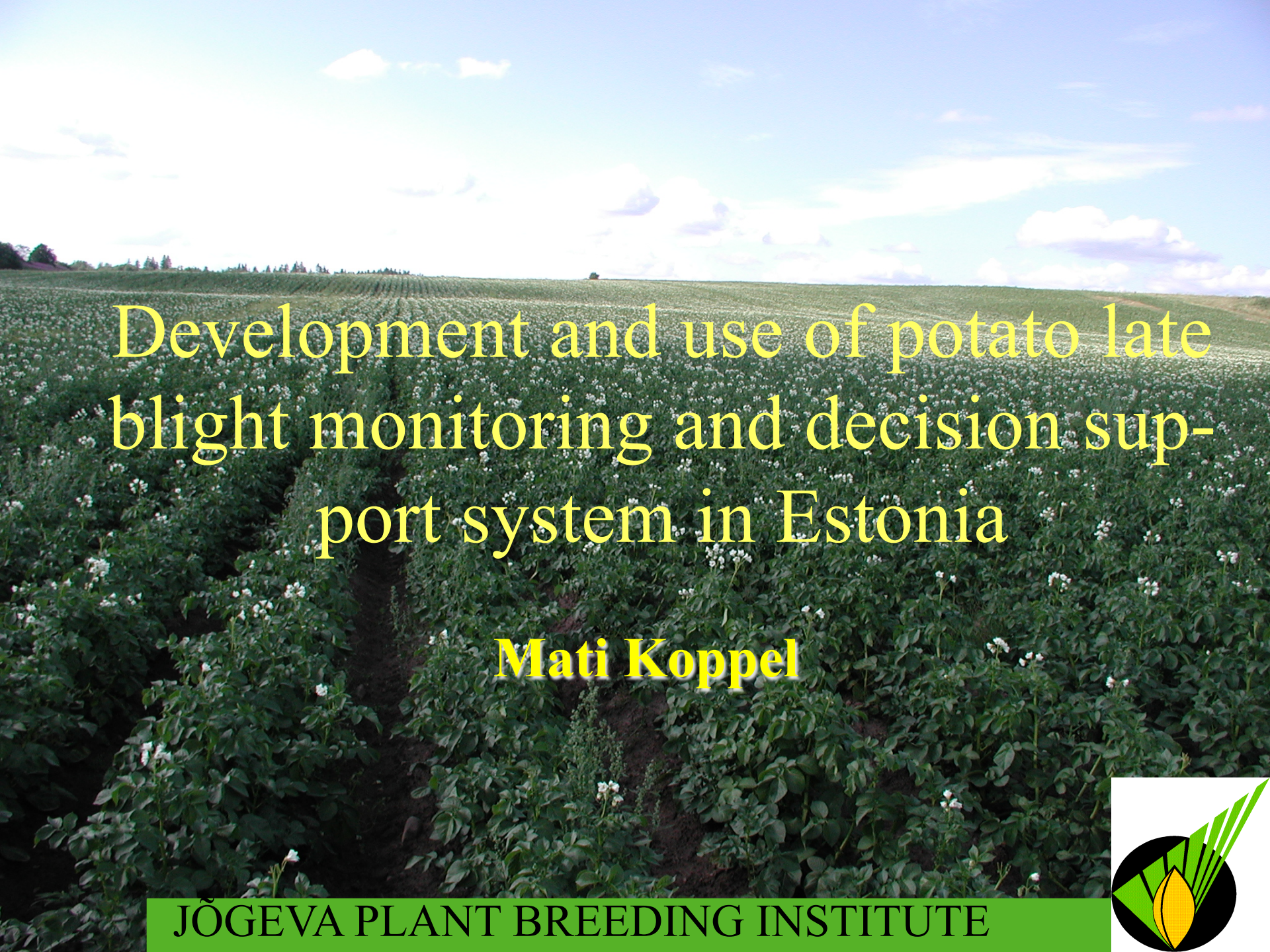


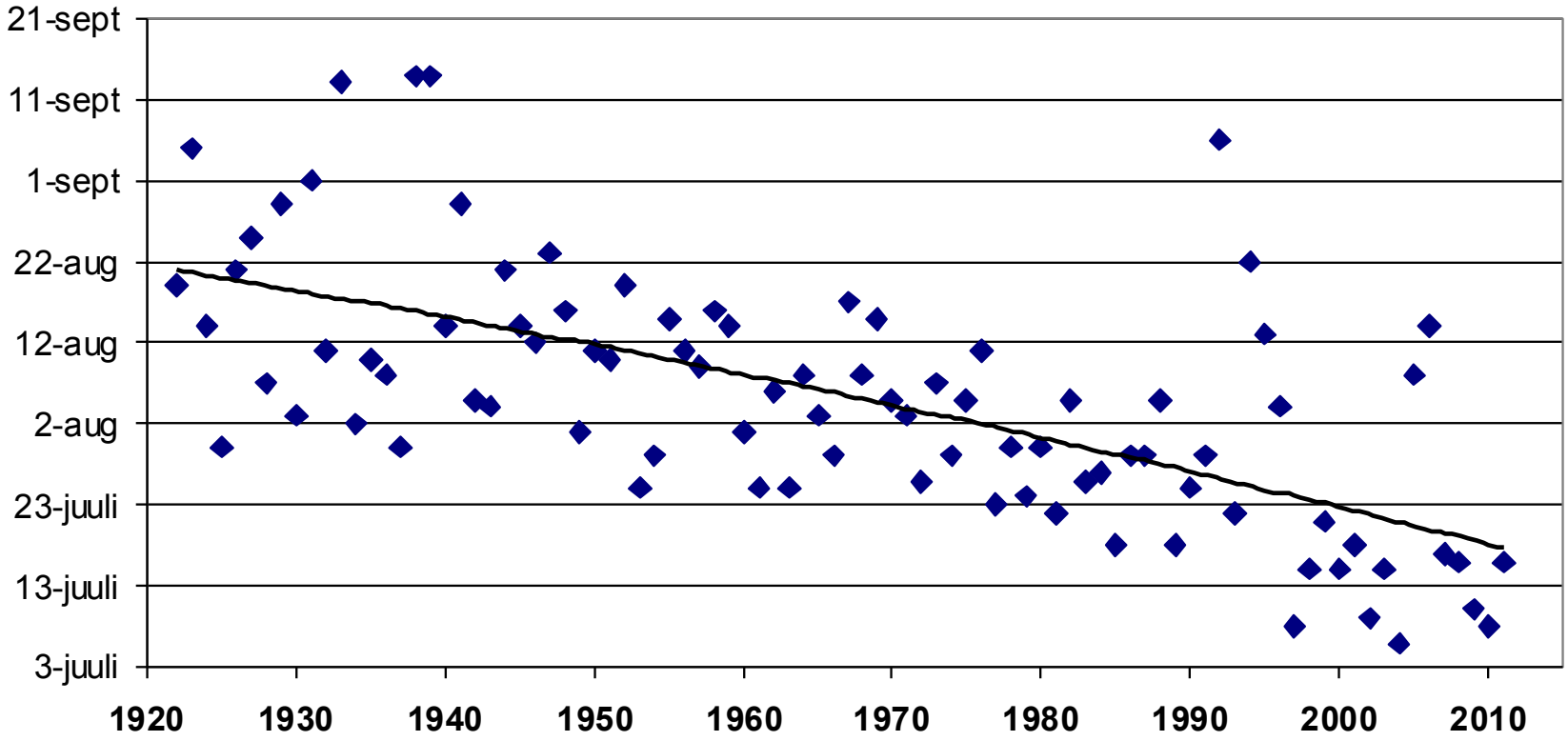
Development and use of potato late blight monitoring and decision support system in Estonia

Mati Koppel

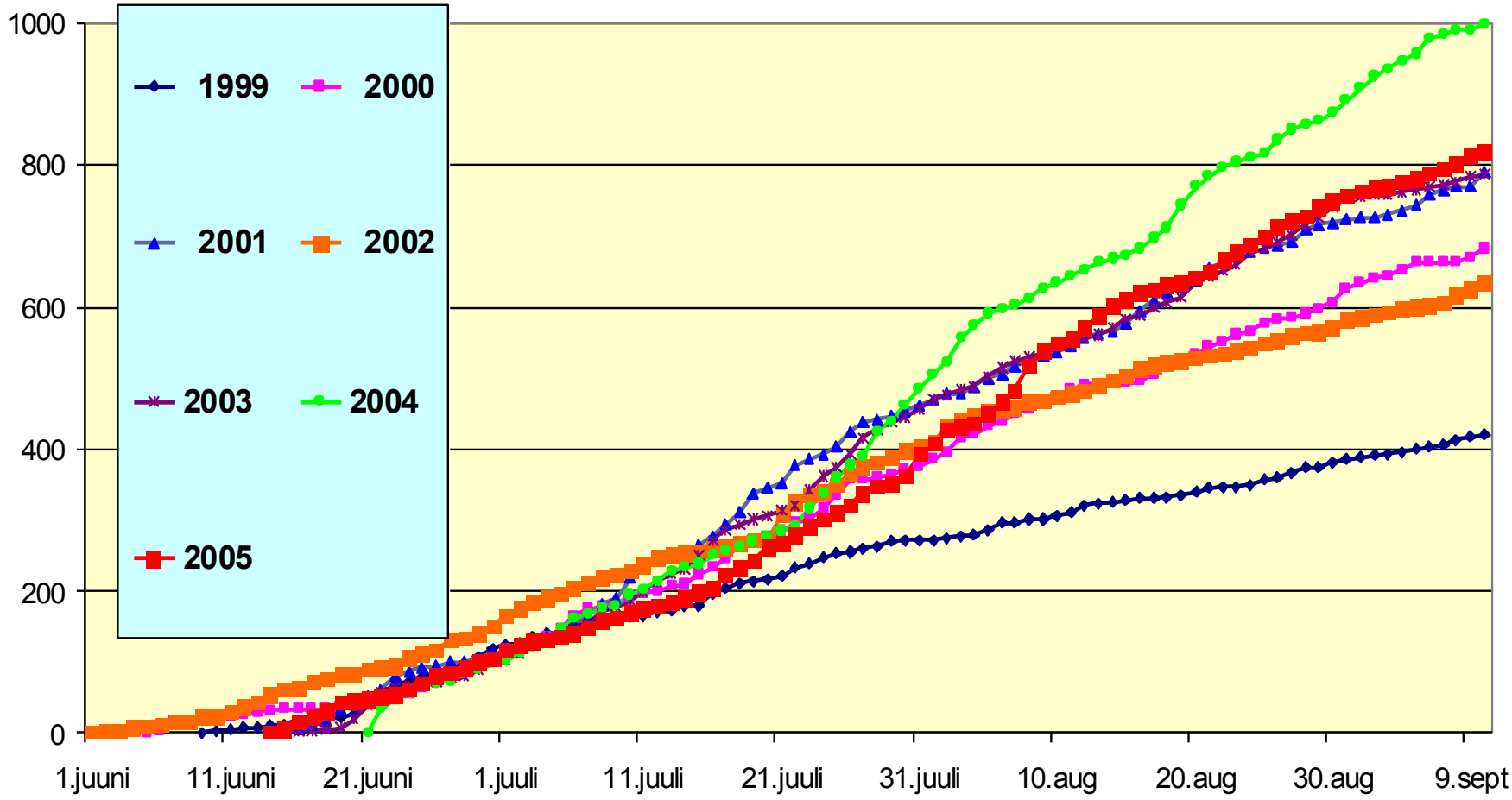
JÕGEVA PLANT BREEDING INSTITUTE


Potato late blight is one of the most harmful diseases
Potato is a high value crop
Multiple fungicide treatments are used to quarantee the high yield

Variation in beginning of late blight infection in Jõgeva, Estonia 1922-2011



Variation in blight favorability of growing seasons

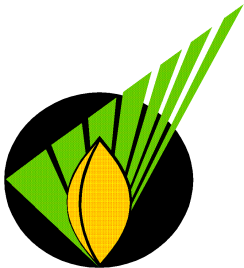


Accumulated risk values for Jõgeva, Estonia 1999-2005

Potato phenology in Estonia

- Planting — May, 1-20
- Emergence — June, 5-20
- Late blight infection — July, 1-25
- Harvest — September, 1-20

ca 30-50 days from late blight infection to harvest
Room for 3-8 fungicide treatments



Project "Development of a Decision Support System for Integrated Pest Management in the Baltic Countries" 1999-2002

WebBlight

Monitoring of late blight outbreaks

Adaptation and validation of NegFry in Baltic conditions

Collection and use of weather data in disease forecast

Classification of variety resistance

Information on available fungicides

Participation in EU.NET.ICP, EUCABLIGHT and Euroblight

Adaptation and validation of NegFry in Baltic countries 1999-2002

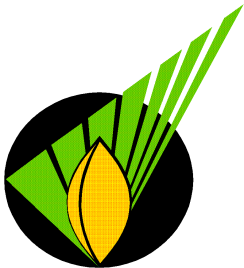
30% reduction the number of applications (45 trials)

Resistance class	No of treatments		Reduction %
	NegFry	Routine	
B1	3,5	4,6	24,7
B2	3,2	5,0	36,3
B3	3,6	5,2	30,5
Year			
1999	2,8	4,8	38,0
2000	4,3	5,8	22,3
2001	4,1	4,6	10,3
2002	2,7	4,6	40,1
Total	3,4	5,0	30,0

Koppel, M., Hansen, J.G., Lassen, P., Turka, I., Bimsteine, G., Valskyte, A., 2003. Implementation of the NegFry decision support system in the Baltic countries in 1999-2002. In Westerdijk, C.E., Schepers H.T.A.M. (Eds) Proceedings of the Seventh Workshop of an European network for development of an integrated control strategy of potato late blight. PPO-Special Report No. 9. pp. 47-57.

Conclusions from use of NegFry and Web-Blight

- NegFry provided good results in experimental stations
- Farmers got to like them
- Too complicated and time consuming for use for farmers
- Fungicide applications could be saved in postponing the first treatment, lesser extent in changing the treatment interval
- Suitable only for fungicides of 7 day treatment interval



Basic components of DSS

- Monitoring late blight outbreaks Web-Blight
- Timing of first treatment Negative prognosis
- Intervals between following treatments
  - Based on weather conditions Fry model
  - Based on variety resistance EUCABLIGHT
- Proper choice of the fungicide EU.NET.ICP

Testing 2006, use 2007-

Principles of new solutions

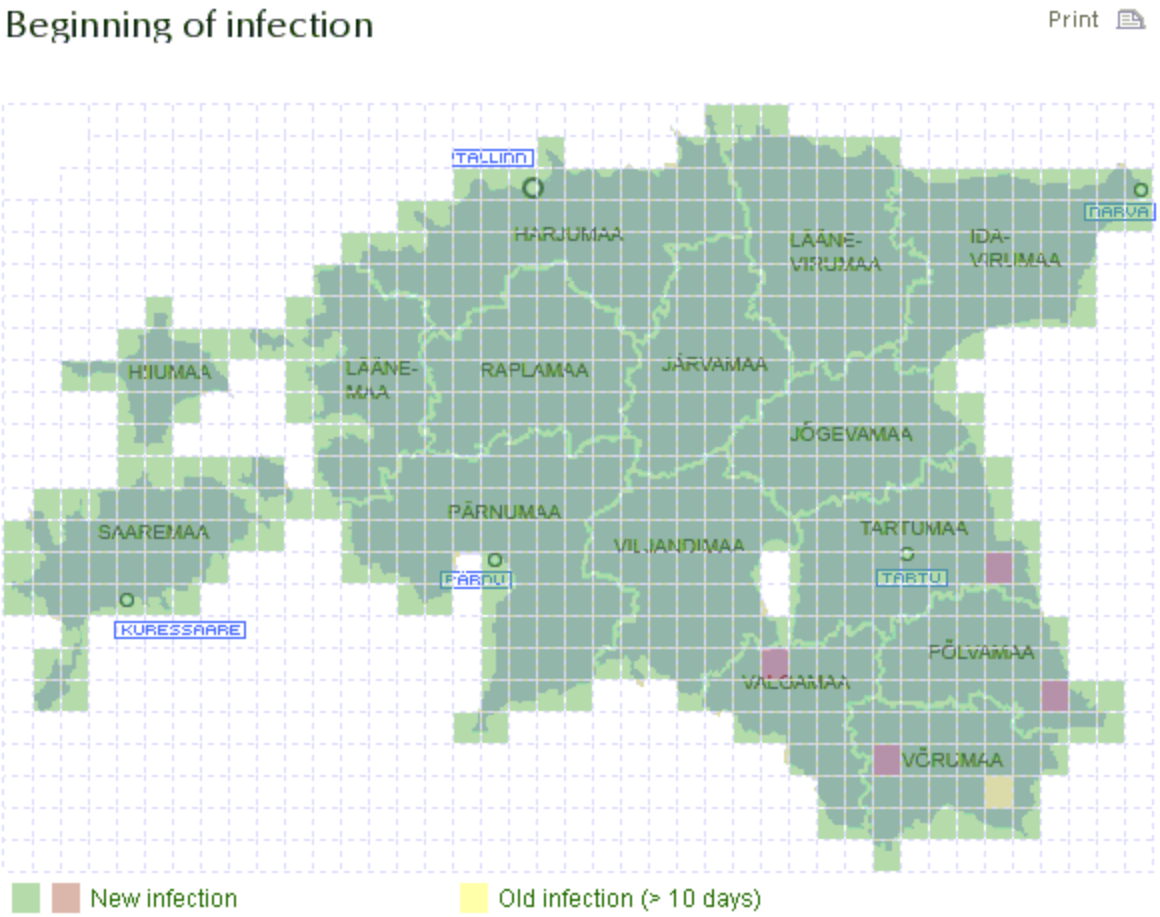
- Optimization of the late bligh control
  - better control with optimal use of fungicides (efficacy and economy, avoidance of failing treatments),
  - not reduction of fungicide use (environment and economy)

- Simple message to the farmer
  - when and how to treat, not why to treat

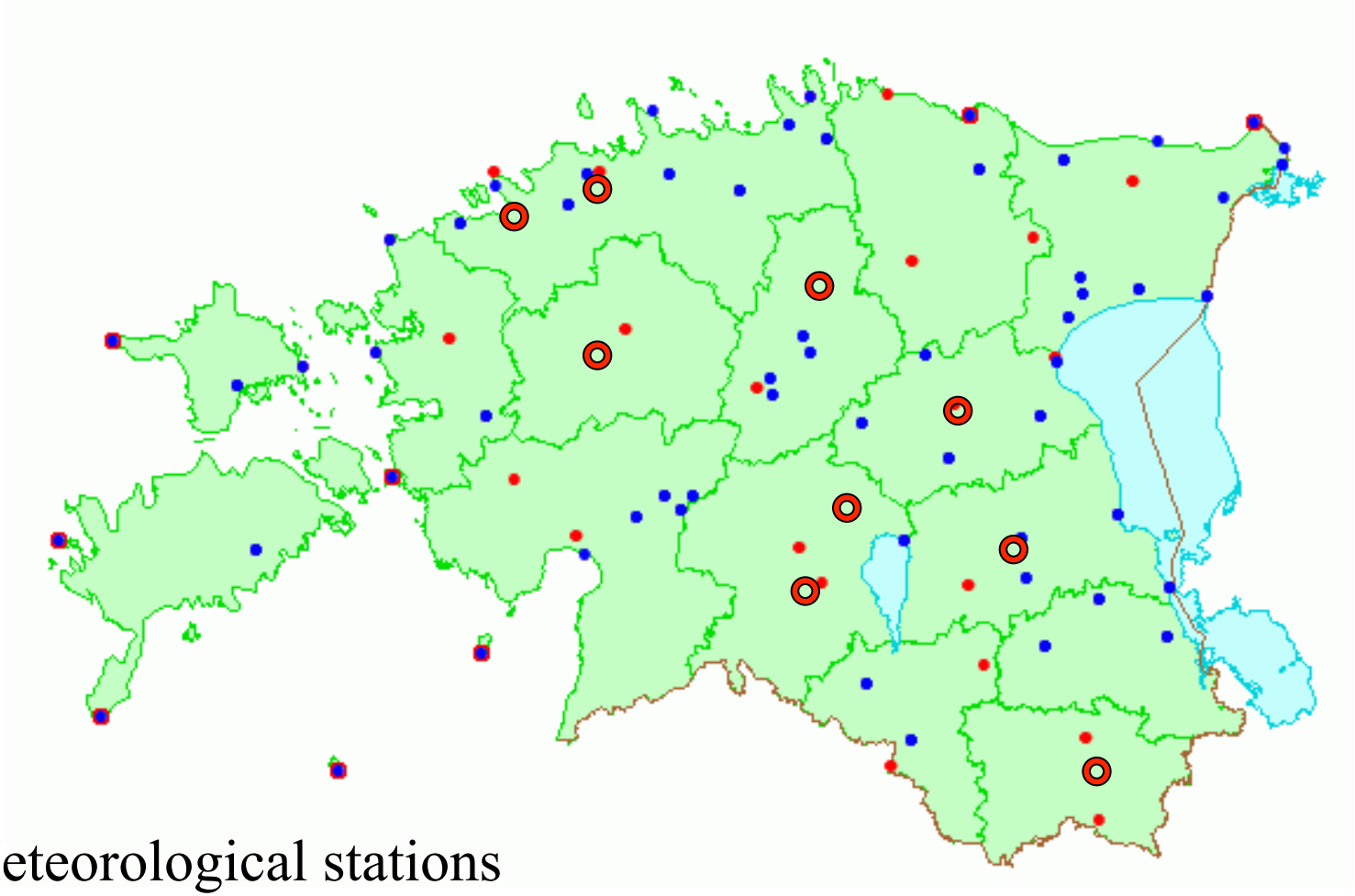
- Area based advice
  - not a single field based advice (easier to understand and use to the farmers)

Estonian DSS on late blight

Beginning of infection

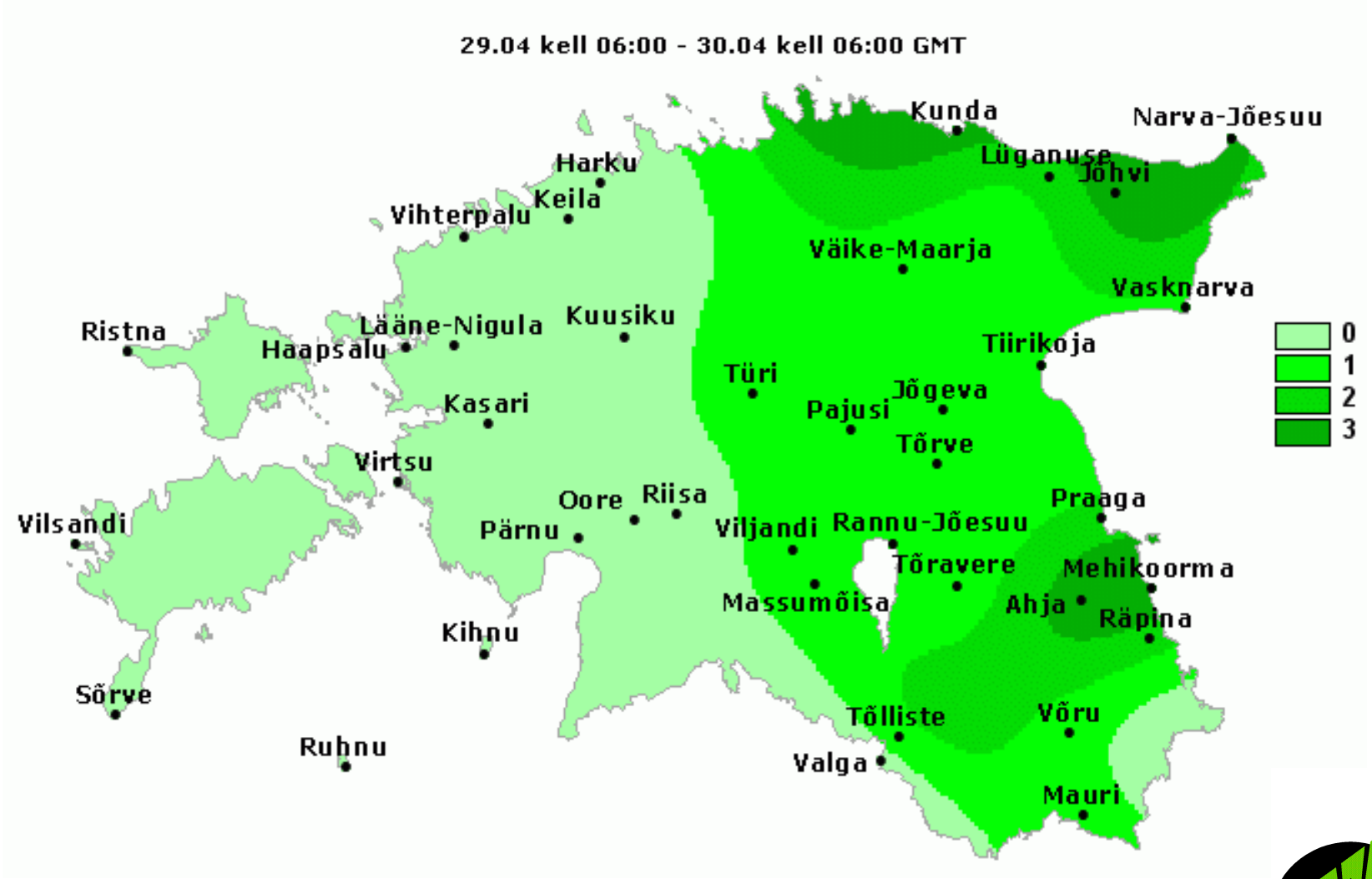


Weather data



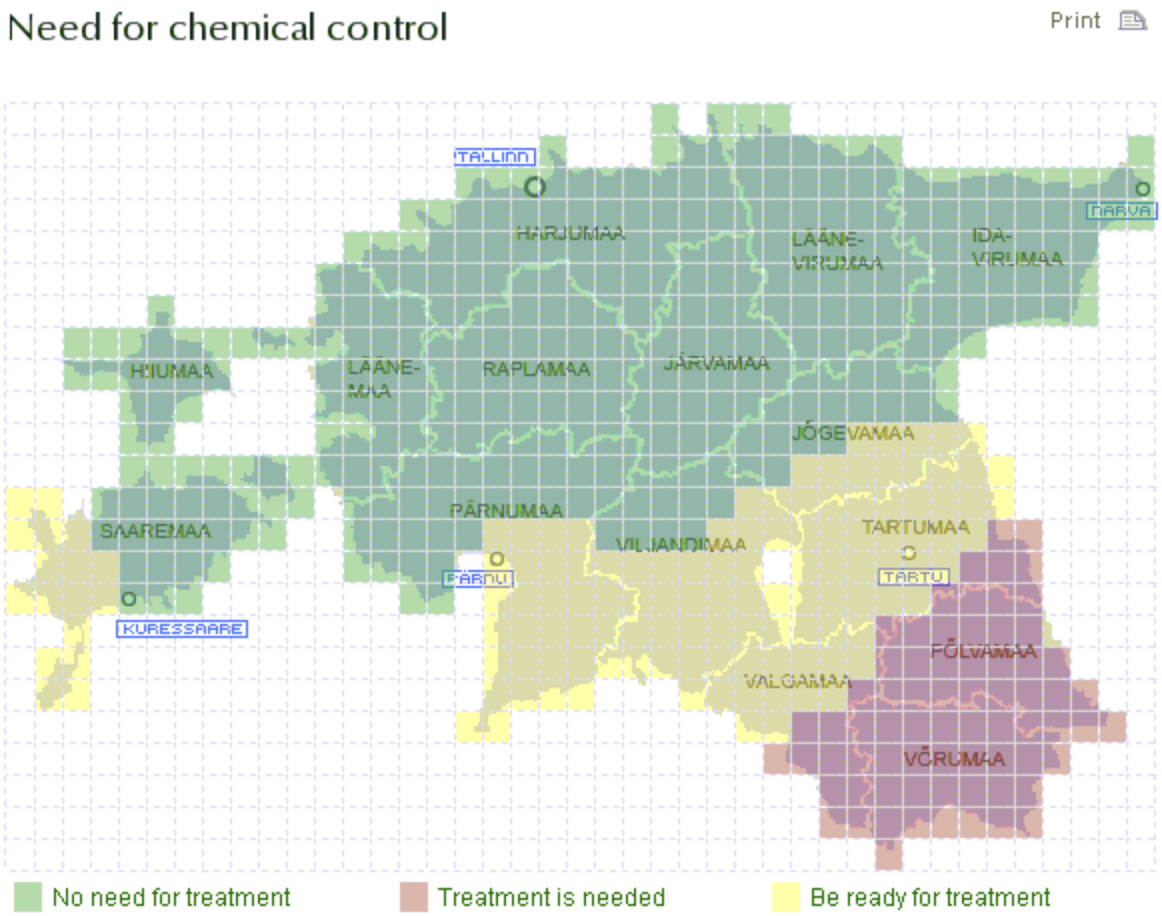
- Meteorological stations
- Automatic weather stations in experimental statiosn

Presipitation maps, mm



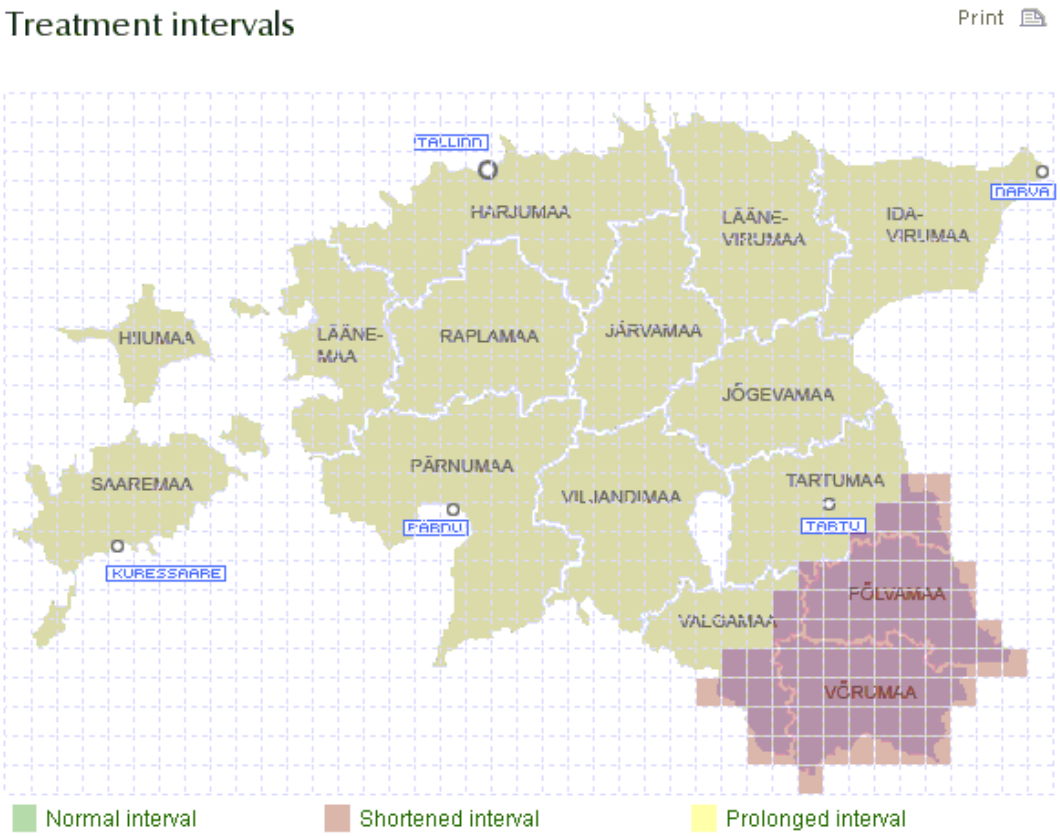
Estonian DSS on late blight

Time of first treatment



Estonian DSS on late blight

Treatment interval



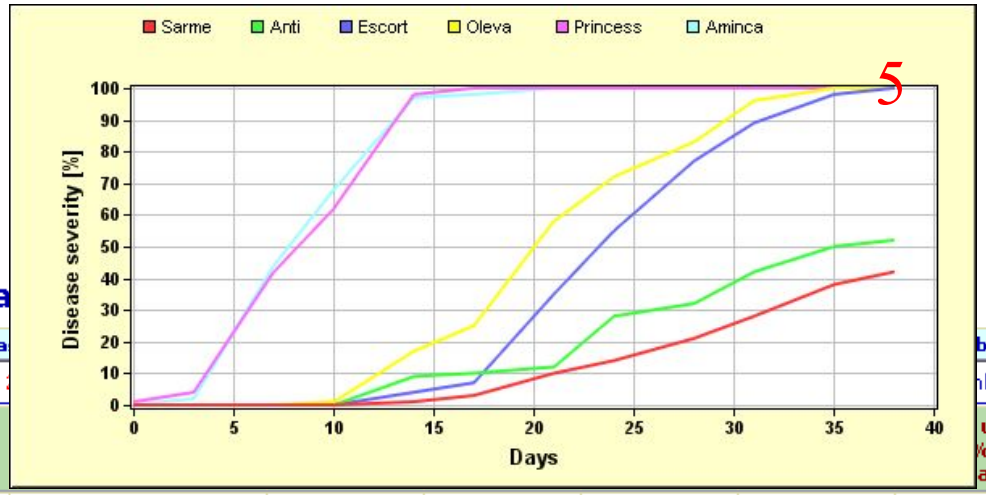
Normal interval - Use treatment interval according to fungicide label recommendation

Shortened interval - Treatment interval has to shorten for one day

Prolonged interval - Treatment interval can prolonged for additional one day

Classification of variety resistances

Information from EUCABLIGHT observation trials



7

Tria

Disea

by date | Documentation

Year:

nber of replicates: 3 Responsibilty: Mati Koppel

						until % ase	Days until 5% disease	Aa	At	1-9 scale
☐	R 9	18,8	0,00	*	*	*	*	*	*	8,9
☐	R 8	36,5	0,01	0,10	0,02	25,8	44,7	-0,68	19,8	8,8
☐	Sarme	463,4	0,12	0,17	0,07	10,2	20,0	-0,61	4,2	7,6
☐	Kuras	493,5	0,13	0,20	0,08	12,5	21,1	-0,58	6,4	7,5
☐	Anti	716,5	0,19	0,15	0,07	0,9	13,1	-0,63	-5,2	6,8
☐	R 1076-97	789,7	0,21	0,37	0,25	17,0	21,5	-0,40	11,0	6,6
☐	R 1559-98	895,3	0,24	0,30	0,20	13,1	18,5	-0,47	7,0	6,4
☐	Robijn	966,2	0,25	0,18	0,08	4,3	13,7	-0,60	-1,8	6,2
☐	R 1079-99	999,6	0,26	0,33	0,23	13,4	18,5	-0,45	7,4	6,1
☐	649-94	1.070,3	0,28	0,32	0,20	12,9	18,1	-0,46	6,8	5,9
☐	R 872-00	1.110,9	0,29	0,26	0,16	7,9	14,6	-0,52	1,9	5,8
☐	1431-99	1.126,7	0,30	0,31	0,22	11,5	16,9	-0,47	5,4	5,7
☐	R 360-98	1.178,2	0,31	0,32	0,22	12,0	17,1	-0,45	5,9	5,6
☐	R 5	1.210,8	0,32	0,44	0,28	15,3	19,1	-0,34	9,2	5,5

Hansen, J. G., Koppel, M., Valskyte, A., Turka I, Kapsa, J. 2005. Evaluation of foliar resistance to *Phytophthora infestans* based on an international field trial network. Plant Pathology 54: 169-179

Variety resistance

Susceptible

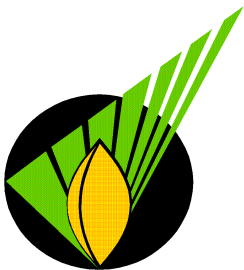
Resistant

Variety resistance

Print

Shorten interval 1 day	Shorten interval 1 day	Normal interval	Normal interval	Extend interval 2 days	Extend interval 2 days
2	3	4	5	6	7
Aminca	Berber	Asterix	Agria	Escort	Ando
Arielle	Bintje	Ditta	Ants	Graniola	Anti
Princess	Carlita	Fontane	Evita	Juku	Kuras
Sinora	Courage	Milva	Fresco	Oleva	Robijn
Velox	Eersteling	Santé	Maret	Piret	Sarme
	Folva	Satina	Picasso	Raja	
	Impala	Sava	Remarka		
	Latona	Van Gogh	Vigri		
	Platina	Varane kollane			
	Red Scarlet	Victoria			
	Secura				

Mod susceptible



Use of fungicides

- Use of recommended doses
- Selection of fungicides according to mode of action and efficacy in certain conditions
- Adjustment of treatment interval according to weather conditions and varietiy resistance

Fungicides - Effectivity and mode of action

Fungitsiidide mõju

	Late blight	New growth	Stem blight	Tuber blight	Early blight
Dithane NT	2	?	1	1	2
Shirlan	3	?	1	1	0,5
Ranman	3	?	1	1	?
Bravo 500 SC	2	?	0,5	0,5	1,5
Ridomil Gold MZ 68 WG	3	2	2	2	2
Tattoo	2,5	1,5	2	2	?
Glory	2,5	1,5	2	2	2
Acrobat Plus					
Sereno WG 60					
Tanos 50 WG					
Electis 75 DG					

Fungitsiidide toimemehhanism ja vihmakindlus

	Kaitsev toime	Raviv toime	Sporulatsiooni vastane	Vihmakindlus
Dithane NT	2	0	0	1,5
Shirlan	3	0	0	2,5
Ranman	3	0	0	3
Bravo 500 SC	2	0	0	2,5
Ridomil Gold MZ 68 WG	2,5	2,5	2,5	3
Tattoo	2,5	2	2	3
Glory	2,5	2	2	3
Acrobat Plus	2,5	1	2	2,5
Sereno WG 60	2,5	0	1,5	2
Tanos 50 WG	2	2	1	2,5
Electis 75 DG	3	0	0	2,5

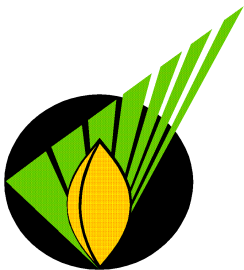
Late blight fungicides

Fungitsiidid

Trüki leht

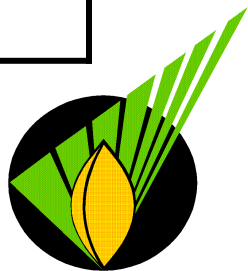
	Dose, kg/l, ha	Movement	Active ingredient	Treatment interval	Cost, EEK/day
Dithane NT	2,5	Contact	mancozeb	7	57
Bravo 500 SC	1,3	Contact	chlorothalonil	7	87
Sereno WG 60	1,25	Translaminar	fenamidon, mancozeb	7	86
Tanos 50 WG	0,6	Translaminar	cymoxanil; famoxadon	7	73
Shirlan	0,3	Contact	fluazinam	7	84
Shirlan	0,4	Contact	fluazinam	10	73
Ranman	0,2	Contact	cyasofamid	10	73
Electis 75 DG	1,25	Contact	soxamid; mancozeb	10	61
Acrobat Plus	2,0	Translaminar	dimetomorph, mancozeb	12	64
Glory	2,0	Systemic	propamocarb, fenamidon	12	66
Ridomil Gold MZ 68 WG	2,5	Systemic	metalaxyl-M; mancozeb	12	84
Tattoo	4,0	Systemic	propamocarb; mancozeb	12	63

EUCABLIGHT



Selection of fungicides

Beginning of infection, normal or unvafourable conditions for late blight	Dithane, Shirlan, Electis, Acrobat Plus
Beginning of infection favourable conditions for late blight, possibility of beeing late with the first treatment	Ridomil Gold, Tattoo, Glory
Active growth ot potato plants before the flowering	Ridomil Gold, Tattoo, Glory
Period of intensive infection and spread of late blight	Shirlan, Ridomil Gold, Electis
Rainy period	Ranman, Ridomil Gold, Tatoo, Glory
Prolonged dry period supressing late blight, but beeing favourable for early blight	Electis, Dithane, Glory, Sereno, Tanos
Last treatments to avoid tuber blight	Ranman, Shirlan



Estonian DSS on late blight

Adjustment of treatment interval according to weather conditions and variety resistance

Weather

Variety

		Blight-favourable	Normal	Unfavourable
		-1	0	+1
Susceptible	-1	-2	-1	0
Moderately susceptible	0	-1	0	+1
Moderately resistant	+1	0	+1	+2

Fungicides of 7 day treatment interval

Dithane; Shirlan 0,3;

Weather

Variety

		Blight-favourable	Normal	Unfavourable
		-1	0	+1
Susceptible	-1	5	6	7
Moderately susceptible	0	6	7	8
Moderately resistant	+1	7	9	9

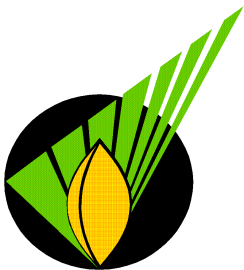
Fungicides of 10-14 day treatment interval

Ridomil Gold, Tattoo

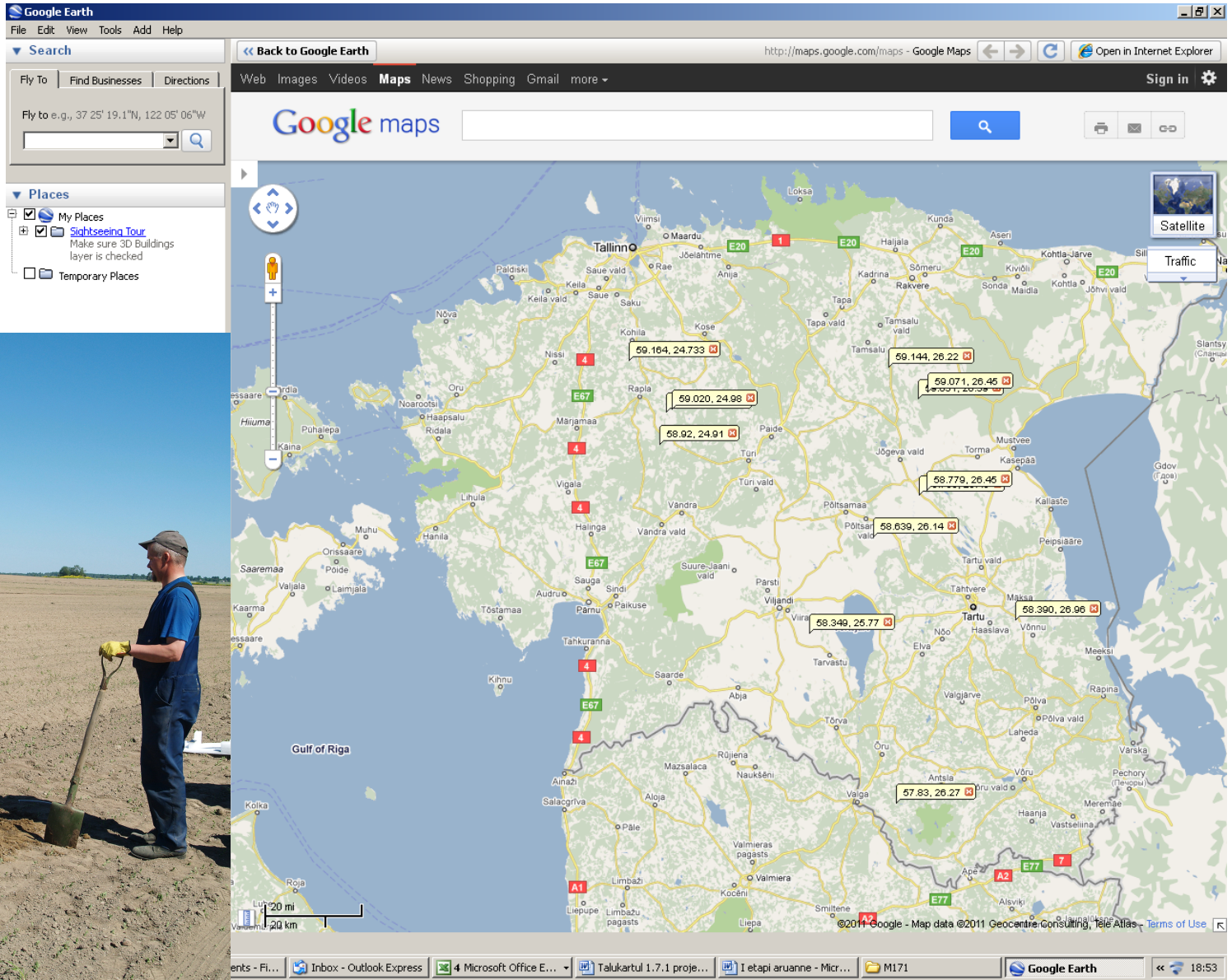
Weather

Variety

		Blight-favourable	Normal	Unfavourable
		-1	0	+1
Susceptible	-1	10	11	12
Moderately susceptible	0	11	12	13
Moderately resistant	+1	12	13	14

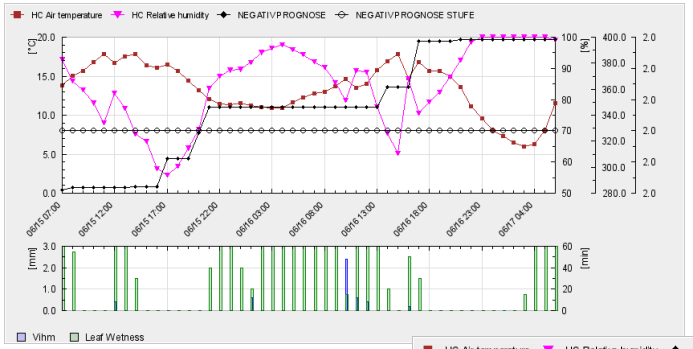


Project of Innovation Support Program: use of site specific weather data in DSS and irrigation management in potatoes 2011-2013

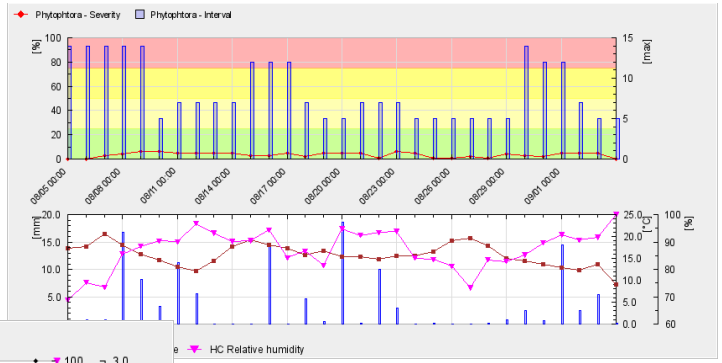


Fieldclimate.com

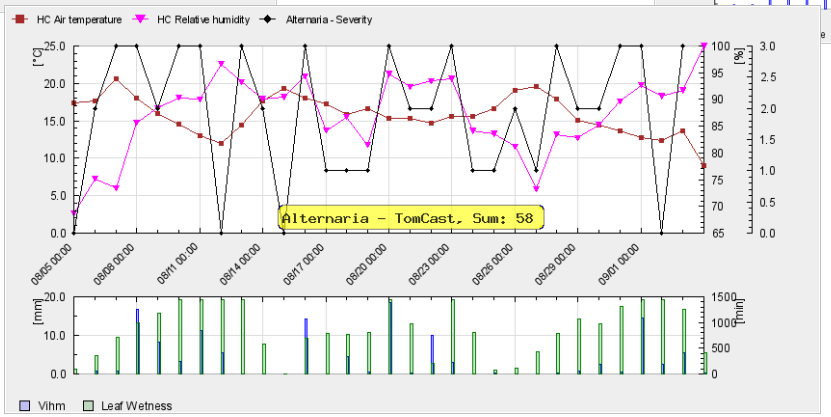
- Negative prognosis



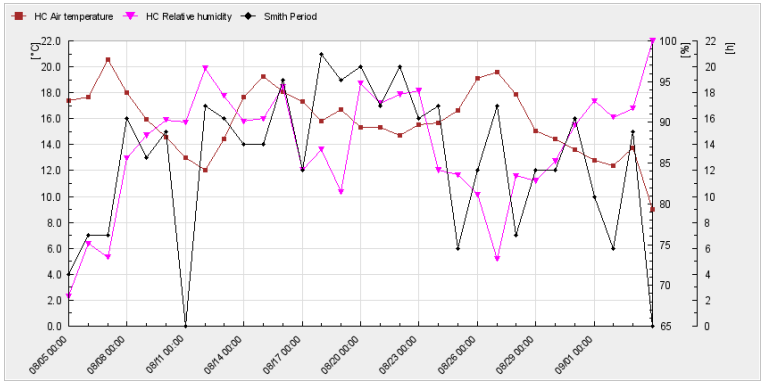
- No blight



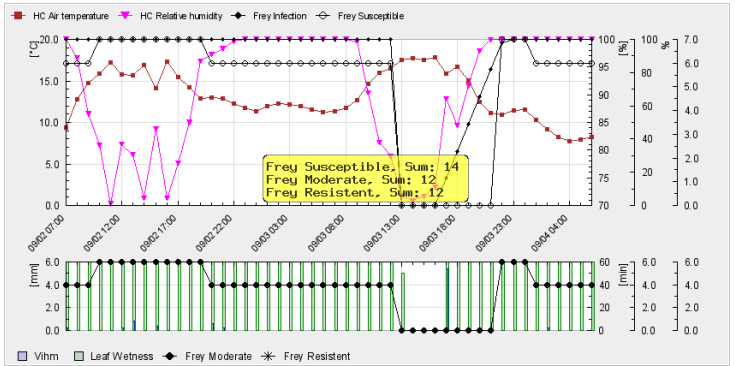
TomCast



- Smith periods



- Fry model



Simple message to the farmer in Google Docs

Advice

Implementation

Reccommendation of fungicides

		Field 10		Field 12		Field 13	
		Flavia 8.06. Satina 8.06 Campina 10.06		Flavia 4.06 Natascha 11.06 Campina 14.06		Toscana 15.06	
		Plan	Actual	Plan	Actual	Plan	Actual
Juuni	1						
	21						
	22						
	23						
	24	Ridomil Gold 2,5	Ridomil Gold 2,5	Ridomil Gold 2,5	Ridomil Gold 2,5		
	25						
Juuli	6						
	7		Dithane				
	8	Dithane		Dithane	Dithane	Dithane	Dithane
	9						
	0						
	1						
	2						
	3						
	4	Shirlan 0,4	Shirlan 0,4	Shirlan 0,4	Shirlan 0,4	Shirlan 0,4	Shirlan 0,4
	5						
	16						
	17						
	18						
	20						
	21	Infinito		Infinito		Infinito	
	22		Infinito 1,6 l		Infinito 1,6 l		Infinito 1,6 l
	23						
	24						
	25						
	26						
	27						
	28						
	29						
	30						
	31	Infinito	Ranman 0,2	Infinito	Ranman 0,2 ainult Flavia	Infinito	
August	1				Infinito 1,4 Natascha, Campina		Infinito 1,4
	2						
	3						

Thank you for attention