6th Webinar from FMD practical management series

Economic impact due to animal diseases – an example of Foot-and-Mouth Disease

Welcome! We will begin at 11.00 am

Before the webinar begins, you can check that your sound is working by selecting 'Meeting' and 'Audio Setup Wizard' and following the on-screen instructions. You don't need to set up a microphone.

If you have any problems, please use the "Technical assistance" box to ask for our help. You can also say hello to your fellow participants using this box.

Agenda

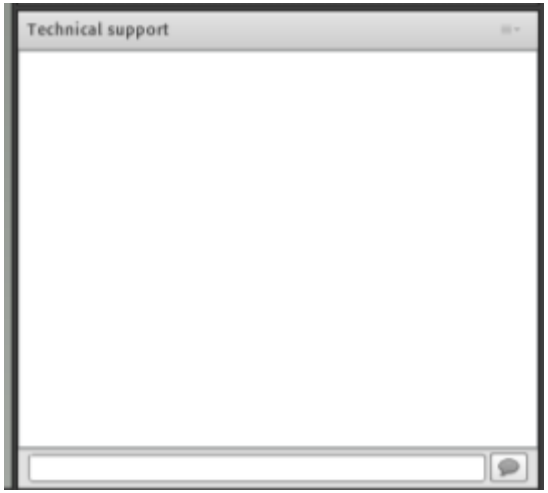
- How to use the webinar screen;

Presentations:

- Economic impact of Foot-and-Mouth Disease (FMD) in FMD-free countries;
- FMD impact in endemic countries;
- Some practicalities and reminder;

We will be recording the webinar!

Introduction to the webinar



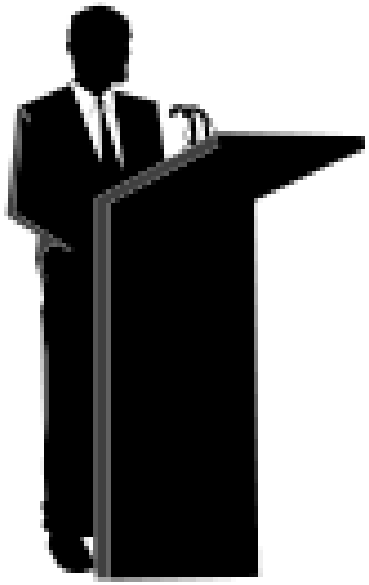
What is your current work affiliation?

- University professor
- University Student
- Government / veterinary services
- Research Institute
- International organization
- Other

Tutors

Prof Jonathan Rushton

Dr Theodore Knight-Jones



FMD – impacts in free countries

Jonathan Rushton
Professor of Animal Health Economics
Norbrook endowed chair in Veterinary Business Management
Adjunct Professor, Institute of Rural Futures, UNE, Armidale, Australia
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EU-FMD Webinar 29th April 2016

When there is no FMD?

- To the layman the removal of a disease from a country could be assumed to remove its impact
- If FMD is not present what could be the impacts?
- This presentation will set out to identify the critical issues to consider and the need to focus on the unexpected
- Presenting a reasoned case for these impacts should drive further work on FMD and support the need for current and future resources

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Important message

- The costs of maintaining freedom and reducing risks of incursion need to be weighed against the benefits from disease freedom
- **FMD prevention costs need to be displayed relative to the benefits of its control**

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Surveillance

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Surveillance

- Countries who invest in the removal of FMD need to plan for systems of surveillance for the re-introduction of the pathogen
- This needs to be a mixture of:
  - An understanding of the potential points of entry
    - Legal trade
    - Illegal trade
      - for monetary gain
      - For nostalgic food and product markets
  - Systems of early warning that includes training of frontline staff and laboratory capacity

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Surveillance

- Local capacity to detect disease can only be verified by evidence that there are false positive reports of disease
  - Given the frequency of vesicular disease in many countries there should always be false positives
- In the case of countries dependent on food imports, there is a need to have inspections of trading partners
- In many cases this will be backed by a process of certification

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Contingency plans

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Contingency plans

- There is a cost to writing and updating an actual plan
- However, to be truly effective this plan needs to be tested through processes of planned simulation
- And ideally the false positives from the field level should also allow for systems to be tested
- All contingency plans have a need for trained staff and for veterinary services to have spare capacity

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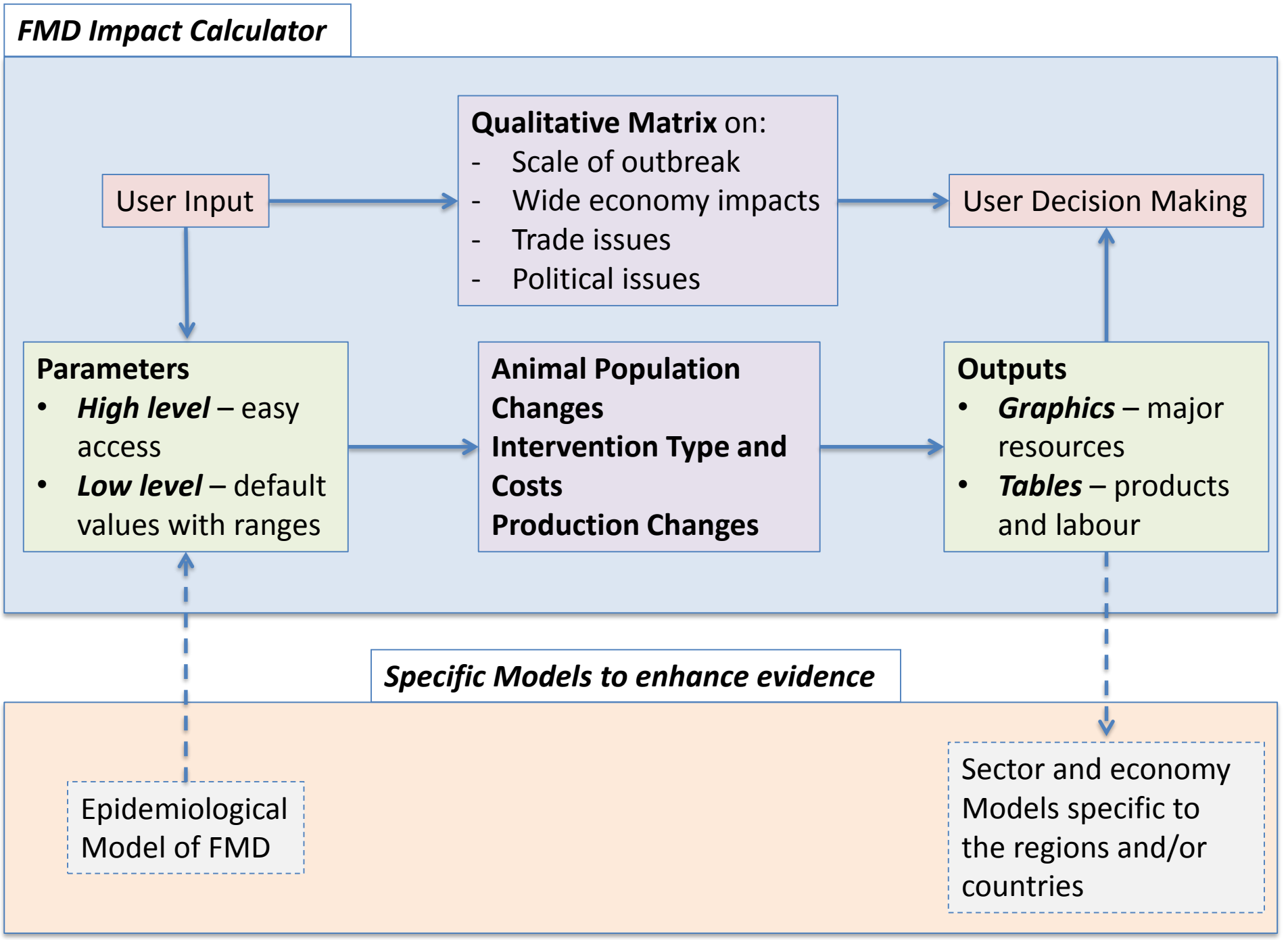
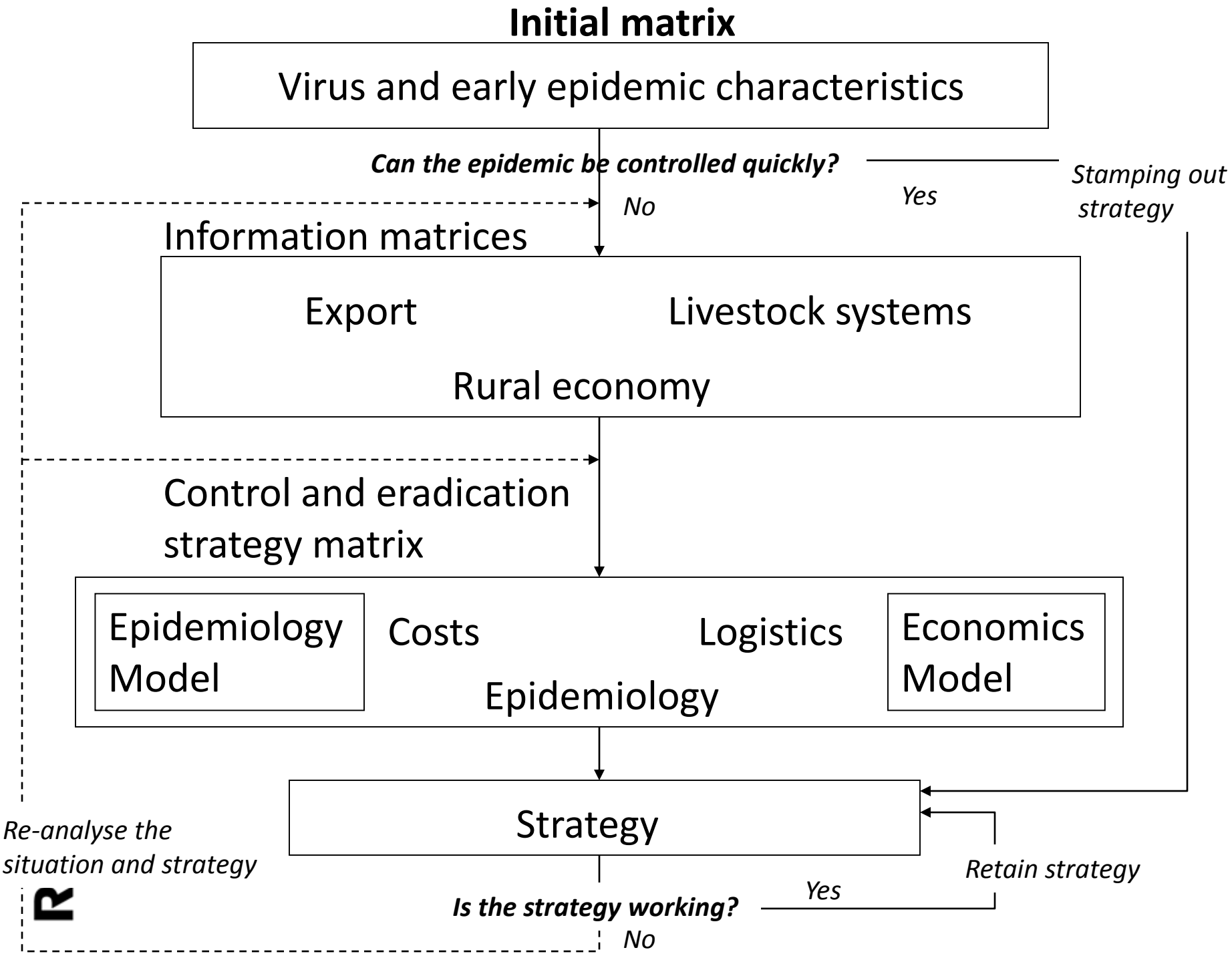

FMD Impact Calculator
User Input
Qualitative Matrix on:
- Scale of outbreak
- Wide economy impacts
- Trade issues
- Political issues
User Decision Making
Parameters
• High level – easy access
• Low level – default values with ranges
Animal Population Changes
Intervention Type and Costs
Production Changes
Outputs
• Graphics – major resources
• Tables – products and labour
Specific Models to enhance evidence
Epidemiological Model of FMD
Sector and economy Models specific to the regions and/or countries


Initial matrix
Virus and early epidemic characteristics
Can the epidemic be controlled quickly?
Yes
Stamping out strategy
No
Information matrices
Export
Livestock systems
Rural economy
Control and eradication strategy matrix
Epidemiology Model
Costs
Logistics
Economics Model
Epidemiology
Strategy
Re-analyse the situation and strategy
Retain strategy
Yes
Is the strategy working?
No

Actual outbreak response

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Free countries - really

- Countries that are free are prone to incursions and epidemics
- Since 2000 there has been a major outbreak in a previously free country every two to three years
- These outbreaks vary in terms of:
  - Scale
  - Reaction of response

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Costs of major outbreaks in previously free countries – between 1997 to 2011

Year	1997	2001	2001	2010	2010-2011
Location	Taiwan[1]	Uruguay[2]	UK[1]	Japan[3]	Rep. Korea[4]
Costs (US$ millions)					
Direct costs	254	-	3,558	550	2,780
Indirect costs	6,363	-	5,646	N/A	N/A
Total cost	**6,617**	**700**	**9,204**	**>550**	**>2,780**
As percentage of GDP	-0.64%	N/A	-0.20%	N/A	N/A
Duration (months)	4.5	4	7.5	4	5
Control Method	S.O. + Vacc	S.O. + Vacc	S.O.	S.O. + Vacc	S.O. + Vacc
Slaughtered Animals	4 million	20,000	6.24m	290,000	3.47m

Key: S.O.= Stamping out, Vacc = Vaccination. N/A = Data not available.
Sources: [1] FAO. [2] Personal Communication F. Muzio [3]Muroga, N. et al., 2011. [4] Yonhap News Agency

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The other impacts

- adoption and adaptation of improved management practices

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Intensification and specialisation of livestock systems

Dairy breeds with some beef purpose

Dairy breeds

Dual purpose breeds

National Beef breeds

International Beef breeds

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Intensification and specialisation of livestock systems

Predominantly grazing and foraging systems

Managed forage and conservation systems

Housing and handling systems

New forage species and concentrates

Sophisticated handling systems

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What is the background to these changes

- **Improved management practices**, which imply greater investments, **need greater certainty**
- Greater certainty can only be **guaranteed** with better disease control management – **contagious disease management**
- Foot-and-mouth disease control is a critical aspect of
  - Managing contagious disease
  - Learning how to manage contagious disease
- Advances in livestock production cannot be achieved without a foundation of animal disease control

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And what of trade?

- Countries who want to export livestock need to demonstrate the control of FMD
  - Some argue there are exceptions where countries that have FMD export to countries with a similar status, but FMD still impedes this trade
- Countries that want to export to high value markets need to demonstrate total control of FMD

FMD distorts markets worldwide

- The reasons are obvious, countries who have invested in eradicating this disease do not want it back!

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Food system

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Agrifood Systems

- **Agrifood systems** span from the **relatively simple** with local level production, processing and consumption
- To the **complex** with geographically and socially separate groups of people and organisations involved in:
  - Input supply
  - Agricultural production systems – primary production
  - Processing, marketing and retailing
  - Transport, financial, education systems
- Agrifood systems incorporate **agriculture** and their main beneficiaries are **consumers**

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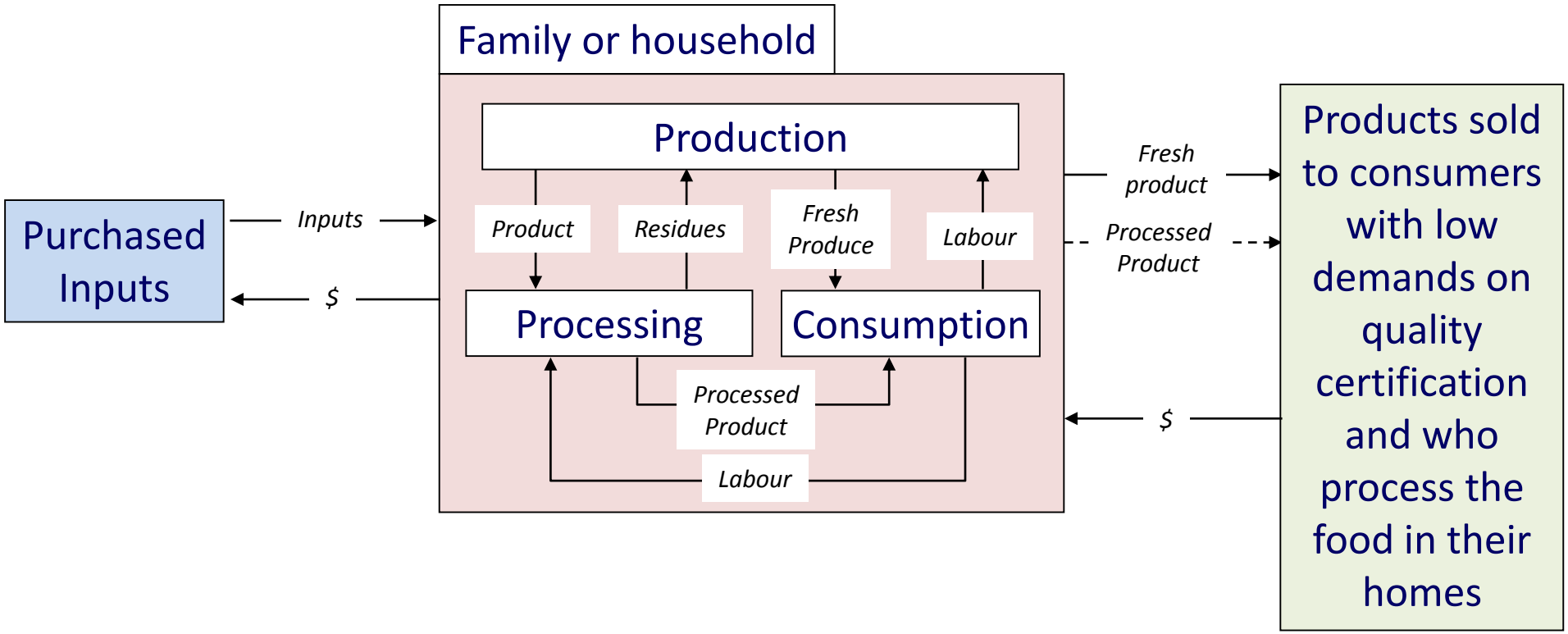
Simple food chain



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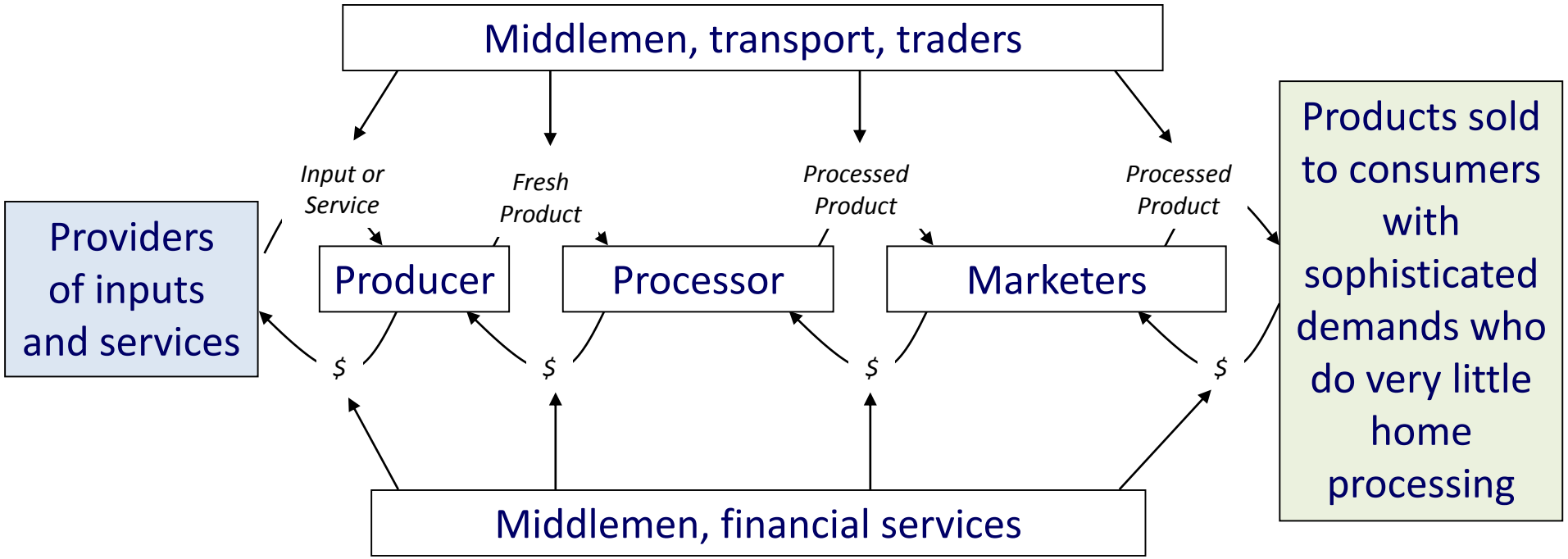
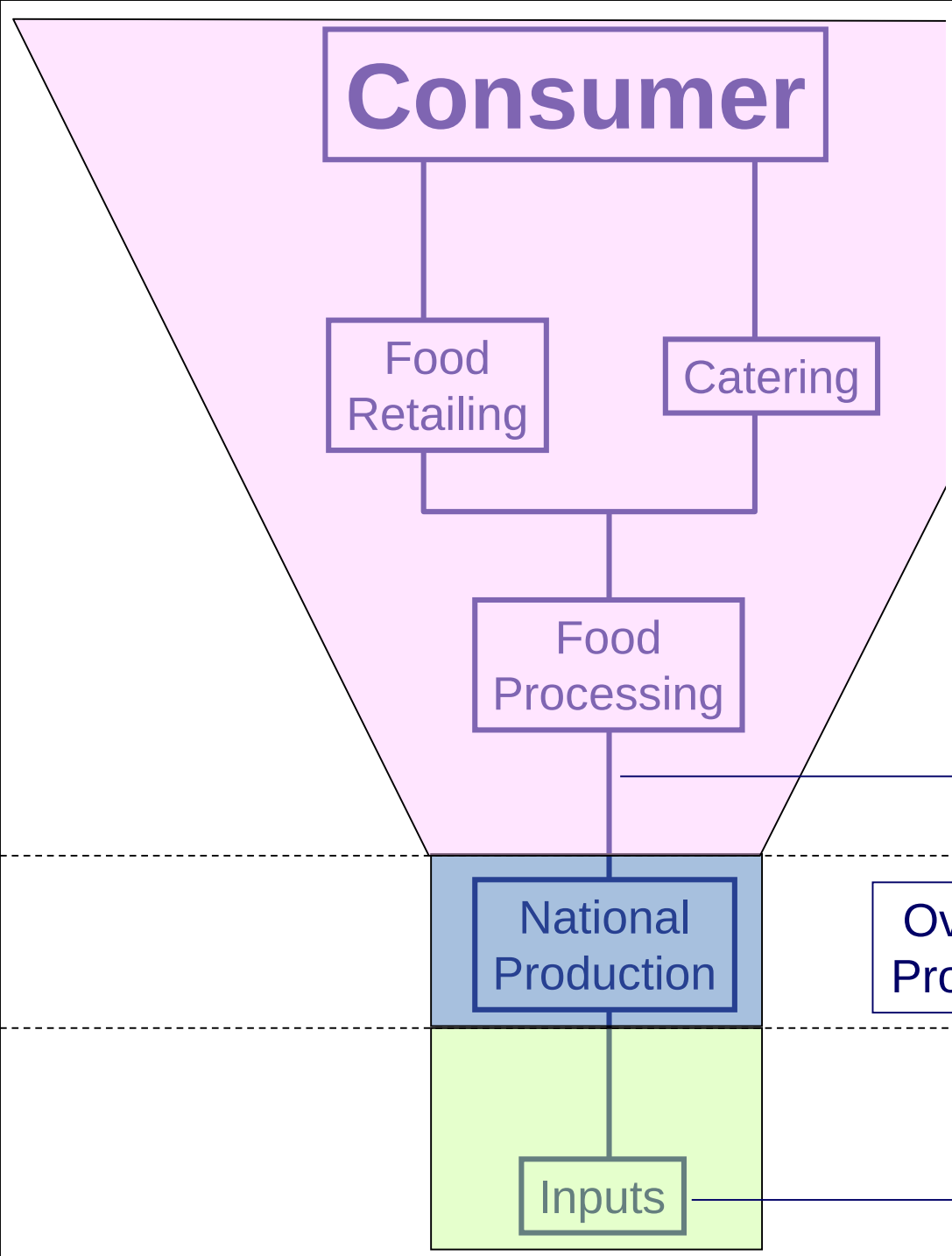
Complex food chain





There are only 339,000 people who work on agricultural holdings in the UK (**0.6% of the population**) yet they can affect the wellbeing of **60 million people**

Animal health contributions to the food chain

Veterinary public health

Clinical treatments
Epidemiology & Disease Control

Diagnostics Immunology

Vaccines

Genetic Resistance

Summary

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The balance between the costs and benefits of FMD freedom

- Costs of FMD
  - Surveillance
  - Contingency plans
  - Epidemic outbreaks
  - Distortion of markets
- Benefits of FMD freedom
  - Adoption of food systems that generate relatively cheap and reliable livestock food products
  - Access to attractive international markets

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Published studies

- I am aware of only one study that costs the FMD freedom and this has yet to be officially published
- The European Commission had problems with identifying costs of disease management, including FMD
- There are problems with how cost data are captured and even greater issues with looking at issues of trade distortion, improved productivity and access to markets

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How to use economics with FMD

- Quantify the economic impact of FMD
  - Identifies poor allocation of people, logistics, finances

Use economics to add value to your decision making for FMD and its control

- Make assessments of the economic benefits of FMD prevention of the people in high risk areas
  - Allows an understanding of economic incentives
  - Can be used to target policies and finances

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A new society

- **International Society for Economics and Social Science of Animal Health**
- We will hold a first meeting for a day before SVEPM in Inverness in March 2017
- We will be inviting papers and posters to cut across the animal health, economics and social sciences

http://www.isessah.com

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References

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- Bates, T. W., Carpenter, Tim E, & Thurmond, M. C. (2003). Benefit-cost analysis of vaccination and preemptive slaughter as a means of eradicating foot-and-mouth disease. *American journal of veterinary research*, *64*(7), 805-12
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- Rushton, J (2009) The economics of animal health and production. CABI, Wallingford, UK. 364 pages
- Rushton, J. (2008) *Economic Aspects of Foot and Mouth Disease in Bolivia*. OIE Revue Scientifique et Technique. 27 (3) pp 759-769

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Questions

- Are you aware of studies that have attempted to quantify the impact of FMD in free countries?
- Can you make these available?
- How would you use this information if it was available?

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Any questions or comments?

FMD impact in endemic countries

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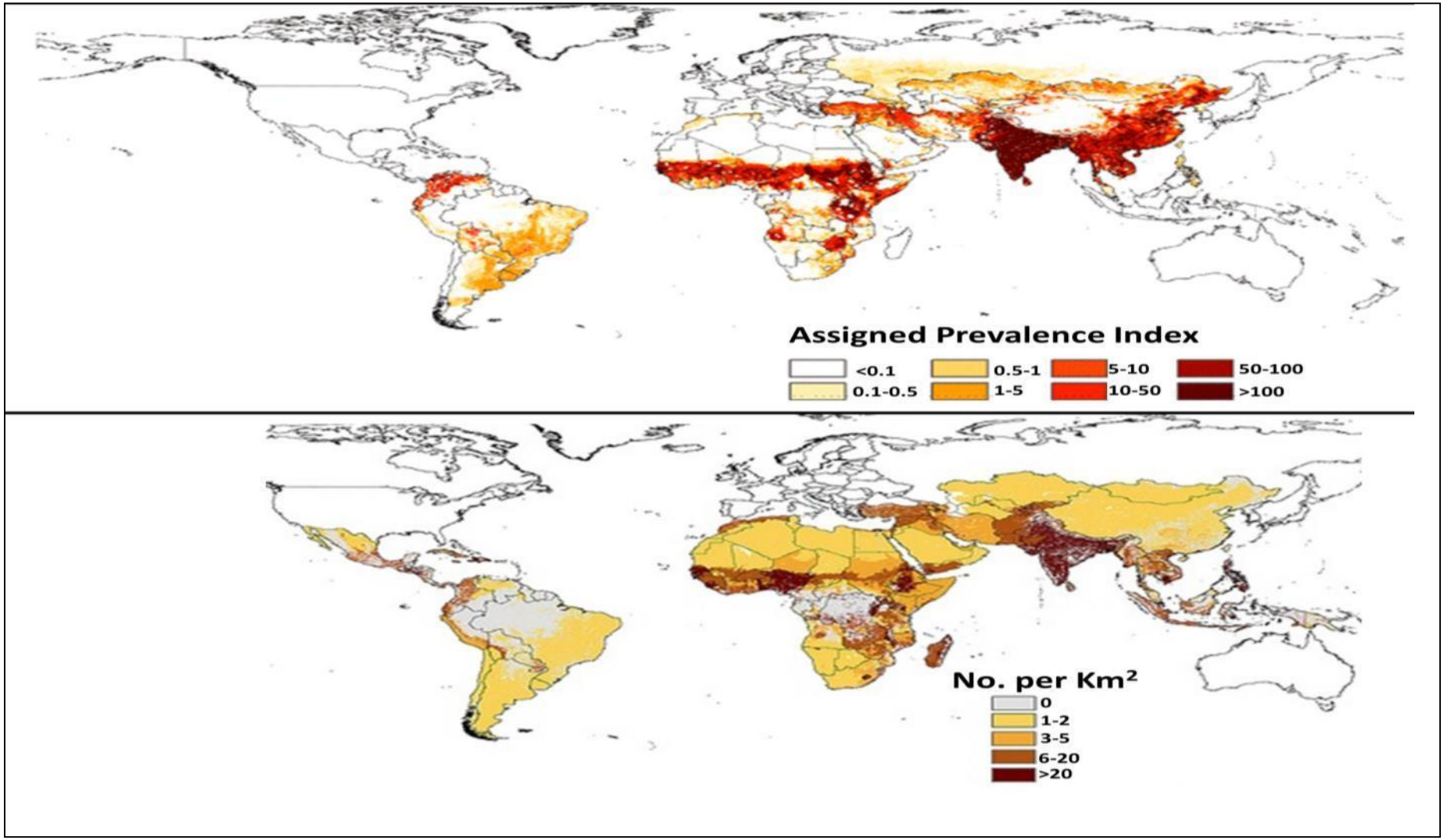
Key Questions

- How important is FMD in endemic countries?
- How does it impact?
- How can we measure this?

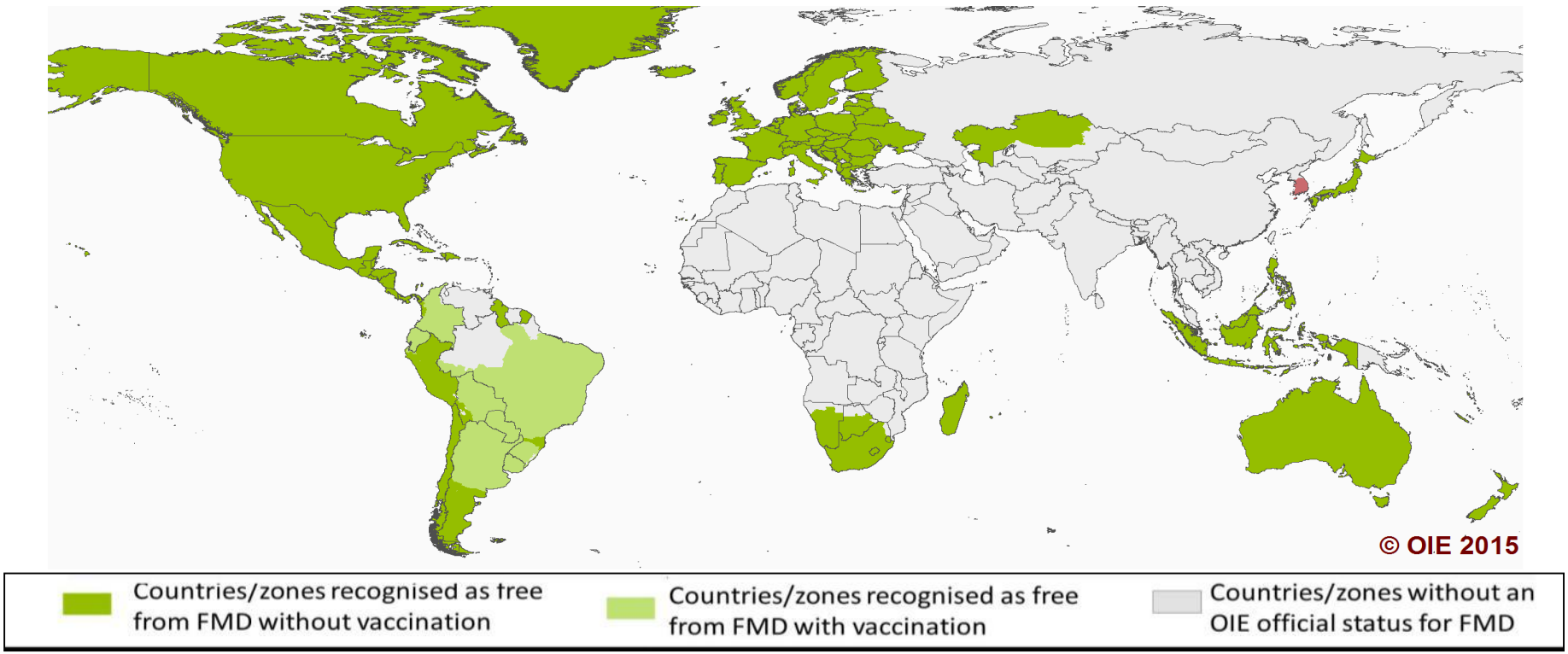
FMD and poverty

Global burden of FMD in cattle (Sumption et al., 2008) –South America, Kazakhstan, North Africa



Density of poor livestock keepers, updated 2012 (Thornton et al., 2002).

OIE 2015 FMD status



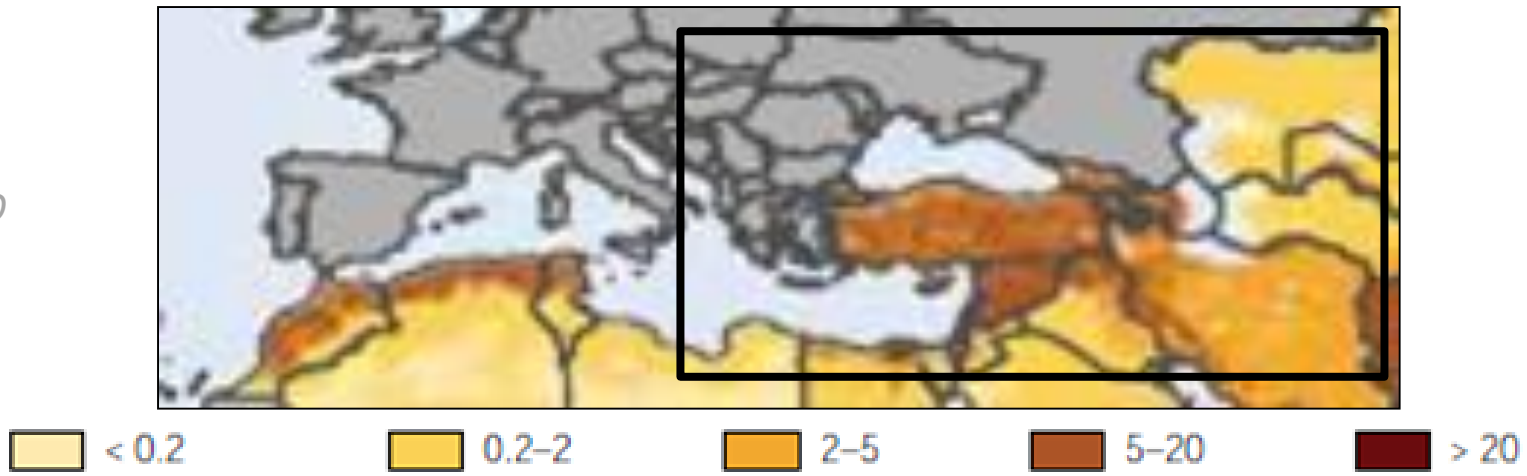
- Few places where FMD is not present in poor livestock keeper populations
  - *Central America, Kazakhstan and Southern Africa, parts of South East Asia and South America.*
- FMD endemnicity associated with poverty – Why?
  - Governance (regional, national, local), FMD status of neighbours
  - Cost of control relative to wealth, shared grazing, civil unrest
  - Equates within country –see Turkey, Southern Africa

Free versus endemic
Endemic FMD impact = Free-country FMD risk

- FMD risk is a product of cross-border disparity
  - Wealth, development & disease status

Density of rural poor livestock keepers/KM^2

Robinson et al., 2011. Global livestock production systems. FAO and ILRI



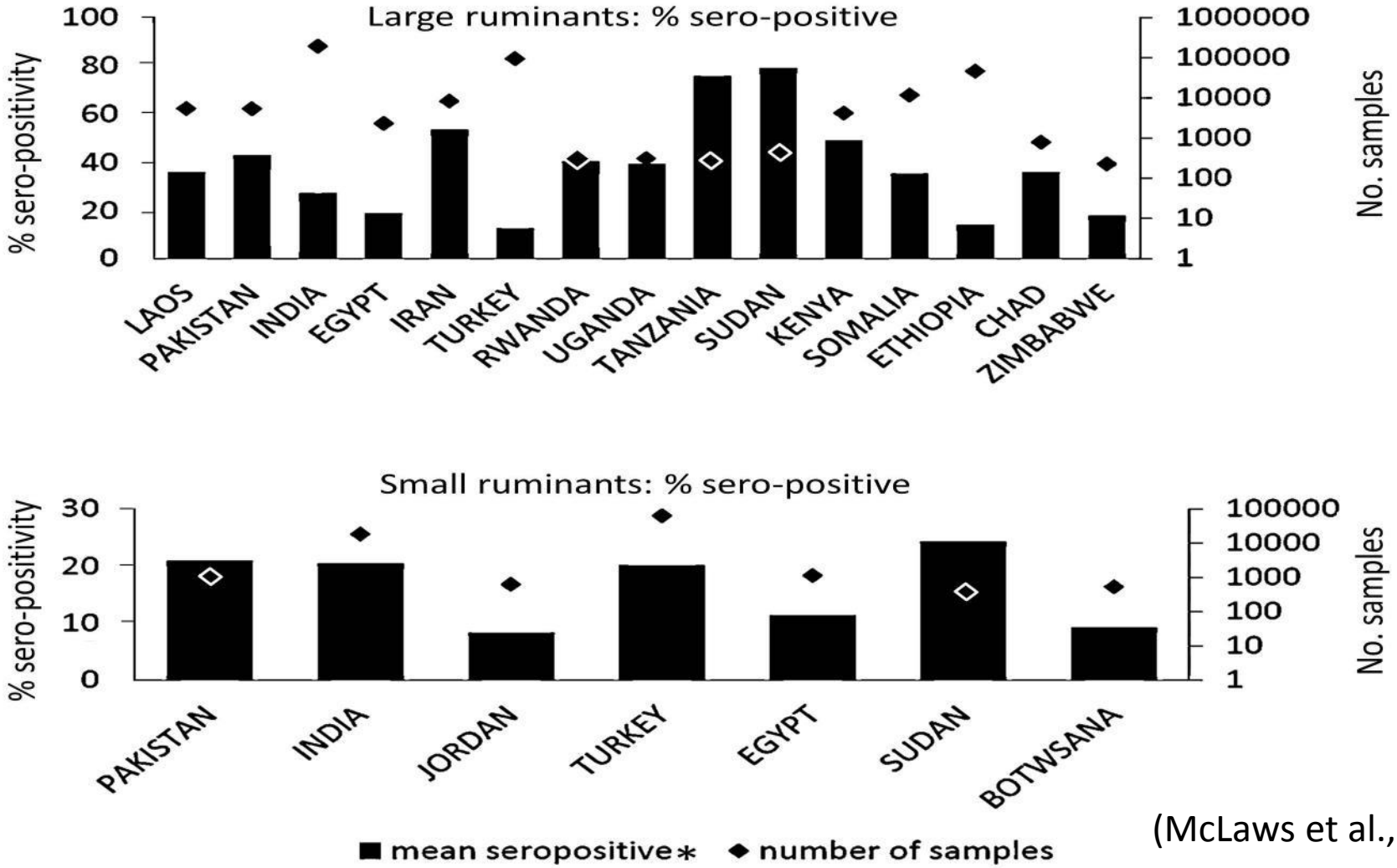
Endemic countries contain 75% of global human population and FMD-susceptible species population

What is FMD burden in endemic countries?

- Globally US$6.5 -21 billion/year direct and vaccination costs only (Knight-Jones & Rushton, 2013)
- But US$2.7–3.6 billion/year in India alone (Ganesh Kumar, 2012)
- Impact in endemic countries is uncertain and neglected?
- Limited evidence creates space for subjective, often non-representative opinion
- What simple, objective evidence is there?

FMD Sero-prevalence studies

Approx. 30% cattle infected per year – % with clinical disease?



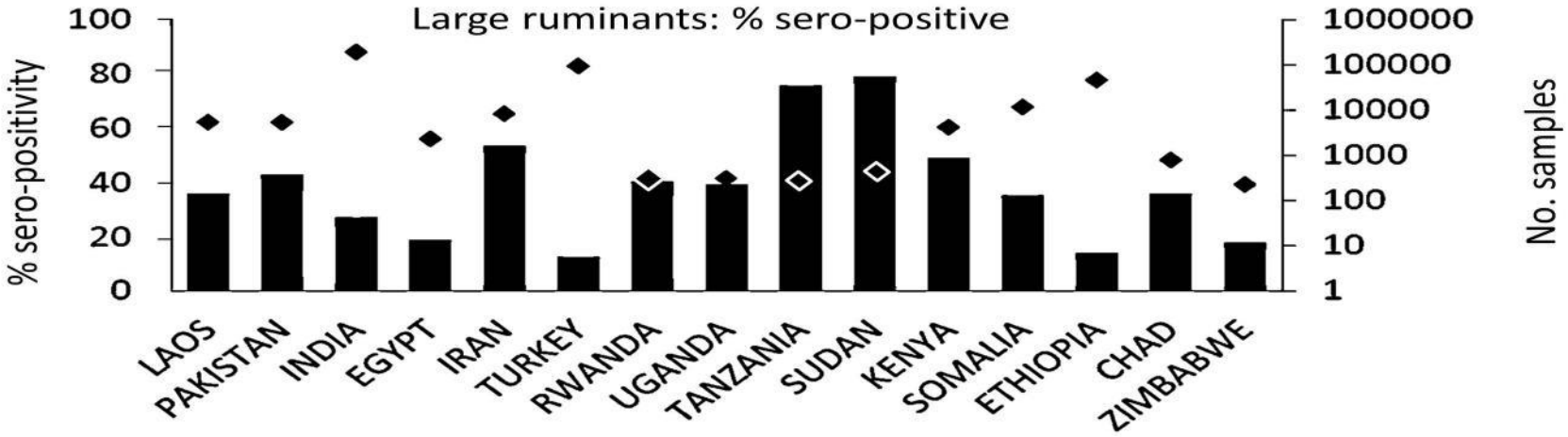
(McLaws et al., 2014)

Question

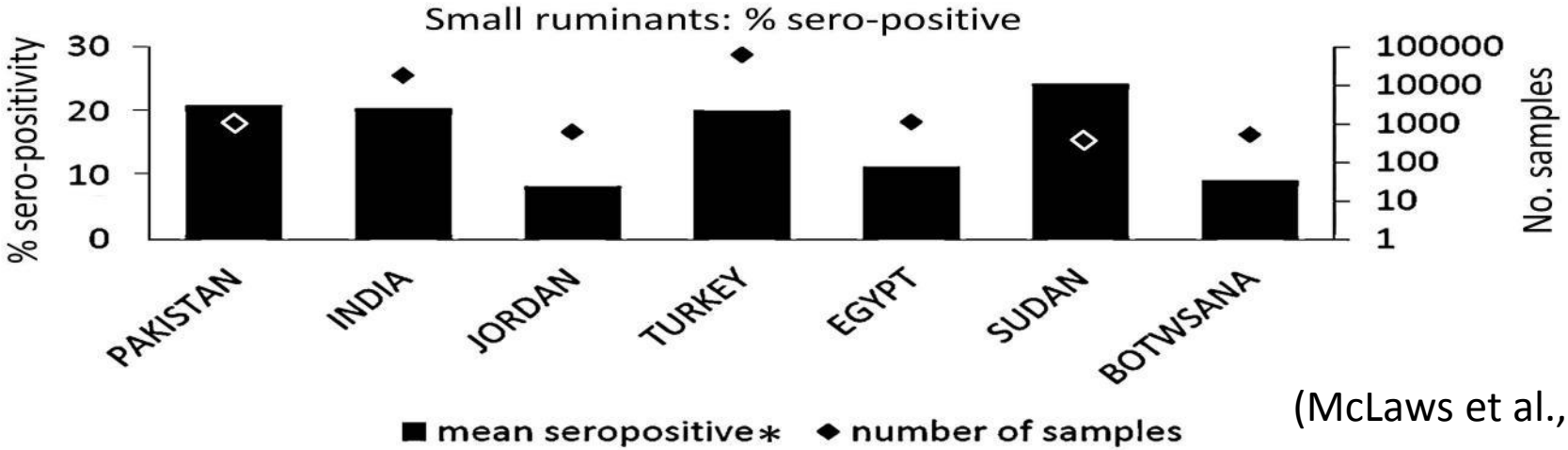
- Direct impact relates to clinical disease
- On average what percentage of FMDV infected cattle develop clinical FMD?
- Answer options: 25%, 50%, 75%, 100%

FMD Sero-prevalence studies

Approx. 30% cattle infected per year – % with clinical disease?



But within a country incidence is highly variable

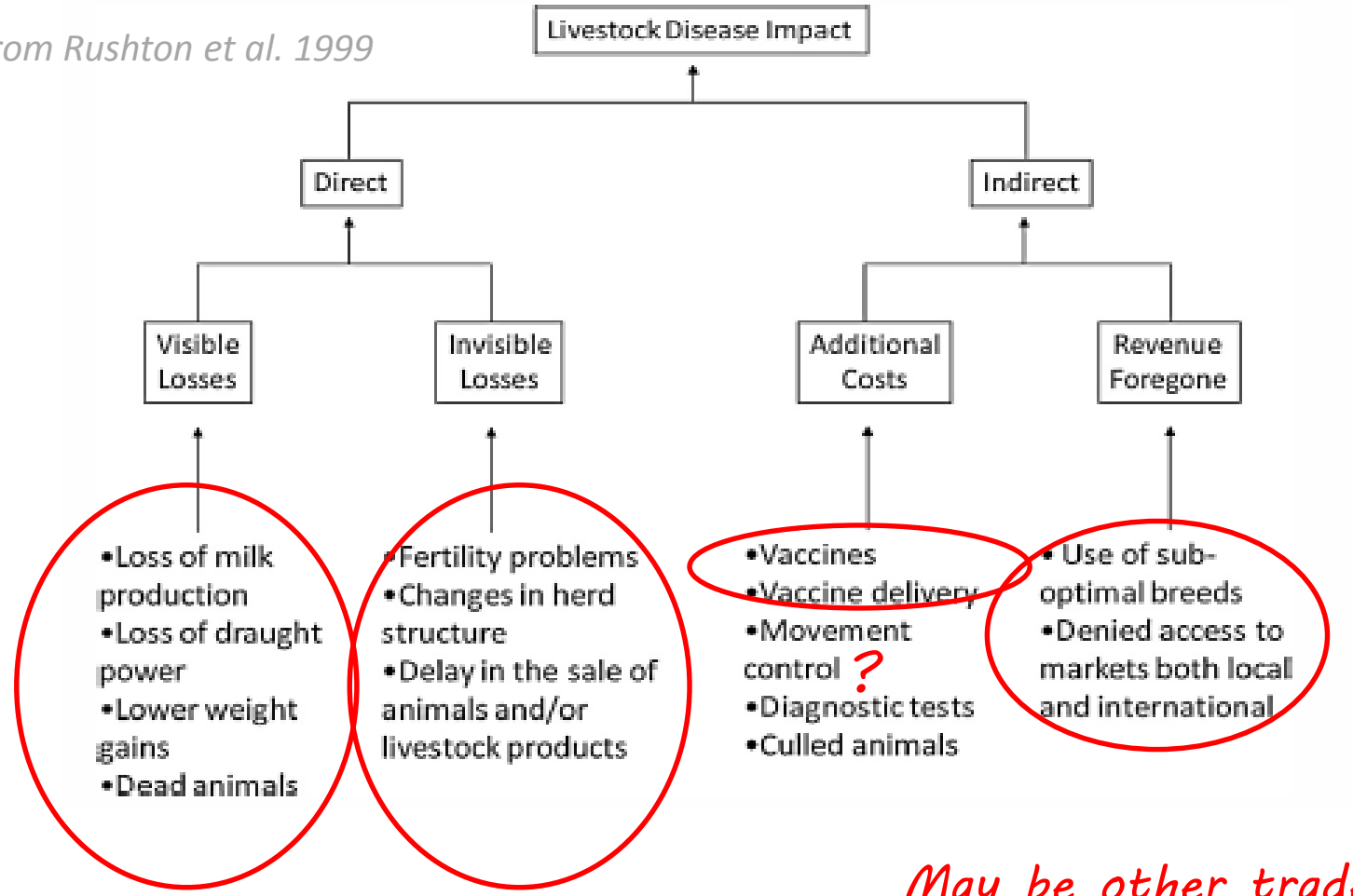


(McLaws et al., 2014)

How are endemic countries affected?

Ongoing or sporadic impacts – Often difficult to measure

Modified from Rushton et al. 1999



May be other trade barriers:
Disease, reliable meat quality, competition

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Measuring impacts

Impacts	Significance	Gaps
Invisible production losses		
Reduced fertility	Significance –High Knowledge – Limited Ease of estimation - Moderate	As a long term impact this has not been captured but could be modelled
Changes in herd structure	Significance –Variable Knowledge – Limited Ease of estimation – Difficult	As a consequence of reduced fertility more adults will be maintained per unit of outputs (milk, cattle for meat) leading to an overall need for greater inputs per unit of output
Delay in the sale of animals and products	Significance –Variable Knowledge – Limited Ease of estimation – Difficult	Timing of sales may be suboptimal as a consequence of reduced weight gains or salvaging cull animals

Knight-Jones, T. J. D., McLaws, M. and J. Rushton, 2016: Foot-and-mouth disease impact on smallholders - What do we know, what don't we know and how can we find out more? Transbound Emerg Dis, In press.

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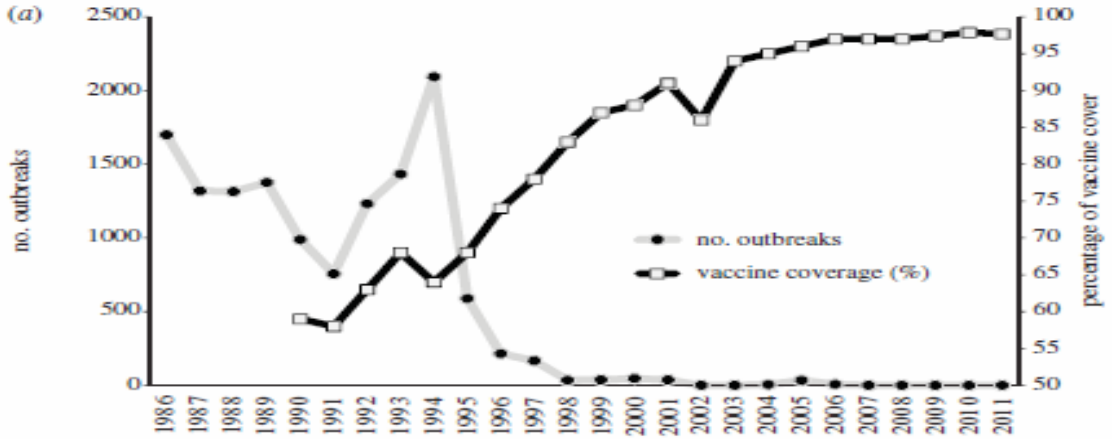
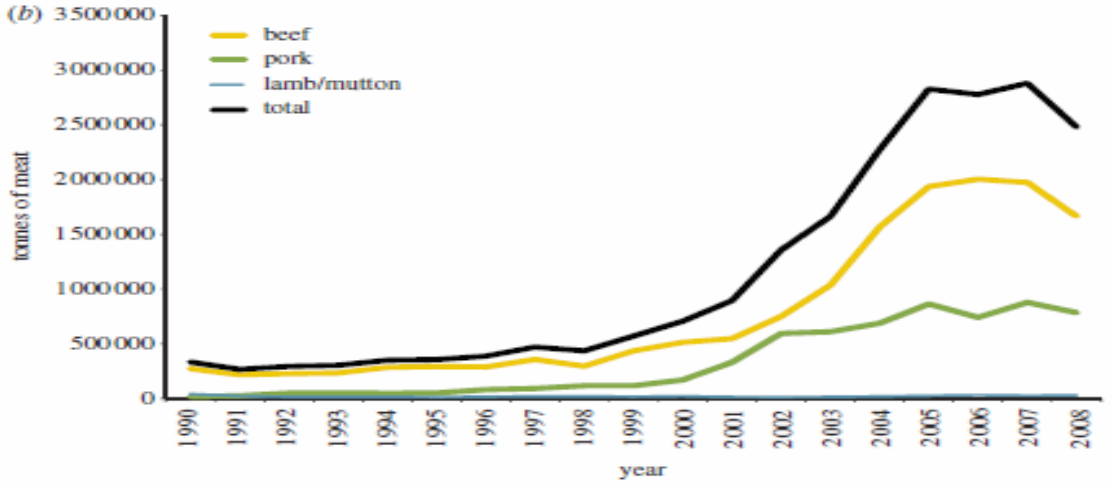
FMD and exports – South America

Brazil - FMD outbreaks and vaccination. Naranjo & Cosivi, Proc Roy Soc B, 2013





South America – Export of meat from FMD-susceptible species

Question

- Which country exported the largest volume of beef in the world in 2014?

Question

- Which country exported the largest volume of beef in the world in 2014?
- Answer: India – so FMD free status not always needed for thriving exports (although trade has since been affected by FMD)

Cost of control

- Impact of wildlife control
  - Fencing and zonation restricts movement of wildlife and people
  - FMD freedom may be fragile – especially near African Buffalo populations
  - Commodity based trade – a sustainable alternative?
- Vaccination is expensive $1 per dose >2 billion doses per year worldwide
  - Requires ongoing programme (Europe & S. America – took decades)

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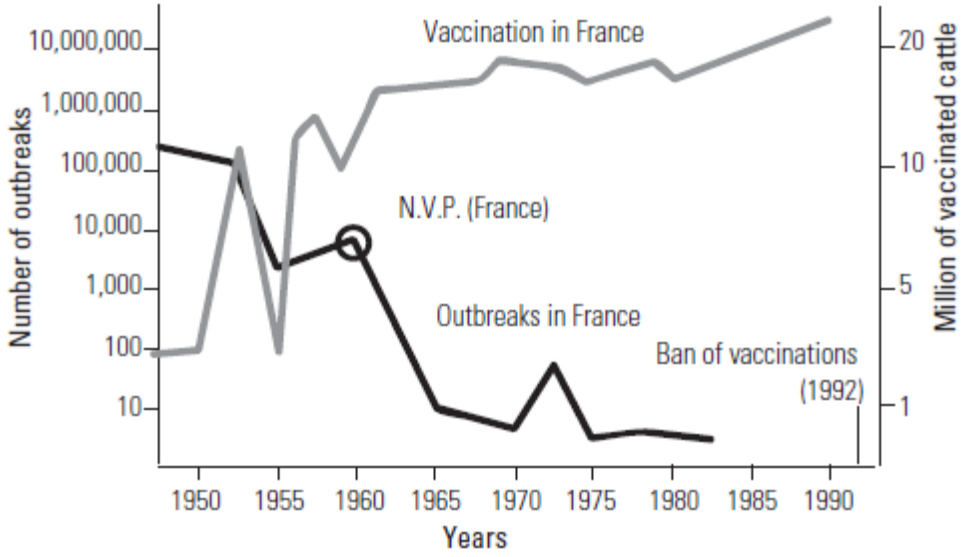
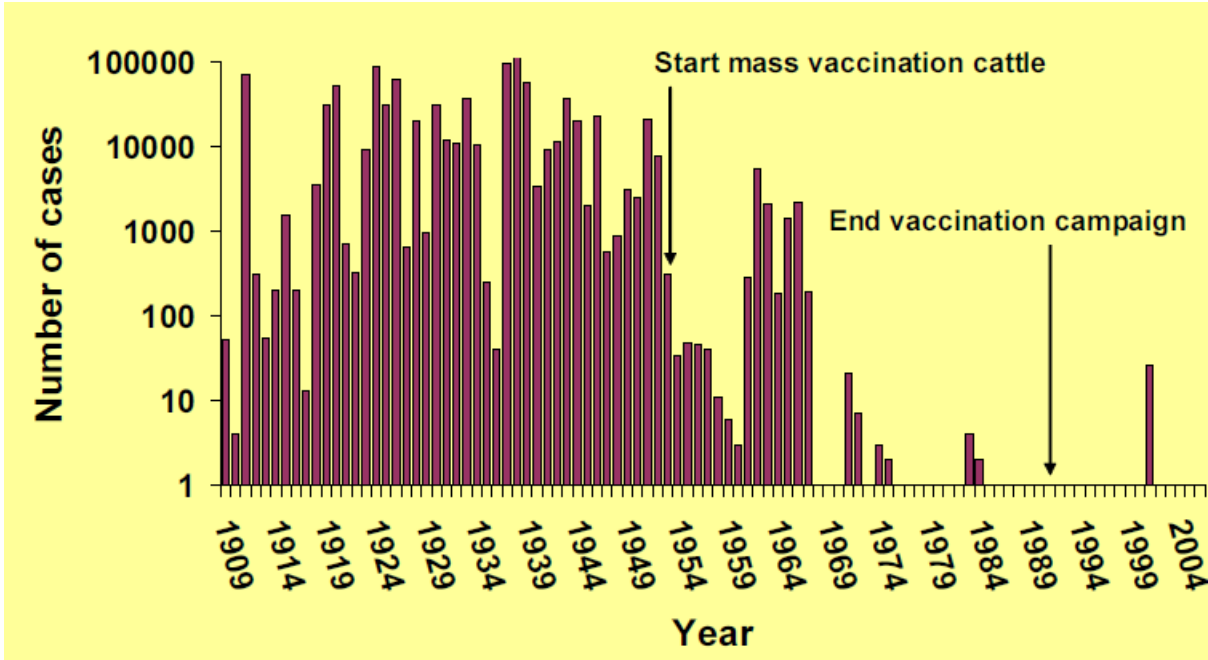


France - FMD outbreaks and vaccination. Lombard et al, OIE, Rev. sci. tech., 2007.



The Netherlands - FMD outbreaks and vaccination. Dekker, A. Foot-and-mouth disease vaccine induced protection. (2010).

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Vaccination & control

- Need quality assured vaccine, effective against local strains
  - "The most expensive medicine is the one that does n't work"
- Many poor livestock keepers depend on communal grazing & frequent trading
  - Livestock are bankable assets sold when cash needed
  - Movement restrictions unpopular and hard to enforce
  - Culling not feasible (too many cases & cost)
  - Producers motivated by herd-size not productivity & FMD does not kill (much)
- Can FMD be controlled by vaccination alone if movement controls are ineffective?
- Economic analyses in endemic countries often use unsubstantiated, optimistic vaccination effect

How to measure?

- Mixture of:
  - Retrospective *ex post* studies
  - Field impact studies (before Vs after, or trials)
  - Modelling studies
- Need to capture:
  - Herd & household, sector impacts, wider economy
  - Household impact as % of annual income
  - Consider both affected and population level impact
- Trade effects – Important but difficult to capture
- Food security – difficult to capture – important if dependent on milk

Conclusion

- Impact is high where incidence is high, for those dependent on commodities whose production and trade is sensitive to FMD
  - Most visible for milk & pigs & trade bans
  - Some producers may be relatively unaffected or resilient to FMD
  - But may be one of many barriers to development
    - improved breeds, market access

Conclusion

- National impact again depends on incidence and economic susceptibility to FMD
- Burden to individual households may be variable but with high prevalence, population level burden may still be large
  - Hence cannot leave control to individuals
  - Effective control needs central & regional coordination

Key Questions

- How important is FMD in endemic countries?
- How does it impact?
- How can we measure this?

- Current knowledge it too patchy & theoretical
- More data needed

Examples – No comprehensive analysis

Jemberu, W. T., M. C. Mourits, T. Woldehanna and H. Hogeveen, 2014: Economic impact of foot and mouth disease outbreaks on smallholder farmers in Ethiopia. Prev Vet Med, 116, 26-36.

Young, J. R., S. Suon, C. J. Andrews, L. A. Henry and P. A. Windsor, 2013: Assessment of financial impact of foot and mouth disease on smallholder cattle farmers in Southern Cambodia. Transbound Emerg Dis, 60, 166-174.

Young, J. R., S. Suon, L. Rast, S. Nampanya, P. A. Windsor and R. D. Bush, 2014: Benefit-cost analysis of foot and mouth disease control in large ruminants in Cambodia. Transbound Emerg Dis.

Nampanya, S., S. Khounsy, R. Abila, J. R. Young, R. D. Bush and P. A. Windsor, 2015a: Financial Impacts of Foot-and-Mouth Disease at Village and National Levels in Lao PDR. Transbound Emerg Dis.

Nampanya, S., S. Khounsy, A. Phonvisay, J. R. Young, R. D. Bush and P. A. Windsor, 2015b: Financial Impact of Foot and Mouth Disease on Large Ruminant Smallholder Farmers in the Greater Mekong Subregion. Transbound Emerg Dis, 62, 555-564.

Casey, M. B., S. Cleaveland, D. Mshanga, T. Kibona, H. Auty, T. Marsh, J. Yoder, B. Perry, R. Kazwala, D. Haydon, D. King, S. Parida, D. J. Paton, R. Reeve and T. Lembo, 2014: Household level impacts of FMD on traditional livestock keeping systems of Northern Tanzania, Oral presentation EuFMD Open Session, Cavtat, Croatia, 29-31 Oct 2014.

Shankar, B., S. Morzaria, A. Fiorucci and M. Hak, 2012: Animal disease and livestock-keeper livelihoods in Southern Cambodia. International Development Planning Review, 34, 39-63.

Garabed R.B., Johnson W.O., Gill J., Perez A.M. & Thurmond M.C. (2008). – Exploration of associations between governance and economics and country level foot-and-mouth disease status by using Bayesian model averaging. J Roy Stat Soc A, 171 (3), 699-722.

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better lives through livestock

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Any questions?

Some practicalities and reminder

Some practicalities

Accessing e-learning website:

https://eufmd.rvc.ac.uk

Log in:

- Your **firstnamelastname** and previously set up password

If you don't have access:

- E-mail us your details to give you an access

  eufmd-training@fao.org

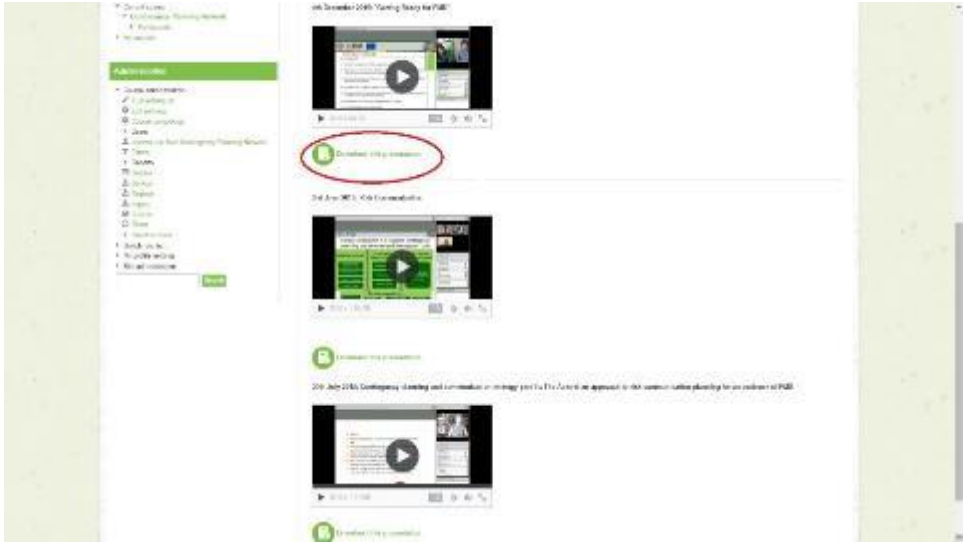
Click "My Courses"

Select a network "**Contingency Planning Network**"

Some practicalities

Network page

- Click sections to open them;
- Follow sequentially down the page to chose the recorded webinar.

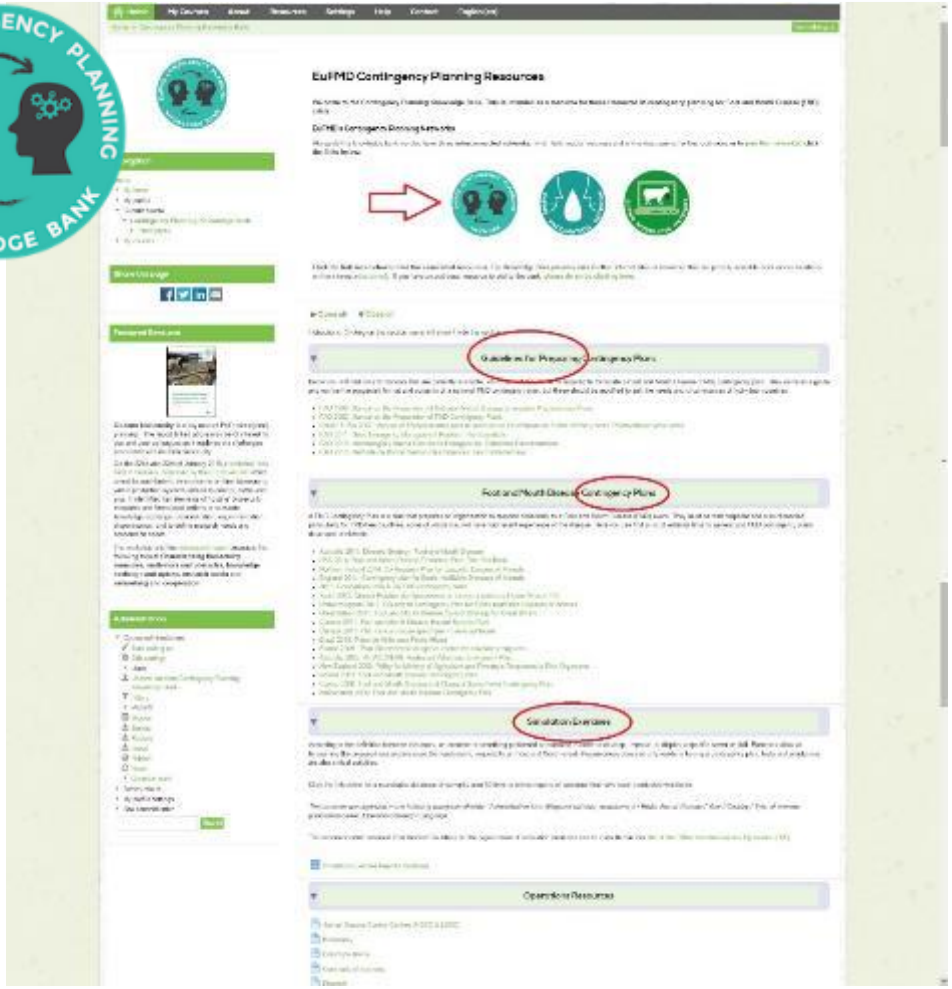


Contingency Planning Knowledge Bank

- Great source of information for those who control FMD

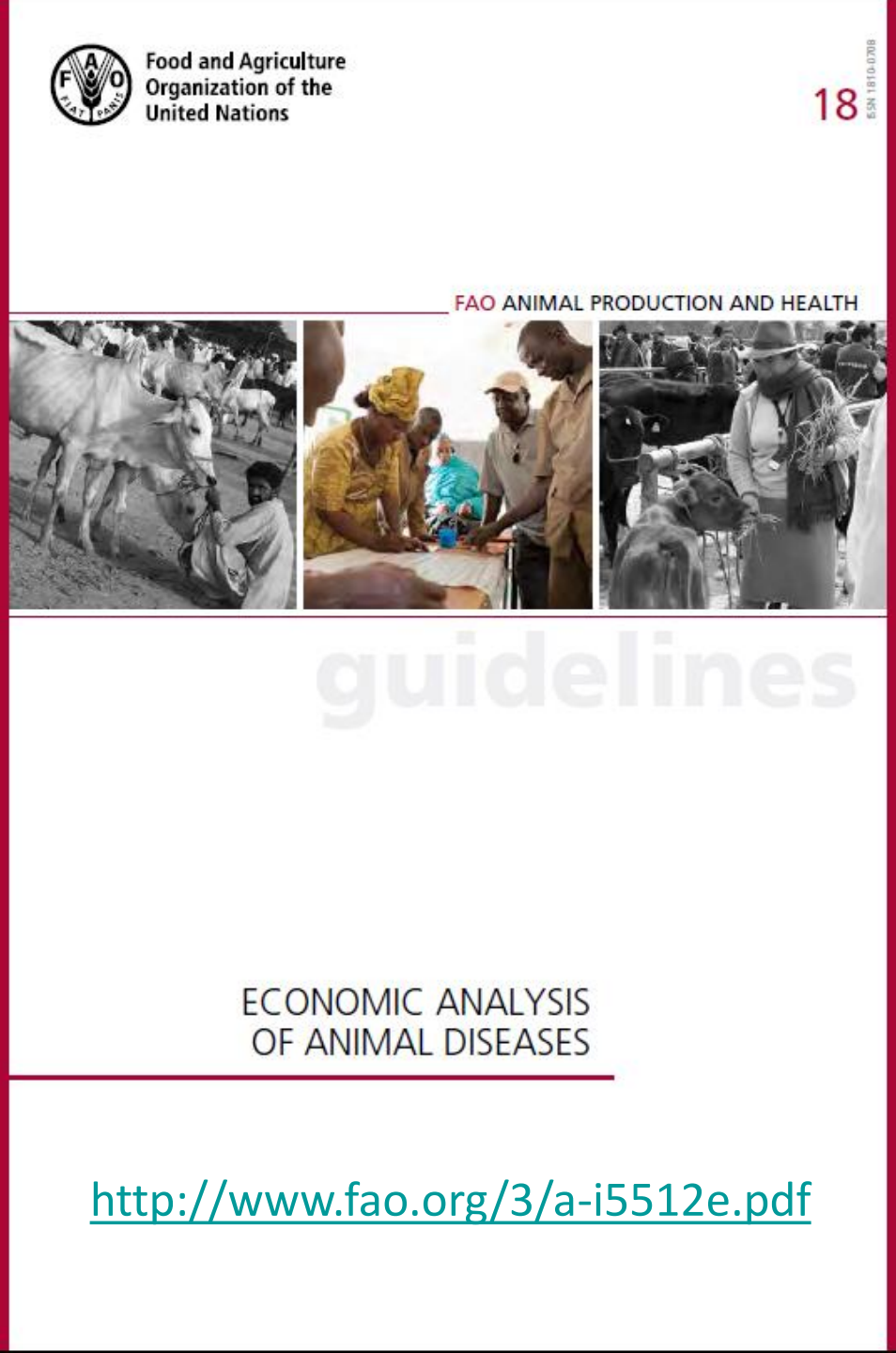
- Free access without log in under the link:

https://eufmd.rvc.ac.uk/course/view.php?id=50



These guidelines prepared by FAO will contribute to a better understanding of the importance of economic analysis when assessing the impact of a particular animal disease in production, trade, market access, food security and livelihoods of rural communities, or when designing or implementing an animal health strategy at national, regional or global level. This framework will provide a good communication tool between animal health technicians, veterinarians and economists in developing countries and will encourage a well-informed collaboration between veterinarians, animal health experts, economists and social scientists for livestock and socio-economic development.

Economic analysis should be an essential part of animal disease policies and disease management strategies.



http://www.fao.org/3/a-i5512e.pdf

2016::Open Session of the EuFMD::

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Thank you for watching and for your participation!