The economic context

Plant health and economics

- **Benefits = avoided losses**
- **Prevention/eradication/control confer benefits to oneself and others**
- **Plant health has public good properties**
  - People cannot be excluded from the benefits
  - Incentive to free ride on the management efforts of others

Market failure: plant health will be undersupplied by the market - requires public intervention

Plant health as a public good

1. Stakeholders who don't account for the potential risks they place upon others
2. Varying phytosanitary standards and different consequences
3. Plant health status can depend upon the poorest performer (weakest link public good) - see 1.

Plant health: asymmetric information

- Akerlof's lemons!
- Buyers have less information than the sellers regarding phytosanitary history
  - Search goods – find out before purchase
  - Experience goods – out of the box
  - Post-experience goods – only learn after a period of time …. to varying degrees the case for plants
- Post experience can last for a long time!

Public response to market failure in plant health

- Provide information
  - Extension
  - Research – improved diagnostics and development of more cost efficient eradication and control options
- Eradication programmes
- Regulate

Plant health: improved detection at “borders”

Improved detection efficacy

- Reduces post experience time lag - prevents/slows damage
- Beneficiaries: public / business sectors (dep. on pest/disease), potentially large benefits

Faster results

- Importers: reduced losses of perishable produce
- Inspectors: improved relations with importers
- Reduced impact of regulation - small scale benefit?

The impact of improved detection

Ask questions

- Pushing the science leads

Modelling

- Networks and agents
- Pest/disease in a landscape
- Technology parameters

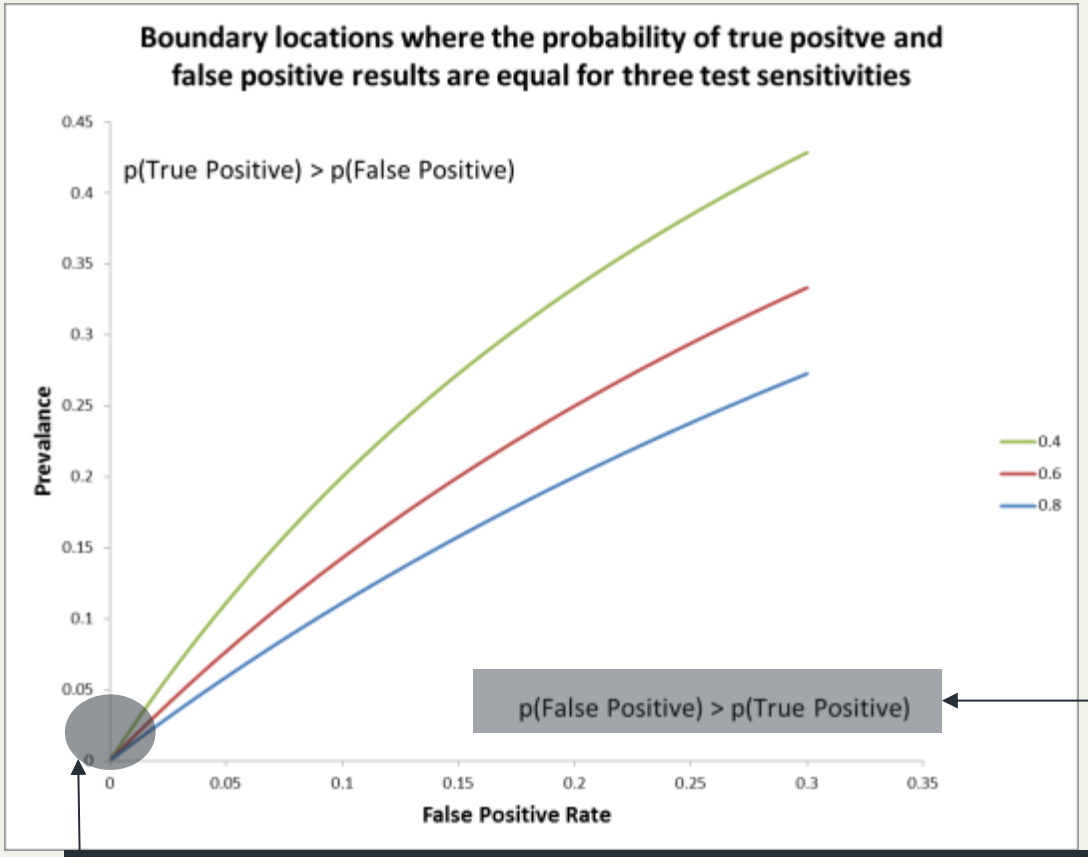
Is the technology good enough?

- Value of avoided losses
- How much better does it need to be or how much cheaper?

Technology questions

- Where/how your technology is likely to be applied? E.g.
  - What is the testing and reporting regime (hourly, daily, weekly?)
  - Can the detection location be easily moved around?
- Which technology it is aimed to replace or improve upon?
  - What advantages does the new technology have over the old technology
- Evidence/parameters of technology performance?
  - What is the sampling unit (e.g. leaf, container, greenhouse, forest …)
  - What is the true positive detection rate, ……..false positive
  - What is the uncertainty associated with these estimates

False Positives matter



LFD Example

True Positive: 37/43 = 0.86

False Positive: 7/117 = 0.06

More:

- False culling
- False quarantine
- False bans

  = Angry Stakeholders

Need to find stuff here. But at low prevalence, low false positive rate becomes more important – increased number of negatives so need to drive false positives down

Using the models

- Given technology effectiveness, what level of deployment is required to make early detection probable.
- Given constraints on the number of deployments how effective must a technology be to enable early detection.
- How much more effective is a targeted deployment of the technology than a random deployment
- If location *i* is positive, what is the probability that another location *j* is also positive