Socio-Economics of foot and mouth disease

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Outline

• Framework
  • Impact issues
  • Nature of FMD
  • Cost structure
• Estimation of FMD impacts
  • Production losses
  • Control costs
• Other impacts of FMD
• Summary
Introduction

- Foot and mouth disease has **global importance**, which is multi-factorial:
  - It affects **many species**
  - It influences the production and **processing** of livestock
  - It influences the **trade** livestock and livestock products
  - It has shaped and continues to shape resource **allocation for animal health**

- FMD affects a colossal number of **animals** each year, and in the process a huge number of **PEOPLE** - producers and consumers
Introduction

• Despite this importance there are no studies estimating the global socio-economic impact of FMD
• The paper we have worked on begins to address this gap by applying a disease impact framework to FMD
• Demonstrating the importance of the disease will give a better impression of where:
  • resources are being used
  • losses are being incurred
  • resource allocation can be improved
Framework
Livestock Disease Impact

- Direct
  - Visible Losses
    - Dead animals
    - Thin animals
    - Animals poorly developed
    - Low returns
    - Poor quality products
  - Invisible Losses
    - Fertility problems
    - Changes in herd structure
    - Delay in the sale of animals and/or livestock products
- Indirect
  - Additional Costs
    - Drugs
    - Vaccines
    - Insecticides
    - Treatment of products
  - Revenue Foregone
    - Denied access to better markets
    - Use of sub-optimal production technology
Nature of FMD

- It is possible to apply the disease impact framework to different countries and make global estimates for FMD.
- The estimate gives a quantification of FMD importance.
- The **nature of FMD adds an additional dimension**.
- It is highly contagious, affects many species and is not easily contained within one farm or one population.
- The presence of FMD creates problems for all livestock owners who are connected to an infected population either geographically or through livestock value chains.
Nature of FMD

• FMD creates what economists call externalities.

• In the case of an outbreak the externalities are negative, i.e. the livestock owner with FMD has a negative impact on those connected to their herd or flock as the disease is likely to spread.

• Similarly, where a livestock owner protects their animals from FMD they will generate a positive externality as they will be protecting the animals of livestock owner who are connected to the protected population.
Nature of FMD

• Where externalities are created there is a need for public investment as not all the costs, in the case of disease presence, or all the benefits, in the case of disease control, can be captured by the livestock owner implementing the actions.

  FMD presence creates NEGATIVE PUBLIC GOODS
  FMD control creates POSITIVE PUBLIC GOODS
The cost structure of control

• Government’s role in FMD needs to focus on creating an institutional environment where population level control costs reflect sufficiently the benefits that a livestock owner can capture in terms of benefits.

• In most cases this requires a combination of:
  • Investments in veterinary education, research and general infrastructure to develop the animal health system – what economists would call fixed costs
  • Specific programmes that cover the costs of FMD control and management – what economists would call variable costs
The cost structure of control

• Many countries have fixed cost investments in animal health systems, and adding a FMD control programme is relatively easy.

• However, countries that have low level investments in fixed animal health costs will not necessarily benefit with a FMD programme alone, there needs to be a combined effort to improve both the fixed and variable costs to get a potential control programme running.
The cost structure of control

• The **fixed cost** element of the FMD programme will generate **capacity** and **skills**
• This will **benefit** other animal disease campaigns and improve the animal health system overall

**Therefore not all costs for this fixed cost element should be assigned to FMD**
FMD Impacts
FMD Impact

Direct

Visible Losses
- Loss of milk production
- Loss of draught power
- Lower weight gains
- Dead animals

Invisible Losses
- Lower fertility
- Change in the herd or flock structure

Indirect

Additional Costs
- Vaccines
- Vaccine delivery
- Movement control
- Diagnostic tests

Revenue Foregone
- Use of sub-optimal breeds
- Denied access to markets both local and international
What has been included in the analysis?

• The results presented are from analysis on the:
  • Impact of FMD on production
  • Cost of FMD vaccination
• These are elements are better understood and have more specific data and research attached to them
Estimating the production losses

• FAOSTAT data were used as a basis for the livestock population at risk
• The prevalence of the disease comes from recent studies on prevalence across the world
  • Some modifications were made to reflect under reporting of disease
• Calculations of the costs of FMD per animal affected
Species and region affected by FMD (LSUs/year)

- **Cattle**: Predicted to be FMD infected in millions (20 or more)
- **Goats**: Predicted to be FMD infected in millions (1 or less)
- **Pigs**: Predicted to be FMD infected in millions (1 or less)
- **Sheep**: Predicted to be FMD infected in millions (1 or less)
- **Buffalo**: Predicted to be FMD infected in millions (1 or less)

Legend:
- **China**: Dark blue
- **India**: Red
- **Rest of Asia**: Green
- **Africa**: Purple
- **Europe**: Teal
- **Middle East**: Orange
- **South America**: Light blue

China is predicted to be the most affected region, with millions of livestock units predicted to be FMD infected.
Vaccination costs

• Estimates of vaccines produced and applied by region have recently been made
• There are also estimates of the costs of the vaccine per dose and its application
• These were used to generate regional estimates of the costs of vaccination
FMD production losses and vaccination costs by region (US$ million/year)
The other impacts
- adoption and adaptation of improved management practices
Intensification and specialisation of livestock systems

Dual purpose breeds

Dairy breeds with some beef purpose

National Beef breeds

Dairy breeds

International Beef breeds
**Intensification and specialisation of livestock systems**

- Managed forage and conservation systems
- New forage species and concentrates
- Predominantly grazing and foraging systems
- Housing and handling systems
- Sophisticated handling systems
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
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!
## Costs of major outbreaks in previously free countries

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<tbody>
<tr>
<td>Location</td>
<td>Taiwan(^1)</td>
<td>Uruguay(^1)</td>
<td>UK(^1)</td>
<td>Japan(^2)</td>
<td>Rep. Korea(^3)</td>
</tr>
<tr>
<td>Costs (US$ millions)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct costs</td>
<td>254</td>
<td>20</td>
<td>3,558</td>
<td>550</td>
<td>2,780</td>
</tr>
<tr>
<td>Indirect costs</td>
<td>6,363</td>
<td>60</td>
<td>5,646</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Total cost</strong></td>
<td><strong>6,617</strong></td>
<td><strong>80</strong></td>
<td><strong>9,204</strong></td>
<td><strong>&gt;550</strong></td>
<td><strong>&gt;2,780</strong></td>
</tr>
<tr>
<td>As percentage of GDP</td>
<td>-0.64%</td>
<td>N/A</td>
<td>-0.20%</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Duration (months)</td>
<td>4.5</td>
<td>4</td>
<td>7.5</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Slaughtered Animals</td>
<td>4 million</td>
<td>20,000</td>
<td>6.24m</td>
<td>290,000</td>
<td>3.47m</td>
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**Key:** S.O. = Stamping out, Vacc = Vaccination. N/A = Data not available.

**Sources:** 1 FAO. 2 Muroga, N. et al., 2011. 3 Yonhap News Agency
Impact of trade bans on exports

Key: SP = Sao Paulo, MS = Mato Grosso do Sul
The vertical line represents the date of detection.
Source: Costa et al., 2011
FMD and poverty
Predicted FMD prevalence

Countries with outbreaks in FMD free zones between Jan 2005-Aug 2011

Assign Prevalence Index:
- < 0.1
- 0.1-0.5
- 1-5
- 5-10
- 10-50
- 50-100
- > 100
Density of susceptible species
Density of poor people dependent on livestock
Governance across the world
Recent studies on the impact of the disease at household level

• For such an important disease there are relatively few studies that have been published on the importance of FMD

• However I want to draw people’s attention to three pieces of work that are addressing this gap
Recent studies on household impact of FMD

<table>
<thead>
<tr>
<th>Country</th>
<th>Impact</th>
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<tr>
<td>Cambodia¹</td>
<td>Reduction in household income of 4.4 – 11.7% annually following a FMD outbreak. Loss of 54 – 92% of animal value following FMD infection.</td>
</tr>
<tr>
<td>Laos²</td>
<td>Loss of 22 – 30% of animal value following FMD infection.</td>
</tr>
<tr>
<td>Sudan³</td>
<td>Loss of US$25 per cow per year in a region where 90% of the population have income less than 1 dollar a day.</td>
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<tr>
<td>Pakistan⁴</td>
<td>Reduction on milk yield in cattle and buffalo after infection. Milk yield only returns to two thirds the level of pre-infection after 60 days</td>
</tr>
</tbody>
</table>

Source: ¹Shankar et al., 2012; ²Rast et al., 2010; ³Barasa et al., 2008; ⁴Ferrari et al 2012
Foot-and-mouth disease undermines trade
• it impedes investment in the livestock sector
• stops poor people having access to markets
• it stops poor people having options for their future and the future of their families
Conclusions
Conclusions

• The global impact of FMD is colossal due to the huge numbers of animals affected.

• This impact can be separated into two components: the **direct losses** due to a reduction in production and changes in herd structure; and **indirect losses** that relate to the significant costs of FMD control and management and poor access to markets and limited use of improved production technologies

• The estimated **annual impact of FMD** in terms of production losses and vaccination alone are in the region of **US$5 billion**
Conclusions

• Much of the global FMD burden of production losses falls on the world’s poorest communities, and those which are most dependent upon the health of their livestock.

• In addition, the presence of FMD in these countries has an impact on the overall herd fertility, modifying the herd structure and affecting the selection of breeds.

• Overall the direct losses limit livestock productivity creating a food security issue and contributing to malnutrition.
Conclusions

• In countries with ongoing control programmes, FMD control and management creates significant costs.
• These control programmes are often difficult to end due to risks of FMD incursion from neighbouring countries.
• The greater movement of people, livestock and commodities implies that risks of international transmission of FMD are increasing.
• This risk further compromises these countries in their ability to export livestock and livestock products as the presence, or even threat, of FMD prevents access to lucrative international markets.
Conclusions

• In FMD free countries outbreaks occur regularly and the costs involved in regaining free status have been enormous.
• Yet we know how to manage this disease, we have had successes.
• There are good social and economic reasons for setting in motion a more coordinated process of FMD management at global level.
One Health oriented Food Systems

Helping PEOPLE, Protecting PEOPLE
Working with PEOPLE