Novel tools to assist with FMD preparedness and response

Wilna Vosloo | 3 October 2022
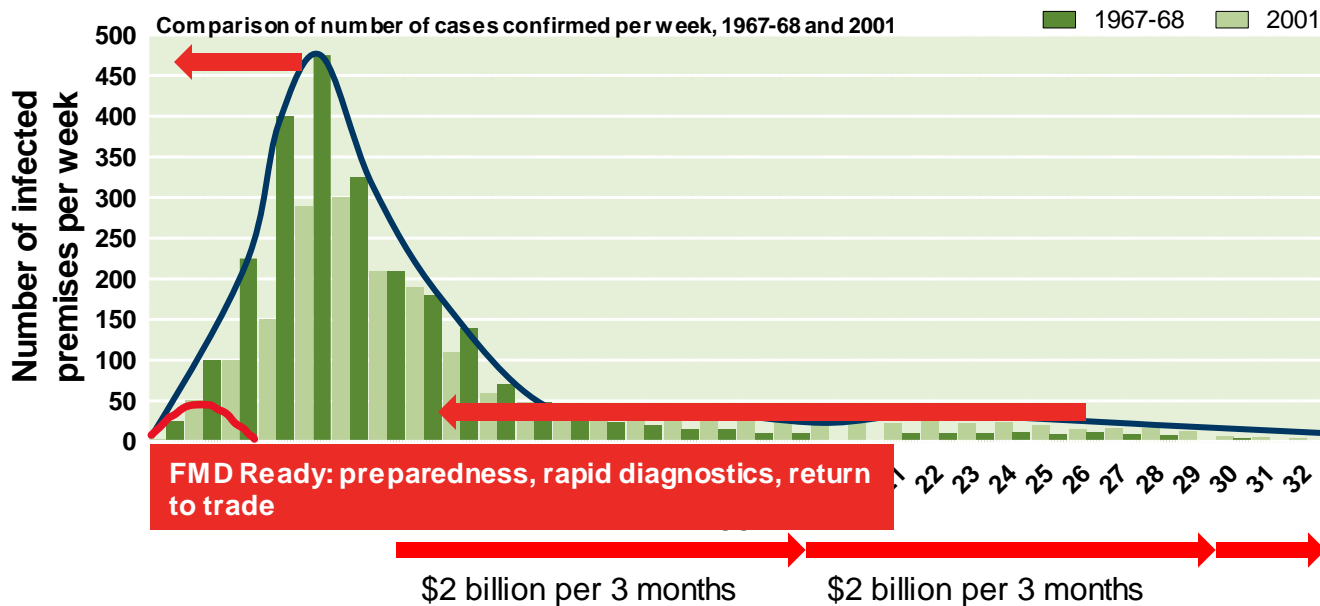
Australia's National Science Agency

Reducing the socio-economic impact of an EAD outbreak

FMD outbreaks Great Britain 1967-68 and 2001

Comparison of number of cases confirmed per week, 1967-68 and 2001
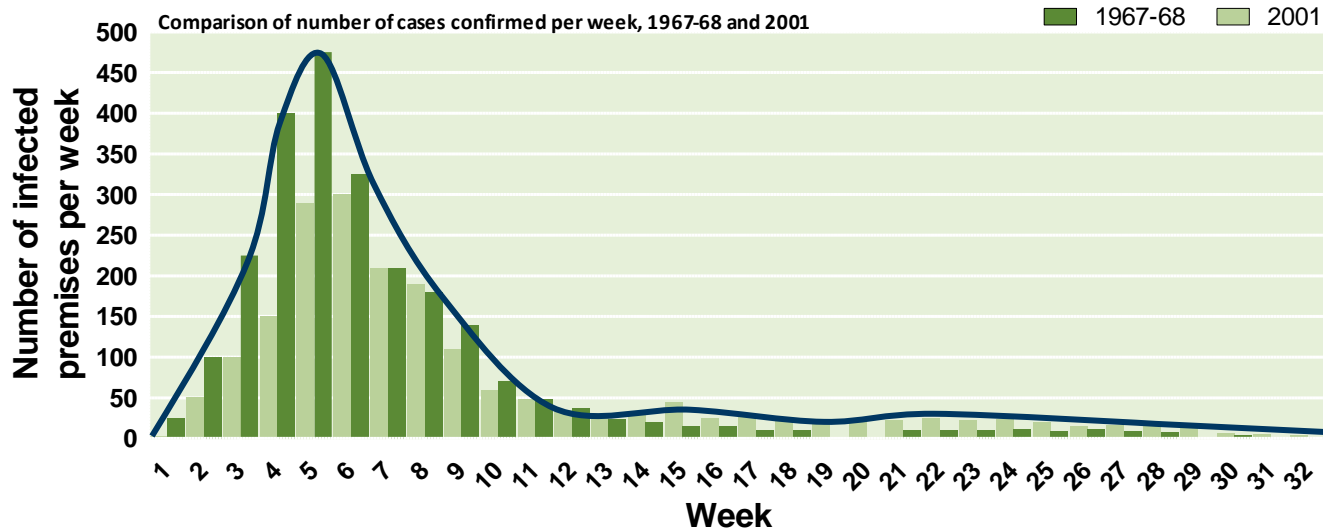
Reducing the socio-economic impact

Great Britain 1967-68 and 2001

Comparison of number of cases confirmed per week, 1967-68 and 2001

1967-68   2001

Number of infected premises per week

500
450
400
350
300
250
200
150
100
50
0

FMD Ready: preparedness, rapid diagnostics, return to trade

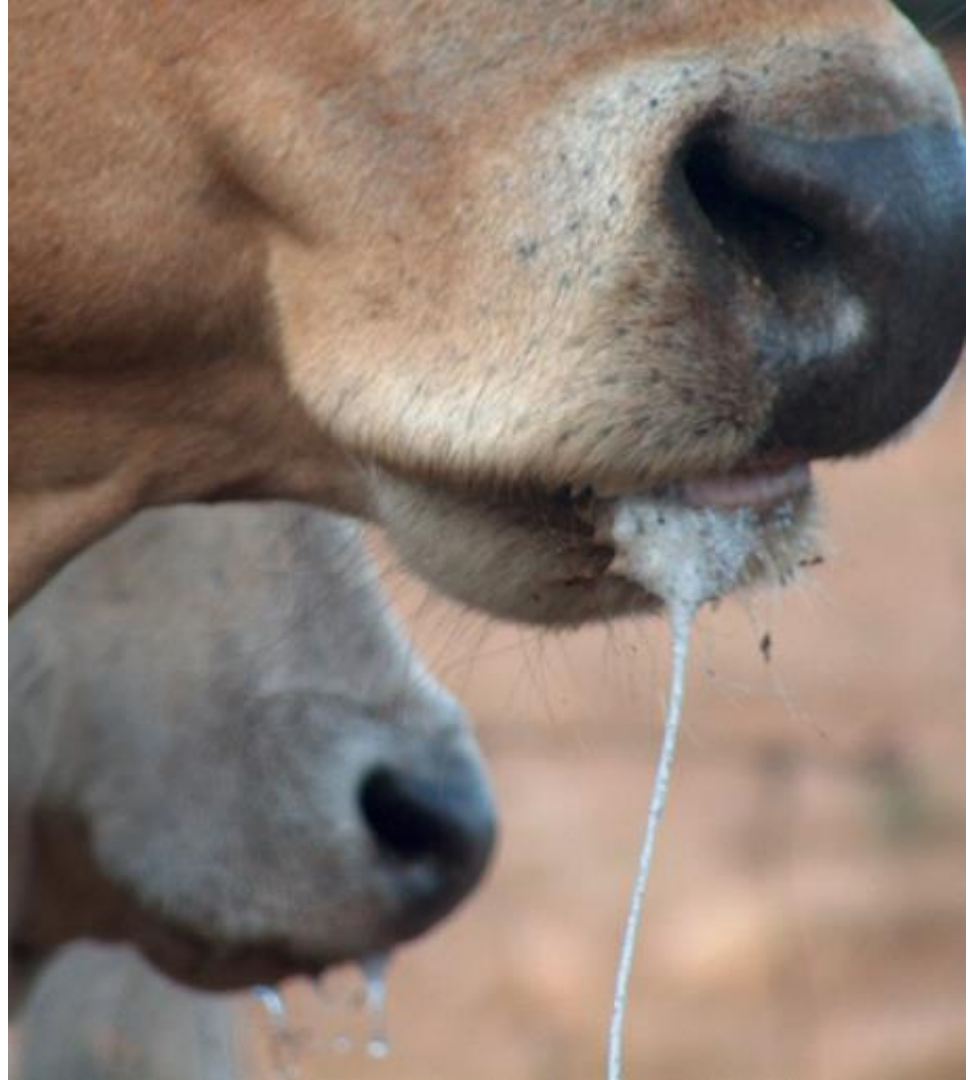21 22 23 24 25 26 27 28 29 30 31 32

$2 billion per 3 months $2 billion per 3 months

FMD preparedness

- Tools to assist with
  - Surveillance
  - Diagnostics
  - Control

Using modelling to prepare for outbreaks and post outbreak surveillance

Australian Animal Disease Spread model

Application of AADIS:

- ➢ Investigate where vaccination is likely to be useful
- ➢ Map disease spread
- ➢ Investigate new approaches to post outbreak surveillance
- ➢ Support economic analysis

Using AADIS to map the risk of FMD spread to better understand geographic conditions

1. ## Where are the risky starting locations?

   ➢ Establishment and spread using the average number of secondary infections arising from the seed herds located in each grid cell

2. ## Where are the vulnerable locations?

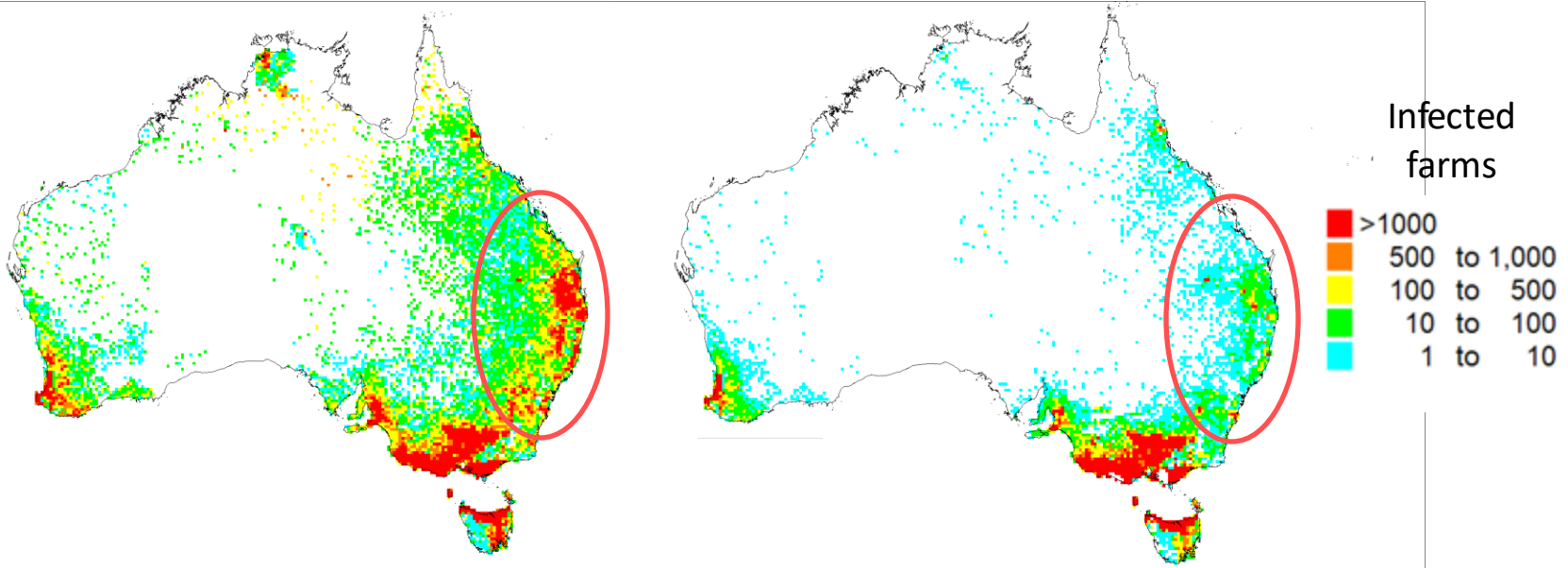   ➢ Mapped vulnerability of areas to infection using the average number of total infected farms in each grid cell

3. ## Where does stamping out reduce the risk of uncontrolled outbreaks?

   ➢ Compared maps with and without basic control (stamping out only)

3. Where does stamping out reduce the risk of uncontrolled outbreaks?

Without control
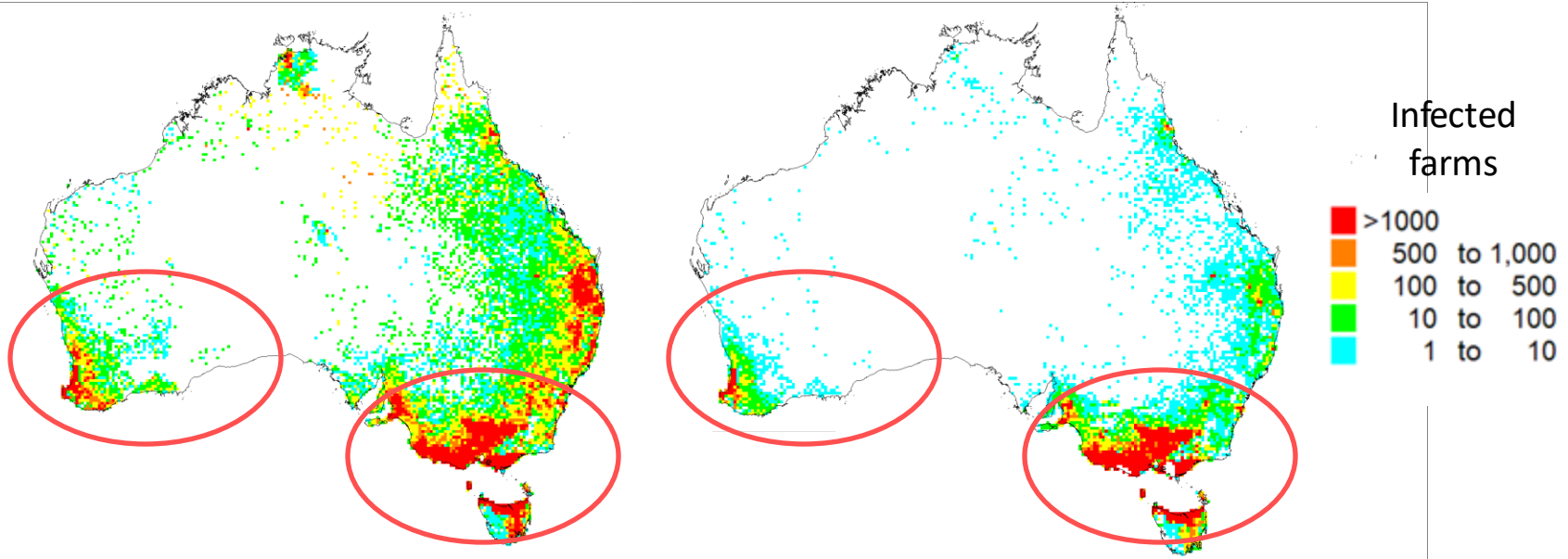
Control (stamping out only)

Infected farms

■	>1000
■	500 to 1,000
■	100 to 500
■	10 to 100
■	1 to 10

Number of infected farms within each grid cell from 500,000 simulation runs

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➢ Where is control with only stamping out less likely to bring an outbreak quickly under control?

Without control

Control (stamping out only)

Infected farms

- ■ >1000
- 500 to 1,000
- 100 to 500
- 10 to 100
- 1 to 10

Number of infected farms within each grid cell from 500,000 simulation runs

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Diagnostics

Ensuring safe transport of samples to the laboratory

- Diagnostic laboratories are classified according to their biocontainment level
- In FMD-free countries, diagnostics for FMD is performed at BSL 3
- Most countries have a limited number of BSL 3 labs
- During outbreaks, heightened surveillance may overburden the BSL 3 lab, and low risk samples may be sent to BSL 2 labs
- McIlvane buffer (citrate-phosphate buffer pH 2.6) completely inactivates FMDV in epithelium tissue in < 2 hours
- PCR positive, RNA could be transfected and live virus recovered for further studies

Tools to assist during outbreaks

Developing a big data application – SPREAD

- Development of the *SPREAD*[1] web-based system to visualise FMD outbreaks and run models assessing the role of wind dispersion in local spread (*Fig. 1*)

- Implementation of routines for the automated next-gen sequence assembly and construction of genomic networks assessing farm-to-farm transmission of FMDV (*Fig. 2*).

- Collation of data of over 10 historical outbreak of FMD in Europe and Asia to enable the verification of the *SPREAD* system (*Fig. 3*).
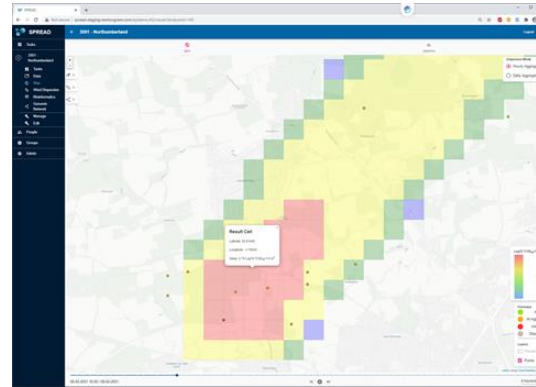

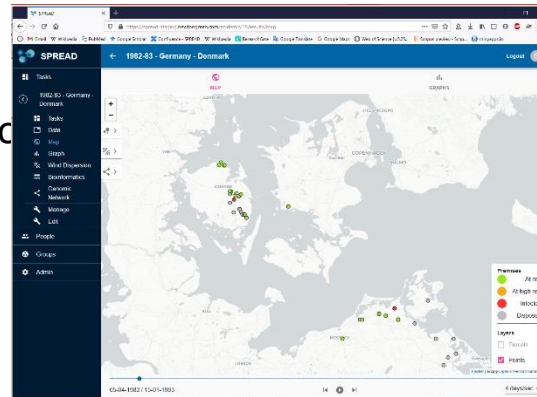**Figure 1.** Wind plumes from the index case of the UK 2001 epidemic

Figure 2. Genomic network of the UK 2007 outbreak

Figure 3. Display of the East Germany / Denmark 1981 outbreaks

[1]System for Preparedness and Response to Emergency Animal Diseases
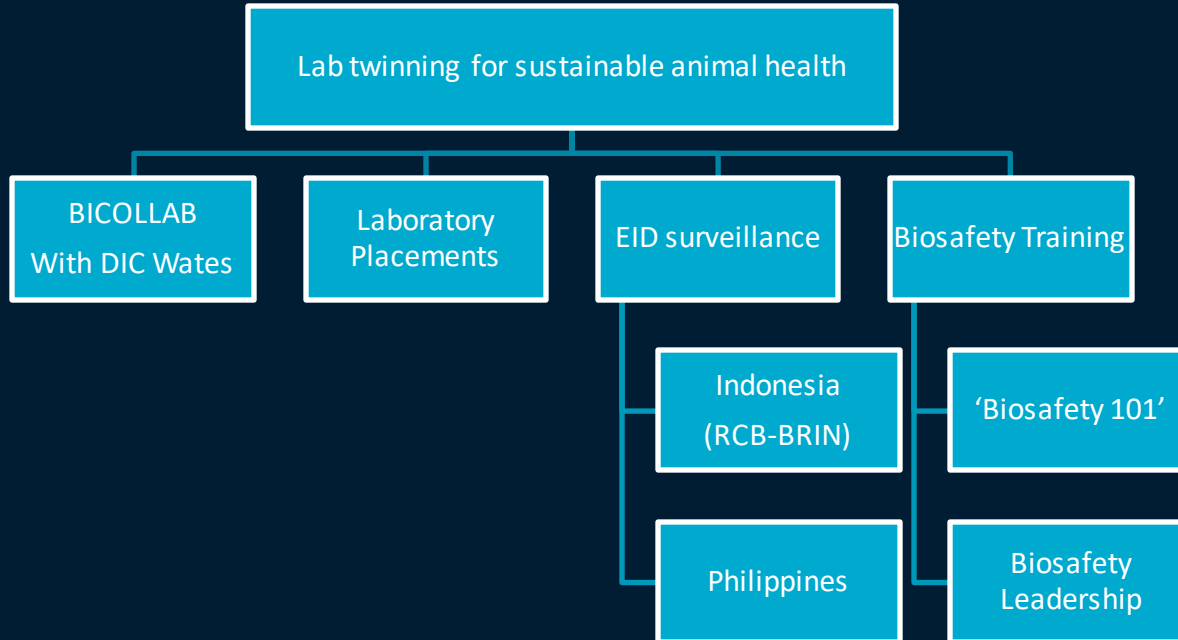Peter Durr et al, ACDP

Support for the region through the International Program at ACDP

International program

- Vision
  - Greater stability, prosperity and resilience across the Asia-Pacific arising from improved health security

FAO Indonesia

- Provision of influenza reagents

- Technical assistance for priority diseases – Swine influenza, JE, Nipah

- Bioinformatics support

- Laboratory Information Management

Phoebe Readford

Thank you

Health & Biosecurity
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Australia's National Science Agency

FMD READY PROJECT

PROJECT PARTNERS