

# need for innovation in integrated control of greenhouse pests

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# INTEGRATED PEST MANAGEMENT (IPM)

- **regulating pest populations by harmonizing**
  - chemical control
  - natural control
  - biological control
- **main pest: spider mites (*Tetranychidae*)**

# BIOLOGICAL PEST CONTROL IN GREENHOUSES



- discovery of the predatory mite *Phytoseiulus persimilis*
- seasonal introductions for spider mite control in cucumbers since 1968
- booming in fruiting vegetables late 80ies



# Organisation Internationale de Lutte Biologique



**Bert Bravenboer**

**1st convenor working group ‘Integrated Control in Glasshouses’**

# symposia of int. working groups 'IPM in Greenhouses'

Naaldwijk 1970



Littlehampton 1973



Antibes 1976



Vantaa 1979



Darmstadt 1982



Catania 1984



Budapest 1987



Antibes 1989



København 1990



Alassio 1991



Asilomar CA 1993



Lisboa 1994



Wien 1996



Tenerife 1997



Brest 1999



Antalya 2000



Victoria BC 2002



Agadir 2003



Naantali 2005



Murcia 2006



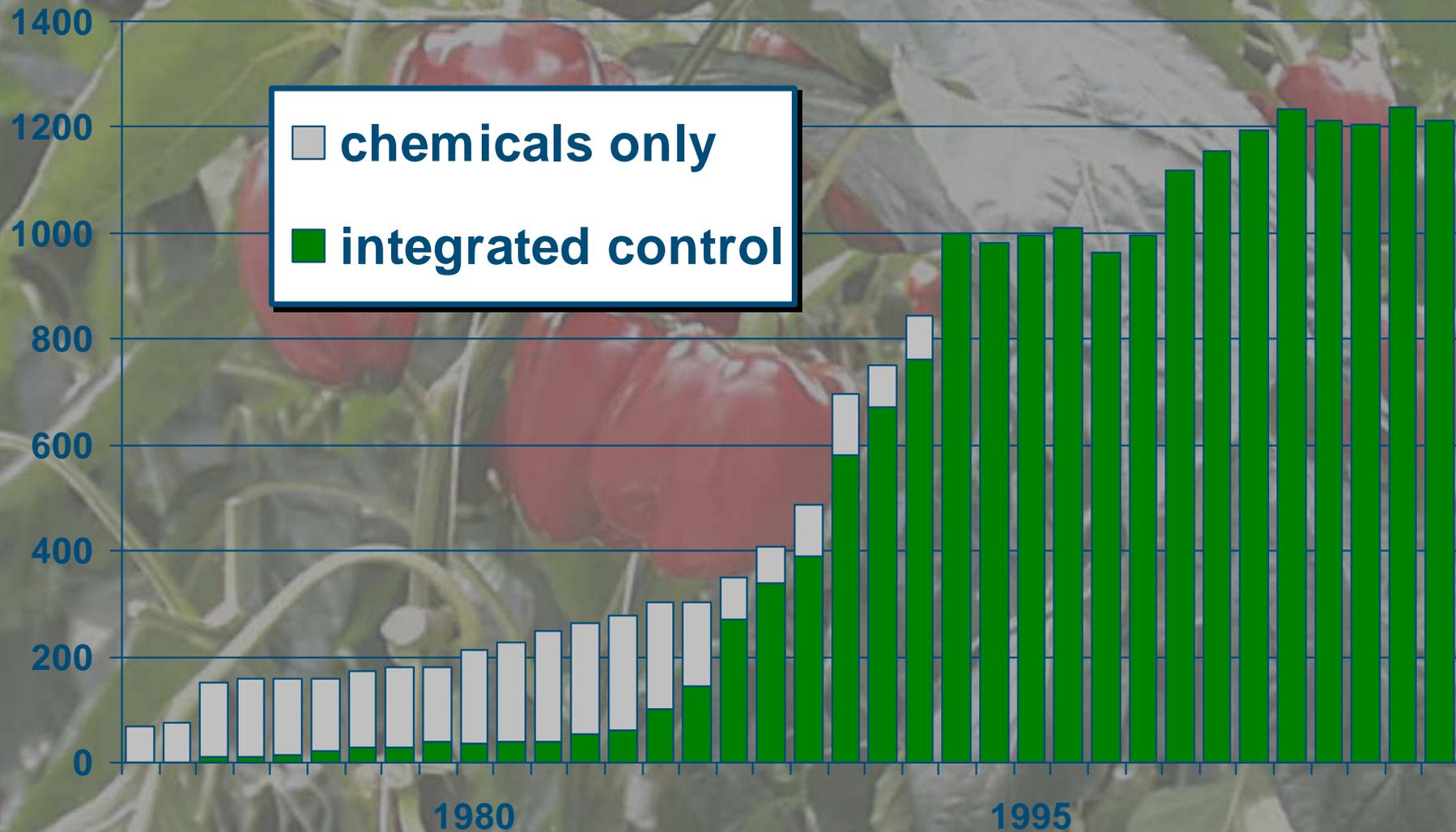
St Michielsgestel 2008



Crete 2009



# acreage of sweet pepper glasshouses in The Netherlands (ha)

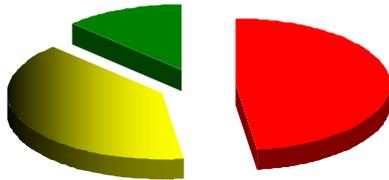


# SELLING OF NATURAL ENEMIES IN THE NETHERLANDS

■ P.p. ■ Enca ■ Dacn ■ Orius ■ Aphidius ■ Aphidol ■ Ambl

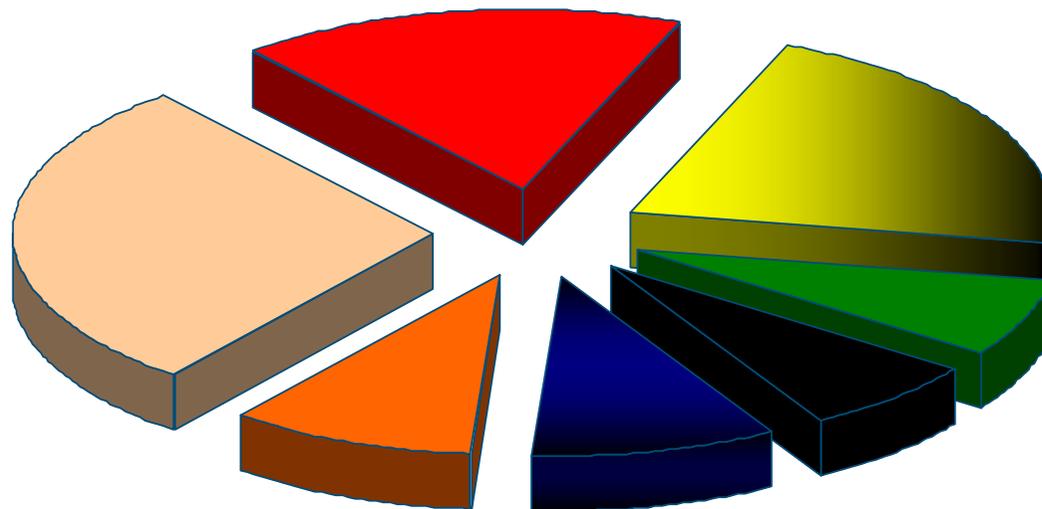
1984

*k€ 1.200*



1992

*k€ 9.900*





**oldest**

# **I P M C R O P S**

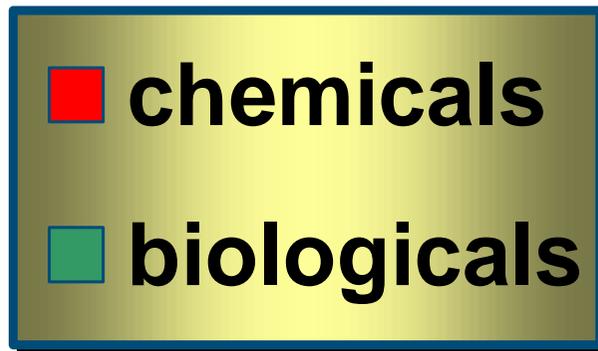
**largest acreage  
biocontrol + biopollination**

**most successful**

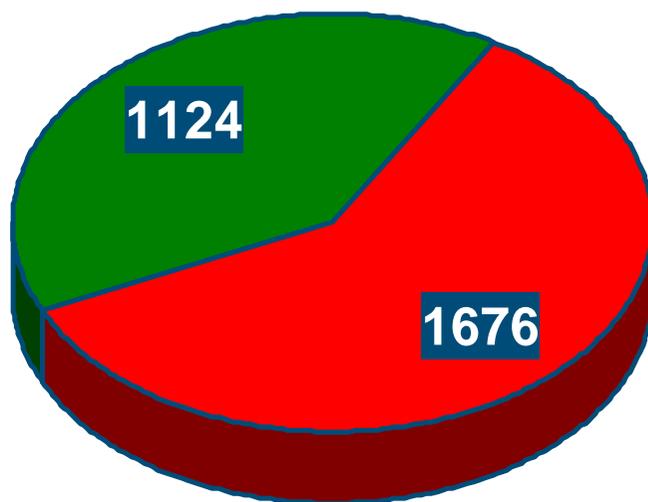


# COSTS OF CROP PROTECTION PRODUCTS

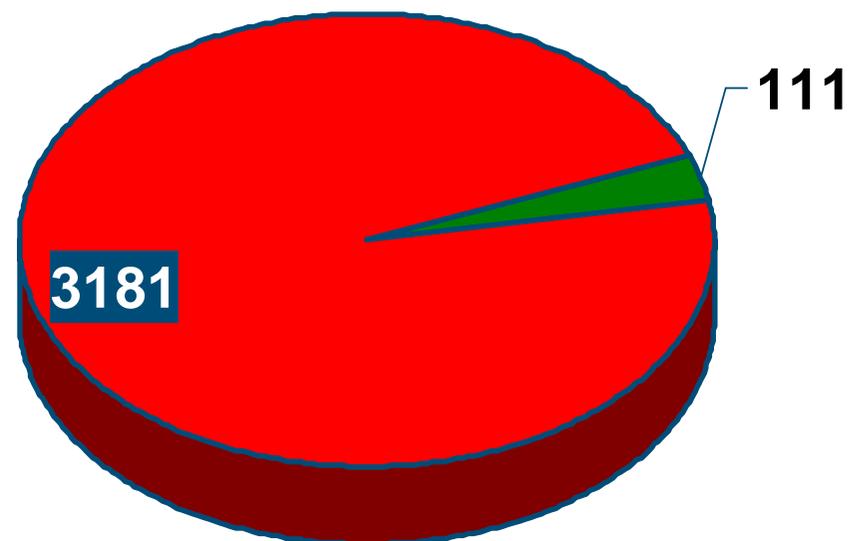
€per hectare



## VEGETABLES



## ORNAMENTALS



# pro's and con's of biocontrol

- ❌ preventing / overcoming pesticide resistance
- ❌ mobility
- ❌ reproduction



- ☐ costs
- ☐ limited choice of pesticides
- ☐ “secondary” pests

# merits of IPM

- health of workers
- minimizing residues
- avoiding pesticide emission (water, air)
- marketing



# CHALLENGES FOR BIOCONTROL TODAY

- **vegetables**
  - demands supermarkets > health authorities
  - reduced Maximum Residue Levels
  - maximum # different residues
  - zero tolerance
- **temperate zone → subtropics**
- **ornamentals**
  - cut flowers
  - pot plants



**3 months**

1½ year







# CONDITIONS in ORNAMAMENTALS

- **temperature**
  - propagation Phalaenopsis 28 °C
  - soil temp. Freesia 15 °C
  - Fatsia 14 °C
- **air humidity**
  - misting
  - dehumidification
- **light**
  - assimilation lamps
  - shadow plants
  - photoperiod
- **system innovation**



# STATEMENT

- **present assortment of biocontrol products insufficient**
  - **# botanical species & varieties**
  - **different climate conditions**
  - **new growing systems**

# Registration important insecticides / acaricides

<b>acequinocyl</b>	<b>Cantack</b>	<b>2007</b>
<b>acetamiprid</b>	<b>Gazelle</b>	<b>2006</b>
<b>avermectine</b>	<b>Vertimec</b>	<b>1995</b>
<b>bifenazaat</b>	<b>Floramite</b>	<b>2003</b>
<b>clofentezin</b>	<b>Apollo</b>	<b>1993</b>
<b>cyromazine</b>	<b>Trigard</b>	<b>1992</b>
<b>etoxazool</b>	<b>Borneo</b>	<b>2009</b>
<b>flonicamid</b>	<b>Teppeki</b>	<b>2008</b>
<b>hexythiazox</b>	<b>Nissorun</b>	<b>1989</b>
<b>imidacloprid</b>	<b>Admire</b>	<b>1995</b>
<b>indoxacarb</b>	<b>Steward</b>	<b>2002</b>
<b>kresoxim-methyl</b>	<b>Kenbyo</b>	<b>1997</b>
<b>lufenuron</b>	<b>Match</b>	<b>2006</b>

<b>methoxyfenozide</b>	<b>Runner</b>	<b>2005</b>
<b>milbemectine</b>	<b>Milbeknock</b>	<b>2002</b>
<b>pirimicarb</b>	<b>Pirimor</b>	<b>70's</b>
<b>pymetrozine</b>	<b>Plenum</b>	<b>2003</b>
<b>pyriproxyfen</b>	<b>Admiral</b>	<b>1997</b>
<b>spinosad</b>	<b>Conserve</b>	<b>2002</b>
<b>spirodiclofen</b>	<b>Envidor</b>	<b>2003</b>
<b>spiromesifen</b>	<b>Oberon</b>	<b>2004</b>
<b>tebufenpyrad</b>	<b>Masai</b>	<b>1997</b>
<b>teflubenzuron</b>	<b>Nomolt</b>	<b>1988</b>
<b>thiacloprid</b>	<b>Calypso</b>	<b>2003</b>
<b>thiamethoxam</b>	<b>Actara</b>	<b>2005</b>

# Important biocontrol agents (pred., paras.)

SPECIES	CATEGORY	TARGET	
<i>Encarsia formosa</i>	hym. parasitoid	whitefly	1926
<i>Phytoseiulus persimilis</i>	predatory mite	spider mite	1968
<i>Aphidoletes aphidimyza</i>	predatory midge	aphids	1978
<i>Dacnusa sibirica</i> 🌸	hym. parasitoid	leafminers	1981
<i>Aphidius</i> sp. 🌸	hym. parasitoid	aphids	1983
<i>Diglyphus isaea</i> 🌸	hym. parasitoid	leafminers	1984
<i>Amblyseius cucumeris</i>	predatory mite	thrips	1986
<i>Orius</i> sp.	predatory bug	thrips	1993
<i>Macrolophus caliginosus</i>	predatory bug	whiteflies	1994
<i>Hypoaspis aculeifer</i>	predatory mite	fungus gnats	1996
<i>Amblyseius swirskii</i>	predatory mite	thrips, whiteflies	2005

🌸 likely to occur spontaneously

# STATEMENT

- **progress in IPM based on the development of new (synthetic and microbial) chemical pesticides**



# **(lack of) innovation in biocontrol**

- **products of nature, not patentable**
- **specific mode of action, small market niche**
- **producers are small companies, limited R&D resources**
- **emphasis on production (rather than development) costs**
- **fierce competition on price**
- **privatising of independent research & extension**
- **public / cooperative funds shrinking**

# DEMAND >> SUPPLY

- commercial vacuum
- premature introduction of “new” products
- recommended against non-preference targets
- recommended under sub-optimal conditions
- based on unrealistic laboratory experiments
- or on inconclusive on-farm trials
- to be used in combination with other measures (including chemical control)
- selective reporting
- dozens of excuses for failures
- “significant” rather than “sufficient” effects
- unique historical evidence
- efficacy standards too low for professional horticulture
- pest absence claimed as efficacy of the product
- → confusing growers, eventually abandoning IPM





# What do we need ?

- **SEARCH FOR NEW PEST ANTAGONISTS**
  - in nature
  - in agricultural ecosystems
  - in the area of pest origine
- **DEVELOPING MICROBIAL PESTICIDES**
  - 1 bacterial insecticide
  - 4 soilborne fungi
  - 1 NPvirus
  - 5 EPnematodes
- **CONFIRMING EFFICACY IN FIELD EXPERIMENTS**
  - adequate monitoring
  - of both pest and antagonist
- **CONTINUOUS QUALITY CONTROL**
  - living products
  - contamination
  - genetic drift

# Does investing in biocontrol agents pay ?

- ✘ **urgent and increasing demand**
  - ✘ **quick dissemination worldwide**
  - ✘ **simple registration procedure (except microbials)**
  - ✘ **well-educated growers (handling complicated strategies)**
  - ✘ **used to relatively high product prices**
- 
- ☐ **well-educated growers (no market for “snake oils”)**
  - ☐ **high quality demands**
  - ☐ **niche products**
  - ☐ **not patentable (innovators ↔ fast followers)**

# Thank you for your attention

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