Making EFAs work for farmers and biodiversity

Felix Wäckers

Agri Environment Schemes

Agriculture → **Environment**

Focus on conservation

Perceived Conflict

Agri Environment Schemes

Agriculture → **Environment**

Focus on ecosystem services

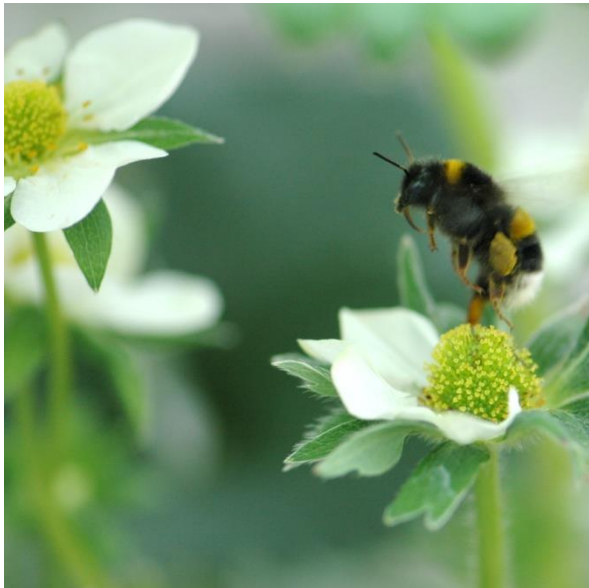
€320 billion/year

€90 billion/year
(*Constanza 1997*)

How to optimize services?

Traditional paradigm: Enhance diversity (diversity = stability = services)

Pimentel, D. (1961) Diversity-Stability hypothesis:
The stability of a community increases with increasing biological diversity



Does it work?

Example biological pest control

How to optimize services?

Traditional paradigm: **Enhance diversity**

Functional biodiversity: Selectively enhance diversity

Focus on functional groups that provide ecosystem services

Targeted landscape management

Informed selection of non-crop plants as a multifunctional tool to optimize ecosystem services

- Select plants that optimize biological pest control or pollination

- Select plants that avoid stimulation of pests

- Select plants that generate multiple ecosystem services

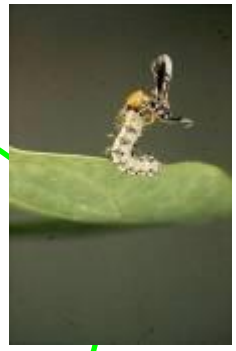
(Wäckers, 1996, 2004)

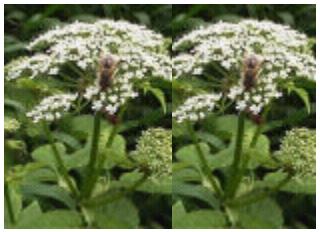
Attractive

Non-attractive

Accessible nectar

Inaccessible nectar





Aegopodium podagraria

Vicia sativa

Leucanthemum vulgare

Galium mollugo

Select to optimize BC benefits

Daucus carota

Trifolium pratense

Medicago lupulina

Trifolium repens

Origanum vulgare

Erigeron annuus

Achillea millefolium

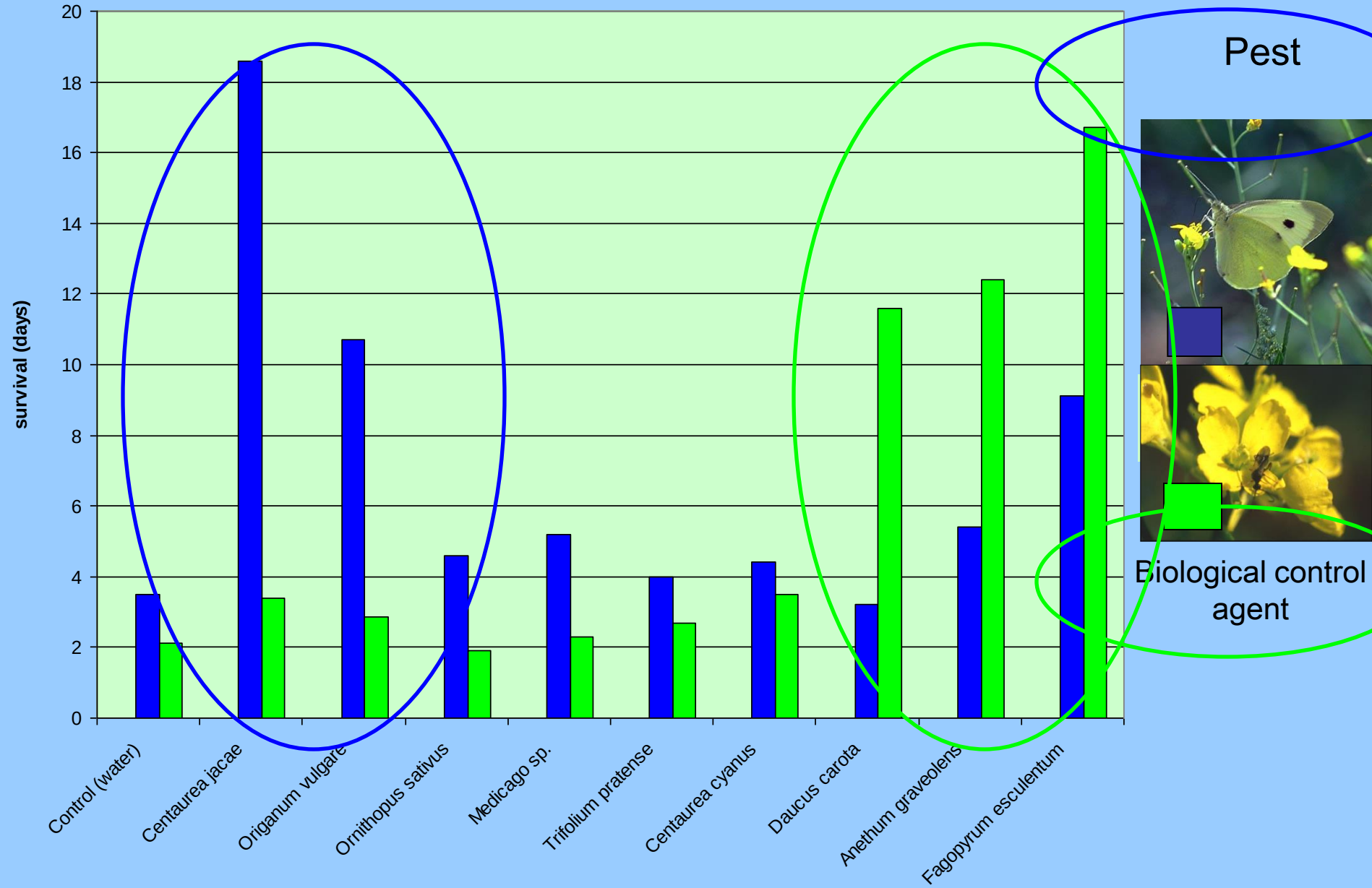
(Wäckers and van Rijn, 2012)

Select plants that optimize biological pest control

family	species	Floral Nectar depth	Longevity (AFLI) Hoverfly *E. balteatus*	Longevity (AFLI) Lacewing *C. carnea*	Longevity (AFLI) Parasitoids	References parasitoids (species)
Apiaceae	*Ammi majus*	0				
Apiaceae	*Coriandrum sativum*	0				
Apiaceae	*Daucus carota*	0				
Apiaceae	*Foeniculum vulgare*	0				
Apiaceae	*Heracleum spondylium*	0				
Apiaceae	*Pastinaca sativa*	0				
Polygonaceae	*Fagopyrum esculentum*	0				
Boraginaceae	*Borago officinalis*	0				
Ranunculaceae	*Ranunculus acris*	0				
Caryophyllaceae	*Gypsophila elegans*	1				
Asteraceae	*Matricaria chamomilla*	1				
Asteraceae	*Achillea millefolium*	1				
Asteraceae L	*Cichorium intybus*	1				
Asteraceae	*Chrysanthemum segetum*	2				
Asteraceae	*Anthemis tinctoria*	2				
Asteraceae	*Leucanthemum vulgare*	2				
Asteraceae	*Tanacetum vulgare*	2				
Asteraceae	*Calendula officinalis*	3				
Asteraceae	*Centaurea cyanus* (+EFN)	3				
Asteraceae	*Helianthus annuus* (+EFN)	3				
Asteraceae	*Cosmos bipinnatus*	4				
Malvaceae	*Malva sylvestris*	4				
Boraginaceae	*Phacelia tanacetifolia*	4				
Fabaceae	*Medicago sativa*	4				
Fabaceae	*Vicia sativa* (+EFN)	4				
Fabaceae	*Lotus corniculatus*	4				

Selecting plants that avoid stimulation of pests

(Winkler et al., 2009)

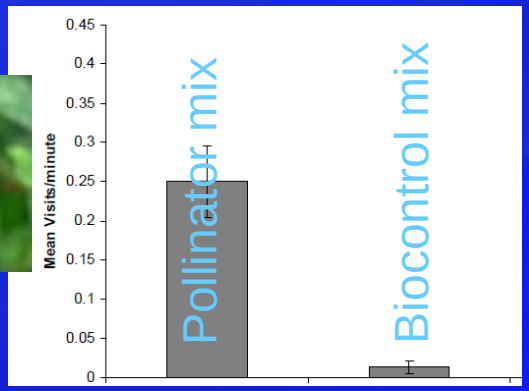


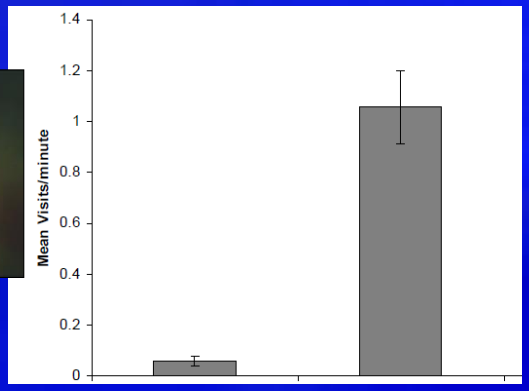
Selecting plants that generate multiple ecosystem services

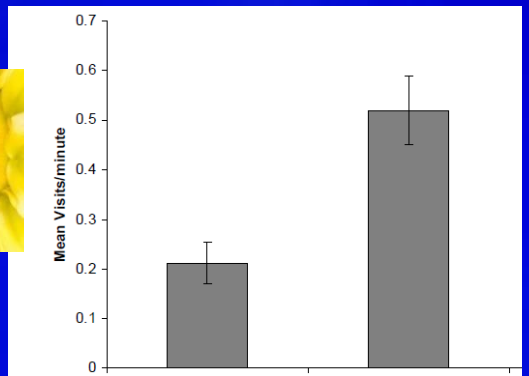
Pollination

Biocontrol

(Campbell, Biesmeijer Varma & Wäckers, 2012)



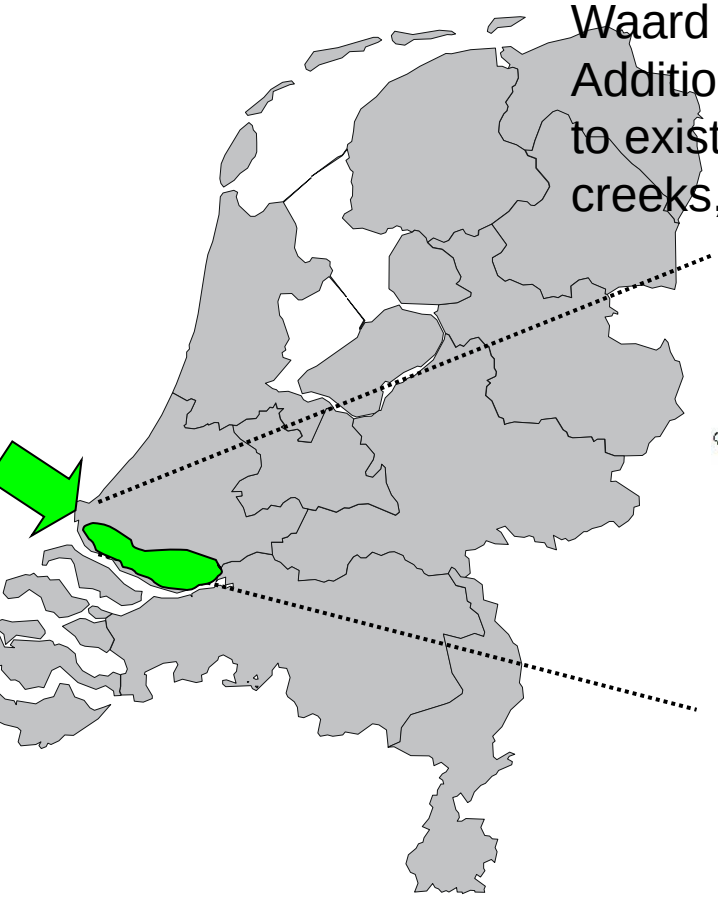


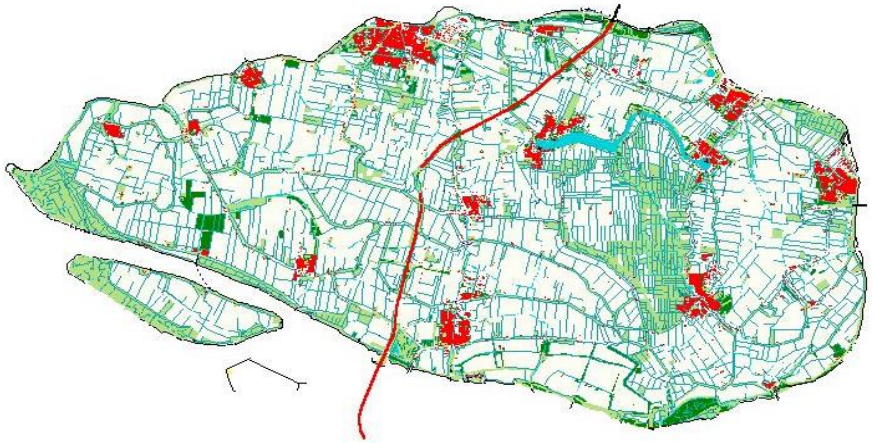


Taking it to the Farmer

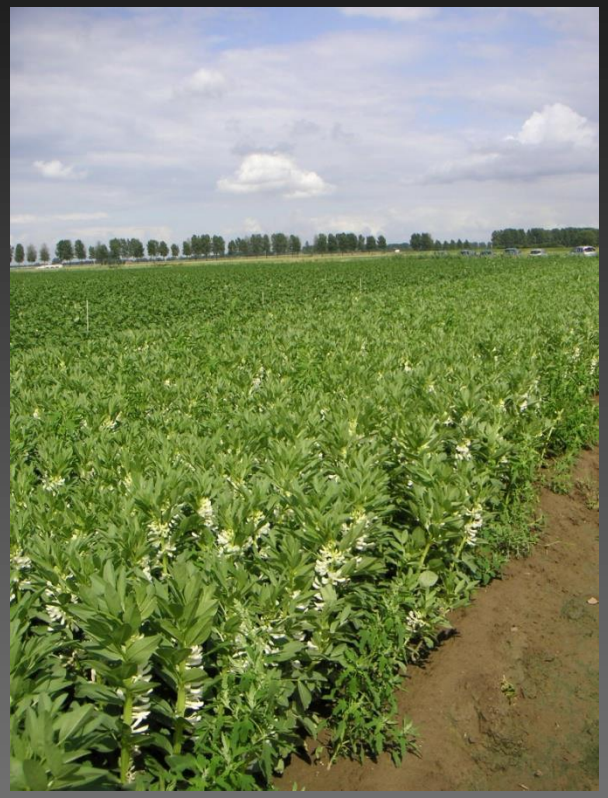
FAB (Functional Agrobiodiversity)

Large scale biodiversity project in the Hoekse Waard working with conventional growers. Addition of annual and perennial field margins to existing landscape features (polders, dikes, creeks, canal borders).

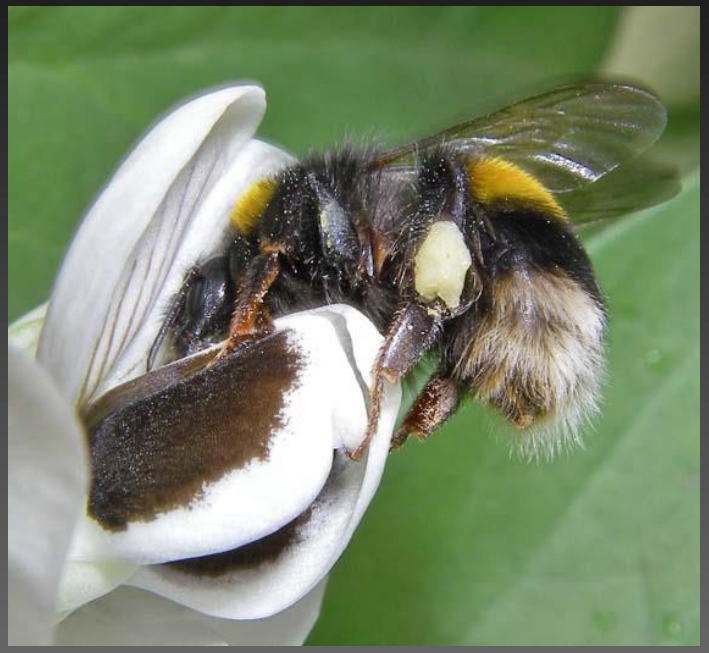




Het unieke van het platteland?
Dat is de schoonheid van de natuur...
en agrarische ondernemers die er mee werken!
Project:
Functionele Agro Biodiversiteit
Initiatiefnemers:
LTO Noord, ZLTO, LLTB
Uitvoerders:
Agrarische ondernemers, LTO projecten, NIOO, Wageningen UR, DLV
Financiering:
LNV, VROM en het Hoofd-productschap Akkerbouw, Productschap Tuinbouw, Waterschap Hollandse Delta en Rabobank
Agrarische ondernemers zoeken hier enthousiast en actief naar de praktische voordelen die de natuur in hun directe omgeving hen biedt en hoe ze die maximaal kunnen benutten.
www.lto.nl/fab

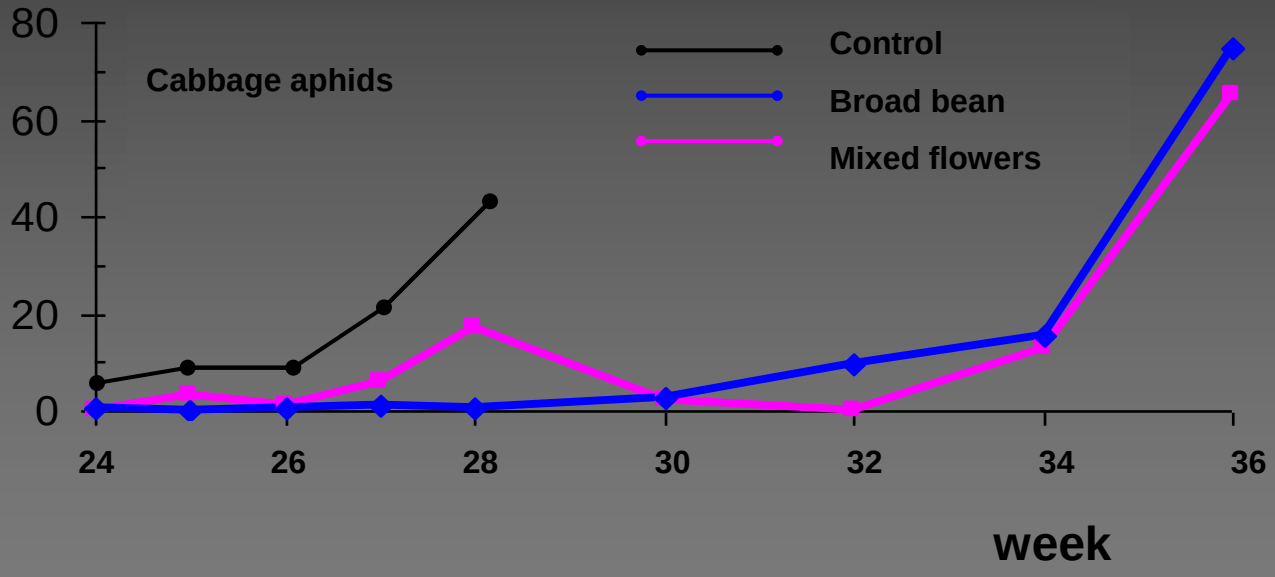


Leguminous Plants: Insect Magnets

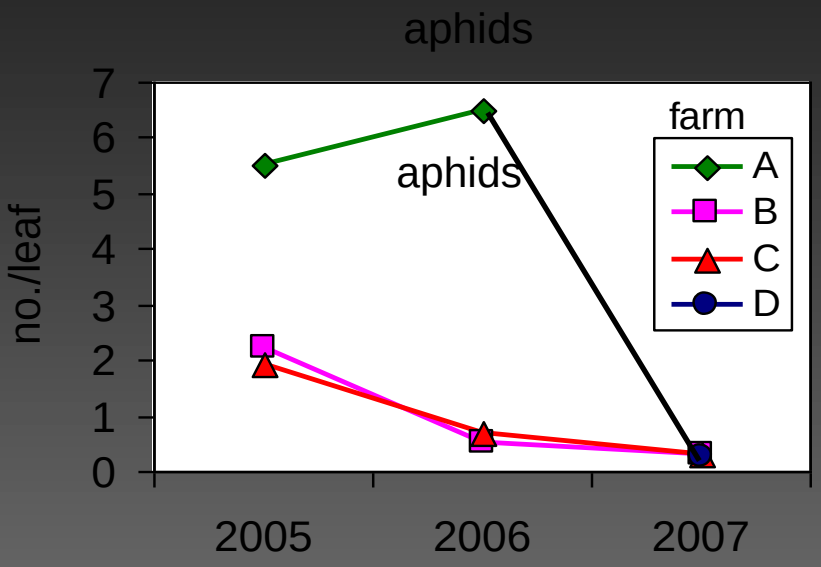


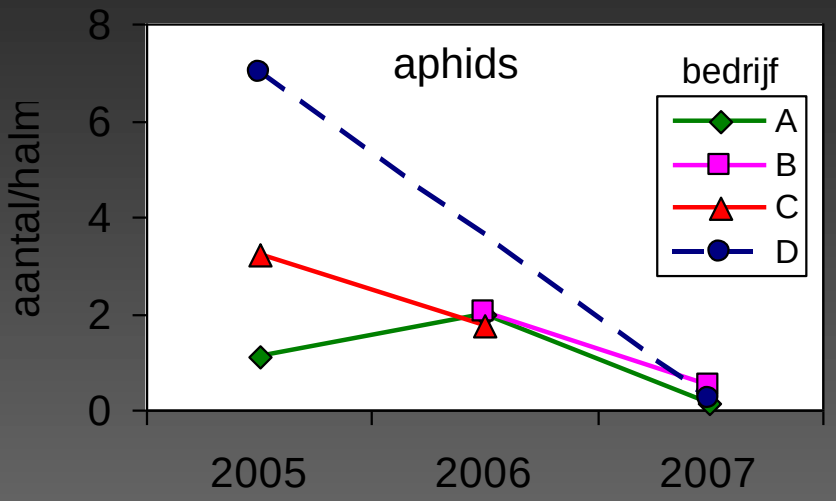
Brussels Sprouts

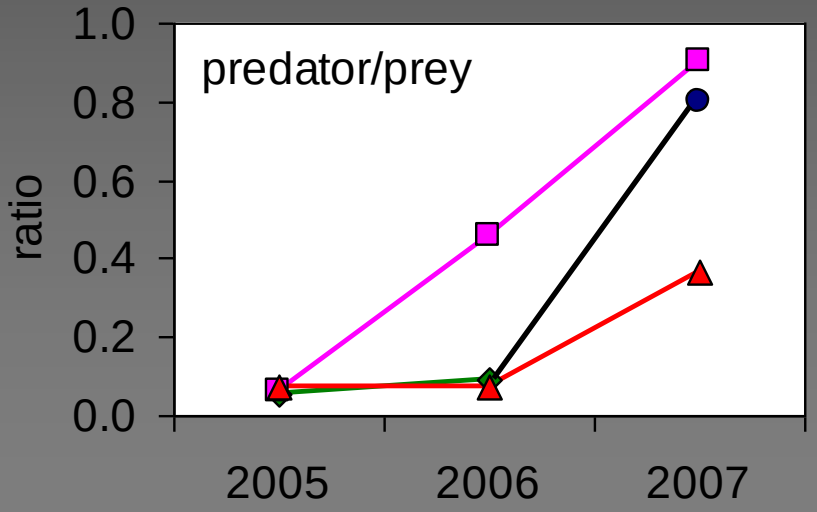
Cabbage aphids



Three year trends in aphid and natural enemy populations at conventional farms

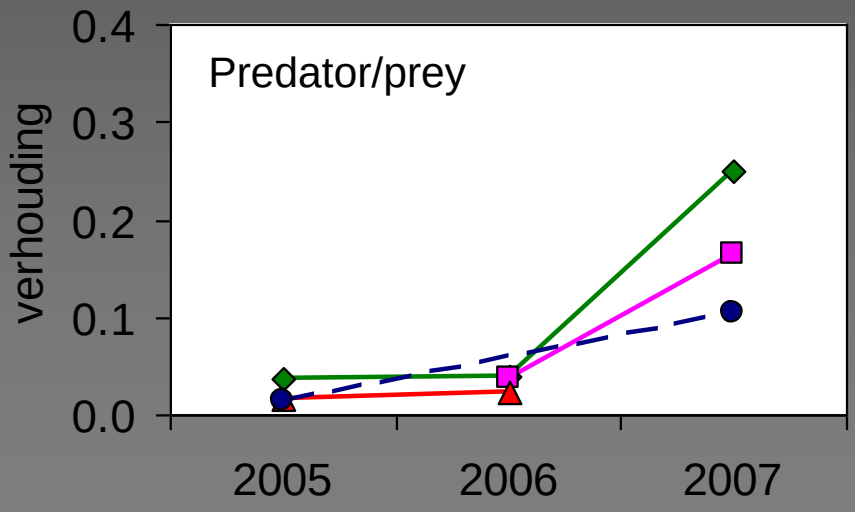






Potato

Aphid peak: mid July

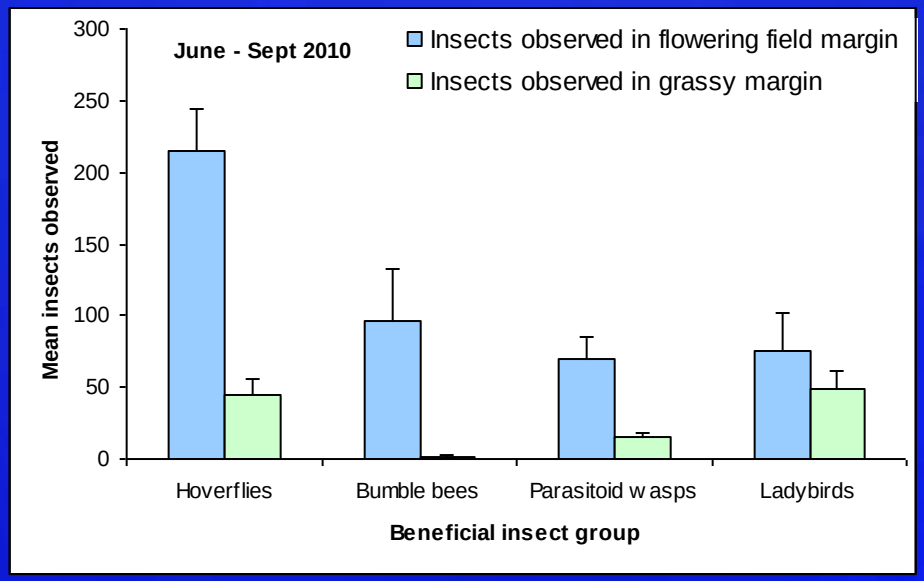


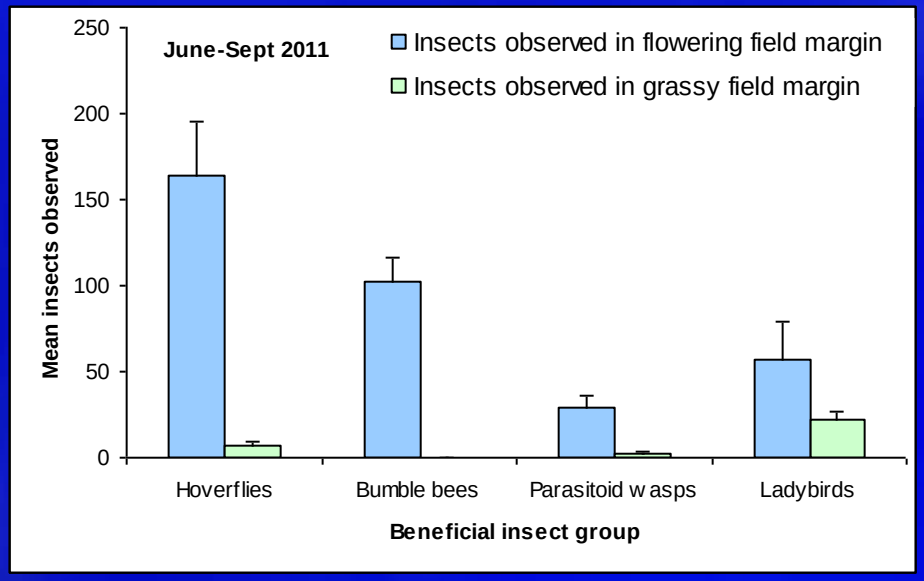
Wheat

mid June

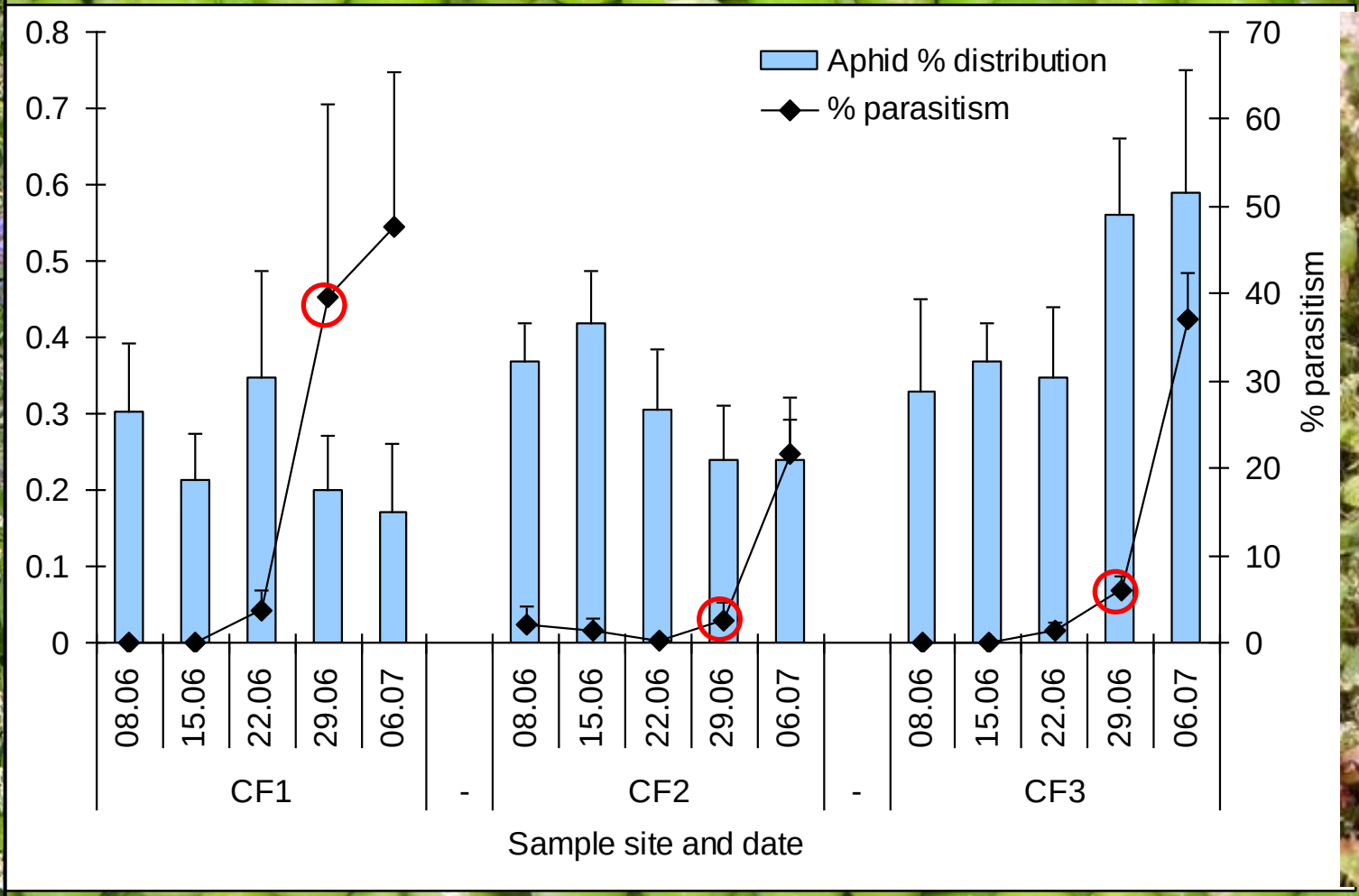
Optimizing Ecosystem Services in Terms of Agronomy and Conservation (ECOSTAC.CO.UK)

Beneficial insects in field margins





Aphids in peas

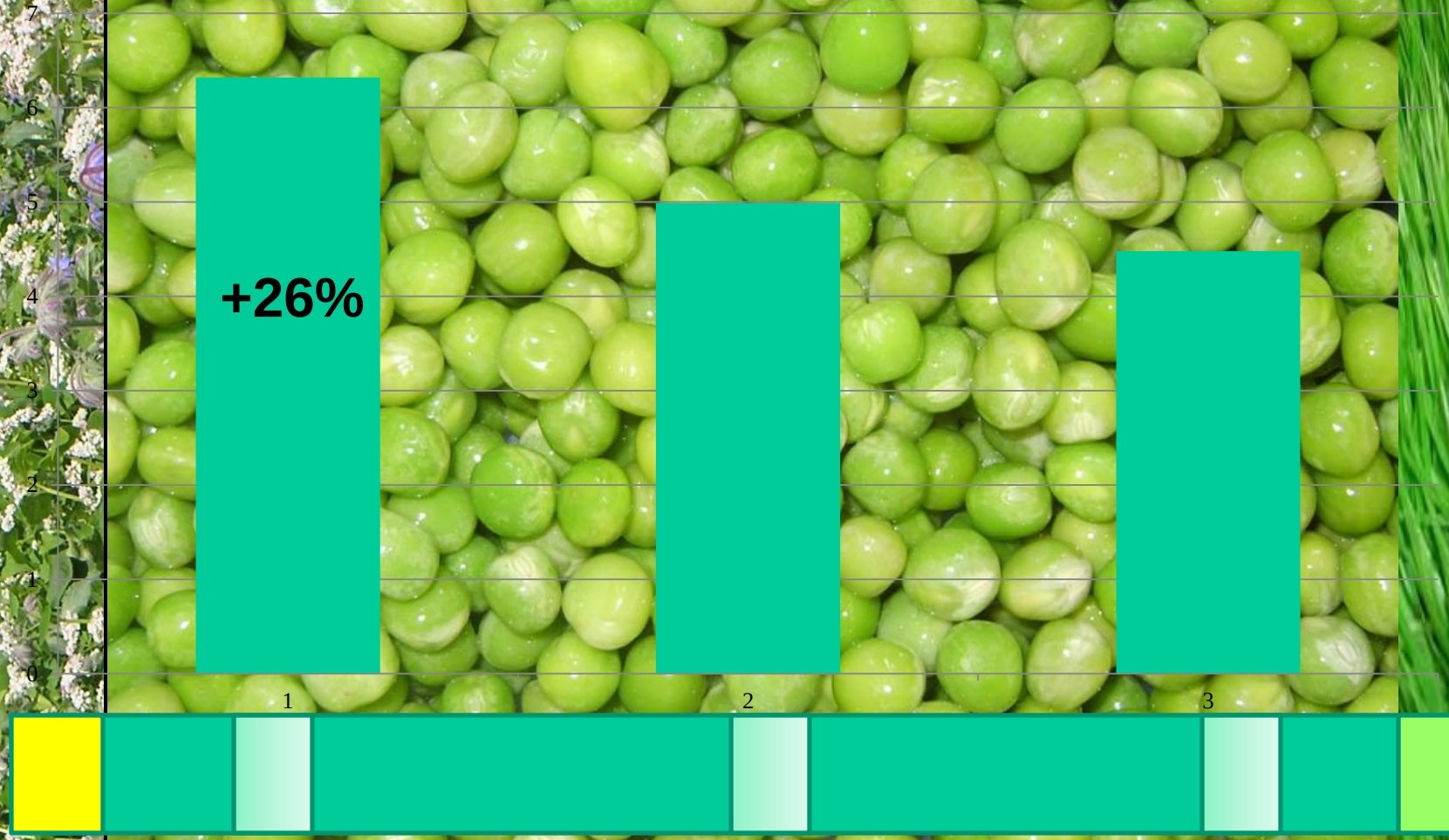


The positive spiral
More beneficials
Fewer pests
More biodiversity
Fewer pesticides

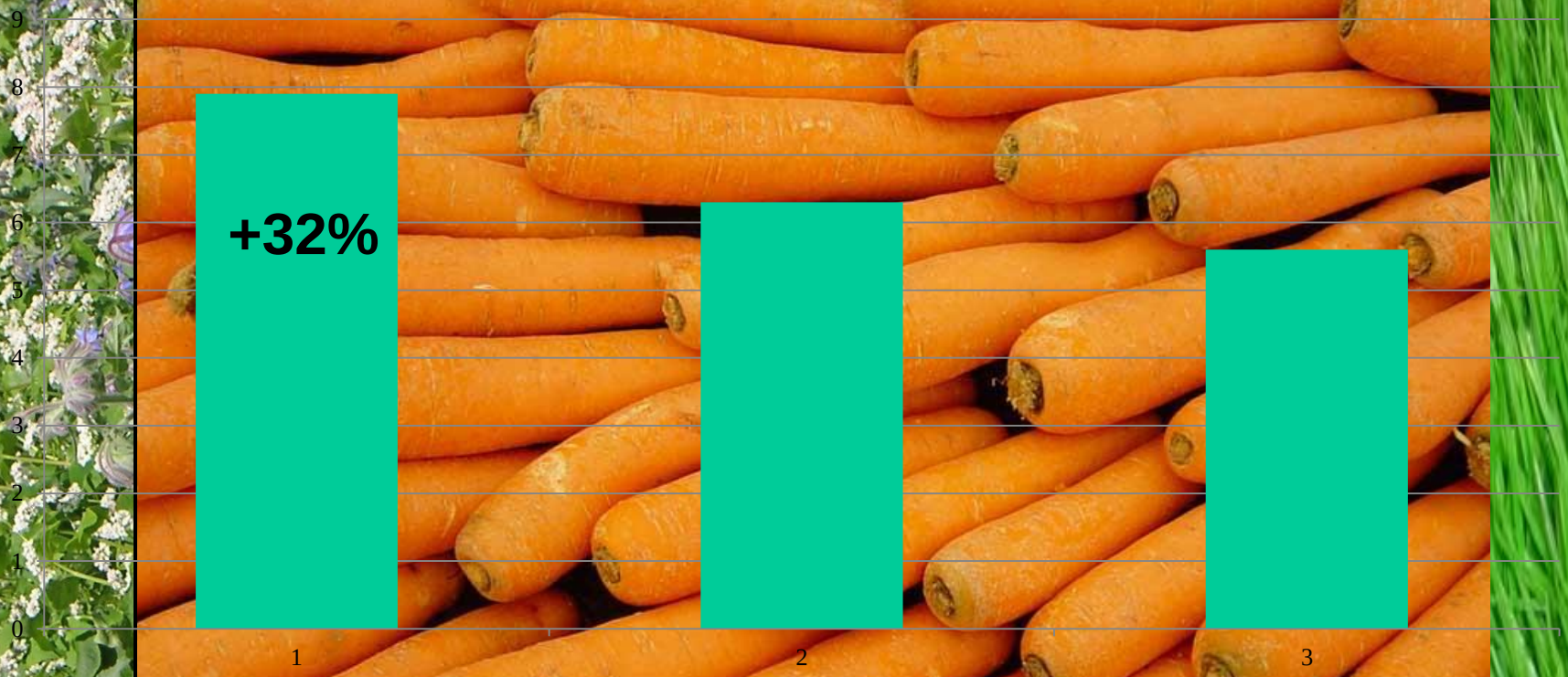
Yield impact?

wheat (yield in tonnes/ha)

peas (yield in tonnes/ha)



carrots (yield in tonnes/ha)



Functional Biodiversity

- Shows that yield and conservation are not conflicting objectives
- Helps growers cope with ongoing decline in pollinators and reduced availability of registered agrochemicals
- Compatible with current practices
- Creates additional economic incentives for farmers to engage in Agri-Environment Schemes
- Makes CAP greening a win-win for farmers and nature

Thanks