

# PURE progress in innovative IPM in pome fruit in Europe



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# overview of the presentation



- introduction of PURE
- innovative IPM strategies for pome fruit
- results innovative pome fruit
- assessments
  - environment
  - cost-benefit analyses
  - overall sustainability
- conclusion



- European agricultural policy
  - Directive 2009/128EC
  - sustainable use of pesticides
  - national action plans
  - integrated pest management (IPM)
- Pesticide Use-and-risk Reduction in European farming systems with Integrated Pest Management (PURE)



## Research

- 1 - INRA
- 2 - RRES
- 3 - AU
- 4 - JKI
- 5 - Stichting DLO
- 6 - WUR
- 7 - CNR
- 8 - KIS
- 9 - SCRI
- 10 - FEM
- 11 - IVIA
- 12 - IOR
- 13 - UDCAS
- 14 - JRC-IPTS

## Extension

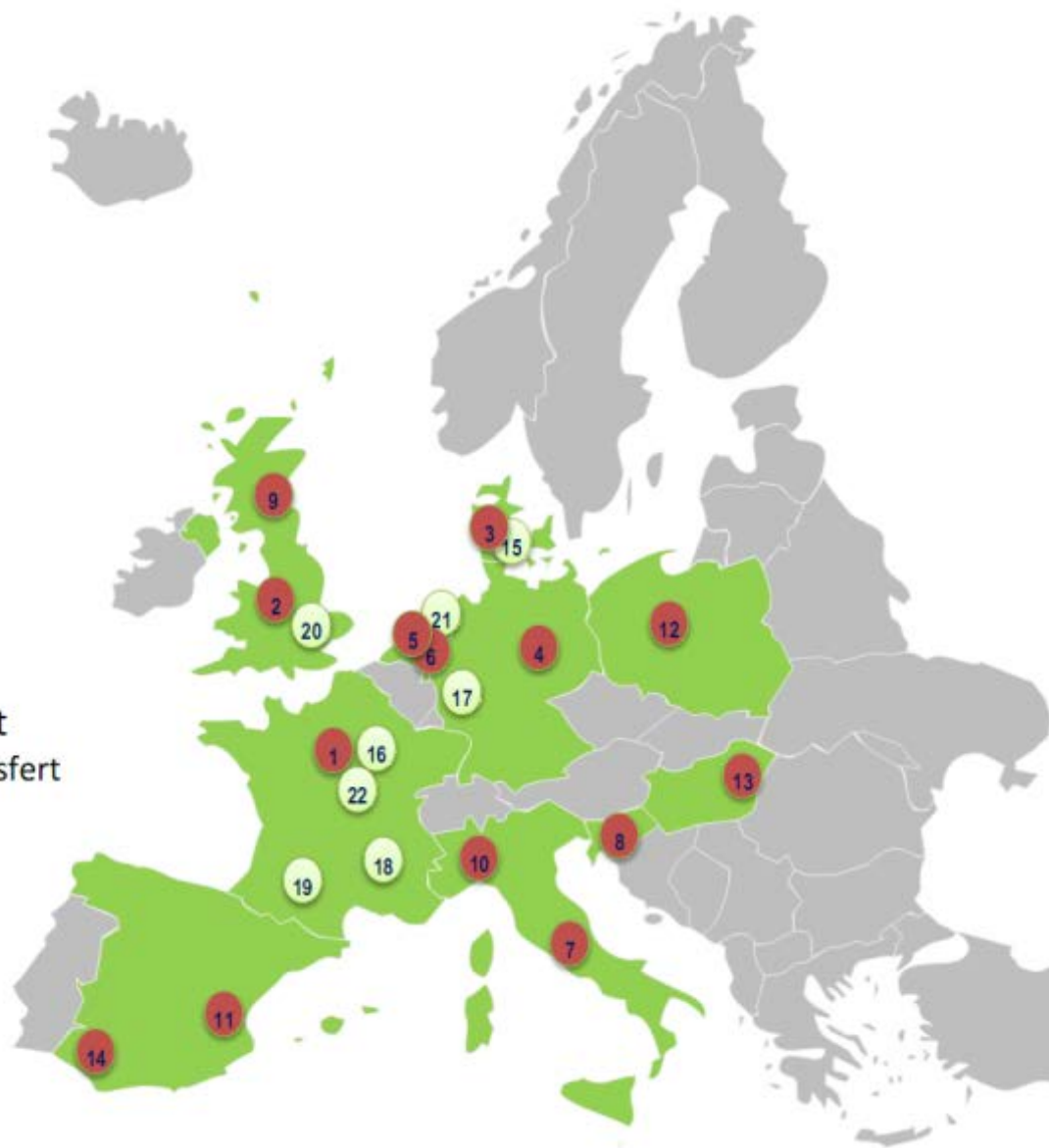
- 15 - DAAS
- 16 - ACTA

## Industry

- 17 - BCS
- 18 - Biotop
- 19 - NPP
- 20 - Burkard
- 21 - Blgg

## Management

- 22 - INRA Transfert



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# approach PURE



- stepwise approach
  - on-station experiments
  - ex-ante assessment
  - on-farm experiments
  - ex-post assessment
  - solve bottlenecks – adapt innovation
  - re-test
- “design – assessment – adjustment cycle”

# codling moth (*Cydia pomonella*)



## exclusion netting

- 3.5 %  $\longrightarrow$  0.2 %
- effect on rosy apple aphid
- effect on beneficial insects



# rosy apple aphids – exclusion netting



mean rosy apple aphid number per shoot (total)



# IPM apple scab (*Venturia pomonella*)

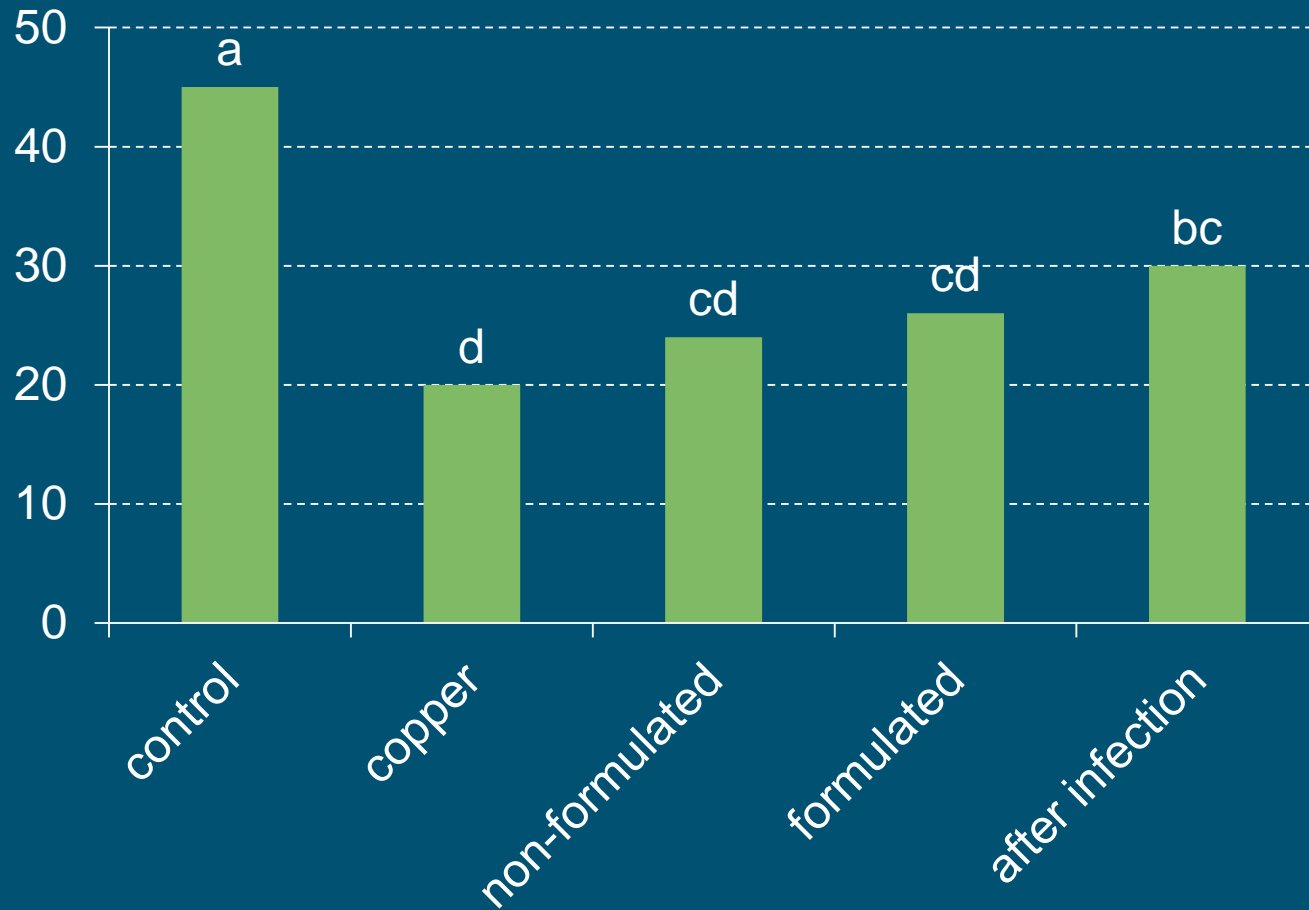


- sanitation measurements
  - urea, Vinasse at leaf fall
  - leaf shredding
  - leaf removal
- antagonists - winter
  - *Athelia*
  - *Microsphaeropsis*
- antagonist – summer
  - *Cladosporium cladosporioides* H39



# antagonist against scab (*Venturia inaequalis*)

scab incidence (%) - fruits



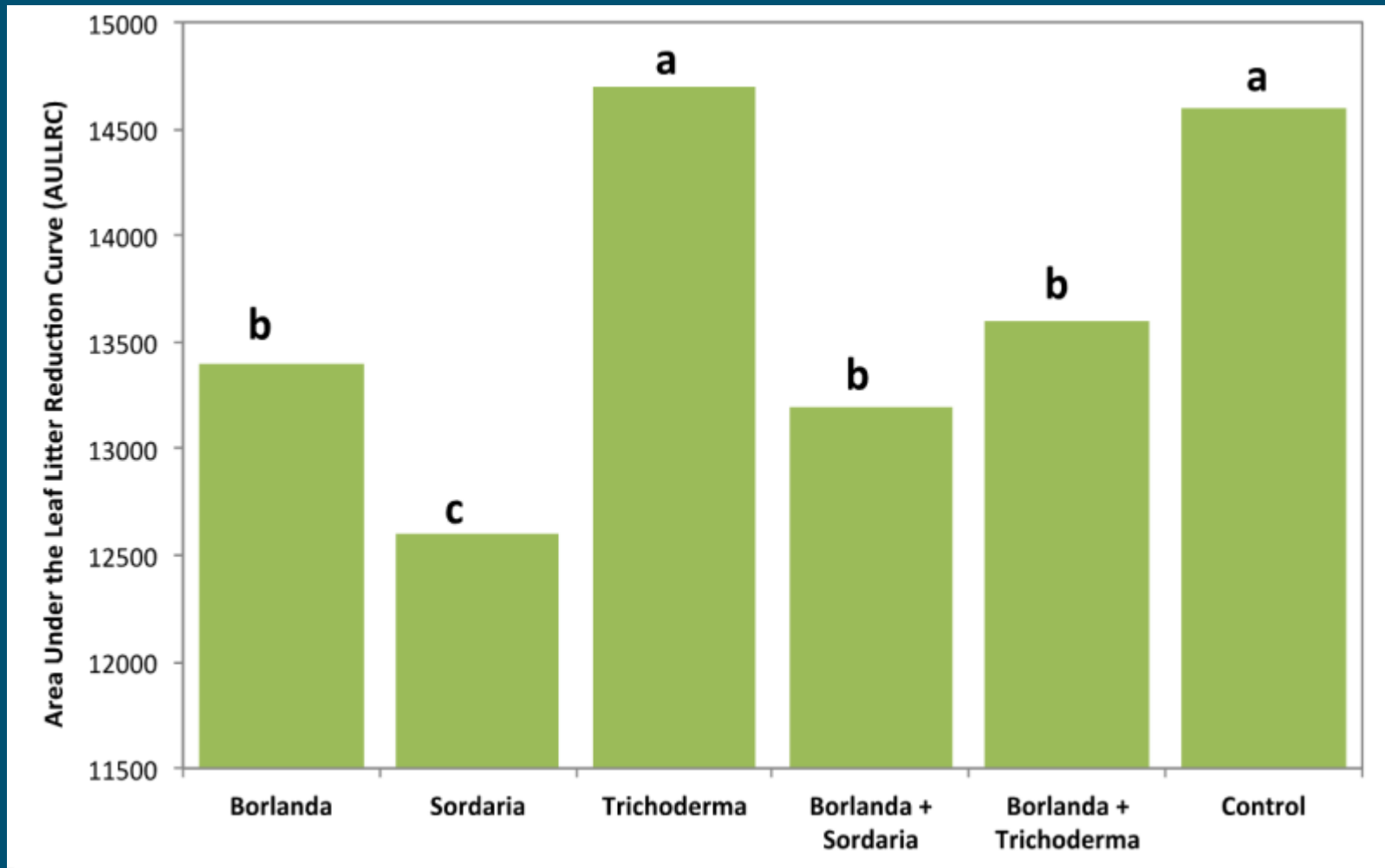
# IPM brown spot (*Stemphylium vesicarium*)



- warning system
- antagonists
- leaf degradation



# total AULDC (Area Under Leaf Degradation Curve)

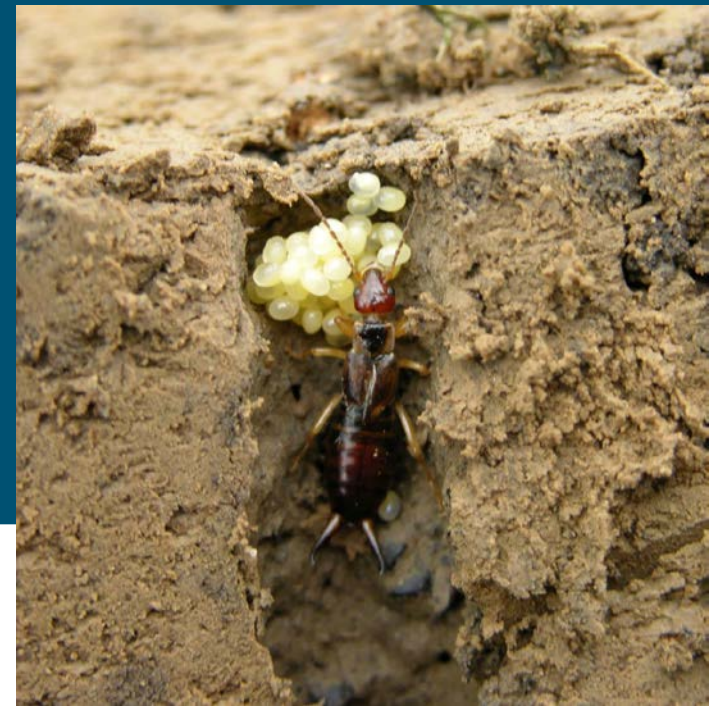


# pear psylla (*Cacopsylla pyricola*)

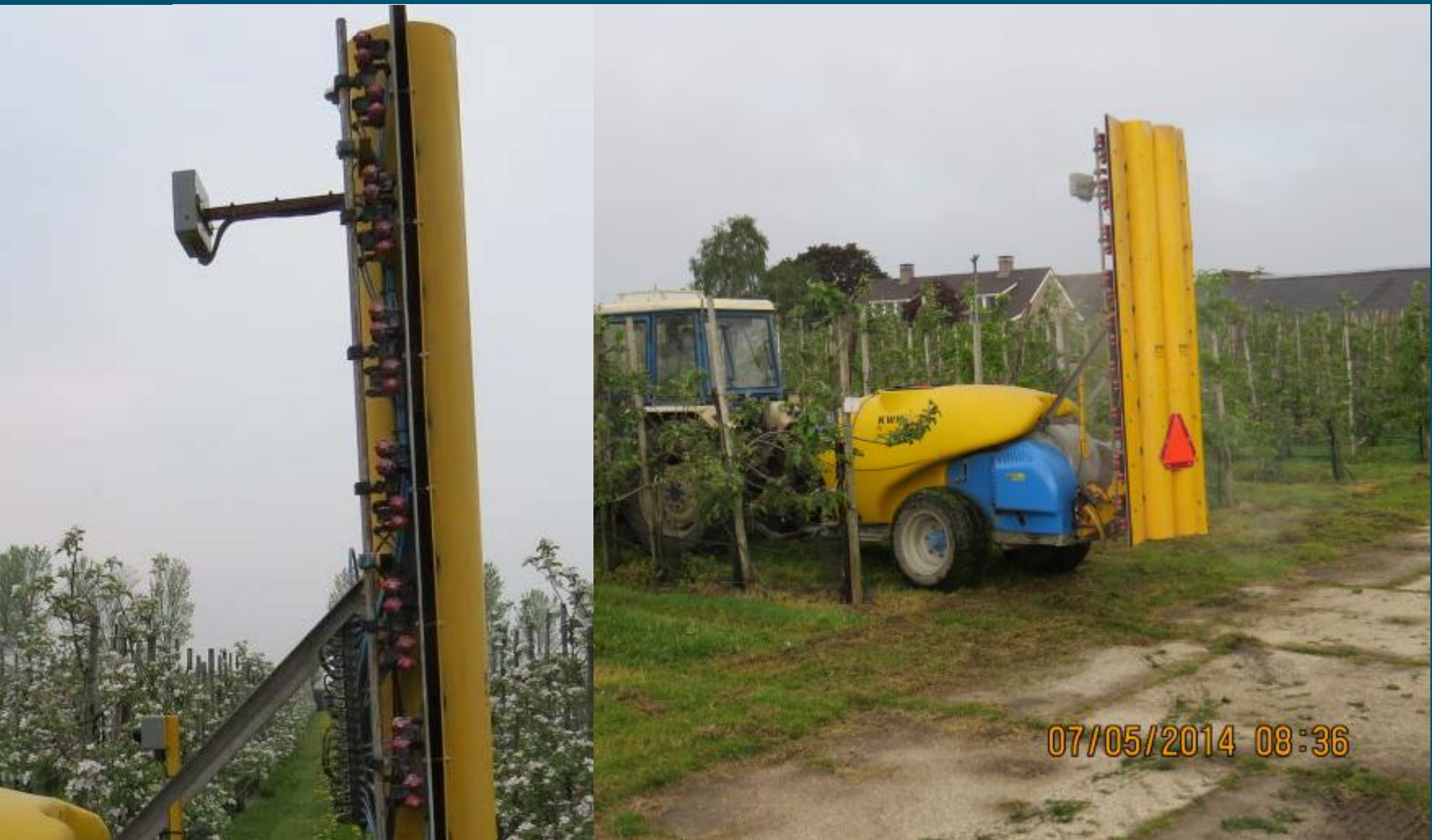


# IPM pear psylla

- multiple generations
  - continuous suppression
- selective pesticide
  - side effects natural enemies
- promote natural enemies
  - woody scrubs / trees
  - flowers



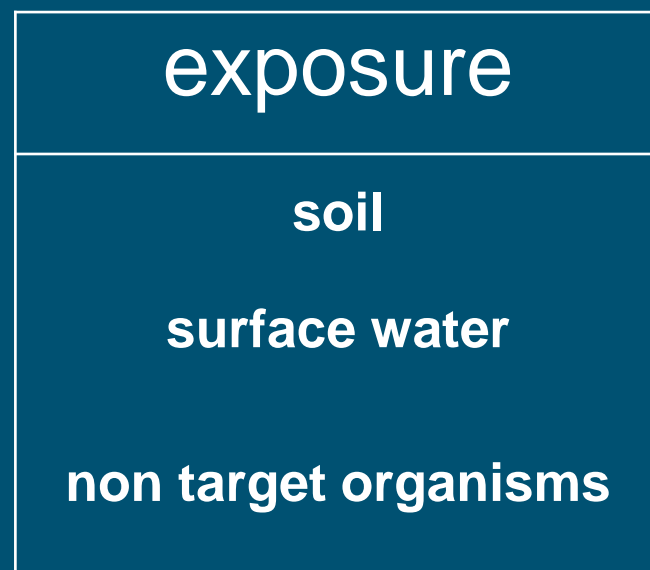
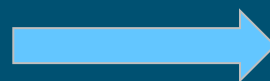
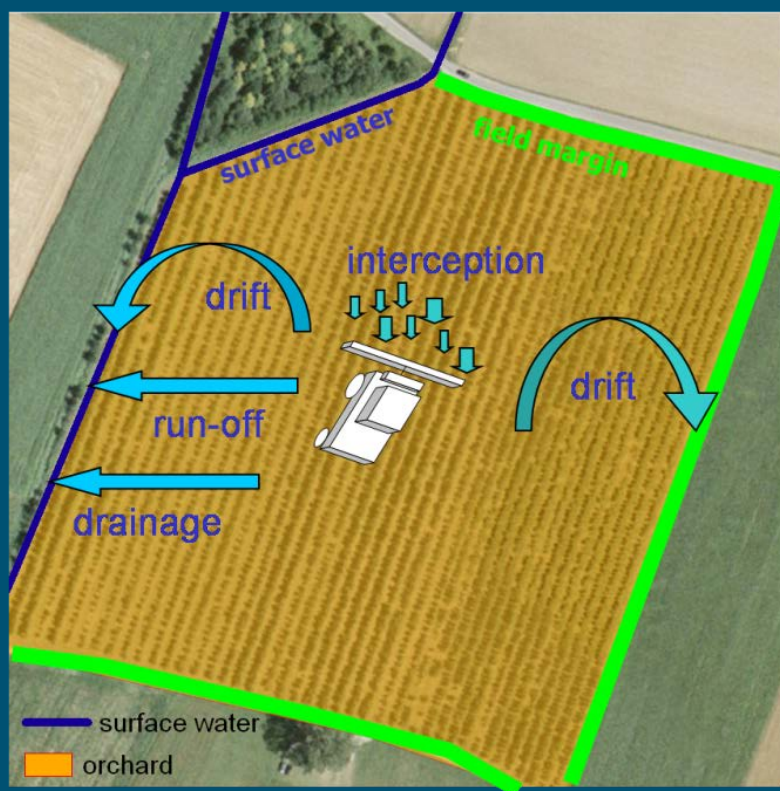
# canopy density sprayer



# SYNOPSIS – environmental assessment



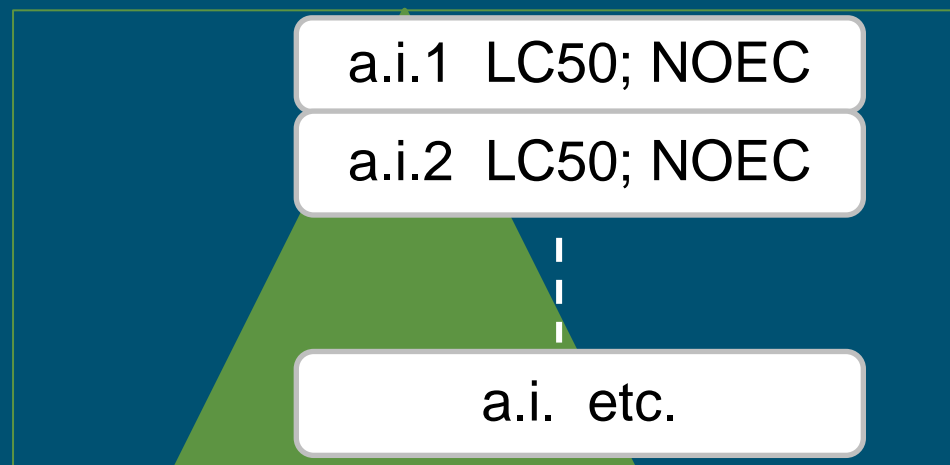
- environmental impact of plant protection
- risk assessment: **field** level and/or **landscape** level



# SYNOPS – environmental assessment



**active ingredient database**



# SYNOPS – environmental assessment



**exposure**

**soil  
surface water  
non target  
organisms**

**toxicity**

**earthworm  
daphnia, algae,  
fish, lemna  
bee**

active ingredient database

a.i.1 LC50; NOEC

a.i.2 LC50; NOEC

a.i. etc.

$$\text{Risk (ETR)} = \frac{\text{calculated Exposure}}{\text{Toxicity}}$$



# SYNOPS – environmental assessment



$$\text{Risk (ETR)} = \frac{\text{calculated Exposure}}{\text{Toxicity}}$$



SYNOPS-WEB

- field specific GIS-data
- application calendars
- field based surveys
- IPM strategies

# SYNOPS – results



example:  
chronic  
aquatic risk

4 risk categories	chronic risk
very low risk	ETR<0.1
low risk	0.1< ETR<1
medium risk	1< ETR<10
high risk	ETR >10

	conventional	innovative IPM	conventional	innovative IPM
	acute risk		chronic risk	
aquatic				
fish				
chironomus				
terrestrial				
bee				



# SYNOPS – results



apple: codling moth (*Cydia pomonella*)

	conventional	innovative IPM	conventional	innovative IPM
	acute risk		chronic risk	
aquatic	446.42	55.97	39.66	8.79
fish	3.54	3.54	4.36	1.24
chironomus	55.97	55.97	2.67	2.67
terrestrial	8.16	0.08	55.94	0.82
bee	8.16	0.01	55.94	0.16

chlorpyrifos, other insecticides

# SYNOPS – results



pear: psylla (*Cacopsylla pyricola*)

	conventional	innovative IPM	conventional	innovative IPM
	acute risk		chronic risk	
aquatic	18.29	0.00	34.08	0.02
fish	1.15	0.00	5.33	0.00
chironomus	18.29	0.00	8.02	0.01
terrestrial	0.26	0.00	2.38	0.00
bee	0.26	0.00	2.38	0.00

insecticides: limited to 1 application

# cost-benefit analyses



	conventional	innovative IPM	break-even
yield class 1			
yield class 2			
yield class 3			
gross yield			
material costs			
labour costs			
pest control costs			
returns for covering other costs			

data are: values in euro (€) / ha

# cost-benefit analyses



pear: brown spot (*Stemphylium vesicarium*)

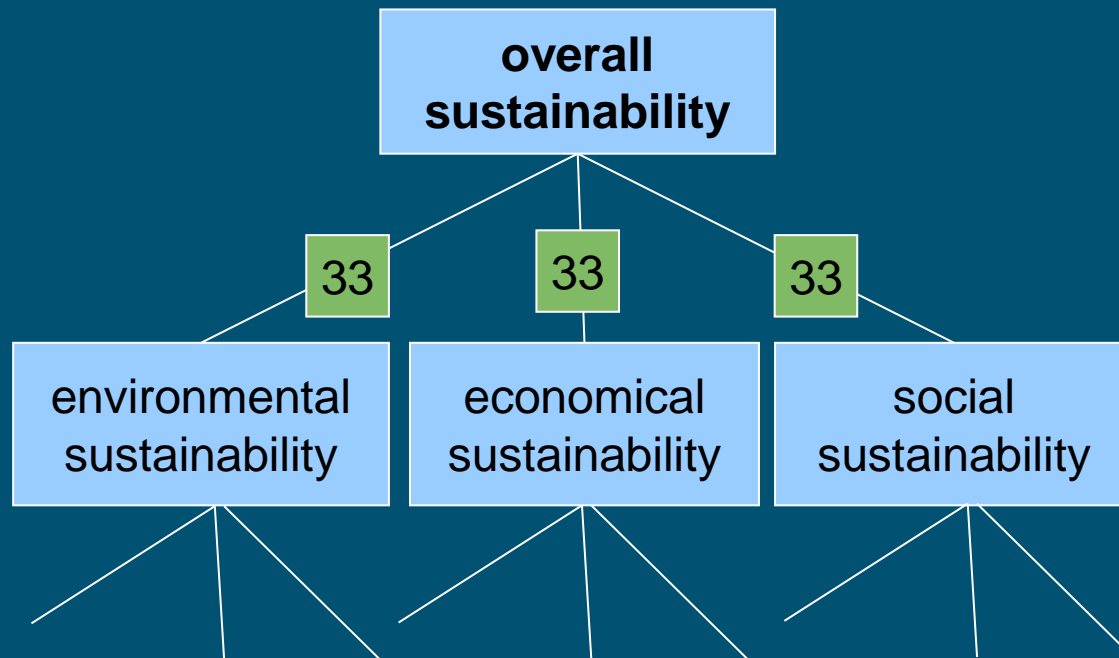
data are: values in euro (€) / ha

	conventional	innovative IPM	break-even
gross yield	42300	41400	42588
pest control costs	770	841	764
returns for covering other costs	41530	40559	41824

# DEXiPM pome fruit

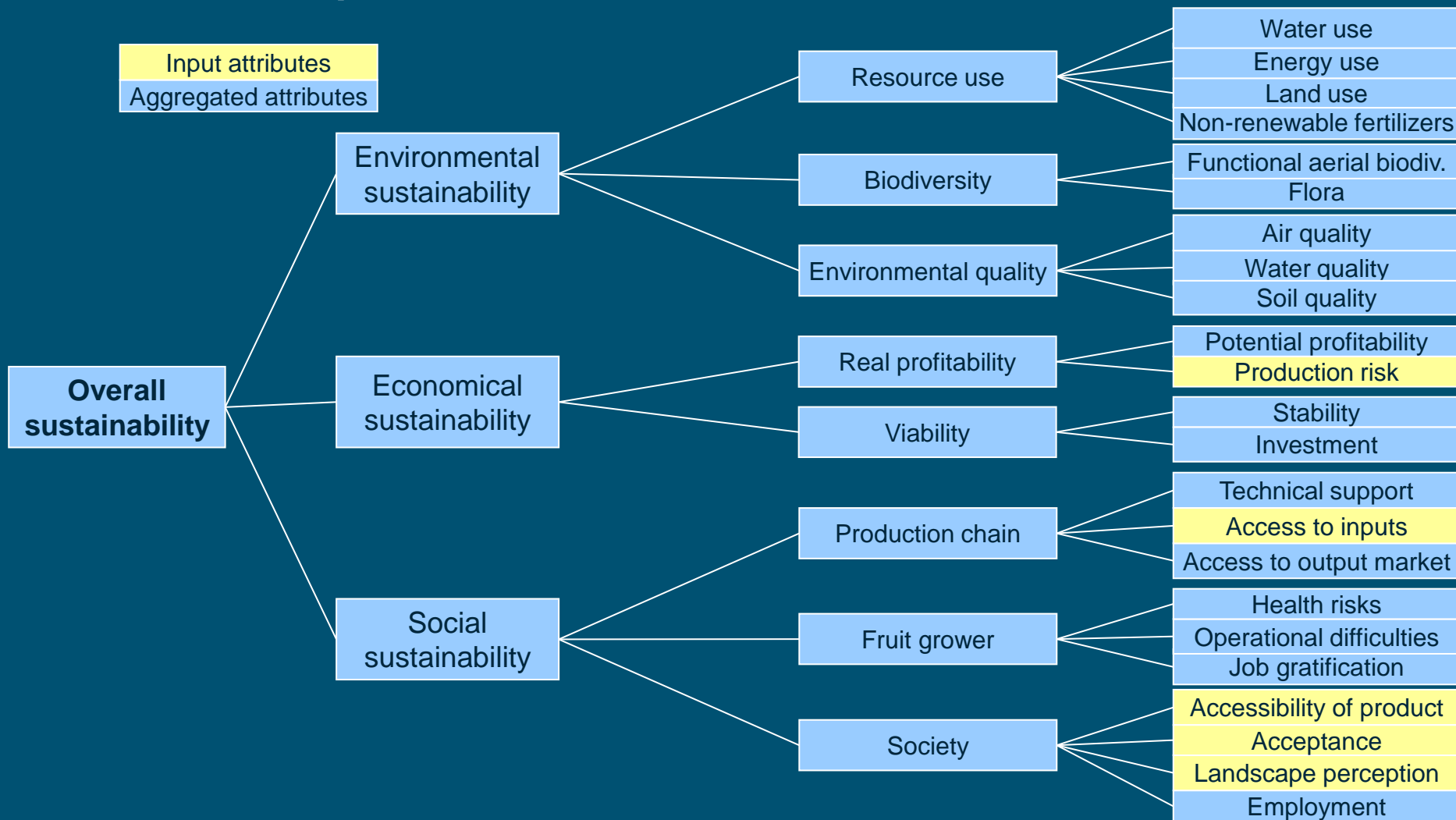


- complex decision: non-comparable subjects
- attributes scored: qualitative (high, medium, low)
- aggregated - weight of attribute



*Very low*  
*Low*  
*Medium*  
*High*  
*Very high*

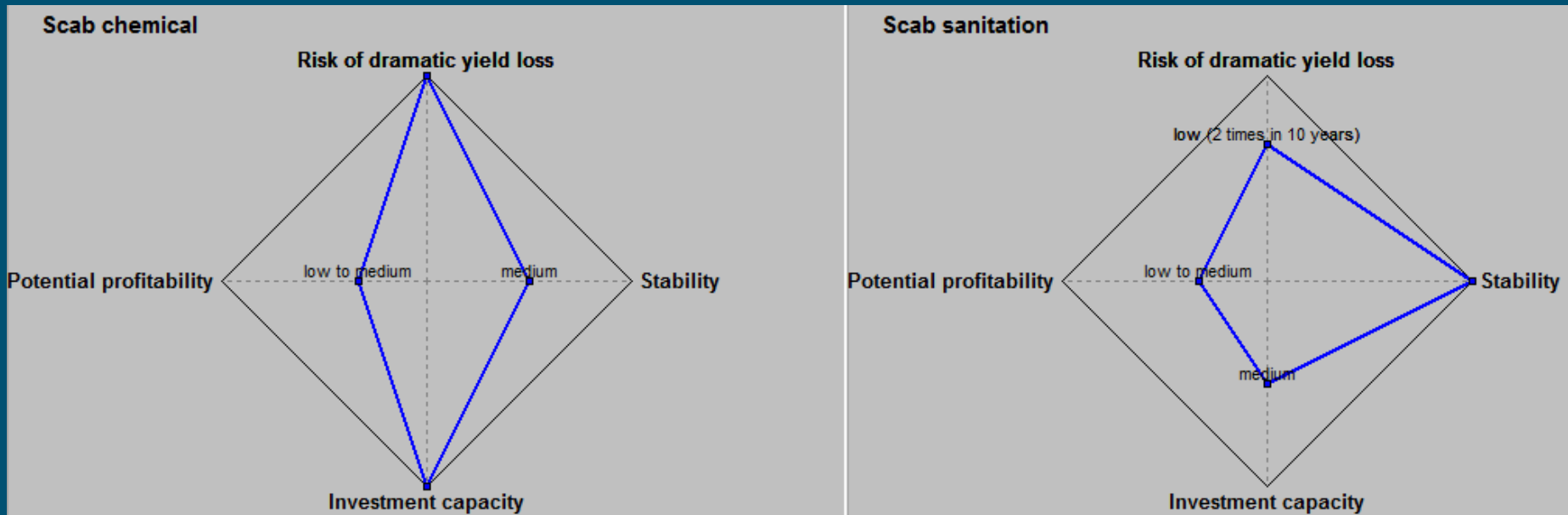
# DEXiPM pome fruit overview



# example: result DEXiPM – apple scab



- economic sustainability: conventional – innovative
  - 4 parameters: risk dramatic yield loss, stability, investment capacity, profitability



# summary



	codling moth	apple scab	brown spot	pear psylla
SYNOPS-WEB environment	😊	😊	😐	😊😊
cost-benefit analysis	😐	😊	😞	😞
conventional overall sustainability	medium-high	medium-high	high	high
innovative IPM overall sustainability	high	medium-high	high	high
DEXiPM pome fruit	😊	😐	😐	😐

# conclusion



- overall sustainability
  - conventional: medium high - high
  - innovative IPM: only slightly improved
  - sensitivity models
- innovative IPM: equal efficacy
- costs innovative IPM: higher
- “design – assessment – adjustment cycle”
  - co-innovation

# Stakeholder interaction



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SEVENTH FRAMEWORK  
PROGRAMME



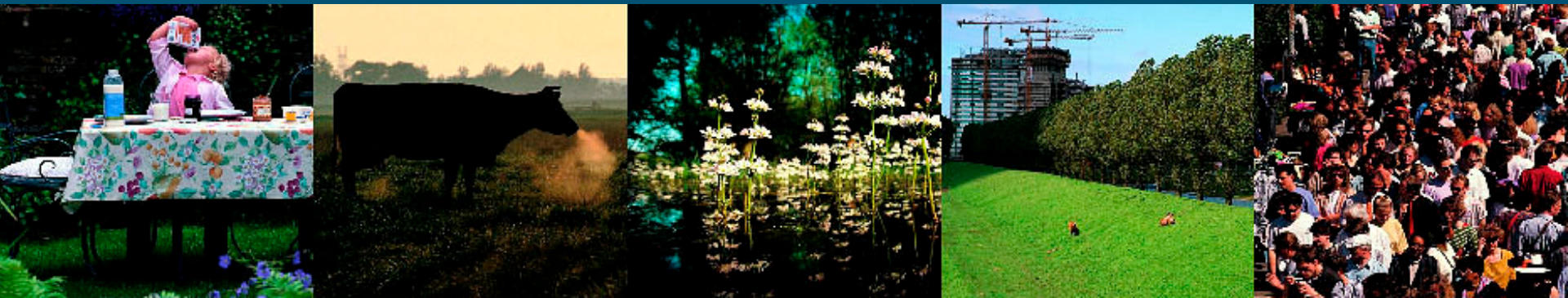
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# Thank you for your attention

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