FOOD QUALITY AND SAFETY

SIXTH FRAMEWORK PROGRAMME

endure

diversifying crop protection

Crop case and system case studies

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Crop case and system case studies in ENDURE

Crop case studies

Objectives

- Exploit the *current knowledge* on optimised pesticide use in existing cropping systems
- Develop optimised crop protection strategies and applied them in different agro-ecological contexts
- Change end-user practice from a 'pesticide only and no-risk attitude' towards a more integrated strategy

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Crop case studies

- Crops should represent different domains of crops:
  - Major and minor crops
  - Annual and perennial crops
  - Arable and vegetable crops
  - Field and glasshouse crops

Crop case and system case studies in ENDURE

Crop case studies

- Wheat
- Potato
- Tomato
- Pomefruit
- Integrated Weed Management (Maize)

- Maize
- Field vegetables
- Banana

- Grapevine

Crop case and system case studies in ENDURE

Crop case studies

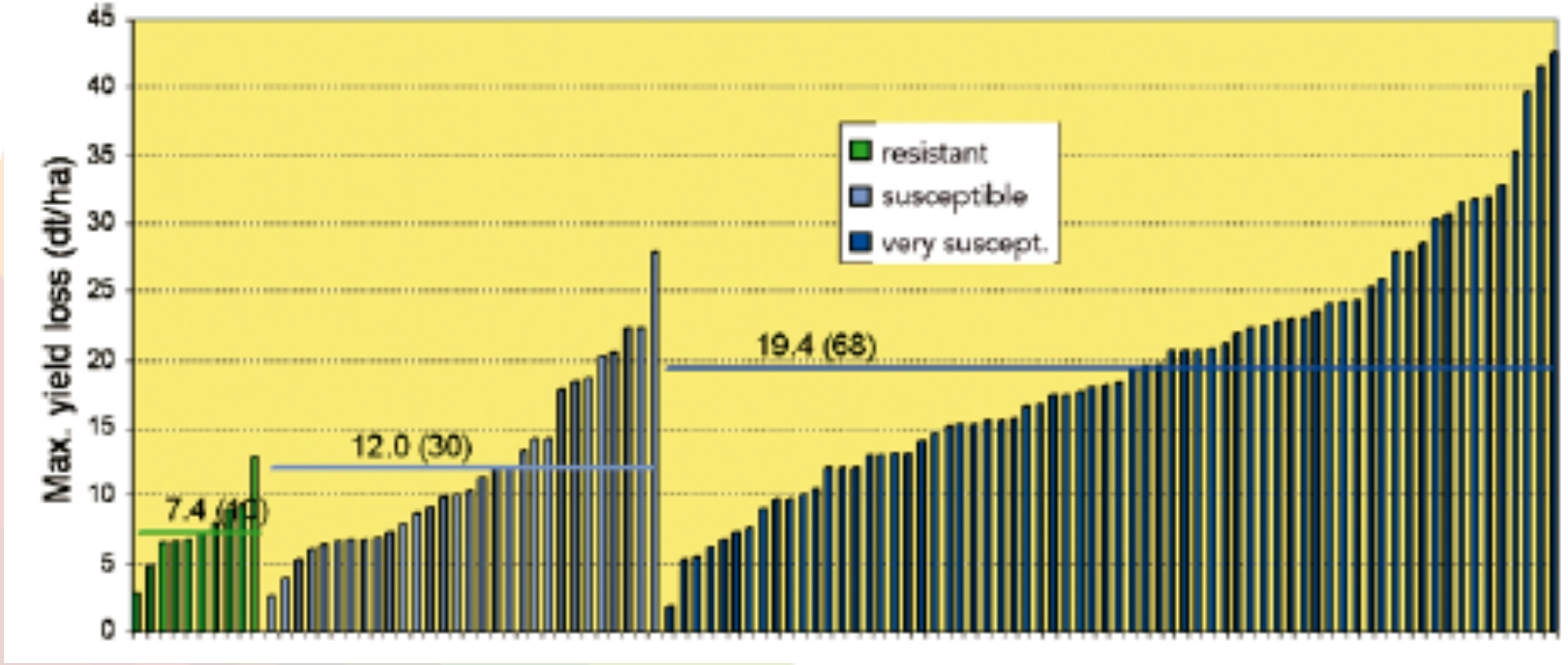
- Focus one specific crop pest issues, e.g. fungal diseases in wheat, late blight in potato and whiteflies in tomato

- **Output:**
  - Reports
  - Guides for advisors and farmers (From Science to Field)
  - Input to Endure Information Centre

Crop case and system case studies in ENDURE

Wheat

Significans of cultivar resistance



Source: 108 trials in France

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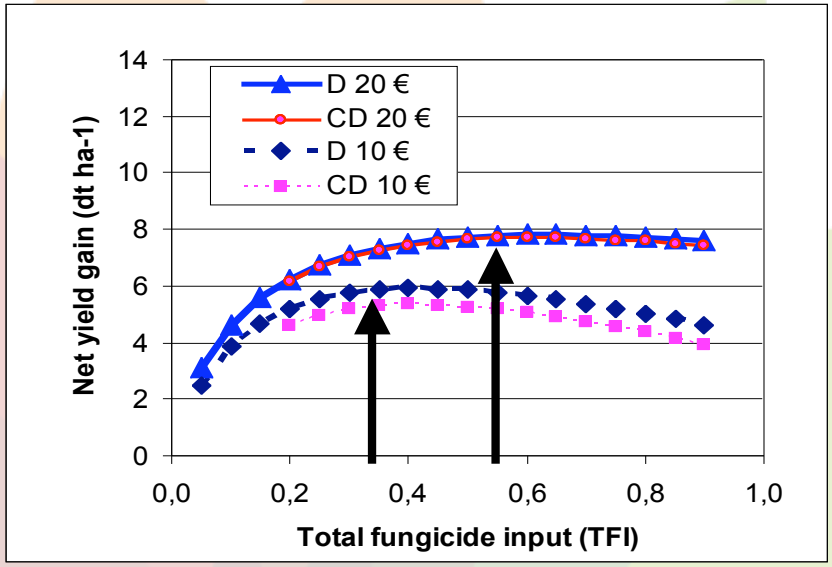
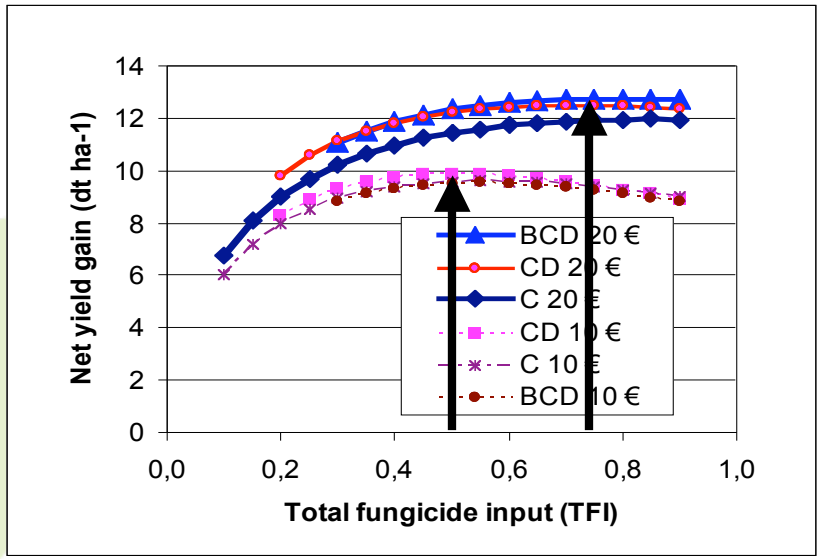
Wheat

Cultivar resistance and fungicide requirement

Resistant cultivar



Susceptible cultivar



A: GS 25-31, B: GS 32-36, C: GS 37-50, D: GS 51-64

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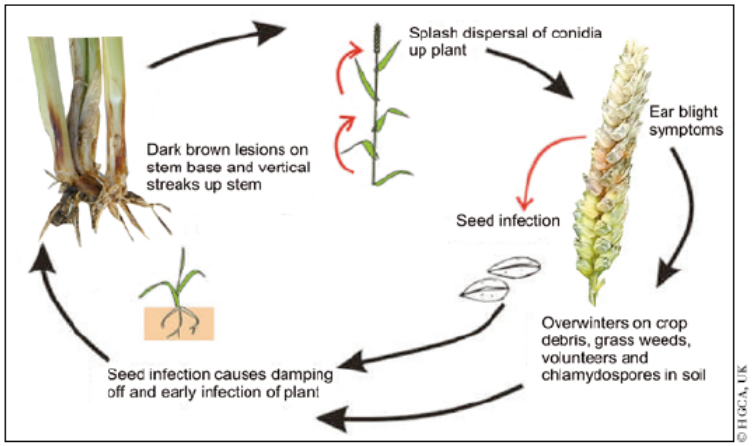
Wheat

Fusarium

Typical life cycle of *Fusarium* species in wheat.



DON risk assessment grid on wheat ARVALIS-Institut du végétal 2008

	Previous crop	Tillage	Varietal susceptibility	Risk category
	Cereals, oilseed rape, flax, peas, beans, sunflowers	Ploughing	Low susceptibility	1
			Medium susceptibility	1
			Susceptible	2b
		No ploughing	Low susceptibility	2a
			Medium susceptibility	2a
			Susceptible	2b
	Sugar beet, potatoes, soya, others	Ploughing	Low susceptibility	2a
			Medium susceptibility	2a
			Susceptible	2b
		No ploughing	Low susceptibility	2a
			Medium susceptibility	2a
			Susceptible	3
	Grain maize, sorghum *(forage maize)*	Ploughing	Low susceptibility	2a
			Medium susceptibility	(2a) 2b
			Susceptible	3
		No ploughing	Low susceptibility	(3) 4
			Medium susceptibility	(4) 5
			Susceptible	(5) 6

Figure 4: Decision key for DON risk (Source: Arvalis, France)

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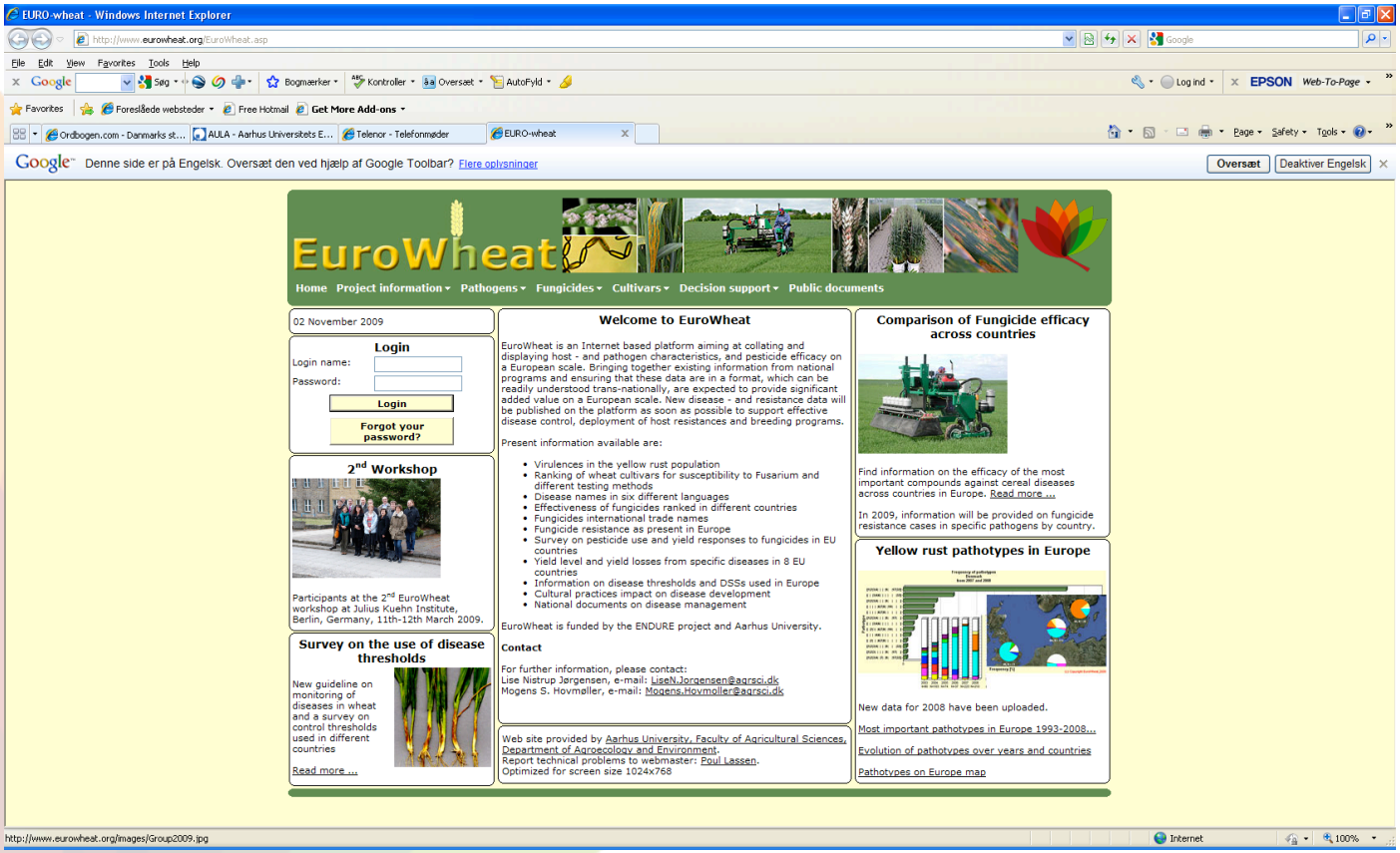
Wheat

EuroWheat



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Potato

Late blight

Reducing primary inoculum sources

Decision Support Systems

Performance of fungicides

Cultivar resistance

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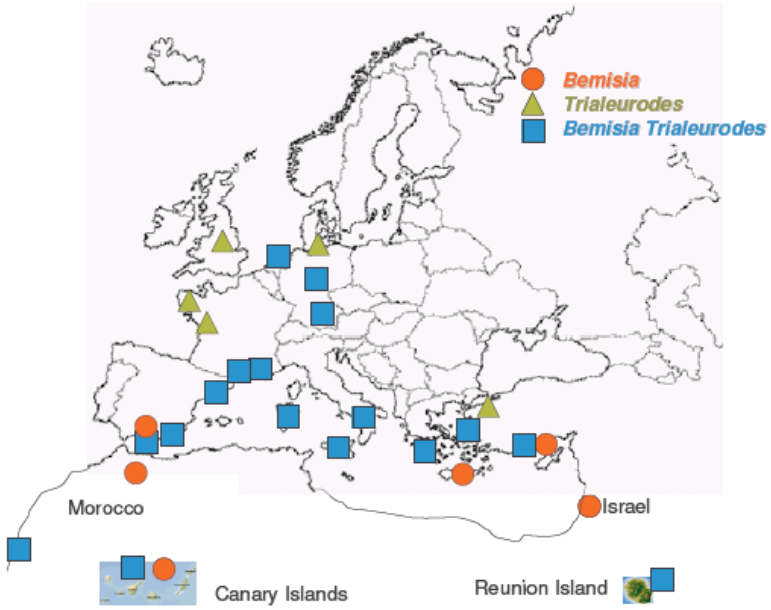
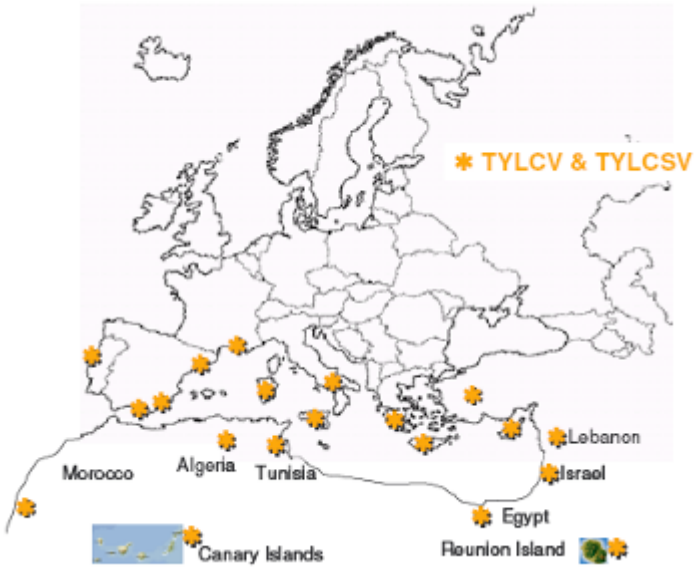
Tomato

Whiteflies – occurence of pest and virus





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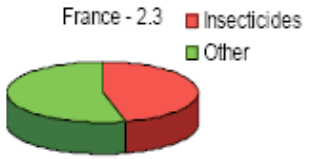
Tomato

Whiteflies – occurence of pest and virus

Area	Cycle	Total surface (ha)	%Chemical	% IPM-Insec.	%IPM-BC	% Organic
Germany	A	3	-	-	90,5	9,5
	C	17	6	18	70	6
South France	A	20	-	18	72	10
	B	35	-	100	-	-
	C	50	-	20	80	-
North Spain-1	A	31	11	19	69	1
	B	18	7	8	69	16
North Spain-2	A	17	30	50	20	-
	B	15	30	50	20	-
South Spain	A	6700	3	78	19	-
	B	3300	7	58	35	-



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Tomato

Whiteflies – tools to manage the pest

Chemical control

Biological control

Exclusion

IPM strategies

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Pomefruit

Scab, brown spot and codling moth - State of art of prevention and control strategies

- Lake Constance (Germany and Switzerland),
- Cataluña (Spain),
- Emilia Romagna, South Tirol and Trentino (Italy)
- Rhone Valley (France)
- Belgium
- The Netherlands
- Sweden.

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Pomefruit

Integrated control of codling moth

Element of the strategy: Population Monitoring: Pheromone traps				
State of the art		**Ready**	**Under development**	
		9	0	
Perspectives for (further) implementation		**Negative**	**Neutral**	**Positive**
		2	2	3
Obstacles	**None**	**Labour**	**Economic**	**Practical**
	X			
Use in practice (% of growers)	From 5% to 100% in IPM strategies.			

Element of the strategy: Decision Support Systems: Tolerance Thresholds				
State of the art		**Ready**	**Under development**	
		5	2	
Perspectives for (further) implementation		**Negative**	**Neutral**	**Positive**
		0	1	3
Obstacles	**None**	**Labour**	**Economic**	**Practical**
	X			
Use in practice (% of growers)	Lower than for phenology models.			

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Pomefruit

Scab, brown spot and codling moth - State of art of prevention and control strategies

Conclusions:

- Knowledge of integrated control well known
- Modern communication technologies are used
- Importance of different tools the same in the North and South
- New EU member states could profit from existing tools
- Bottlenecks exists, e.g. acceptance of resistant cultivars and technical and economic reasons

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Integrated Weed Management

Comparing strategies in maize

- Standard chemical treatment
- IWM (inter-row cultivation + chemical)
- Advanced IWM (less herbicide than IWM)

Pisa (I), Dijon (F) & Flakkebjerg (DK)

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Integrated Weed Management

Comparing strategies in maize

- Standard and IWM provided similar weed control
- Advanced IWM provided poorer weed control in Pisa but not in Dijon and Flakkebjerg

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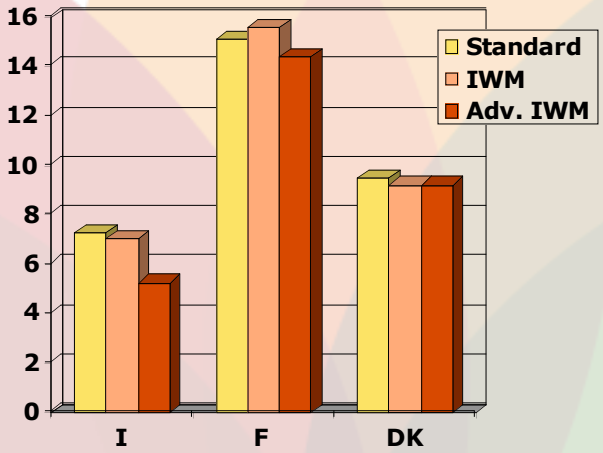
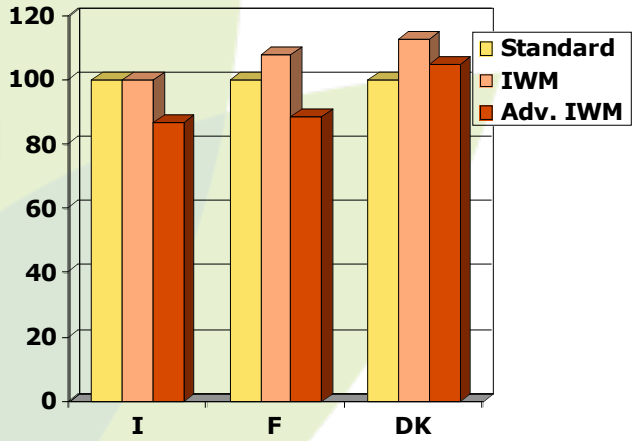
Integrated Weed Management

Yields, costs and environmental impact

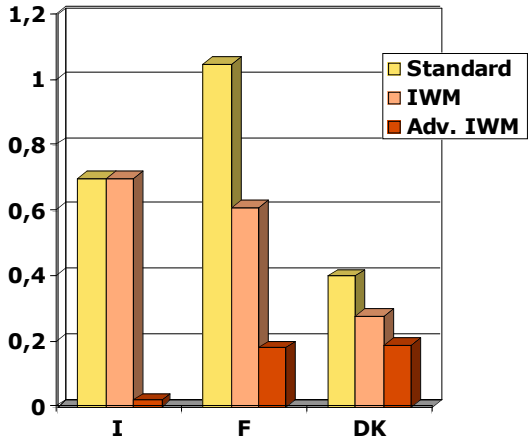
Cob yield (t DM/ha)



Relative costs



Environmental index (*Ipest*)



Integrated Weed Management

Other options for Integrated Weed Management

- Crop rotation
- Stale seedbed
- Cover crops
- Intra-row cultivation

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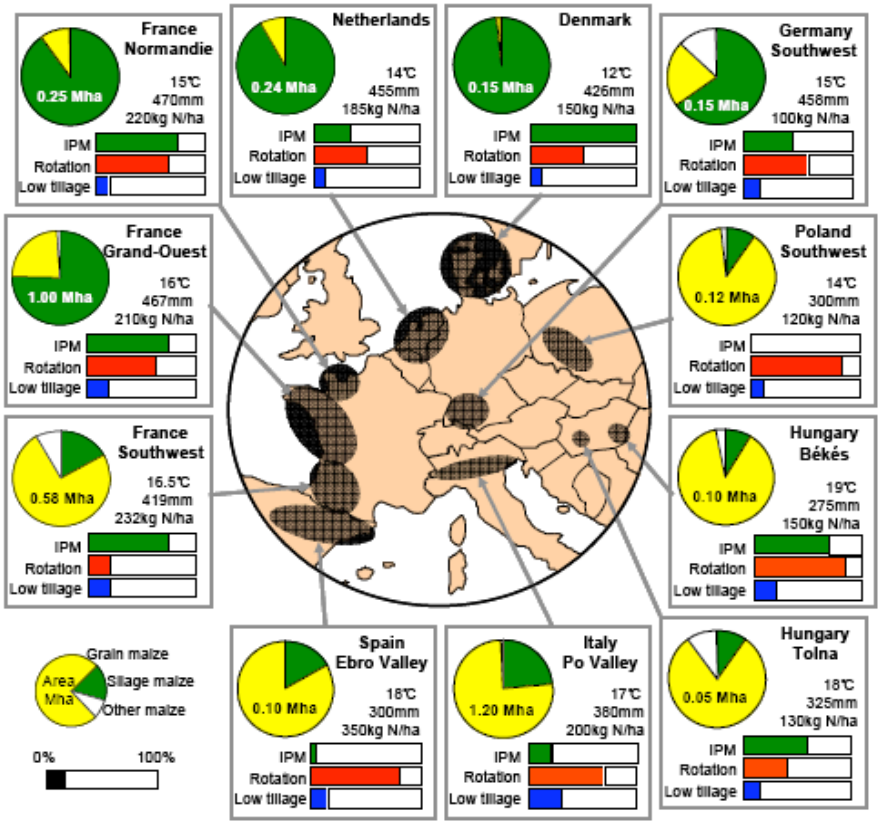
Maize

Key pests and options to reduce pesticides in eleven European regions



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Maize

Importance, occurrence and population development of insect pests

Order	Species	Hungary Békés	Hungary Tolna	Italy Po Valley	Spain Ebro Valley	France Southwest	France Grand-Ouest	France Normandie	Netherlands	Denmark	Germany Southwest	Poland Southwest
Lepidoptera	*Ostrinia nubilalis* (Pyralidae)											
	Sesamia nonagrioides (Noctuidae)											
	Agrotis spp. (Noctuidae)											
	Helicoverpa armigera (Noctuidae)											
Coleoptera	*Diabrotica virgifera virgifera* (Chrysomelidae)											
	Agriotes spp. (Elateridae)											
Sternorrhyncha	Aphididae											
Diptera	*Oscinella frit* (Chloropidae)											
Auchenorrhyncha	*Zyginidia scutellaris* (Cicadellidae)											

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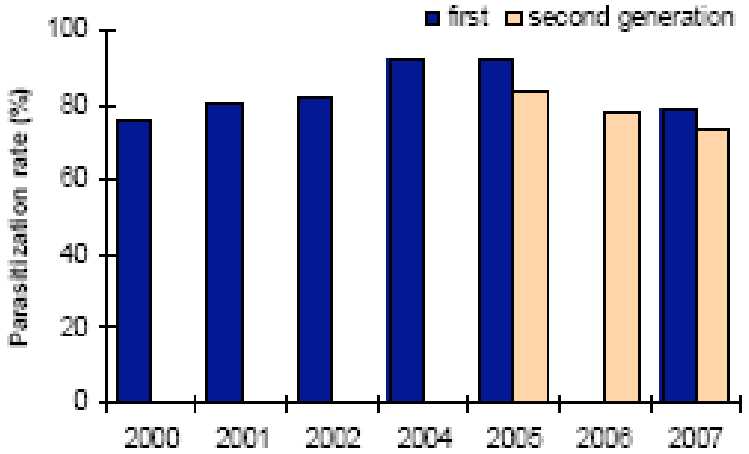
Maize

European corn borer



Parasitization rate of first and second generation ECB after mass release of *Trichogramma* wasps

Source: Biotop, Valbonne, France

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Maize

Fusarium

Management Factors	Impact
Strategic	
Crop rotation	High
Crop residue management	High
Good nutrient supply	Medium
Tactical	
Variety choice	Medium
Seed quality	Low
Sowing time	Low
Crop structure	Low
Control measures	
Disease control	Low
Weed control	Low
Insect Control	High
Harvest and storage	High

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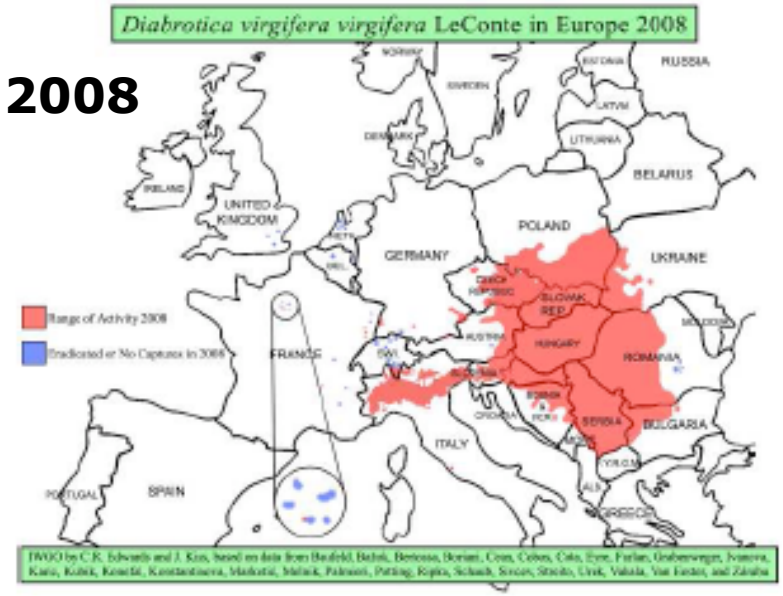
Maize

Western Corn Rootworm



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Field vegetables

Tasks:

- PPP (including BCA) availability in selected EU countries (*major differences)*
- Evaluation of past and ongoing research on soil fumigation and steaming
- Joint experimentation
- Landscape management to improve biological control

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System case studies

- Identify science-based sources of innovation for implementing alternative crop protection strategies (from basic research and case studies)
- Promote a system approach and explore the potential of ecological approaches
- Identify relevant criteria for assessing the sustainability of crop protection strategies
- Design *ex ante* assessment tools through knowledge-based models that would make it possible the evaluation of innovative strategies

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System case studies

Designing innovative crop protection strategies requires:

- that emerging technologies are considered (DNA-based detection techniques, robotics, IT, etc),
- that new sources of resistance genes are explored
- that the potential of landscape management of cropping systems or deployment of semiochemicals for reducing pest incidence are considered
- etc.

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System case studies

- Orchard systems
- Winter crop-based systems
- Maize-based systems

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System case studies

Maize-based systems

- **Status**
  - Describing current systems in different regions
  - Proposing advanced systems making use of existing tools and technologies

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System case studies

Maize-based systems

- MS1: Silage maize, in rotation, irrigated
- MS2: Silage maize, in rotation, not irrigated
- MS3: Silage maize, not in rotation, irrigated
- MS4: Silage maize, not in rotation, not irrigated
- MS5: Grain maize, in rotation, irrigated
- MS6: Grain maize, in rotation, not irrigated
- MS7: Grain maize, not in rotation, irrigated
- MS8: Grain maize, not in rotation, not irrigated

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System case studies

Maize-based systems

Practices	MS1-MS5	MS3-MS7	MS6
Field margin management	x		
Early detection	X		
Major tillage (ploughing)	X		
Crop resistance	x	x	
Crop choice in rotation	x		X
Variety choice	x		
Early sowing	x	x	X
Insecticides	X	X	X
Seed treatments	x	x	X

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System case studies

Maize-based systems

- **Status**
  - Describing current systems in different regions
  - Proposing advanced systems making use of existing tools and technologies
  - Compare the economic, environmental and social sustainability of the current and advanced systems using DEXiPM
  - SWOT (Strenghts Weaknesses Opportunities Threats) analysis

System case studies

Maize-based systems

- **Future activities**
  - Design innovative systems
  - Compare the economic, environmental and social sustainability of the innovative systems to that of the current and advanced systems using DEXiPM

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Thank you for your attention

Questions?