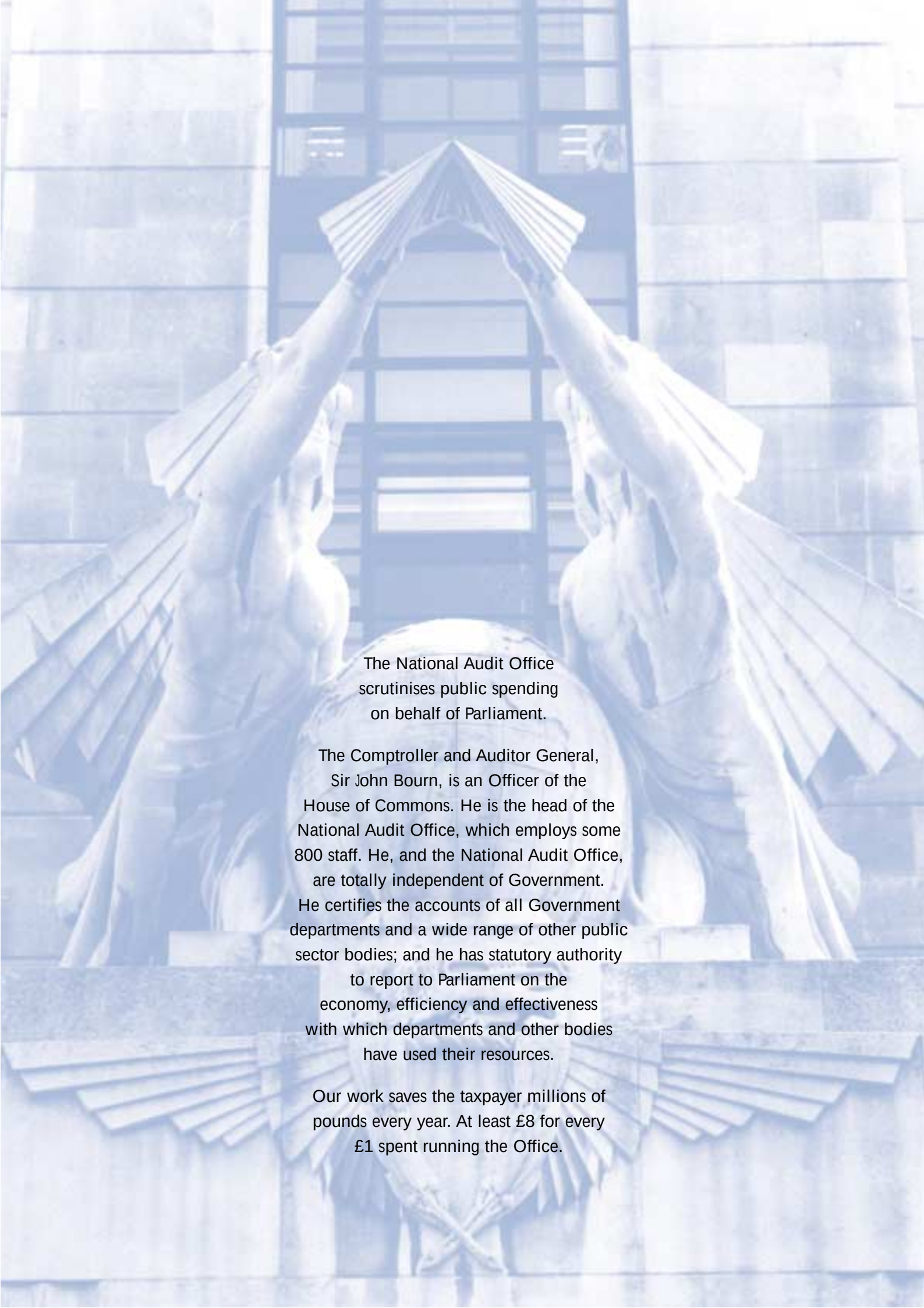
NATIONAL AUDIT OFFICE

Protecting England and Wales from plant pests and diseases

REPORT BY THE COMPTROLLER AND AUDITOR GENERAL
HC 1186 Session 2002-2003: 29 October 2003



The National Audit Office scrutinises public spending on behalf of Parliament.

The Comptroller and Auditor General, Sir John Bourn, is an Officer of the House of Commons. He is the head of the National Audit Office, which employs some 800 staff. He, and the National Audit Office, are totally independent of Government. He certifies the accounts of all Government departments and a wide range of other public sector bodies; and he has statutory authority to report to Parliament on the economy, efficiency and effectiveness with which departments and other bodies have used their resources.

Our work saves the taxpayer millions of pounds every year. At least £8 for every £1 spent running the Office.

Protecting England and Wales from plant pests and diseases

REPORT BY THE COMPTROLLER AND AUDITOR GENERAL
HC 1186 Session 2002-2003: 29 October 2003

LONDON: The Stationery Office
£9.25

Ordered by the
House of Commons
to be printed on 27 October 2003

Contents

This report has been prepared under Section 6 of the National Audit Act 1983 for presentation to the House of Commons in accordance with Section 9 of the Act.

John Bourn **National Audit Office**
Comptroller and Auditor General **21 October 2003**

The National Audit Office study team consisted of:

Geraldine Barker, Christine Rose and Howard Kitson under the direction of Pamela Thomas and Keith Holden

This report can be found on the National Audit Office web site at www.nao.gov.uk

For further information about the National Audit Office please contact:

National Audit Office
Press Office
157-197 Buckingham Palace Road
Victoria
London
SW1W 9SP

Tel: 020 7798 7400

Email: enquiries@nao.gsi.gov.uk

Part 2

Part 3

Appendices

Pictures courtesy of Department for Environment, Food and Rural Affairs and Horticulture Research International

Summary

1 This report focuses on the work of the Department for Environment, Food and Rural Affairs (DEFRA) in protecting England and Wales from the risks of plant pests and diseases[1] causing harm to the economy. Plant pests and diseases pose less risk to human health than animal pests and diseases, although people can be poisoned by some plant diseases. Generally, however, plant pests and diseases are not transferable to people and plants affected by them do not harm consumers. Their main impacts are economic. They affect the appearance, growth, yield and ultimately the value of farmers' and growers' produce. A 2000 economic evaluation[2] of the country's plant health programme estimated that £279 million of potato crops in southern England might be at risk from Colorado Beetle and £133 million of crops such as tomatoes, cucumbers and ornamental plants were at risk from Tobacco Whitefly.[3]

2 Although farmers and growers bear the primary responsibility for protecting their crops, the Department is also active in preventing, detecting and dealing with pests and diseases. It aims to maintain and promote high levels of health in arable and horticultural plants and produce, protecting the country's agricultural and horticultural industries from imported pests and diseases, and supporting domestic trade and exports. Each year, it spends £8 million on import controls and £14 million researching the diagnosis and control of pests and diseases. Its work is subject to two key international agreements[4] banning the introduction and movement of specified harmful organisms, plants and produce from specified origins, and requiring the inspection of imports, assessment of the risks posed by pests and diseases, and designation and maintenance of pest-free or low-pest areas. The government has translated these agreements into UK legislation. To comply with the requirements of the World Trade Organisation, the Department's import controls must have a scientific basis and must not be used as a barrier to trade.

1 *The Plant Health (Great Britain) order 1993 (SI 1993 No. 1320) defines a **plant pest** as a harmful organism liable to infect a plant or plant product. Plant pests include insects, fungi, bacteria and viruses that feed on, infect or cause disease on plants or plant products. A **disease** is a condition where the normal functions of the plant are disturbed and harmed. A **pathogen** is an organism that causes disease.*

2 *An Economic Evaluation of MAFF's Plant Health Programme, ADAS Consulting Ltd and the Imperial College London, commissioned by the former Ministry of Agriculture Fisheries and Food.*

3 *Tobacco Whitefly is a serious pest which can transmit over 60 viruses that damage a wide range of plants and directly feeds on crops such as tomatoes and cucumbers.*

4 *European Union Directive 2000/29/EC and the United Nations Food and Agriculture Organisation's International Plant Protection Convention (IPPC), 1952.*

The country has a good record in preventing major outbreaks of pests and diseases, in which the Department plays a key part

3 The number of recorded outbreaks of pests and diseases has fluctuated, averaging 150 a year over the 8 year period 1993 to 2000 but increasing to more than 200 in 2001 and some 370 in 2002. The country has a good record, however, in containing and eradicating most outbreaks: only three economically significant pests and diseases have become established in this country in recent years. It is difficult, however, to demonstrate the extent to which this record is attributable to the Department's activities, as other factors such as the tough conditions placed by the country's major supermarket chains on the produce they will accept from producers, pesticides and the weather have a part to play. Stakeholders we consulted and respondents to the Department's customer satisfaction surveys are confident, however, in the effectiveness of the Department's measures to control and eradicate pests, facilitate exports and maintain quality standards. Farmers, growers, international organisations and trading partners have a high regard for the Department's work and its inspectors.

The Department nonetheless needs to focus more on key risks and outcomes

4 Although the Department has extensive knowledge about the nature and extent of risks from pests and diseases, it does not rank them in a systematic way. It does not routinely subject the control of key pests and diseases to full cost benefit analysis to assess whether the damage that they would cause if left unchecked would outweigh the costs of keeping them out. Neither the Department's outcome measures used by the Department to report on its annual performance, nor its 'lessons learnt' reviews carried out after all major outbreaks, record systematically the impact that outbreaks have had on yields and farmers' finances or the costs incurred in containing and eradicating them. Nor do they record the level of farmers' and growers' losses prevented in dealing with outbreaks, thereby understating the impact of the Department's work.

5 Farmers and growers have to pay for any crops affected by a pest or disease to be treated or destroyed and do not receive any compensation from the government for the losses incurred. In the United States there is a government-subsidised insurance programme, under which the government subsidises up to two-thirds of farmers' and growers' insurance premiums. Insurance cover against pests and diseases - with or without government subsidy - remains unavailable in England and Wales.

6 The Department has to carry out inspections to meet the requirements of international agreements. It sets five annual targets, depending on the items to be inspected. International agreement or the demands of the market dictate the level of two of these targets. The Department can therefore set three targets at levels it considers to be appropriate, in each case being permitted by international agreements to inspect all, or a representative sample of, the items covered by the targets. The Department chooses to inspect all (some 4,000) consignments of plants, plant cuttings and tissue cultures imported from

non-European Union countries each year, considering that they pose the greatest risk of bringing pests or diseases into this country. It aims to inspect some 1,100 (around 6 per cent of) consignments of plant produce imported from outside the European Union and to carry out 40,000 inspections of plants, planting material and plant produce being moved within the European Union.

7 Data were not readily available on the total number of consignments being moved, which we could then have used to help us assess the reasonableness of the Department's target of inspecting 40,000 such consignments each year. It was not clear to us how statistical advice influenced the setting of three-quarters of this target, while the other quarter was based on the level of inspector resources that were expected to be available rather than on any risk or statistical analysis. Some inspectors considered that this target was too high, while some stakeholders considered that inspectors had too much work to do. The Department relies on its inspection regime to maintain this country's status as a "protected zone", recognised by the European Union as being free from specified key pests and diseases. The European Union has not specified, however, how many inspections it requires to maintain such status. Nor does the Department know how its inspection coverage compares with that of other countries. It is therefore difficult to know whether the Department is carrying out the right number of inspections.

8 In 2001-02 and 2002-03, few inspections detected pests or diseases. In both years, the aggregate detection rate was only a little over 2 per cent. Of the some 64,000 inspections carried out in 2002-03, for example, only 1,400 detected a pest or disease. Within these aggregate figures, however, detection rates varied depending on the items being inspected. The paucity of detections could be due to the absence of pests and diseases within the general population of items being inspected, or to poorly targeted and/or poor quality inspections. The Department does not analyse detection rates and was therefore unable to explain whether low detection rates indicate good standards of plant health or the limits of its ability to detect pests and diseases.

9 Inspectors do not have access to complete and timely information about imports to allow them to select those that are highest risk and inspect them on a timely basis so that they may detect any pests or diseases before they can spread. In the last two years, the Department has failed to meet its key target of inspecting all plants, plant cuttings and tissue cultures imported from non-European Union countries within two weeks of their entry into this country - by which time, most of these high risk items have been planted out and therefore risk spreading any pests and diseases that might be affecting them. Not all relevant inspectors have direct access to the dedicated link to HM Customs and Excise's CHIEF computer system, which records all imports arriving in this country, and have to rely instead on informal arrangements to find out about imports. None of the inspectors at Heathrow Airport and Felixstowe Dock retained the necessary information to demonstrate that the riskiest consignments had been inspected.

10 Without information about the number of consignments being moved within this country or being imported from, or exported to, other European Union countries, or documentation to show that the riskiest have been inspected, it is difficult to see how the Department can focus its inspection strategy effectively. This gives rise to concern that the low rate at which inspections detect pests and diseases could be attributable to poorly targeted inspections.

The Department's work needs to be better co-ordinated, particularly with industry and with counterparts in other countries

11 The Department recognises that it needs to put in place an over-arching strategy to co-ordinate the variety of plant-health work that takes place within the Department and in its executive agencies and other bodies. The main public bodies funding plant health research lack a coherent national strategy to co-ordinate their work. The Department's research also needs to be better co-ordinated with that of its counterparts in Europe. The means for transferring knowledge and technologies to the industry are inadequate, resulting in a poor return on much of the public monies invested in research and development.

12 Plant health authorities in the United States and New Zealand place more emphasis on reducing risks at the point of origin, by working with producers in exporting countries to ensure that their exports are pest and disease-free. The Department's inspectors have visited exporting countries where there have been specific problems with the country's exports to England and Wales, while the European Commission also visits non-European Union countries that it considers are priorities for tackling the risk of pests and diseases being imported into member states and has also undertaken collaborative exercises, involving inspectors from member states' plant health authorities, in countries where there have been persistent problems. Some exports, however, such as bonsai plants from Japan and China, remain key sources of imported pests or diseases into England and Wales and have not been covered by either the Department's or the Commission's programme of visits.

13 Stakeholders we consulted considered that risks were increasing due to a variety of developments, such as new restrictions on the use of pesticide. The main pesticides used to combat *Thrips palmi*, for example, are no longer available because they are prohibited from use in the European Union. Any outbreak might therefore be more difficult to contain and eradicate in future. The Department's plant health teams and its Pesticides Safety Directorate need to work more closely together to co-ordinate the phasing out of key pesticides alongside the development and use of other means of control, such as pest-resistant crops.

14 The Department also needs to give more attention to where its own responsibilities end and where those of the industry start. For example, the Department recognised at an early stage of the outbreak of *Rhizomania* in 1992 that its priority was to contain the disease and stop it spreading until the industry had developed a range of sugar beet varieties tolerant to the disease. The Department did not, however, make it sufficiently clear that it was looking to the industry to develop such varieties within a reasonable timescale. The industry was therefore unready when the Department lifted its controls in 2002.

The Department does not have sufficient means to assure the quality of inspectors' work

15 Inspectors carry out most inspections on their own. The Department does not have a peer review system to provide assurance on the quality of inspectors' work. The international air freight industry operates night and day, seven days a week. Imports can arrive late at night and at weekends and, because of their perishable nature, consignments may leave the airport within a few hours of arrival. However, inspectors' normal working patterns follow typical working hours from Monday to Friday. Consignments may therefore arrive at ports of entry late at night or at weekends and leave again before inspectors have had a chance to inspect them.

The Department needs to give more attention to ensuring that it has the necessary scientific capacity in the coming years

16 A Science Audit of the Central Science Laboratory in February 2002 found that the Laboratory was dependent on the knowledge and expertise of key individuals, which would be lost when the scientists retired unless steps were taken to pass on expertise and know-how. Stakeholders also expressed concern that the availability of appropriate scientific advice more generally might decline in the coming years as plant health specialists retired and fewer young scientists entered the field.

Recommendations

17 On the basis of our findings, we make the following recommendations:

Focusing on key risks and outcomes

(i) The Department should rank key pests and diseases according to how much of a risk they pose to the agricultural or horticultural sectors of the economy, as a means of targeting its resources where the risks are greatest.

(ii) The Department should routinely subject control of key pests and diseases to full cost benefit analysis to confirm whether the damage they would cause if left unchecked would outweigh the costs of keeping them out of this country or of containing or eradicating them.

(iii) The Department should include in its 'lessons learnt' reviews of key outbreaks the impact that outbreaks have had on farmers' yields and finances, and the costs of containing and eradicating them. It should also record the level of losses that the Department has prevented in dealing with outbreaks, to demonstrate the full effectiveness of its work.

(iv) The Department should examine, with the industry and insurers, the scope for insurance programmes to be introduced to help protect farmers and growers against losses caused by plant pests and diseases.

(v) The Department should review the reasons why some inspections detect few plants and diseases, focusing in particular on whether inspections are being poorly targeted or whether the level of inspection activity is disproportionate to the attendant risks.

(vi) The Department should consider whether it is carrying out the right number of inspections, in light of statistical advice, risk analysis, low detection rates and the coverage required to maintain the country's protected zone status.

(vii) The Department should, as a matter of priority, give relevant inspectors access to the dedicated link to HM Customs and Excise's CHIEF computer system and complete its work with HM Customs and Excise to provide inspectors with wider access to reliable and timely information about imports.

Co-ordination with industry and counterparts in other countries

(viii) In developing its over-arching strategy for co-ordinating plant health work within and outside the Department, the Department should incorporate measures for co-ordinating plant health research and for transferring knowledge and technologies to the industry so that the returns on public monies invested in research and development are maximised.

(ix) The Department should consider whether more emphasis on reducing risks at their source, by working with producers in non-European Union countries to ensure that their exports to this country are pest and disease-free, would provide more effective risk management than the current level of inspections of imports.

(x) The Department's plant health teams should work more closely with their departmental colleagues in the Pesticides Safety Directorate to co-ordinate the phasing out of key pesticides with the development and use of other means of control, such as pest-resistant crops.

(xi) The Department should clarify where its responsibilities end and where those of the industry start, when responding to the threats posed by an outbreak.

Assuring the quality of inspectors' work

(xii) The Department should introduce a peer review system to provide assurance on the quality and efficiency of inspectors' work.

(xiii) The Department should assess the extent to which import consignments may avoid inspection by arriving at ports of entry late at night or at weekends and determine the need to carry out inspections whenever imports arrive in this country.

Ensuring the necessary scientific capacity

(xiv) The Department should take the lead in ensuring that there will be an adequate supply of young scientists to replace plant health specialists as they retire over the coming years.

Part 1 Introduction

Background

1.1 This report focuses on the work of the Department for Environment, Food and Rural Affairs (DEFRA) in protecting England and Wales from the risks of plant pests and diseases that might cause harm to the economy. The Department aims to maintain and promote high levels of health in arable and horticultural plants and produce, protecting the country's agricultural and horticultural industries and the natural environment from imported pests and diseases and supporting domestic trade and exports.

1.2 Epidemics of plant diseases that cause significant damage are rare in the natural environment, where different species of plants grow together, and pests and diseases do not have the same opportunity to spread as they have in a monoculture, where plants of the same species are grown together. Pests and predators also tend to reach an ecological balance in the natural environment. In contrast, the man-made environments of agriculture and horticulture are characterised by fields or glass houses full of the same or a few, species of plants. Such environments can be ideal hosts for a wide range of plant pathogens, while an invasion by a pest can cause serious damage in the absence of any natural predators.

1.3 Plant pests and diseases pose less risk to human health than animal pests and diseases, although people and livestock can be poisoned by some plant diseases. Generally, however, plant pests and diseases are not transferable to people and plants affected by them do not harm consumers. Their main impacts are economic - as they affect the appearance, growth, yield and ultimately the value of agricultural and horticultural produce - and environmental, where pests and diseases can impact on wild flora. At the local level, farmers and growers spend money on pesticides and herbicides to protect their crops. Their livelihoods can also be put at stake as their incomes suffer from lower yields or depressed prices on account of poorer quality produce. Plant pests and diseases can also damage the national economy, by affecting the volume and value of our imports and exports, and by harming the country's reputation for providing a healthy and sustainable supply of produce needed to attract multinational food processing companies to establish production facilities in this country.

1.4 A 2000 economic evaluation[5] of the country's plant health programme suggested that the financial impacts of plant pests and diseases on this country could be extremely large. For example, it estimated that £279 million of potato crops in southern England might be at risk from Colorado Beetle and £133 million of crops such as tomatoes, cucumbers and ornamental plants were at risk from Tobacco Whitefly.[6]

1.5 Cereals are England's most valuable crop, with a total value of some £2 billion, and exports worth over £200 million, in 2001. Horticultural produce (vegetables, fruit and ornamentals such as plants and trees) are the next most valuable crops, with a total value of £1.9 billion, and exports worth £116 million, in 2001. The value and volume of agricultural production and exports vary from year to year, and are affected more by climatic and economic factors than by pests and diseases. Nevertheless, evidence gathered by the Department indicates that farmers spend around £87 million a year on fungicides to control major diseases in cereal crops alone.[7] The Horticultural Development Council, a body financed by a statutory levy on horticultural growers to carry out horticultural research, estimates that 10 to 20 per cent of horticultural production is lost to pests and diseases each year.

5 *An Economic Evaluation of MAFF's Plant Health Programme, ADAS Consulting Ltd and the Imperial College London, commissioned by the former Ministry of Agriculture Fisheries and Food.*

6 *Tobacco Whitefly is a serious pest which can transmit over 60 viruses that damage a wide range of plants and directly feeds on crops such as tomatoes and cucumbers.*

7 *Cereal surveys carried out by Central Science Laboratory and ADAS Consulting Ltd.*

Farmers and growers are responsible for protecting their own crops

1.6 Farmers and growers bear the primary responsibility for protecting their own crops from pests and diseases. They can take a variety of measures to protect their crops **(Figure 1)**.

1.7 Farmers and growers pay levies to industry levy boards, such as the Horticultural Development Council, to fund research into new methods of controlling pests and diseases already established in this country. They also have to bear the cost of treating or destroying their crops if they are infested with a pest or disease. If a pest or disease not native to this country poses a threat to their crops, farmers and growers are required to notify the Department. The Department may order the crops to be destroyed, without compensation for the farmers or growers.

The Department is also active in helping to control pests and diseases

1.8 The Department undertakes a range of activities to prevent, detect and deal with outbreaks of pests and diseases **(Figure 2)**. It spends £8 million a year regulating the import and movement of plants, plant material and produce to prevent the introduction or spread of serious plant pests and diseases from abroad and, as part of its sponsorship of the farming and horticultural industries, a further £14 million on research into the diagnosis and control of pests and diseases already established in this country.

1.9 The Department's work is subject to two key international agreements:

- European Union Directive 2000/29/EC aims to prevent the import of key pests and diseases into the European Union that could cause economic harm to farmers and growers or damage to the environment. European Union countries have to ban the introduction and movement of specified harmful organisms, and of plants and produce from specified origins. Plants and plant produce are also required to meet specified standards, and countries must have procedures in place to monitor the movement of plants and plant produce between European Union states; and
- the 1952 International Plant Protection Convention (IPPC), a United Nations treaty adopted by the Food and Agriculture Organisation, requires governments to adopt control measures to protect plants from harmful pests and diseases, including inspection of consignments of plants and plant produce being traded, the conduct of pest risk assessments, and the designation and maintenance of pest-free or low-pest areas. The European and Mediterranean Plant Protection Organisation (EPPO), the regional arm of the IPPC, also sets regional standards for the protection of plants. It maintains lists of notifiable pests for the region, and an alert list to provide early warning of pests that might pose a risk to its member countries.

1 Measures that farmers and growers can take to protect their crops from pests and diseases

Farmers and growers can do much to protect their crops from pests and diseases.

- Growing disease-resistant varieties.
- Rotating their crops.
- Following the Department's codes of good agricultural practice.
- Making appropriate use of pesticides and fungicidal sprays.
- Using biological control agents.
- Heeding advice from the Department and the agro-chemical industry.

Source: National Audit Office

The government has translated these agreements into UK legislation, primarily through the Plant Health Act 1973. The Department must also work within the requirements of the 1995 World Trade Organisation Agreement on Sanitary and Phytosanitary Measures, which aims to ensure that countries' plant health controls on imports have a scientific basis and are not used as a barrier to trade.

National Audit Office scope and methodology

1.10 We focused on the key risks posed by plant pests and diseases, the Department's record in dealing with outbreaks when they occur and its work to detect pests and diseases and prevent them from spreading. We examined whether the Department:

- focuses on the key risks (Part 2 of our report); and
- is effective in detecting plant pests and diseases, and in dealing with outbreaks to prevent their spread (Part 3).

Appendix 1 summarises the methods we used to obtain evidence for our report. We did not examine the part that genetically modified crops might play in plant health. The Department is carrying out research in this area, which it will use to inform its approach for maintaining plant health.

2 The Department's activities to control plant pests and diseases

The Department carries out a range of activities to control plant pests and diseases.

Identification and preparedness

- **Pest risk assessments** to assess the nature of the risks posed by pests and diseases emerging abroad that could threaten this country.
- **Research** to diagnose pests and diseases and to develop measures for controlling them.
- **Surveys of crops** to check for high-risk pests and diseases prevalent elsewhere in the European Union and support the country's status as a zone free from such pests and diseases.

Prevention and detection

- **Plant passporting**[1] - inspection of premises of growers who wish to move plants around the country or more widely within the European Union and authorisation of growers to self-certify that their plants have been produced on healthy premises.
- **Inspection of imports** of all plants and plant material, and a sample of plant produce, imported from outside the European Union to ensure they are free from pests and diseases designated as high risk by the European Union.
- **Inspection of exports** of plants and plant material to certify they are free from pests and diseases designated as high risk by the importing country.
- **Inspection of seed potato crops -** to ensure potatoes are free of pests and diseases.

Dealing with outbreaks

- **Eradication or containment** of any high risk pests and diseases arriving in this country.

NOTE

1. A plant passport is an official label or document travelling with a consignment giving evidence that the requirements of the European Union Plant Health Directive have been satisfied.

Source: National Audit Office

Part 2

Focusing on the key risks

The type and severity of risks vary among pests and diseases

2.1 **Figure 3** shows examples of pests and diseases grouped into four main categories:

- those that are already **established** in England or Wales;
- those that are **not established** in England or Wales and which pose an economic or environmental threat to this country, having caused economic or environmental damage in other countries;
- those that are **not established** in England or Wales and which do not pose a threat; and
- those that were **unknown** before their outbreak.

2.2 The Department's principal focus is on keeping non-established pests and diseases out of this country, eradicating outbreaks if they occur or, if this does not work, containing the pests or diseases until there are either effective means for their control or varieties of plants that are resistant to them. Risks from established pests and diseases are managed primarily by farmers and growers, although the Department also funds research into such pests and diseases.

The Department has extensive knowledge about the risks that this country faces

2.3 The Department draws on a range of information about pests and diseases:

- the European Union lists some 470 key pests and diseases that plant health authorities must prevent from being imported into the European Union. If farmers or growers find any of them, they are required to notify their plant health authority;
- the Central Science Laboratory (CSL), one of the Department's executive agencies, carries out a pest risk assessment on all new pests or diseases detected on imports coming into the country or identified in scientific literature to determine the likelihood of their entering and establishing themselves in this country and their potential economic harm;
- the Department maintains a database showing the status of 1,613 plant pests, giving details about the pest risk assessments on 194 pests that might become established in this country and providing details about interceptions arising from inspections;
- Rothamsted Research, an independent research body, carries out nationwide insect surveys. CSL and ADAS Ltd - a former advisory and research arm of the Department privatised in 1996 - has three crop monitoring networks including one that monitors wheat and oilseed rape crops to provide weekly data on incidence and severity of disease and effectiveness of control treatments applied;
- the Department liaises with European Union member states on plant health issues, participates on working groups set up from time to time to deal with particular issues and attends meetings of the European Plant Protection Organisation. It also discusses any common problems directly with other countries; and
- the Department inspects the import and movement of plants, plant material and produce, while amateur botanists and lepidopterists inform it of any species new to this country that they come across.

3 Examples of the risks posed by plant pests and diseases

The type and severity of risks vary among plant pests and diseases.

Examples of pests and diseases already established in England or Wales

Aphids

- Consisting of 30 species, aphids are the most significant established plant pests in England and Wales. They damage plants by feeding and are also responsible for transmitting half of all the viruses that pass between plants. They cause economic losses in excess of £100 million a year.

Western Flower Thrips (*Frankliniella occidentalis*)

- These are insects, less than 2 millimetres long, which can destroy a wide range of vegetable and ornamental crops such as chrysanthemums and fuchsias. Following an initial outbreak in 1987, the pest has now become established in England and Wales.

***Rhizomania* (Beet necrotic yellow vein virus)**

- A virus transmitted by a soil borne fungus that reduces the root weight and sugar content of sugar beet crops and that can destroy the entire crop. Appeared for the first time in England in 1987. A 15-year campaign was fought to contain the virus while the industry sought to develop resistant strains of sugar beet. However, the government confirmed in 2002 that the virus had become established in this country. To date, some 240 farms have been affected.

Examples of pests and diseases posing a threat from abroad

Colorado Beetle (*Leptinotarsa decemlineata*)

- An insect that feeds on potato leaves and that can completely destroy the plant if the population is high enough. Established in several European countries, including Italy, Spain and France.

The South American Leaf Miner (*Liriomyza huidobrensis*)

- An insect widespread in the tropics that feeds on a range of plants, including economically important plants such as lettuce and chrysanthemums. Severe infestations can destroy whole crops.

Potato Ring Rot (*Clavibacter michiganensis sepedonicus*)

- A highly contagious bacterial disease affecting potatoes that is present in some other European Union countries, such as Germany and Denmark, and in the USA where losses have been as high as 50 per cent of the crop. Once established, the bacterium can survive in the soil for many years and is therefore extremely difficult to eradicate.

Example of a pest not posing a threat from abroad

The Mediterranean Fruit Fly (*Ceratitis capitata*)

- An insect that has spread to almost every continent around the world, the Mediterranean Fruit Fly causes damage to a wide range of fruit crops particularly citrus and peaches. It is not a threat to this country because the types of fruit susceptible to damage by the Fruit Fly are not grown in this country.

Example of a disease affecting this country, that was unknown before its outbreak

Mushroom Virus X

- A disease first identified in England in 1998 that has since appeared in other countries. It reduces mushroom yields and can have a devastating impact on growers. Three major growers have ceased trading after their crops were struck with the disease and the cost to the industry is estimated at £50 million.

Source: National Audit Office

2.4 The Department uses this information, and its accumulated knowledge and experience, to determine the threat from plant pests and diseases. The Department is currently most concerned about:

- *Phytophthora ramorum*, a fungus that is causing the death of some species of oak trees in California and Oregon in the United States (hence, the condition is known as Sudden Oak Death). Emergency legislation against the threat was introduced in England and Wales in May 2002 and was replaced by legislation implementing European Union-wide emergency measures in November 2002. The fungus has been found at over 280 sites in England and Wales, although none has been found on oaks or other established trees.
- Potato Brown Rot and Potato Ring Rot, serious bacterial diseases not established in this country that are notifiable under the European Union Plant Health Directive (see Figure 3 and Appendix 2).
- Karnal Bunt, an economically damaging disease of various types of wheat. Although not found in the UK or any other European Union member state, the disease has the potential to reduce significantly the quality and marketability of grain and damage export markets, since many countries now regulate against it.
- Colorado Beetle - see Figure 3.
- *Thrips palmi* - see Appendix 2.

2.5 In November 2000, ADAS Consulting Ltd and Imperial College of London, carried out full cost benefit analyses to assess whether action should be taken against six key pests and diseases[8] and concluded that the likely damage that they would cause if they were let into the country outweighed the costs of keeping them out. The Department does not, however, rank key pests and diseases in a systematic way, according to how much of a risk they pose to the agricultural and horticultural sectors of the economy. Rankings and cost-benefit analyses would inform the Department's strategy and help it to target its resources according to the balance of risks - for example, between indigenous pests and diseases and those posing a threat from abroad, and between pests and diseases where there would be differing costs and benefits of taking action or none at all.

The Department recognises that it needs to put in place a coherent strategy for managing its plant health work

2.6 Risks have changed over recent years. Figure 3 shows, for example, that some pests and diseases previously not present in this country, such as Western Flower Thrips and *Rhizomania*, have become established in England and Wales. Over 200 alien pests, comprising viruses, fungi, bacteria and insects, have become established in the UK from abroad in the last 20 years. Stakeholders we consulted considered that a variety of developments increased the risks from non-established pests and diseases **(Figure 4)**.

4 Developments that might be increasing the risk of plant pests and diseases

Key stakeholders considered that the risks from non-established pests and diseases were increasing due to a variety of developments.

Increasing and changing patterns of trade and travel

- **Liberalisation of trade** is bringing down trade barriers and reducing import controls. The forthcoming **expansion of the European Union** could also increase risks as produce from Eastern European states starts to circulate more freely within the European Union.
- **Increased trade** is exposing the country to a greater variety of pests and diseases. Consumers demand more exotic plants and produce all year round and arrange personal imports over the Internet.
- **More exotic holidays** present the risk of plant pests being brought into the country on clothes, in suitcases and on other personal possessions as tourists return home from abroad. Pests are more likely to survive today's shorter journey times.

Changes in farming practices

- **Use of recycled growing material** might recycle soil borne diseases.
- **New restrictions on the use of pesticides, increased resistance to pesticides and greater production of organic crops** might increase the risk of an outbreak of pests and diseases.

Climate change

- **Warmer winters** might also lead to **increased survival** of a wider range of pests and diseases.

Source: National Audit Office structured interviews with key stakeholders

8 *Colorado Beetle, Thrips palmi, Bemisia tabaci, Potato Ring Rot, Potato Brown Rot and Rhizomania, which are among the 470 key pests and diseases that plant health authorities must prevent from being imported into the EU (paragraph 2.3).*

2.7 In addition to the liberalisation of trade and the expansion of the European Union, the Department is also faced with increasing imports of small quantities of plants, plant cuttings and tissue cultures by private travellers or by post as people order material over the Internet. There is also the risk of illegal imports, not declared to HM Customs and Excise.

2.8 The threats posed by changes in farming practice and climate change are not explicitly addressed in the Department's approach to managing the risks from plant pests and diseases. The Horticultural Development Council told us that stricter pesticide legislation was reducing the availability of horticultural pesticides, that there were gaps in pesticide availability for each major horticultural crop and that there was currently no solution to fill many of these gaps. For example, the main pesticides used to combat *Thrips palmi* (Case 1 at Appendix 2) are no longer available because they are prohibited from use in the European Union. Any outbreak might therefore be more difficult to contain and eradicate in future. The Horticultural Development Council considered that many of the country's horticultural crops were at risk, including cabbages, cauliflowers, celery, cucumbers, cherries, plums, raspberries and strawberries. The Department liaises regularly with the horticulture industry over crop protection issues and is working with the industry to help identify key gaps in crop protection that might arise with the loss of some pesticides.

2.9 The activities of various parts of the Department, and of the Department's executive agencies and other bodies, impinge on plant health issues **(Figure 5)**. The Department does not, however, have an over-arching strategy to co-ordinate the variety of work that takes place. For example, the Department's Global Atmosphere Division has worked on the predicted impact of climate change on agriculture. The Division was not aware, however, of the Department's work on cereal surveys over the last 30 years that also shows the impact of weather on a year by year basis on agriculture and diseases in cereals. The Department has recognised that its approach to plant health could be better co-ordinated and aims to put in place an over-arching strategy for 2004-05.

2.10 The Department also needs to give more attention to the boundaries where its own responsibilities end and where those of the industry start. For example, the Department recognised at an early stage of the outbreak of *Rhizomania* in 1992 (Case 4 at Appendix 2) that its priority was to contain the disease and stop it spreading until the industry had developed a range of sugar beet varieties tolerant to the disease. The Department did not, however, make it sufficiently clear that it was looking to the industry to develop such varieties within a reasonable timescale. The industry was therefore unready when the Department lifted its controls in 2002.

5 Parts of the Department and other organisations whose activities impact on plant health matters

The activities of various parts of the Department, and of the Department's executive agencies and other bodies, impinge on plant health issues.

Climate, Energy and Environmental Risks Directorate (Climate change)	Food, Industry and Crops Directorate (Liberalisation of trade, Plant Health)	Science Directorate (Horticultural and Arable research)	Executive Agencies (Pesticide restrictions, climate change, plant pest risk assessments, plant health research)
Global Atmosphere Division	Plant Health Division and the Plant Health and Seeds Inspectorate	Agriculture, Environment and Food Technology Division	Central Science Laboratory
	Horticulture and Potatoes Division and Horticultural Marketing Inspectorate		Pesticides Safety Directorate
	Arable Crops Division		

Source: National Audit Office

The Department has become more flexible in selecting the pests and diseases that it focuses on from one year to the next

2.11 During the period of our examination, the Department adopted a set of outcome measures and targets to evaluate its performance in the area of plant health. Four measures focus on minimising the number and impact of outbreaks **(Figure 6)**. Stakeholders we consulted questioned the appropriateness of the five key pests and diseases adopted by the Department. ADAS Consulting Ltd considered that the focus on these was not representative of the threats posed from trade and international traffic. In response, the Department has adopted a new approach for 2003-04, retaining its outcome measures and targets but focusing on specific pests and diseases, such as Sudden Oak Death, that pose a current threat to this country. The Department will change its focus as threats change from year to year.

The Department could do more to reduce risks in exporting countries

2.12 Plant health authorities in the United States and in New Zealand put an emphasis on seeking to reduce the risk of imported plant pests and diseases at the point of origin, by working with producers in exporting countries to ensure that their crops are pest and disease-free before allowing their import. In contrast, the Department normally writes to countries whose imports cause persistent problems of pests and diseases coming into this country, to agree any courses of action that might be required. It then relies on its inspection regime in this country to detect any pests or diseases coming in from abroad. The Department considers that this is the most cost-effective approach.

2.13 The Department told us that imports of cut flowers and cuttings of herbaceous plants from Israel, potatoes from Egypt, beans from Kenya and bonsai plants from Korea, Japan and China are key sources of imported pests or diseases. The Department told us that there had been a noted reduction in the number of detections of *Bemisia tabaci* on Israel's imports of cut flowers and plant cuttings after the Department had written to the Israeli authorities.

2.14 The Department's inspectors have visited some countries where there have been persistent problems. For example, they visited Egypt to advise on controls against Potato Brown Rot and Kenya to improve pre-export controls on a range of material. The European Commission also visits non-European Union countries that it considers are priorities for tackling the risk of pests and diseases being imported into member states. Since 1999 the Commission has visited 14 countries, in 8 cases tackling issues relevant to pest and disease control in England and Wales. The Commission has also undertaken collaborative exercises, involving inspectors from member states' plant health authorities, in countries where there have been persistent problems. For example, the Commission is working with the authorities in Egypt to eradicate Potato Brown Rot from its watercourses. Exports of bonsai plants from Japan and China have not been covered by either the Department's or the Commission's programme of visits, however, and remain key sources of imported pests or diseases into England and Wales.

6 The Department's four key measures and targets for assessing its performance in controlling outbreaks of plant pests and diseases, 2002-03

The Department adopted four outcome measures and targets to evaluate its performance in minimising the number and impact of outbreaks of plant pests and diseases in 2002-03.

Outcome measure	Target
■ Minimise outbreaks of serious plant pests and diseases	■ No increase in the number of outbreaks of 5 key pests[1] and diseases compared with previous year
■ Prevent the introduction of pests and diseases from third countries	■ No outbreaks attributable to imports
■ Eradicate or contain outbreaks where they occur	■ No spread of pests or diseases from site of any outbreaks
■ Facilitate exports of plants and plant products	■ No rejections of, or complaints about, exports by importing countries

NOTE

1. Colorado Beetle, *Bemisia tabaci*, *Liriomyza huidobrensis*, Potato Brown Rot and *Thrips palmi*. These are among the 470 key pests and diseases that plant health authorities must prevent from being imported into the European Union (paragraph 2.3).

Source: Department for Environment, Food and Rural Affairs

Farmers and growers cannot insure against pests and diseases

2.15 Farmers and growers have to pay for infected crops to be treated or destroyed. Unlike livestock farmers who were compensated from public funds for losses caused by foot and mouth disease, arable farmers and horticulturalists do not receive any compensation from the government for losses caused by plant pests or diseases. In the USA, government-subsidised insurance programmes help to protect farmers and growers against sharp falls in crop yields or revenue **(Figure 7)**. Depending on the level of insurance cover that farmers and growers take out, government subsidies of insurance premiums range from 38 per cent to 67 per cent.

2.16 The Prime Minister and the Secretary of State for the Environment, Food and Rural Affairs asked the Policy Commission on the Future of Farming and Food to report on how to create a sustainable, competitive and diverse farming sector. In January 2002, the Commission recommended that the government should encourage farmers and growers to insure themselves against financial risks. Although the Commission's recommendation was directed at compensation issues associated with the eradication of livestock diseases, the Commission did highlight the wider need for farmers to protect themselves financially from risks, pointing to the use of crop insurance in the USA and Canada. General insurance cover against pests and diseases, however, remains unavailable in this country. The Department told us that it has no plans to address this gap.

There is concern that the Department's scientific skills might diminish over the coming years

2.17 Risk assessment requires input from a range of specialists **(Figure 8)**. Several organisations we consulted, however, considered that the Department did not have access to the full range of knowledge and skills required. For example, CAB International, a leading global not-for-profit organisation specialising in sustainable solutions for agricultural and environmental problems, was concerned about the decline in British expertise in identifying pests and diseases.

2.18 A Science Audit of the CSL in February 2002 found that the Laboratory was dependent on particular individuals who had accumulated a breadth of knowledge and expertise, which would be lost when the scientists retired, unless succession planning addressed the need to pass on expertise and know-how. As a result, senior staff of the CSL now allow junior staff to accompany them to important meetings in order to cascade knowledge and experience.

7 The American Multiple Peril Crop Insurance Scheme

Farmers and growers in the USA can insure against losses from pests and diseases.

- Introduced in response to the Dustbowl that affected the Great Plains in the 1930s, this Scheme insures farmers' and growers' yields on an "all risks" basis, including risks from pests and diseases.
- The Scheme is a partnership between the federal government and private insurers. The government sets the Scheme's rules and insurance rates, and subsidises running costs and premiums.
- The Scheme covers 70 per cent of the country's land designated for growing crops, insures some $28 billion-worth of crops and generates premiums of some $2 billion a year.

Source: National Audit Office

8 Specialists needed to assess the risks from plant pests and diseases

A range of specialists is needed to assess the risks from plant pests and diseases.

Plant pathologists and entomologists	To identify and classify diseases and pests and their effects on plants
Environmental scientists	To advise on changes to the environment affecting insect populations and diseases
Epidemiologists	To advise on the spread of pests and diseases
Economists	To evaluate the economic risks

Source: National Audit Office

2.19 Stakeholders expressed concern that the availability of appropriate scientific advice more generally is likely to decline in the coming years as the scientists who specialise in plant pests and diseases retire and fewer young scientists enter the field. The former Ministry of Agriculture, Fisheries and Food used to fund students to undertake appropriate research qualifications but the Department no longer does so. The Biotechnology and Biological Sciences Research Council, the government's leading funding agency for biological research, awards a small number of studentships each year for projects in plant breeding and crop protection. Some industry levy boards also sponsor students to study for doctorates in plant health. The Horticultural Development Council launched a programme in June 2001, supporting two

doctorate students a year from 2002. In May 2002, the House of Lords Select Committee on Science and Technology[9] expressed concern about the general decline in biology expertise and research over the past twenty years, and that research to identify and describe organisms and species continued to be under-funded.

The Department needs to work more closely with other research bodies in this country and abroad

2.20 The Department spends some £14 million a year on its own "strategic" research, and also funds jointly with the industry other strategic projects, into the diagnosis and control of plant pests and diseases already established in this country. The Department's Pesticides Safety Directorate, for example, is researching how pesticides and fungicides work and the extent to which they are susceptible to the build up of resistance. Strategic research should produce results that can be developed further by levy bodies and applied to the benefit of farmers and growers. Applied ("near market") research is the responsibility of the industry and is funded mainly by levies paid by farmers and growers to their respective levy bodies.

2.21 The Horticultural Development Council, the levy body that undertakes research paid for by the horticultural industry, expressed concern that it was not clear what outcomes the Department expected from its research nor who would use the results. The Council therefore did not know where it should focus its own efforts to avoid duplicating the Department's research. In the Council's view, the Department should consult more with the levy bodies and with the industry when commissioning research. The Home Grown Cereals Authority commented, however, that both the Department and the Authority have a good understanding of each other's programmes and share information to avoid duplication. Other stakeholders suggested that the Department should commission more research into potential new pests and diseases, and how best to contain and eradicate them, and research the plant health implications of intensive farming and help determine good practice.

2.22 In September 2001, the Department appointed consultants to review the objectives for horticultural research and development in this country and the interactions between the main public bodies that fund horticultural research - the Department and the Biotechnology and Biological Sciences Research Council - and the industry levy bodies. In their January 2002 report, the consultants concluded that the policies adopted by these organisations did not add up to a coherent national strategy because the organisations had different aims and objectives. A January 2003 review pointed to the need for the Department to put in place a coherent, long-term strategy for funding horticultural research and development.

2.23 The Horticultural Development Council has established that, outside of the university sector, there are 17 research establishments, of varying size, involved in agricultural and horticultural scientific work ranging from fundamental research to near market research. The Council is concerned about the proliferation of publicly funded research, resulting in duplication, under-utilisation of assets and high overheads. The Department's research also needs to be better co-ordinated with that of its counterparts in Europe. The Department's research programme did not always take sufficient account of research being done elsewhere in Europe.

2.24 The Department's new Science and Innovation Strategy, launched in April 2003, recognises that the Department's science interests often overlap with those of other bodies. The Department now aims to increase the proportion of its research that is co-ordinated or shared with other organisations, both in this country and abroad.

The Department's research does not always benefit farmers and growers

2.25 The Department's strategic research is unlikely to have a direct impact on growing practices in the near term. We reviewed the outcomes of 10 Departmental research projects completed within the last two years: six produced outcomes helpful to farmers and growers, while the expected benefits of the other four are as yet unfulfilled or unproven, up to two years after the research was completed. Although some projects deliver outcomes that should benefit farmers and growers, the Department often cannot be certain that farmers and growers have actually made use of them. Some stakeholders considered that many of the Department's technological developments failed to provide practical benefits to farmers and growers. The consultants commissioned by the Department to review the objectives for horticultural research and development in this country concluded that the mechanisms by which knowledge and technologies were transferred from research bodies to the rest of the industry were inadequate and that this resulted in a poor return on much of the investment in research and development. The Department expects that, through its new Science and Innovation Strategy, it will promote the take up of its scientific research results and build the transfer of results into all of its research projects and programmes.

9 *Third Report 2001-02: What on Earth? The Threat to the Science Underpinning Conservation.*

Part 3

Detecting pests and diseases

3.1 The Department carries out a range of activities to detect the presence of plant pests and diseases (See 'Prevention and Detection' activities in Figure 2). It needs skilled and experienced inspectors in the right places around the country to carry out the work.

3.2 Identification of pests and diseases can be difficult for the Department and farmers and growers alike. There might be several types of a particular pest, some of which will represent a significant threat and some of which will not. It is not always possible to detect or identify pests and diseases through physical examination. For example, some small insect pests might need to be identified in a laboratory, while bacteria and viruses can be detected only when plants show the symptoms of disease and these might not appear for several years.

3.3 This part of the report examines whether the Department:

- has the right inspectors in the right places;
- carries out enough inspections;
- inspects the riskiest imports;
- is effective in detecting pests and diseases, keeping them out of this country and tracing them back to their points of origin; and
- is effective in dealing with outbreaks and preventing their spread.

The Department has the right inspectors in the right places

3.4 The Department has 88 field staff in 37 offices across England and Wales, and a further 6 staff engaged in plant health work at its inspectorate headquarters in York **(Figure 9)**. Local offices are strategically located, mainly in market towns and at ports and airports, to allow inspectors to travel to farmers' and growers' premises or to give them access to imports as they arrive in this country. Inspectors in local offices are usually responsible for a geographic area, or a group of local farmers, growers or traders.

3.5 Inspectors have relevant degrees and considerable practical experience from their years of working for the Department **(Figure 10)**. They were generally well regarded by stakeholders we consulted, although some stakeholders considered that inspectors had too much work to do. The number of inspectors has remained broadly steady in recent years. In most locations we visited, staffing was up to complement and staff turnover was low. The Department does, however, have problems attracting inspectors to the south-east of England because of the high cost of living.

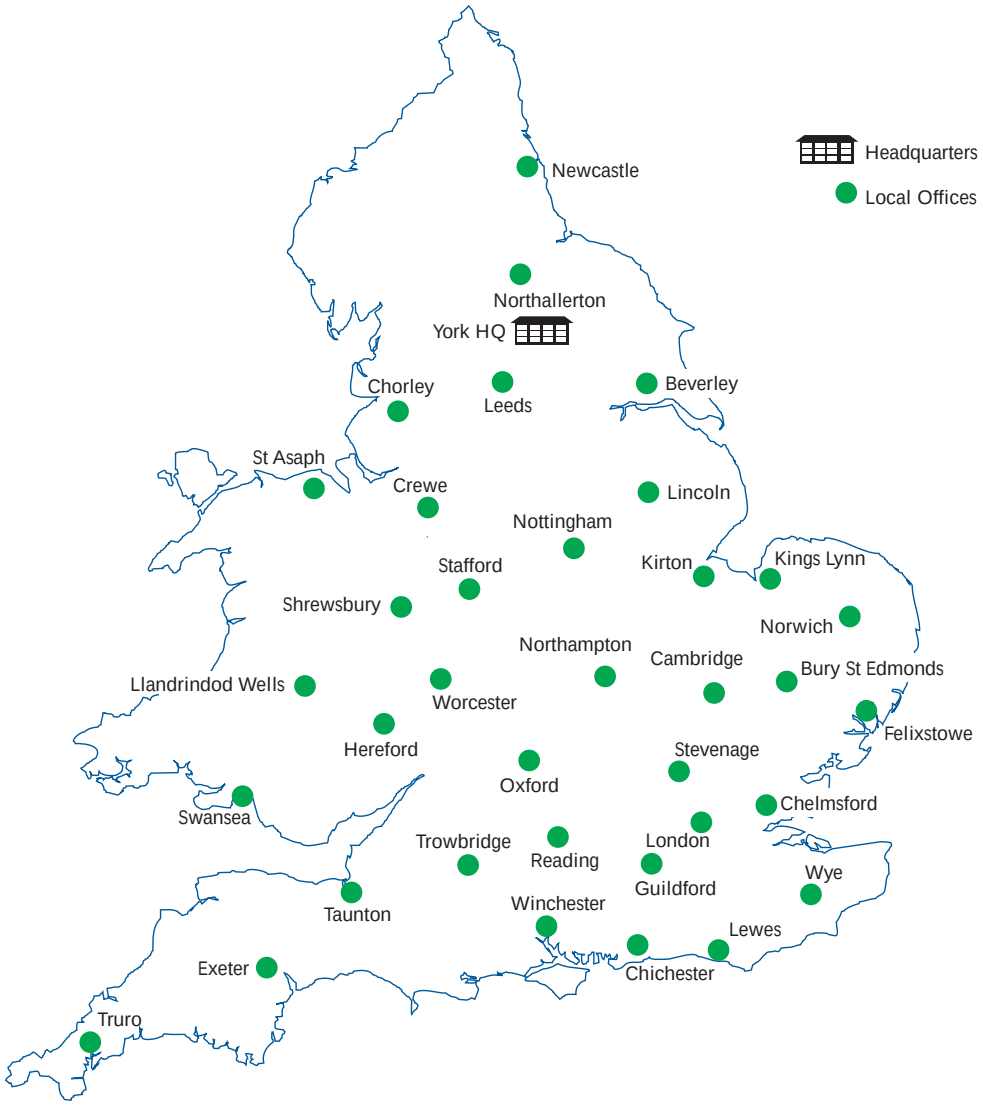
It is difficult to know whether the Department is carrying out the right number of inspections

3.6 **Figure 11** shows that the Department has to carry out inspections to meet the requirements of international agreements. With the exception of the first target, the Department has the discretion to set its targets at a level it considers to be appropriate. However, in practice, the market dictates that all consignments of plants and plant produce being exported to non-European Union countries be inspected and certified as free of pests and diseases; exporters would not be able to sell their produce without such certification. The Department can therefore set three of its targets at levels it considers to be appropriate, in each case being permitted by international agreements to inspect all, or a representative sample of, the items covered by the targets:

- the Department considers that consignments of plants, plant cuttings and tissue cultures imported from non-European Union countries pose the greatest risk of bringing pests or diseases into this country, and therefore aims to inspect all such consignments within two weeks of entry;
- the Department regards plant produce imported from outside the European Union as a lower risk and therefore aims to inspect around 1,100 of these consignments each year; and

9 Location of the Department's plant health staff in England and Wales

The Department has plant health staff located in offices across England and Wales.



Source: Department for Environment, Food and Rural Affairs

10 A typical plant health inspector

Plant health inspectors have degrees in relevant disciplines and considerable practical experience from their years of working for the Department.

A Plant Health and Seeds Inspector examining a glasshouse crop

A typical plant health inspector

- will be a graduate in agriculture, horticulture or a related discipline
- will have had several years of practical experience in agriculture, horticulture or an allied industry
- will have spent two years as a trainee inspector developing inspection competencies
- will be responsible for a geographical area covering part of or the whole of a county and embracing a range of inspection environments from ports through to nurseries, farms, processing plants and scientific institutes
- will travel 7,000 to 8,000 miles a year on official business, visiting up to 4 sites a day

Source: National Audit Office

- the Department aims to carry out 40,000 inspections of plants, planting material and plant produce being moved within the European Union.

3.7 One inspection does not necessarily equate to an inspector making a separate visit, for example, to the premises of a grower. For example, inspectors visiting a grower to certify growers' premises under the plant passporting regime against the first target in Figure 11 may also take the opportunity to check for the presence of pests or diseases against the last target.

3.8 In the case of consignments being moved within the European Union, data were not readily available on the total number of consignments being moved, which we could then have used to help us assess the reasonableness of the Department's target of inspecting 40,000 such consignments each year. The Department told us that it set part of this target (accounting for some 29,000 of the 40,000 target) on the basis of scientific advice about the number of inspections needed to arrive at a statistically valid assessment of the presence of pests and diseases within the consignments, taking account of the level of detections, and therefore risk, in previous years. It was not clear to us, however, how the statistical advice influenced the setting of the target. Further, the remaining 11,000 inspections within the 40,000 target was based on the level of inspector resources that were expected to be available to carry out additional checks when, for example, inspectors visited a grower for other purposes; it did not reflect any risk or statistical analysis. Some inspectors that we interviewed considered that the target of 40,000 was too high, representing a considerable proportion of the Department's plant health workload.

3.9 More generally, the Department relies on its inspection regime to maintain this country's status as a "protected zone", free from key pests and diseases. Member states of the European Union may take measures to protect themselves from pests and diseases that are established elsewhere in the European Union and that are on the European Union's list of 470 notifiable pests and diseases (see paragraph 2.3). In such cases, countries are said to be "protected zones". England and Wales are currently protected zones from two key pests - *Bemisia tabaci* and Colorado Beetle. They were protected zones for *Rhizomania* until March 2002, when they lost such status.

3.10 Maintaining the country's status as a protected zone from key pests and diseases is a key priority for the Department. Not only does it protect domestic crops and avoid the need for containment and eradication action by the Department, it also protects the country's export markets, giving farmers a competitive edge over those of other European Union countries in exporting produce to third countries that are themselves keen to remain free from pests and diseases.

11 The Department's inspection targets to detect pests and diseases, 2002-03

All but one of the Department's five inspection targets is set at the Department's discretion.

Objects of inspection	International Requirement	Target set by the Department
Premises of growers seeking to move plants and planting material within the country or elsewhere in the European Union, under the plant passporting arrangements (see Figure 2).	**All** premises of growers to be inspected at least once a year.[1]	
Plants and plant produce being exported to non-European Union countries.	Exports to be certified as free from pests.[2]	**All (some 10,000)** such consignments.
Plants, plant cuttings and tissue cultures imported from non-European Union countries. Plant produce imported from non-European Union countries. Plants, planting material and plant produce being moved within the country or being imported from, or exported to, other European Union countries.	The consignment "shall be meticulously inspected either in their entirety or by representative sample." [1]	**All (some 4,000)** consignments of such imports to be inspected within 2 weeks of entry. **Some 1,100** (6 to 8 per cent) of such consignments. **40,000** inspections.

NOTES

1. Required under European Commission Directive 2000/29/EC.
2. Required under the International Plant Protection Convention.

Source: National Audit Office

12 **The number of inspections carried out by the Department to detect pests and diseases compared with targets, 2001-02 and 2002-03**

The Department missed three of its five inspection targets in 2001-02 and two in 2002-03.

Objects of inspection	2001-02		2002-03	
	Target	Outturn	Target	Outturn
Premises of growers seeking to move plants and planting material within the country or elsewhere in the European Union	**All** premises of growers	**All** 986[1] premises	**All** premises of growers	**All** 986[1] premises
Plants and plant produce being exported to non-European Union countries	**All** consignments	**All** 9,628[2] consignments	**All** consignments	**All** 9,294[2] consignments
Plants, plant cuttings and tissue cultures imported from non-European Union countries	**All** consignments within 2 weeks of entry	**81 per cent** (3,911 out of 4,814 imported consignments) within 2 weeks of entry	**All** consignments within 2 weeks of entry	**86 per cent** (3,214 out of 3,720 imported consignments) within 2 weeks of entry
Plant produce imported from non-European Union countries	1,281 consignments	996 consignments (**shortfall** of 285 - 22 per cent)	1,094 consignments	795 consignments (**shortfall** of 299 - 27 per cent)
Plants, planting material and plant produce being moved within the country or being imported from, or exported to, other European Union countries	40,000 consignments	36,012 consignments (**shortfall** of 3,988 - 10 per cent)	40,000 consignments	45,496 consignments (5,496 - 14 per cent more than target)

NOTES

1. The figure of 986 denotes the nurseries taking part in the plant passporting regime. The number of nurseries participating varies by less than 1 per cent in a year. The figure of 986 is the number of nurseries in the scheme as at March 2003.

2. Inspections of premises and exports to non-European Union countries are demand-led. Completeness therefore depends on growers and exporters applying to the Department to be inspected. The Department inspected all such premises and exports of which it was notified.

Source: Department for Environment, Food and Rural Affairs

3.11 The Department must be able to demonstrate that the country's agricultural and horticultural industries are free from pests and diseases covered by the protected zone status. The European Union has not specified, however, how many inspections it requires to maintain protected zone status, only that member states must carry out regular or systematic official surveys taking account of sound scientific and statistical principles. Other Member States have interpreted this as a requirement for 100 per cent inspections, although the Department does not have access to data showing how its inspection coverage compares with that of other countries.

3.12 In the short term at least, the Department's inspection resources are fixed and the case of Sudden Oak Death demonstrates that the Department needs some flexibility over its resources in order to be able to respond to threats that emerge at short notice during the course of a year. The Department also has to do enough inspections of particular commodities to retain the country's protected zone status, although there is no absolute minimum level specified by the European Commission. These factors, together with the absence of a clear statistical basis for setting the 40,000 inspections target, mean that it is difficult to know whether the Department is carrying out the right number of inspections.

The Department has met some, but not all, of its inspection targets in the last two years

3.13 **Figure 12** shows that the Department has failed to meet all of its inspection targets in the last two years. In particular, it fell short of meeting its key target of inspecting all plants, plant cuttings and tissue cultures imported from non-European Union countries - which it considers pose the greatest risk of bringing pests or diseases into this country - within two weeks of entry. It is important that all such imports are inspected within two weeks; after that, most have been planted out by growers and therefore risk spreading any pests or

diseases that might be affecting them. In 2002-03, the Department inspected more than 45,000 consignments of plants, planting material and plant produce being moved within the European Union. It did more than the target level of 40,000 because it had to become actively engaged in monitoring for the presence of the fungus that causes Sudden Oak Death (see Appendix 2, case study 7). The Department exceeded its target without additional resources, as inspectors checked often multiple species of plants with each counting as one inspection during visits to growers and other premises to check for the disease, whilst also carrying out fewer of the other types of inspections.

It is not clear that the Department inspects the riskiest imports

3.14 Figure 11 shows that three of the Department's targets involve inspecting all of the relevant import or export consignments or growers' premises each year:

- In the case of the first two targets - certification of growers' premises and inspecting exports to non-European Union countries - the market helps to ensure completeness of inspections; exporters and growers would not be able to sell their produce without the necessary certification[10] that they are free of pests and diseases.
- The third target concerns inspecting plants, plant cuttings and tissue cultures imported from non-European Union countries. Inspectors need to have access to complete, reliable and timely information to ensure that all such imports are inspected within the two week target period.

3.15 The Department's other two targets - concerning plant produce imported from non-European Union countries and plants, planting material and plant produce being moved within the European Union - involve inspecting a selection of consignments. Each year this country receives some 25,000 consignments of plant produce imported from non-European Union countries, while the number of consignments of plants, planting material and plant produce moved within the country or imported from, or exported to, other European Union countries is unknown.

The Department does not have access to complete, reliable and timely information

3.16 All commercial imports of plants, plant cuttings and tissue cultures from outside the European Union must be accompanied by a phytosanitary certificate provided by the plant health authority of the exporting country, declaring that the imports are free of pests and disease. When plants, plant cuttings and tissue cultures from non-European Union countries arrive in this country, usually at an airport, HM Customs and Excise are expected to check, on the Department's behalf, that all consignments have the necessary certificate. These types of imports are fragile and they need to be processed in good time to prevent them from being damaged or from dying in transit. It is also easier for the Department's inspectors to check imports once they have arrived at their final destinations and been laid out for bedding or planting out. The Department therefore operates an "Approved Importer Scheme", allowing some importers to move plants and planting material from the port of entry to an approved growing site anywhere in the country. An approved importer is required to give the Department advance notification of each non-European Union import made under these arrangements, in most cases sending import declarations electronically to the "Customs Handling of Import and Export Freight" (CHIEF) computer system operated by HM Customs. HM Customs send the phytosanitary certificates to the Department's relevant offices around the country responsible for inspecting imports on farmers' and growers' premises.

3.17 The Department aims to inspect the material at the growing site within two weeks of the import arriving in this country. However, staff in the Department's field offices that we visited considered that these arrangements were not working well and told us that they did not have access to the information needed to inspect in good time all imports of high risk plants, plant cuttings and tissue cultures from non-European Union countries. This is borne out by the Department's failure to meet its two week target period in both 2001-02 and 2002-03 (Figure 12). We found that:

- not all relevant inspectors have direct access to the CHIEF system, having to rely on daily visits, where possible, to local Customs offices or on Customs officials alerting inspectors to import declarations. The Department is working with HM Customs to give inspectors wider access to the CHIEF system, but there is currently no target date to have such access in operation and this has to be within the provisions of the Data Protection Act;

10 *The Department issues phytosanitary certificates in accordance with the International Plant Protection Convention, to show that the consignment has been inspected and found to be free of pests and disease.*

- although there are statutory penalties of up to £5,000 fine or up to 6 months in prison for importers who fail to comply with the conditions of the Approved Importer Scheme, inspectors considered that neither penalty was a deterrent because the Department had never enforced either of them; and
- it could take several weeks for the phytosanitary certificates to arrive at inspectors' offices, by which time the plants or planting material could have been planted out or moved on to other nurseries, making inspection difficult.

3.18 The Department usually inspects imports of plant produce at their ports of entry. Most of these imports, however, do not need to be accompanied by a phytosanitary certificate and inspectors do not routinely receive advance notice of such imports. In the absence of formal, systematic arrangements to provide inspectors with complete and timely information about such imports, inspectors have to rely on other means to do their jobs. The inspector at Felixstowe Docks, for example, had established an informal arrangement with the dock company by which he made regular visits to the company's offices at the port to access its computer system and find out about imports of plant produce arriving on the quayside. The inspector told us that this worked satisfactorily, but it depended on the goodwill of the port.

3.19 The inspector at Felixstowe Docks was fortunate that the dock company recorded such information for its own billing purposes. In contrast, airports do not. We found at Heathrow Airport that inspectors had to rely on a combination of local knowledge about the pattern of cargo flight arrivals, their countries of origin and the types of cargo being imported, and periodic visits to transit sheds at the airport in order to find such imports and carry out their inspections.

3.20 Over 80 species of plants, planting material and plant produce must be accompanied by a plant passport if they are moved either within the country or more widely within the European Union. In almost all cases, the Department has no prior knowledge of when such movements are to take place and has to rely on routine visits to farmers' and growers' premises, usually after plants, planting material and plant produce have moved within, or have been exported from, the country to check from the farmers' and growers' records that they had valid passports. The Department checks at ports of entry that imports of plants, planting material and plant produce from other European Union countries are accompanied by valid passports, but inspectors' work is again hindered by the problems of poor information noted above.

Inspectors cannot show that they have selected the riskiest consignments for inspection

3.21 Inspectors draw on their knowledge and experience, as well as a range of other information, to select import consignments for inspection. Inspectors have access to a database recording all of the pests and diseases found on imported plants and produce, and receive reports of pests and diseases detected after inspection. They also draw on their own knowledge and experience about the types of produce, and their countries of origin, where imports have in the past been found to be most prone to carrying pests and diseases. They also receive monthly intelligence reports alerting them to threats emerging from other countries. Individual consignments are generally selected at random for inspection. At Heathrow Airport and Felixstowe Docks we were unable to ascertain whether the consignments selected for inspection had been targeted at the riskiest because no documentation trail supporting selection was retained. Without data on the basis of selection of consignments for inspection, it is difficult to assess whether the low detection rate is attributable to an absence of pests and diseases or to the wrong consignments being inspected.

3.22 The international air freight industry operates night and day, seven days a week. At Heathrow Airport, for example, imports can arrive late at night and at weekends and, because of their perishable nature, consignments may leave the airport within a few hours of arrival. Inspectors should be available to inspect imports whenever the need arises. However, inspectors' normal working patterns follow typical working hours from Monday to Friday. Consignments may therefore arrive at ports of entry late at night or at weekends and leave again before inspectors have had a chance to inspect them. The inspectors at Heathrow Airport told us that they were planning to pilot a rota of inspections involving early and late shifts.

Few inspections detect pests and diseases

3.23 Using the Department's reported data, we compared the number of inspections carried out in 2001-02 and 2002-03 with the number of detections. **Figure 13** shows that few pests and diseases were detected in either year compared with the number of inspections carried out. In both years, the aggregate detection rate was only a little over 2 per cent. Of the some 64,000 inspections carried out in 2002-03, for example, only 1,400 detected a pest or disease.

13 Number of reported inspections and detections, 2001-02 and 2002-03

In the last two years, the number of detections of pests and diseases has been very low compared with the number of inspections carried out.

Objects of inspection	2001-02		2002-03	
	Number of inspections	Number of detections	Number of inspections	Number of detections
The premises of growers seeking to move plants and planting material within the country or elsewhere in the European Union	986[1]	2 (0.2 per cent)	986[1]	16 (1.6 per cent)
Plants and plant produce being exported to non-European union countries				
■ excluding grain	9,456	Not known2	9,229	Not known2
■ grain	172	5 (2.9 per cent)	65	7 (10.8 per cent)
Plants, plant cuttings and tissue cultures imported from non-European Union countries	4,814	357 (7.4 per cent)	3,720	444 (11.9 per cent)
Plant produce imported from non-European Union countries	5,418	363 (6.7 per cent)	4,079	268 (6.6 per cent)
Plants, planting material and plant produce being moved within the country or being imported from, or exported to, other European Union countries	36,012	560 (1.6 per cent)	45,496	664 (1.5 per cent)
TOTAL	56,858	1,287 (2.3 per cent)	63,575	1,399 (2.2 per cent)

NOTES

1. See Note 1 to Figure 12.
2. The Department does not record the number of detections made by these inspections.
3. This Figure treats "number of detections" as "number of inspections that have detected a pest or disease". In practice, some inspections might detect more than one disease, so percentage detection rates might in reality be lower than the rates appearing in this Figure.

Source: National Audit Office summary of data provided by the Department

3.24 Within these aggregate figures, however, detection rates varied depending on the items being inspected. Four of the five highest detection rates, ranging from 6.6 per cent to 11.9 per cent, came from inspections of imports from non-European Union countries. In contrast, detection rates from inspections of the premises of growers in this country and of plants, planting material and plant produce being moved within and between this country and the European Union were 1.6 per cent at best. Other agencies that use inspections as part of their work similarly achieve varied detection rates. Trading Standards Officers, for example, achieve a detection rate of 5 per cent in their inspections for inaccurate weighing and measuring equipment,[11] while Fisheries Inspectors[12] achieve detection rates of 10 to 13 per cent in sea inspections and 2 to 4 per cent in landings of catches.

3.25 The paucity of detections could be attributable to the absence of pests and diseases within the general population of plants, planting material, plant produce and premises being inspected, or to poorly targeted inspections and/or poor quality inspections. The Department does not analyse detection rates or seek to assess why some inspections have such low rates of detection. It was therefore unable to explain whether low detection rates indicate good standards of plant health or the limits of its ability to detect pests and diseases. In addition, in the absence of data on the number of detections made through inspections of non-grain exports to countries outside the European Union, the effectiveness of these inspections could not be assessed.

11 *HC495 - Department of Trade and Industry: Regulation of Weights and Measures.*
12 *HC563 - Fisheries Enforcement in England.*

The Department needs to pay more attention to the quality of inspections

3.26 Inspectors can face practical problems where consignments that they wish to inspect are transported with other consignments in container crates, requiring them to arrange for the containers to be unloaded or for the inspectors themselves to get inside the containers. This can cause delay in releasing consignments from ports of entry, in an area where the perishable nature of the imports places pressure on inspectors for early release.

3.27 Inspectors carry out most inspections on their own. The inspector at Felixstowe - the country's busiest port and the second busiest in the European Union - is the only inspector permanently stationed at the port, although he does receive assistance from other inspectors at seasonal times of the year when particularly large volumes of imports arrive in port. Senior inspectors oversee the work of inspectors. However, the Department does not have a formal peer review system to provide assurance on the quality of the work carried out by inspectors.

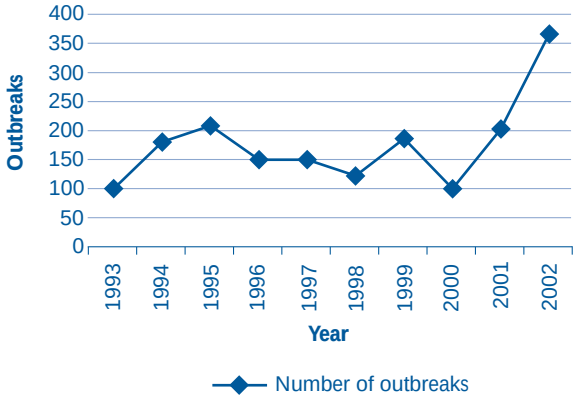
The country has a good record in preventing major outbreaks

3.28 **Figure 14** shows that the number of recorded outbreaks has fluctuated over the 8 year period 1993 to 2000, averaging 150 a year, but rose to more than 200 in 2001 and some 370 in 2002. The country, however, has a good record in containing and eradicating most outbreaks that have occurred. Only three pests and diseases of economic significance have become established in this country in recent years - Western Flower Thrips, *Rhizomania* and Mushroom Virus X.

3.29 A consultants' review commissioned by the Department and published in October 2000 concluded that farmers, growers, international organisations and trading partners held the Department's plant health work in high regard. Stakeholders we consulted and respondents to the Department's customer satisfaction surveys particularly valued plant health controls and were confident in their effectiveness in controlling and eradicating pests, facilitating exports and maintaining quality standards. It is difficult, however, to demonstrate the extent to which the country's good record is attributable to the Department's activities, as other factors might have had a part to play. For example, driven very much by consumer demands for high quality produce, the country's major supermarket chains place tough conditions on the produce they are prepared to accept. These standards act as a check on the import of pests and diseases into this country. Evidence from the Department's cereal surveys also shows that, aside from the use of fertiliser and pesticides, the weather has been the main factor affecting yields and the incidence of cereal pests and disease over the last decade.

14 Number of recorded outbreaks, 1993 to 2002

The number of recorded outbreaks has fluctuated over the 8 year period 1993 to 2000, averaging 150 a year, but rose to more than 200 in 2001 and some 370 in 2002.



Source: National Audit Office summary of the Department's recorded data

The Department has not, however, contained all outbreaks and needs to improve the way it assesses its performance

3.30 **Figure 15** shows the Department's reported performance in 2000-01 and 2001-02 against four key outcome measures and targets concerned with minimising the number and impact of outbreaks. Over the period, the number of outbreaks of key pests and diseases was halved, the number of outbreaks from imports fell from four to zero, and no exports were rejected by importing countries because of the presence of a pest or disease. In both years, however, the Department failed to contain a significant proportion of outbreaks on their original sites.

3.31 The 2000 economic evaluation of the country's plant health programme[13] provided an indication of the impact of outbreaks and the scale of the losses prevented by containment and eradication measures. It estimated that the costs of controlling Colorado Beetle would rise to between £1 million and £2 million a year if the pest became established, compared with some £37,000 under the current regime; likewise, the costs to taxpayers of controlling Tobacco Whitefly would rise from £254,000 to £2 million a year. The Department

13 *An economic evaluation of MAFF's Plant Health Programme, ADAS Consulting Ltd and the Imperial College London, commissioned by the former Ministry of Agriculture, Fisheries and Food.*

15 The Department's performance against four key outcome measures and targets concerned with controlling outbreaks of plant pests and diseases, 2000-01 and 2001-02

In 2000-01 and 2001-02, the Department's reported performance improved against four key outcome measures and targets concerned with minimising the number and impact of outbreaks.

Outcome measure and target	Reported performance	
	2001-02	2000-01
1. **Minimise outbreaks of serious plant pests and diseases** No increase in the number of outbreaks of 5 key pests and diseases[1] compared with previous year	35 outbreaks: **target met**	74 outbreaks, compared with 97 in 1999-00: **target met**
2. **Prevent the introduction of pests and diseases from third countries** No outbreaks attributable to imports	No outbreaks attributed to imports: **target met**	4 outbreaks attributed to imports: **target not met**
3. **Eradicate or contain outbreaks where they occur** No spread of pests or diseases from site of any outbreaks	21 (60 per cent of) outbreaks not contained at original sites, although all were eradicated within one growing season: **target not met**	32 (43 per cent of) outbreaks not contained at original sites, although all were eradicated within one growing season: **target not met**
4. **Facilitate exports of plants and plant products** No rejections of, or complaints about, exports by importing countries[2]	2 rejections: **target substantially met**	1 rejection: **target substantially met**

NOTES

1. Colorado Beetle, *Bemisia tabaci, Liriomyza huidobrensis*, Potato Brown Rot and *Thrips palmi*.
2. Countries receiving plants and plant produce from this country may require the Department to certify that the products have been inspected and are pest-free. None of the 3 rejections in 2000-01 or 2001-02 was due to the presence of a pest or disease.

Source: Department for Environment, Food and Rural Affairs

now requires a 'lessons learnt' review to be carried out after all major outbreaks, to assess how well the outbreaks were handled and whether control measures were successful and to make recommendations for future action where necessary. Neither the Department's outcome measures nor its 'lessons learnt' reviews, however, routinely record the impact that key outbreaks have had on yields and farmers' finances, or the costs incurred in containing and eradicating the outbreaks. Nor does the Department record the level of farmers' and growers' losses prevented through dealing with outbreaks, thereby understating the impact of the Department's work.

3.32 We examined the Department's documentation on seven outbreaks over the period 1986 to 2002 (Appendix 2) and noted that:

- In four of the seven cases, the outbreaks had been caused by imported plant cuttings or infected soil on imported produce. In one of these cases, timely inspection at the grower's premises resulted in the outbreak being eradicated and prevented from spreading. In the other three cases, however, detection came too late to prevent spread.
- In the other three cases - involving *Thrips palmi*, Mushroom Virus X and Sudden Oak Death - the sources of the outbreaks are unknown.
- Carefully targeted control measures can contain and eradicate serious pests, whilst at the same time minimise the impact on growers' income and increase growers' chances of staying in business.
- Timely and accurate identification of pests and diseases is essential to prevent the spread of pests and diseases.
- Eradication can be difficult as a pest or disease can establish itself quickly causing real damage to growers' livelihoods. Prevention is therefore better than cure.

Appendix 1 Study Methodology

Examination at the Department

We interviewed staff at the Department's inspectorate headquarters in York and inspectors in eight offices around the country:

Beverley	Exeter
Cambridge	Felixstowe
Chichester	Heathrow
Crewe	Worcester

We ascertained how inspectors planned their work, and also accompanied them to observe inspections. At Cambridge, Chichester, Crewe, Heathrow and Felixstowe we examined whether there was an audit trail evidencing the inspections carried out. At the Headquarters in York, we examined the management information system and the Department's Intranet to assess information available to inspectors. We interviewed key staff in the Department's agricultural and horticultural commodity divisions and examined a sample of 10 research projects.

Consultation with stakeholders

We consulted a wide range of private and public sector organisations with an interest in plant health to obtain their views on the Department's performance in maintaining the country's plant health status. We also opened a website that was available for interested parties to make a contribution to our study. We consulted or visited:

Horticultural bodies

- Horticultural Trades Association
- British Bedding and Pot Plants Association
- Donaldson's of Chichester
- National Farmers Union - Horticulture
- Horticultural Development Council

Agricultural bodies

- Agricultural Supply Trade Association
- British Potato Council
- Home Grown Cereals Authority
- ADAS Consulting Ltd

Scientific/research bodies

- Horticulture Research International
- Biotechnology and Biological Sciences Research Council
- Wye College
- Dr Mike Shaw, Agro-Botany Department, University of Reading
- Natural Resources Institute
- Forestry Commission
- Centre for Applied Biology International
- National Institute Agricultural Botany

Other bodies

- Francis Bassom (Surrey University)
- HM Customs and Excise
- Forestry Commission

International comparisons

Using the Internet, we reviewed information about plant health regimes in the USA, Australia and New Zealand. We also took account of a report published by the New Zealand Audit Office in November 2002 into that country's handling of risks to plant and animal health from invasive species.

Expert opinion

We invited an expert panel to review our findings, conclusions and recommendations:

- Professor Christopher Gilligan (University of Cambridge, Department of Plant Sciences).
- Professor Lorna Castleton (University of Oxford, Department of Plant Sciences).
- Professor Jim Marks (Applied Plant Sciences Division, Agriculture and Food Science Centre, Department of Agriculture and Rural Development, Northern Ireland).
- Professor Graham Jellis (Director of Research and Development, Home Grown Cereals Authority).
- Dr Stephen Hunter (Department for Environment, Food and Rural Affairs, Plant Health Division).

Appendix 2

National Audit Office reviews of seven outbreaks of plant pests and diseases involving the Department, 1986 to 2002

CASE 1

Outbreak of *Thrips palmi* in southern England, April 2000

What is Thrips palmi and why is it a concern?

Thrips palmi is an insect that originates from South East Asia. In Europe, given its weather conditions, this insect can only affect crops grown under glass. It can cause considerable damage to a wide range of glasshouse ornamental and vegetable crops, particularly cucumber, aubergine and sweet pepper. It can also transmit viruses, some of which are not currently present in Europe.

Thrips palmi are extremely small and to the naked eye impossible to distinguish from other types of Thrips that do not pose such a threat to glasshouse crops, making detection and diagnosis difficult.

What was the nature of the outbreak?

During a routine inspection of chrysanthemums in a glasshouse near Chichester in April 2000, the Department found that some of the plants were infested with Thrips palmi. It is likely that the pests had been in the glasshouse for some time. In the autumn of 1999, the grower had observed that the Thrips on his plants were resistant to the usual insecticides. He had attempted to agree a price for the Central Science Laboratory to carry out resistance testing, but had not done so. The Laboratory therefore did not carry out the testing, which would have identified the Thrips earlier.

This was the first outbreak of the pest in the European Union. The Department concluded that, if the outbreak was not eradicated, it would be only a matter of time before the pest became widespread in glasshouses in this country. The consequences of the outbreak spreading to other growers could have been serious for the horticultural industry, which operates on very tight profit margins.

What action was taken?

The Department initiated an eradication programme, involving restrictions on movements of the growers' produce and special licences for the use of pesticides not usually used in this country. The Department also designed a new spray nozzle to ensure chemicals reached the whole of the plant. Inspectors made 116 visits to the grower's premises and also visited 110 neighbouring nurseries within a 5 kilometre radius, up to four times each, to monitor any spread of the pest or the viruses that it can transmit.

What was the outcome?

The pest was fully eradicated on the original site in July 2001, 16 months after the outbreak. The pest was successfully contained and did not spread to other growers. The outbreak cost the grower £100,000 but it would have been several million pounds if the grower had had to close down his entire production. The main pesticides used to combat the pest are no longer available, because they are not permitted to be used in the European Union. Any future outbreak might therefore be more difficult to contain and eradicate.

CASE 2

Outbreak of the South American Leaf Miner, May 1999

What is the South American Leaf Miner and why is it a concern?

The South American Leaf Miner - *Liriomyza huidobrensis* - is a small fly that lays eggs inside the leaves of a wide range of high value horticultural crops. When the eggs of the fly hatch, the larvae tunnel within the leaves, damaging and disfiguring them. As well as reducing the quality of the plants, the pest reduces the plants' capability for photosynthesis. Outbreaks have occurred in this country in the past. Severe infestations can lead to total crop loss. Control of the pest on edible crops is particularly difficult due to the limited availability of effective treatments and the potential for a rapid increase in the pest population.

An adult South American Leaf Miner - Liriomyza huidobrensis.

What was the nature of the outbreak?

The Department has dealt with many outbreaks of the pest over recent years - there were 32 outbreaks in 2000-01 and a further 14 in 2001-02. We looked at the handling of an outbreak that occurred in May 1999, when the Department detected the presence of the fly during a routine inspection of imported cuttings in a 2.65 hectare glasshouse in Chichester. The grower had used cuttings imported from Kenya, Brazil and the Canary Islands to produce chrysanthemums for the supermarket trade.

What action was taken?

The Department advised the grower to target the specific bays in his glasshouse that were affected by the pest and to treat the plants with appropriate insecticides. The grower told us that he was pleased with the way in which the Department had helped him to eradicate the pest.

What was the outcome?

The pest was fully eradicated in November 2000, 18 months after the outbreak. During that period, however, the grower was able to continue selling his flowers, after being treated, to the supermarket trade. The outbreak could have been very damaging for the grower and could, if it had been left uncontrolled, have forced the closure of his business, which was worth around £3 million a year.

CASE 3

Outbreak of Western Flower Thrips, 1986

What is Western Flower Thrips and why is it a concern?

Western Flower Thrips - *Frankliniella occidentalis* - is an insect originating in North America, where it affects more than 240 species of plants. It damages plants grown in glasshouses, by feeding, laying eggs and transmitting viruses from plant to plant.

An adult Western Flower Thrips - Frankliniella occidentalis - so small it is impossible to identify with the naked eye.

What was the nature of the outbreak?

The Department first detected the pest in 1986, and this outbreak was eradicated by early 1989 after a very expensive and disruptive campaign. It found the pest again in October 1986, at a nursery using imported chrysanthemum cuttings. The pest had, however, already been distributed widely to the nursery's many customers. By June 1989, there were 352 known infected sites, with 68 types of plants affected.

What action was taken?

The Department initially tried to visit all of the nurseries that had received potentially infected material. However, it soon recognised that this was impracticable and therefore sought to limit the spread by visiting a sample of suspected sites.

What was the outcome?

The Department decided to abandon any attempt to contain the spread of the pest. Eradication measures had caused considerable expense for growers. Western Flower Thrips is now the major pest problem on ornamental plants in this country.

CASE 4

Outbreak of Rhizomania, 1992

What is Rhizomania and why is it a concern?

Rhizomania is a soil borne disease that can cause large reductions in yields of sugar beet crops. It is spread by a fungus that can survive in soil for over 30 years. The disease was first detected in southern Europe in the 1950s, and spread to the Netherlands and France.

Sugar beet infected with Rhizomania, showing the tangled bearded roots that reduce crop yields.

What was the nature of the outbreak?

The first outbreak of *Rhizomania* in this country took place at a sugar beet farm in Bury St Edmunds, Suffolk in 1987. The most likely source was soil on imported produce; just a few grams of soil are enough to spread the disease. There were two further outbreaks in 1989 in Norfolk. The Department used aerial photography, checks on processed crops and field inspections, and imposed strict controls on what crops could be grown on affected farms, to contain the disease. In 1992, however, a further 13 outbreaks were detected.

What action was taken?

In 1992, the United Kingdom was designated as a Protected Zone for *Rhizomania* under EC plant health directives, allowing it to continue to maintain strict controls on the import of material that might transmit the infection from the European Union and third countries where the disease was established.

The Department's overriding policy aim was to contain the disease and stop it spreading. It did not, however, estimate how long it would need to impose containment measures or make it clear to the industry that a range of sugar beet varieties tolerant to the disease needed to be developed.

The Department continued to carry out annual surveys to determine the extent of the disease, by visual inspection from the ground and the air. Although the number of outbreaks fluctuated from year to year, there was a consistent upward trend and in 2001, 68 outbreaks were detected, affecting 211 farms, almost all in Norfolk or Suffolk. The disease was therefore established in this country. Research showed that it could take 6 to 9 years for infection to cause obvious visual symptoms in beet crops, so further outbreaks could be expected.

What was the outcome?

The United Kingdom's status as a Protected Zone for *Rhizomania* was due for review in March 2002 and the European Commission did not support the Department's application for such status to continue. With the loss of protected zone status, the relevant import controls and cropping restrictions were lifted. The Department is no longer surveying for *Rhizomania*, although it continues to advise growers to restrict the spread of soil and has handed over responsibility for the control of the disease to the industry.

CASE 5

Outbreaks of Potato Brown Rot, 1992 to date

What is Potato Brown Rot and why is it a concern?

Potato Brown Rot is a disease caused by a bacterium (*Ralstonia solanacearum*) that can seriously damage potato production. The bacterium is found in watercourses and its main host is Woody Nightshade (*Solanum dulcamara*), a member of the same plant family as the potato. Irrigation of potato crops from such watercourses is responsible for spreading the disease. If the disease became established in the United Kingdom, it could lead to a ban on exports of potatoes, a trade worth £27 million to growers.

Potatoes infected with Brown Rot showing the characteristic pattern and colour of the disease.

What was the nature of the outbreak?

There have been five confirmed outbreaks of Potato Brown Rot in this country - two in the Thames Valley (in 1992 and 1995), two in Northamptonshire in 1999 and one in Kent in 2000. The bacterium also caused two outbreaks of the disease in tomato crops in Bedfordshire in 1997 and 1998. During the first outbreak, the Department found that Woody Nightshade was growing on the banks of the River Thames and that the source of the infection was river water used to irrigate potato crops.

To survive high (summer) temperatures, the brown rot bacterium needs a high level of bacteria in a low level of water. The Department believes that the source of the disease in this country was the 1976 drought when a lot of potatoes were imported from countries such as India and Pakistan that are not normally allowed to import potatoes into this country. Potato washings and peel entered the sewerage system and then into rivers at a time when river levels were low and temperatures high.

What action was taken?

Since the first outbreak in 1992, the Department has been taking measures to eradicate the disease. It has carried out surveys to detect the spread of the bacterium in watercourses throughout England and has prohibited the irrigation of crops from infected watercourses. The Department, with the assistance of the Environment Agency, has been working to eradicate the woody nightshade plants from sensitive locations.

What was the outcome?

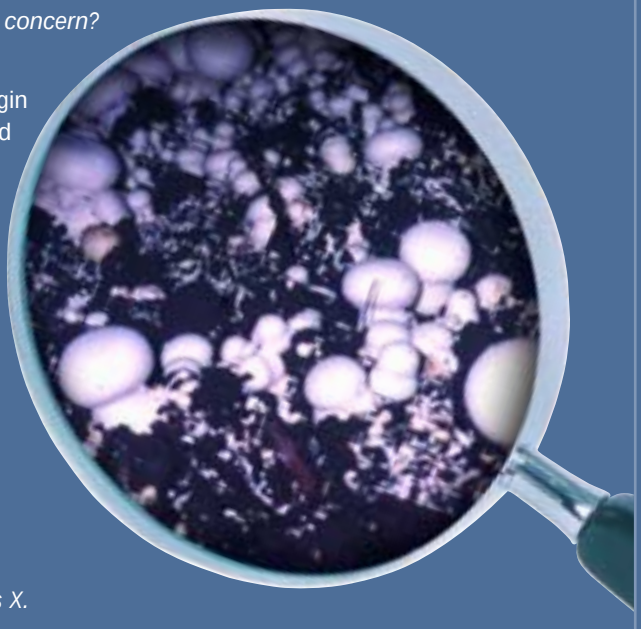
The Department believes that the bacterium can be eradicated, provided that infected areas are kept clear of host plants for at least two years. Water logging is a factor with this disease and the Department believes that potatoes succumb to the disease when they become waterlogged. Flooding of farmers' fields during the past two winters therefore makes eradication difficult. The Department has not yet eradicated the disease.

CASE 6

Outbreak of Mushroom Virus X, 1998

What is Mushroom Virus X and why is it a concern?

Mushroom Virus X is a virus of unknown origin that affects commercial mushroom crops and can reduce yields by 40 per cent or more. The virus is called Mushroom Virus X because of its unknown origin.



Mushrooms deformed by Mushroom Virus X.

What was the nature of the outbreak?

In 1998, the mushroom industry detected a disease that it believed was caused by the re-emergence of a virus not seen for 30 years. When analysed more closely, the disease was found to have been caused by a new complex of at least two viruses and possibly by a combination of as many as four viruses.

What action was taken?

The Horticultural Development Council, the industry's Levy Board, quickly commissioned a three-year research project into the disease and, in 2001, the Department established a monitoring and research regime for the disease. Hygienic growing conditions appear to be key in preventing and controlling this disease. Mushroom growers send suspect samples for diagnosis and, if the disease is found, the grower is instructed to cease cropping and sterilise the growing area. Workers in the mushroom farms are also advised on how they should control their movements in order to minimise the risk of spreading the infection.

What was the outcome?

Mushroom Virus X is now endemic in this country. It has affected around 80 per cent of commercial mushroom growers and losses to the industry have amounted to £50 million, resulting in farm closures and the loss of nearly 800 jobs.

CASE 7

Outbreak of Sudden Oak Death

What is Sudden Oak Death and why is it a concern?

Sudden Oak Death *(Phytophthora ramorum)* is a fungus that is causing the sudden death of oak trees and damage to other species in the United States of America. The fungus has reached epidemic proportions along the coast of California and poses a potential threat to trees, woodland and heathland in England and Wales.

What was the nature of the outbreak?

The fungus has been found at over 280 sites in England and Wales, although none has been found on oaks or other established trees. The fungus has caused twigs and leaves to die back on rhododendron and viburnum and has been found on other species, such as yew. The susceptibility of European trees has not yet been fully determined, but preliminary results suggest that European oak species might be more resistant than some American ones. As knowledge of the fungus has only recently been described, knowledge of the disease is limited. Initial work suggests that the disease might be spread locally by rain water or irrigation channels, while its spread over longer distances might be caused by the movement of contaminated plant material, such as diseased wood, and soil.

What action was taken?

The government introduced emergency legislation against the threat in May 2002. This was replaced by European Union-wide emergency legislation in November 2002, designating *Phytophthora ramorum* as a notifiable disease (see paragraph 2.3). The Department's officials have visited the USA and have also been carrying out an extensive survey in England and Wales to check for the presence of the pathogen that causes the disease. Eradication action is being taken as a precautionary measure wherever the pathogen is found. The Department, the Forestry Commission and the Horticultural Development Council have commissioned joint research to investigate the disease and potential ways of managing it.

What was the outcome?

Work is on-going. More data are expected to be available by the end of 2003 to help assess the risks posed by the disease and the measures required to contain and eradicate it, where necessary.