuigen/fraude;
- Opzettelijk onjuiste conclusies trekken / stelliger dan gerechtvaardigd;
- In de hand werken van onjuiste interpretaties door de media;
- Het onheus bejegenen van collega's om onderzoek te beïnvloeden;
- Veinzen van expertise (acquisitie, media, hoorzittingen 2e kamer);
- Spindoctor technieken inzetten tegen onwelgevallige kennis;
- Gohst writing;
- Pal review (vriendjespolitiek);



Klakkeloos gebruik van opmerkelijke veldproeven

Herbeoordeling neonicotinoïden houdende bestrijdingsmiddelen 29 juni 2011 Ctgb p.44:

- "In a field study, Cutler and Scott-Dupree (2007) found no effects on brood and colony development (including overwintering) after foraging on treated oilseed rape (residue levels up to 2.59 ppb, in pollen)."
- Veldstudies wegen zwaarder dan labstudies in toelatingskader!

<http://goo.gl/arZDG>



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Veldproef Cutler & Scott-Dupree, 2007:
Exposure to Clothianidin seed treated canola has no long-term
impact on honey bees. J. Econ. Entomol 100, 765-772 [[ref](#)]

ABSTRACT We conducted a long-term investigation to ascertain effects on honey bee, *Apis mellifera* L., colonies during and after exposure to flowering canola, *Brassica napus* variety Hyola 420, grown from clothianidin-treated seed. Colonies were placed in the middle of 1-ha clothianidin seed-treated or control canola fields for 3 wk during bloom, and thereafter they were moved to a fall apiary. There were four treated and four control fields, and four colonies per field, giving 32 colonies total. Bee mortality, worker longevity, and brood development were regularly assessed in each colony for 130 d from initial exposure to canola. Samples of honey, beeswax, pollen, and nectar were regularly collected for 130 d, and the samples were analyzed for clothianidin residues by using high-performance liquid chromatography with tandem mass spectrometry detection. Overall, no differences in bee mortality, worker longevity, or brood development occurred between control and treatment groups throughout the study. Weight gains of and honey yields from colonies in treated fields were not significantly different from those in control fields. Although clothianidin residues were detected in honey, nectar, and pollen from colonies in clothianidin-treated fields, maximum concentrations detected were 8- to 22-fold below the reported no observable adverse effects concentration. Clothianidin residues were not detected in any beeswax sample. Assessment of overwintered colonies in spring found no differences in those originally exposed to treated or control canola. The results show that honey bee colonies will, in the long-term, be unaffected by exposure to clothianidin seed-treated canola.



Veldproef opmerkelijk opgezet!

- Afstand case en control 295 meter; volk (40000 bijen) foerageert in straal van 3km! (2800 ha)
- Blootstelling 3 weken, bijen fourageren 25 weken voor wintervoorraad
- $1/2800 \times 3/25 \times 100\% = 0,004\%$ van de wintervoorraad kwam van proefveld
- Clothianidine gevonden in controle groep: case en control aten van elkaar's veld
- Percentage koolzaadstuifmeel niet aangegeven in de studie
- Hidden sponsor: Bayer US\$ 134367 [[ref](#)]
- In 2010 diskwalificeerde US-EPA deze studie [[ref](#)]
- Zomer 2011 baseerde Ctgb in NL zich klakkeloos op deze studie [p44 [ref](#)]
- Ctgb wordt gefinancierd door agrochemische industrie [[ref](#)]



Problems with field studies

- Some field studies have $n=1$ (Schmuck 2001)
- Many flaws in experimental set-up of field studies used for authorization
- Many field studies turned out to have a hidden sponsor: Bayer Cropscience
- Example: Cutler and Dupree 2007 study
- In authorization protocols field studies (even flawed ones and $n=1$ ones) get more weight than lab studies, but from a scientific point of view lab studies are more reliable!





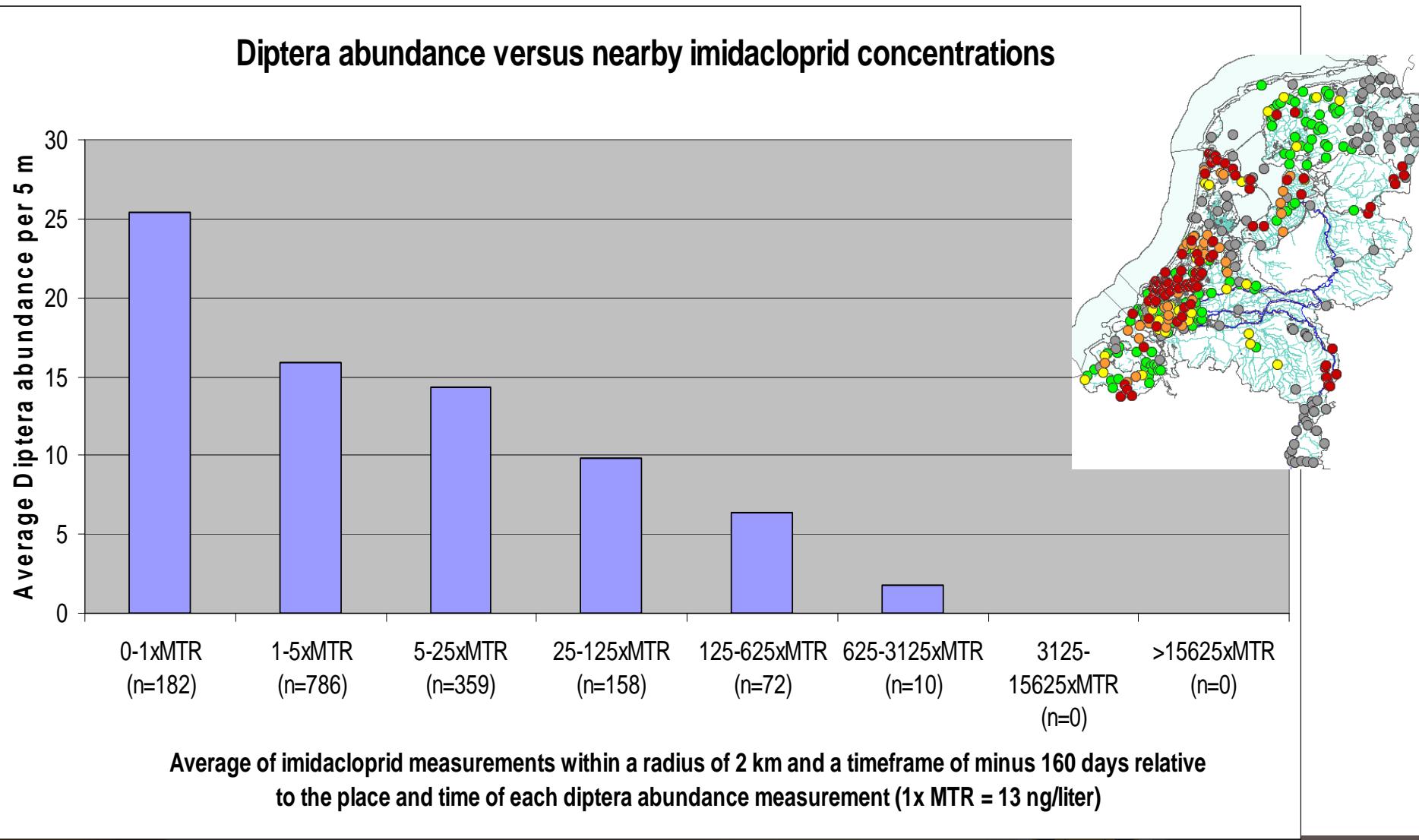
Task Force on Systemic Pesticides

Established March 2011

- 28 scientists 10 different countries – wide range of disciplines
- Integrated assessment of impacts of systemic pesticides on biodiversity and ecosystem services
- Improve risk management
- Explore alternatives
- Inform policymakers and the public



High levels of measured imidacloprid in Dutch surface water correlate strongly with low insect abundance, especially for flying insects – MSc thesis Tessa van Dijk, UU



Task Force on Systemic Pesticides

Achievements:

- Correlation demonstrated between neonics in surface water and decreased insect abundance in Netherlands.
- Soil and water samples taken in the major remaining breeding area of the Blacktailed Godwit in NL.
- IUCN President Dr. Ashok Khosla supported the statement *IUCN and the global problem related to the use of systemic pesticides*, leading to support from the Triodos Foundation.



Task Force on Systemic Pesticides

Future goals

- Identifying financial support for the Task Force.
- Meta-analysis of scientific evidence of the impacts of the rapidly growing use of systemic pesticides on biodiversity and ecosystem services with a focus on pollinators and other non-target species.
- Publication of three related scientific journal articles.
- Identification of alternative pest control
- Preventing inadequate risk assessments in the future.



Wiping out the insects from the global food web has very large scale ecological impacts

Accelerating the collapse of the ecosystem

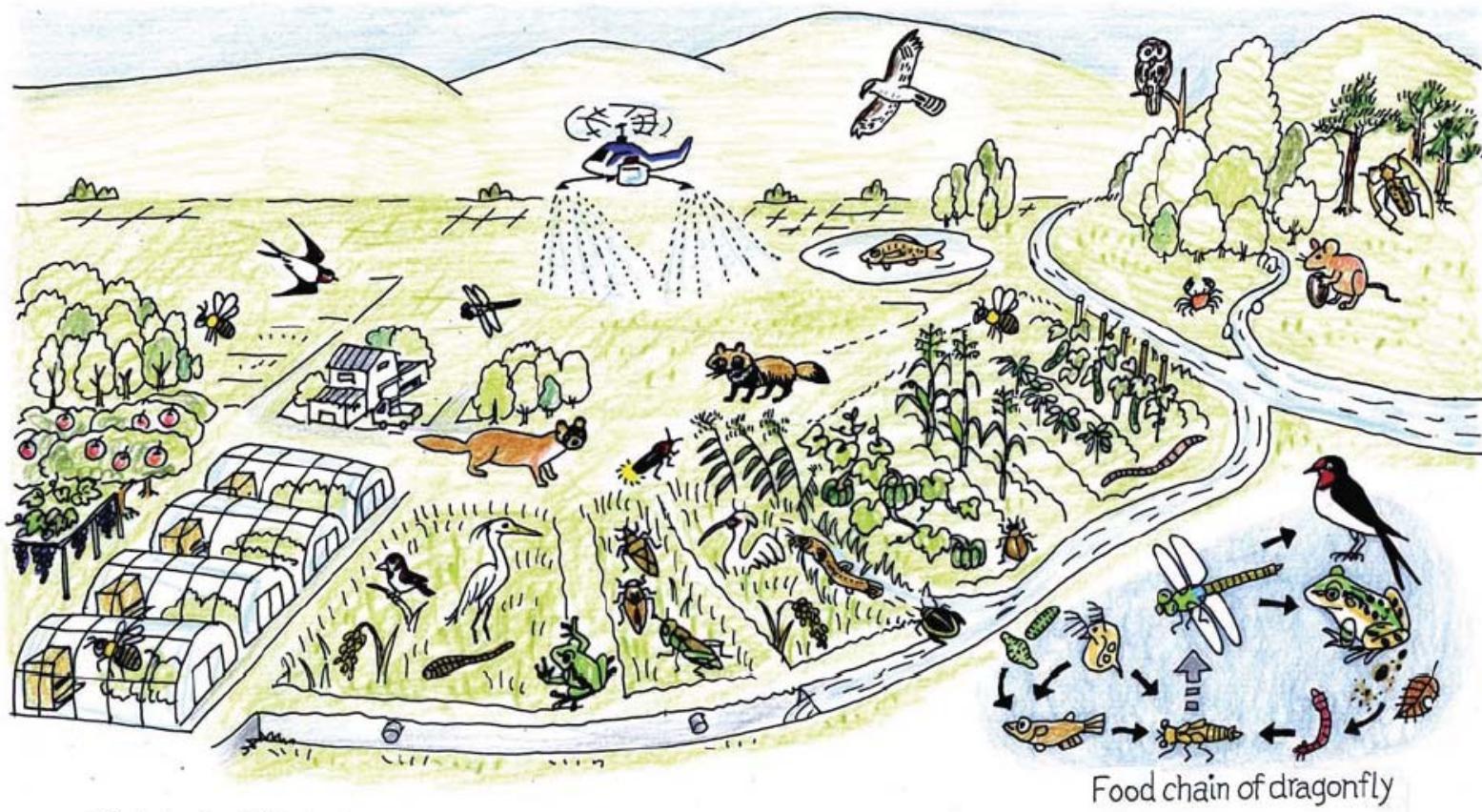


Illustration: Saori Yasutomi



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Verder lezen

- Bijensterfte, een nieuw risico
http://www.jvds.nl/Bijensterfte_overzicht.pdf
- The Threat of Neonicotinoid Pesticides on Honeybees, Ecosystems, and Humans
http://www.bijensterfte.nl/sites/default/files/Neonicotinoid_e.pdf
- Global honey bee colony disorders and other threats to insect pollinators (UNEP 2011 report)
http://www.unep.org/dewa/Portals/67/pdf/Global_Bee_Colony_Disorder_and_Threats_insect_pollinators.pdf
- The puzzle of honey bee losses: a brief review
<http://www.bulletinofinsectology.org/pdfarticles/vol63-2010-153-160maini.pdf>
- Tennekes 2010: The toxicity of neonicotinoid insecticides to arthropods is reinforced by exposure time
http://www.boerenlandvogels.nl/sites/default/files/Tennekes_2010_Toxicology_17.pdf
- Tennekes & Sánchez-Bayo 2011: Time-Dependent Toxicity of Neonicotinoids and Other Toxicants http://www.boerenlandvogels.nl/sites/default/files/Tennekes_Sánchez-Bayo_JEAT_2011_Review%20Article_7.pdf
- The impact of neonicotinoid insecticides on bumblebees, Honey bees and other nontarget invertebrates
http://www.bijensterfte.nl/sites/default/files/Impact_neonicotinoid_insecticides_non-target_invertebrates.pdf
- The Effects of Pesticide-Contaminated Pollen on Larval Development of the Honey Bee, *Apis mellifera*
http://archives.evergreen.edu/mastertheses/Accession86-10MES/burlew_daMES2010.pdf
- Effects of neonicotinoid pesticide pollution of Dutch surface water on non-target species abundance
<http://www.bijensterfte.nl/sites/default/files/FinalThesisTvD.pdf>
- The systemic insecticides - A disaster in the making
<http://www.disasterinthemaking.com/>
- Late lessons from early warnings
http://www.eea.europa.eu/publications/environmental_issue_report_2001_22
- <http://www.bijensterfte.nl>



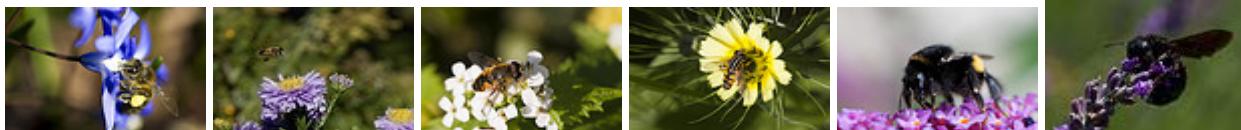
www.jvds.nl

www.bijensterfte.nl



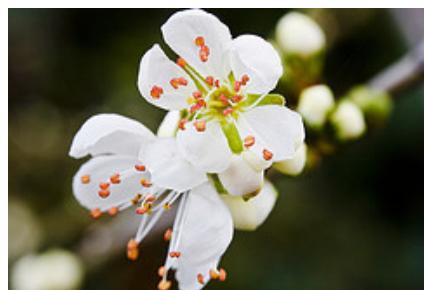
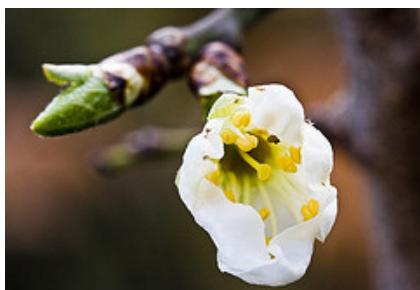
Onafhankelijk onderzoek bijensterfte en landbouwgif

Stichting Triodos Foundation vraagt uw steun voor onderzoek.



- Overal in de wereld wordt een sterke achteruitgang waargenomen in het voorkomen van (wilde) bijen en andere insecten, die een hoofdrol spelen bij de bestuiving en voortplanting van 80% van alle wilde planten en voedselgewassen.
- Systemische pesticiden zijn ongekend giftig voor bijen en andere bestuivende insecten en zijn desastreus voor de insectenrijkdom in bodem en water. Ze zijn in 10 jaar tijd wereldwijd uitgegroeid tot het meest gebruikte en sterkst groeiende soort insecticide. Niet alleen voor de insectenrijkdom van onze planeet maar ook voor insectenetende vogels en andere dieren en uiteindelijk ook mensen zal het al maar toenemend grootschalig gebruik van deze pesticiden niet zonder gevolgen blijven. Insiders maken zich hierover grote zorgen.
- Op veel plaatsen worden (deel)onderzoeken gedaan, maar nodig is een gecoördineerd en omvattend onafhankelijk onderzoek door een internationaal multidisciplinair team van integere wetenschappers. De internationale unie voor het behoud van natuur en natuurlijke hulpbronnen IUCN heeft hiertoe een wetenschappelijke taakgroep ingesteld. De Nederlandse onderzoeker Dr. Jeroen van der Sluijs, specialist integrale beoordeling van milieu- en gezondheidsrisico's, is gevraagd door deze internationale taakgroep dit wereldwijde onderzoek te leiden. De hoop en verwachting is dat dergelijk onderzoek een completere en meer gebalanceerde weergave van de stand van kennis geeft dan dat van de toelatingsautoriteiten en landbouwministeries die zich vooral baseren op de vertrouwelijke onderzoeksgegevens die de fabrikant van het gif zelf aanreikt. Onafhankelijk onderzoek kan leiden tot beter begrip bij het publiek en meer bereidheid tot het nemen van maatregelen bij wetgevende instanties.
- Tot het zover is, zal het geld dat nodig is om een betrouwbaar beeld te krijgen van de rol die deze uiterst gevaarlijke pesticiden spelen bij de wereldwijde sterke terugloop onder bestuivende insecten, van particuliere giften en fondsen moeten komen. De bedrijven, die zeer grote sommen geld verdienen aan deze bestrijdingsmiddelen, noch de politiek willen meebetalen aan volledig onafhankelijk onderzoek.

Om een internationale groep integere wetenschapsmensen en deskundigen in staat te stellen dit uiterst belangrijke onderzoek op te zetten en hiervoor financiële steun te vinden, is bij Triodos Foundation een steunfonds met een startbedrag in het leven geroepen waar u uw bijdrage kunt storten. Giften aan het hierna genoemde steunfonds zijn aftrekbaar voor de inkomstenbelasting volgens de gangbare regels.



Research Fund IUCN Task Force Systemic Pesticides

Wat kunt u doen?

Help. Stort uw bijdrage op:
rekeningnummer 200.02.48.594
ten name van "STF Research Pesticides" te Zeist.

www.triodosfoundation.nl www.bijensterfte.nl www.iucn.org

Triodos  Foundation