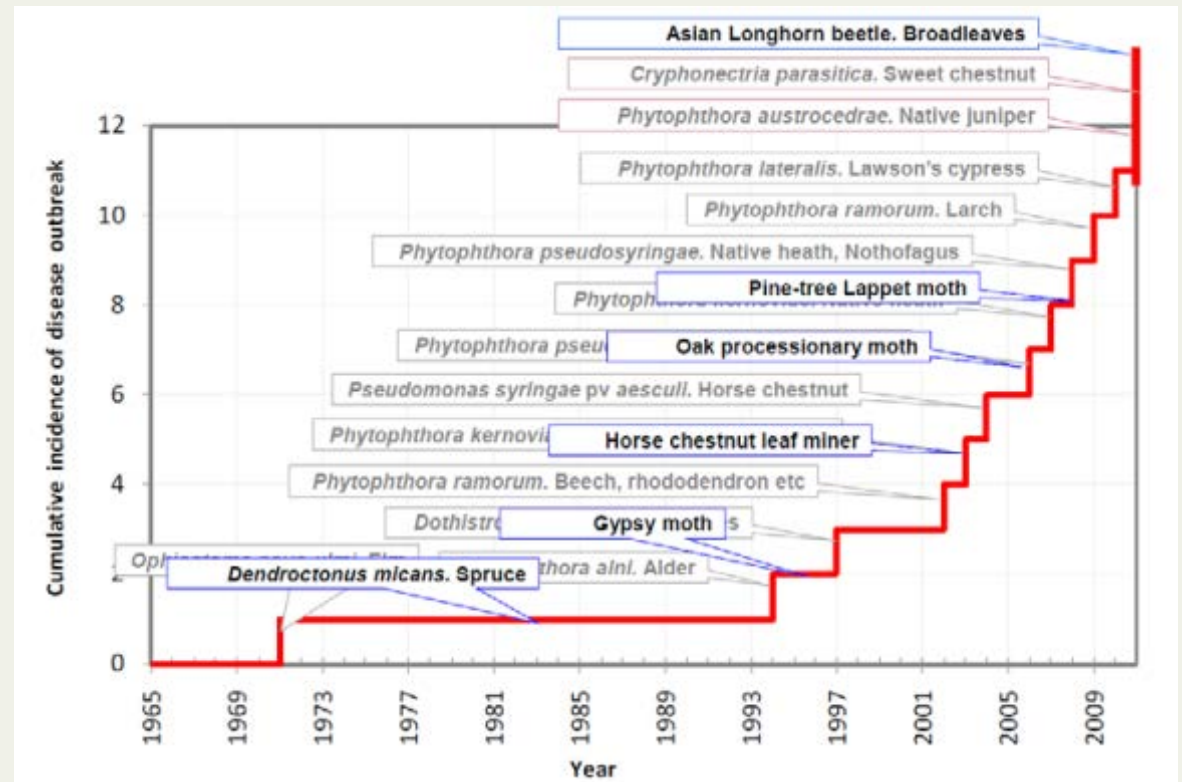


# A generic decision tool for assessing response options to tree pests in the UK

Glyn Jones  
Environmental Economist  
Fera



11<sup>th</sup> meeting: Ottawa, Canada 29 August-1 September 2017

# Content

- What we were asked to do
- How we did it
- Decision Support Tool
- Limitations

NB: we haven't finished it!

## Some Australian words of wisdom .....

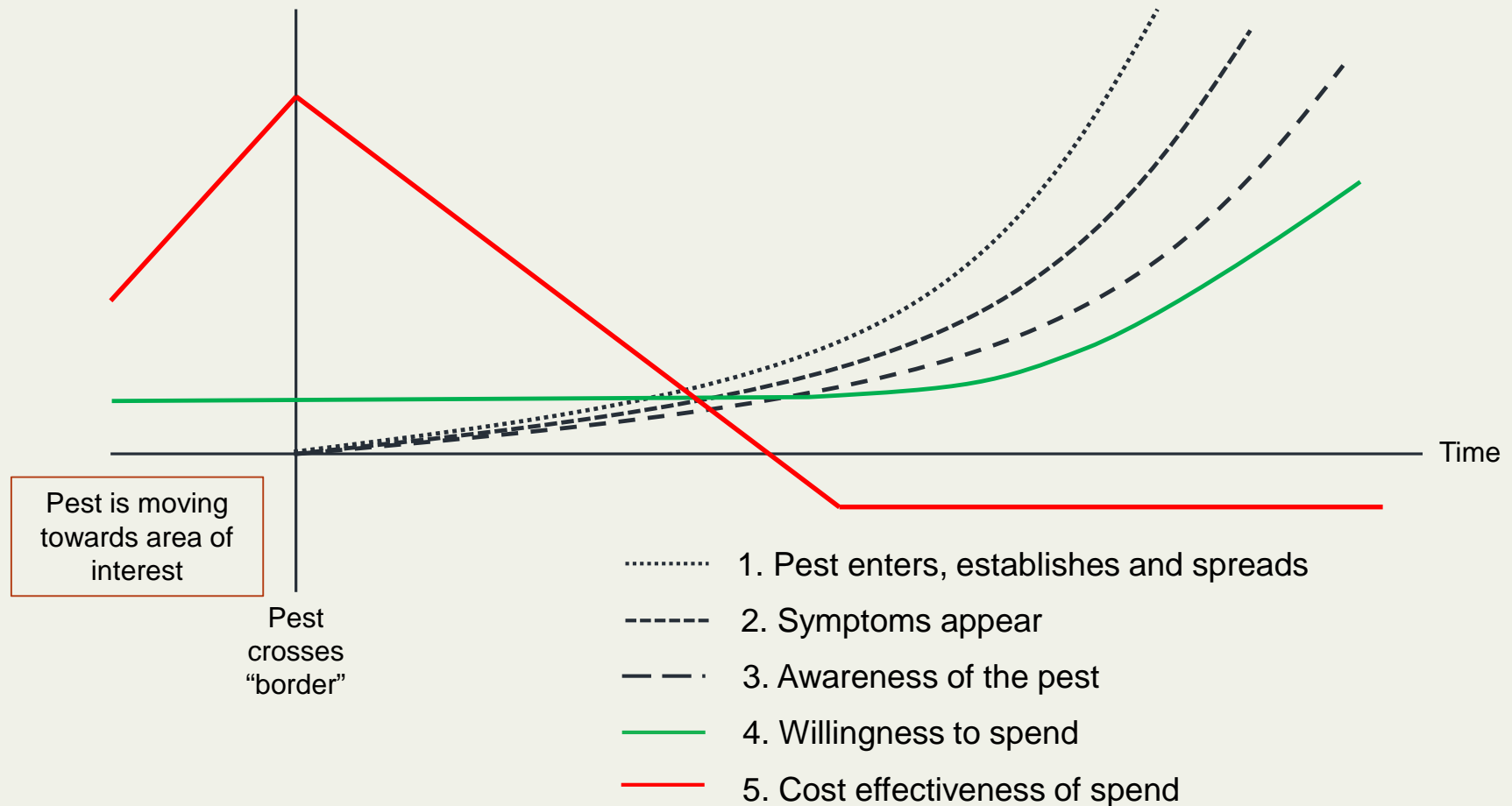
*Virtually all decision support people are time-pressured ..... seldom have the luxury of researching specific species in detail over months or years*

*.....usually asked to predict the economic, environmental and social impacts of threatening or newly-arrived species in areas they have not been observed in before; all within a matter of hours, days or (at best) weeks.*

*.....Moreover, the context to which a response effort is to be made constantly changes due to external pressures*

(Cook, D.C., Wilby, A., & Fraser, R.W. Improving Plant Biosecurity Policy Evaluation and Prioritisation: The Economic Impacts of Pests and Diseases)

# Why do we need a Decision Support Framework?

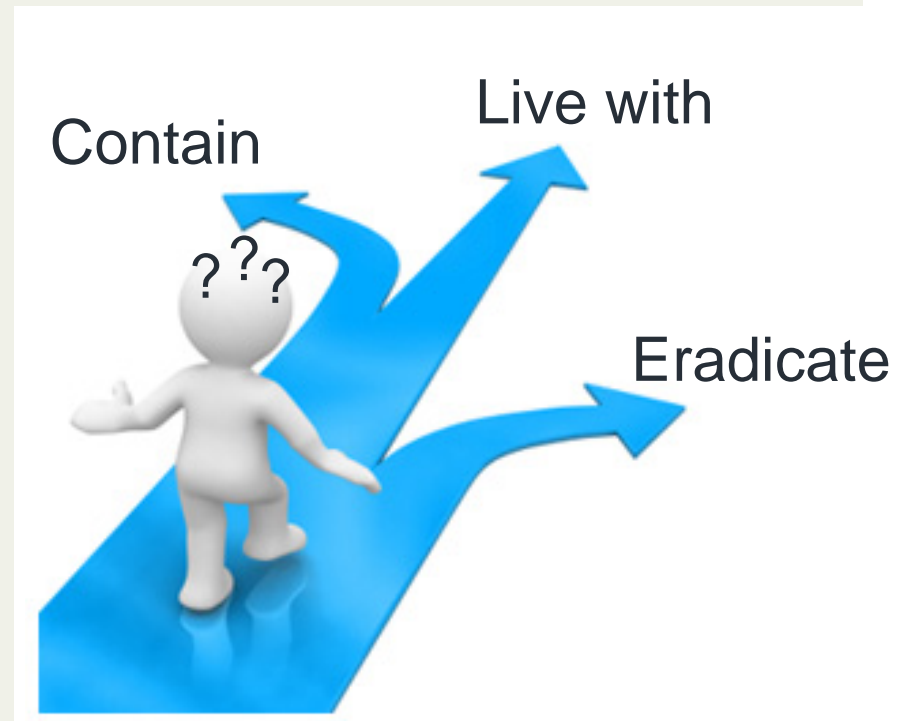


## What we were asked to do

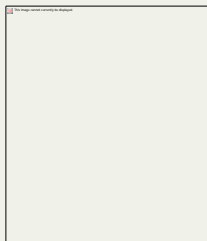
Develop a Decision Support Framework & Tool for tree pest/disease management

Requirements:

- Generic
- Clear and replicable
- Simple and transparent
- Quick results
- Easily accessible to a range of end-users



# Project team



# Customer



Modellers

Economics and  
ecosystem services

Modellers

# Development process



## Steering group meetings:

- Model requirements
- Choice of platform
- Additional outcome: **more input from policy makers needed**

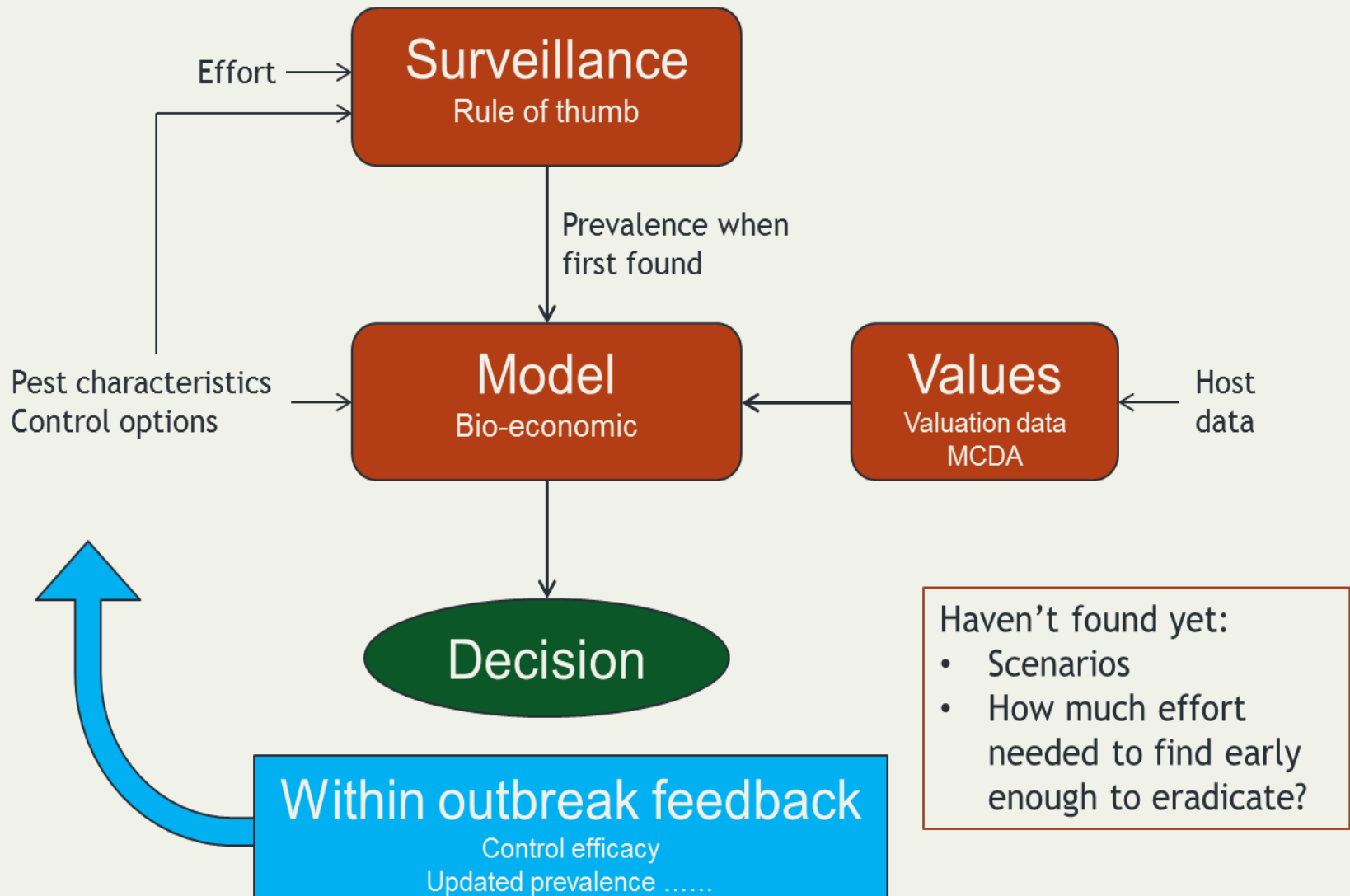
## Stakeholder workshops (co-design of the tool):

- Attending: PH policy makers, social scientists, modellers,...
- First WS: How will the outputs be used and how should they be presented?
- Second WS: presentation & feedback on working version of tool

## Project advisory group reviews:

- Feedback on process and model

# “Straw man” model



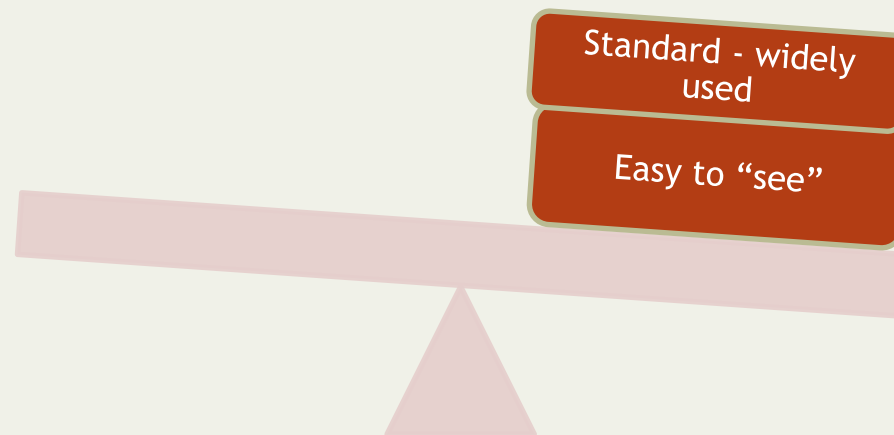


# End-user Needs

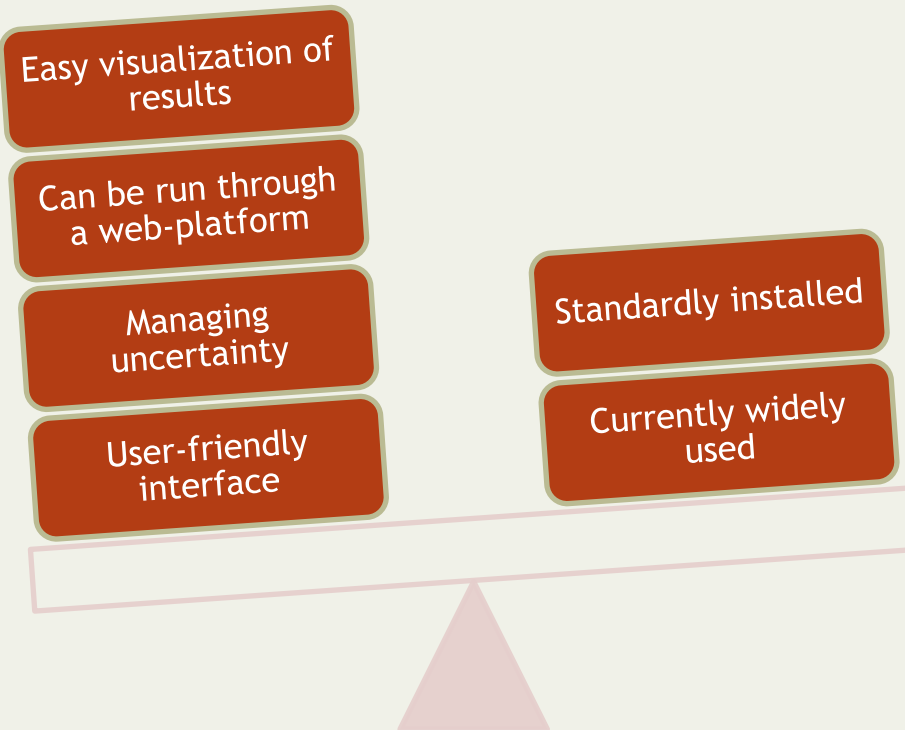
- Standardised framework for scenario assessment
- Help integrate quantitative model outputs:
  - Set quantitative analysis into context
    - + Legal, social,... implications of management options; urban vs natural environment; “What-if” scenarios
  - Assessment of uncertainty
  - Easily digestible visualisations
- Can be used and understood by a range of end-users

Provide a basis for the narrative between the quantitative cost benefit analysis and the policy decision that includes wider social and political concerns

# Choice of Platform

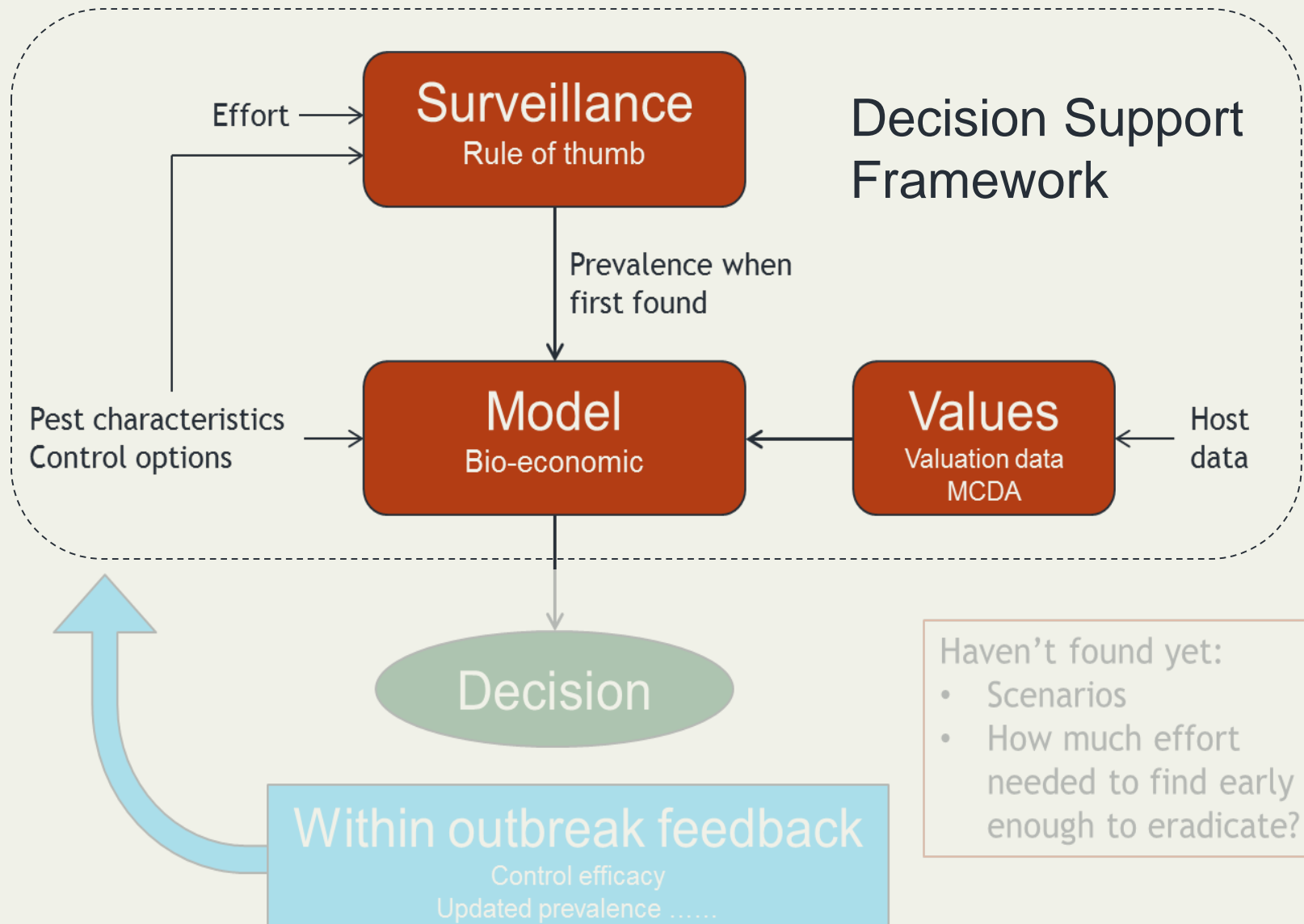


# Choice of Platform

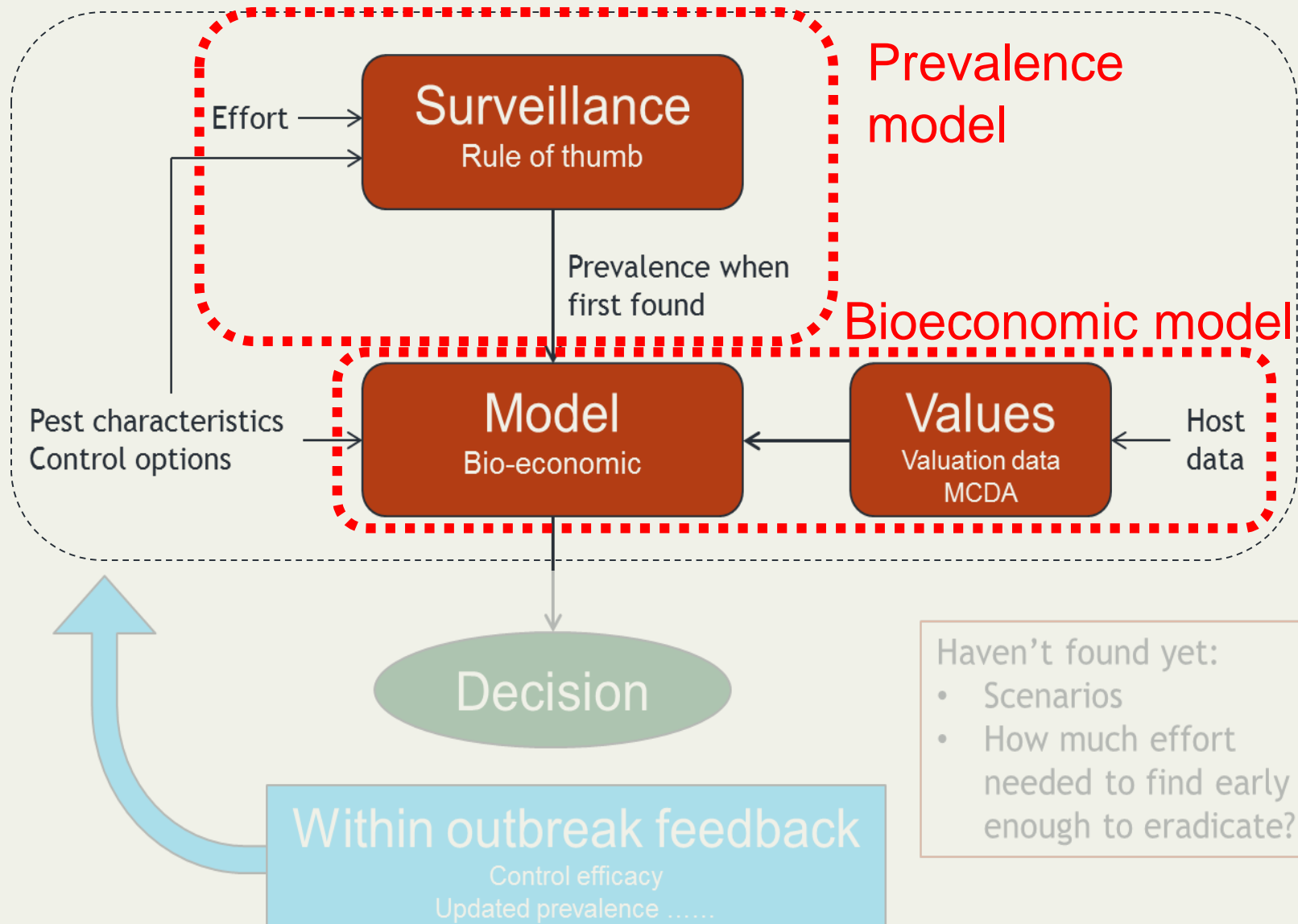


# “Straw man” model

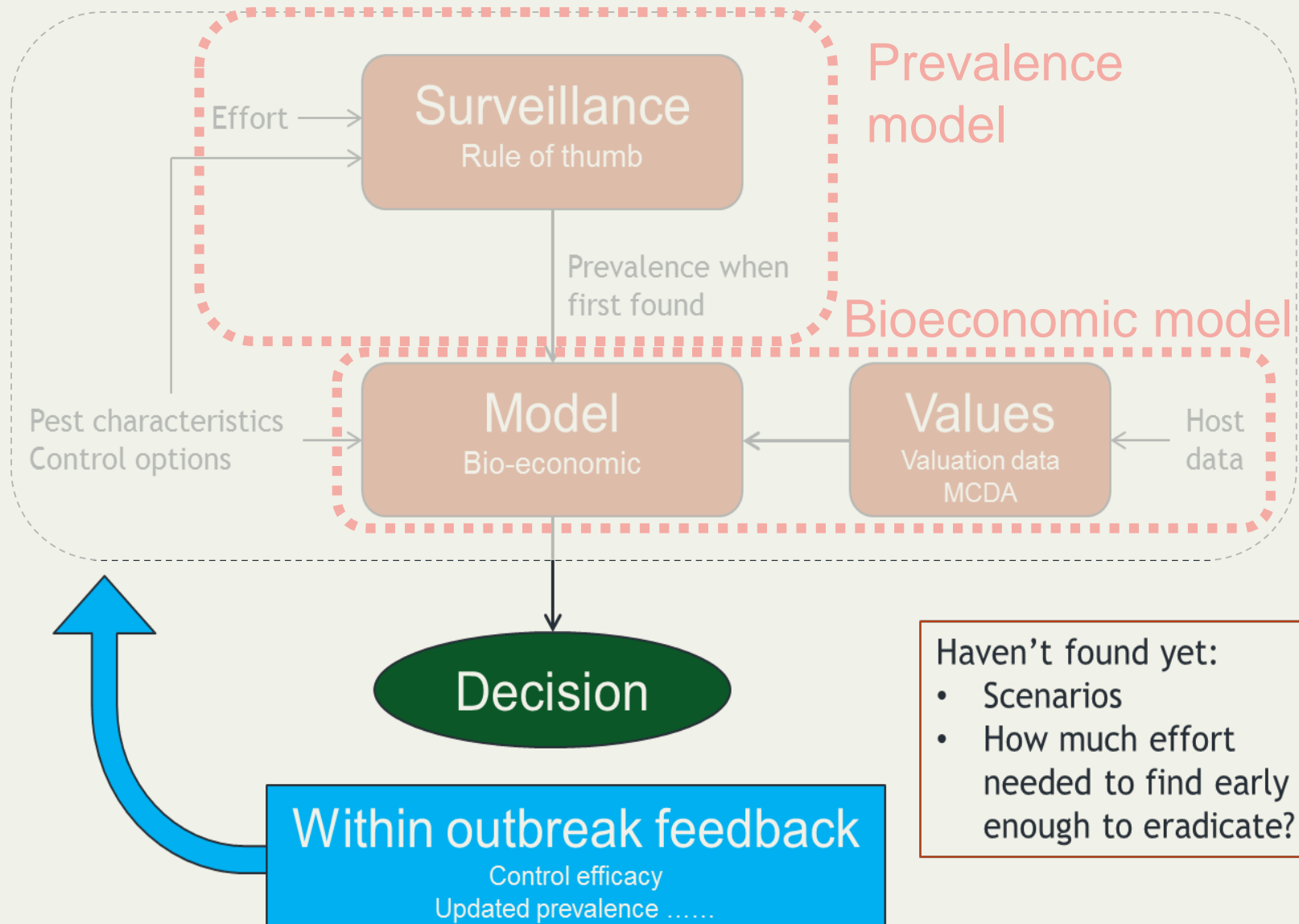
## Decision Support Framework



# "Straw man" model



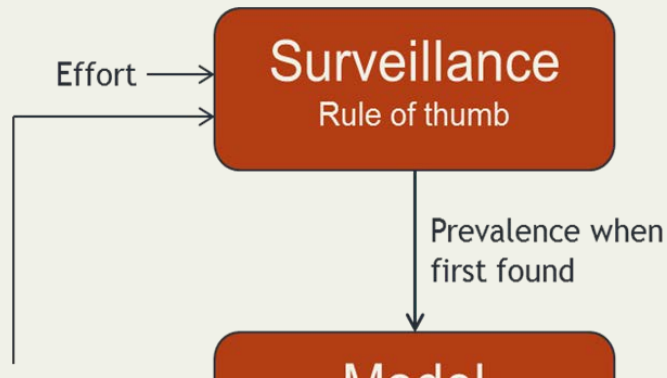
# "Straw man" model



Haven't found yet:

- Scenarios
- How much effort needed to find early enough to eradicate?

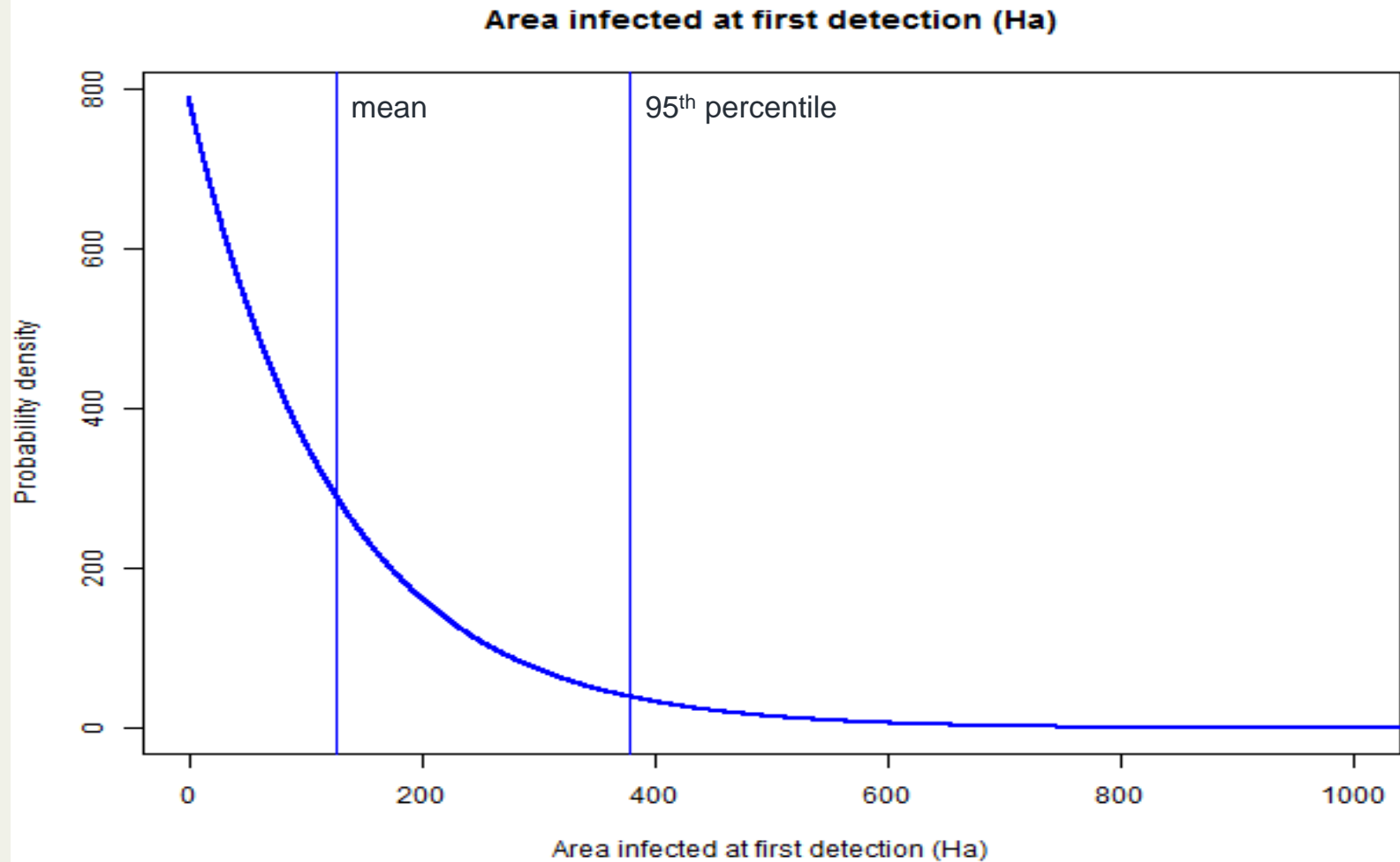
# Prevalence model



Estimates the **proportion of affected hosts (the “incidence”)** **at the time of first detection**, based on:

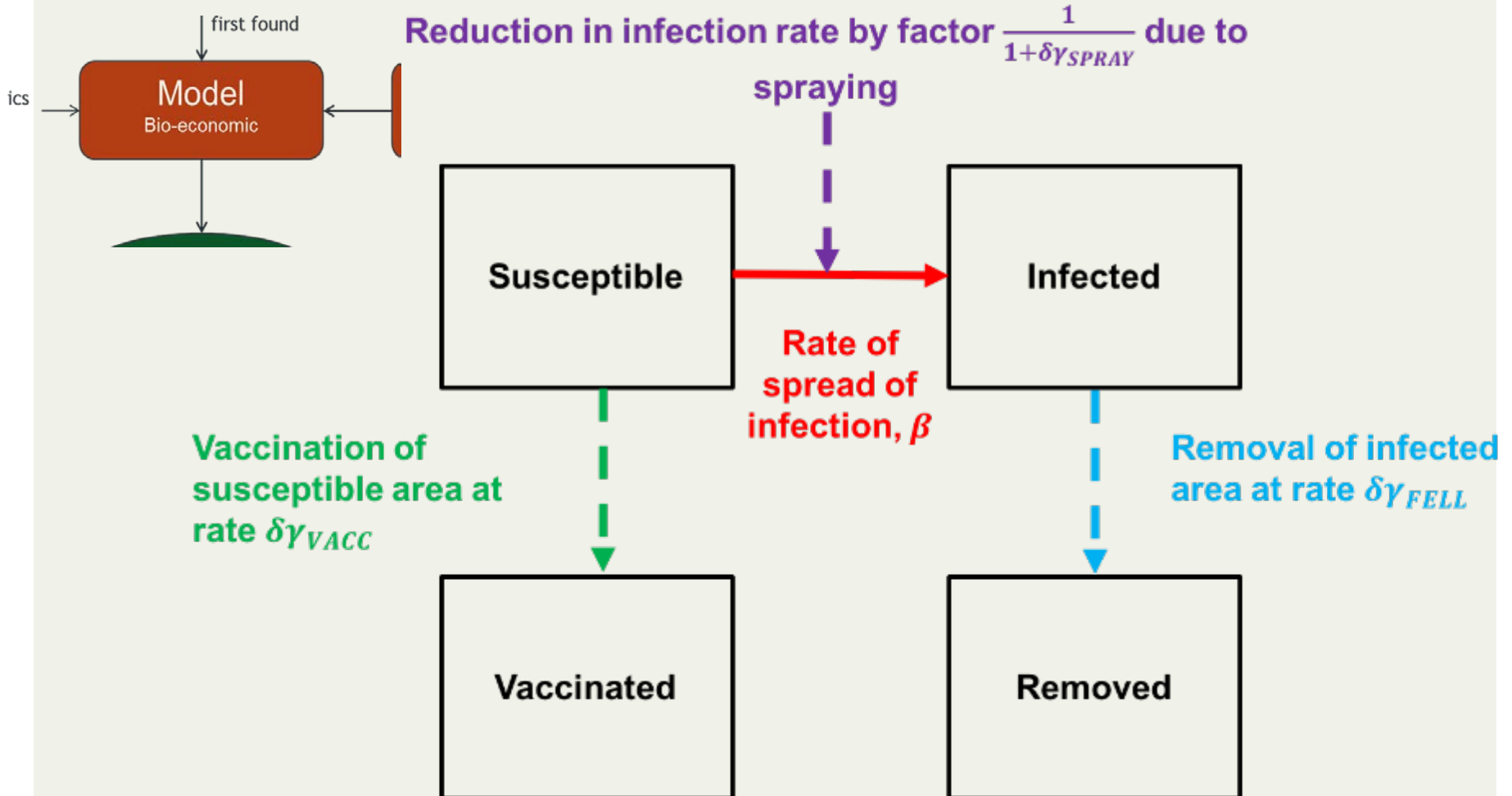
- Total host area
- Spread rate + uncertainty
- Interval between sampling
- Number of samples

# Prevalence model

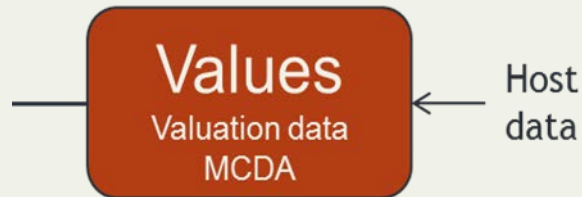




# Epidemiological model: SIVR



# Environmental Values



Timber, landscape, carbon, biodiversity, recreation, air quality, “other”

- Various issues
  - Old stated preference data (pre-2003) not produced to value ecosystem service losses
  - Context - urban trees v wilderness trees
  - Recommendation from PAG not to use the biodiversity value

# User Inputs - initial set up

## General parameters

Area (ha):

100000

Annual discount rate:

0.035

Baseline initial infected area (ha):

100

Number of replicates (large number means more reliable results but slower simulations):

100

## The rate of spread

Set expected time until the initial infected area doubles (months):

Time until the initial infected area doubles (months):

18

Set the minimum area (ha) below which the infection will be eradicated:

Threshold area for extinction (ha):

1

# User Inputs - type of control, efficacy, & cost

## Control options

Select control model (only one model can be selected) and press Update; note changed input box below:

Control model:

Infected area ▲

- Infected area
- Healthy area
- Rate of spread

...lling (assumes: value as selected in

managing one ha):

60 ▼

Select the costs per ha for implementing the desired control option

Cost per ha of managed land (GBP):

3000 ▼

# User Inputs - values saved or lost



## Values at risk

### Value from healthy forest

(please use the sliders to select lower and upper values; separate the sliders if necessary)

#### Timber (GBP per ha):



### Value for infected forest (% of healthy)

(please use the sliders to select a single value)

#### % of healthy value:



Specify the value of timber  
(assumes continuous cropping  
and no changes to age structure):

# User Inputs - uncertainty, effort



FC Tool Welcome Dashboard Settings Input/output menu Report menu Help

Choose the parameters:  
(please use the sliders to select lower and upper boundary; separate the sliders in the case of the upper parameter is fixed)

Uncertainty in rate of spread and initial prevalence

Select uncertainty range around baseline (100%) rate of spread:  
0 50 100 120 150 200 250 300 350 400 450 500

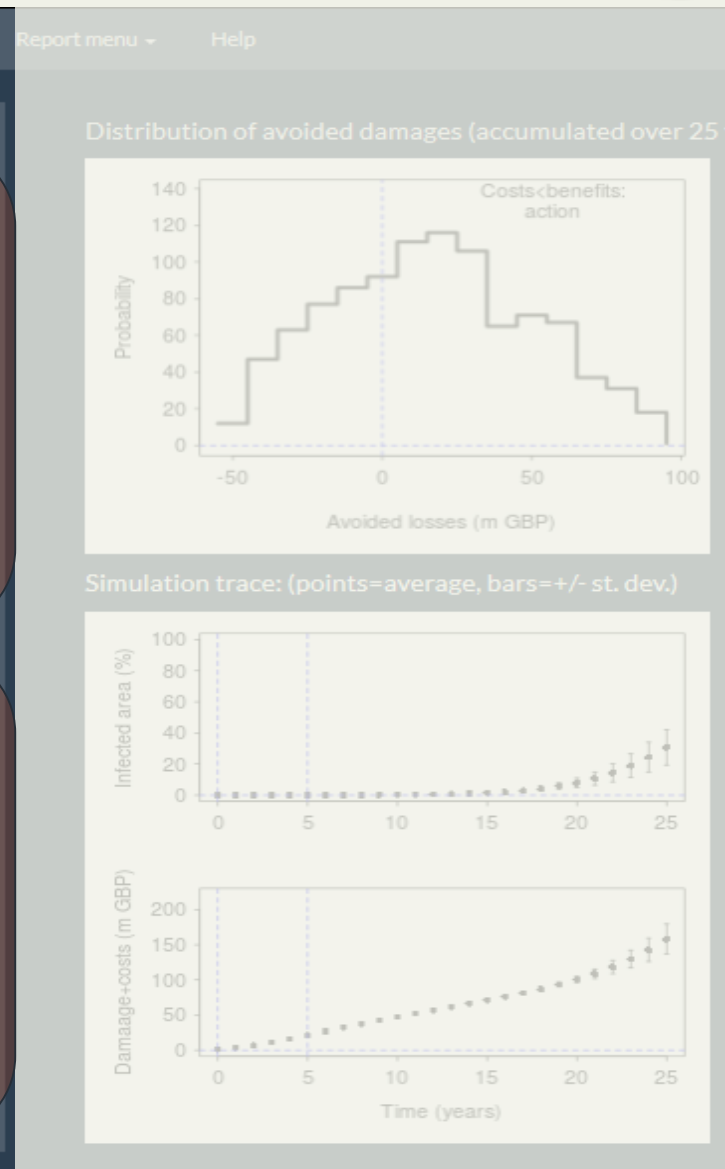
Select uncertainty range around baseline (100%) initial area of infection:  
0 50 100 150 200 250 300 350 400 450 500

Area controlled per year and number of years controlled

Select control effort (number of stand managed per year):  
0 100 200 300 400 500 600 700 800 900 1,000

Select period in which control is applied:  
0 3 6 9 12 15 18 21 24 25

Update



# Other User Inputs

## General parameters

Area (ha):

100000

Annual discount rate:

0.035

Baseline initial infected area (ha):

100

Number of replicates (large number means more reliable results but slower simulations):

100

## The rate of spread

Set expected time until the initial infected area doubles (months):

Time until the initial infected area doubles (months):

18

Set the minimum area (ha) below which the infection will be eradicated:

Threshold area for extinction (ha):

1

# Outputs



FC Tool

Welcome

Dashboard

Settings

Input/output menu

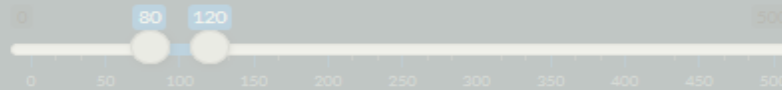
Report menu

Help

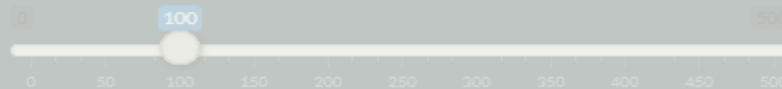
## Choose the parameters:

(please use the sliders to select lower and upper boundary; separate the sliders if necessary; press Update when finished)

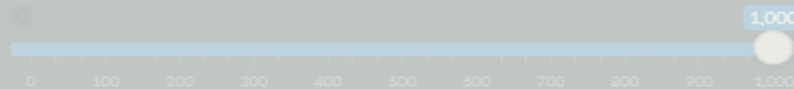
Select uncertainty range around baseline (100%) rate of spread:



Select uncertainty range around baseline (100%) initial area of infection



Select control effort (hectare of land managed per year):

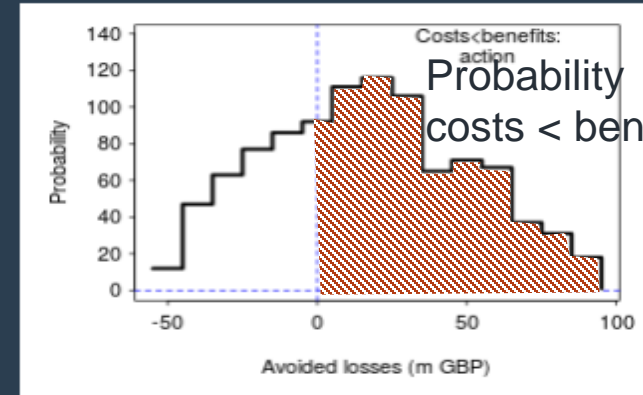


Select period in which control is applied:

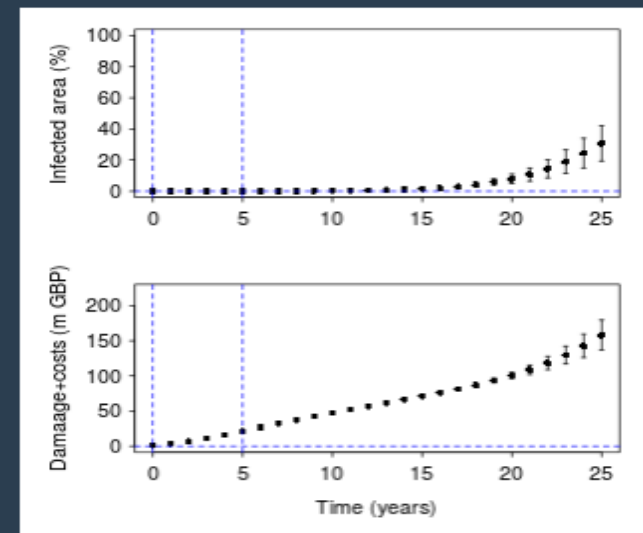


Update

Distribution of avoided damages (accumulated over 25 years)



Simulation trace: (points=average, bars=+/- st. dev.)





# Limitations

- Only one spread model
- Spread assumed constant over time
- Limited control options
- Environmental values
- ... there are others!

= future development opportunities!

## The C\$80.64m question (US\$ = C\$1.26)

- Will it be used?
- Should it be used?

Any suggestions for improvements  
gratefully received