Worldwide Impact of PCN: Potato Cyst Nematode control in Scotland

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Outline

- The implementation of the EU Potato Cyst Nematode Directive (2007/33/EC) in Scotland – Soil testing
- The effects of implementation of the Directive on the incidence of Potato Cyst Nematodes in seed land
- Potato Cyst Nematode situation in Scotland
- Variation in Potato Cyst Nematode incidence across Scotland
- The ware survey - a requirement of the new Directive
- Role of resistant varieties in controlling Potato Cyst Nematodes
- Management Options - living with Potato Cyst Nematodes

Background

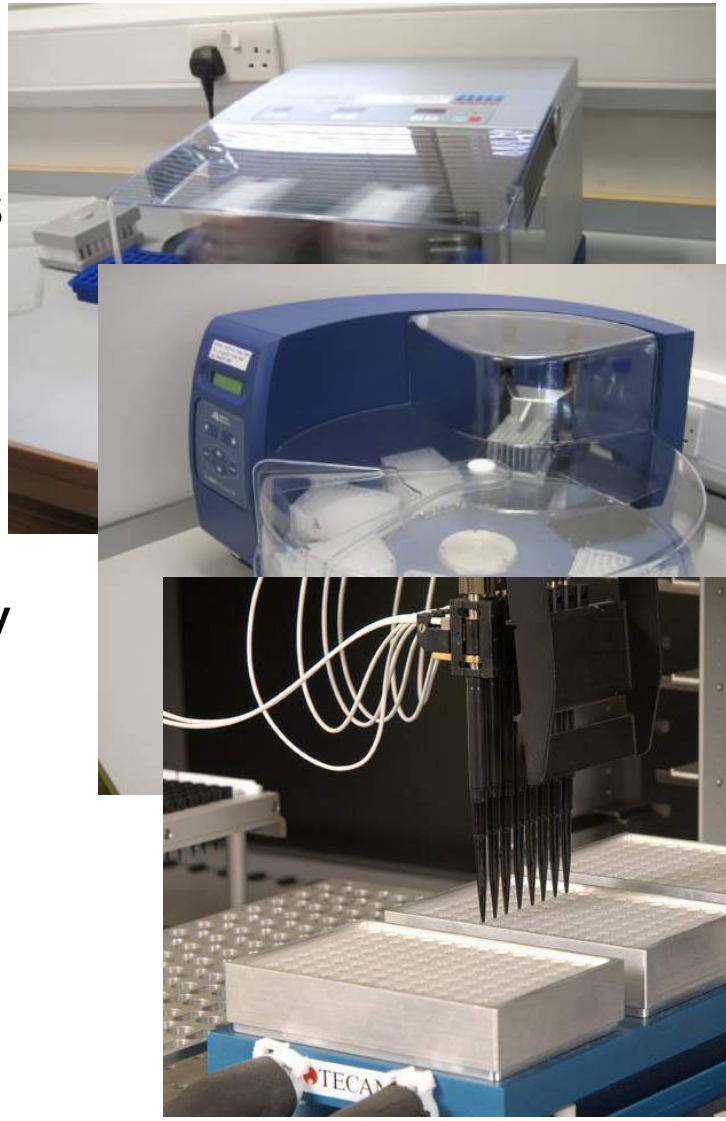
- EU Potato Cyst Nematode Directive (2007/33/EC) came into force 1 July 2010
- All land to be used for seed production (incl. farm saved seed) must be tested and found free from Potato Cyst Nematodes
- New sampling rates for seed stipulated
- Sampling rate has increased by over 2-fold (114% increase)
- Area testing positive for Potato has increased by over 2-fold (122% increase)
- 5.3% of the area sampled for seed now tests positive for Potato Cyst Nematodes

Extracting Potato Cyst Nematodes – since 2010

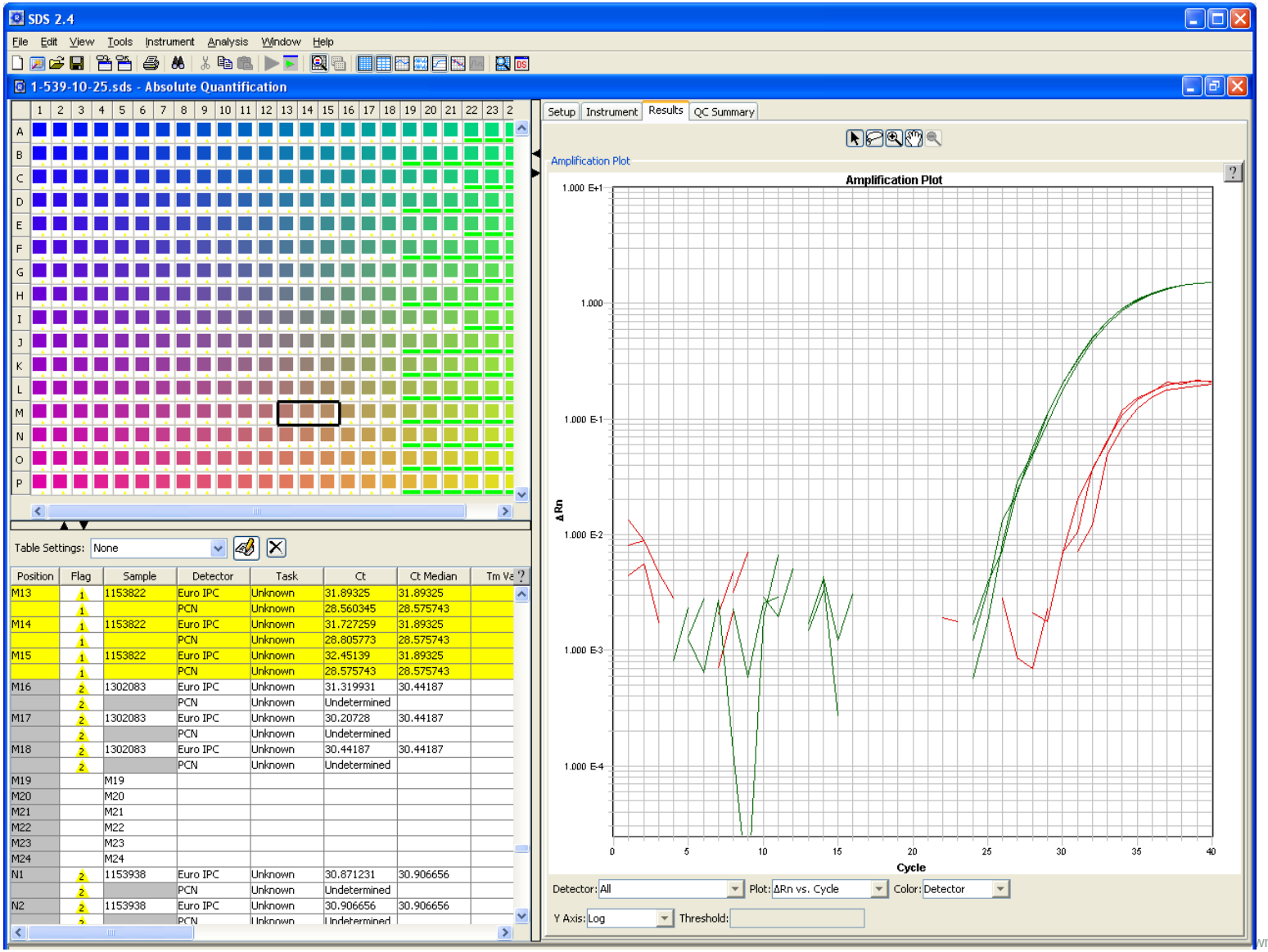
Sample Tracking – since 2010

DNA extraction and PCR

- DNA extraction of the entire float is carried out in batches of 95 by grinding in a bead beater
- MagMax automated system and a modified Qiagen Plant DNeasy kit are used to purify the DNA
- PCR reactions are set up in 384 well plates using a liquid handling robot



Real-time PCR diagnostics



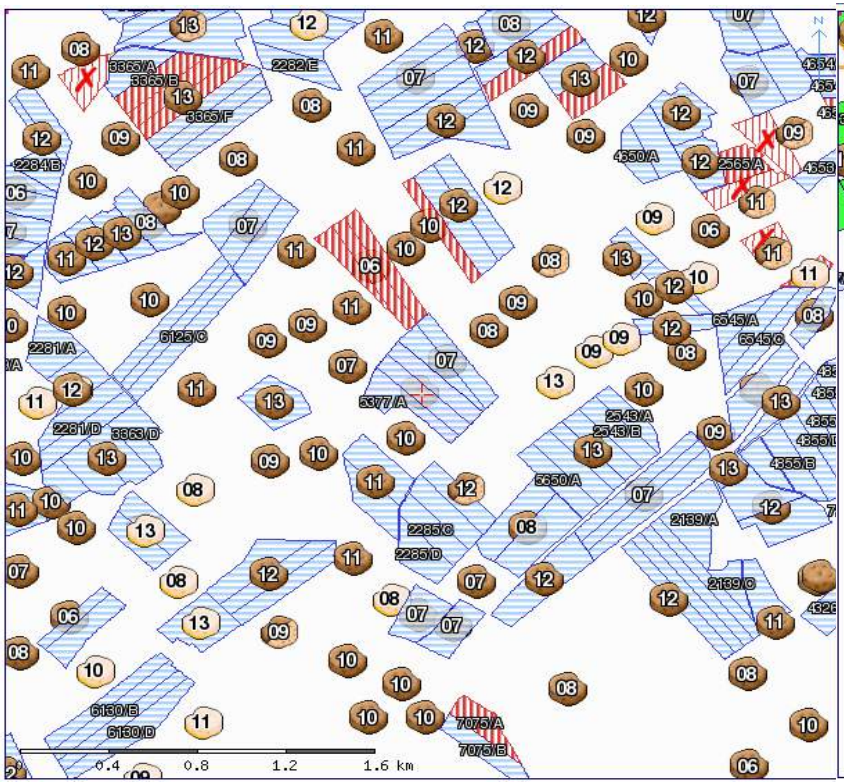
SASA Lab – Diagnostics

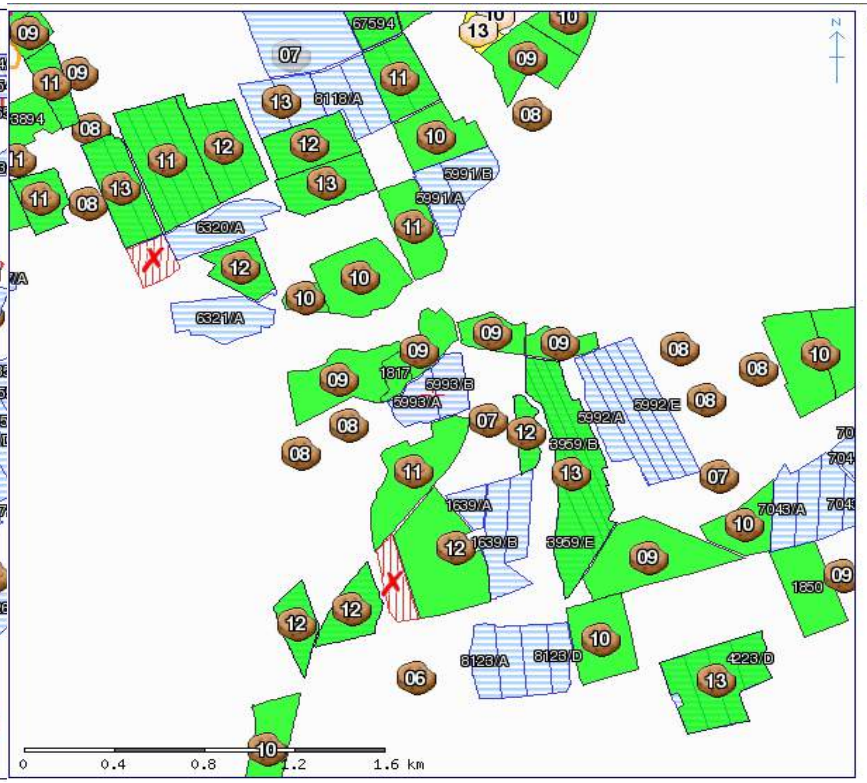
- PCR method for detecting Potato Cyst Nematodes DNA developed by Diagnostics and Molecular Biology at SASA (based on a pilot developed at JHI)
- Automated high throughput method using the entire ‘float’ (debris) from the carousel
- Eliminates need for visual examination of ‘float’

Efficiency Gains

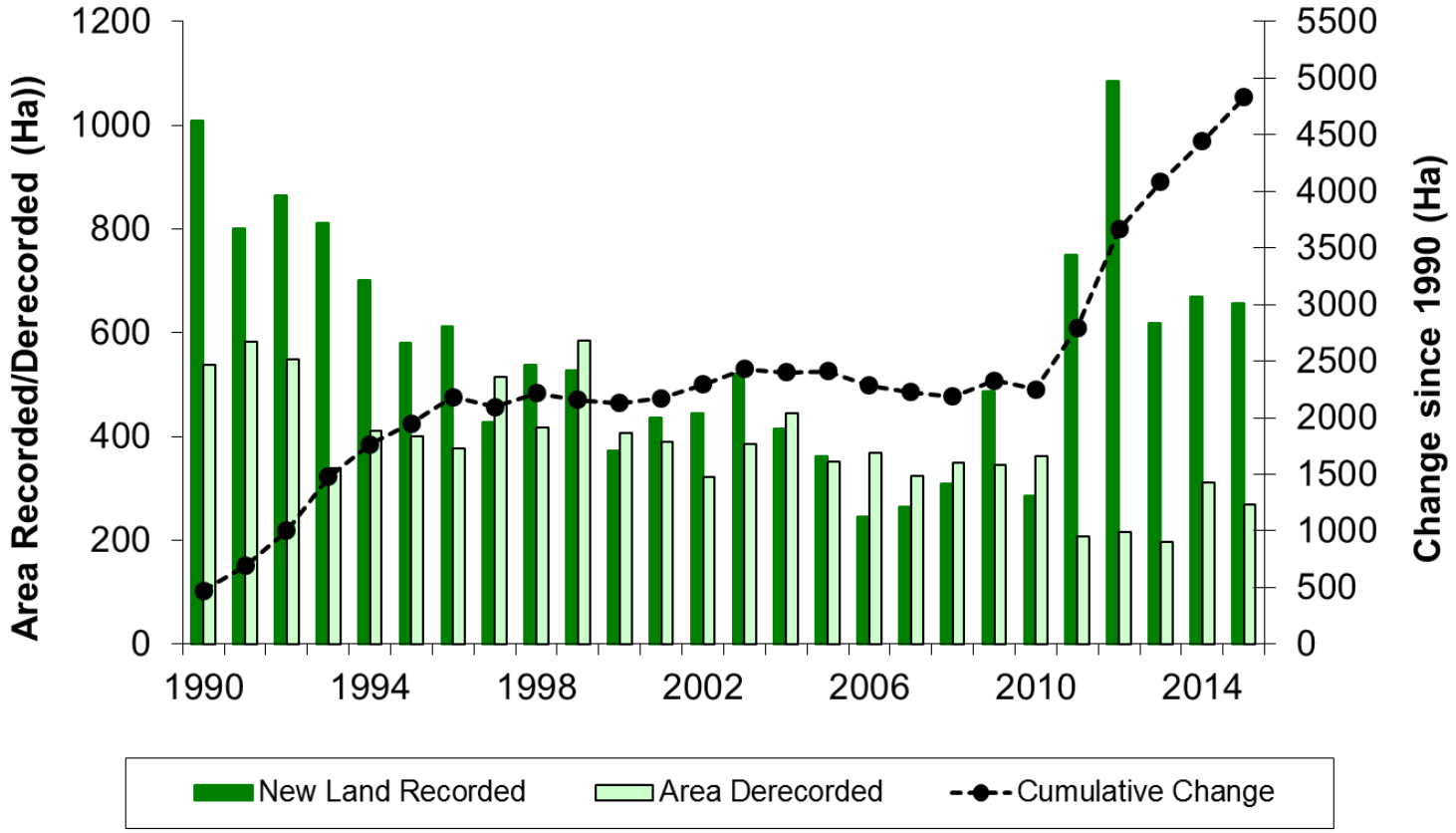
- PCR: 800 PCR reactions/person/week (500 ha/person/week)
- Visual: 65 samples/person/week (70 ha/person/week)

Mapping of test results & potato crops



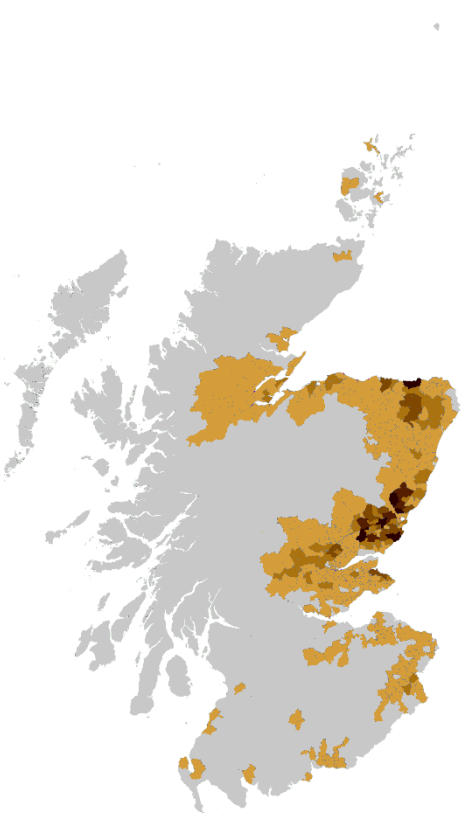


Change in area recorded as infested 1990 - 2015

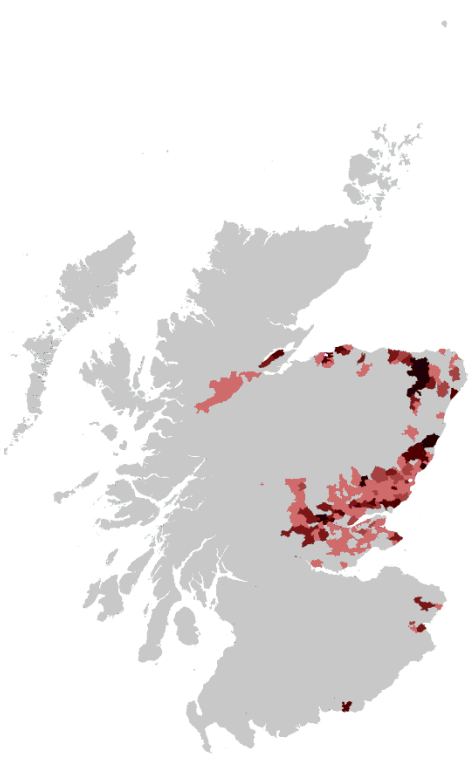


Since 2010, the area recorded as infested has increased by over 500ha p.a.

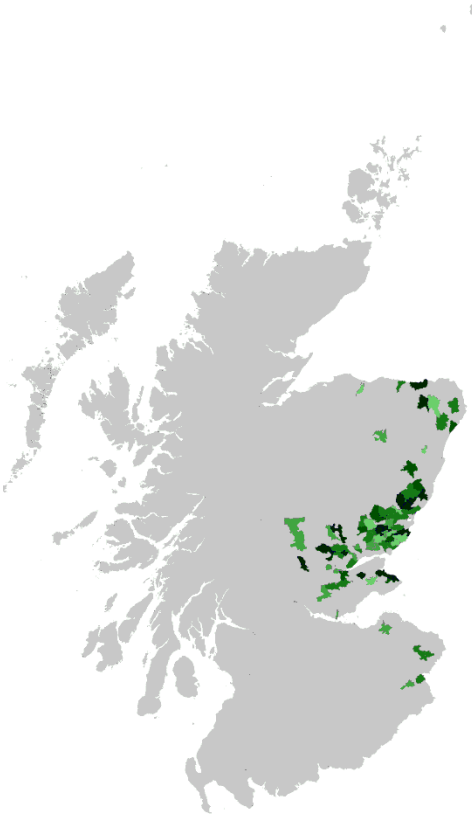
Distribution of seed potato production and Potato Cyst Nematodes 2000–2007



SPCS pre-crop soil sampling

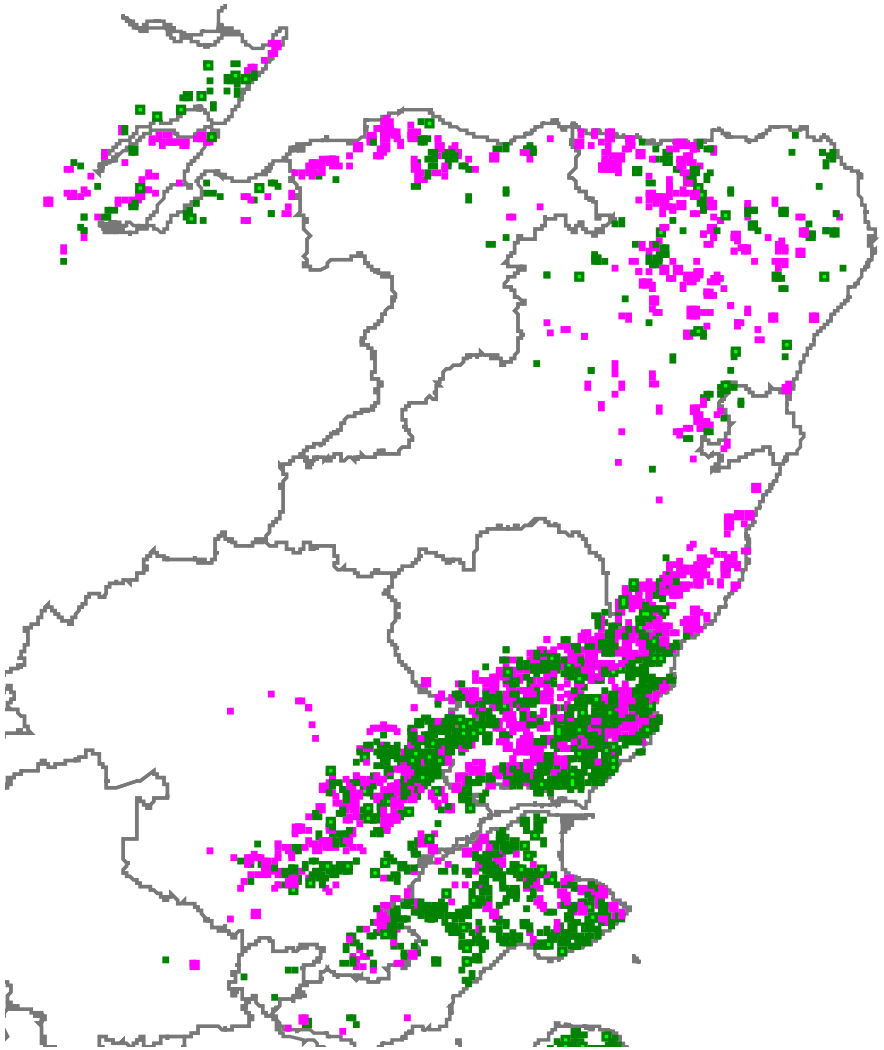


Globodera rostochiensis



Globodera pallida

Ware and seed potato production



Geographical variation in the incidence 2011-15

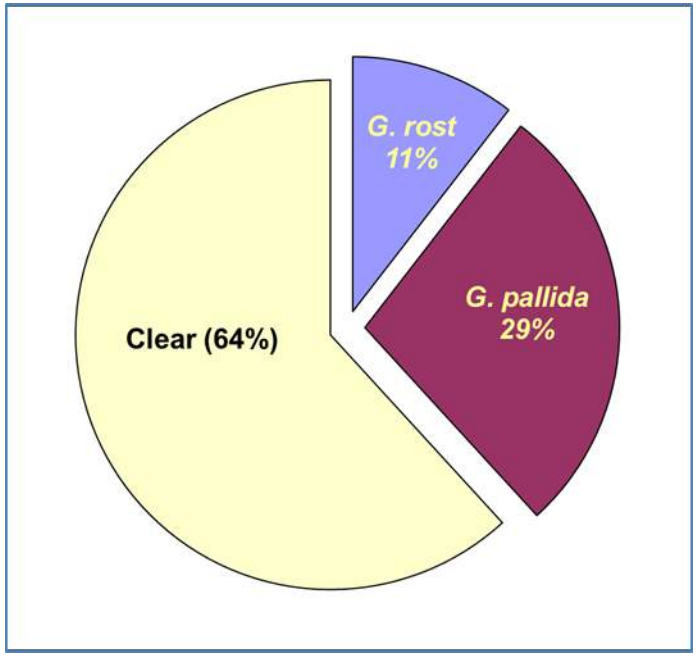
County	Area Tested	Area with *G. pallida*	Area with *G. rostoch*	*G. pallida*	*G. rostoch*
ANGUS	31%	70%	48%	228%	158%
PERTH	17%	10%	17%	62%	105%
ABERDEEN	12%	3%	3%	23%	25%
KINCARDINE	11%	6%	10%	60%	97%
FIFE	6%	5%	7%	81%	119%
ROSS & CROMARTY	5%	0%	1%	2%	27%
BANFF	4%	1%	3%	24%	76%
MORAY	4%	2%	5%	37%	123%
BERWICK	3%	1%	1%	21%	20%
Others	8%	3%	3%	40%	45%

Data in first three columns expressed as a percentage of the totals for Scotland

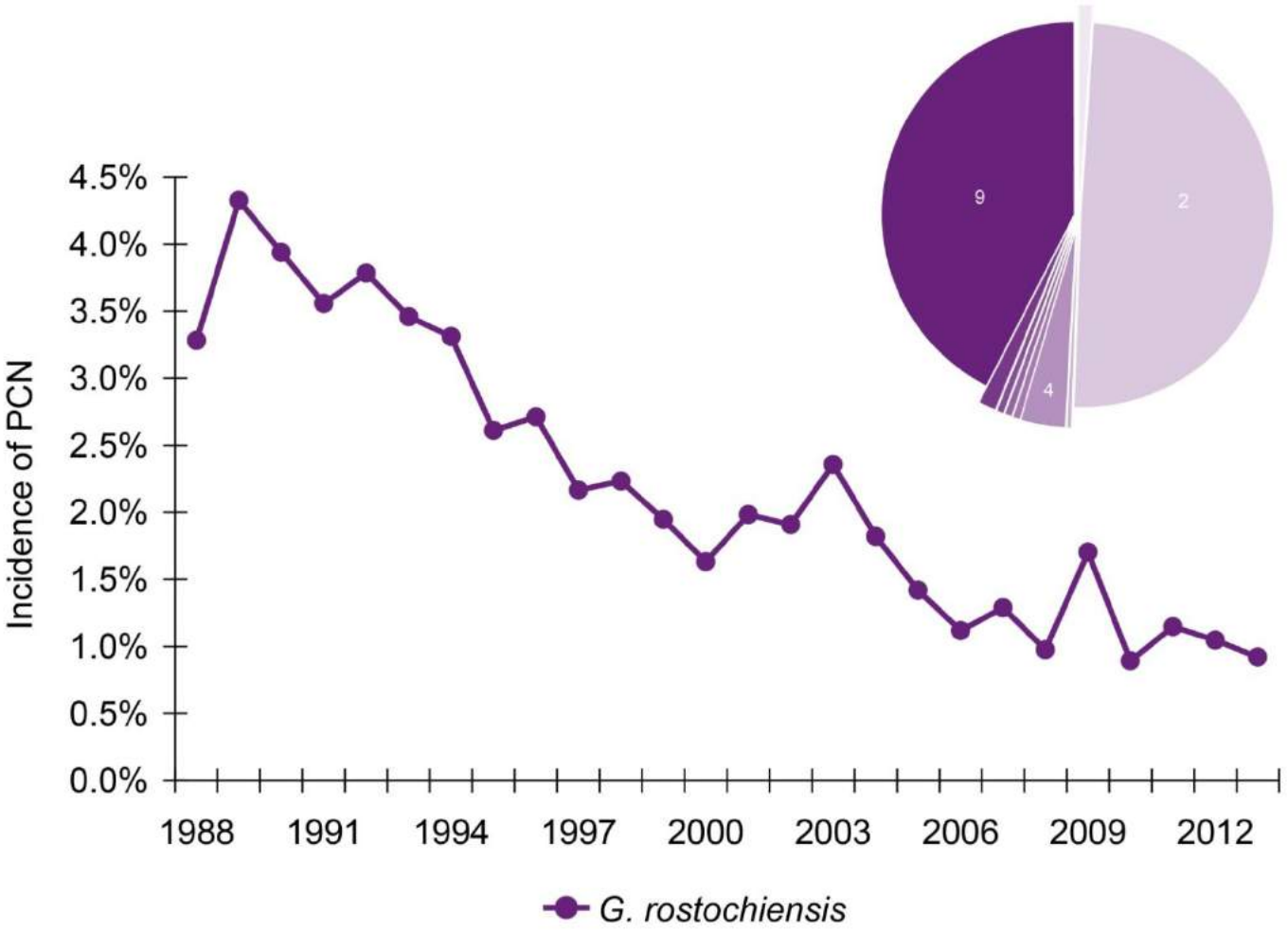
Data in last two columns indicate under/over-representation w.r.t. Scotland

Ware survey - Scotland

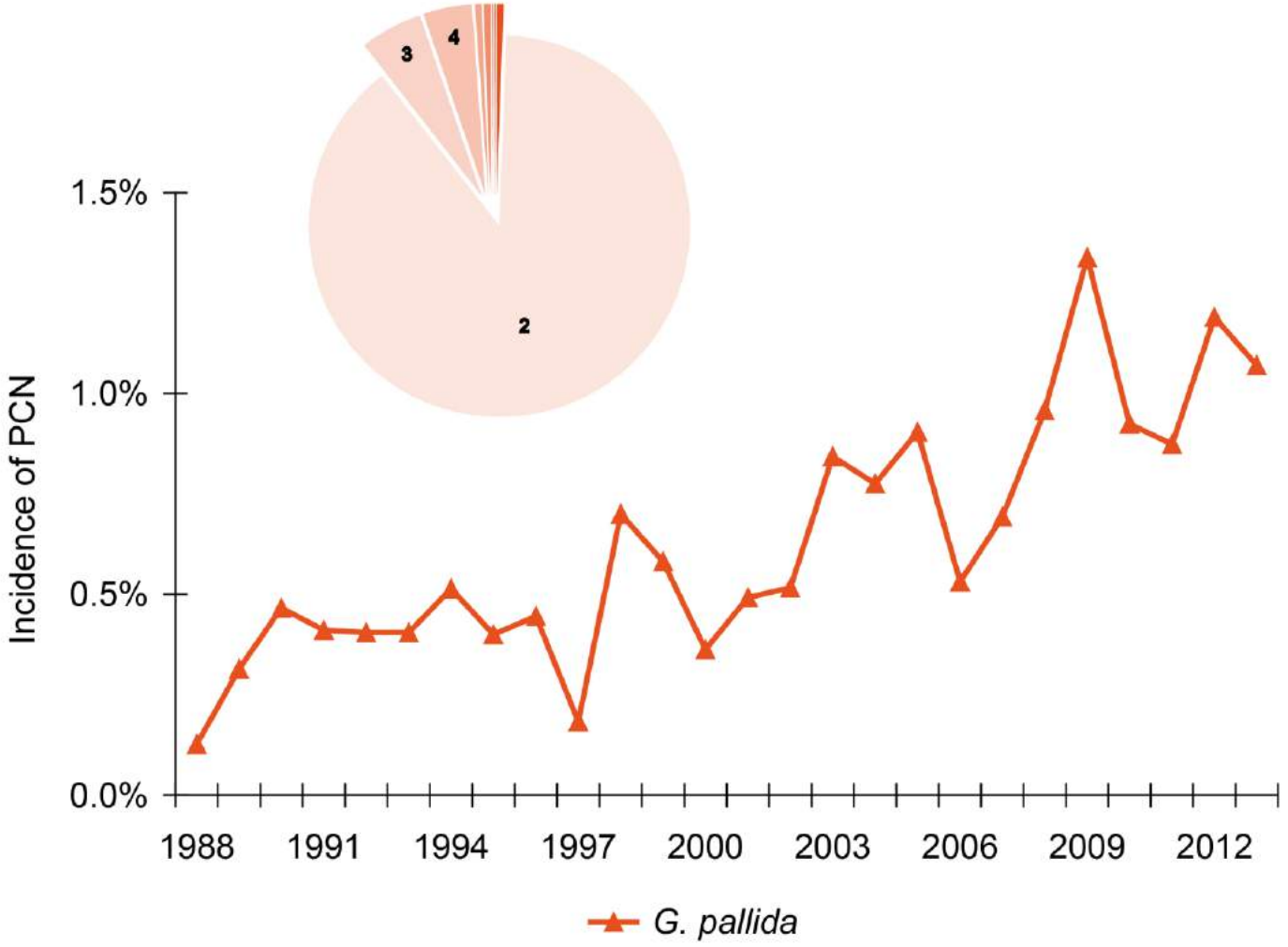
- 0.5% of c.15,000 ha planted with ware each year
- Approx. 80ha - 4ha from each of c. 20 fields p.a. (i.e. only 102 fields or 403 ha over 2010-14)
- Chosen at random, only one field per farm
- Sampled at 400ml/ha
- If Potato Cyst Nematodes found – as infested, crop cannot be planted
- 36% of Scottish ware potato land is infested
- *G. pallida* is the dominant species



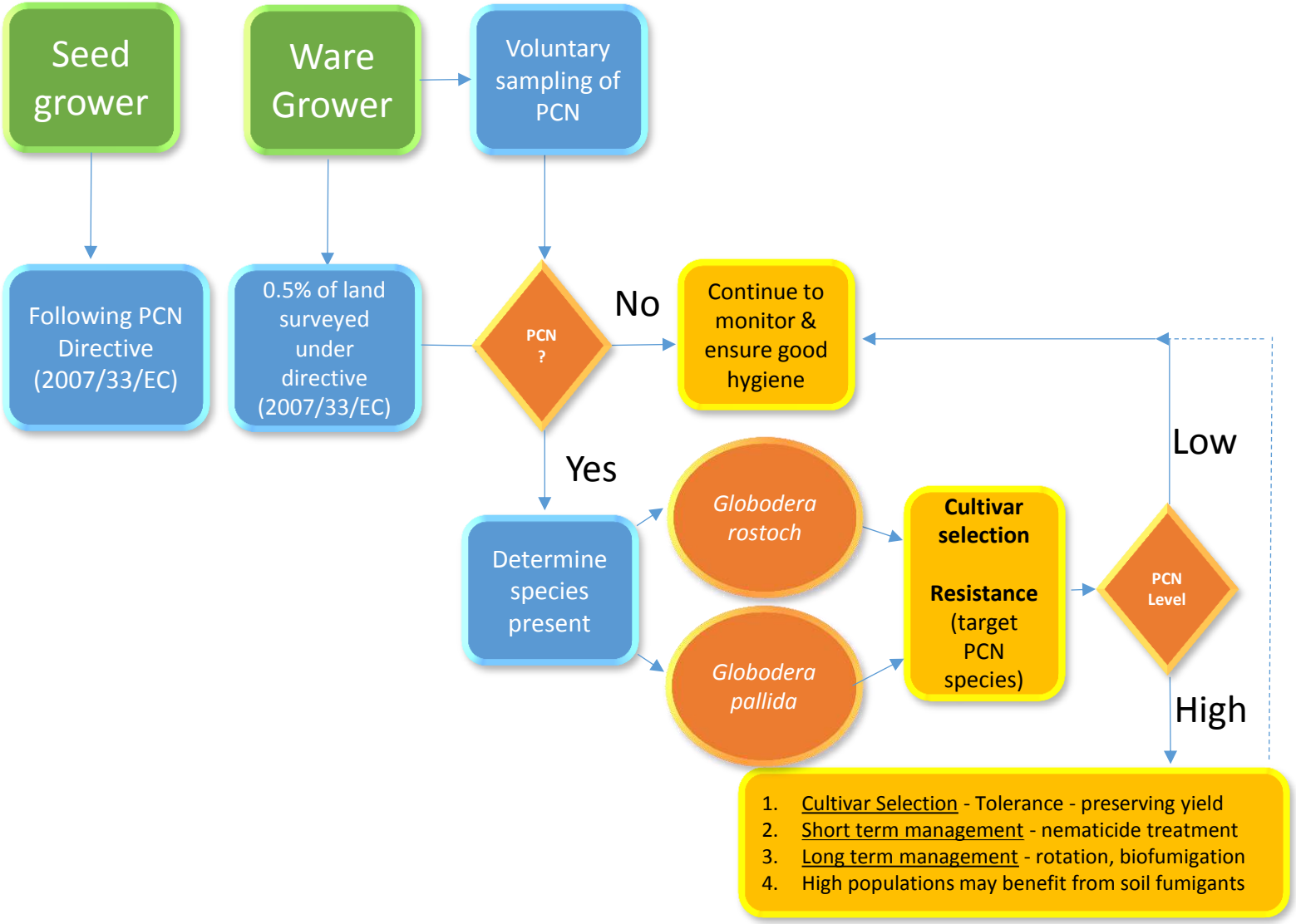
G. rostochiensis – incidence and resistant varieties



G. pallida – incidence and resistant varieties



Summary of PCN management



Conclusions – Impact of New Directive in Scotland

- The rate of soil sampling has increased 2.1-fold
- Area of land recorded as infested has increased 2.2-fold
- Angus is the county with by far the highest incidence of PCN
- *G. pallida* is the dominant species in Angus, but *G. rostochiensis* still dominates elsewhere
- 7.5% of land entered for seed production in Angus was lost to PCN each year (2011-14). Improved of *G. pallida* is urgently required
- The greater intensity of potato production in Angus is likely to have 'advanced' the Potato Cyst Nematode problem in this county
- The higher sampling rate introduced with the new Directive have highlighted the Potato Cyst Nematode problem
- Overall, 36% of ware land surveyed in Scotland has tested positive for Potato Cyst Nematodes, compared with 5.3% of seed land





www.sasa.gov.uk

The Scottish Government

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