The challenge of increasing potato production for a world of 9 billion people – 10 February 2011

Peter J Gregory

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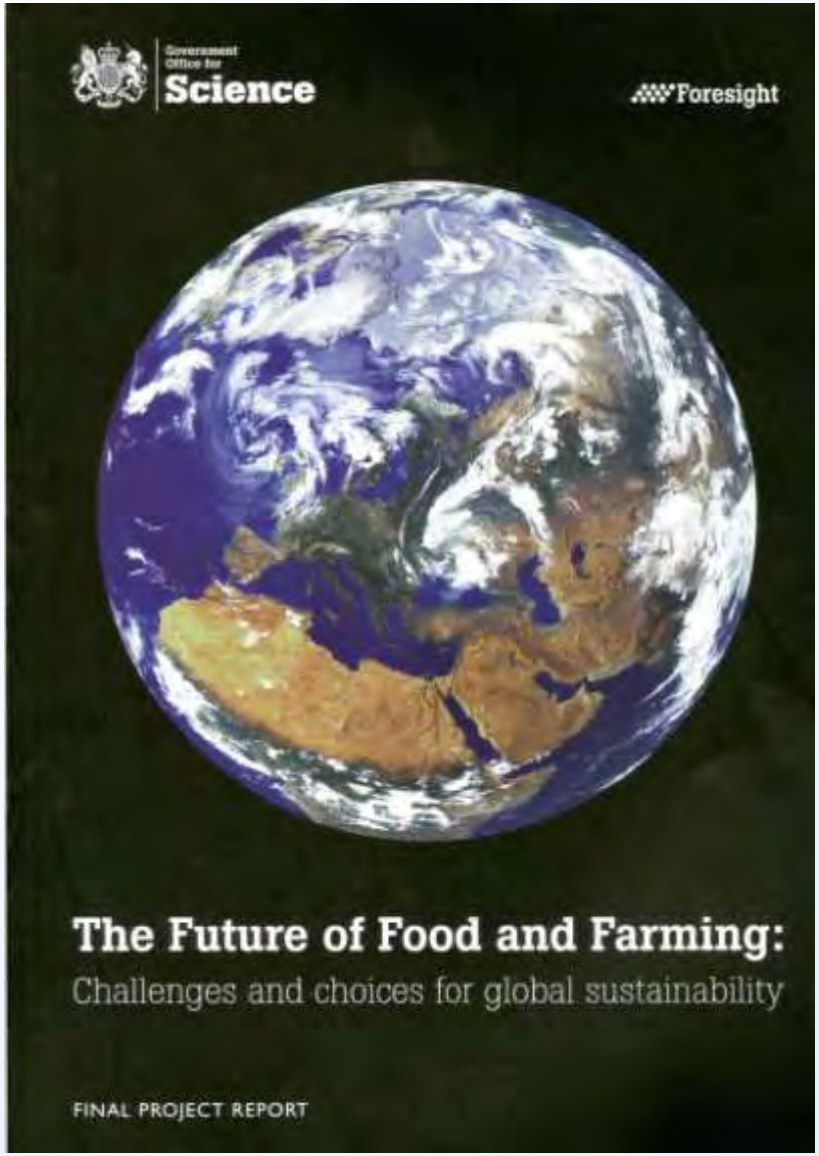
UK Foresight



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Some big challenges

- Food security – global farming review
- Research at SCRI - producing more with less, and reducing waste
- Climate change
- Conclusions

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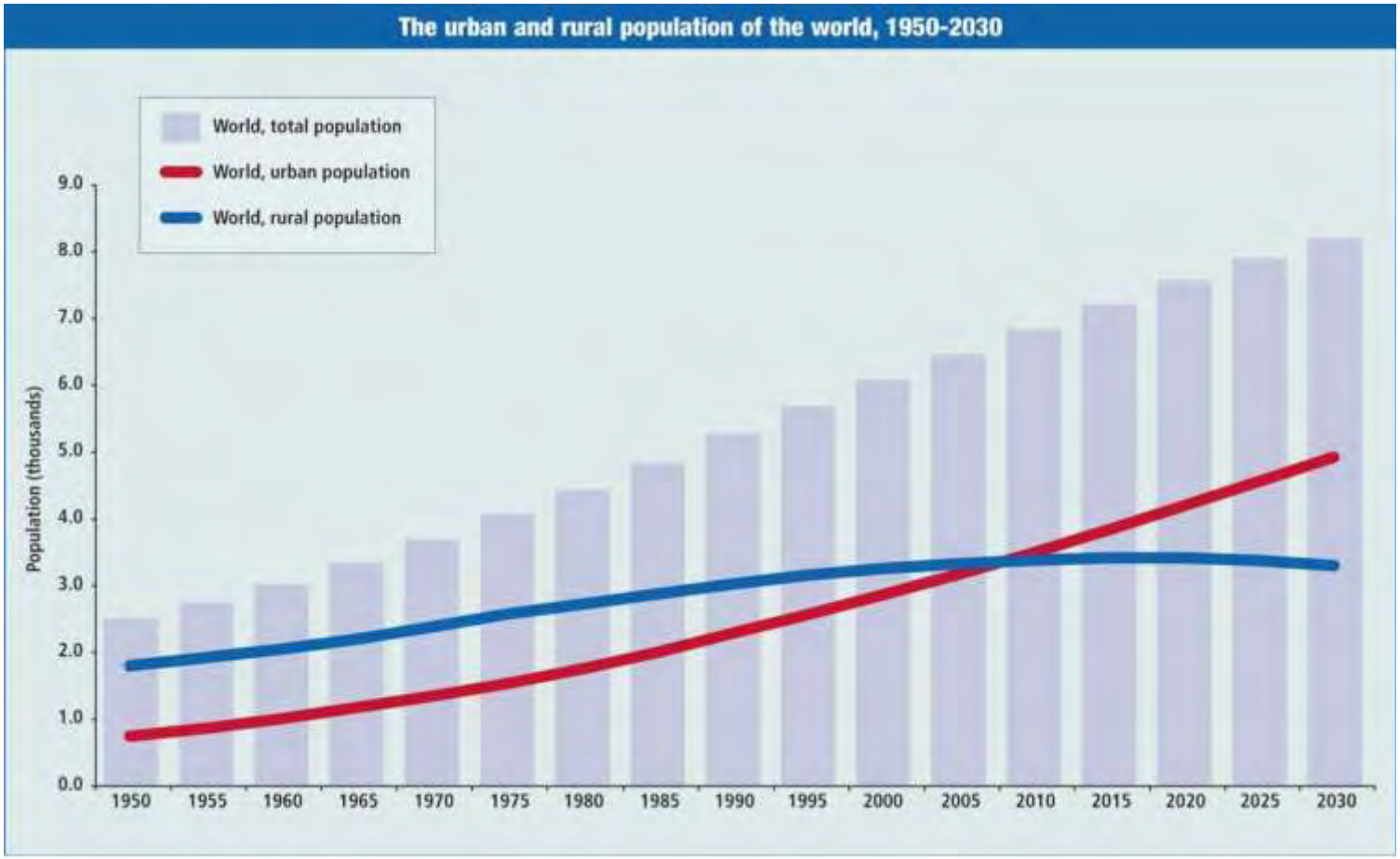
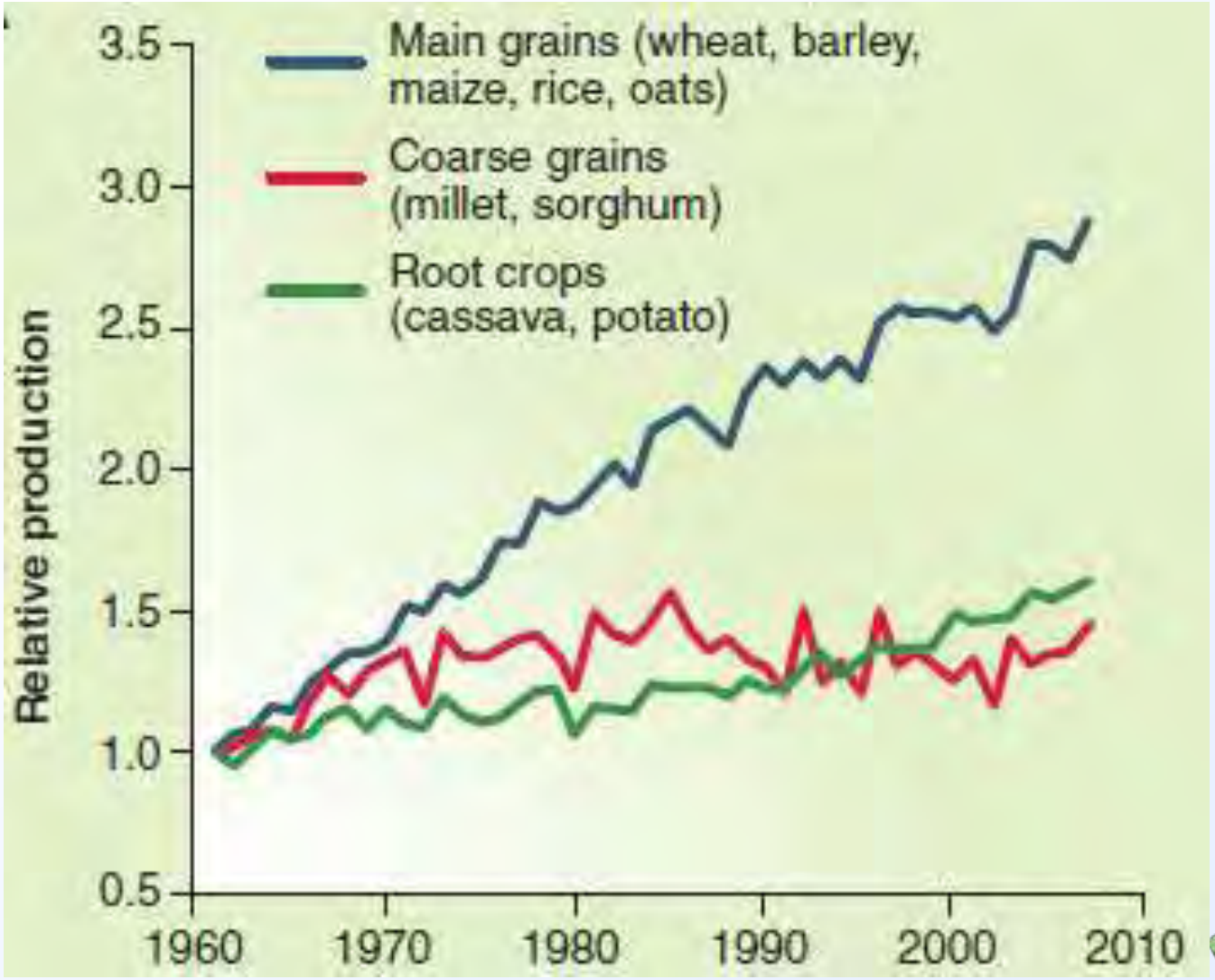
Food security

Rural and Urban Populations



Changes in the relative global production of crops since 1961 (from Godfray et al. 2010)



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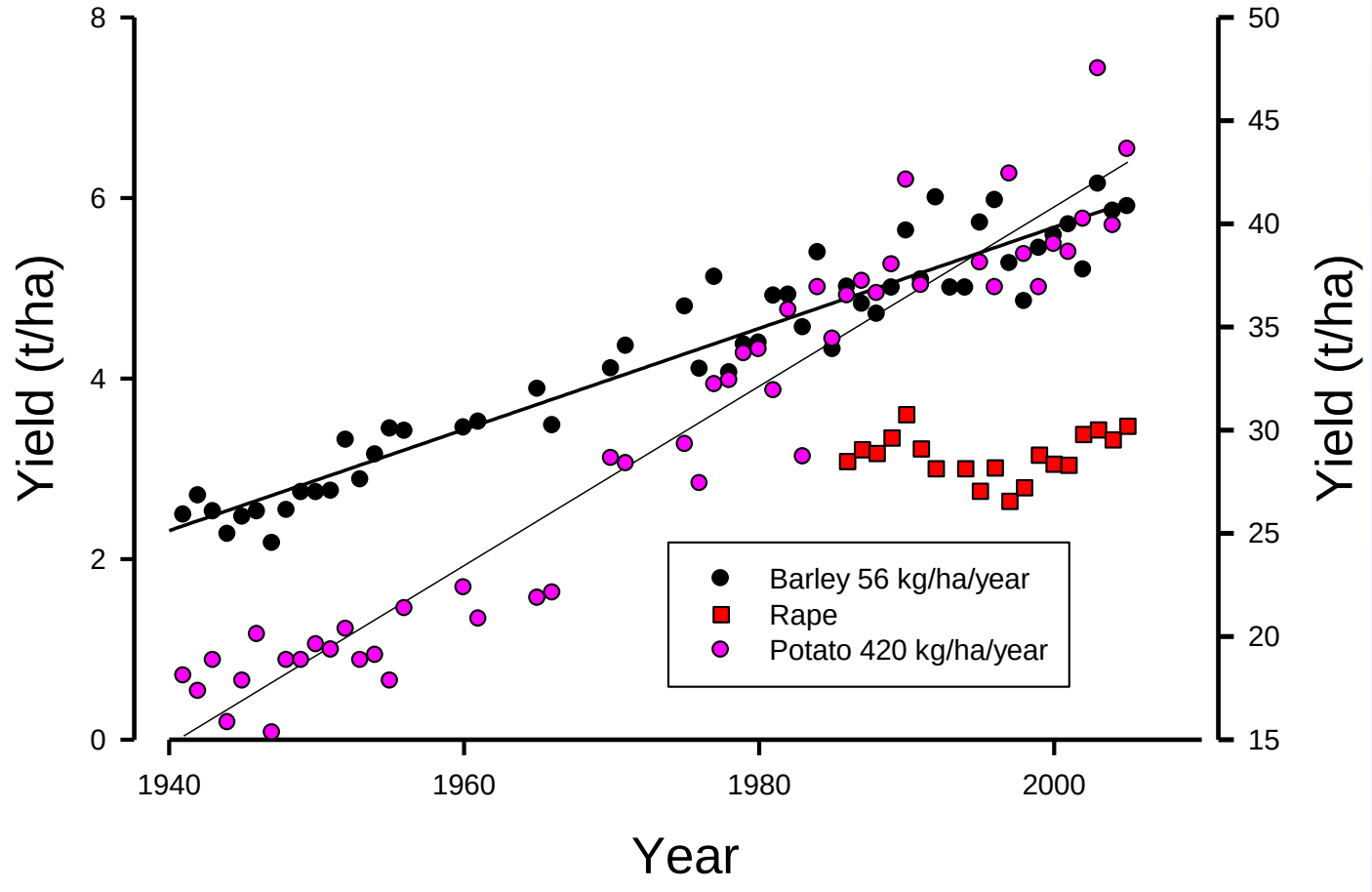
Changes in Yield, Scotland, 1940-2005



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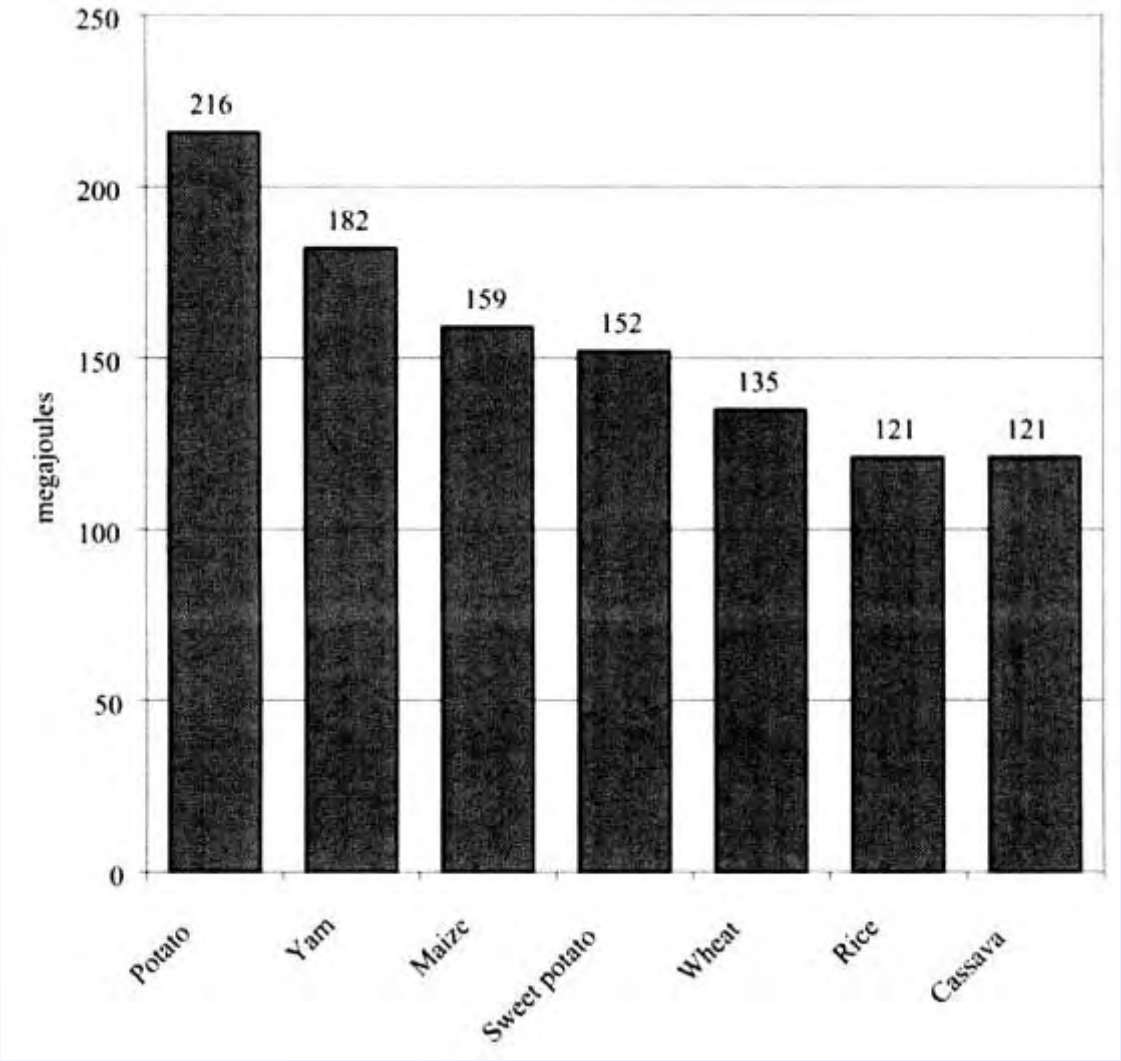
Edible energy production (MJ/ha/day – from Scott, 2002)



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The Future of Food and Farming, 2011: Key Challenges

- Balancing future demand and supply sustainably (sustainable production/waste reduction)
- Addressing the threat of future volatility in the food system
- Ending hunger
- Meeting the challenges of a low emissions world
- Maintaining biodiversity and ecosystem services while feeding the world

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SCRI research - producing more with less, and reducing waste

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The Commonwealth Potato Collection

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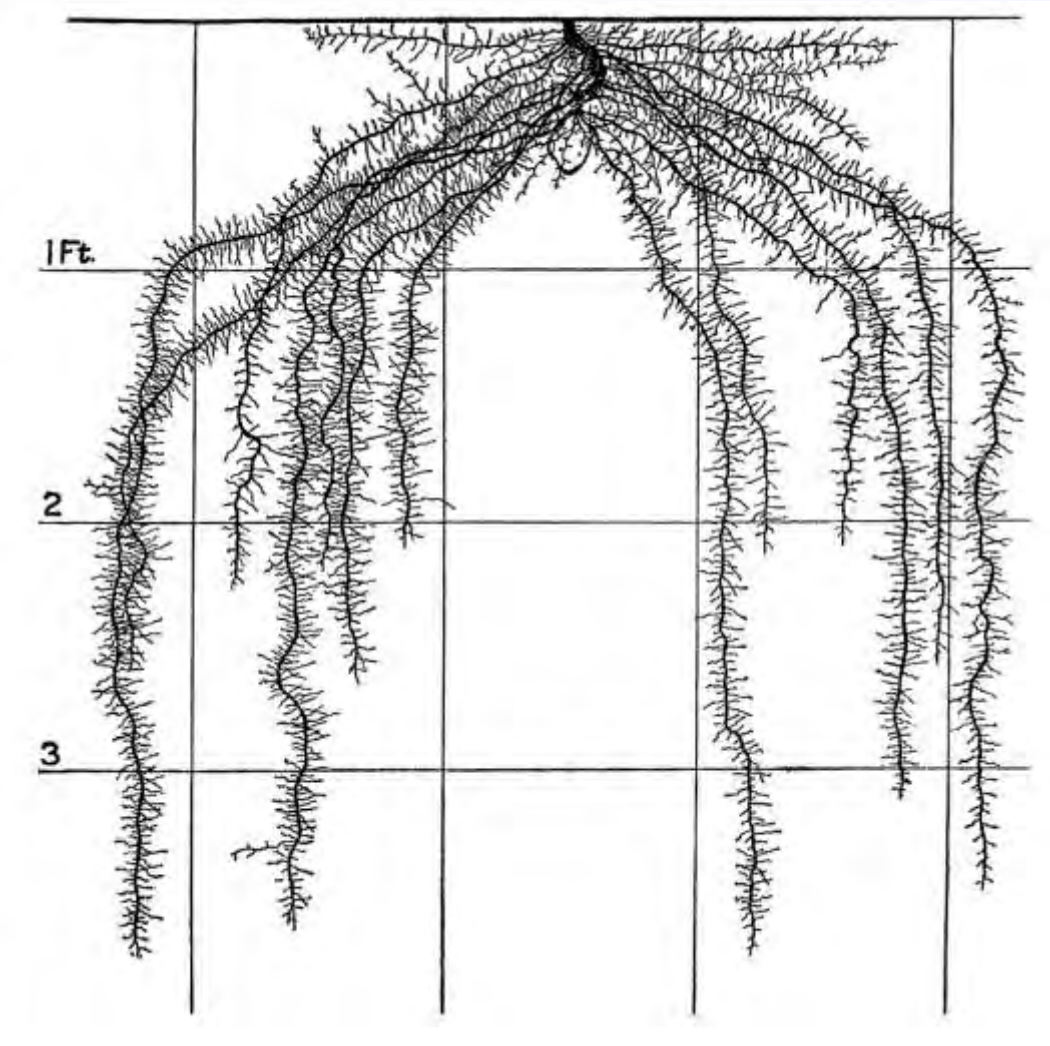
Potato roots at maturity (Weaver, 1926)



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Excavation of a potato root system

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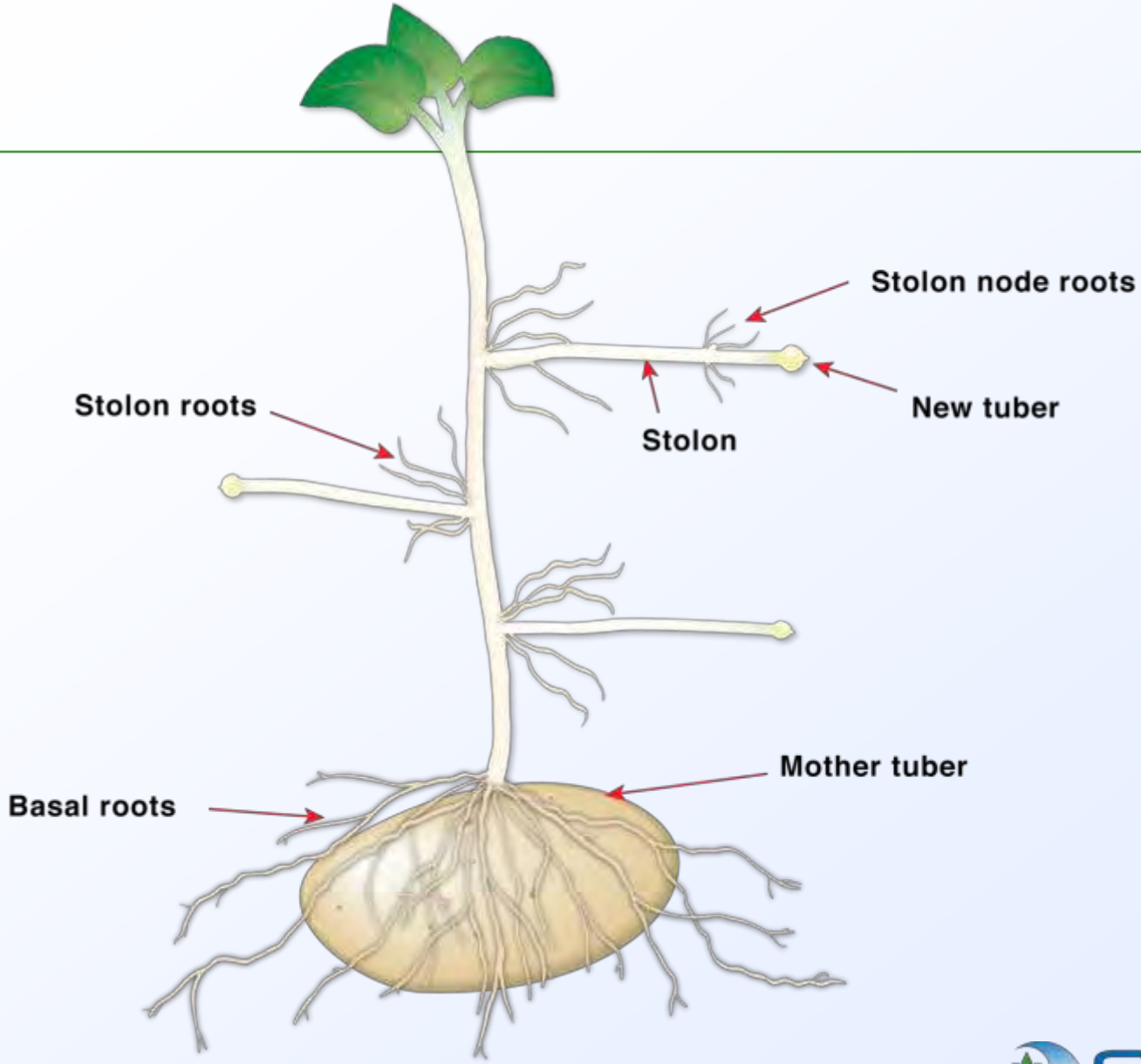

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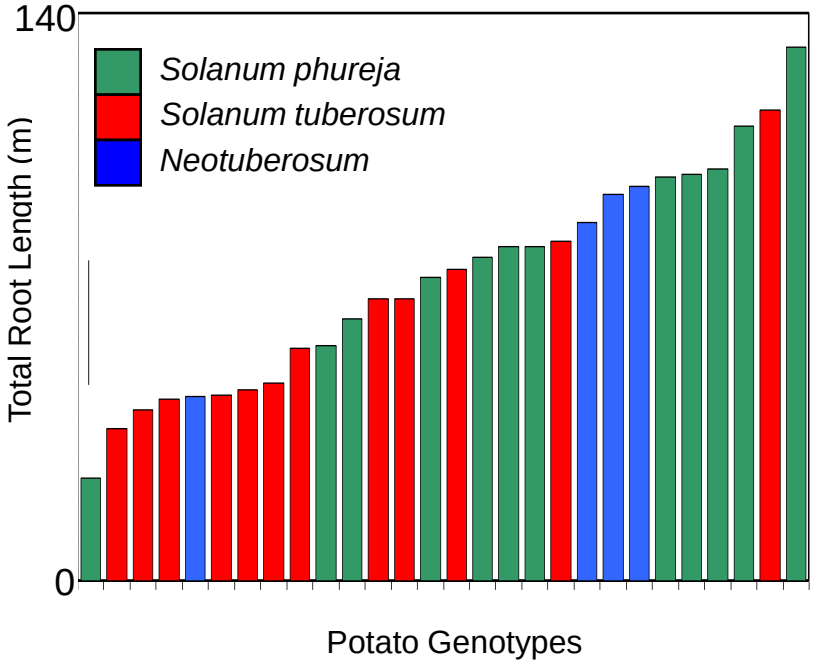
Root characteristics shown to impact resource capture

~5-fold variation in root length



RERAD Workpackage 1.7.1
RERAD Workpackage 1.2

Wishart et al. 2010 JXB (in prep)

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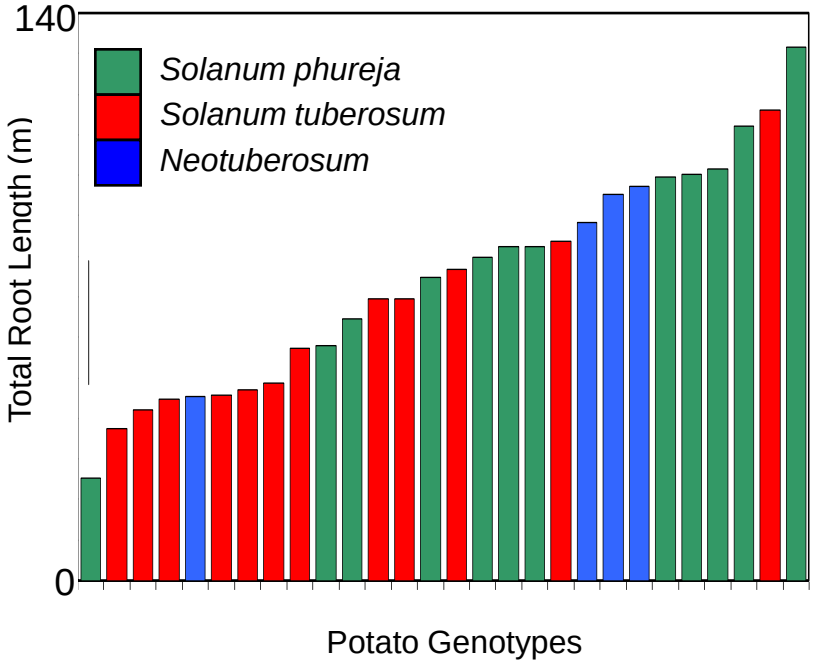

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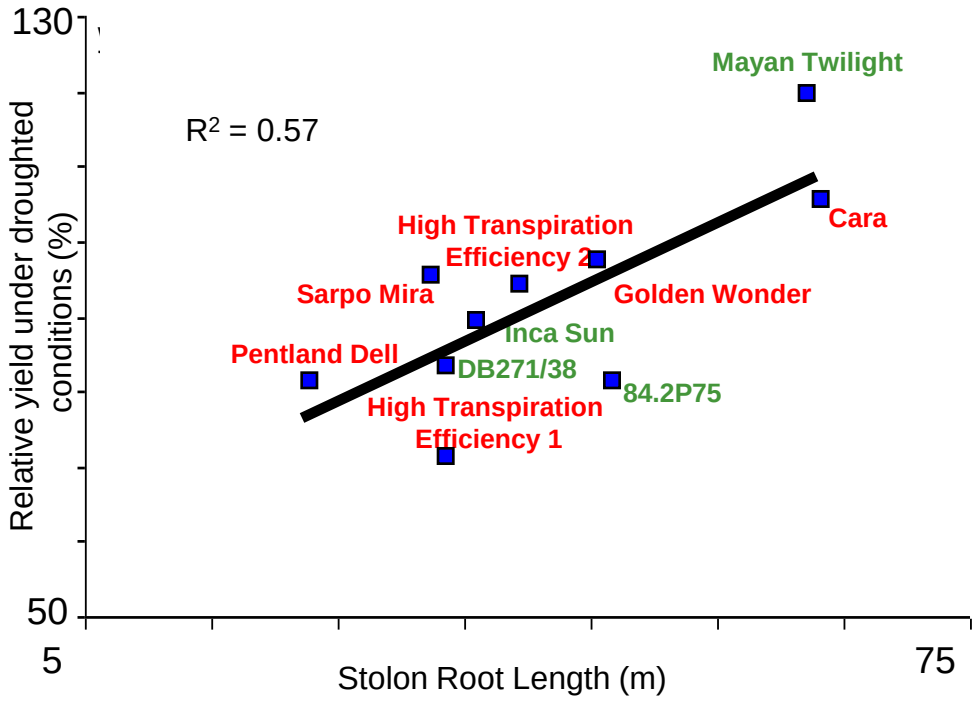
Longer stolon roots = better drought tolerance



Late blight disease

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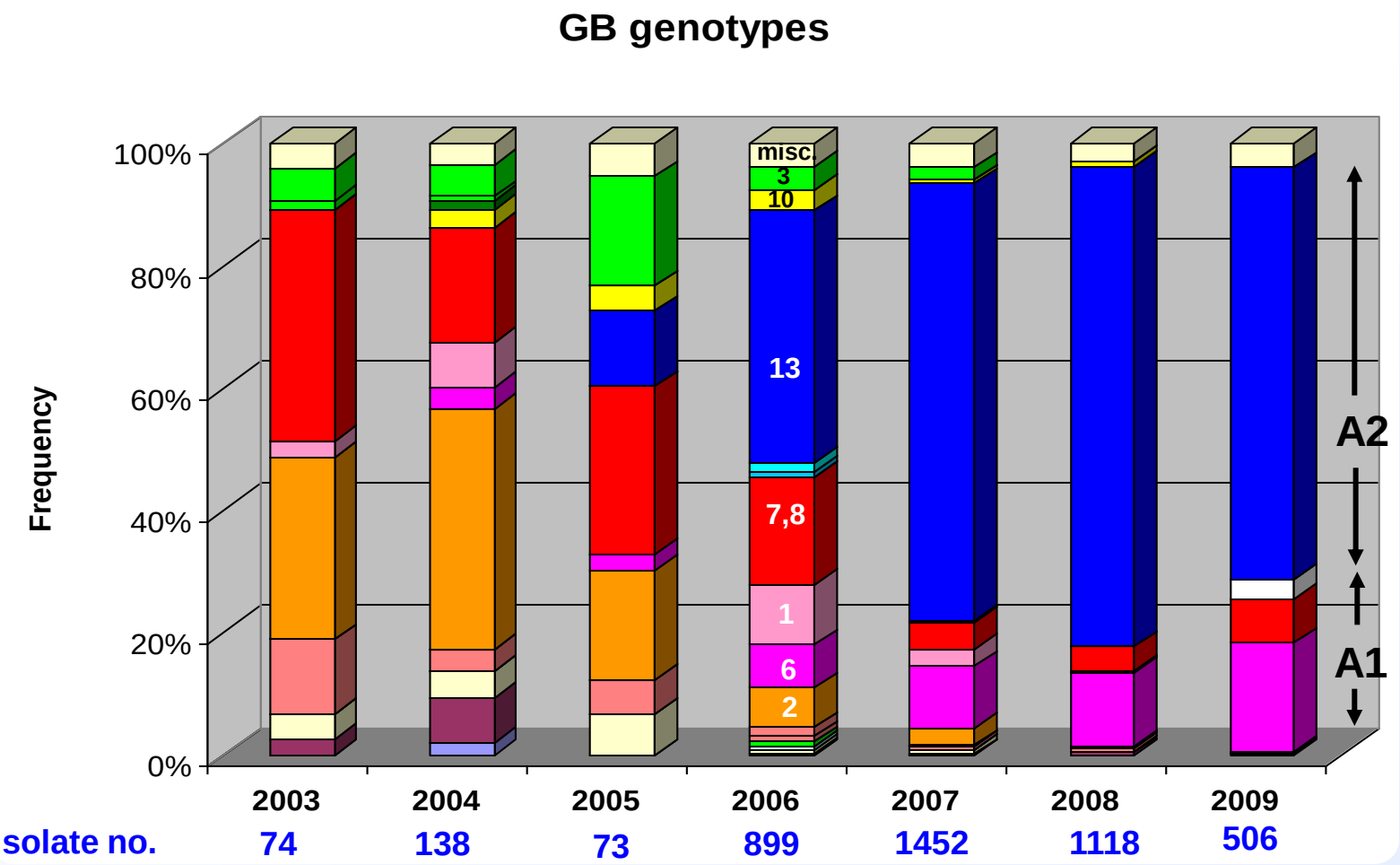
Population change – *P. infestans*



Genotype 23_A1 – white tomato, petunia, potato. Increase?

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Blue 13 overcomes blight resistance in cv. Stirling

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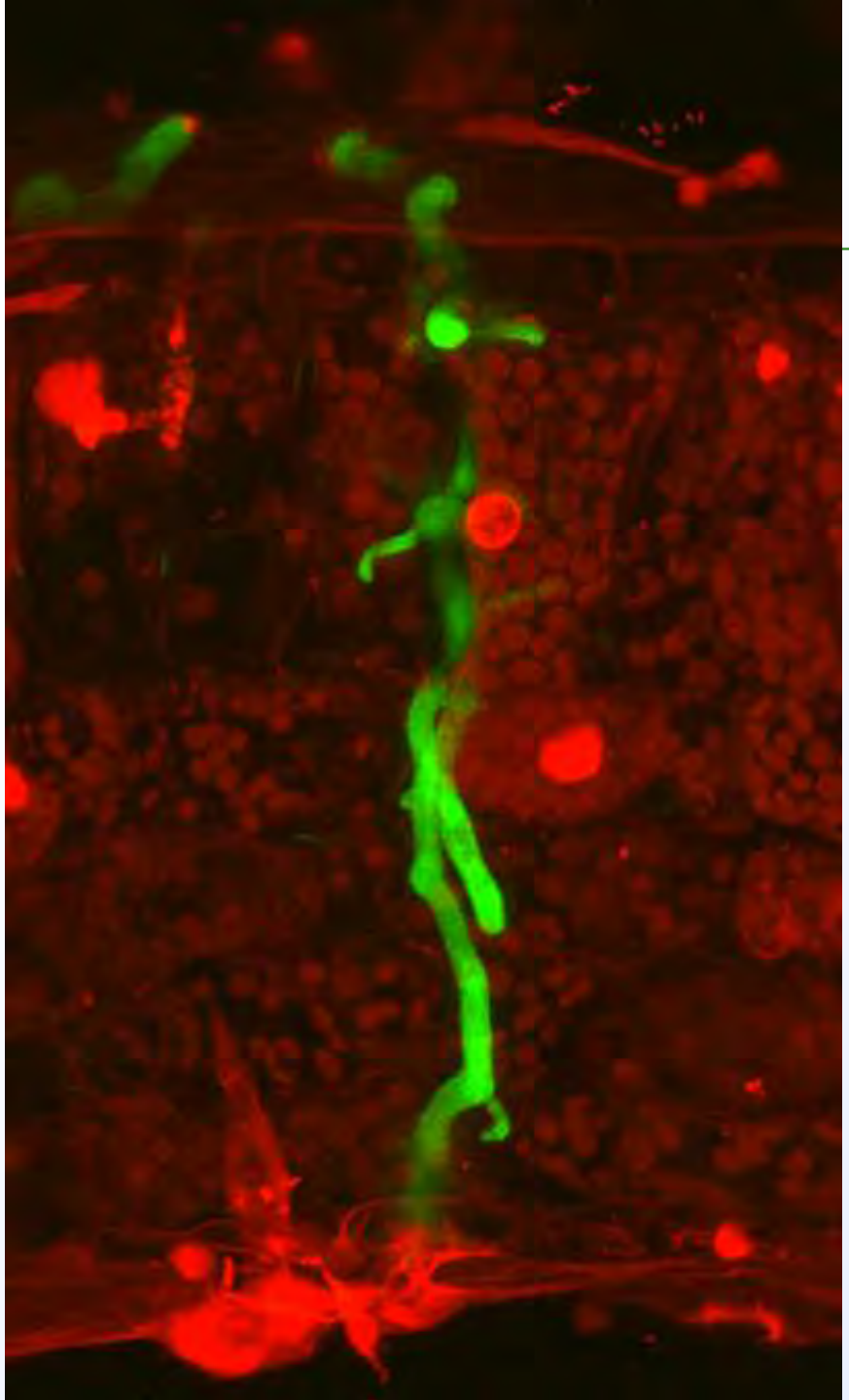
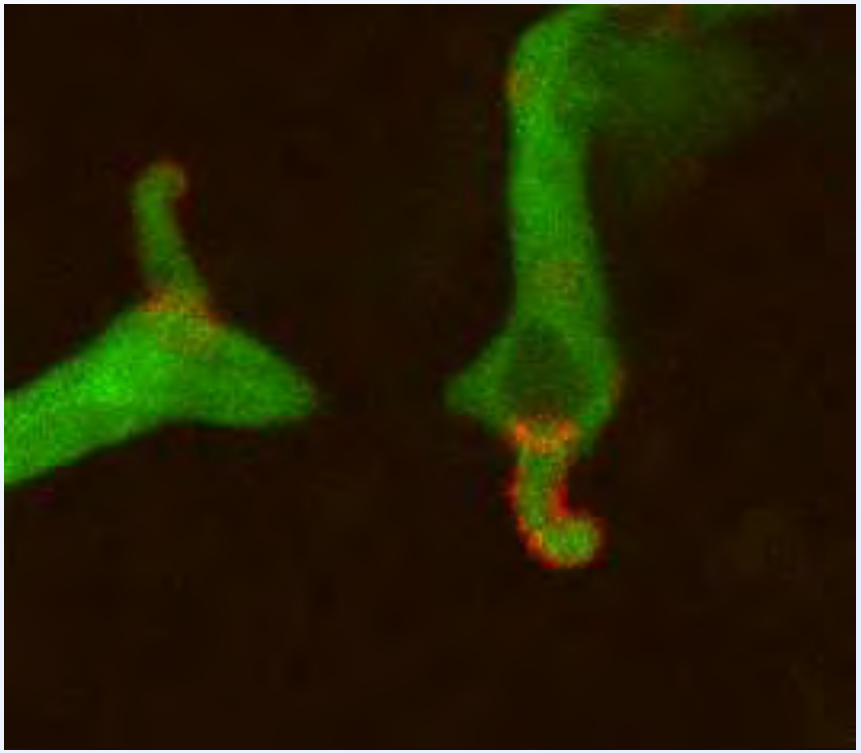


P. infestans infection



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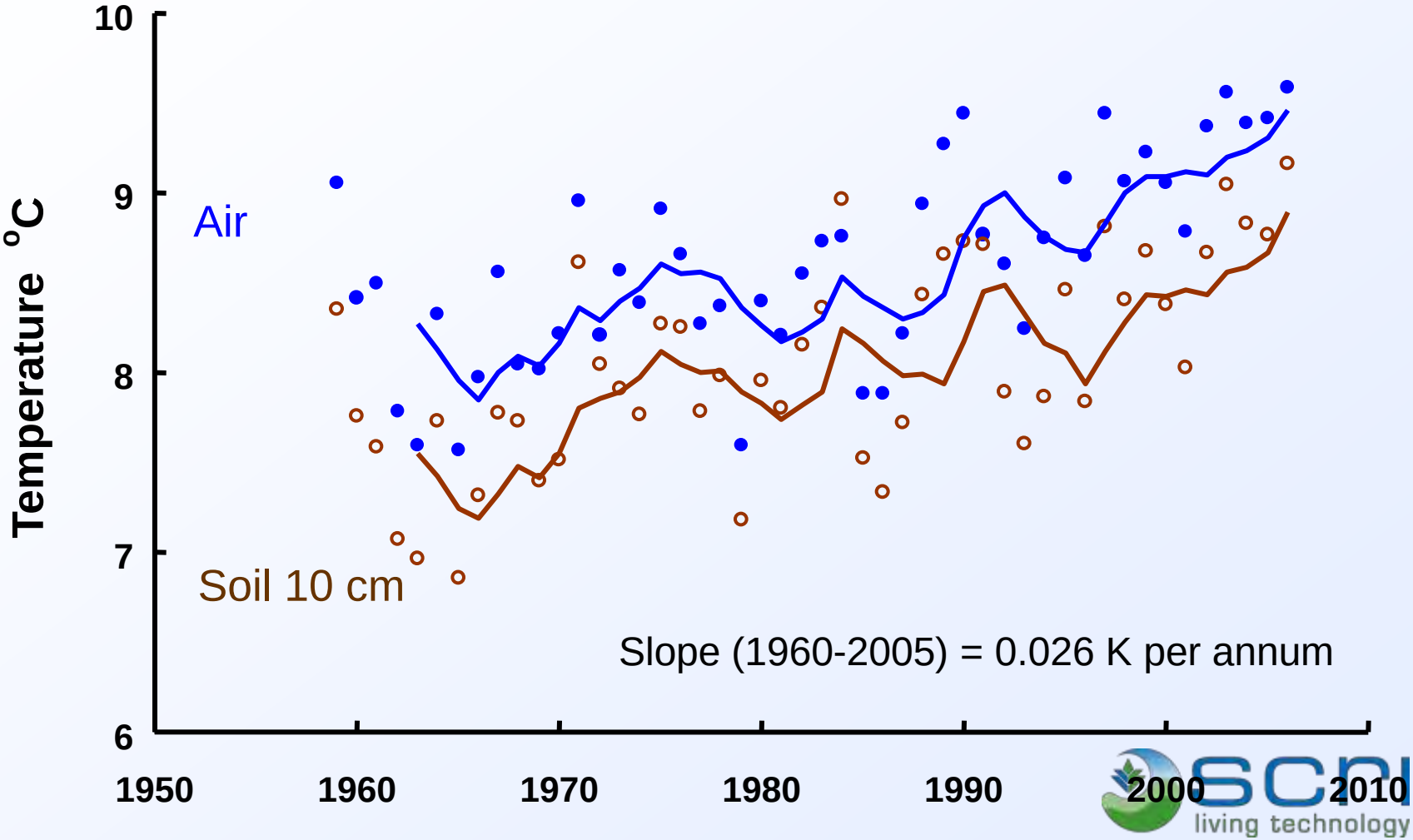
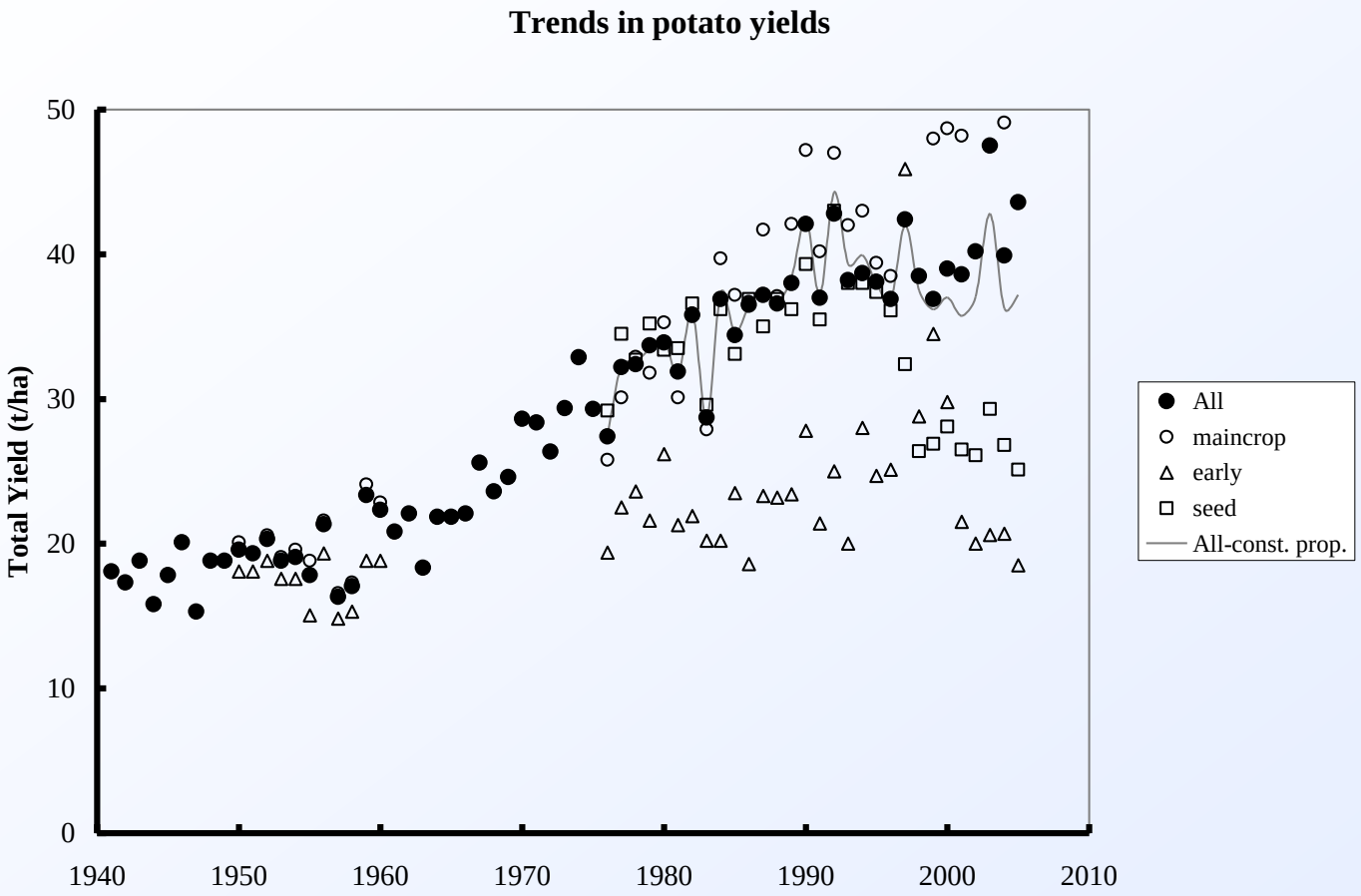
Climate change

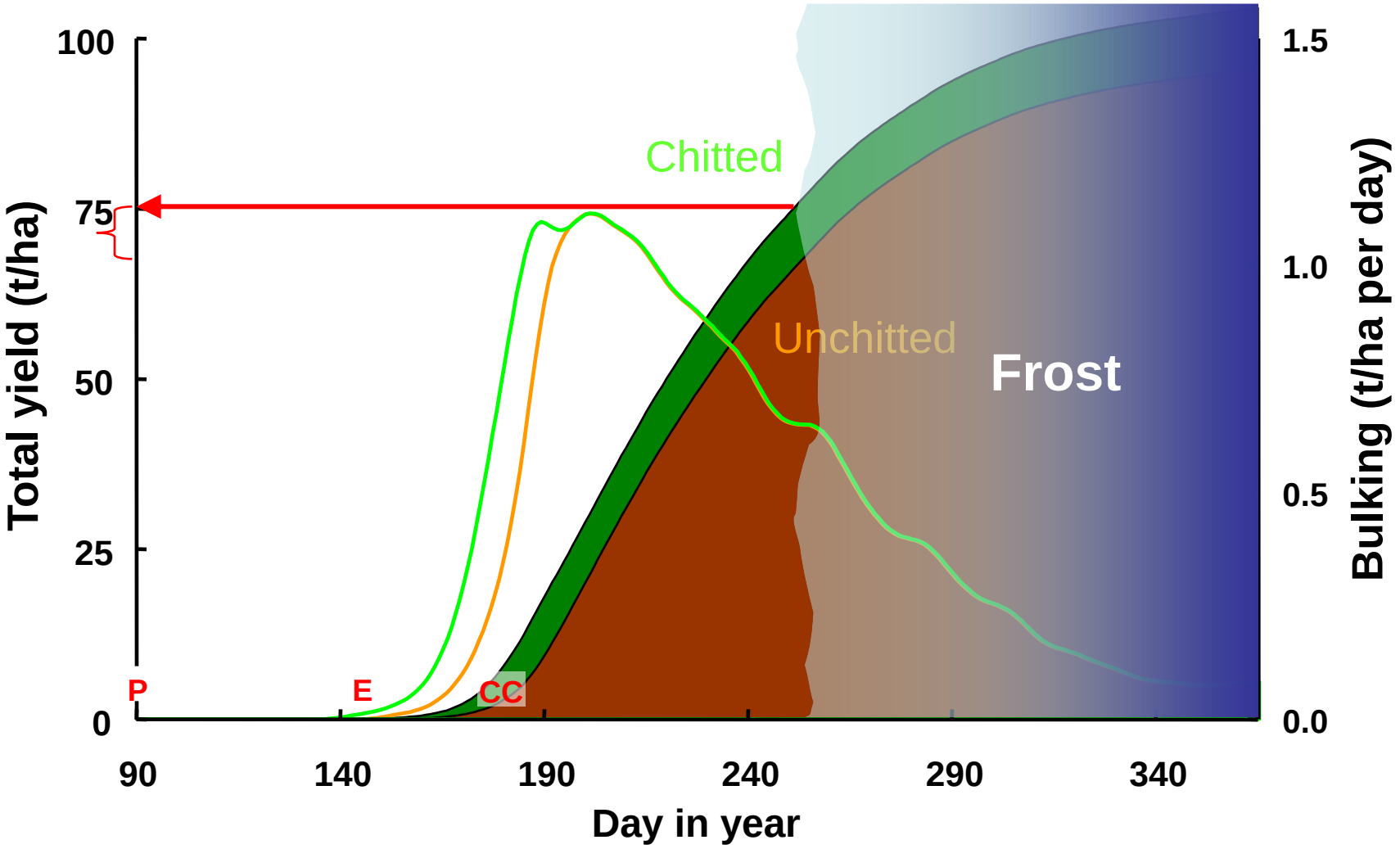
Annual mean temperatures (Dundee)



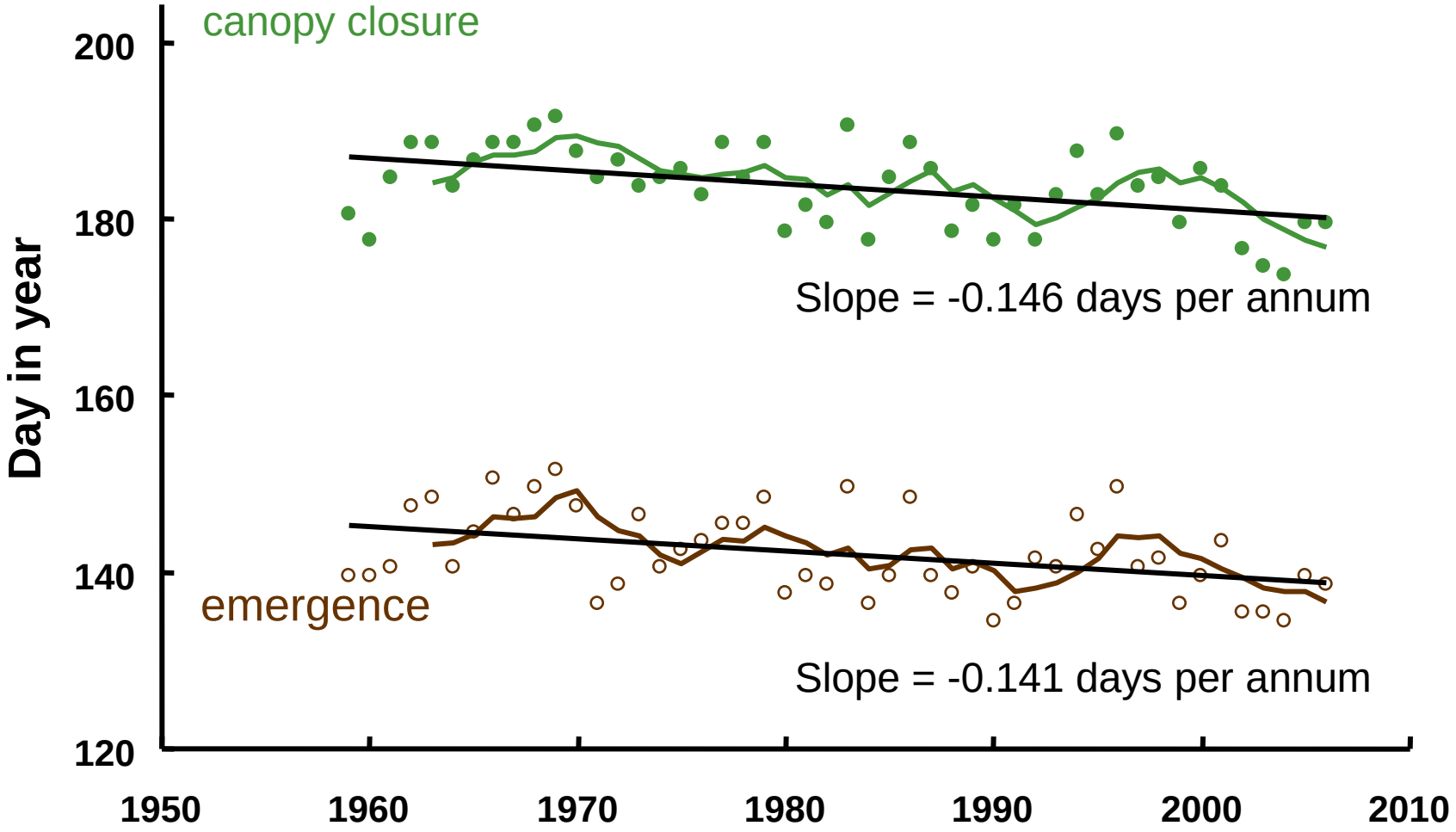
Change in maincrop potato yields, Scotland



Potential yield using long-term average weather (1970-2000)



Predicted dates - Chitted



Estimated average trends in potential yield (t/ha/annum)over the period 1960-2006.

Site	Unchitted	Chitted
Kinloss	+0.41	+0.29
Craibstone	+0.37	+0.33
Mylnefield	+0.26	+0.22
Royal Botanic Gardens	+0.15	+0.15
Cockle Park	+0.21	+0.23

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Potatoes – contribution of warming to increased potato yields

- Since 1960 both soil and air temperatures have risen by 1.2 K (0.026 K per annum)
- A consequence of this observed rise is that potato crops planted on the same date throughout this period are expected to emerge some 6 to 8 days earlier today than in 1960.
- Since maximum bulking rates are around 1 t/ha per day of fresh tubers, this earliness translates into a potential yield increase of 6-8 t/ha.
- This is amounts to about 25% of the observed increase in yields (about 30 t/ha) in Scotland since 1960.

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Conclusions

- Less land per capita and an urban population is likely to increase global demand for potatoes (but not Europe) – “Trade will be more important – not less”
- Pressure on land to deliver multiple benefits (e.g. clean water, energy, tourism) will lead to pressure for more sustainable production systems using resources more efficiently – “Grow more at less cost to the environment”
- Climate change may continue to benefit potato growers in Scotland – “The UK will have to produce more to offset the shortage of water in southern Europe”

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SCRI will undertake research to develop new crops that are

- resilient to changes in climate
- resistant to current and emerging diseases
- produce more crop per unit of resource input
- meet consumer demands for tasty and healthy food

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Thanks to

- Bruce Marshall
- Tim George
- Philip White
- Steve Whisson
- Paul Birch
- David Cooke
- John Ingram, NERC

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