Economic costs of the foot and mouth disease outbreak in the United Kingdom in 2001

D. Thompson (1), P. Muriel (1), D. Russell (1), P. Osborne (1), A. Bromley (2), M. Rowland (2), S. Creigh-Tyte (3) & C. Brown (3)

(1) Economics and Statistics Directorate, Department for Environment, Food and Rural Affairs, 3-8 Whitehall Place, London SW1A 2HH, United Kingdom
(2) Economics and Statistics Directorate, Department for Environment, Food and Rural Affairs, Foss House, 1-2 Peasholme Green, Kings Pool, York YO1 2PX, United Kingdom
(3) Economics Branch, Department for Culture, Media and Sport, 2-4 Cockspur Street, London SW1Y 5DH, United Kingdom

Summary
The authors present estimates of the economic costs to agriculture and industries affected by tourism of the outbreak of foot and mouth disease (FMD) in the United Kingdom (UK) in 2001. The losses to agriculture and the food chain amount to about £3.1 billion. The majority of the costs to agriculture have been met by the Government through compensation for slaughter and disposal as well as clean-up costs. Nonetheless, agricultural producers will have suffered losses, estimated at £355 million, which represents about 20% of the estimated total income from farming in 2001. Based on data from surveys of tourism, businesses directly affected by tourist expenditure are estimated to have lost a similar total amount (between £2.7 and £3.2 billion) as a result of reduced numbers of people visiting the countryside. The industries which supply agriculture, the food industries and tourist-related businesses will also have suffered losses. However, the overall costs to the UK economy are substantially less than the sum of these components, as much of the expenditure by tourists was not lost, but merely displaced to other sectors of the economy. Overall, the net effect of FMD is estimated to have reduced the gross domestic product in the UK by less than 0.2% in 2001.

Keywords
Agriculture – Economic costs – Foot and mouth disease – Tourism – United Kingdom.

Introduction
This paper describes the assumptions and calculations underlying best estimates of the costs of the foot and mouth disease (FMD) outbreak to those sectors of the United Kingdom (UK) economy directly affected, and their input suppliers. The effects of the outbreak on the public sector and consumers are also estimated. Although the eventual macroeconomic impact of the FMD outbreak still cannot be determined with certainty, the broad magnitudes are becoming clearer. The effect on UK gross domestic product (GDP) in 2001 appears to have been modest relative to normal fluctuations and was estimated in the 2001 Pre-Budget Report to be less than 0.2% of GDP (1). However, the impact on severely affected regions is likely to be more pronounced. This paper focuses on the costs to the agriculture and food industries and to those firms that depend on tourist expenditure. The analysis was carried out in the autumn of 2001 and, where possible, some of the assumptions have been updated.

The estimates of the economic impact of FMD on agriculture and downstream sectors are based on the numbers of animals slaughtered, as well as the length of restrictions for both livestock movements and the export ban. There are still areas of uncertainty surrounding some of these issues and the estimates in this paper are based on the most plausible assumptions. Where appropriate, some alternative assumptions are tested in order to examine the sensitivity of the results.

Cases of FMD continued to the end of September 2001; since then, there have been no subsequent cases. The last county in the UK was declared disease-free on 14 January 2002, thereby enabling livestock movements under licence across the country. There was a progressive relaxation of restrictions on
countryside access throughout the course of the disease. However, it is difficult to predict whether, or how quickly, visits to the countryside for tourism, recreation and leisure pursuits will recover to the levels recorded in the absence of the disease. There is anecdotal evidence of tourist income in some areas being much higher than usual in the autumn – perhaps fuelled not just by recovery, but by some people choosing to forego visits abroad after 11 September 2001. However, it is difficult to know whether any of this is as a result of FMD and no account has been taken in this paper of any such resurgence.

Even having eradicated the disease, there will be a period during which restrictions on the movement of livestock will remain and the authors also assumed that the export of livestock and livestock products will not recover for some months beyond the eradication of the disease. A partial relaxation of the ban on exports of pig meat was announced in the autumn and on 22 January 2002, the UK regained FMD-free status, which clears the way for the reopening of exports. The full benefits of these relaxations remain to be felt as exports will take some time to recover.

Agriculture and tourism in the rural economy

To place the economic effects in perspective, this section gives some statistics to illustrate the size of agriculture and other affected industries.

Agriculture employs about 2% of the total UK workforce and accounts for less than 1% of GDP, although other agriculture-related businesses have also been affected by the outbreak. In contrast, tourism employs over 7% and the contribution of this sector to the GDP is substantially greater at 4.7% (Fig. 1).

Livestock and livestock products are a very important part of UK agriculture. The value of output from the species susceptible to FMD accounts for about 40% of the total output of the UK agricultural industry. Clearly therefore, anything that affects this sector will have a significant impact on the industry as a whole (Fig. 2).

Similarly, as agricultural land accounts for over three quarters of the total area of the UK, anything that reduces access to that land will have a serious impact on the industries that depend on the land.

Foot and mouth disease directly affected a wide area of the country (Fig. 3). For the first few months of the outbreak, many footpaths throughout the UK were closed in order to prevent the spread of infection, so the effects on tourism initially spread to much of the countryside.

The total number of animals slaughtered under disease control measures was 4 million, of which the vast majority were sheep. A large number of animals were slaughtered in order to prevent welfare problems for farmers who were prevented by movement restrictions from moving their stock from farms. In the analysis, the authors assumed that about 2.9 million animals would be slaughtered under these schemes; however, the final figures were lower than this assumption. The latest figures are shown in Table I.

Direct effects on agriculture and the food supply chain

Assumptions

The analysis is based on the slaughtering, for disease control purposes, of 4 million animals. The best estimate in autumn 2001 was that some 2.9 million livestock would enter the welfare disposal scheme. At that time, some 2.6 million animals had been slaughtered under the livestock welfare and light lamb disposal schemes. The assumption of the authors
available to the domestic market. The impact on prices might therefore be slightly overstated.

In relation to livestock movement restrictions in infected areas, the authors assumed that controls would progressively decrease and by the end of January 2002, all counties would attain disease-free classification, allowing movement restrictions to be completely removed. As noted above, all counties were declared disease-free on 14 January 2002.

Some trade in pig meat was allowed to resume at the end of October 2001. The best guess of the authors was that full trade in animal products would resume by spring 2002. Even though the UK has disease-free status, the extent to which full trade will resume is still difficult to determine. To test for the sensitivity of the results due to a delay in the complete resumption of exports, especially for sheep meat, a couple of alternatives are examined, as follows:

- that trade fully resumes in October 2002
- full trade resumes in autumn 2003.

The assumptions concerning the numbers of livestock destroyed and the length of the delay in resuming exports are set out fully in Table II.

**Summary of effects on agriculture and the food chain**

The results summarised in Table III show that the economic effect of FMD on agriculture and the food chain is likely to consist of a loss of approximately £3.1 billion, aggregated over the full duration of the controls associated with the outbreak. The vast majority of this impact will be felt in 2001.

The principal costs arise from the slaughter and disposal of livestock, the associated cleaning and disinfecting of premises and administration costs. However, there were some Exchequer savings arising from the closure of the ‘over-thirty-month scheme’ and the reductions in the level of the sheep annual premium (SAP) as a result of higher European Union (EU) prices. At the commencement of the outbreak, the Government decided to pay agri-monetary aid. In total, the value of these payments from the UK Exchequer is estimated to be broadly £2.6 billion. The main component is the cost of compensation for animals destroyed (£1.1 billion) and this is assumed to exactly equal their value. Given the differences in accounting methods, this compensation may not exactly equal the change in value in the aggregate balance sheet for UK agriculture (3). The actual cost to the UK taxpayer will, however, be affected by the extent to which these costs can be reclaimed from the EU budget. Assuming that the eligible costs (control measures, compensation and disposal and cleaning) are partly funded by the EU budget, the cost to the UK taxpayer would be reduced by some £325 million. There will also be some residual costs (£355 million) to agricultural producers (after slaughter and

### Table I

<table>
<thead>
<tr>
<th>Animal</th>
<th>Numbers slaughtered for disease control</th>
<th>Numbers slaughtered for welfare reasons</th>
<th>Total numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>594,000</td>
<td>169,000</td>
<td>1,135,000</td>
</tr>
<tr>
<td>Sheep</td>
<td>3,334,000</td>
<td>1,586,000</td>
<td>42,264,000</td>
</tr>
<tr>
<td>Pigs</td>
<td>145,000</td>
<td>287,000</td>
<td>6,482,000</td>
</tr>
<tr>
<td>Other</td>
<td>4,000</td>
<td>5,000</td>
<td>N/A</td>
</tr>
</tbody>
</table>

a) As recorded by the Agricultural Census in June 2000
b) In addition, 526,000 lambs were slaughtered under the light lambs scheme
N/A: not available
welfare compensation and agri-monetary payments) and there will be some costs (£170 million) to other parts of the food chain. Consumers will receive some windfall benefit from the lower prices in 2001 resulting from supplies overhanging the market whilst the export ban remains in place. However, this gain proves transitory and over the period to 2005, there is a small loss to consumers.

**Income effects on agricultural producers**

The results showing the impact upon agricultural producers reveal that there are likely to be a range of costs to producers that lie beyond the loss of livestock which have been slaughtered and for which compensation has been provided (Table III). These costs arise from a number of factors, as follows:

– effect of price changes resulting from changes in supply to the UK market

– reductions in price arising from disposal of products on the UK market

– costs of withholding animals on farms

– losses due to delay in returning to production

– changes in subsidy payments

– agri-monetary aid.

Several factors have affected the supply of agricultural products to the UK market. The slaughter and disposal of livestock have reduced production, the movement restrictions have prevented normal supplies reaching markets and the restrictions on exports have meant that products that would normally have been disposed of overseas will increase the supplies on the domestic market. To some extent, these variations in supply will be accommodated by changes in the level of imports, but inevitably there will be some adjustment to the domestic supply/demand balance.

The effect on prices of agricultural commodities has been estimated by determining the supply position due to the reductions in domestic production and the closure of export markets. Imported supplies are assumed to be available from the rest of the EU, but no account has been taken of any impact of FMD on the demand for products in the UK or the rest of the EU. In fact, disruption to supplies on the domestic market was relatively short-lived and the observed price changes have been relatively modest. The loss to producers associated with price changes is therefore estimated to be about £50 million.

A further effect of the export ban will be that some products from UK agriculture which are generally sold in the EU will have to be disposed of on the domestic market. In certain cases, products have no ready market in the UK and could only be sold at substantial discount. Examples of such products are light lambs and sow meat. The disposal of these products is a substantial cost and it is estimated that the loss of value on these products to livestock producers is £130 million.
The SAP is calculated on the basis of the difference between an average EU market price and the basic price. Estimates show that the market price in the UK will drop as a result of increased supplies which cannot be exported, but the ban on exports will have the effect of raising the EU price. On average, the EU price will rise and the value of the SAP is estimated to fall by some £120 million.

When FMD occurred in February 2001, the Government rapidly decided to take the option of paying agri-monetary aid. This reduced the costs faced by producers by £155 million.

The analysis shows that the greatest part of the cost to farm producers falls on the sheep sector where the risks of a market overhang are greatest and where there is a substantial reduction in subsidy payment. The pig sector has also suffered from the export ban. The costs in the dairy and beef sectors – mainly resulting from the withholding of produce due to movement controls and consequential losses before re-stocking can take place – are likely to be offset by increased prices and the benefits of the additional agri-monetary aid.

**Sensitivity analysis**

Under the central assumption of the authors, uncompensated losses to producers total £355 million. If export markets for sheep and beef do not recover for a further seven months (i.e. until October 2002), these losses are estimated to rise to £450 million. A further delay of six months would increase the costs by a further £170 million. The additional losses arise almost entirely from a delay in recovering sheep meat exports. This has two principal effects. Firstly, producers continue to suffer a quality-related price discount as output is sold into low value domestic usage (e.g. pet food). Secondly, delay in recovering export markets adds to the general deflationary pressures in the domestic market. These two distinct sources of price pressure each contribute about one half to the increased losses.

**Income effects on the food supply chain**

The authors have credited to agricultural producers the full revenue effect of price changes, some of which in practice may be absorbed at other points in the supply chain. In addition, there will be some specific effects on the supply chain before and beyond the farm-gate. These effects beyond the farm-gate will be most marked for auction markets, slaughterhouses and food processors, the activities of which were disrupted by the combined effects of the movement ban and export ban. The total loss of value added for these sectors is estimated to be of the order of £170 million. The authors have not attempted to identify the impact on individual supply industries. However, these are included as part of the indirect effects which are estimated in the section entitled ‘Indirect impacts’ below and in Appendix 1.

**Other sectors**

Foot and mouth disease is likely to have diverted substantial resources from other employment activities to destroy...
diseased livestock, bury, burn or otherwise dispose of the carcasses and disinfect and clean-up infected premises. Most of this expenditure will fall to the public sector. Additional spending to tackle the disease and the implications thereof is estimated at some £2.8 billion. However, there will be some offsetting savings to the Exchequer as a result of lower payments for the SAP and the ‘over-thirty-months scheme’. The cost, net of these savings, is estimated to be about £2.6 billion. This figure will be reduced further when account is taken of receipts from the EU budget and the UK share of financing this. This additional spending represents a loss to the economy in the sense that these resources could have been productively employed elsewhere had FMD not occurred. In practice, some of this activity may involve resources laid idle in the food supply chain as a result of FMD and already identified as a welfare loss in the analysis.

Country breakdown of results
Economic losses to agricultural producers not compensated by the Exchequer and the downstream food chain sectors have been disaggregated by country within the UK – this has been a ‘top down’ allocation of UK estimates. The full results, for best guess assumptions, are reported in Table IV. These show that losses of about £230 million have been incurred by agricultural producers in England, about 60% of the UK total. Both Scotland and Wales have incurred losses in the £60 to £65 million range. By comparison, the impact on producers in Northern Ireland has been negligible, in part due to the lifting of the export ban in early summer 2001.

| Table IV |
| Economic effects* of foot and mouth disease on agriculture and food chain industries in the United Kingdom (£ million) |

<table>
<thead>
<tr>
<th>Industry</th>
<th>England</th>
<th>Wales</th>
<th>Scotland</th>
<th>Northern Ireland</th>
<th>Total: United Kingdom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural producers</td>
<td>230</td>
<td>65</td>
<td>60</td>
<td>0</td>
<td>355</td>
</tr>
<tr>
<td>Downstream industries</td>
<td>115</td>
<td>25</td>
<td>25</td>
<td>5</td>
<td>170</td>
</tr>
<tr>
<td>Total</td>
<td>345</td>
<td>90</td>
<td>85</td>
<td>5</td>
<td>525</td>
</tr>
</tbody>
</table>

* Uncompensated producer effects only

In the food chain sectors downstream from the farm-gate, almost two thirds of the UK losses, about £115 million, have fallen in England. Scotland and Wales have both incurred losses of about £25 million, 15% for each of the UK loss. Northern Ireland has incurred a modest loss, as auction markets re-opened during the late summer and slaughterhouses and meat processors were only slightly affected by the outbreak.

Indirect impacts
The industries supplying inputs to agriculture and the food chain will also be adversely affected by FMD. These impacts are discussed in Appendix 1. Total losses are about £65 million.

Spending on tourism
Overall, the UK tourist sector, both rural and urban, is estimated to have lost between £2.7 and £3.2 billion of value added in 2001 as a result of the FMD outbreak under the ‘central’ assumptions for postponement and cancellation of trips. The methodology used to estimate the overall impact on domestic tourism is necessarily subject to serious data limitations in terms of ‘hard’ data on actual behaviour. Consequently, the analysis draws heavily on attitudinal survey data and a series of assumptions. It should be borne in mind that the effects measured in this paper relate to all businesses which are affected by a fall in tourist expenditure. The range of businesses affected will be wider than those which might readily be associated with the provision of tourist activities.

Direct effects on rural tourism
In March to August 2000, residents of the UK spent approximately £35 billion on day visits and trips within the UK of one night or more. These are the months in 2001 when access to the countryside was subject to restrictions; the figures are taken as a conservative proxy for spending in the absence of FMD. Some restrictions also continued into September and October. However, given the events of 11 September 2001, the effect of FMD cannot be measured thereafter. At that point, the overall impact could have turned positive, through the take-up of displaced trips and holidays, and achieved significant growth in some cases as some people stayed in the UK rather than going abroad. Therefore, no attempt has been made to isolate FMD effects after the end of August 2001.

The United Kingdom tourism survey (UKTS) collects data at monthly intervals on the domestic tourism industry and during March to May 2001, incorporated specific questions relating to the FMD outbreak (Appendix 2). The survey results indicate that 30% of visitors changed their plans as a direct result of FMD and of these visitors, 70% were planning trips to the countryside and 30% to urban areas.

These results have been used as the basis of estimates of the loss to domestic tourism due to FMD. In the absence of data beyond May 2001, two scenarios were considered. In the first, it is assumed that the survey results from March to May 2001 will remain constant in the following three months, June to August 2001. This is taken as an upper estimate as this period is considered to be the peak of the disease. However, results from the English Tourism Council (ETC) attitudinal survey conducted in August 2001 indicate that the perception by consumers of the domestic industry changed very little from the earlier months and this provides support for the assumption that behaviour will not have changed much either.

In the second scenario, the authors consider that the negative impact of FMD on tourism will decline in subsequent months. This is the lower estimate and is based upon the assumption that for each month after May 2001, the number of visitors
changing their plans as a result of FMD fell by the following percentages:

– June: 10% (less than March to May)
– July: 30% (less than March to May)
– August: 50% (less than March to May).

Both the lower and upper estimates rely on the UKTS March to May 2001 data which indicate that, of the 30% of visitors claiming to have changed their plans:

– 30% postponed their trip
– 13% changed their plans in some other way
– 43% cancelled their trip altogether
– 13% switched destinations within the UK
– 2% substituted an overseas trip.

The authors have assumed that 25% of postponed visits are equivalent to cancellations, but this may overstate the likely impact on tourism of the FMD outbreak as they will be recouped in the following period. Thus, sensitivity analysis has been applied to the 25% assumption. The loss of tourism revenues from this broad interpretation of cancellations is estimated to be between £3.9 and £4.7 billion, divided between a loss of £2.4 to £2.9 billion in revenues to the rural economy and a loss of £1.5 to £1.8 billion in urban areas. However, the impacts on rural and urban revenues are respectively understated and overstated; tourists who changed their plans or switched destinations within the UK added net revenues of between £245 and £295 million to urban tourism and reduced rural tourism receipts by a corresponding amount.

Between March and May 2001, UKTS indicates that 2% of those who changed plans opted to go overseas instead. This represents a direct loss to the economy as a whole and the loss of receipts to the UK tourist sector is estimated to be between £155 and £185 million, divided between £95 to £115 million in rural areas and £60 to £70 million in urban areas.

The total receipts of tourist businesses from UK tourists are estimated to have fallen by between £2.8 and £3.4 billion in rural areas as a result of FMD and urban tourism receipts from UK residents are expected to have contracted by between £1.3 and £1.6 billion. These are estimates of the impact on receipts and some of the costs associated with the provision of tourism goods and services will also have been reduced. The impact on the economy is represented by the loss in value added and this will be smaller.

Gross value added is estimated to represent 60% of tourism spending. This estimate was derived from the weighted average of gross value added/gross output for each of the tourism sectors shown below. The only sector where value added is less than 54% is rail, which is small – about 13% of travel value added (Table V).

<table>
<thead>
<tr>
<th>Sector</th>
<th>Gross value added/gross output (percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation</td>
<td>62.8</td>
</tr>
<tr>
<td>Retail</td>
<td>61</td>
</tr>
<tr>
<td>Catering</td>
<td>62.8</td>
</tr>
<tr>
<td>Attractions</td>
<td>53.8</td>
</tr>
<tr>
<td>Travel</td>
<td></td>
</tr>
<tr>
<td>– road</td>
<td>54</td>
</tr>
<tr>
<td>– rail</td>
<td>29</td>
</tr>
</tbody>
</table>

With value added equal to 60% of output, income derived from tourism in rural areas (excluding related industries also affected) contracted by between £1.7 and £2.0 billion (60% of the lost receipts) as a result of the reduced spending on domestic tourism by UK residents. The corresponding reduction in value added derived from urban tourism is about £0.8 and £0.9 billion.

**Direct effect on tourism from overseas**

Expenditure by overseas visitors in the UK in 2000 was nearly £13 billion, of which 56% was spent in the March to August period. Spending in the countryside by overseas residents is only 6% of the total spent. In consequence, any reduction in overseas visitors mainly results in losses of urban tourism receipts.

Information from the International Passenger Survey (IPS) for March to August 2001 shows a decline in both visitor numbers and expenditure compared to 2000. There are a number of reasons for the decline, of which FMD is only one. The slowing of the global economy, in particular the economy of the United States of America (as North America accounts for 28% of overseas visits to the UK) as well as the weakness of the Euro, are contributory factors to the decline.

The central assumptions are that these ‘other’ factors will account for 50% of the decline in inbound tourism expenditure reported by the IPS over the period March to August 2001. Therefore, it is assumed that FMD will account for the other 50% of decline reported by IPS from March to August 2001. These assumptions have been applied to the actual decline reported in IPS from 2000 to 2001 for each month from March to August. Therefore, the loss of tourism receipts due to FMD is estimated at £425 million (equivalent to value added of £255 million), of which £400 million is the loss in urban areas.
Overall impact of tourism: direct effects of foot and mouth disease

Table VI summarises the impacts from FMD on receipts and value added derived from tourism.

Table VI
Expected impact of the 2001 outbreak of foot and mouth disease on tourism receipts and value added of the United Kingdom (£ million)

<table>
<thead>
<tr>
<th></th>
<th>Rural</th>
<th></th>
<th>Urban</th>
<th></th>
<th>Total</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
<td>High</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Domestic tourism</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– substitution within the tourism sector</td>
<td>–245</td>
<td>–295</td>
<td>+245</td>
<td>+295</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switch from domestic to overseas destinations</td>
<td>–95</td>
<td>–115</td>
<td>–60</td>
<td>–70</td>
<td>–155</td>
<td>–185</td>
</tr>
<tr>
<td>Loss from reduced overseas visitors</td>
<td>–25</td>
<td>–400</td>
<td>–425</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: based on a central scenario for:
- postponement of trips
- proportion of decline in spending by overseas visitors attributable to foot and mouth disease

Figures may not add up exactly as they are rounded to nearest £5 million

Sensitivity analysis

For 30% of tourist trips by UK residents that are postponed because of FMD, a range of assumptions has been examined to reflect possible behavioural patterns. The results for the central assumptions, 25% of postponed visits falling outside the March to August period, suggest losses in value added of between £2.7 billion and £3.2 billion, as shown in Table VI. Under more ‘optimistic’ assumptions all postponed visits are re-scheduled within the six month period and value added losses in tourism are reduced to £2.3 billion and £2.8 billion. Under ‘pessimistic’ assumptions, one half of postponed visits fall outside the six month period and tourism value added losses total between £3.2 and £3.8 billion.

As a check on the broad magnitude of estimates, the authors have compared these with information collected from surveys of selected areas carried out by Prism Research Ltd, which undertook a study of the impact of FMD on rural businesses. Almost 2,500 businesses, located in six largely rural local authority districts, were surveyed by telephone. The businesses selected cover the entire range of activities outside core agriculture, i.e. agriculture-related, manufacturing, construction and services. The six districts chosen for the survey reflect a combination of areas badly affected by outbreaks in Cumbria and Devon and areas unaffected by cases of FMD in East Anglia. Although Prism staff were careful to note that their results should not be generalised to the wider economy, they nonetheless enable some broad estimates to be made of the magnitude of the impact of FMD on tourism in the rural economy.

Prism does not provide any precise quantitative data from their survey on the monetary impact of FMD on economic activity. However, a measure of lost output value from the results reported can be deduced. The survey suggests that during the March to August 2001 period, businesses as a group lost turnover to the value of 17.5% in the Eden district of Cumbria and 10.5% in Carlisle (the latter contains the urban area of Carlisle), in West Devon the loss of turnover was 12.5% and in East Devon, 5.7%. In contrast, businesses lost 4.2% of turnover in North Norfolk and 2.9% in mid-Suffolk. This distribution of results is in line with expectations that losses from FMD would be correlated with the frequency of FMD outbreaks by district.

The mixture of districts selected by Prism is clearly not a complete range, but provides a reasonable cross-section of rural Britain for the purpose of assessing the impact of the FMD outbreak on businesses affected by tourism expenditure. The loss of business turnover for all six districts combined, covering a rather wider set of industries than those likely to have been affected directly by loss of tourism spending, is 7.6%. This reduction has been applied to baseline expenditure by tourists in UK rural areas of £34 billion during March to August 2001 in the absence of FMD. The loss of receipts by rural businesses, based on the Prism results, is estimated by the authors to be about £2.6 billion. This is at the lower end of the range estimated above, which was £2.8 to £3.4 billion. The evidence from the Prism results corroborates, in broad terms, the estimates of the authors, although subject to the caution that there is no strict relationship between reduced visitor spending and loss of turnover by local businesses.

Indirect impacts

Industries supplying firms involved in tourism in the UK will also be affected by the FMD outbreak. Under the central assumptions, these indirect impacts are estimated to be between £1.8 billion and £2.2 billion (see Appendix 1 for details underpinning the calculations).

Conclusions

This paper has been produced jointly by economists and statisticians from the Department for Environment, Food and Rural Affairs (DEFRA) and the Department for Culture, Media and Sport (DCMS). The authors aim to provide some estimate of the principal effects of FMD on the economy during 2001, assess the different impacts in each of the countries of the UK and give an indication of how the outbreak affected both rural
and urban areas. These assessments are limited by the nature of the available information. The difficulty of obtaining reliable and detailed data became obvious during the outbreak and was commented on by the Rural Task Force. The diverse and fragmented nature of tourism in rural areas makes it very difficult to be precise at any time, and statistics which track change are only available some four months in arrears. Given the very local nature of some of the damage and some of the recovery, the conclusion of this report has to be treated with great care, as ‘best available estimates’.

The 2001 Pre-Budget Report (1) explained that the overall effect on the GDP in 2001 is estimated to have been modest relative to normal fluctuations – less than 0.2% of GDP – but the impact on severely affected areas has been much more pronounced. The authors examine the economic impact of FMD on the agriculture and food sectors and on those sectors of the economy affected by tourism. Some estimates of the effects on rural and urban areas are presented, along with estimates of the costs to the agriculture and food industries in the four countries of the UK.

Many uncertainties surround the estimates, but the calculations in this paper give some indication of the orders of magnitude. The results reflect a best estimate of the difference between the position with and without FMD rather than a comparison of the situation before and after the disease.

Table VII summarises the main results. The losses to agriculture and the food chain, including the costs compensated by the Exchequer, amount to about £3.1 billion. Businesses directly affected by tourist expenditure are estimated to have lost a similar amount (between £2.7 and £3.2 billion). However, these latter impacts have been variable, with both winners and losers. Businesses only a few miles apart may have been affected in very different ways; some may have hardly been affected or may even have increased business, while others may have been forced to close. Some businesses suffered serious losses in the spring but underwent a recovery in the summer and a boom in the autumn and early winter, while others saw little improvement or were seasonal in nature. The extent to which changes have been a result of FMD is difficult to ascertain as this cannot be measured directly. The authors aimed to measure the aggregate impact on all the businesses covered and implicitly assumed that any recovery in tourist activity in the summer and autumn over the previous year was not as a result of FMD.

The majority of the costs to agriculture have been met by the government through compensation for slaughter and disposal as well as clean-up costs. Nonetheless, agricultural producers will have suffered a substantial loss, estimated at £355 million, which represents about 20% of the estimated total income from farming in 2001. The food industry will also have suffered losses estimated at £170 million. The vast majority of the losses from tourism are accounted for by domestic tourism rather than visitors from overseas.

Many uncertainties surround the estimates, but the calculations in this paper give some indication of the orders of magnitude. The results reflect a best estimate of the difference between the position with and without FMD rather than a comparison of the situation before and after the disease.

Table VII summarises the main results. The losses to agriculture and the food chain, including the costs compensated by the Exchequer, amount to about £3.1 billion. Businesses directly affected by tourist expenditure are estimated to have lost a similar amount (between £2.7 and £3.2 billion). However, these latter impacts have been variable, with both winners and losers. Businesses only a few miles apart may have been affected in very different ways; some may have hardly been affected or may even have increased business, while others may have been forced to close. Some businesses suffered serious losses in the spring but underwent a recovery in the summer and a boom in the autumn and early winter, while others saw little improvement or were seasonal in nature. The extent to which changes have been a result of FMD is difficult to ascertain as this cannot be measured directly. The authors aimed to measure the aggregate impact on all the businesses covered and implicitly assumed that any recovery in tourist activity in the summer and autumn over the previous year was not as a result of FMD.

The majority of the costs to agriculture have been met by the government through compensation for slaughter and disposal as well as clean-up costs. Nonetheless, agricultural producers will have suffered a substantial loss, estimated at £355 million, which represents about 20% of the estimated total income from farming in 2001. The food industry will also have suffered losses estimated at £170 million. The vast majority of the losses from tourism are accounted for by domestic tourism rather than visitors from overseas.

Many uncertainties surround the estimates, but the calculations in this paper give some indication of the orders of magnitude. The results reflect a best estimate of the difference between the position with and without FMD rather than a comparison of the situation before and after the disease.

Table VII summarises the main results. The losses to agriculture and the food chain, including the costs compensated by the Exchequer, amount to about £3.1 billion. Businesses directly affected by tourist expenditure are estimated to have lost a similar amount (between £2.7 and £3.2 billion). However, these latter impacts have been variable, with both winners and losers. Businesses only a few miles apart may have been affected in very different ways; some may have hardly been affected or may even have increased business, while others may have been forced to close. Some businesses suffered serious losses in the spring but underwent a recovery in the summer and a boom in the autumn and early winter, while others saw little improvement or were seasonal in nature. The extent to which changes have been a result of FMD is difficult to ascertain as this cannot be measured directly. The authors aimed to measure the aggregate impact on all the businesses covered and implicitly assumed that any recovery in tourist activity in the summer and autumn over the previous year was not as a result of FMD.

The majority of the costs to agriculture have been met by the government through compensation for slaughter and disposal as well as clean-up costs. Nonetheless, agricultural producers will have suffered a substantial loss, estimated at £355 million, which represents about 20% of the estimated total income from farming in 2001. The food industry will also have suffered losses estimated at £170 million. The vast majority of the losses from tourism are accounted for by domestic tourism rather than visitors from overseas.

Many uncertainties surround the estimates, but the calculations in this paper give some indication of the orders of magnitude. The results reflect a best estimate of the difference between the position with and without FMD rather than a comparison of the situation before and after the disease.

Table VII summarises the main results. The losses to agriculture and the food chain, including the costs compensated by the Exchequer, amount to about £3.1 billion. Businesses directly affected by tourist expenditure are estimated to have lost a similar amount (between £2.7 and £3.2 billion). However, these latter impacts have been variable, with both winners and losers. Businesses only a few miles apart may have been affected in very different ways; some may have hardly been affected or may even have increased business, while others may have been forced to close. Some businesses suffered serious losses in the spring but underwent a recovery in the summer and a boom in the autumn and early winter, while others saw little improvement or were seasonal in nature. The extent to which changes have been a result of FMD is difficult to ascertain as this cannot be measured directly. The authors aimed to measure the aggregate impact on all the businesses covered and implicitly assumed that any recovery in tourist activity in the summer and autumn over the previous year was not as a result of FMD.

The majority of the costs to agriculture have been met by the government through compensation for slaughter and disposal as well as clean-up costs. Nonetheless, agricultural producers will have suffered a substantial loss, estimated at £355 million, which represents about 20% of the estimated total income from farming in 2001. The food industry will also have suffered losses estimated at £170 million. The vast majority of the losses from tourism are accounted for by domestic tourism rather than visitors from overseas.

The industries which supply agriculture, the food industries and tourist-related businesses will also have suffered. The aggregate effect on these upstream sectors is estimated at £1.9 to £2.3 billion. The overall impact on suppliers to the agriculture and food industries has been relatively modest because FMD has led to increases in the demand for some types of input (e.g. feed) as well as reductions in demand for other inputs. While most of the effects will occur in 2001, some of the agricultural effects will be felt for a number of years after.

The estimates of the direct effects on agriculture and tourism can also be disaggregated to derive estimates of the differential effect on rural and urban areas. It has not been possible to derive rural and urban estimates for the indirect effects. The direct loss in rural areas is estimated to be in the range £2.2 to £2.5 billion, while the loss in urban areas is estimated to be in the range £1.0 to £1.2 billion.

Regional estimates have only been possible for the costs to agriculture and the food industry. These show that approximately two thirds of the costs occur in England, with around one sixth each in Scotland and Wales. Northern Ireland incurs less than 1% of the cost.

It is important to note that these estimates do not represent the overall net cost to the economy. A major reason why the costs to the economy as a whole are less than suggested by the estimates presented here is that expenditure on trips to the countryside (by visitors of the UK) which have been foregone because of FMD appears to have largely been replaced by spending elsewhere in the economy, either in alternative tourist locations or on goods and services unrelated to tourism (see the Technical note below). However, the estimates in this paper show that even though the overall impact upon the level of GDP in 2001 has been relatively modest (less than 0.2%),

Table VII

<table>
<thead>
<tr>
<th>Sector</th>
<th>National</th>
<th>Rural</th>
<th>Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture/food chain</td>
<td>-3,125</td>
<td>-2,700</td>
<td>-2,030</td>
</tr>
<tr>
<td>- compensated by Government</td>
<td>2,585</td>
<td>-1,685</td>
<td>-1,015</td>
</tr>
<tr>
<td>- direct effect</td>
<td>-625</td>
<td>-3,205</td>
<td>-1,175</td>
</tr>
<tr>
<td>Tourism (range)</td>
<td>-45</td>
<td>-85</td>
<td>-85</td>
</tr>
<tr>
<td>- direct effect (range)</td>
<td>-1,835</td>
<td>-1,835</td>
<td>-2,180</td>
</tr>
</tbody>
</table>

* This table shows the losses arising from foot and mouth disease. There are some sectors of the economy that will have benefited from tourist expenditure which has been displaced; these are not shown here (see text)
considerable losses have been incurred by particular sectors or within certain sectors. Furthermore it should be borne in mind that these estimates do not cover costs which are not captured through the market: for example, the stress suffered by livestock producers whose stock was slaughtered, or by the public foregoing the opportunity for country walks or the environmental impact of carcass disposal. All of these factors will need to be borne in mind when appraising policy options.

Technical note
Measurement of the economic effects of foot and mouth disease
There will be a range of economic and non-economic consequences from the FMD outbreak, not all of which are entirely captured by the conventional measure of GDP, namely:
- there will be distributional impacts from the outbreak as farm prices change, producing losses to farmers and also to consumers. These relative price effects are not detected by an output lost measure of GDP
- some of the costs of FMD to the producer will arise from restrictions reducing the quality of the product with a corresponding lower price received, rather than the quantity of output
- following practice regarding national income accounts, the loss in value from slaughtered animals is treated as a catastrophic loss rather than a temporary reduction in output. The costs associated with retaining animals on farms due to the imposition of movement restrictions are broadly offset by higher values for work in progress which are measured within agriculture's gross value added. The loss of output accrues over time from the foregone growth in stock and the effects of a smaller breeding herd. The computation of losses to GDP in future years is extremely problematic and is not reported in this paper
- the capital accounts of the agricultural sector have been affected by the outbreak. Livestock destroyed represent the loss of a capital asset but there are offsetting changes in so far as Exchequer compensation is used to either reduce liabilities or accumulate assets in one form or another. These balance sheet impacts have been published separately by DEFRA (3)
- some impacts are not taken into account as they are particularly difficult to measure because markets for them do not exist. These include the stress and emotional difficulties caused to farmers and other users of the countryside, adverse impacts on animal welfare and possible environmental impacts of disease control measures. Although these are legitimate components of an economic assessment of the effect of the disease on economic welfare, they do not feature in this analysis.

Appendix 1
Indirect impacts: multipliers for agriculture, tourism and retail
In addition to the direct effects on agriculture, the food chain industries downstream from the farm-gate and tourism, there are indirect effects on the industries supplying goods and services to the directly affected sectors. Quantifying the total impact on upstream industries supplying agriculture is especially problematic. The lower level of livestock production reduced demand for certain inputs but increased work in progress, as livestock movement restrictions kept animals on farms longer, and thus had the opposite effect. In addition, certain service suppliers, notably veterinarians, would have been redeployed to tackle the FMD outbreak. The study has not attempted to quantify the impacts on each upstream business, but the authors have calculated these in total using multipliers derived from the ‘input-output tables’ of the Office for National Statistics.

The values of the multipliers are given in Table A. A multiplier of 0.68 for tourism means that a shock which increases tourism value added by £1 million also increases the value added in other sectors by £680,000. There are no estimates of how these multipliers are divided between rural and urban areas. In agriculture and the slaughtering/meat processing sectors, a significant proportion of output from the sector is an input within the sector itself. To avoid double counting, the multipliers have been adjusted to ensure that only suppliers outside the sector are captured, as shown in Table A.
Table A  
Impact on input suppliers of a unit change in final demand, by sector

<table>
<thead>
<tr>
<th>Sector</th>
<th>Adjusted multiplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>0.807</td>
</tr>
<tr>
<td>Abattoirs/meat processors</td>
<td>0.812</td>
</tr>
<tr>
<td>Tourism</td>
<td>0.68</td>
</tr>
</tbody>
</table>

These adjusted multipliers have been applied to output related losses in the industries directly affected. In agriculture/food chain sectors, the application of multipliers has been restricted to output related impacts. In agriculture, some important adverse impacts from FMD have taken the form of lower prices received by producers and no multipliers have been applied to these. This is because these are revenue losses which are unlikely to have significantly affected input requirements.

The direct impacts of FMD have been allocated between rural and urban areas. However, no attempt has been made to allocate the indirect impacts on the same spatial basis. The estimated economic value of these indirect impacts is reported in Table B.

Table B  
Estimated economic value of indirect impacts of the foot and mouth disease outbreak

<table>
<thead>
<tr>
<th>Sector</th>
<th>Cost (£ million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture/food chain</td>
<td>85</td>
</tr>
<tr>
<td>Tourism (range)</td>
<td>1,835 to 2,180</td>
</tr>
</tbody>
</table>

Appendix 2

United Kingdom Tourism Survey-2001 foot and mouth disease related questions

Q9 Has the current outbreak of FMD affected any plans you may have had to take trips within the UK in April? For example, you may have cancelled or postponed a trip that you had planned to take in April or gone to a different place or for a shorter time because of the outbreak.

If yes, ask Q11.

Q11 Which of the following describe how you have changed your plans for taking trips within the UK in April? Have you:
   – cancelled one or more planned trips because of the outbreak?
   – postponed one or more planned trips until later in the year because of the outbreak?
   – gone to a different place within the UK from the one you originally intended to go to, because of the outbreak?
   – gone abroad instead of taking a trip within the UK because of the outbreak?
   – reduced the length of a trip because of the outbreak?
   – changed your plans in some other way?
Coûts économiques du foyer de fièvre aphteuse survenu au Royaume-Uni en 2001

D. Thompson, P. Muriel, D. Russell, P. Osborne, A. Bromley, M. Rowland, S. Creigh-Tyte & C. Brown

Résumé
Les auteurs proposent une estimation chiffrée des pertes économiques subies par l’agriculture et le secteur d’activités tributaire du tourisme lors de l’épizootie de fièvre aphteuse qui a frappé le Royaume-Uni en 2001. L’agriculture et la chaîne alimentaire ont accusé des pertes de l’ordre de 3,1 milliards de livres sterling. La majeure partie des débours effectués par le secteur agricole a été couverte par les pouvoirs publics, sous la forme d’indemnisations versées dans le cadre des mesures d’abattage, d’élimination et d’assainissement. Il n’en reste pas moins que les exploitants agricoles auront essuyé des pertes évaluées à 355 millions de livres sterling, soit environ 20 % du revenu total estimé de l’agriculture en 2001. Selon les études relatives au tourisme, les domaines d’activités qui dépendent directement des dépenses des touristes auraient enregistré un manque à gagner d’un montant global équivalent (entre 2,7 et 3,2 milliards de livres sterling), du fait de la réduction du nombre des visiteurs dans la campagne britannique. Toutes les filières d’approvisionnement de l’agriculture, de l’industrie des aliments et du tourisme ont aussi été durement frappées. Les pertes globales subies par l’économie britannique sont toutefois inférieures à la somme de ces composantes, en raison du fait que les revenus liés au tourisme n’ont pas été entièrement perdus mais, pour une grande part, transférés vers d’autres secteurs économiques. Il est estimé que l’impact global net de la fièvre aphteuse en 2001 a représenté pour le Royaume-Uni une baisse du produit intérieur brut inférieure à 0,2 %.

Mots-clés

English Tourism Council attitudinal survey key findings
Wave 11 (24 August-26 August 2001)
– 24% of consumers agree that ‘most places in the countryside are closed at the moment’ compared to 27% in June
– 54% of people agree that ‘people should stay out of the countryside to avoid spreading foot and mouth disease’ compared to 55% in June
– 72% of consumers agree that ‘you hear different messages about the countryside, some say it’s open and others say it’s closed to tourists’ – exactly the same percentage as June
– 32% agreed that ‘I wouldn’t visit the countryside because of the health risks associated with burning carcasses’. This has increased 3% since June.
– 35% agree that ‘you can’t go to the countryside because most footpaths are closed’ (2).
Costos económicos del brote de fiebre aftosa en el Reino Unido en 2001

D. Thompson, P. Muriel, D. Russell, P. Osborne, A. Bromley, M. Rowland, S. Creigh-Tyte & C. Brown

Resumen
Los autores presentan estimaciones de los costos económicos que supuso para la agricultura y los sectores dependientes del turismo el brote de fiebre aftosa surgido en el Reino Unido en 2001. Las pérdidas del sector agrícola y de los distintos eslabones de la cadena alimentaria se elevan a cerca de 3.100 millones de libras esterlinas. A través de las indemnizaciones por sacrificios sanitarios y por las tareas de eliminación y desinfección, el Gobierno absorbió gran parte de las pérdidas del sector agrícola. Pese a ello, según las estimaciones, los ganaderos habrán perdido unos 355 millones de libras esterlinas, equivalentes más o menos a un 20% de los ingresos totales estimados del sector agropecuario en 2001. A partir de las encuestas sobre turismo se calcula que las empresas del sector directamente afectadas perdieron en total una cantidad similar (entre 2.700 y 3.200 millones de libras esterlinas) a causa de la caída en el número de visitantes en zonas rurales. Los proveedores del sector agrícola, la industria alimentaria y las empresas relacionadas con el turismo también habrán sufrido pérdidas. Sin embargo, el costo global para la economía británica es inferior a la suma de estos componentes, puesto que gran parte de los gastos turísticos no se perdió sino que fue dirigida hacia otros sectores de la economía. El impacto global neto de la fiebre aftosa en el Reino Unido ha sido estimado en una reducción del producto interior bruto de menos del 0,2% en 2001.

Palabras clave

References