Józefa Kapsa

PLANT BREEDING AND ACCLIMATIZATION INSTITUTE
- NATIONAL RESEARCH INSTITUTE - RADZIKÓW
DEPARTMENT OF POTATO PROTECTION
AND SEED SCIENCE – BONIN, POLAND

Opportunities for strengthening the Pest Monitoring Systems and Decision Support Systems

Conference „*Sustainable use of pesticides and IPM in East-Central Europe and the Baltics*”.
Radzików, 4-6 September 2011

Definition of IPM and the use of products for plant protection

The integrated pest management (IPM) was defined by Smith and Reynolds (1966) as:

"A pest population management system that utilizes all suitable techniques in a compatible manner to reduce pest populations and maintain them at levels below those causing economic injury."

1. **The utilization of all available control techniques,**
2. **The use of the economic injury level for decision of control**
3. **Maintenance of the pathogen/pest population density below the economic injury level.**

Regulation 1107/2009

„Plant protection products should be used properly, in accordance with their authorisation, having regard to the principles of IPM and givng priority to non-chemical and natural alternatives wherever possible"

Directive 2009/ 128 /EC for the sustainable use of plant protection products:

„Principles of the IPM (…..) shall applay at lates by 1 January 2014".

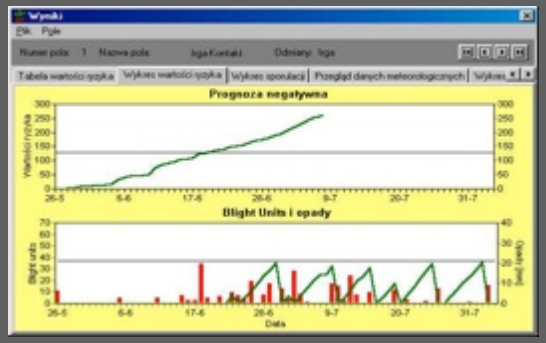
Essential elements of an integrated control strategy for late blight in potato

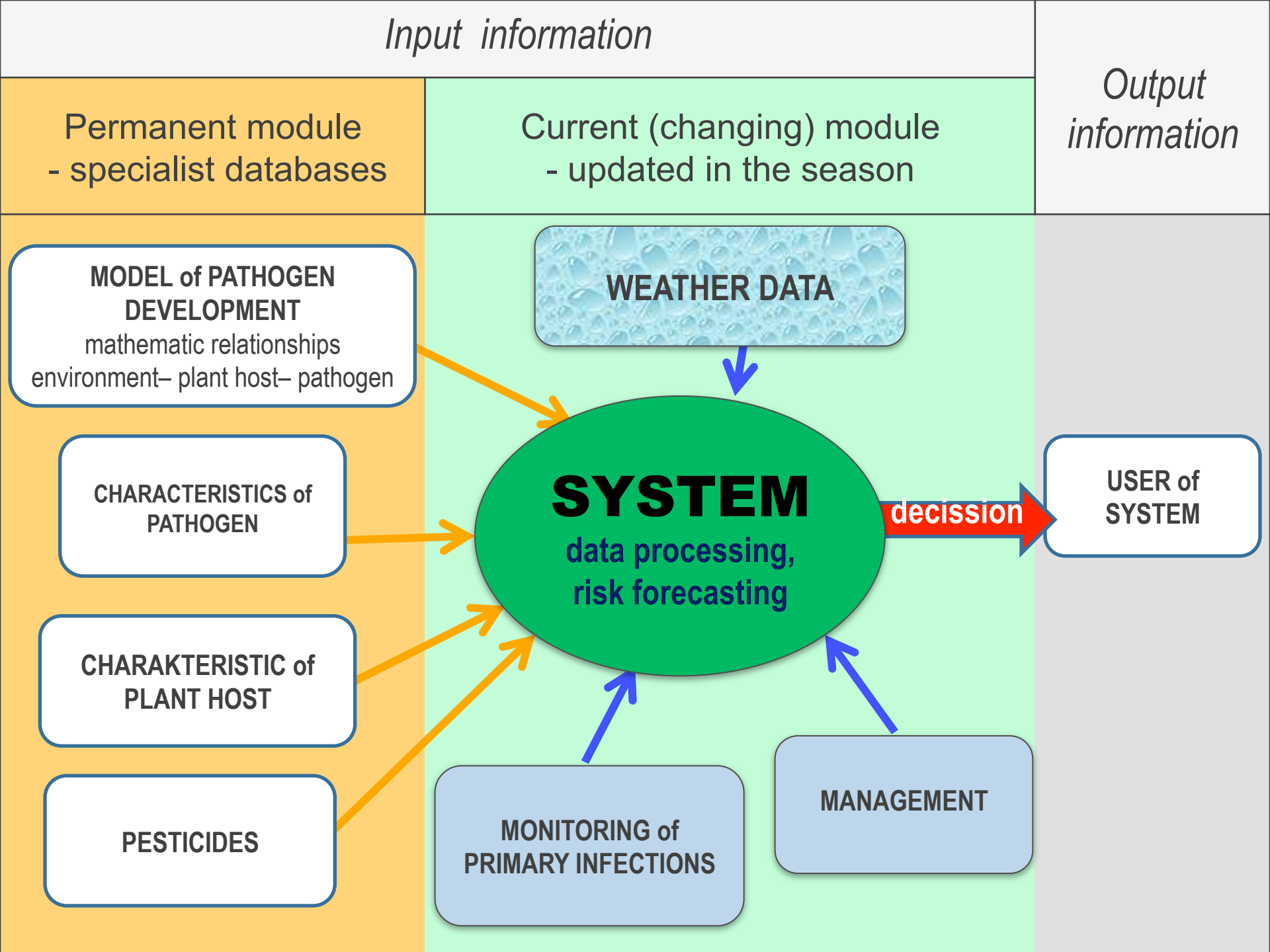
Stages of IPM	Activities in potato cultivation	Elements of IPM
PREVENTION	Previous crop and decisions before planting	soil type and crop rotation adequate cultivation techniques optimal fertilization and irrigation, weed control choice of cultivars
MONITORING	Control activities during planting	seed health (certified seed) acceleration of plant sprouting in potato crops formation of ridges seed and /or soil treatments
INTERVENTION	Control of pest during growing season	elimination of pathogen /pest sources irrigation chemical control
	Harvesting	maturity of tuber weather conditions, avoidance of wet loads avoid mechanical damages, careful handling chemical treatments (desiccation)
	Potato storage management_	curing-holding-warming

Control of agrophages during growing season

- **elimination of pathogen /pest sources**
  - potato dump hygiene
  - control of volunteer potatoes
  - negative selection

- **chemical control**
  - forecasting and monitoring
  - DSSs
  - choice of product
  - haulm destruction




Input information
Output information
Permanent module
- specialist databases
Current (changing) module
- updated in the season
MODEL of PATHOGEN DEVELOPMENT
mathematic relationships
environment– plant host– pathogen
WEATHER DATA
CHARACTERISTICS of PATHOGEN
SYSTEM
data processing,
risk forecasting
decission
USER of SYSTEM
CHARAKTERISTIC of PLANT HOST
PESTICIDES
MONITORING of PRIMARY INFECTIONS
MANAGEMENT

Potato cultivars resistant to late blight (9 point scale)

02.2011 – on Polish National List **137** potato cultivars,

Table cultivars:

- Medea, Ursus (degree 6,5)
- Zeus, Soplica (degree 6)

Starch cultivars:

- Bzura, Kuras, Ślęza (degree 8)
- Bosman, Hinga, Inwestor, Neptun, Sekwana, Sonda (degree 7)
- Umiak (degree 6,5)
- Gandawa, Jasia, Pokusa, Rudawa, Skawa (degree 6).

DSS - NegFry to control late blight

Meteo station

Data of
- air temperature. [^{O}C]
- air humidity. [%]
- precipitation [mm]
- frequency 1 hour

Meto data

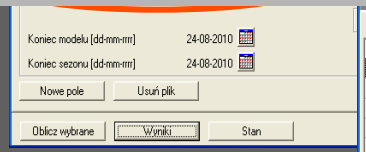
Program NegFry

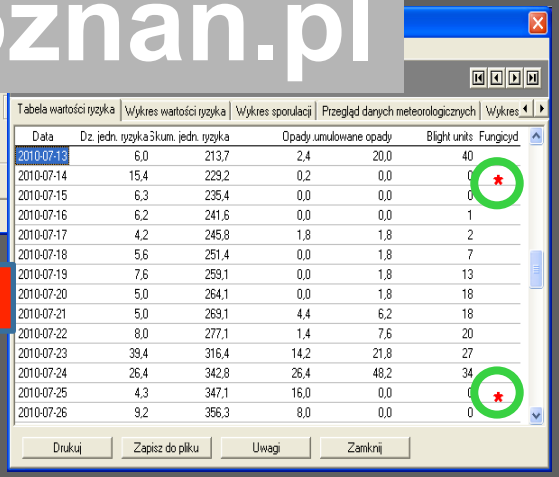
Information about a field

www.iung.pulawy.pl

www.ior.poznan.pl

bout terms





Final results

Efficacy of LB control - validation of NegFry

Year	Level of plant destruction -%			Difference of spray number
	K	R	NF	
2003	98,5	16,5	17,5	2
2004	99,7	7,1	4,1	1
2005	99,1	18,3	14,9	0
2006	88,5	0,2	0,2	3
2007	99,5	4,7	2,3	3
2008	81,7	4,7	3,8	2
2009	98,9	29,7	25,2	2
2010	95,0	0,4	0,2	1

K – untreated control
R – routine, sprays each 7 days
NF – sprays acc. DSS NegFry

Validation of DSS NegFry – determination of LB appearance (Bonin, 2002-2010)

Year	NegFry prognosis of LB appearance	Date of LB appearance in locality	Difference between dates (days)	ARV*	DRV**
2002	16.06.	26.06.	10	139,2	10,3
2003	03.07.	30.07.	27	131,5	12,9
2004	23.06.	28.06.	5	147,9	8,1
2005	07.07.	25.07.	18	131,0	9,6
2006	22.06.	27.06.	5	137,8	14,9
2007	19.06.	25.06.	6	133,3	8,1
2008	30.06.	17.07.	17	140,3	7,0
2009	22.06.	20.06.	2	130,1	7,4
2010	26.06.	05.08.	40	139,5	10,6

Effectiveness of late blight control in different protection programmes

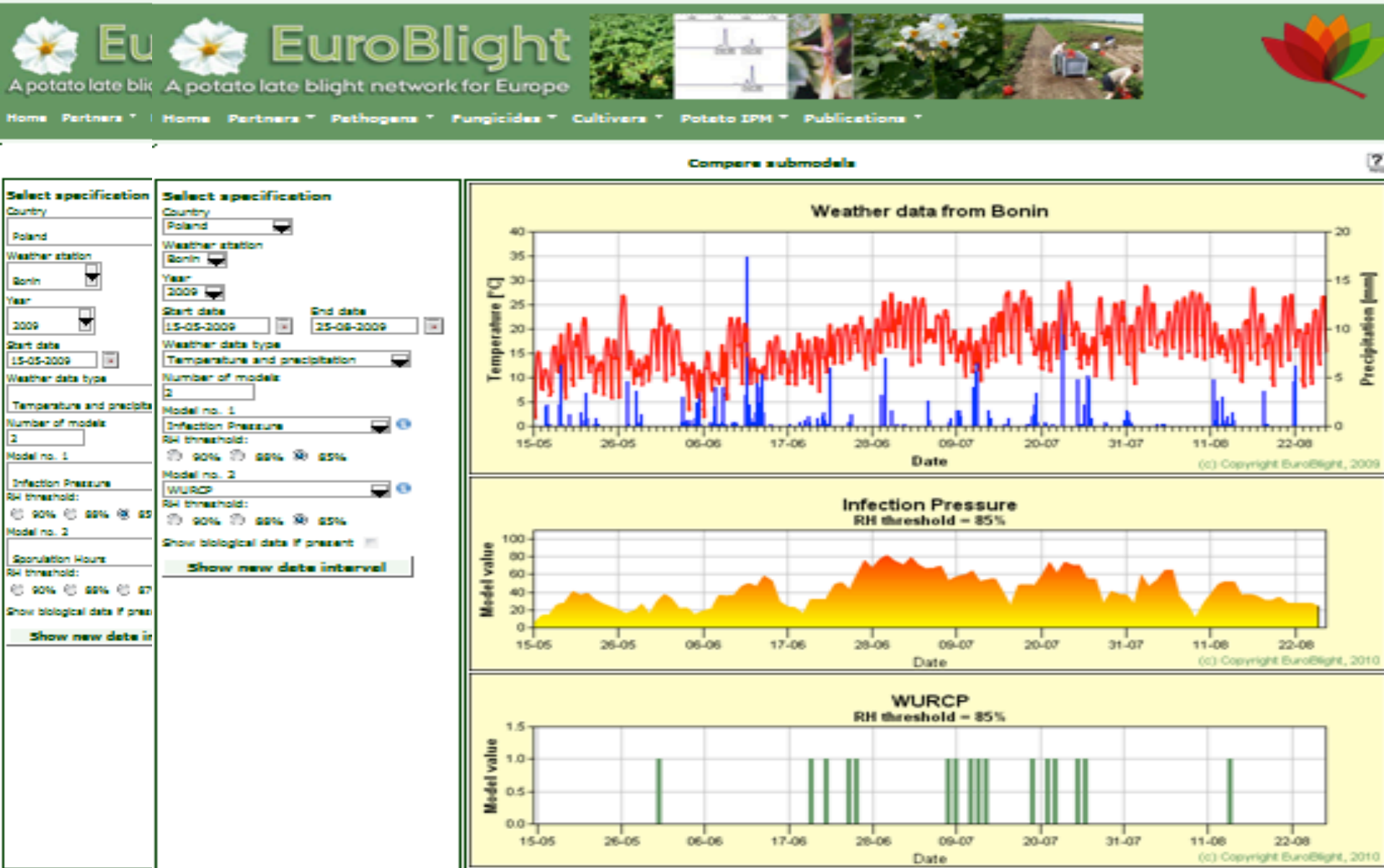
Lata	Level of plant destruction-%			Efficacy of protection- %		Number of sprays		Difference in number of applications
	K	R	NF	R	NF	R	NF	
2003	98,5	16,5	17,5	84,3	84,3	5	3	2
2004	99,7	7,1	4,1	92,9	95,9	5	4	1
2005	99,1	18,3	14,9	81,4	84,8	7	7	0
2006	88,5	0,2	0,2	99,8	99,8	9	6	3
2007	99,5	4,7	2,3	95,3	97,7	8	5	3
2008	81,7	4,7	3,8	95,0	96,0	7	5	2
2009	98,9	29,7	25,2	70,0	74,5	7	5	2
2010	95,0	0,4	0,2	99,6	99,8	6	5	1

K – untreated control
R – routine, sprays each 7 days
NF – sprays acc. DSS NegFry

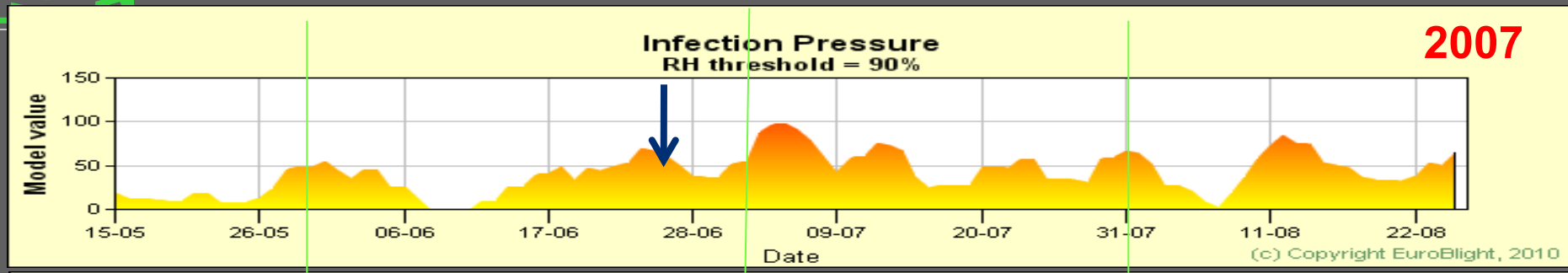
Efficacy of potato protection against late blight in conventional field in 2009

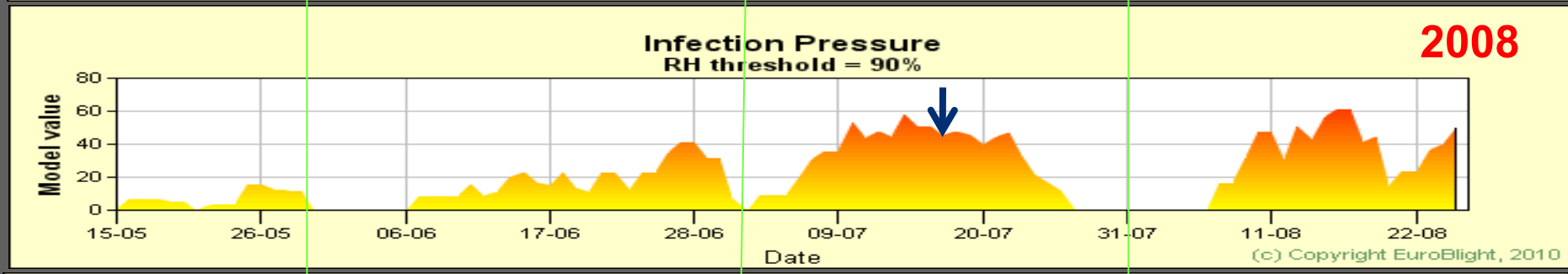
Protection treatment	Number of sprays	Plant destruction on - 3.09.	Tuber yield (t/ha)	Yield increase compare to untreated control	
				t/ha	%
Untreated control	**0**	**97,0**	**30,2**	**-**	**-**
Intensive	**11**	**0,3**	**39,7**	**9,5**	**31,3**
Programe NegFry	**6**	**0,7**	**44,1**	**13,9**	**46,0**
LSD a=0,05		**5,4**	**9,1**	-	

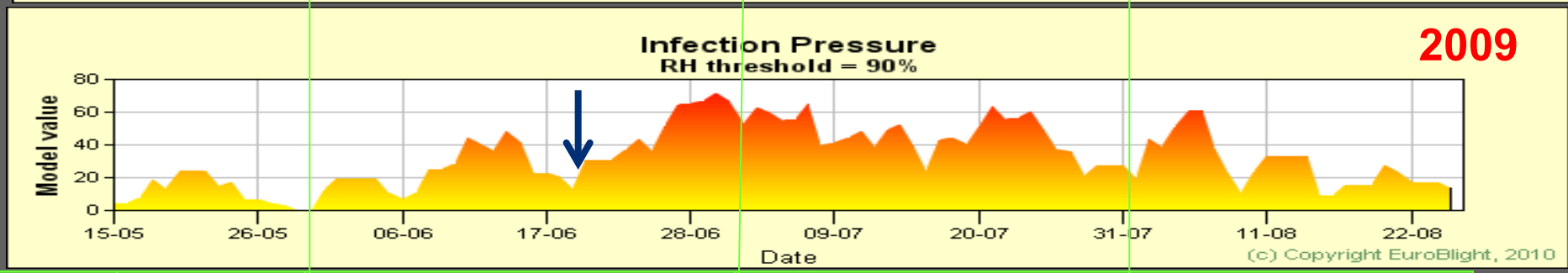
Comparison of submodels



Risk of LB occurence in Bonin (years: 2007 – 2009)





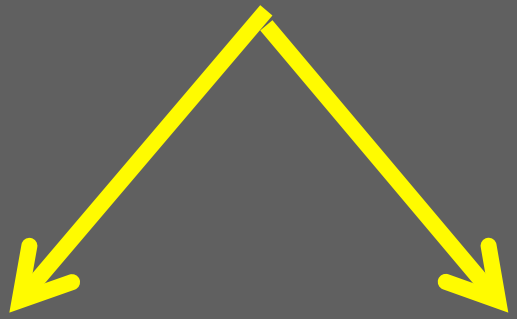


Year	May	June	July	August
2007		25.06.		
2008			17.07.	
2009		20.06.		

Monitoring – definition and its role in DSSs

Monitoring – a regular observation, is the key objective of the IPM and a very important part of DSSs.

Observation is broken into two steps:

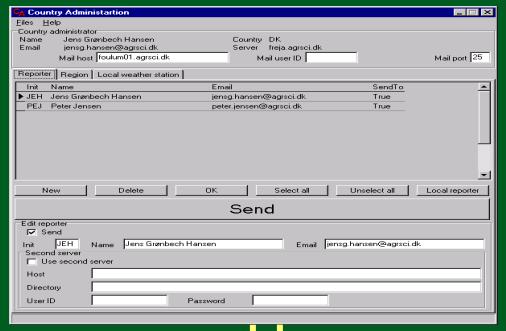


inspection identification

Organizing of pest monitoring (The Pest Monitoring Network)

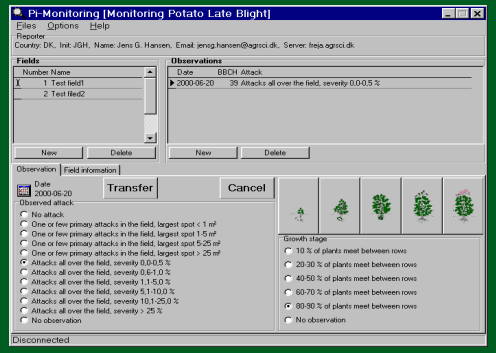
Reporters- monitoring

Country administrator



FTP

Pi-Monitoring



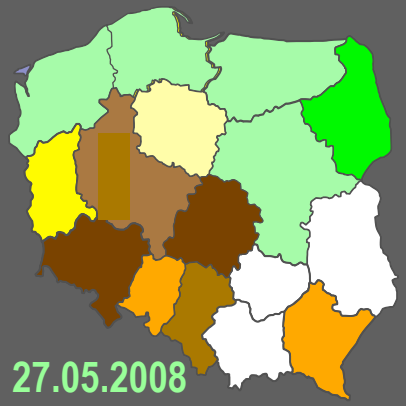
Web-Blight

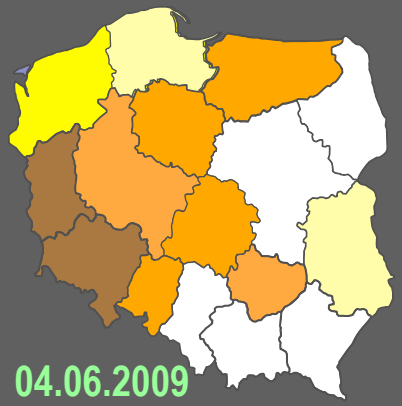
Web-Blight Data base

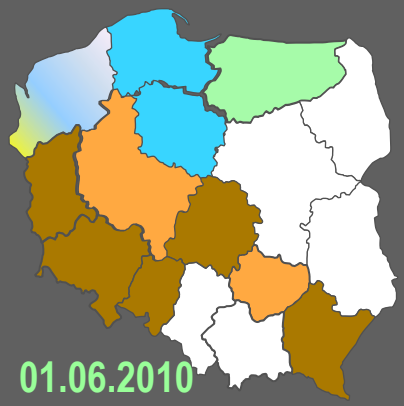
Service → the farmers

Risk assessment of LB occurence in Poland in 2008 – 2010 based on field monitoring

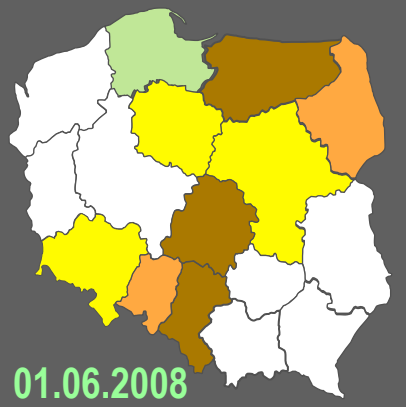
a/ trained reporters

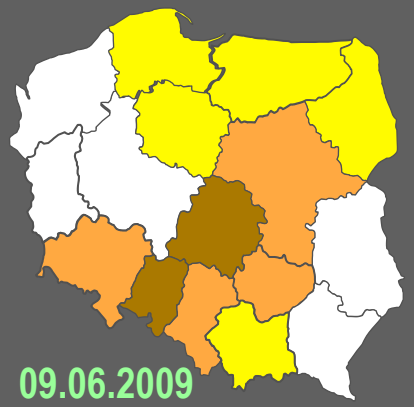


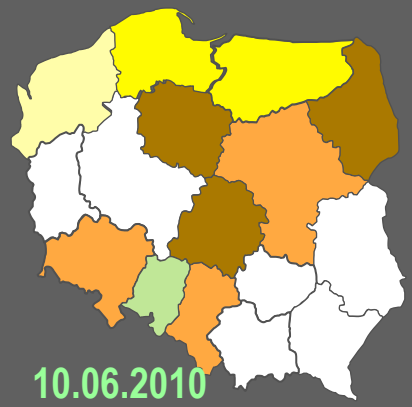




b/ questionnaire filled by inspectors of Plant Health and Seed Inspection Service







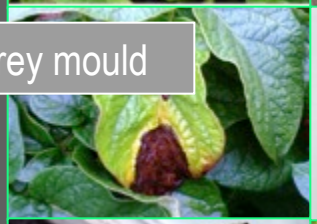
<20	21-31	1-10	11-20	21-30	1-10	11-20	21-31	1-10	11-20	21-31	No data
May		June			July			August			

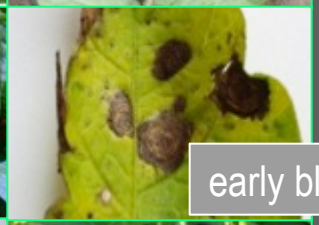
Proper diagnosis as a key component of the IPM program

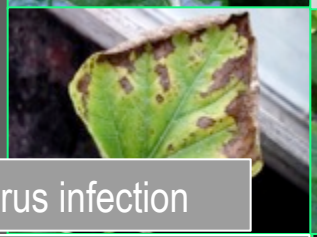
late blight?


late blight

grey mould

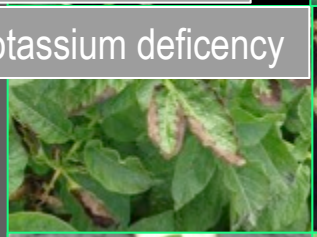


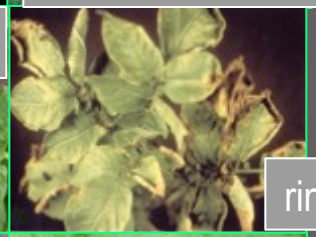

early blight

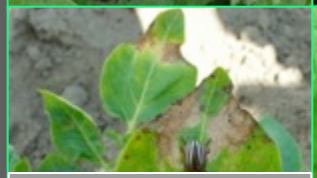

virus infection

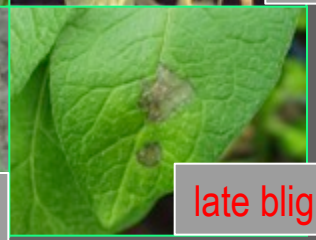

magnesium deficency

potassium deficency

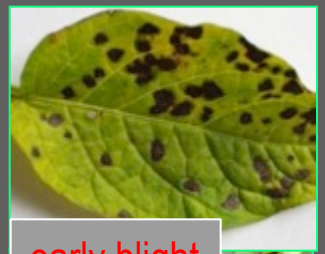


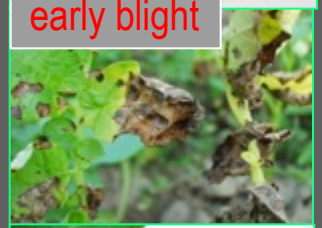

ring rot


herbicide toxity


late blight

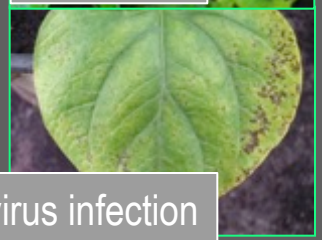
early blight?


early blight



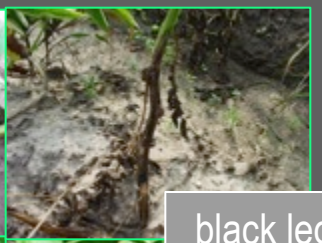

manganese deficency

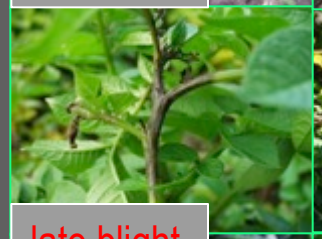

late blight

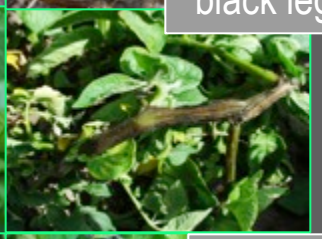

virus infection

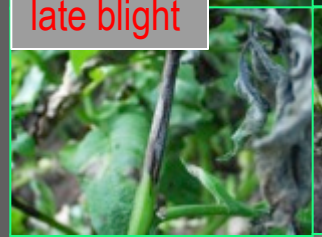
stem late blight?

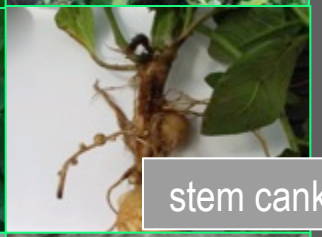

late blight

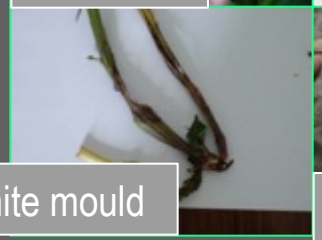

black leg


late blight


black leg


late blight

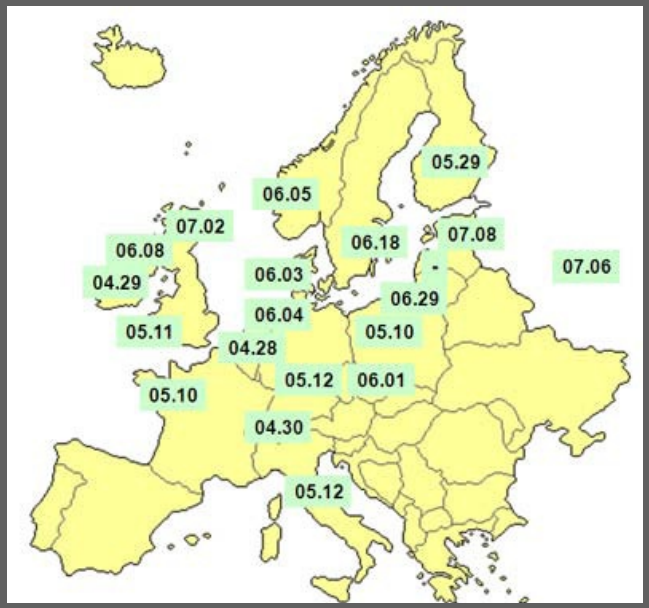

stem canker


white mould

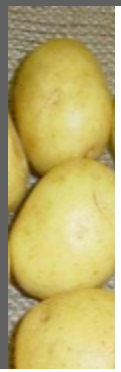

black dot

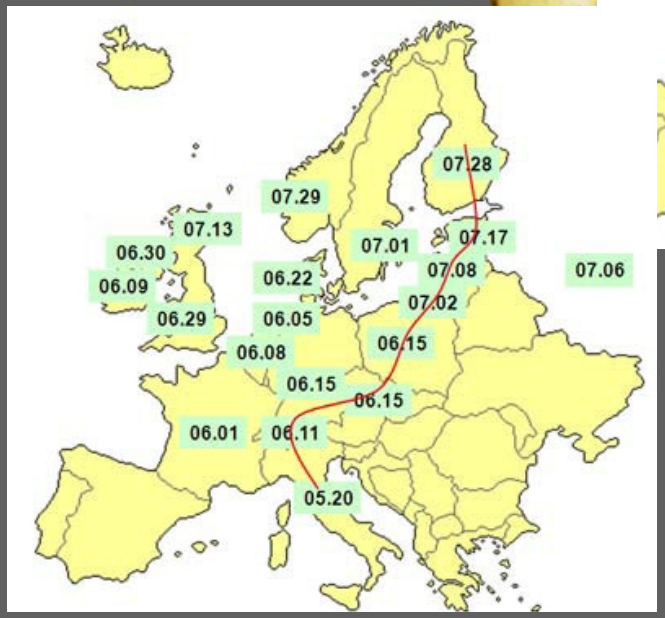
Results of observations of LB in Europe in 2009

source: Hansen *at al*. 2010)



The first observation of LB in very early potatoes or under the cover





The first LB observation in more than five conventional potato fields

The level of tuber blight attacks in 2009

Thank you for attention

IPM

USUSC P0138 University Extention Service
13:01:02 May 5, 1919. First power sprayer to be used in Tooele County.
Purchased by Agent for P.V. Clegg, Tooele, Utah. This outfit sprayed
1080 apple and pear trees in five days.