Department of Agriculture, Food and the Marine
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Irish Tillage and Land Use Society,
Winter Meeting, December 7th 2017

"Our Shrinking Chemical Tool Box"

Gordon Rennick B.Agr.Sc., M.Sc.,

Pesticide Control Division,

Department of Agriculture, Food and Marine

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A brief history (1st generation)

- **2500 B.C.**
  Ancient Sumerians used sulfur compounds to kill insects

- **300 B.C.**
  Chinese recognize phenology (connection between climate and periodic biological phenomena)

- **1101 A.D.**
  The Chinese discover soap as a pesticide (Fatty Acids)

- **1600's**
  Tobacco infusions (Nicotine), herbs and arsenic become the major materials used for insect pest control
- **1880s Bordeaux Mixture**
- **1890 Mercuric chloride**
- **1900 Paris green (mixture of arsenic and copper sulfate)used for the control of Colorado potato beetle**

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A brief history (2nd Generation)

Synthetic Pesticide Era--1939 to today

- 1930's trend toward synthesizing new compounds
- 1936 Metaldehyde
- 1940's During WWII both sides work on organophosphates as nerve gases and coincidentally discover the insecticidal properties of these chemicals
- 1942 Gamma HCH, Thiram
- 1944 DDT
- 1945 MCPA
- 1947 2,4-D
- 1950's early 60's "The Green Revolution"
- 1951 Dimethoate, CIPC
- 1952 Folpet
- 1954 Demeton S Methyl
- 1956 Dodine, Mecoprop, Atrazine, Simazine
- 1959 Organotins
- 1960 Chlormequat
- 1961 Mancozeb
- 1962 DiQuat & Paraquat, Methiocarb Silent Spring
- 1964 Chlorothalonil
- 1965 Carbofuran
- 1966 Chlorpyrifos


'Silent Spring' Is Now Noisy Summer

Pesticides Industry Up in Arms Over a New Book

By JOHN M. LEE

The $300,000,000 pesticides industry has been highly irritated by a quiet woman author whose previous works on science have been praised for the beauty and precision of the writing.

The author is Rachel Carson,

Rachel Carson Stirs Conflict—Producers Are Crying 'Foul'

fending the use of their products. Meetings have been held in Washington and New York. Statements are being drafted and counter-attacks plotted.

A drowsy midsummer has suddenly been enlivened by the greatest uproar in the pesticides industry since the cranberry

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A brief history (Modern times)

- 1968 Benomyl, Phenmedipham
- 1969 Tridemorph, Desmedipham, Ethofumesate, Chlorotoluron, Propyzamide
- 1970's Serious beginning of research on IPM approaches to pest control
- 1970 IPU
- 1971 Glyphosate
- 1973 Triadimefon, Carbendazim, Difenzoquat
- 1974 Deltamethrin, Guazatine
- 1975 Pendimethalin, Cypermethrin, Diclofop methyl, Triclopyr
- 1976 Cymoxanil, Flamprop-M
- 1977 Metalaxyl, Prochloraz, Clopyralid
- 1978 Triadimenol, Propammocarb
- 1979 Propiconazole, Fenpropimorph, Esfenvalerate
- 1980's Increase in IPM research & genetic engineering applications in agriculture
- 1981 Fluazifop P, Mepiquat chloride
- 1983 Kresoxim methyl, Fluroxypyr, Metsulfuron methyl
- 1984 Flusilazole
- 1985 DFF, Tribenuron, Thifensulfuron
- 1986 Cyproconazole, Fenpropidin, Tebuconazole
- 1987 Cyazofamid, Prosulfocarb, Propaquizafop
- 1988 Fenoxaprop, Difenoconazole
- 1989 Trinexapac
- 1990 Fluazinam

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A brief history (Modern times)

- 1990 Imidacloprid, Thiamethoxam
- 1991 Triflusulfuron-methyl,
- 1992 Azoxystrobin, acetamiprid
- 1993 Epoxiconazole
- 1994 Bacillus subtilis
- 1995 Ampelomyces quisqualis, Flufenacet
- 1996 Quinoxyfen
- 1997 Ferric phosphate
- 1998 Trifloxystrobin
- 1999 Picolinafen
- 2000 Pyraclostrobin, Picoxystrobin, Thiacloprid
- 2002 Prothioconazole, Clothianidin
- 2004 Fluopyram
- 2005 Proquinazid
- 2006 Boscalid, Pinoxaden, Chlorantraniliprole,
- 2010 Isopyrazam
- 2011 Bixafen
- 2016 Oxathiapiprolin, Sulfoxaflor
- *2018* Mefentrifluconazole?? Fenpicoxamid ??

the landscape today

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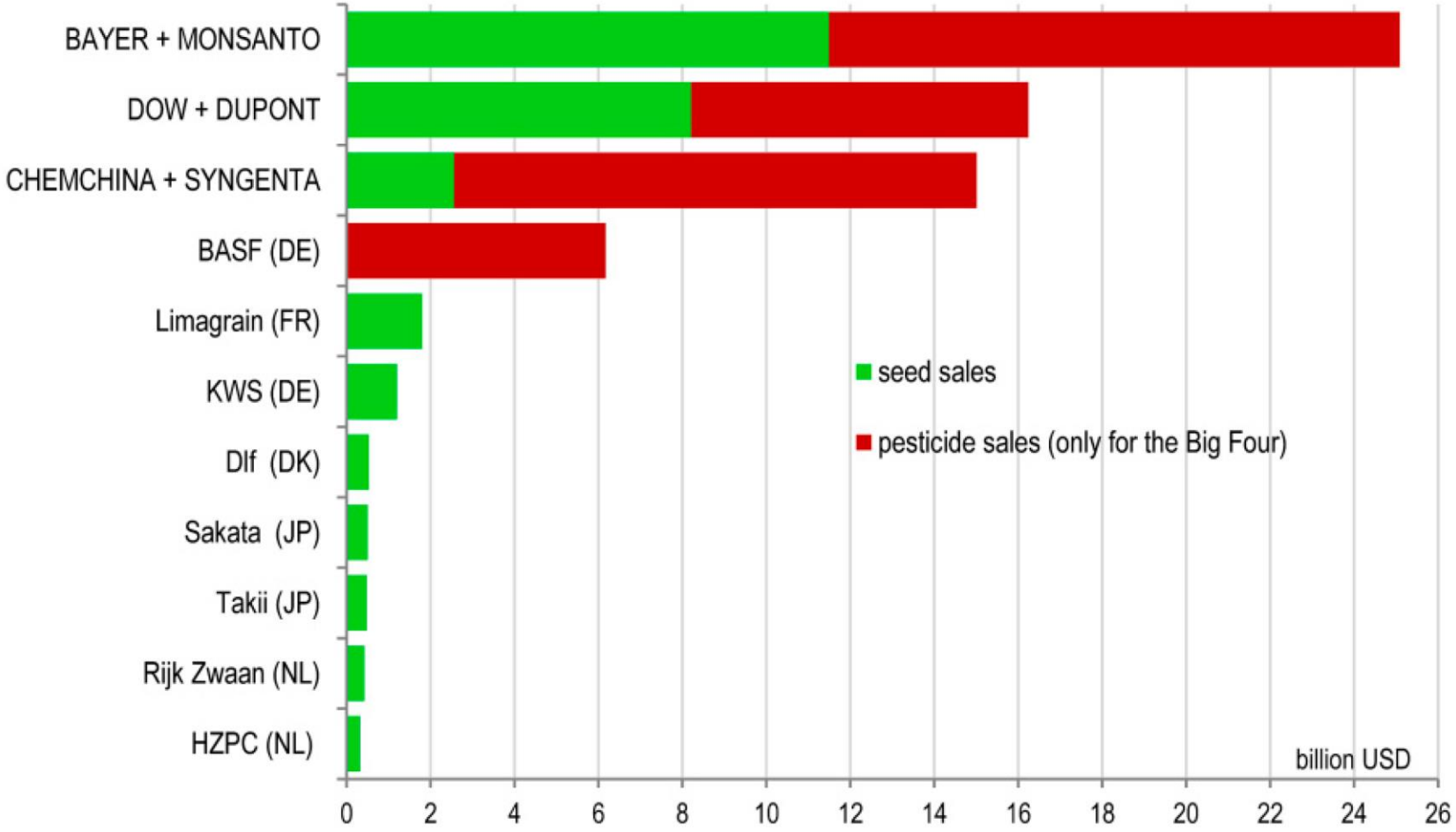
Agri Seeds and Chemicals



Sylvie Bonny
Economie Publique, AgroParisTech, INRA, Université Paris-Saclay, 78850 Thiverval-Grignon, France

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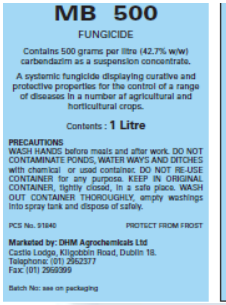
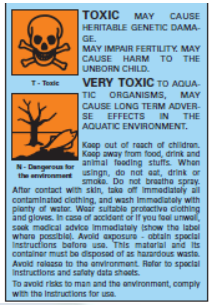
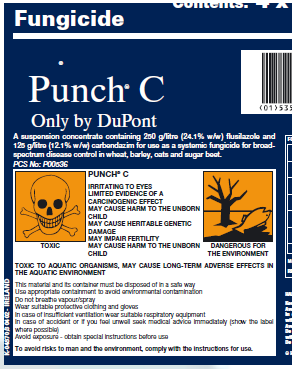
Recent losses……

Aldicarb (Temik) 2003
Benomyl (Benlate) 2002
Demeton S methyl (Metasystox 55) 2007
Dichlobenil (Casoran G) 2009
Diphenylamine (NoScald) 2011
Flamprop-M (Commando) 2003
Flusilazole (Punch C) 2013
Carbendazim (MB500) 2013
Guazatine 2012
Lindane 2001
Ioxynil 2017
IPU 2017







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Recent losses……

Maneb 2017

Mercurous chloride 1979

Oxydemeton methyl (Metasystox R)

Picoxystrobin (Acanto) 2018

Terbutryn (Opogard) 2007

Tepraloxydim (Aramo) 2015

TCA (Atlas Hebron) 2001

Simazine & Atrazine 2007

Linuron (Lingo, Afalon) 2017

Prometryne (Gesegard) 2007

Paraquat (Gramoxone100) 2007

Flupysulfuron (Lexus) 2017

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New active substances

Rate of discovery

More targeted

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New active substances

~12 g/ha

More biologically active…

IMPORTANT INFORMATION

FIELD OF USE: For use only as an agricultural (IRL only)/horticultural insecticide

Crops	Max. single dose	Max. no of applications at max. single dose	Max total dose	Latest time of application
Potatoes (IRL only)	60 ml/ha	2 per crop	120 ml/ha	14 days before harvest
Apples, pears	175 ml/ha	2 per year	350 ml/ha	14 days before harvest

Read the label before use. Using this product in a manner that is inconsistent with the label may be an offence. Follow the code of practice for using plant protection products

Improved human and environmental safety profile

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New active substances

1945 MCPA 1650 g/ha

(2-methyl-4-chlorophenoxyacetic acid)

AGRITOX®

A soluble concentrate containing 500 g/L (44.25% w/w) MCPA as the dimethylamine salt.
A selective herbicide for the control of many broad-leaved weeds in cereals and grassland.

IMPORTANT INFORMATION
FOR USE ONLY AS AN AGRICULTURAL HERBICIDE.

Crops	Maximum individual dose	Maximum total dose	Latest timing
Winter wheat	3.3 L/ha	3.3 L product/ha/crop	Before 3rd node detectable (GS 33)
Spring wheat, winter and spring barley, rye and oats	3.3 L/ha	3.3 L product/ha/crop	Before 1st node detectable (GS 31)
Undersown cereals (listed above) with red clover	1.4 L/ha	1.4 L product/ha/crop	Before 1st node detectable (GS 31)
Undersown cereals (listed above) with grass only	2.7 L/ha	2.7 L product/ha/crop	Before 1st node detectable (GS 31)
Grassland	3.3 L/ha	6.6 L product/ha/year	N/A
Grassland (seed crop)	3.2 L/ha	3.2 L product/ha/year	5 weeks before heading

Finy® PCS No.: 02360

THIS BOOKLET IS PART OF THE APPROVED PRODUCT LABEL.

FINY® is a water soluble granule formulation containing 200 g/kg metsulfuron-methyl for the control of broad-leaved weeds in wheat, oats, triticale and barley, in linseed and in set-aside land. Only for professional use.

FOR USE ONLY AS AN AGRICULTURAL HERBICIDE.

Crops/situations	Maximum individual dose	Maximum total dose	Maximum number of treatments	Latest time of application
Wheat, barley, oats and triticale	30 g product/ha	30 g product/ha	1 per crop	Before flag leaf sheath extending stage
Linseed	30 g product/ha	30 g product/ha	1 per crop	Before flower buds visible or up to 30 cm tall, whichever is the sooner
Set-aside	30 g product/ha	30 g product/ha	1 per year	Before 1st August in year of application

1983 Metsulfuron methyl

6 g/ha (0.0006g/m^2)

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New active substances

1965 Chlorpyrifos 960 g/ha

(Cutworms, Aphid, Caterpillars, leatherjackets, beetles, capsids, moths, weevils, mites….)

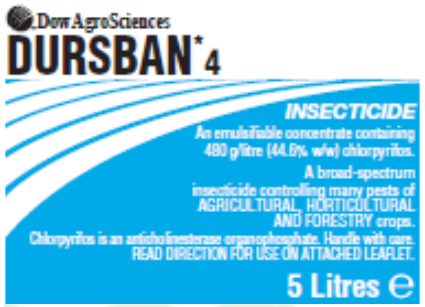
BRASSICA AND VEGETABLE CROPS

SPRAY APPLICATION

RATES OF USE AND PESTS CONTROLLED

Crops that can be treated	*Pest*	*Rate per hectare*
Broccoli, cabbage, calabrese, cauliflower, Chinese cabbage	Aphids	1.0 litre
Broccoli, cabbage, calabrese, cauliflower, Chinese cabbage	Caterpillars (small), leatherjackets, whitefly (adults)	1.5 litres
Broccoli, cabbage, calabrese, cauliflower, Chinese cabbage, bulb onions, seed potatoes[1]	Cutworms	2.0 litres

[1] IMPORTANT - Do not spray seed potato crops under severe drought stress as damage may occur. The variety Desirée is particularly susceptible.



IMPORTANT INFORMATION:
FOR USE ONLY AS A HORTICULTURAL INSECTICIDE

Crops:	Brussels sprouts, broccoli/calabrese, cabbage, cauliflower, collards, kale and lettuce
Maximum individual dose:	0.5 L/ha
Maximum number of treatments:	2
Latest time of application:	Brussels sprouts, broccoli/calabrese, cabbage, cauliflower, collards and kale: 3 days before harvest Lettuce: 7 days before harvest

READ THE LABEL BEFORE USE. USING THIS PRODUCT IN A MANNER THAT IS INCONSISTENT WITH THE LABEL MAY BE AN OFFENCE. FOLLOW THE CODE OF PRACTICE FOR USING PLANT PROTECTION PRODUCTS.

2006 Spirotetramat 75 g/ha

(Aphids and whitefly only)

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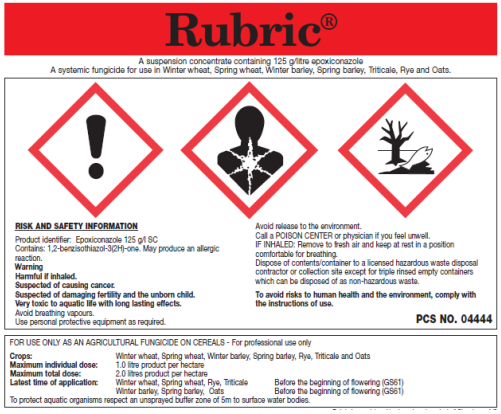
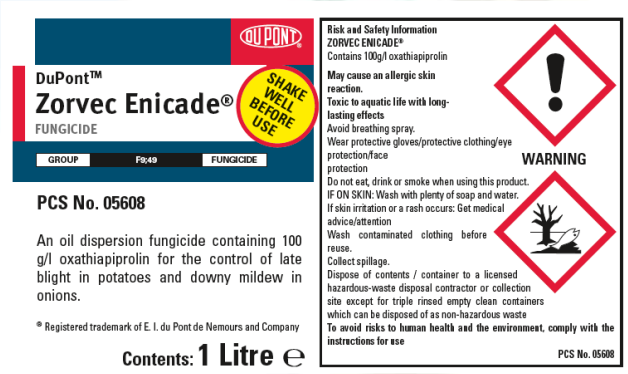
New active substances

1961 Mancozeb 1600 g/ha

1993 Epoxiconazole 125 g/ha



2017 Oxathiapiprolin 20 g/ha



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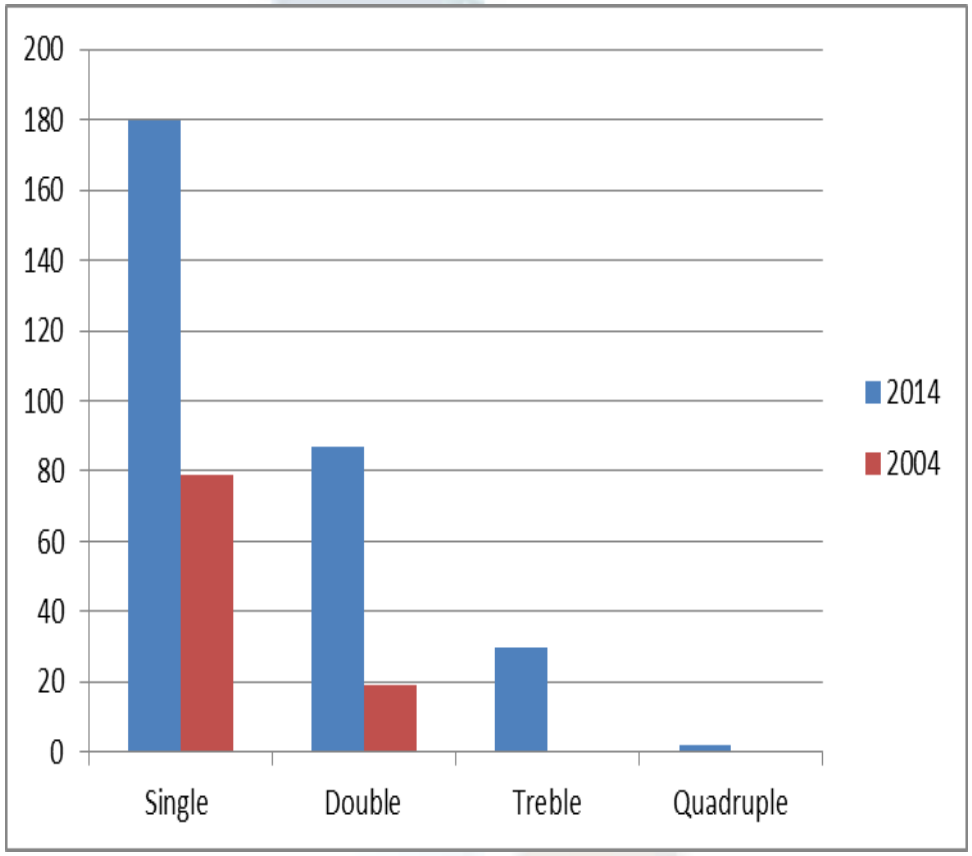
Mixtures……

2004 Applications versus 2014 applications



2004 60% >1 active
2014 80% >1 active

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The future……

"Green" products,

Micro-organisms,

IPM sensitive products

Nanotechnology….

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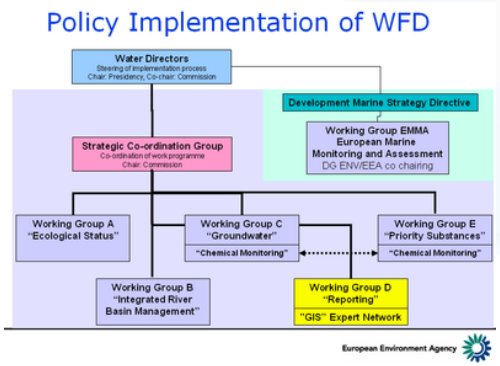
The future……

Pollinators...

EQS Water

Endocrine disruption

Negligible exposure



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The future……

Regulatory constraints

2015 Comparative Assessment

Impact of cut off criteria

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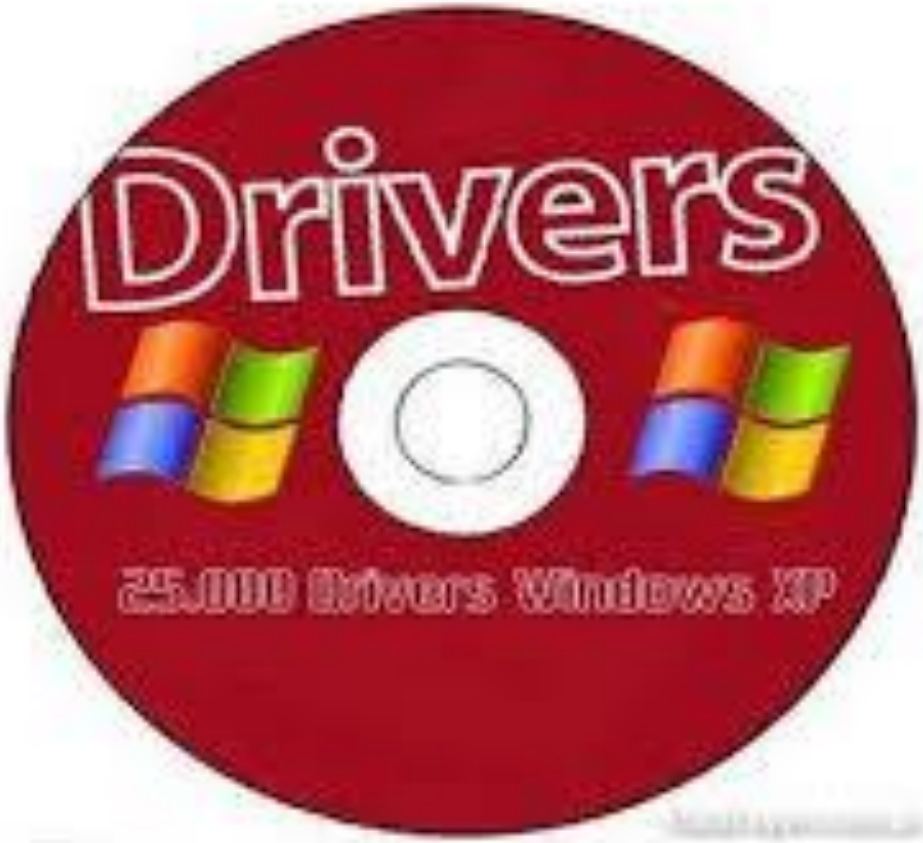

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Public Opinion and Mass Media

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"Never let the facts get in the way of a good story."
— Mark Twain

Regulations

(Acts adopted under the EC Treaty/Euratom Treaty whose publication is obligatory)

REGULATIONS

REGULATION (EC) No 1107/2009 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 21 October 2009

concerning the placing of plant protection products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Community, and in particular Article 37(2), Article 95 and Article 152(4)(b) thereof,

Having regard to the proposal from the Commission,

Parliament by its Resolution of 30 May 2002 ([5]) and the Council in its Conclusions of 12 December 2001 asked the Commission to review Directive 91/414/EEC and identified a number of issues for the Commission to address.

(3) In the light of the experience gained from the application of Directive 91/414/EEC and of recent scientific and technical developments, that Directive should be replaced.

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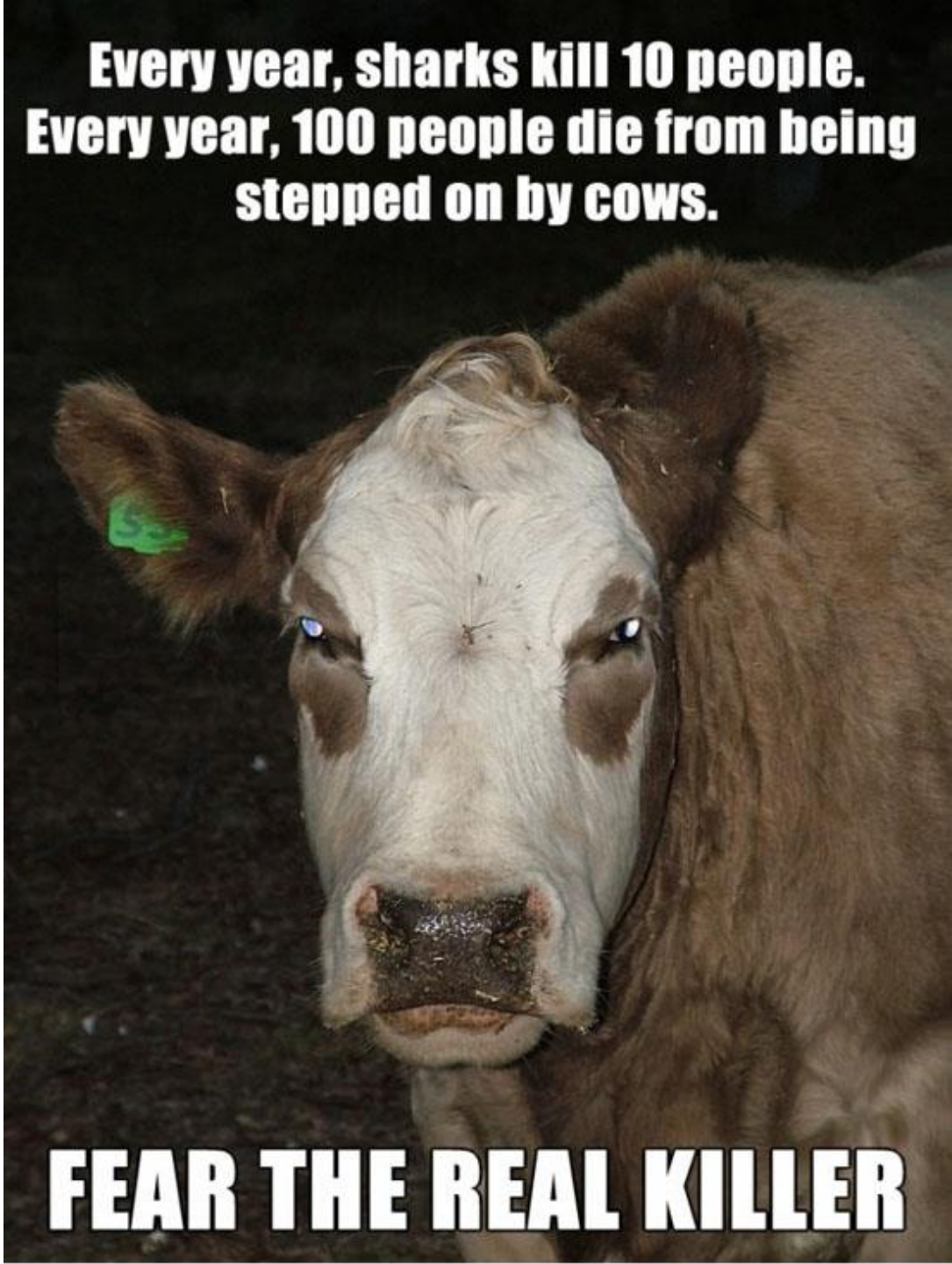
Hazard based "Cut off" criteria…

-If not Cat 1A or 1B Mutagen
-If not Cat 1A or 1B Carcinogen
-If not Cat 1A or 1B Repro Toxin
-If not an ED
-If not a POP
-If not a PBT
-If not a vPvB
-If not an ED to NTO
-If no unacceptable bee effects



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1107

Hazard based "Cut off" criteria…

Precautionary principle……..

America's cats, kill between up to 4 billion birds in a year

Peter Marra, (Smithsonian Conservation Biology Institute)

The mammalian toll is even higher, ranging from 6.9 billion to 20.7 billion annually.

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Safety First!

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Regulation

Substitution principle

Time will tell!

Biological activity…..

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Some of the active substances at risk of being lost because of human toxicology concerns

ED of very high concern	ED of low concern	Potential ED – further information needed
Fungicides (16/37)		
Mancozeb	Bupirimate Iprodione Myclobutanil Prochloraz Tebuconazole Thiophanate-methyl	Carbendazim Cymoxanil Fluazinam Fosetyl aluminium Hymexazol Mandipropamid Prothioconazole Silthiofam Thiram
Herbicides (15/36)		
Ioxynil Linuron	Metribuzin Propyzamide	2,4-D Chlorpropham Dimethenamid-P Ethofumesate Fluazifop-p-butyl Glufosinate-ammonium Lenacil S-metolachlor Pinoxaden Tepraloxydim Terbuthylazine
Insecticides (9/20)		
Abamectin Thiacloprid	Spiromesifen	Chlorpyrifos Clothianidin Beta-cyfluthrin Lambda-cyhalothrin Spinosad Spirotetramat

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Some of the active substances at risk of being lost because of ecotoxicology concerns

ED of very high concern	ED of low concern	Potential ED – further information needed
Fungicides (7)		
Iprodione Myclobutanil Prochloraz Tebuconazole		Carbendazim Chlorothalonil Thiram
Herbicides (5)		
Ioxynil		2,4-D S-metolachlor Metribuzin
Insecticides (8)		
Cypermethrin Fenoxycarb	Abamectin	Chlorpyrifos Beta-cyfluthrin Lambda-cyhalothrin Dimethoate Malathion

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Candidates for substitution
(only 7 year approval)

Low ADI/AOEL/ARfD

1-Methyl-cyclopropene
Bromadiolone
Diclofop
Difenacoum
Dimethoate
Dimoxystrobin
Diquat (dibromide)
Ethoprophos
Fenamiphos (aka phenamiphos)
Fluometuron
Fluquinconazole
Haloxyfop-P (Haloxyfop-R)
lambda-Cyhalothrin
Metam (incl. -potassium and -sodium)
Methomyl
Oxamyl
Sulcotrione
Triazoxide

Inactive Isomers

Metalaxyl

Toxic For Reproduction

Epoxiconazole
Flumioxazine
Glufosinate
Quizalofop-P-tefuryl

Endocrine Disruptors

Chlorotoluron
Dimoxystrobin
Epoxiconazole
Profoxydim
Thiacloprid

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Candidates for substitution
(only 7 year approval)

2 PBT Criteria

Aclonifen
Benzovindiflupyr
Bifenthrin
Bromuconazole
Chlorotoluron
Copper compounds
Cyproconazole
Cyprodinil
Difenoconazole
Diflufenican
Dimoxystrobin
Diquat (dibromide)
Epoxiconazole
Esfenvalerate
Etofenprox
Etoxazole
Famoxadone
Fludioxonil
Flufenacet
Fluopicolide
Fluquinconazole
Haloxyfop-P (Haloxyfop-R)
Imazamox
Isopyrazam
lambda-Cyhalothrin
Lenacil
Lufenuron
Metconazole
Metribuzin
Metsulfuron-methyl
Myclobutanil
Nicosulfuron
Oxadiazon
Oxyfluorfen
Paclobutrazol
Pendimethalin
Pirimicarb
Prochloraz
Propiconazole
Propoxycarbazone
Prosulfuron
Quinoxyfen
Tebuconazole
Tebufenpyrad
Tri-allate
Ziram

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Newly approved

Beer

Clayed charcoal

Diammonium phosphate

Equisetum arvense L.

Fructose

Sucrose

Hydrogen peroxide

Lecithins

Mustard seeds powder

Salix spp. cortex

Sodium chloride (Salt)

Sodium hydrogen carbonate (baking powder)

Sunflower oil

Urtica spp.(nettle juice)

Vinegar

Whey

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IPM

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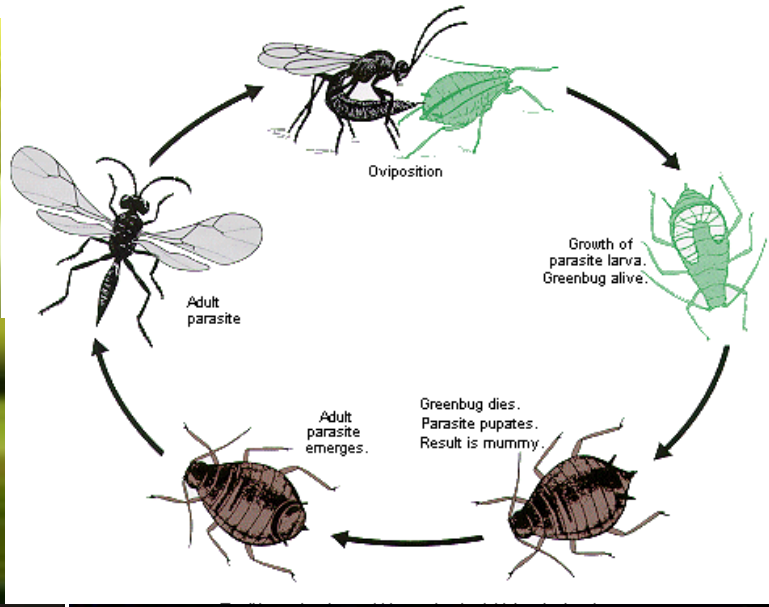

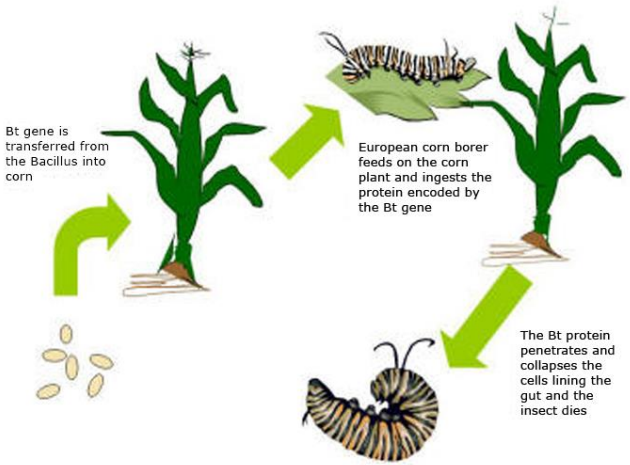

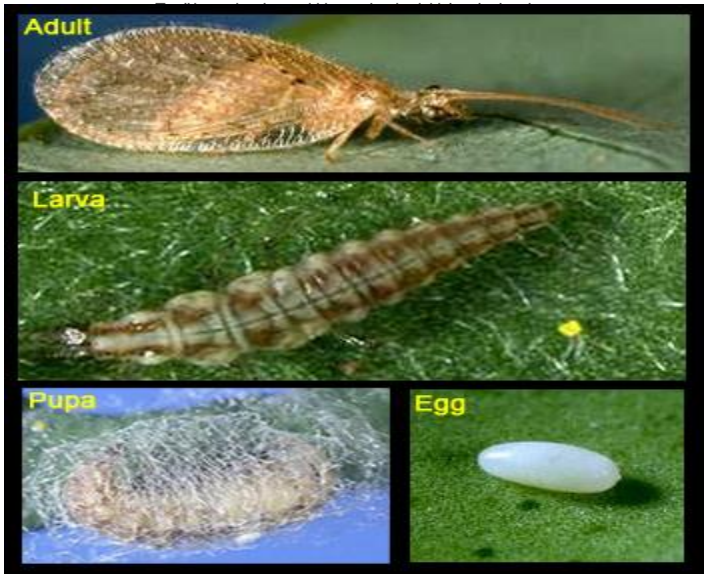

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Mefentrifluconazole REVYSOL

Fenpicoxamid INATREQ™ ACTIVE

Clothianidin BAYER REDIGO Deter

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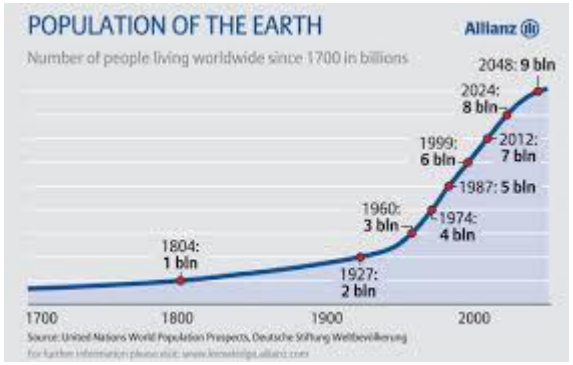

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Best to draw your own……


FARMING
noun /färmiNG/
THE ART OF LOSING MONEY
WHILE WORKING 400 HOURS
A MONTH TO FEED PEOPLE
WHO THINK YOU ARE TRYING
TO KILL THEM

www.pcs.agriculture.gov.ie

- See our Handbook
-
- Phone 01-6157618 (direct line)

E-mail: pcs@agriculture.gov.ie
gordon.rennick@agriculture.gov.ie