Towards sustainable agricultural waste management

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Statement of use
The implementation of the EC Framework Directive on Waste will extend existing waste management controls to agricultural waste. To achieve sustainable waste management, significant changes will need to take place in the management of a range of non-natural waste streams. This report has been commissioned to inform the development of a future UK strategy and is of interest to a wide audience including the farming industry, regulators, NGOs and the waste management industry.

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Executive summary

The planned extension of waste management controls to agricultural waste (required under the *EC Framework Directive on Waste*) has focused attention on the range of non-natural waste materials arising on farms and the need for significant change to achieve sustainable waste management. To help facilitate the development of an effective strategy, this report presents information on:

- the current situation (scale and structure of the agricultural industry, types and quantities of wastes, and current practices);
- drivers for change (the proposed legal controls and other drivers);
- waste management options and barriers;
- the experience in other EU Member States;
- recommendations for a UK strategy.

It is based on extensive consultation and literature review conducted between October 1999 and November 2000.

The main focus is on the non-natural waste streams that are likely to be included in the definition of controlled waste. Most natural (organic) materials such as slurry and manure should not fall within this definition when used for agricultural benefit. However, the effective management of these materials, together with the increasing amount of organic waste imported onto farms from other sectors, is too important to ignore. A brief overview of key issues and recommendations concerning the management of organic materials is therefore provided in a separate annex of the report.

Current situation

The UK agricultural industry is diverse and changing rapidly amid ongoing economic difficulties (caused by a combination of factors including the strength of the pound, weak world markets, the BSE crisis and, more recently, the foot-and-mouth epidemic). Statistics for 1999 show that there are roughly 240,000 agricultural holdings in the UK (from small, remote hill farms in Wales to large arable enterprises in the east of England).

The industry produces a range of non-natural wastes including, for example, packaging, plastic films, animal health products, machinery and building waste. The total quantity is estimated to be in the order of 0.5 million tonnes per year. However, it should be noted that there is still limited reliable data available for many waste streams, and the quantity of waste currently stockpiled on farms is unknown.

Current practices for managing these wastes include on-farm burning, burial and stockpiling, and inclusion in the household waste collection. These practices reflect the long-term exclusion of agricultural waste from the controlled waste regime. Nevertheless, off-farm waste recovery has increased in recent years. For example, take-back of waste by machinery engineers and vets has become relatively common. Subsidised schemes for the recovery of silage plastics are operating in Wales, Scotland

and Cumbria (transporting waste to British Polythene Industries' reprocessing plant in Dumfries, Scotland). However, since the national scheme operated by the Farm Film Producers Group ceased in 1997, many farmers have been stockpiling plastics.

Drivers for change

The proposed extension of controls to agricultural waste will be the most immediate driver for change in practices (since many of the current practices, such as on-farm burial, will no longer be viable). Other drivers, however, are growing fast for example, farmers are facing increasing demands from retailers, and input manufacturers and distributors are facing growing producer responsibility obligations.

Options and barriers

Following a methodical assessment of the options for each waste stream, the overall conclusion is that a mixture of on- and off-farm waste management options will be needed in the short-term. The strengths and limitations of each option are summarised in the report.

Critically, a number of potential barriers to the options at the higher end of the waste hierarchy (that is reduction and recovery) exist. These include:

- low farmer awareness and motivation;
- limited cost-effective techniques for on-farm waste recovery;
- high logistics costs for off-farm recovery;
- poor markets, high reprocessing costs and limited facilities.

Experience in other EU Member States

A brief review of practices in other Member States has highlighted the difficulty in implementing the *Framework Directive on Waste* in agriculture. Widespread change in practices has only occurred in Member States where convenient and cost-effective waste transfer routes have been made available to farmers. These include national schemes for the recovery of waste pesticide packaging and silage film, and the use of municipal waste collection facilities. The different approaches and lessons learned are summarised in the report.

Recommended strategy for the UK

The overall conclusion is that concerted effort is needed to achieve sustainable waste management in the UK agricultural sector. A summary of the Project Team's recommendations for a strategy is provided below.

Leadership and vision

1. The Government should facilitate the development of a national agricultural waste strategy. This should include a vision of an integrated, sustainable system based on stakeholder partnership and applicable to all sizes and types of farms throughout the UK.

Underlying principles

2. ***Stakeholder partnership:*** a National Stakeholder Forum should be established to stimulate the formation of a strong stakeholder partnership and develop practical and effective action plans. The long-term role (if any) of the Forum should be reviewed at a later date.

3. ***Integration of related strategies:*** The various Government departments and agencies dealing with strategies for waste management, agriculture and rural development should co-ordinate their efforts to identify (i) common objectives and (ii) the best means to facilitate progress.

4. ***Emphasis on waste reduction:*** continuous efforts should be made to identify and encourage opportunities to reduce waste through improved product design and farming practices.

5. ***Practical, cost-effective arrangements for waste collection:*** further research should be conducted to determine the feasibility of combining: (i) use of local authority waste collection facilities, (ii) large-scale scheme(s) for plastic packaging and film recovery, and (iii) direct take-back by suppliers of certain wastes. One-off schemes for the recovery of stockpiled materials (such as scrap metal, tyres and asbestos) are also recommended.

6. ***Agreed role of on-farm management options:*** a code of practice covering on-farm options for waste management should be established (recognising the time needed to establish waste collection infrastructure), and further R&D should be conducted.

7. ***Co-ordinated R&D:*** R&D should be co-ordinated to improve information on waste arisings and management options, and help overcome barriers such as high logistics costs and poor markets for secondary materials.

8. ***Effective communication:*** a comprehensive communication strategy should be developed by the proposed National Stakeholder Forum (to raise awareness and motivate all stakeholders).

Action planning and implementation

9. The proposed National Stakeholder Forum should develop detailed short- and long-term action plans. Consideration should be given to the diversity of farms in the UK and the time needed to develop infrastructure and change attitudes.

10. Implementation of the practical arrangements for agricultural waste management should be conducted at regional level to take account of local differences. Agricultural waste management should be integrated into existing decision-making frameworks, for example the waste planning system and regional strategies.

Monitoring progress

11. In the short-term, the proposed National Stakeholder Forum should monitor progress. In the longer-term, key performance indicators for agricultural waste management should be integrated into the systems developed by Government departments and agencies to monitor various aspects of sustainable development.

1. Introduction

1.1 Context

Until recently, most research and information concerning agricultural waste has centred on the organic materials arising on farms, particularly manure and slurry. Attention to non-natural waste materials such as packaging, tyres and oil has been limited. This situation has now changed. The Government's plans to extend waste management controls to agricultural waste (summarised in Box 1) have focused attention on:

- the significant change needed to achieve sustainable management of the non-natural waste streams (bearing in mind the likely future restrictions on the disposal of waste on farms, their wide geographical distribution and the limited infrastructure for collection);
- the fact that the main organic materials produced on farms (for example, manure and slurry) do not fall within the definition of waste if used for agricultural benefit.

In view of this, the principal subject of this report is the management of non-natural agricultural waste. However, the effective management of the organic materials, together with the increasing amount of organic waste imported onto farms from other sectors, is too important to ignore (given the quantity and nature of these materials, and the fact that controlled waste legislation is likely to apply when they are not used for agricultural benefit). A brief overview of key issues and recommendations concerning the management of organic materials is therefore provided in a separate annex of this report.

Box 1 - Extension of legal controls to agricultural waste

To implement the *EC Framework Directive on Waste*, the Government intends to extend existing waste management controls to waste from agriculture and from mines and quarries. A consultation paper is due to be issued in 2001.

The main controls include a waste management licensing system, a legal duty of care and a registration system for businesses transporting waste. Additional controls exist for hazardous waste (defined as 'special waste' in UK legislation).

In brief, the extension of these controls to agricultural waste is likely to mean that waste disposal on farms will no longer be possible without a waste management licence or exemption. (*Note*: exemptions generally apply to waste recovery operations, such as composting and energy recovery). Since the costs associated with applying for and holding a licence are very high, the only viable option for many waste streams will be to transfer the waste to a contractor for disposal or recovery at a licensed facility (as is the practice in other industries).

The controls will not apply to natural (organic) materials arising on farms when used for agricultural benefit. In addition, sheep dip disposed to land under a Groundwater Authorisation and burial of animal carcasses are likely to be excluded since they are controlled under the *Groundwater Regulations 1998* and the *Animal By-products Order 1999* respectively.

The subject of agricultural waste management brings together a number of complex issues - namely waste management, agriculture and rural development all of which are currently under review in the UK. This report should therefore be considered in the context of:

- the evolving strategies associated with each of these issues for example, in England: *Waste Strategy 2000*, *A New Direction for Agriculture* and the *Rural White Paper* (see Box 2);
- recent reviews and inquiries such as the Better Regulation Task Force review of Environmental Regulations and Farmers (reported in November 2000), and the House of Commons Select Committee inquiry into Delivering Sustainable Waste Management (reported in March 2001);
- ongoing discussion and debate on these issues, for example on the future of agriculture and rural communities (heightened recently amid the foot-and-mouth epidemic in 2001).

Box 2 - Related strategies and plans

Waste Strategy 2000
Published in May 2000, *Waste Strategy 2000* describes the Government's vision for waste and resource management. It has two key objectives: (1) to tackle the amount of waste produced by breaking the link between economic growth and waste production, and (2) to put waste that is produced to good use through substantial increases in re-use, recycling, composting and energy recovery. Similar strategies have been developed in Scotland, Northern Ireland and Wales.

A New Direction for Agriculture
The Government set out its long-term strategy for the future development of agriculture in *A New Direction for Agriculture* published in December 1999. This presents a vision of an industry that is: (1) competitive, diverse and flexible, (2) responsive to consumer wishes, (3) environmentally responsible, and (4) an integral part of the rural and wider economy. The Prime Minister launched the *Action Plan for Farming* in March 2000 and an industry forum was formed including representatives of the farming and food industries and Government departments.

Rural Development Plan
The England Rural Development Plan is the Government's plan to implement the *EC Rural Development Regulation* (1999). Over seven years £1.6 billion has been allocated to be spent on a range of schemes to protect and improve the countryside and encourage sustainable enterprise.

Rural White Paper (Our Countryside: The Future – A Fair Deal for Rural England)
Published in November 2000, the *Rural White Paper* sets out the Government's vision for rural England. Its preparation was led jointly by the DETR and MAFF, and also involved other Government departments and agencies.

Regional strategies
The Regional Development Agencies (RDAs) in England have developed strategies for sustainable development in their regions. In the South West of England, *New Directions for South West Farming* was launched by the NFU in mid-2000.

Moreover, it is important to recognise that although the legal changes have direct implications for farmers (as the waste producers), there are a number of other parties who have an interest and a role to play in agricultural waste management, for example input suppliers, waste management companies, central and local government, and Government agencies. These 'stakeholders' are shown in Figure 1 below.

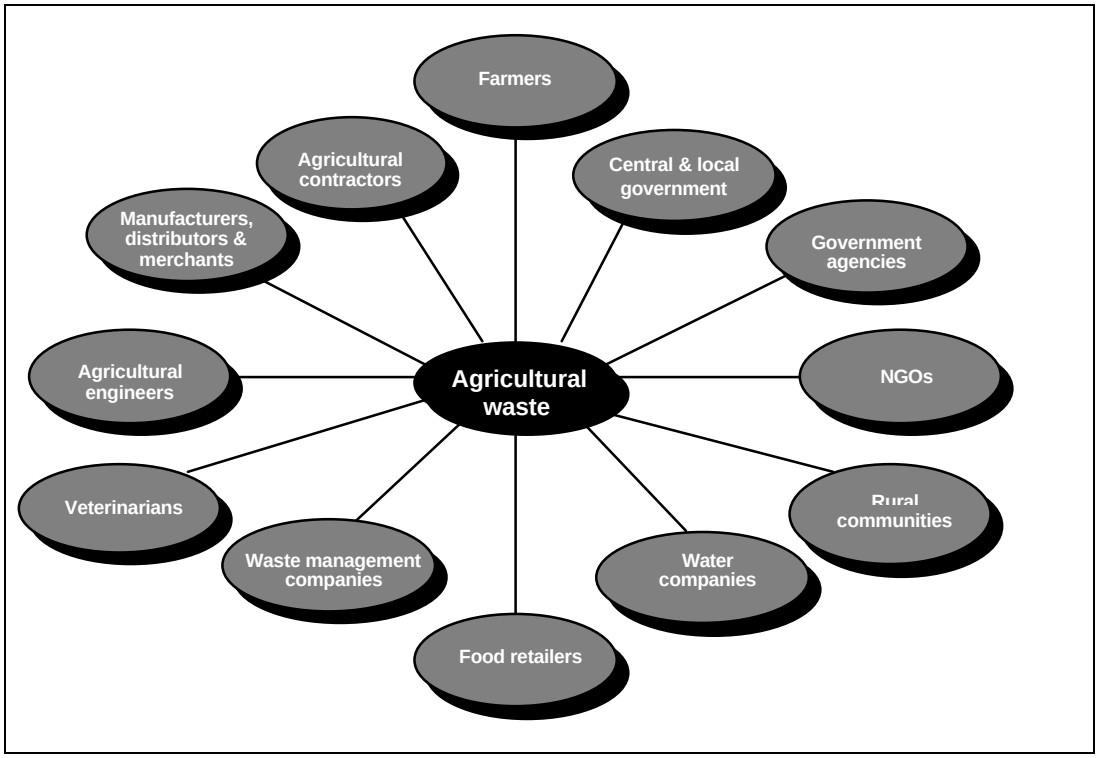


Figure 1 - Stakeholders in the management of agricultural waste

1.2 Aim and objectives

The aim of this project is to facilitate the development of an effective strategy for sustainable agricultural waste management in the UK. The specific objectives are to:

- collate information on agricultural waste arisings and current practices;
- identify and assess the options for managing agricultural waste;
- review experience in other selected EU Member States;
- recommend a strategy for the UK.

1.3 Scope

As noted in Section 1.1, the main focus of research has been on those non-natural waste streams that are likely to be included in the definition of controlled waste, although a limited review of the management of organic by-products and animal carcasses has been conducted. Other related and important issues, such as the increase in commercial waste on farms (from diversified activities) and the growing incidence of fly-tipping, have been considered but have not been included in this report.

The research has centred on England (to which most references in this report relate) but the issues covered generally also apply to Wales, Scotland and Northern Ireland, and data on waste arisings is included for all regions of the UK. As will be discussed in Section 6, a UK framework for an agricultural waste strategy is recommended.

1.4 Approach

The research approach has been based on (1) understanding the issues associated with agricultural waste management, (2) identifying and assessing the management options, and (3) recommending a strategy. Key aspects of the approach included:

- consultation with more than 100 organisations and individuals in the UK, approximately 60 organisations in other EU Member States (see note below) and several pan-European organisations (see Appendix A for list of consultees);
- an extensive literature review;
- visits to farms and associated suppliers in the south west and east of England (two regions with different types and scales of agricultural activity) to gather detailed information on waste arisings and current practices, and obtain practical comments and opinions on future waste management options;
- two focus group meetings in the south west and east of England, including a mix of farmers, suppliers, waste contractors and other local stakeholders (see Appendix B).

The project commenced in October 1999. An interim report was produced in March 2000, and a draft final report was issued in November 2000.

The Project Steering Group formed at the start of the project (see 'Acknowledgements' for a list of members) has played a key role in guiding and evaluating the work. The Group has met periodically to review progress and discuss the project findings and recommendations. It should be noted, however, that this report represents the Project Team's views following examination of the information and opinions obtained; it is not intended to convey the specific views of Steering Group members or the organisations they represent.

Note:
Consultation with representatives of other EU Member States was initially limited to Germany, France, the Netherlands, the Republic of Ireland and Sweden. In January 2001 the Environment Agency provided additional funding to enable consultation with several national-level organisations in all 14 Member States.

2. Current situation

To understand the need for a strategy to achieve sustainable agricultural waste management and the size of the challenge, it is important to consider:

- the special characteristics of the UK agricultural industry;
- the sources, types and quantities of non-natural wastes;
- current practices.

2.1 The UK agricultural industry

There are approximately 240,000 agricultural holdings in the UK, and the industry as a whole contributes approximately 0.5 per cent to the GDP (based on 1999 figures). Figure 2 shows the range of farming activities and the size of holdings. However, these statistics do little to convey:

- the diversity and geographical distribution of agricultural holdings throughout the UK from small, remote hill farms in Wales, and crofts in Scotland, to large arable enterprises in the east of England;
- the importance of farming to the rural environment and economy, and the overall complexity of its role; and
- the economic pressures on many farmers, and the considerable changes occurring in the industry (see Box 3).

Box 3 - Pressures and changes in agriculture

The UK agricultural industry has been experiencing difficult times in recent years. A report published in 2000 by accountants Deloitte & Touche showed that national farm incomes fell by 90 per cent between 1995 and 2000 due to a combination of: (1) the strength of the pound, (2) weak world markets, (3) BSE and other crises, and (4) the increase in the cost of some inputs. Since then, the foot-and-mouth epidemic has substantially increased the economic difficulties for many farmers.

The combination of all of these pressures has resulted in progressive and ongoing changes in the industry for example, a general shift toward fewer but larger farms, increasing diversification and increasing use of contracting services. Further change is expected amid: (1) increasing competition in agricultural markets (as a result of Common Agricultural Policy(CAP) reform, the forthcoming World Trade Organisation negotiation, and enlargement of the EU); (2) reduction in subsidies and gradual transfer from production-linked payments to environmental protection measures; and (3) changes in market demands (with consumers becoming more concerned about various aspects of food quality). Moreover, for some farmers, the foot-and-mouth epidemic has forced rapid and substantial change. Its overall impact on the pace of change in the industry remains to be seen.

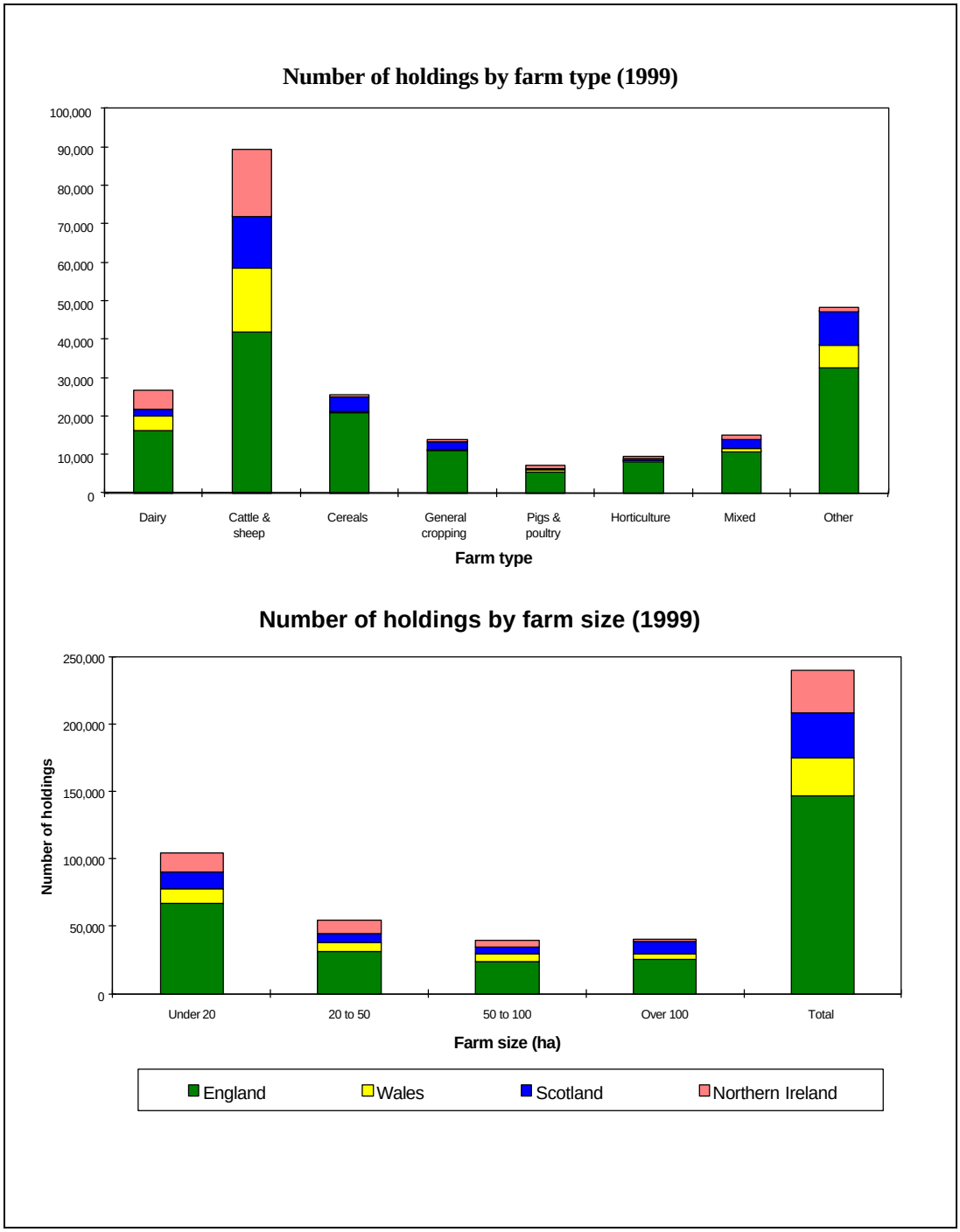


Figure 2 - Number of agricultural holdings by farm type and size in the UK

2.2 Waste streams

The agricultural industry produces a range of non-natural wastes. Figure 3 below shows the main sources and types of waste arising. As indicated, the majority of these wastes are associated with the inputs to farming such as agrochemicals, seeds, animal health products and machinery. Other waste streams arising on some farms, for example from diversified activities such as tourism, are also likely to be significant and growing in scale, but are not covered in this report.

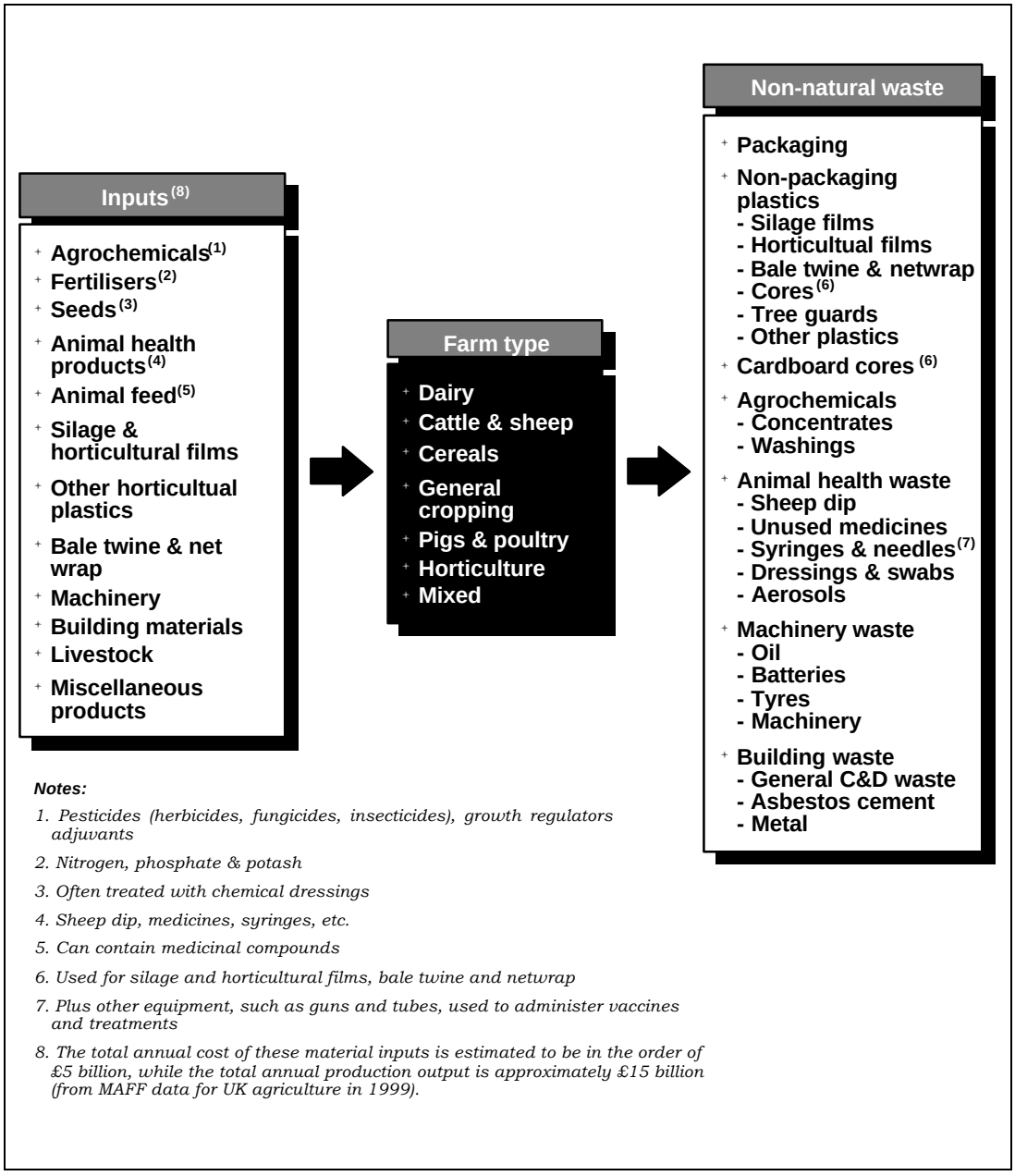


Figure 3 - Sources and types of non-natural agricultural waste

The total quantity of non-natural agricultural waste arising each year in the UK is estimated to be in the order of 0.5 million tonnes (note that reliable data has been scarce for many waste streams, and this estimate does not include waste that has been stockpiled over a number of years). Figure 4 gives an indication of the scale of some of the main waste streams. This highlights the differences in the quantities of the various wastes produced in England, Wales, Scotland and Northern Ireland (due to the different types and scales of farming in each country). Figure 5 on the following page further illustrates the regional variations by comparing the quantities of selected waste arisings in the different regions of England. On a farm-by-farm basis, the types and quantities of waste depend on the enterprise mix and farming practices (the latter varying according to the size of farm, geographical location, and whether the farm is organic or conventional).

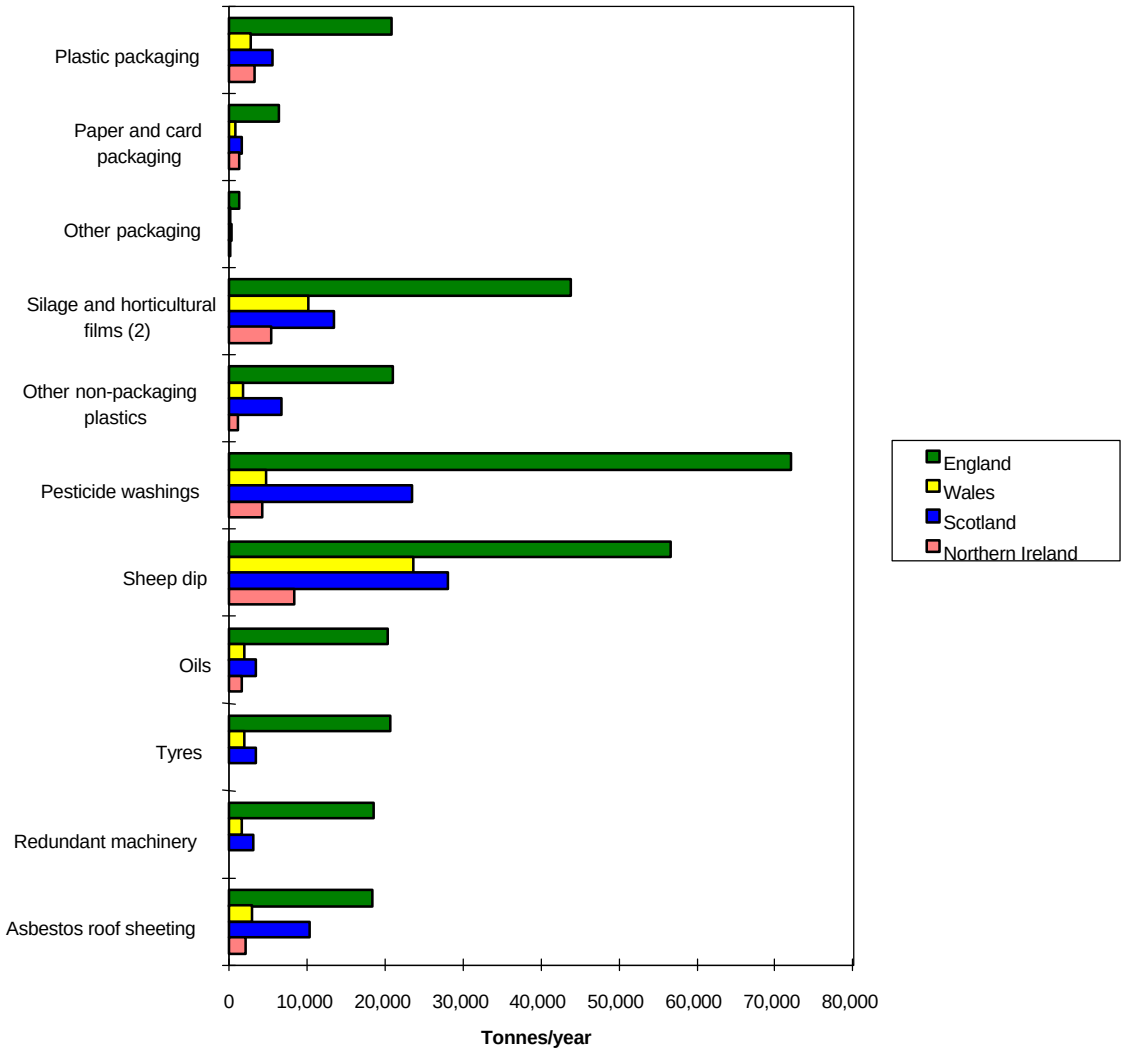


Figure 4 - Estimated quantities of selected non-natural waste streams [(1)]

Notes:

1. *The waste estimates have been generated using a calculation methodology first developed by the Project Team in 1998 under contract to the Environment Agency. This methodology is based on linking data obtained by comprehensive literature review and consultation with MAFF agricultural census data (see Appendix C for details and an assessment of data accuracy).*
2. *'Silage & horticultural films' includes an estimation of associated contamination by soil, water and other residues (50% w/w for silage plastic and 80% w/w for mulch film and crop cover).*

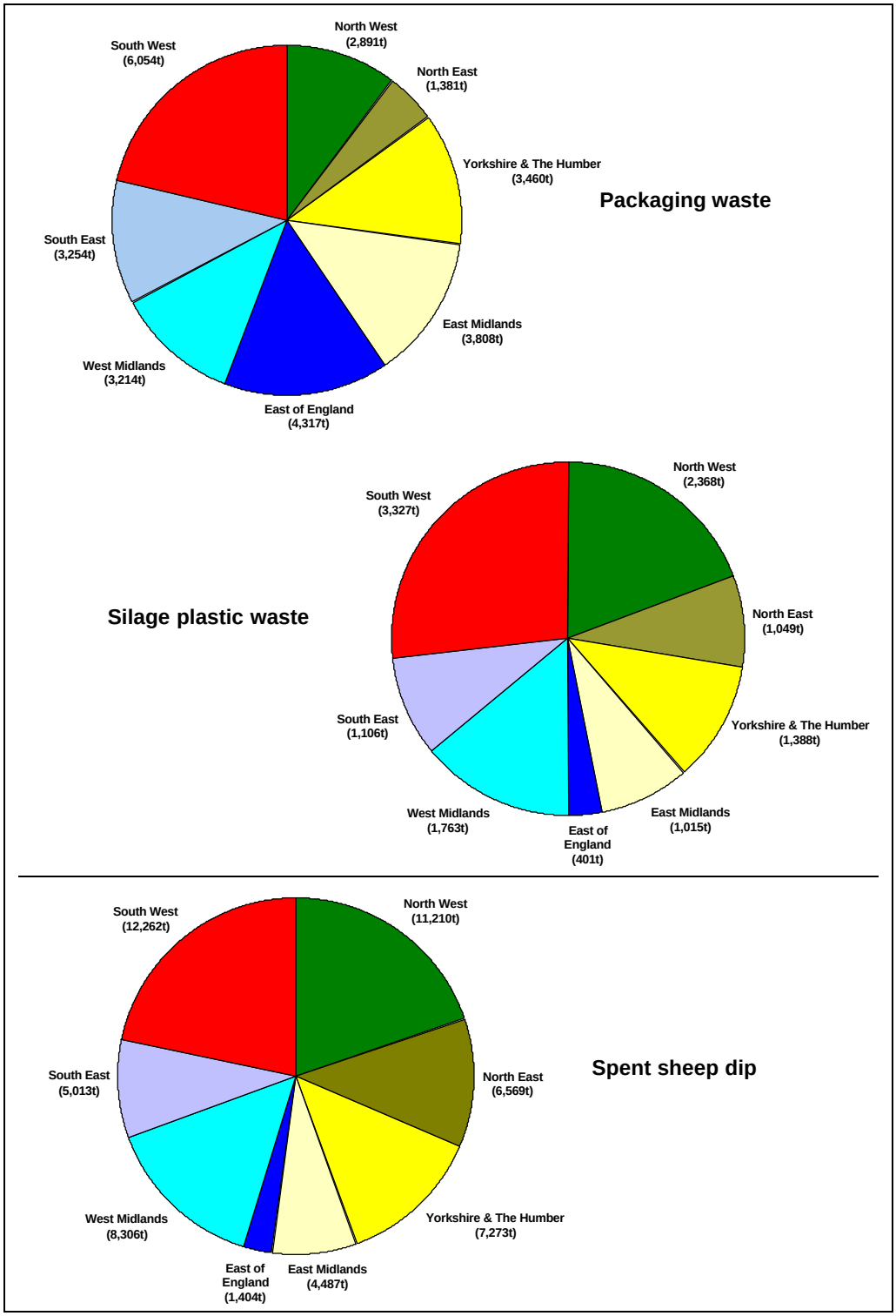


Figure 5 - Comparison of selected waste streams in different regions of England [(1)]

(1) Planning regions (not including Greater London).

Overall, the quantity of non-natural agricultural waste (0.5 million tonnes per year in the UK) appears small in comparison with the 80 million tonnes of slurry and farmyard manure produced each year, and with the quantities of waste generated in other industries (estimated to be 48 million tonnes in England and Wales). However, this comparison of waste quantities alone disguises the significance of many of the non-natural agricultural waste streams, for example the environmental and human health hazards associated with agrochemicals and animal health products, and the visual impact of silage plastic. In addition, it is important to note that these estimates are of annual waste arisings alone and do not take account of waste that has been stockpiled on farms over the years.

Further information about each of the main categories of waste is provided below.

Packaging waste

The quantity of packaging waste is estimated to be just over 44,000 t/year in the UK. A large proportion of this waste stream is plastic (32,000 t/year), which reflects the recent trend towards plastic primary packaging in all input sectors. The types of plastic are principally polyethylene and polypropylene. Paper is mainly in the form of secondary cardboard packaging, although primary paper packaging is still used for some animal feed, seed and agrochemical products. The total quantity of waste paper and card packaging is estimated to be 10,000 t/year.

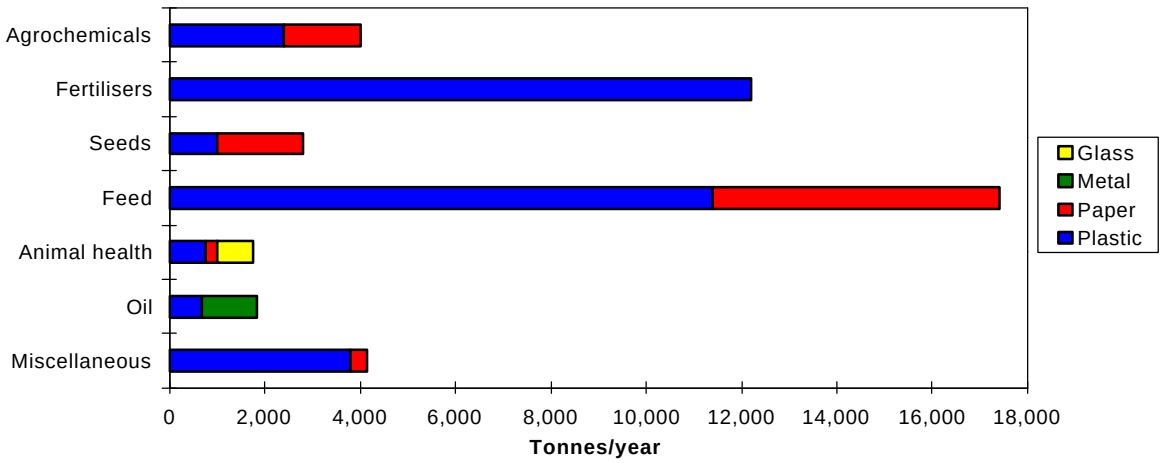


Figure 6 - Packaging waste streams

The waste metal and glass packaging waste streams, although small in quantity, are significant since they arise from the supply of hazardous substances, including sheep dip (supplied in tin-plated steel drums), medicines (some of which are supplied in glass) and oil (supplied in steel as well as plastic drums). Triple rinsing of all primary packaging used for agrochemicals and animal health products is recommended by manufacturers and suppliers, and design improvements have been made in recent years to facilitate rinsing. Other packaging waste streams such as fertiliser, seed and feed bags can also have hazardous characteristics due to the nature of the products they contained; for example, ammonium nitrate fertiliser is classified as an oxidising agent.

The total quantity of packaging waste has been reduced in recent years as a result of improvements in packaging design and product delivery systems. Examples include:

- reduction in the weight of packaging plastic;
- increase in the size of bags used for the supply of fertilisers and seeds (now mainly 500kg polypropylene bags with polyethylene inners);
- development of highly active agrochemicals that are applied at g/ha rather than kg/ha, so resulting in less packaging;
- increase in the size of containers used for agrochemicals (now mainly 5-litre and 10-litre polyethylene containers);
- increase in the proportion of animal feed delivered in bulk (now estimated to be more than 80 per cent of total feed delivered in the UK).

There are also a limited number of re-usable (multi-trip) containers on the market in the agrochemical sector, but these represent less than 2 per cent of the UK market at present.

A final point to note concerning packaging waste is that a considerable proportion arises on a seasonal basis in line with the farming calendar, for example waste packaging from agrochemicals, seeds and fertilisers generally arises in the spring/early summer and autumn.

Non-packaging plastics

In addition to packaging, plastic is used for a variety of purposes in farming, such as silage making and horticulture. The total quantity of waste non-packaging plastic is estimated to be 60,000 tonnes per year in the UK (based on 1998 data). More than half of this is silage and horticultural films, and the actual weight of these waste streams is much higher due to high levels of contamination with soil, water and other debris. As shown in Figure 7 on the following page, the total weight of waste silage plastic is estimated to be in the order of 50,000 tonnes per year (including 50 per cent contamination), and the weight of waste horticultural films is estimated to be 23,000 tonnes (including 80 per cent contamination of mulch film and crop cover).

The use of plastic films (low-density polyethylene) for silage making and in horticulture has increased significantly over the past two decades. Improvements in design are ongoing and include reduction in weight of the films. For silage making, there has been an increase in the use of silage wrap (for big bales) and a corresponding reduction in silage sheet (for clamps) and bags. Total UK sales figures for 1998 show 17,500 tonnes silage wrap, 6,500 tonnes silage sheet and 1,000 tonnes silage bags. With regard to horticultural films, there is a very small quantity of photo- and bio-degradable products on the market, but the performance of these products is low at present and R&D is ongoing.

Other non-packaging plastic waste includes bale twine, netwrap, tree guards, cores used for silage wrap and bale twine, and a variety of pots, trays, and the like used in horticulture. Each of these waste streams has increased in recent years.

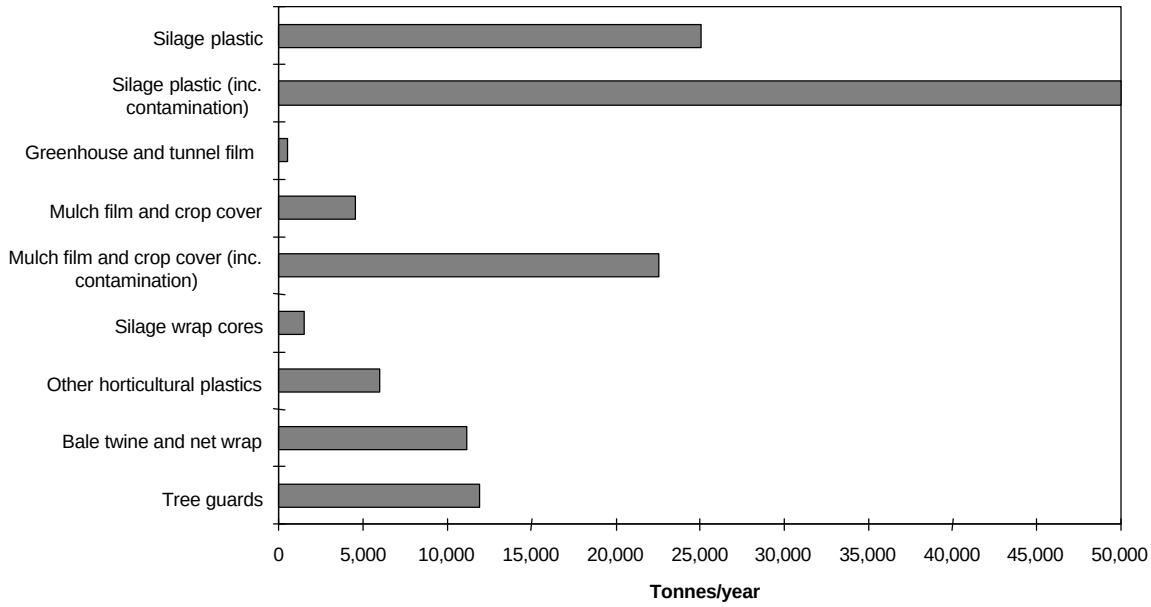


Figure 7 - Non-packaging plastic waste streams

Non-packaging cardboard

Waste cardboard cores arise from the use of silage sheet, some horticultural films and net wrap. The size and weight of these cores varies but the average weight of a core used for silage sheet is 6-8kg. Based on this figure, the total quantity of waste silage sheet cores is estimated to be 930 tonnes/year in the UK. No reliable data is currently available for cores used for horticultural films and net wrap.

Waste from animal health products

In addition to packaging waste, a variety of other waste arises from the use of animal health products, including:

- spent sheep dip;
- syringes and needles used for administering products such as vaccines and penicillin;
- disposable gloves;
- dressings and swabs;
- plastic tubes used for administering creams for mastitis treatment and drying out routines;
- discarded and damaged guns for administering products such as worm treatments;
- aerosols;
- unused medicines and sheep dip.

Sheep-dip waste arises from the practice of dipping sheep in baths of insecticide for the control of ectoparasites (such as scab, blowfly, lice and ticks). The amount of sheep dipping has declined in recent years following deregulation and the increasing use of alternative methods for ectoparasite control, for example pour-on preparations applied directly to the fleece. However, the pour-on preparations are not effective against sheep scab, and the only approved methods include dipping in organophosphates (OPs) or synthetic pyrethroids (SPs), or injection with one of the two licensed macrocyclic lactones, ivermectin or doramectin. OPs provide the most cost-effective method of control.

The relative use of OPs and SPs has fluctuated in recent years due to human health and environmental concerns, as described in Box 4.

The total quantity of waste sheep-dip solution is estimated to be 116,000 tonnes/year in the UK (based on 1998 data).

Unused sheep-dip concentrate may also arise as a waste. This is typically returned to the supplier, but no reliable data exist.

Box 4 - Fluctuation in the use of OP and SP sheep dips

The use of OPs declined from 95 per cent in 1987 to 23 per cent in 1997 amid growing concern about the health effects of OPs and the withdrawal of compulsory dipping for scab. The market for SP dips consequently expanded, but it has become increasingly clear that SP dips are highly toxic to the environment and this has prompted a recent move away from their use.

In December 1999, OPs accounted for approximately 50 per cent of sheep ectoparasite sales. However, in December 1999 all OP dip licences were suspended and all OP products were recalled for repackaging. Following advice from the Veterinary Products Committee, the Government invited marketing authorisation holders to develop plans and submit applications for containers with closed delivery systems that will minimise operator exposure to the OP concentrate. Some dips were reintroduced in October 2000 in interim packaging (with a vented tap), but final proposals for improved packaging are due in August 2001.

Quantitative data on other waste arising from the use of animal health products, such as syringes, guns, gloves and dressings, are limited. Based on consultation with suppliers, vets and farmers, it has been estimated that the total quantity of waste syringes and needles is approximately 46 tonnes per year in the UK (but limited reliable data has been available). The range of products administered this way includes:

- vaccines;
- antibiotics, including penicillin;
- other medicines;
- mineral supplements.

The quantity and range of animal health waste arising depends on the type of enterprise. Pig and dairy enterprises generally produce the largest quantities and range of wastes due to the risk of disease and, therefore, the need to vaccinate and treat the livestock with a range of products. In contrast, the range and quantity of products administered

on beef and sheep farms tend to be lower. On poultry farms, many of the medicines are administered in drinking water or applied in the form of a spray; packaging therefore accounts for a greater proportion of the animal health waste, although syringes and needles are still used for administering certain medicines and vaccines.

Agrochemicals

Agrochemicals include a variety of pesticides (for example, herbicides, fungicides and insecticides), growth regulators, desiccants and adjuvants. In addition to packaging, other waste streams can include washings, unused concentrates and contaminated clothing.

Pesticide washings arise from the rinsing of pesticide spray tanks following spraying. The recommended practice is to apply the washings to an unsprayed area of crop, so avoiding waste and reducing risk to the environment. In light of improvements in sprayer design, increasing financial pressures on farmers, and the introduction of the *Groundwater Regulations 1998* (controlling the disposal of pesticides to land), it appears that practices for managing pesticide washings (and therefore avoiding waste) have improved significantly in recent years.

The quantity of unused agrochemical concentrates on farms also appears to have declined due to improved control (driven by financial pressures and food assurance schemes), but no reliable data exist. In 1992, the British Agrochemical Association and the UK Agricultural Supply Trade Association (UKASTA) ran the National Pesticide Retrieval Scheme for unused agrochemicals. They collected approximately 300 tonnes (with distributors collecting the bulk of it).

Machinery waste

A variety of waste related to machinery arises on farms. The main wastes are lubricating and hydraulic oils, tyres, batteries and scrap machinery/parts.

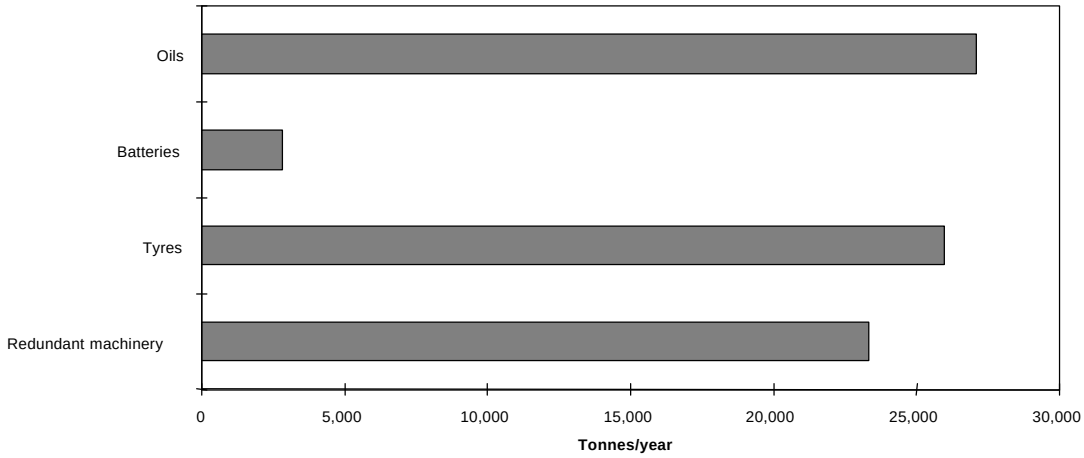


Figure 8 - Estimates of machinery waste

In addition, large quantities of scrap car tyres are found on some farms following the disuse of silage clamps and move to silage bales (sometimes as many as 200-300 tyres). However, no reliable data are currently available and the estimates for tyres shown in Figure 8 are for farm vehicle tyres only.

Equipment containing Chloroflurocarbons (CFCs) and halons still exist on some farms, although quantitative data are limited. The existence of electrical equipment containing Polychlorinated Biphenyls (PCBs) is also unknown (see Box 5). Based on consultation to date, it is considered unlikely that there are electrical transformers containing PCBs on farms, but there may be some capacitors.

Box 5 - PCBs in electrical equipment

Polychlorinated biphenyls (PCBs) were widely used as coolants in electrical transformers and di-electrics in capacitors. As evidence emerged in the 1970s that they pose a significant risk to the environment and human health (due to their toxicity, persistence and tendency to bioaccumulate), the production of PCBs in the UK was phased out in 1977. Subsequently, in 1986, their supply and use in new equipment was banned. Use in equipment pre-dating 1986 still continues. However, the *Environmental Protection (Disposal of Polychlorinated Biphenyls and Other Dangerous Substances) Regulations 2000*, implemented in May 2000, required that PCBs should be removed and disposed of properly by 31 December 2000. Some holders of PCB equipment (for example, equipment containing PCBs at concentrations between 50-500 ppm) were entitled to defer the removal and disposal, but must register the equipment with the Environment Agency (paying a registration fee of £155 plus an annual renewal fee).

Building waste

Building waste can include a variety of materials such as bricks, concrete, metal and asbestos cement-bonded sheeting (see Box 6). No reliable data are currently available, but bearing in mind the large numbers of buildings on most farms, and the increase in farm diversification and building conversion, the building waste stream is considered to be significant and likely to increase in the future.

Box 6 - Asbestos on farms

Asbestos cement-bonded roof sheeting is found widely on farms in the UK. No reliable data are available but it has been estimated by farm building experts that as many as 80-90 per cent of farm buildings are roofed with these materials. Based on consultation with these experts and farmers, it has been estimated that 34,000 tonnes of asbestos cement waste arises on farms in the UK each year (but this is a very rough estimate).

Other forms of asbestos, for example in pipe lagging, are less common, but may occur on some farms. Very limited information is available at present.

2.3 Current practices

The range of practices currently used by farmers to manage waste, shown in Figure 9, reflects the exclusion of agricultural waste from the controlled waste regime and an increase in pressures on suppliers in recent years. Farmers generally use the most practical and time-efficient methods available to them. For several waste streams, such as packaging, this method is open burning since alternative options are limited. For others, such as machinery and veterinary product waste, take-back by suppliers has become more common.

Figure 10 on the following page presents selected data on current waste management practices from MAFF's *Pilot Farm Practices Survey* conducted in March 2000. This was a postal survey covering a range of issues. The data shown is based on responses from 235 farmers in England. This gives a useful indication of the most common practices for different waste streams. However, as with all postal surveys, it should be viewed with some caution. Note that the terms 'landfill' and 'recycled' used in the questionnaire did not specify the route, that is take-back by supplier or transferred direct to a waste contractor.

Further comments on the various practices are provided on the following pages.

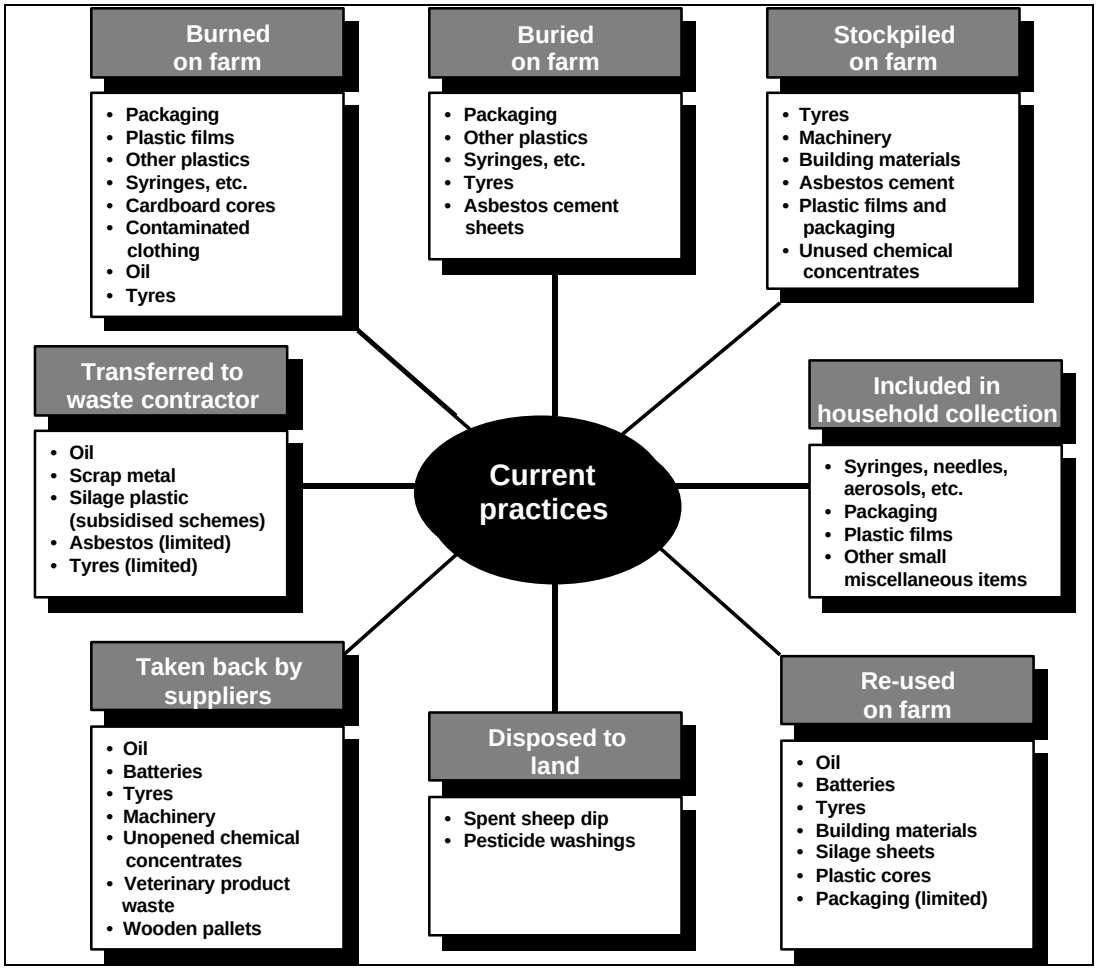
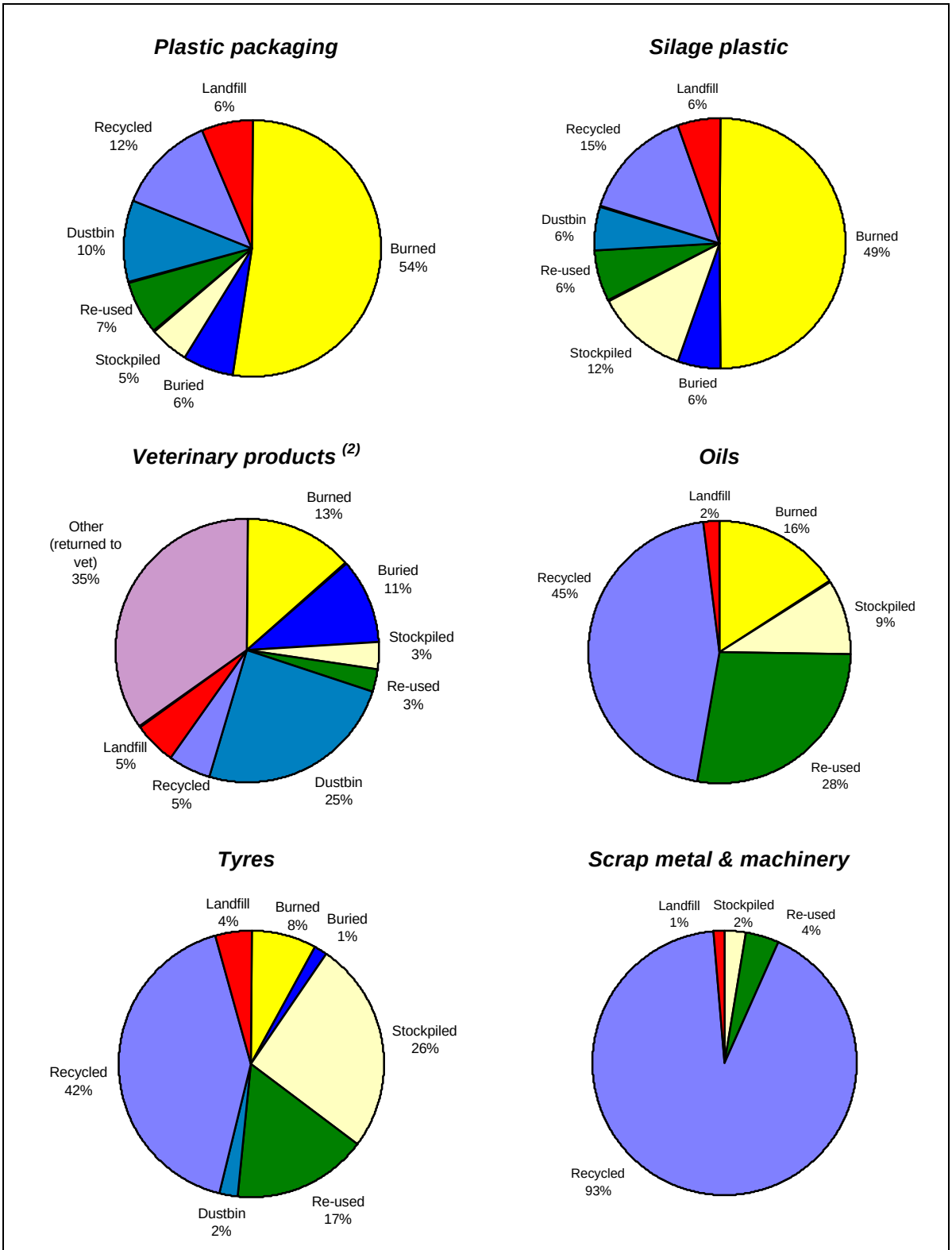


Figure 9 - Overview of current practices



Notes: *(1) Postal survey conducted by ADAS in March 2000; (2) Including packaging, syringes and needles.*

Figure 10 - Selected data from MAFF's pilot farm practices survey (1)

Burning

Open burning is still the most common practice for the disposal of packaging, plastic films and other plastics. However, the burning of plastics appears to have reduced recently with increased farmer awareness of the *Air Code* and the *Clean Air Act 1993* (see Box 7). This is confirmed by the findings of MAFF's Pilot Farm Practices Survey. Of the farmers who responded, 53 per cent are burning plastic packaging, 48 per cent are burning silage plastic, and 68 per cent are burning cardboard and paper packaging. Figures of 70-80 per cent for both plastic and paper packaging would have been more likely in the past.

Box 7 - The Air Code

The *Code of Good Agricultural Practice for the Protection of Air (*the *Air Code)* states specifically 'do not burn plastics, rubber, tyres or other materials' in the open because this can produce large amounts of dark smoke. The emission of dark smoke is prohibited under the *Clean Air Act 1993,* although the burning of plastic containers contaminated by pesticides is exempt provided that there is no other reasonably practicable method and the burning is carried out in a manner that minimises the emission of dark smoke.

Following research sponsored by the Crop Protection Association (formerly the British Agrochemicals Association) in 1997, there has been an increase in the use of 'drum incinerators' by farmers, although the actual number in use is unknown. The drum incinerator is basically a 205-litre metal drum with a series of holes at set configurations. It is available commercially, for about £85, but can be constructed quite easily by farmers.

Some farmers also dispose of packaging waste in small-scale incinerators or burners, but this is less common. Small-scale incinerators are typically found on large poultry and pig farms for the disposal of animal carcasses. There are reported to be a total of approximately 3,000 in England and Wales. They may also be used for packaging and other non-natural waste, but they are generally not purchased for this purpose.

Animal health product waste (packaging, syringes, dressings and the like) is also often burned. In the Government's Pilot Farm Practices Survey (Figure 10), 13 per cent of the farmers stated that they burn veterinary product waste. For other pharmaceutical products purchased from merchants (rather than vets), the figure is likely to be higher since the 'take-back by supplier' route is not currently available.

Burial

On-farm burial is less common, but tends to occur where there are old quarries or other suitable excavations. It is also more likely to take place on farms located adjacent to residential properties (where open burning has led to complaints in the past). Materials buried can include animal health product waste (such as packaging, syringes and needles), other packaging and plastic films. As shown in the Farm Practices Pilot Survey data (Figure 10), typically 5-10 per cent of farmers are burying these items. More commonly buried materials include asbestos cement roof sheets and other building waste.

Stockpiling

Stockpiling of plastic waste on farms has increased over the past few years as pressures to stop burning have grown. Many farmers are stockpiling silage plastic in the hope that the *Farm Film Producers Group* scheme (discussed on Pages 21-22) will be revived or a similar scheme established.

Stockpiling of tyres is also common. The MAFF survey results (Figure 10) show that 26 per cent of the farmers who responded are currently stockpiling tyres. The number of tyres stockpiled can be large, sometimes 200-300 car tyres following the disuse of silage clamps (as discussed in Section 2.2).

Other waste frequently stockpiled includes asbestos cement-bonded roof sheets, other building waste and machinery.

Inclusion in household waste collection

Disposal of small waste items with the household waste is common. Of particular note is the disposal of animal health waste, such as medicine containers, syringes and aerosols, via this route. The results of MAFF's survey show that 25 per cent of the farmers who responded are currently using this route for animal health waste (Figure 10).

Other waste materials that cannot be easily burned, including plastics, are also sometimes included with the household collection. MAFF's pilot survey data indicates that 10 per cent of farmers are currently using this route for the disposal of silage plastic and plastic packaging (Figure 10).

Re-use on farm

Most waste that can be re-used is re-used by farmers. This includes:

- oil: for machine maintenance;
- building waste: for farm tracks;
- plastic cores: for drainage or other purposes;
- batteries: for electric fencing;
- tyres: for silage clamps and as scrapers or rollers.

MAFF's survey data indicates that 28 per cent of farmers are re-using oil and 17 per cent are re-using tyres (Figure 10).

Silage sheet and crop covers are also re-used by some but not all farmers. Reuse of packaging on farms has decreased in recent years due to changes in packaging design; for example, fertilisers are now commonly supplied in 500kg bags that are opened by cutting the bottom and are therefore not reusable. However, 50kg paper and plastic feed and seed bags are often reused by farmers and by the construction industry.

Disposal to land

Spent sheep dip is typically spread to land where it is sorbed to organic material and subject to microbial and chemical breakdown. Under the *Groundwater Regulations 1998*, an authorisation is required from the Environment Agency and strict guidelines must be followed. Approximately 11,000 authorisations have been issued to farmers and contractors in England and Wales (as at 2000).

Pesticide washings may also be spread to land under an authorisation from the Environment Agency. Application of washings to unsprayed areas of crop (the recommended method) appears to have become common practice.

Take-back by suppliers

Take-back of waste by suppliers appears to be increasing in relation to veterinary-supplied products and machinery-related materials, but is limited for waste arising from other inputs (for example, packaging waste).

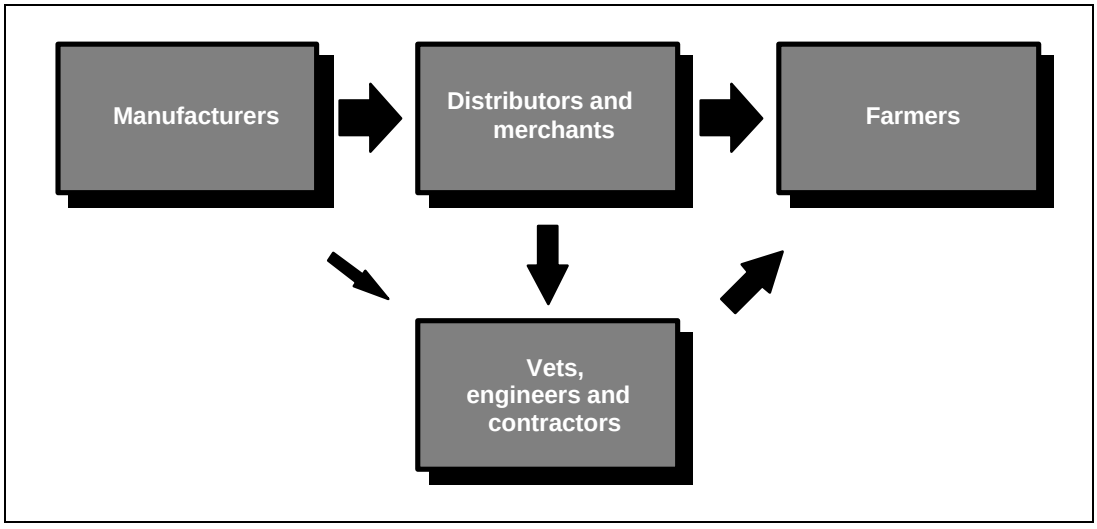


Figure 11 - Input supply chain

In the situations where it does occur, the supplier is generally a service-provider visiting farms on a regular basis. For example:

- vets typically take back any waste they generate during their visits, and many also provide special containers for sharps and pharmaceutical waste generated from products they supply (charging around £20 per container, although this varies);
- machinery engineers often take back vehicle batteries and oil during on-farm servicing;
- specialist tyre dealers often take back old tyres (typically charging £5-10 per tractor tyre).

The main drivers have been growing customer demand and, in the case of veterinary products, heightened public concern. However, the practices are not universal. The MAFF pilot survey data indicates that approximately 30-40 per cent of farmers are returning waste to vets. A key determining factor appears to be the relationship between the supplier and customer (farmer). Not surprisingly, the practice is more common where farmers are regular customers.

Take-back of packaging waste is very limited at present and has reduced in recent years due to increased concern about the risk of product contamination and transfer of animal disease. The only packaging items currently returned for re-use are wooden pallets and a limited number of refillable agrochemical containers on the market. These containers represent less than 2 per cent of the UK market at present. To fulfil their recovery obligations under the *Producer Responsibility Obligation (Packaging Waste) Regulations 1997*, all input manufacturers, distributors and merchants have joined compliance schemes (as at 2000). Some distributors and merchants have attempted to provide take-back services in the past, but these have not proved successful due to a combination of complex logistics, high costs and low farmer awareness.

Transfer to waste contractors

Since agricultural waste is not a controlled waste at present, transfer to waste management contractors is limited, but it does occur where the waste has a value for recovery, for example scrap metal and oils (particularly on large farms).

Farmers in some parts of the country are also paying for the collection of silage plastic. In the mid-1990s, a national scheme for the recovery of silage plastic existed but this ceased in 1997 (see Box 8). At the present time, subsidised voluntary schemes are operating in Wales, Cumbria and Scotland, and a scheme is being planned in East Lancashire. All of these schemes currently transport waste to British Polythene Industries' reprocessing plant in Dumfries, Scotland. Each existing scheme is described briefly below:

- 'Second Life Plastics Wales' was launched in October 1999 and is operated by P&M Birch. The scheme received £500,000 funding from the European Commission, the National Assembly for Wales and the Environment Agency for a three-year scheme. In 2000, approximately 4,000 farmers were participating in the scheme. They pay an annual membership fee of £27.50, which includes collection of the first 700kg of plastic, and £40.50 per tonne thereafter. The three-year target is for about 7,000 out of 29,000 farms in Wales to have joined the scheme and to have recycled about 10,000 tonnes over that period.
- Two schemes have been operating in Scotland: one in the Dumfries and Galloway region and another organised by the Royal Scottish Agricultural Benevolent Institution. The Dumfries and Galloway scheme was established with landfill tax credit funding. Initially, 2,500 farmers participated in the scheme, but when a membership fee of £30 per year was introduced, the membership dropped to 450. The Royal Scottish Agricultural Benevolent Institution scheme was established with sponsorship and grants from other bodies. Farmers pay £50 and receive a large bag for depositing silage plastic waste. The Institution anticipates selling 500 bags in 2000.

- The Cumbria Farm Plastic Recycling Scheme was established in January 2000 based on an initiative led by South Lakeland District Council. Funding bodies include South Lakeland District Council, Cumbria Waste Management Environmental Trust, Fells and Dales Leader II Project, Carlisle City Council, Eden District Council, the Environment Agency, Friends of the Lake District and Allerdale Borough Council. More than 700 tonnes of plastic were collected during the first year. More than 20 collection points have been set up around the county, mainly at livestock markets. Collections are three times a year over a two-day period. Farmers are charged according to the load, £10-40 (and are paying approximately a third of the total cost).

Without funding, none of the above schemes is likely to prove sustainable due to high costs deterring farmers from participating (discussed further in Sections 4.2 and 6.2).

Box 8 - History of silage plastic recovery schemes in the UK

1987 - British Polythene Industries plc (BPI), a manufacturer of silage and horticultural film, invested in a reprocessing plant in Scotland.

1988 - 'Second Life Plastics' scheme established by BPI. This included a national collection network of approximately 30 collection agents. In 1992, they received more than 15,000 telephone requests to collect more than 4,000 tonnes of film.

1993 - 'Second Life Plastics' scheme ceased due to a slump in the plastics market and the fact that BPI alone was bearing the cost of £300,000 per annum.

1994 - 'Farm Film Producers Group' set up by PIFA (the Plastic and Industrial Films Association) and polymer manufacturers. They charged a voluntary levy of £100 per tonne - the resources were used to fund a nationwide collection system using local agents who were paid £80/tonne to collect plastics from farms and transport them to BPI's reprocessing plant in Dumfries, Scotland.

1996 - 'Farm Film Producers Group' in difficulty due to two importers refusing to pay the levy and, therefore, undercutting the prices of competitors by around 5-10 per cent (the 'free-rider' problem).

1997 - 'Farm Film Producers Group' ceased.

1998 - DETR published consultation paper on *Options for Tackling the Problem of Waste Non-Packaging Farm Plastics*. This outlined two options: (1) a voluntary approach, and (2) the introduction of producer responsibility regulations. The Government's decision was to wait and see if a voluntary approach could prove successful.

2000 - Subsidised voluntary schemes operating in Wales, SW Scotland and Cumbria (all transporting plastic to BPI's plant in Dumfries). Manufacturers and other interested parties continue to lobby for producer responsibility legislation. No formal response from the Government, but indications are that it is unlikely to go ahead with producer responsibility legislation.

3. Drivers for change

Widespread attention to agricultural waste management has clearly been limited to date. This is not surprising given: (1) the exclusion of agricultural waste from waste management controls, (2) the relatively small quantities of waste generated in comparison with other industries, and (3) the recent economic difficulties in farming (and related industries). However, the drivers for change are increasing rapidly. The Government's announcement of plans to extend controls to agricultural waste (implementing the *Framework Directive on Waste*) has acted as a catalyst. This has drawn attention to a variety of issues, such as the visual impact of long-term stockpiling of plastics and other waste on farms, and the potential (but not quantified) environmental and human health risks associated with other common practices (for example, burning and burial of waste on farms).

This section summarises the main drivers for change in agricultural waste management practices, including the proposed legal controls on waste and a range of other drivers affecting farmers and all parties in the input supply chain.

3.1 Proposed legal controls

On implementation of the proposed *Waste Management Licensing (Amendment) Regulations*, agricultural waste will become a 'controlled industrial waste' and the various laws and regulations summarised in Table 1 (which already apply to other industries) will apply to agriculture.

Table 1 - Summary of key legislation for controlled industrial waste

Acts and regulations	Relevant requirements
Environmental Protection Act 1990, section 33	It is an offence to treat, keep or dispose of controlled waste without a waste management licence (or an exemption).
Environmental Protection Act 1990, section 34	All those producing or dealing with controlled waste have a 'duty of care' to prevent it escaping their control, transfer it only to an authorised person, and provide a written description.
Environmental Protection (Duty of Care) Regulations 1991	On transfer of controlled waste, a 'waste transfer note' must be completed, signed by all parties in the transaction. Records must be kept for two years.
Environmental Protection (Registration of Carriers and Seizure of Goods) Regulations 1991	Any persons transporting waste on behalf of waste producers must be registered. Waste producers transporting their own waste do not require registration.
Waste Management Licensing Regulations 1994 (and amendments)	These regulations underpin the entire waste management licensing system. Exemptions from licensing are listed (principally for waste re-use and recovery operations).
Special Waste Regulations 1996 (and amendments)	A 'consignment note' system must be followed for the transfer of 'special waste' (defined in the Regulations). Consignment notes must be kept for a minimum of three years.

Under this legislation, dumping of any waste, or treating it without a licence, may result in a maximum fine of £20,000 and/or six months in prison on summary conviction or an unlimited fine and/or two years in prison (five years if special waste is involved) on conviction on indictment.

The legislation should not apply to the return of unused/unopened products (such as agrochemicals or medicines) and refillable containers to suppliers, or to organic materials if used for agricultural benefit (for example, landspreading) because they do not fall within the legal definition of waste (see Box 9). At the time of writing this report, however, it was not certain whether organic materials such as manure and slurry would be excluded completely from the legal controls. The Government's *Action Plan for Farming*, issued in March 2000, indicated that they will be excluded by virtue of Article 2 of the *EC Framework Directive on Waste*, which excludes faecal matter and other non-dangerous substances used in farming "where they are already covered by other legislation", but this is a grey area and needs confirmation.

Box 9 - Definition of waste

The legal definition of waste is "*any substance or object…..which the producer or the person in possession of it discards or intends or is required to discard"*. Further guidance is given in Annex 2 to DOE Circular 11/94, which states that it is *"any substance or object that falls out of the commercial cycle or out of the chain of utility"*.

There are also likely to be a number of other exclusions and exemptions from waste management licensing. Examples are listed in Table 2. Details are to be confirmed following the Government's consultation process.

Table 2 - Possible exclusions and exemptions from waste management licensing

Exclusions	Exemptions [1]
• Disposal of sheep dip and pesticide washings to land under a Groundwater Authorisation (controlled by the *Groundwater Regulations 1998*) • Burial of animal carcasses (controlled by the *Animal By-products Order 1999)*	• Composting • Energy recovery • Re-use • Storage pending collection • Small-scale incineration at the place of production, i.e., equipment that incinerates non-hazardous waste at a rate of less than 50kg/hr[2]

[1] *Exemptions typically have to be registered with the Environment Agency (or its counterparts in the Devolved Administrations). The Government stated in its 'Action Plan for Farming', issued in March 2000, that the registration systems will be "as simple as possible" and that exemptions will be provided "without any charges".*

[2] *This is also currently exempt from permit requirements under the Pollution Prevention Control Regulations 2000, which replace the authorisation regime under the Environmental Protection Act 1990. However, it appears that the exemption is unlikely to apply following implementation of the Waste Incineration Directive (in 2002 for new incinerators and 2005 for existing equipment), except for the incineration of animal carcasses, which is covered by the EC Animal Waste Directive.*

Even with these exclusions and exemptions, the practical and financial implications of the proposed controls are significant for farmers. As the 'waste producers', farmers will have to bear any cost associated with waste disposal or recovery (following the 'polluter pays principle').

Given the high costs associated with holding a waste management licence, and the more stringent controls on waste incineration expected on implementation of *EC Waste Incineration Directive* (in or before 2005), on-farm disposal is unlikely to be a viable long-term option for most farmers (see Box 10).

Box 10 - Potential cost of on-farm waste disposal

Landfill

Based on 2000 rates, the application fee for a licence to landfill industrial waste is £2,575 and the annual subsistence fee is £3,125. In addition, the capital and operating costs would be substantial to meet the requirements of increasingly stringent legislation (particularly following the implementation of the *EC Landfill Directive*). The minimum capital cost of constructing a landfill that meets existing legal standards is around £500,000 (but the total cost is typically substantially higher).

Incineration

Small-scale incinerators (<50kg/hr) are currently exempt from licensing and from Integrated Pollution Prevention and Control (IPPC) permit requirements (see Table 2). At present, approximately 3,000 incinerators exist on farms in England and Wales, mainly on large pig and poultry farms for the incineration of animal carcasses (see Section 2.3). The purchase cost of these units is typically £2,000 - £10,000. However, to comply with the future requirements of the *Waste Incineration Directive* (to be implemented in the UK in 2002 for new incinerators and 2005 for existing equipment), it has been estimated that the cost would be in the order of £100,000 - £250,000 (*Note:* only incinerators for the disposal of animal carcasses are exempt from the Directive. Controls on these small-scale incinerators are expected to be included in the revised *Animal Waste Directive*).

The alternatives to on-farm disposal are either to recover the waste on-farm under an exemption (as described above, there should be no charge for registration) or to transfer the waste to a waste contractor for recovery/disposal at a licensed site.

The total charge for waste collection and disposal or recovery includes:

- the collection and transport cost;
- the cost for disposal or recovery (gate fee);
- landfill tax (if disposed to landfill): £12 per tonne for active wastes in 2001, but increasing by £1 per tonne each year, with a review in 2004.

The cost to the farmer will therefore depend on a number of factors, including:

- farm location and distance to a suitable facility;
- quantity of waste;
- nature and classification of the waste;
- final treatment method (for example, landfill, incineration with or without energy recovery, or recycling);
- market demand for secondary materials.

With regard to the third factor (the nature and classification of the waste), Table 3 on the following page provides an indication of the likely classification of the main waste streams. This is important since the disposal costs for wastes classified as 'special waste' or 'clinical waste' will be much higher. It is also important to note that packaging waste arising from the use of pesticide, sheep dip, prescription medicines and other hazardous products is classified as 'special waste' if it contains more than 0.01 per cent of the product. However, if the packaging is triple-rinsed following recommended practices it will probably be classified as 'non-hazardous' (that is deemed to contain less than 0.01 per cent of the product). This opinion is based on experience in other EU Member States and the Project Team's interpretation of the Environment Agency's 'De Minimis Policy'. Confirmation from the Government and Environment Agency is needed.

Some example costs based on the most common waste management options available at present are given in Box 11. In general, costs for waste disposal are increasing and are set to increase substantially upon implementation of the EU *Landfill Directive* and the *Waste Incineration Directive*.

Box 11 - Example costs for waste collection and disposal (based on 2000 rates)

Collection and transport cost:
£50-£80 per load (depending on location, quantity and frequency of collection)

Gate fees:
Plastic and packaging waste (non-special waste)
- Landfill - £20 per tonne (plus £12 per tonne Landfill Tax)
- Incineration - £90-£100 per tonne

Unrinsed pesticide containers (special waste)
- Landfill - £70-£100 per tonne (plus £12 per tonne Landfill Tax)
- Incineration - £70-£100 per 20 x 5-litre drums or £190-£220 per pallet box

Asbestos cement-bonded sheets (special waste)
- Landfill £50-£80 per tonne (plus £12 per tonne Landfill Tax)

Table 3 - Possible classification of non-natural agricultural waste streams[1]

Special waste[2]	Non-hazardous waste
• Unused pesticides and other agrochemical concentrates • Prescription medicines • Sheep-dip concentrates • Spent sheep dip [4] • Pesticide washings [4] • Oil • Packaging or other materials contaminated with >0.01 per cent of agrochemicals, sheep dip, prescription medicines, oil or other products classified as 'special waste' [5] • Batteries [6] • Asbestos • Equipment containing halons and CFCs • Electrical equipment containing PCBs • Undrained vehicles and machinery [7]	• Plastic films and other non-packaging plastics • Cardboard cores • Secondary cardboard packaging • Animal-feed bags • Fertiliser bags • Seed bags • Rinsed agrochemical and animal-health packaging containing <0.01 per cent of product[5] • Wooden pallets • Redundant machinery • Construction and demolition waste • Tyres
	Clinical waste[3]
	• Syringes, needles and dressings • Medicines and other pharmaceutical products • Used medicine containers

Notes:

1. *Based on existing legislation applying to other industries.*
2. *Special waste exhibits certain hazardous properties as defined in the Special Waste Regulations 1996. These regulations are under review at present.*
3. *Clinical waste is defined in the Controlled Waste Regulations 1992. It includes: animal tissue, drugs and other pharmaceutical products, swabs and dressings, syringes, needles, and other sharp instruments, and any other potentially infectious materials arising from veterinary or pharmaceutical practices. Some clinical waste can also be special waste.*
4. *Disposal to land of sheep dip and pesticide washings with an authorisation issued under the Groundwater Regulations 1998 is likely to be excluded from controlled waste legislation.*
5. *The Environment Agency's 'De Minimis Policy' states that packaging waste contaminated with hazardous materials is not classified as 'special' waste if the hazardous material constitutes less than 0.01 per cent by weight. This is in line with legislation in other EU Member States.*
6. *The transfer of up to five lead acid batteries does not require a consignment note or registration as a waste carrier.*
7. *From 1 January 2002.*

3.2 Other drivers

The extension of legal controls to agricultural waste is likely to be the most immediate and direct driver for change in waste management practices. Various other developments, however, are increasing the need for farmers and all parties in the input supply chain to reduce waste and improve the management of waste that is produced. Examples of other drivers are shown in Table 4.

Table 4 - Examples of other drivers for change in waste management practices

Stakeholder	Drivers
Farmers	• Increasing retailer and consumer demands (for example, in the form of assurance schemes), and increasing competitive pressures. • Growing public concern about the environmental and human health impacts of waste, and increasing pressures from local communities and visitors to the countryside. • Gradual transfer of income support from production-linked payments to environmental protection measures. • Other legislation (for example, *Pollution Prevention and Control Regulations 2000* affecting large pig and poultry farms).
Input manufacturers and suppliers	• Growing public concern about the environmental and human-health impact of their products and therefore growing importance of product and industry image. • Increasing demands from customers (farmers) to minimise and recover waste, and increasing competitive pressures. • Increasing costs associated with the *Producer Responsibility Obligation (Packaging Waste) Regulations 1997*. • *Packaging (Essential Requirements) Regulations 1998*: which state that any packaging placed on the market must comply with certain 'essential requirements' including, for example, minimisation of packaging weight and volume, and suitability for reuse, recycling, energy recovery or composting. • Other upcoming producer responsibility legislation (for example, proposed *End-of-life Vehicles Directive*, and amendments to directives on batteries and oil). • Developing EU *Integrated Product Policy* (looking at the whole lifecycle of products with the aim of reducing their environmental impacts).

4. Options and barriers

Drivers for change in agricultural waste management practices are clearly increasing. But what are the alternatives? This section presents the conclusions of an assessment of waste management options and highlights the potential barriers to sustainable waste management. It should be viewed in the context of the general framework for making decisions about waste management in the UK (see Box 12) and the national strategies for sustainable waste management (see 1.1). It is particularly important to recognise that making decisions about waste management is a complex process. Various factors such as the type of waste, the distance to suitable facilities and the local market for secondary materials will influence the decision.

Box 12 - Waste management decision-making and planning

The basic decision-making techniques and principles have existed for several years, that is the 'best practicable environmental option' (BPEO) using the 'waste hierarchy' (of reduction, reuse, recovery and disposal) as a guide, and considering the 'proximity principle' and 'precautionary principle' (see Appendix D). More recently, the need to integrate the principles of sustainable development (taking account of environmental, economic and social impacts) has been recognised.

The land-use planning system plays an important role. In England, *Planning Policy Guidance Note 10: Planning and Waste Management (1999)* defines the responsibilities of various parties, including:

- Regional Planning Bodies (producing planning guidance and strategies);
- Regional Technical Advisory Bodies, RTABs (providing specialist advice to the planning bodies);
- Waste Planning Authorities (developing local waste plans);
- the Environment Agency (regulating developments and providing information and advice).

Note: In 2000, the Environment Agency produced a series of reports entitled *Strategic Waste Management Assessments* (one for each region) containing information on waste arisings and facilities.

4.1 Assessment of waste management options

Following a methodical assessment of the options for each waste stream, the overall conclusion is that a variety of options will be needed to achieve sustainable agricultural waste management (in view of expected legal constraints, described in 3.1). An overview of the best options is shown in Figure 12. Table 5 lists the main strengths and limitations of each option. These highlight that:

- ***Waste reduction*** provides the greatest overall benefits (reducing financial and environmental costs). This should therefore be at the heart of any strategy for agricultural waste management. Incentives for farmers to reduce waste have been limited to date and there is clearly potential for reduction of some waste streams through improved farming practices. Many input manufacturers and distributors have already acted to reduce waste and, in the short-term, the scope for further reduction through design appears to be relatively small, but a complete 'rethink' of some inputs and processes could bring significant waste reduction in the longer term. However, even with extensive application of this option, it is unlikely that waste streams will be eliminated completely. The need for other options therefore remains.

- ***Re-use*** of waste can have significant financial and environmental benefits (although not always) and this option is potentially viable for a number of waste streams. However, the scope for increased re-use of waste on farms (that is beyond current practice) appears to be limited. In addition, technical and logistical constraints are restricting the development of re-usable agricultural packaging, a situation not unique to the UK (re-usable pesticide containers represent less than 3 per cent of the market in all EU Member States). Re-use is therefore unlikely to play a significant role in the short-term, but opportunities do exist (for example, off-farm re-use of machinery and building materials). Further research is needed.

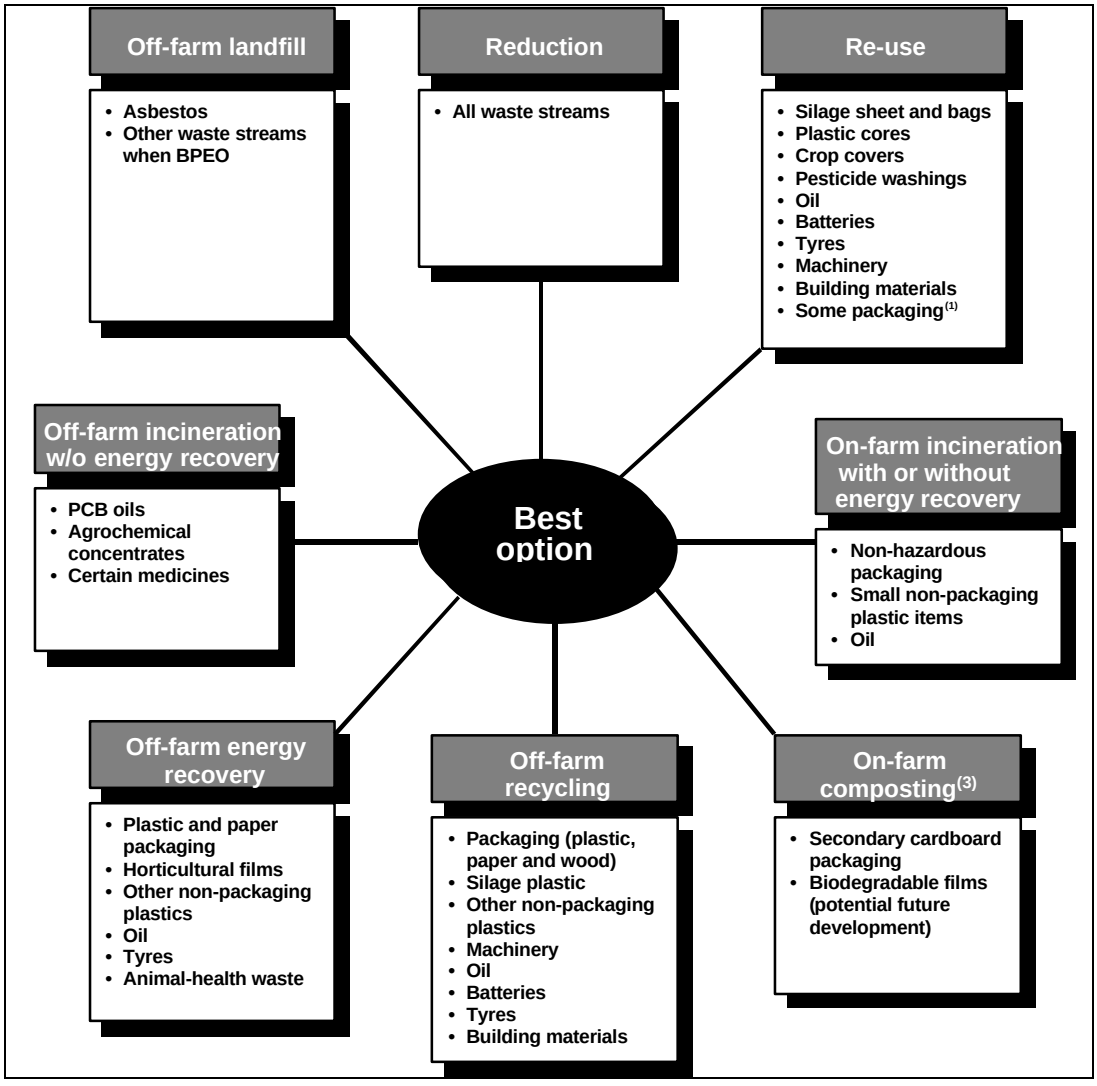


Figure 12 - Overview of best options

- ***On-farm incineration without energy recovery***, for example in the 'drum incinerator' described in 2.3, may be one of the most realistic options in the short-term (particularly on small farms in remote areas). It is not a long-term option, since on implementation of the *Waste Incineration Directive* (in 2002 for new incinerators and 2005 for existing equipment) the requirements for emission control and monitoring mean that it will no longer be viable (see 3.1). Small-scale incineration of non-hazardous waste (for example, secondary packaging) is likely to be exempt from waste management licensing (see 3.1), but the specific details have not been confirmed by either the Government or the Environment Agency (at the time of writing).

- ***On-farm energy recovery*** is clearly a better option in principle since it recovers value from the waste. However, the requirements of the *Waste Incineration Directive* are also likely to apply to incineration with energy recovery; therefore, this is not considered a long-term option. Nevertheless, further research into alternative energy recovery technologies is recommended since use of this option eliminates the costs associated with waste transportation.

- ***On-farm composting*** is only potentially viable for a small proportion of the non-natural waste stream, principally secondary cardboard packaging. It is not considered viable for other primary paper packaging (that is packaging used for seeds, feed and agrochemicals) due to the risk of soil contamination. In future, composting of biodegradable films may be a viable option, but this is uncertain at present. Overall, further research is needed before confirming the role of composting.

- ***Off-farm recycling*** is a viable option for several waste streams including, for example, packaging, non-packaging plastics, oil, metal and building materials. However, the cost-benefit ratio in comparison with other options depends on a number of factors such as logistics (that is waste collection and transport to suitable facilities) and reprocessing efficiency, and the markets for secondary materials. These factors are discussed in 4.2. Further information on the current status and issues associated with recycling agricultural plastics (such as silage film and packaging) is provided in Appendix F.

- ***Off-farm energy recovery*** should play an integrated part in the management of several waste streams, including packaging, non-packaging plastics, oils and tyres. It is also likely to be the BPEO for clinical waste from animal-health products. A potential benefit of this option for plastic packaging, compared with recycling, is that it does not require segregation of different materials (see Appendix F). As for recycling, the cost-benefit ratio of off-farm energy recovery compared with other options depends on logistics efficiency and the availability of suitable facilities (see 4.2)

- ***Off-farm incineration*** without energy recovery is not considered a viable option for non-hazardous waste. It may however, be the BPEO for certain hazardous wastes that require high temperature incineration (for example, certain agrochemicals and medicines, and oils containing PCBs).

- ***Off-farm landfill*** is currently the only viable option for asbestos (although technologies using heat treatment or acid digestion are being investigated). It is also likely to be the BPEO for other waste streams in certain circumstances, for example, in parts of the country where suitable recovery facilities are not available.

Table 5 - Strengths and limitations of each option for agricultural waste

Option	Strengths	Limitations
Reduction	• Reduces resource consumption (reducing environmental and financial costs). • Reduces environmental and financial costs associated with waste disposal or recovery.	• Technical and legal constraints (for example, packaging design requirements to maintain product quality and minimise health and safety risks). • Unlikely to eliminate waste completely and, therefore, the need for other options.
Re-use	• Can reduce resource consumption and associated environmental and financial costs (but see next column). • Reduces environmental and financial costs associated with waste disposal or recovery.	• Further opportunities for re-use on farms (beyond current practice) appear to be limited. • Cost-benefit ratio for re-usable packaging depends on logistics and operating efficiency. To date, these factors have limited the development of, for example, re-usable pesticide containers. • Potentially increases risks associated with health and safety and product contamination. • Other technical constraints.
On-farm incineration without energy recovery	• Eliminates environmental and financial costs associated with transportation. • If using 'drum incinerator' design, low capital and operating costs for farmers (see 2.3).	• Only viable for non-hazardous combustible materials in the short-term (and awaiting confirmation from Government on this). • On implementation of the *Waste Incineration Directive* (in or before 2005) it will no longer be viable. • Potential for local pollution exists if good management practices are not followed (that is for rinsing containers). • Potentially time consuming for farmers.
On-farm energy recovery	• Reduces financial and environmental costs of waste disposal. • Eliminates environmental and financial costs associated with transportation.	• As above (for 'on-farm incineration without energy recovery'). • Lack of other cost-effective technologies at present.

Table 5 (cont.) - Strengths and limitations of each option for agricultural waste

Option	Strengths	Limitations
On-farm composting	• Reduces environmental and financial costs of waste disposal. • Eliminates environmental and financial costs associated with transportation. • Reduces consumption of artificial fertilisers. • Improves soil structure.	• Only potentially viable for biodegradable materials (small proportion of waste stream). • Not recommended for primary packaging or other potentially contaminated materials due to risk of soil contamination. • Lack of approved standards and guidance for farmers at present.
Off-farm recycling	• Provides secondary materials (so reducing overall demand for raw materials). • Reduces financial and environmental costs of waste disposal.	• Viability depends on virgin material prices, markets for secondary materials and collection and processing costs (the latter affected by farm location and level of waste contamination). • Depressed markets and limited number of facilities at present. • Many farms are in remote locations and many waste streams are bulky making the financial and environmental costs of collection potentially high. • Likely to require segregation of different plastics.
Off-farm energy recovery	• Reduces use of fossil fuels. • Reduces financial and environmental costs of waste disposal. • Plastics (one of the largest waste streams) have high calorific value. • No segregation of materials needed.	• Limited number of facilities for energy recovery at present. • Many farms are in remote locations, and many waste streams are bulky making the financial and environmental costs of collection potentially high.
Off-farm incineration without energy recovery	• Only viable option for certain hazardous wastes that require high temperature incineration (for example, certain agrochemicals and medicines).	• No value recovery. • High financial and environmental costs (and the financial costs will increase on implementation of the *Waste Incineration Directive*).
Off-farm landfill	• Greater number of facilities compared with recycling and energy recovery at present, and may be BPEO in certain circumstances. • Only viable option for asbestos waste.	• Increasing financial costs (given the rising Landfill Tax and implementation of the *Landfill Directive)*. • As for other off-farm options, the fact that many farms are in remote locations, and many waste streams are bulky, makes the costs of collection potentially high.

4.2 Potential barriers

Critically, a number of potential barriers exist that are likely to limit or slow the process of change if not tackled effectively. Some have been mentioned already, and many also apply to other industrial, commercial and household waste streams. Table 6 below provides a summary.

Table 6 - Summary of the main potential barriers to options at the higher end of the waste hierarchy (for example, waste reduction and recovery)

Potential barriers	Comments
Low farmer awareness and motivation	• Low level of awareness at present. • Research has shown the general difficulties of raising farmer awareness. • Experience in other countries has demonstrated that overcoming this barrier is essential (see Section 5). • Ongoing economic difficulties and recent crises (such as the foot-and-mouth disease epidemic) are likely to have a negative impact on motivation.
Limited cost-effective techniques for on-farm waste recovery	• On implementation of the *Waste Incineration Directive*, small-scale incineration with or without energy recovery will no longer be viable (see 3.1). • No other suitable and cost-effective energy recovery technologies exist at present. • Composting will only be a possible option for a very small proportion of the non-natural waste stream (and standards and guidance for composting are still evolving).
High logistics costs for off-farm recovery/disposal	• Logistics costs are likely to be high due to the long distances between farms and suitable facilities, and the high volume-to-weight ratio of many waste streams (for example, packaging and plastic films). • Some waste streams, particularly silage and horticultural films, are often heavily contaminated (50-80 per cent contaminated). • Existing schemes for silage film recovery are all subsidised and are not considered sustainable due to high logistics costs (see 2.3).
Poor markets, high reprocessing costs, and limited facilities	• Generally poor markets for secondary materials at present (for example, for plastics and metals). • Reprocessing costs can be high due to contamination (for example, of silage plastic and pesticide packaging). • Drop in virgin material prices affects markets. • Generally low level of investment in new facilities at present. • Currently only one facility in the UK able to recycle silage plastic (BPI's plant in Dumfries) and this is now charging a gate fee of £30 per tonne (as at 2001).

5. Experience in other EU member states

To gain greater insight into alternative approaches to agricultural waste management, the Project Team conducted a brief review of practices in other EU Member States. This involved:

- telephone conversations with representatives of relevant national-level organisations (principally organisations representing farmers, input suppliers and waste management companies);
- review of relevant literature (identified via the Internet and consultees).

Initially, it was limited to five Member States: Germany, the Netherlands, France, the Republic of Ireland and Sweden, but was later extended to all 14 Member States following contribution of additional funding by the Environment Agency.

Subsection 5.1 provides an overview of the main findings and conclusions. Subsections 5.2 to 5.5 provide further information on:

- packaging waste recovery schemes;
- plastic film recovery schemes;
- use of municipal waste collection facilities;
- incentives and awareness programmes.

More detailed information is available in a report entitled *Agricultural Waste Management in Other EU Member States* produced by the Project Team for the Environment Agency (R&D Technical Report P1-399/2).

Notes:

1. *Agricultural waste is covered by the same controls as waste from other industrial sectors in all 14 Member States (implementing the EC Framework Directive on Waste).*
2. *The purpose of the Review was to gain information on agricultural waste management practices in each Member State. It was not to review compliance with the Framework Directive on Waste or gain detailed information on legislation. Limited contact has been made with government organisations (only initial enquiries in Germany, the Netherlands, Ireland and Sweden), as requested by the Environment Agency.*
3. *A list of consultees is given in Appendix A.*
4. *The information summarised here is based on a limited number of telephone conversations. Much of it is therefore opinion rather than fact, based (particularly in Member States where regional variation is high).*
5. *The scale and type of agriculture varies significantly between Member States. A list of key agricultural statistics is provided in Appendix G.*

5.1 Overview

The information gathered on practices in other Member States has highlighted:

- the difficulty in implementing the *Framework Directive on Waste* in the agricultural sector;
- the fact that widespread change in practices (i.e., reduced disposal on farms and use of options higher up the waste hierarchy) has only occurred where convenient and cost-effective routes to transfer waste have been made available to farmers;
- the considerable time needed to develop infrastructure and change attitudes.

There appear to be four broad approaches at present, as summarised below.

1. ***Principally utilising municipal waste collection facilities***. This approach is taken in Denmark and Finland where the waste management infrastructure appears to be well-developed. In Denmark, farmers transport their waste to municipal sites and pay an annual tax to the local authority. Use of these facilities by farmers, and the overall level of waste recovery, appear to be high in both countries.
2. ***Developing single material recovery schemes and also utilising municipal waste collection facilities***. Several Member States appear to take this approach. For example, in the Netherlands there are national schemes for the recovery of waste pesticide packaging and silage film; for other waste streams, farmers generally use municipal waste collection sites. Similarly, in Germany and Belgium where national schemes for pesticide packaging recovery and local schemes for film recovery exist (principally using distributors' premises for collection), farmers are also able to use municipal sites for other waste streams. In each of these countries, the level of waste recovery appears to be relatively high, although on-farm disposal is still thought to occur in remote locations.
3. ***Developing single material recovery schemes, but making no formal arrangements for other waste streams.*** In the Republic of Ireland, a national scheme for the recovery of waste silage film was introduced following the implementation of regulations in 1997. Under this scheme, manufacturers and importers pay £100 per tonne a year to a compliance scheme (which is added to the price of the product) and film is collected from farms by a contractor. Estimated recovery in 2000/1 was 40-50 per cent. In France, a national pesticide packaging recovery scheme commenced operation in 2000 (organised by manufacturers and utilising distributors' premises for collection), and legislation on the recovery of agricultural films was introduced in January 2001. However, in both Ireland and France no formal arrangements exist at present for other waste streams. Practices for these other waste streams, and for waste plastics that are not recovered, are uncertain; on-farm burning and stockpiling are considered likely.
4. ***Making no formal nationwide arrangements***. A number of Member States have not, as yet, implemented any formal nationwide arrangements for managing agricultural waste. These include Greece, Italy, Portugal and Spain. On-farm waste disposal and stockpiling appear to be common in each of these Member States, although regional variation is high (for example, in Andalusia in Spain the level of horticultural film recovery is high due to the substantial quantities used). The need

for more formal arrangements is recognised in each country and research and pilot projects are in progress.

It is also important to note that:

- The use of private waste contractors by farmers is not common practice although it is likely to be more common for large farming enterprises in some Member States (this was reported, for example, in Belgium and Germany). In general, the main role of the private waste sector in agricultural waste management is as contractors to local authorities and the operators of waste recovery schemes.
- Take-back of waste by suppliers seems to be common for batteries, tyres and oil in many Member States. This is similar to the situation in the UK but is more formalised in Member States with specific producer responsibility legislation or voluntary agreements.
- The status of agricultural input design and delivery systems appears to be similar throughout the EU. No practices that are significantly different from current UK practice have been identified. For example, according to consultees in the national crop protection associations, re-usable pesticide containers represent no more than three per cent of the markets for agrochemicals in each Member State (similar to the current situation in the UK).
- The level of farmers' uptake of best practices for waste reduction seems to vary between Member States depending on the general level of public awareness and the existence and maturity of waste recovery schemes (since the latter typically include measures to encourage waste reduction at source). Incentives and awareness programmes are discussed in 5.5.
- None of the Member States appears to have a comprehensive and documented national strategy for managing agricultural waste, although certain countries such as Denmark and Finland have drawn specific attention to agricultural waste in their national waste plans. Several other Member States have focused attention at a national level on particular agricultural waste streams, namely pesticide packaging and silage and horticultural films. The latter includes Belgium, Germany, Ireland, the Netherlands and, more recently, France. Others, such as Spain, Portugal, Italy and Greece, are in the early stages of considering arrangements for agricultural waste; national-level discussions are ongoing in these Member States. The Portuguese Government commenced development of a strategic plan for agricultural waste in 1998, but this seems to be on hold.

5.2 Packaging waste recovery schemes

The direct impact of the *EC Directive on Packaging and Packaging Waste* on the recovery of agricultural packaging appears to be limited in most Member States. As in the UK, agricultural input suppliers are generally able to join compliance schemes, and direct recovery is limited for economic reasons. Where recovery schemes targeting agriculture have been established, this has generally been in response to the introduction, or threat, of specific legislation (or a tax) requiring manufacturers to arrange recovery of the packaging. This has occurred in Belgium, Germany, the Netherlands and, more recently, France. However, it is worth noting that:

- in Denmark, packaging waste from the agricultural sector is recovered via municipal waste collection sites;
- in Austria, two packaging waste recovery schemes have been developed (recovering packaging from all sectors, including agriculture) - one recovers a certain amount of agricultural packaging via municipal sites; the other recovers waste from collection centres operated by private waste companies and is developing arrangements to collect agricultural packaging via distributors' premises;
- in Sweden, an agricultural co-operative (supplying seeds, silage plastics and fertilisers) has developed arrangements to recover packaging (and plastic films) in some regions - both collecting from farms and using collection points on the co-operative's premises - but the Scheme is experiencing difficulties and is currently being reviewed in consultation with the Swedish Government; and
- in several Member States it appears that a certain amount of agricultural packaging is recovered via the municipal waste collection system (e.g., in Germany and Sweden).

National pesticide packaging recovery schemes exist in Belgium, Germany, the Netherlands and France. A comparison of these schemes is presented in Table 7. This shows that:

- all have been led by the national crop protection associations in response to, or the threat of, legislation or a tax;
- all are based on strong stakeholder partnerships, that is, between Government, manufacturers, distributors and farmers;
- apart from the Dutch scheme, all are financed via a product levy paid by pesticide manufacturers and passed on to distributors and users (farmers are not typically charged directly, although they are often charged for unrinsed containers, as noted below);
- all include measures to encourage farmers to triple-rinse pesticide containers (triple-rinsed containers being classified as 'non-hazardous waste' in each country);
- all include a comprehensive farmer awareness and education programme (for example, mailings, media coverage and exhibitions at agricultural shows).

In Spain, a pilot scheme was conducted in 1999 in the Rioja region. This was co-ordinated by the national crop protection association, AEPLA, and involved farmers taking packaging waste to collection points at distributors' premises. However, the scheme proved unsuccessful due to a low level of farmer participation. Since then, AEPLA has commissioned a consultancy to conduct further research on the viability of a national scheme (due to be completed 2001).

Pilot schemes are also in progress in Portugal and Greece. The scheme in Greece, which commenced in March 2001, is being organised by the Greek Agrochemical Association and involves 100 farmers in the Thessaloniki region.

Table 7 - Comparison of existing pesticide packaging recovery schemes

	Belgium	France	Germany	Netherlands
Start date	1997	2000	1996	1997
Driver	Ecotax Act 1993 (exemption can be obtained if the supplier operates a recovery scheme and meets a set target, which is currently 80 per cent).	Threat of legislation. Discussions with Government.	Threat of legislation initially, followed by introduction of specific requirements in 1998.	Legally binding covenant between Government and associations representing manufacturers, distributors and farmers.
Organisation	Established by crop protection association. Distributors' sites are used as collection points (Sept-Nov). Farmers are required to triple-rinse packs, and are charged for non-rinsed packs (the latter introduced in 2001).	Established by crop protection association. Distributors' sites are used as collection points. Farmers are required to triple-rinse packs.	Established by crop protection association and distributors. A company was formed to operate the scheme. Distributors' sites are used as collection points (two to three times a year). Farmers deposit packs that have been emptied, triple-rinsed, and the caps removed. Unclean packs are rejected.	The covenant led to the formation of a private company to operate the scheme. Municipal waste sites (operated by local authorities) are used as collection points. Farmers are able to deposit packs that have been triple-rinsed (according to legally binding guidance).
Scope and coverage	Primary pesticide packs only. Nationwide: 302 collection points.	Primary packs and unused pesticides. Nationwide: 1,000 collection points.	Primary pesticide packs only. Nationwide: 168 collection points.	Primary packs and unused pesticides. Nationwide.
Financing	Product levy. Farmers charged for non-rinsed packs (see above).	Product levy.	Product levy.	Direct charge to farmers (higher if packs are unrinsed).
Recovery methods	Combination of incineration with energy recovery and use as a fuel in cement and steel industries.	Combination of incineration with energy recovery and use as a fuel in cement and steel industries.	Combination of incineration with energy recovery and use as a fuel in cement and steel industries.	Combination of recycling and energy recovery.
Recovery rate	83.7 per cent in 1998 (483 tonnes).	Target of 10 per cent in 2001; to be increased to 50 per cent.	50 per cent in 2000.	No data available.

5.3 Plastic film recovery schemes

The recovery of waste silage and horticultural films has been focused on by many Member States. Several have attempted recovery schemes in the past and found them to be unsuccessful due to 'free riders' (as experienced by the previous UK Farm Film Producers' Group scheme, see Box 8 in Section 2.3) and low farmer awareness.

Three Member States have introduced national legislation requiring manufacturers and importers of agricultural films to arrange recovery; these include the Netherlands (in 1996), the Republic of Ireland (in 1997) and France (in January 2001). In Belgium, legislation has been drafted in Wallone, one of the three regions of the country. In Italy, there is national legislation requiring producers and converters of polyethylene products to form a consortium for waste recovery (Article 48 of the Ronchi Decree 1997). Under this legislation, farmers are obliged to transfer their waste films to the consortium; however, in reality, although the consortium (Polieco) has been established, it is not yet operational. As at mid-2000, no polyethylene producer had joined the consortium, and petitions had been submitted to the Italian Government by polyethylene producers and the association of recyclers.

National schemes for the recovery of waste agricultural films currently exist in the Republic of Ireland and the Netherlands. A comparison of these schemes is presented in Table 8 overleaf. Both operate under legislation. The Irish scheme is financed via a levy paid by manufacturers and importers, and added to the price of the product. The Dutch scheme is also financed via a product levy, but this does not cover collection from farm (as it does in Ireland); Dutch farmers requesting waste film collection (rather than delivering it to a central collection point) must pay an additional charge.

Both the Irish and Dutch schemes have proved successful to date. Farmer awareness campaigns have played an essential part. In addition, in Ireland, participation in the film recovery scheme is a requirement under one of the agri-environment schemes.

Despite their success, however, free riders still remain a concern for the operators of the Irish and Dutch film recovery schemes. For example, in Ireland there have been problems with the illegal importing of film from Northern Ireland (undercutting the price of films). In response to this problem, expansion of the scheme to Northern Ireland is under consideration.

In France, a decree on the collection, re-use and recovery of farm films was introduced in January 2001, following discussions between the Government and the Committee de Plastic Agriculture. This states that from 1 July 2002:

- manufacturers and importers of film must ensure that waste film is collected and recovered;
- distributors must make provision for the collection of waste film near to its point of sale, and organise publicity for the service;
- all parties (that is, manufacturers, distributors and farmers) must aim to reduce both the quantity of waste produced and its environmental impact.

Table 8 - Comparison of film recovery schemes in Ireland and the Netherlands

	Ireland	Netherlands
Start date	1997	1995
Driver	*Waste Management (Farm Plastics) Regulations 1997*. These require manufacturers and importers either to operate a deposit and refund scheme or participate in an approved recovery scheme.	*Decree on the Disposal of Agricultural and Horticultural Films 1996*. This requires manufacturers and importers to ensure that the waste film is collected and recovered. It replaced an earlier covenant between the Government and the plastics and farmers' associations.
Organisation	There is only one approved recovery scheme operated by the Farm Film Producers' Group (part of Repak, the packaging recovery organisation). A contractor, Farm Relief Services, collects the film from farms and transports it to one of 13 main collection points. Farmers telephone the service when they have sufficient quantity of film (min of 200kg) between March and November.	Operated by the Folined Foundation, an organisation established in 1995 by the film manufacturers, recyclers and farmers' association. Film is either delivered by farmers to central collection points or collected from farms (once a year between April and June). However, if collected from farm, the collection costs have to be paid by the farmer (see below).
Scope and coverage	Silage films only. Nationwide.	Principally silage films, but plans to start collecting horticultural films in late 2001. Nationwide.
Financing	Manufacturers and importers pay a fee of £100 per tonne and add this to the price of the product. There is no additional charge for farmers.	Manufacturers and importers pay a fee of approximately £50 per tonne and add this to the price of the product. This fee covers operating and processing costs but, it does not cover collection from farms. If collected from farm, the farmer is charged for the collection (and the charge varies depending on whether the film is 'broom cleaned').
Recovery methods	Recycled at the British Polythene Industries' plant in Dumfries, Scotland.	Recycled.
Recovery rate	27 per cent in 1999 (3,773 tonnes). Estimated recovery for 2000/2001 is 40-50 per cent (6-7,000 tonnes). Total of 6,500 farms participating.	Estimated to be 30-40 per cent in 2000.

Small-scale localised schemes for the recovery of silage and/or horticultural films exist in several other Member States, including Austria, Belgium, Germany, Portugal, Spain and Sweden. These are generally operated by film manufacturers. For example:

- in Austria, there are a number of schemes operated by film manufacturers in the west of the country. These recover approximately 3,000 tonnes of the total of 20,000 tonnes placed on the market each year. Farmers pay a fee to deposit their waste film at collection points on distributors' premises;
- in Germany, it has been reported that at least two or three film manufacturers operate their own film recycling plants and collect waste film via distributors' premises. Farmers are charged, but the charge varies depending on the degree of contamination;
- in the region of Andalusia in Spain, there are at least five plants for recycling horticultural film and a high level of recovery (due to the substantial quantities of film used in this region).

In Belgium, there are small-scale schemes operated by sugar beet processing companies. For example, one company, Raffierie Tirlemontoise, provides new film free of charge to its suppliers (farmers) and operates a waste film collection centre on its premises once a year (typically in January). Approximately 50 per cent of the film supplied is normally recovered. Film that is clean enough to be recycled is collected by a local recycling plant (producing car bumpers). Heavily contaminated film is collected by a waste management company for incineration with energy recovery.

In Sweden, an agricultural co-operative has developed arrangements to recover waste films and packaging in some regions (as mentioned in 5.2) - both collecting from farms and using collection points on the co-operative's premises. These regional schemes are experiencing difficulties however, and are currently being reviewed in consultation with the Swedish Government.

5.4 Use of municipal waste collection facilities

The use of municipal waste collection facilities is a recognised waste transfer route for farmers in several Member States. The facilities utilised are generally provided for householders and small commercial/industrial organisations; farmers are included in the latter category. For example:

- in Denmark, farmers transport waste to designated collection centres and pay an annual 'tax', the level of which varies according to the waste type and quantity;
- in Belgium and Germany (where national schemes for pesticide packaging recovery exist), farmers are also able to utilise municipal sites; they are typically charged for this, but practices are reported to vary between regions;
- in the Netherlands (which has national schemes for pesticide packaging and film recovery), municipal sites are used for the collection of pesticide packaging (see 5.2) and farmers are also able to use these sites for depositing other non-natural wastes;

- in Sweden (where localised schemes for packaging and film waste recovery exist), the use of municipal sites is considered to be the most common route for non-natural agricultural waste; farmers are charged a fee depending on the waste type and quantity (for example, the equivalent of 8-16 pence/kg for waste silage plastic).

Collection of agricultural waste from farms by local authorities does not appear to be common, although it has been reported in Belgium that some farmers may establish formal contracts with local authorities. This is likely to be associated with large farming enterprises.

Inclusion of a certain amount of agricultural waste in the household waste stream is also considered likely in several Member States (particularly on small farming enterprises).

5.5 Incentives and awareness programmes

It is widely recognised that farmer awareness and motivation are critical to agricultural waste management systems. As discussed in 5.2 and 5.3, ongoing farmer awareness campaigns play a central role in the existing recovery schemes for waste pesticide packaging and plastic films in Belgium, the Netherlands, Germany, the Republic of Ireland and France. These campaigns typically include mailings, articles in agricultural journals, media coverage and exhibitions at agricultural shows. In addition, incentives for farmers to reduce waste (particularly hazardous waste) are generally built into the waste recovery schemes. For example:

- under the pesticide packaging recovery schemes in Belgium and the Netherlands, farmers are charged for non-rinsed packaging (whereas for triple-rinsed packaging there is no charge) and in Germany, non-rinsed packaging is rejected;
- under the Dutch waste film recovery scheme, the charge for collection from farm varies depending on whether the film has been cleaned.

Specific government initiatives to provide incentives for farmers and raise their awareness appear to be limited (although contact with government organisations has not been made during this project), but it is worth noting that:

- in the Republic of Ireland, waste management is included as one of 12 measures under the Rural Environmental Protection (REP) Scheme (an agri-environment scheme) this measure is to “maintain and improve the visual appearance of the farm” and states that plastic films should be re-used where possible, collected and stored after use, then transferred to a waste recovery scheme;
- in Finland, the Government has stated specific actions in its National Waste Plan, including (1) the wide dissemination of advice and information on waste issues to farmers (2) development of voluntary environmental management schemes (3) provision of guidelines on unrecovered manure and (4) development of waste management in rural areas.

In Sweden, the national farmers' association has established a best practice scheme, known as 'Eco-audit', which requires participating farmers to comply with applicable best practice standards, including standards on waste management. The scheme is based on a questionnaire of 250 questions, and farmers are required to prepare a farm plan to state how they intend to meet the standards. Written guidance is provided, and during 1995-98 the farmers' association funded an advisory service to kick-start the scheme. To date, the Eco-audit scheme has proved very successful in Sweden; approximately 50 per cent of farmers participate (accounting for 90 per cent of production) and many Swedish food companies now stipulate compliance with the scheme as a condition of purchase (the effect of the latter is particularly notable in the dairy sector where more than 95 per cent of all farms participate in the scheme).

6. Recommended strategy for the UK

The clear conclusion from the information in Sections 2 to 5 of this report is that concerted effort is needed to achieve sustainable agricultural waste management in the UK. This section presents the Project Team's recommendations for a national strategy. Developed following extensive consultation with stakeholders, these recommendations are based on recognition of the need for:

- strong leadership and vision;
- clear and agreed underlying principles;
- co-ordinated action planning and implementation;
- systems for monitoring progress.

A summary is provided in Box 13.

6.1 Leadership and vision

Recommendation 1: ***The Government should facilitate the development of a national agricultural waste strategy. This should include a vision of an integrated, sustainable system based on stakeholder partnership and be applicable to all sizes and types of farms throughout the UK.***

Given the range of stakeholders and the level of change needed in agricultural waste management, strong leadership is essential to gain consensus and drive progress.

The Government should lead the development of a national strategy, in collaboration with the Devolved Administrations, since a broad and balanced view is needed. Moreover, the issues associated with agricultural waste management are closely linked not only with the proposed regulations to implement the *Framework Directive on Waste,* but also with the Government's wider strategies and plans for agriculture, rural development and waste management.

To facilitate the process, the Government should issue the Consultation Paper on the proposed regulations as soon as possible. The next task should be to develop a clear vision for agricultural waste management in consultation with stakeholders. Consideration should be given to:

- the unique characteristics of the agricultural industry, and the ongoing difficulties and changes occurring in the sector;
- the risks and opportunities associated with agricultural waste management;
- the potential barriers to sustainable waste management (described in 4.2);
- the critical roles of the various stakeholders;
- regional differences;
- practices in other EU Member States;
- the overall views and needs of stakeholders.

Box 13 - Summary of recommendations

Leadership and vision

1. The Government should facilitate the development of a national agricultural waste strategy. This should include a vision of an integrated, sustainable system based on stakeholder partnership and be applicable to all sizes and types of farms throughout the UK.

Underlying principles

2. Stakeholder partnership: A National Stakeholder Forum should be established to stimulate the formation of a strong stakeholder partnership and develop practical and effective action plans. The long-term role (if any) of the Forum should be reviewed at a later date.

3. Integration of related strategies: The various Government departments and agencies dealing with strategies for waste management, agriculture and rural development should co-ordinate their efforts to identify (1) common objectives and (2) the best means to facilitate progress.

4. Emphasis on waste reduction: Continuous efforts should be made to identify and encourage opportunities to reduce waste through improved product design and farming practices.

5. Practical, cost-effective arrangements for waste collection: Further research should be conducted to determine the feasibility of combining (1) use of local authority waste collection facilities, (2) large-scale scheme(s) for plastic packaging and film recovery, and (3) direct take-back by suppliers of certain wastes. One-off schemes for the recovery of stockpiled materials (such as scrap metal, tyres and asbestos) are also recommended.

6. Agreed role of on-farm management options: A code of practice covering on-farm options for waste management should be established (recognising the time needed to establish waste collection infrastructure), and further R&D should be conducted.

7. Co-ordinated R&D: R&D should be co-ordinated to improve information on waste arisings and management options, and help overcome the barriers identified in 4.2 of this report (such as high logistics costs and poor markets for secondary materials).

8. Effective communication: A comprehensive communication strategy should be developed by the proposed National Stakeholder Forum (to raise awareness and motivate all stakeholders).

Action planning and implementation

9. The proposed National Stakeholder Forum should develop detailed short- and long-term action plans. Consideration should be given to the diversity of farms in the UK and the time needed to develop infrastructure and change attitudes.

10. Implementation of the practical arrangements for agricultural waste management should be conducted at regional level to take account of regional/local differences. Agricultural waste management should be integrated into existing decision-making frameworks, for example, the waste planning system and regional strategies.

Monitoring progress

11. In the short term, the proposed National Stakeholder Forum should monitor progress. For the longer term, key performance indicators for agricultural waste management should be integrated into the systems developed by Government departments and agencies to monitor various aspects of sustainable development.

6.2 Underlying principles

To be effective, some fundamental principles must underpin the strategy, including:

- stakeholder partnership;
- integration of related strategies;
- emphasis on waste reduction;
- practical, cost-effective arrangements for waste collection;
- agreed role of on-farm management options;
- co-ordinated R&D;
- effective communication.

Recommendations for each are presented and discussed in 6.2.1 to 6.2.7 respectively.

6.2.1 Stakeholder partnership

Recommendation 2: A National Stakeholder Forum should be established to stimulate the development of a strong stakeholder partnership and develop practical and effective action plans. The long-term role (if any) of the Forum should be reviewed at a later date.

The co-operation of all stakeholders (at national, regional and local levels) is essential for success. Key stakeholders include farmers, input manufacturers, distributors, merchants, vets, engineers, waste management companies, Government departments, local authorities and Government agencies. The whole range is shown in Figure 1, on Page 3.

In recent years, many of these stakeholders have been addressing agricultural waste management issues (examples are shown in Box 14), but there has been limited co-ordination of activities.

Based on the experience of other EU Member States such as the Netherlands, Germany and France, the development of a strong stakeholder partnership at a national-level is key to stimulating and driving progress. The formation of a National Stakeholder Forum is therefore recommended.

To ensure success of the proposed National Stakeholder Forum, it will need strong leadership, the involvement of representatives of all key stakeholder groups, and clear and agreed objectives. The recommended objectives of the Forum include:

- agreeing the strategy and the roles of each stakeholder group (see Table 9);
- developing detailed action plans (with clear priorities and timescales);
- steering communications to regional and local stakeholders;
- identifying mechanisms to monitor progress and measure success.

The long-term role (if any) of the Forum should be reviewed at a later date.

Box 14 - Examples of stakeholders' activities

- Representatives of the ***input supply sectors,*** including the Crop Protection Association, UK Agricultural Supply Trade Association (UKASTA), Fertiliser Manufacturers' Association, National Office of Animal Health and the European Adjuvant Association, together with representatives of the NFU, have met regularly since 1998 to discuss the reduction and recovery of packaging waste. Activities have included promoting best practices for cleaning pesticide containers, and a study on the feasibility of packaging recovery (including a large trial in the north west of England in 1999).

- The ***European Crop Protection Association*** has developed a documented 'Container Management Strategy' (updated in 2000).

- Since the ***UK Farm Film Producers Group*** scheme ceased in 1997, members of the Group have continued to lobby Government for producer responsibility legislation to overcome the 'free rider' problem and enable the re-establishment of a national scheme. In addition, members of the ***Farm Film Collectors Group*** have continued to meet on a regular basis.

- The ***National Farmers Union*** and ***Country Land and Business Association*** have developed awareness and guidance materials on specific issues in the past, and in June 2000 published articles on the implications of the proposed waste regulations in their monthly bulletins.

- The ***Environment Agency*** commissioned research to produce estimates of agricultural wastes arisings in 1998; conducted a lifecycle assessment study on waste silage film in 2000 (using the WISARD software); and has included data on agricultural waste in the *Strategic Waste Management Assessments (SWMAs)* issued in 2000.

- The ***DETR**** produced a consultation paper on the options for non-packaging plastics in 1998. More recently, the Department has been drafting the consultation paper concerning the extension of controls to agricultural waste, and leading discussions with other Government departments/agencies and the NFU. In early November 2000, the Department hosted a meeting to discuss options for waste packaging and non-packaging plastics.

- ***MAFF**** has commissioned research on waste minimisation in the past, and produced a manual entitled *Opportunities for Saving Money by Reducing Waste on Your Farm* in 1999 to encourage uptake of waste minimisation practices by farmers, followed by a number of on-farm events in 2000. MAFF has also been leading on the *Action Plan for Farming,* which refers to the proposed waste regulations.

***** *Now the Department for Environment, Food and Rural Affairs (DEFRA).*

Table 9 - Recommended roles of key stakeholders

Stakeholders	Recommended roles
Central Government	• Leading the development of an agricultural waste strategy. • Integrating the vision and objectives into Government policy and other related strategies. • Facilitating the development of a large-scale scheme for waste plastics recovery. • Identifying funds to pump-prime waste recovery schemes. • Co-ordinating R&D and communication programmes.
Farmers	• Reducing waste by improving farm management practices. • Re-using and recovering waste on farm where feasible. • Participating in any schemes for waste recovery. • Following legal requirements and any recommended practices (for example, for cleaning, segregating and storing waste).
Manufacturers/ importers	• Developing strategies for waste reduction through design. • Conducting R&D. • Participating in waste recovery schemes. • Communicating information through the supply chain.
Distributors/ merchants/ engineers/ vets	• Conducting R&D into the feasibility of waste take-back. • Establishing take-back arrangements where viable. • Participating in waste recovery schemes. • Communicating information to farmers.
Waste management companies	• Investing in reprocessing and energy recovery facilities suitable for agricultural waste. • Developing waste collection infrastructure.
Local Government	• Integrating agricultural waste into the waste planning system. • Investigating the feasibility of providing waste collection facilities/services for farmers. • Establishing facilities and/or services (as appropriate).
Environment Agency [(1)]	• Confirming waste classifications and exemption registration procedures. • Collating and disseminating information. • Monitoring and enforcing compliance.
Countryside Agency and RDAs [(1)]	• Integrating agricultural waste management into national and regional initiatives for sustainable agriculture and rural development.
NGOs [(2)] ***and research organisations***	• Providing advice and support to Government, farmers and other stakeholders.

1. Including counterparts in the devolved administrations.
2. Non-governmental organisations such as LEAF, FWAG and Wildlife Trusts.

6.2.2 Integration of related strategies

<u>Recommendation 3</u>: The various Government departments and agencies dealing with strategies for waste management, agriculture and rural development should co-ordinate their efforts to identify (1) common objectives and (2) the best means to facilitate progress.

Considerable attention is being given to waste management, agriculture and rural development in the UK, with a number of strategies and plans evolving (as discussed in 1.1). Integration is vital to achieve the vision of sustainable agricultural waste management and the wider goal of sustainable development. This requires effective communication between all of the Government departments and agencies involved in implementing these strategies at national, regional and local levels.

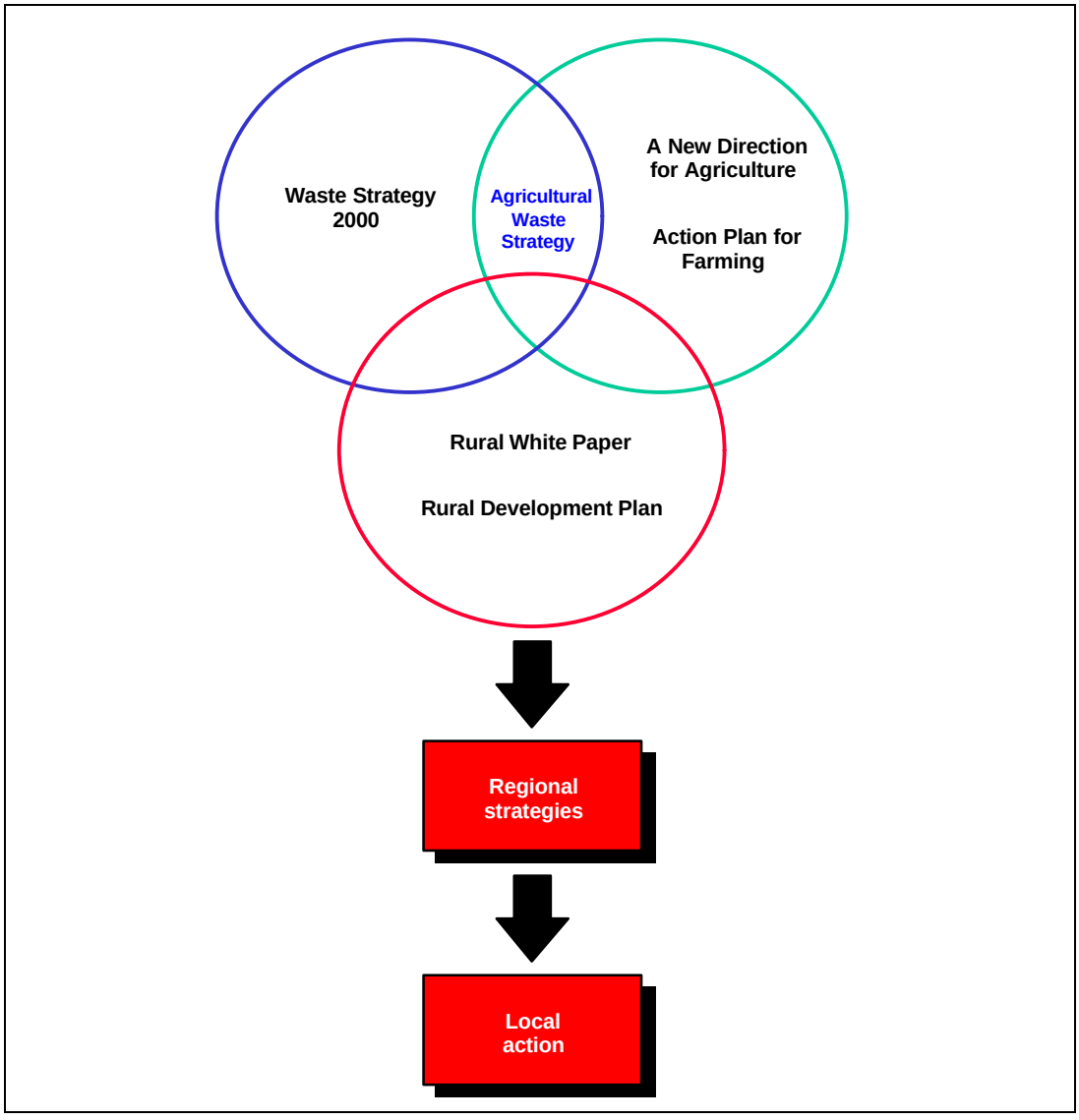


Figure 13 - Proposed integration of strategies *(1)*

(1) Based on England, but applicable to the devolved administrations.

Various initiatives are being developed (as summarised in Box 15) and many of these provide opportunities to facilitate progress, for example:

- integrating R&D needs for agricultural waste management into the *Waste and Resource Action Programme (WRAP)* and other national research programmes;
- utilising the business advice and knowledge transfer measures planned under the *Action Plan for Farming* to communicate information on waste management to farmers;
- building waste management into agri-environment schemes developed under the *Rural Development Plan*, and food assurance schemes developed by retailers (now under the NFU's 'British Farm Standard' mark);

The Government should also seek other measures to encourage sustainable agricultural waste management (directed at farmers, input manufacturers/suppliers and other key stakeholders).

Box 15 - Examples of initiatives under existing strategies and plans

Waste Strategy 2000

The *Waste and Resource Action Programme* (WRAP) is a dedicated new body (established in 2000) with objectives to develop markets and end-uses for secondary materials; promote investment in reprocessing; co-ordinate research and the dissemination of information; and provide advice and guidance. The programme is a partnership involving the DETR (now DEFRA), DTI, the private sector, the Environment Agency, and the devolved administrations. In 2000, the DETR committed funding of £25 million and the DTI another £4 million. In addition, WRAP is expected to seek funding from the private sector and through the Landfill Tax Credits Scheme.

Action Plan for Farming

A range of measures is being developed to provide advice to farmers and encourage knowledge transfer, including one-to-one farm advice by the Small Business Service through Farm Business Advisors, and launch of an electronic portal. Approximately £8 million has been allocated.

An Industry Forum met for the first time in 2000. It involves all UK agricultural departments and other departments, and representatives of the farming and food industries. The aim is to drive the plan forward.

Rural Development Plan

Under the *Action Plan for Farming*, the Government plans to publicise the *Rural Development Plan* schemes widely. £1.6 billion has been allocated to be spent over seven years for a range of schemes to protect and improve the countryside and encourage sustainable enterprise.

6.2.3 Emphasis on waste reduction

<u>Recommendation 4</u>: Continuous efforts should be made to identify and encourage opportunities to reduce waste through improved product design and farming practices.

Since waste reduction provides the greatest overall benefits, measures to encourage reduction through improved product design and farming practices should be identified and utilised.

Increasing producer responsibility legislation and evolving Integrated Product Policy (outlined in 3.2) should drive long-term improvements in product design. In the short-term, the Government should consult with each input sector (for example, fertilisers, crop protection products, animal feed and health products, and films) and establish their proposed strategies for waste reduction. Each sector should be encouraged to develop formal documented strategies, including short, and long-term action plans and clear guidelines for farmers. Some already exist, for example, the European Crop Protection Association's *Container Management Strategy*, but they are not widely known.

In addition, measures to stimulate the uptake of best practices by farmers, such as cross-compliance measures, should be identified. (*Note*: Recommendations for raising farmer awareness and facilitating the uptake of best practices are discussed in 6.2.7).

6.2.4 Practical, cost-effective arrangements for waste collection

<u>Recommendation 5</u>: Further research should be conducted to determine the feasibility of combining (1) use of local authority waste collection facilities, (2) large-scale scheme(s) for plastic packaging and film recovery, and (3) direct take-back by suppliers of certain wastes. One-off schemes for the recovery of stockpiled materials (such as scrap metal, tyres and asbestos) are also recommended.

Given the limited long-term options for on-farm waste recovery or disposal (see 4.1) and the potential barriers to off-farm waste recovery (described in 4.2), there is an urgent need to develop practical and cost-effective arrangements for waste collection. The review of practices in other EU Member States (presented in Section 5) further demonstrates this need. Very few farmers contract private waste companies directly, and widespread change in practices (that is, reduced burning/burial on farms and increased off-farm waste recovery) has only occurred where convenient, low-cost waste collection routes have been made available to farmers.

In view of this experience and the current situation in the UK, the feasibility of combining the following waste collection routes for farmers should be further investigated:

- use of local authority waste collection facilities;
- large-scale recovery scheme(s) for waste plastic packaging and films;
- direct take-back by suppliers.

The potential strengths and limitations of each route are summarised in Table 10.

Table 10 - Potential strengths and limitations of proposed collection routes for off-farm waste recovery/disposal

Collection route	Strengths	Limitations
Local authority waste collection facilities	• Utilises existing facilities (civic amenity sites). • Relatively low cost and convenient for farmers (compared with use of private waste contractors). • Appears to work well in several other Member States (see 5.4).	• Local authorities do not have a duty to collect agricultural (industrial) waste. • Existing facilities may not be equipped to handle some of the waste streams (particularly bulky and hazardous materials). • Requires development of financing arrangements and management controls.
Large-scale recovery scheme(s) for waste plastics	• Provides economy of scale for recovery of difficult/bulky waste streams. • Product levy approach enables long-term investment in infrastructure and avoids direct charge to farmers. • Provides convenient transfer route for many farmers. • Provides greater assurance of risk management for supply chain and regulators. • Provides commercial opportunities for private waste sector. • Could potentially be expanded to include all plastics and even other waste streams (if feasible). • National schemes in several other Member States have been successful (see Section 5).	• Needs support and commitment of manufacturers and distributors (no progress at present due to a variety of concerns regarding costs and risk of 'free riders' undermining the scheme(s)). • May need legislation to drive development (as shown in other countries). • No other country has combined waste packaging and films in one scheme and, therefore, may need separate schemes. • Administrative and logistical arrangements likely to take considerable time to become established. • Unlikely to achieve recovery rates above 30-50 per cent in first three to five years.
Direct take-back by suppliers	• Already in practice for some waste streams (for example, batteries, oil, tyres, machinery and veterinary products) (see 2.3). • Waste is collected during farm visits so avoiding additional transport costs and long-term storage on farms. • Least effort route for farmers. • Provides greater assurance of risk management for supply chain and regulators. • Provides economy of scale for recovery.	• Although in practice for some waste streams, not universal (estimated less than 30-50 per cent). • Extension of controls to agricultural waste could deter take-back if exclusion from waste carrier registration requirements is not confirmed. • Possible increase in supply of medicines via merchants (following a review announced in the Government's *Action Plan for Farming* in 2000) is likely to reduce take-back by vets. • Unlikely to be viable for other waste streams.

Review and comparison of the strengths and limitations listed in Table 10 show the need for a combined approach in the UK. This is the approach adopted in the Netherlands, Belgium and Germany, and the level of waste recovery appears to be relatively high in each of these countries (with environmental and financial benefits), as discussed in Section 5.

To develop this proposed approach, the support and involvement of the following stakeholders is essential:

- local authorities;
- manufacturers and distributors of silage and horticultural films and products supplied in plastic packaging;
- vets;
- agricultural engineers;
- Government;
- Environment Agency;
- farmers.

Further investigation and wider consultation concerning this combined approach are recommended in order to establish:

- the short, and long-term feasibility;
- costs and benefits compared with other approaches;
- appropriate financing arrangements.

In addition, consideration should be given to the development of **'**one-off' waste collection/recovery schemes for certain waste streams that have accumulated on many farms, for example, scrap metal, tyres from disused silage clamps and asbestos cement roof sheeting. Without such schemes, these items are likely to remain on farm creating a negative impact on the environment and a risk to human safety. The logistics and potential sources of funding should be investigated. They could possibly form part of a programme to raise farmers' awareness about waste management, and could be linked with farm diversification initiatives.

6.2.5 Agreed role of on-farm management options

Recommendation 6: A code of practice covering on-farm options for waste management should be established (recognising the time needed to establish waste collection infrastructure), and further R&D should be conducted.

There appear to be limited long-term options for on-farm waste recovery or disposal (given the combination of future legal constraints and lack of cost-effective techniques), as described in Section 4. There will however, almost certainly be a need for on-farm options in the short-term (and possibly in the long-term in very remote locations). This is a practical fact bearing in mind the length of time needed to establish waste collection

infrastructure (as experienced in other EU Member States), and the structure and distribution of the UK agricultural industry. However, any on-farm options utilised must have minimal impact on the environment and human health, and meet the requirements of the *EC Framework Directive on Waste* and other applicable legislation.

To ensure that these criteria are met, there is a need for clarity on the Best Practicable Environmental Options and the legal requirements. For example, at the time of writing, it is not certain whether the 'drum incinerator' currently used on some farms (as described in 2.3) will be exempt from waste management licensing for non-hazardous waste. Therefore, we do not know whether this would be a possible option prior to implementation of the *EC Waste Incineration Directive* (discussed in 4.1).

To bring clarity, the Government should establish an interim 'code of practice' following review and consultation with stakeholders. In addition, further R&D should be conducted to investigate the long-term role of on-farm waste management options (for example, energy recovery and composting).

6.2.6 Co-ordinated R&D

***Recommendation 7*: R&D should be co-ordinated to improve information on waste arisings and management options, and help overcome the barriers identified in 4.2 of this report (such as high logistics costs and poor markets for secondary materials).**

As discussed in the Introduction to this report (1.1), there has been limited attention to non-natural agricultural waste until recently. The current project has helped to collate and improve the information, but clearly more R&D is needed, for example to:

- improve the accuracy of waste estimates;
- provide more detailed information on the cost-benefits of different management options to help determine the BPEO at a local level;
- determine the feasibility of using local authority waste collection facilities for certain waste streams in different areas of the country (as discussed in 6.2.4);
- establish the logistics and infrastructure for a possible large-scale plastics recovery scheme (discussed in 6.2.4);
- identify and develop markets for secondary materials;
- develop best practice standards and guidance (for example, on waste reduction, storage and recovery).

One of the roles of the proposed National Stakeholder Forum should be to agree the priority R&D needs and to facilitate its completion and the dissemination of results. Integration with existing R&D programmes, such as the Waste and Resource Action Programme (WRAP) and other Government and industry programmes is recommended (as mentioned in 6.2.2).

6.2.7 Effective communication

<u>Recommendation 8</u>: A comprehensive communication strategy should be developed by the proposed National Stakeholder Forum (to raise awareness and motivate all stakeholders).

The overall success of the strategy depends on effective communication. Bearing in mind the current low level of awareness and the changes needed, a comprehensive communication strategy is essential. Limited progress will be made unless farmers are aware of the requirements and are motivated to adopt new practices. In addition, early communication to a range of other stakeholders is vital to stimulate the development of local partnerships and infrastructure. Without this, practical and cost-effective options will not be available. Moreover, many of these other stakeholders will be a key source of information for farmers.

The proposed National Stakeholder Forum should develop the Communication Strategy. The following should be discussed and agreed:

- target groups, for example, farmers, input suppliers, local authorities, waste management companies, regulators and farm advisors (at national, regional and local levels);
- key messages and information needs for each group;
- the best communication channels for each group (utilising existing information systems wherever possible);
- the timing of communications (in the short-term and considering long-term information needs).

Careful consideration should be given to the best approach for communicating information to farmers. Previous research has highlighted the difficulties. Due to time pressures, farmers often ignore:

- written information except certain periodicals;
- demonstrations unless they are 'real' commercial farms;
- training opportunities unless closely linked to business implications; and
- advice unless it is face-to-face.

A strategy is therefore needed to ensure information is communicated to farmers in a way that attracts their attention and prompts rapid uptake throughout the industry. Ideally, this should be part of a wider strategy to encourage the development of 'integrated farm management plans', which translate the range of environmental standards into specific, practical advice (as recommended in the Better Regulation Task Force's report on *Environmental Regulations and Farmers*, published in November 2000). In the short-term, however, it will be important to review and consider:

- the existing routes by which farmers receive information (for example, periodicals, and discussions with suppliers, advisors and other farmers);

- the success to date of the waste minimisation manual, produced by MAFF (now the Department for Environment, Food and Rural Affairs, DEFRA) '*Opportunities for Saving Money by Reducing Waste On Your Farm'* (see Box 14 in 6.2.1);
- opportunities to integrate waste management information into the *Small Business Service* for farmers (one-to-one advice through business advisors), and the electronic portal (both part of the *Action Plan for Farming*);
- opportunities to integrate information and best practice standards into food assurance schemes;
- the awareness campaigns developed as part of waste plastic recovery schemes in other Member States (see 5.5);
- the experience of the previous UK Farm Film Producers' Group scheme and existing film recovery schemes (for example, in Wales and Cumbria).

6.3 Action planning and implementation

***Recommendation 9*: The proposed National Stakeholder Forum should develop detailed short- and long-term action plans. Consideration should be given to the diversity of farms in the UK and the time needed to develop infrastructure and change attitudes.**

The seven principles described in 6.2 should underpin the strategy, but detailed short, and long-term action plans (with specific tasks/responsibilities and realistic target dates) will be needed to put them into action. One of the principal roles of the proposed National Stakeholder Forum should be to develop these plans. Consideration should be given to the issues and recommendations discussed in 6.2 and to:

- the requirements of the proposed *Waste Management Licensing (Amendment) Regulations*, and the proposed time-scale for implementation (see 3.1);
- the key decisions and actions needed to enable progress;
- practical issues, such as the diversity of farms in the UK and the time needed to develop infrastructure and change attitudes;
- priority R&D needs.

***Recommendation 10*: Implementation of the practical arrangements for agricultural waste management should be conducted at regional level to take account of regional/local differences. Agricultural waste management should be integrated into existing decision-making frameworks, for example, the waste planning system and regional strategies.**

Wide variations exist between regions in the UK (for example, in the type and scale of farming enterprises, and the waste management infrastructure). Implementation of the practical arrangements for agricultural waste management should therefore be conducted at regional level to take account of the specific issues and priorities of each region.

A range of decision-making frameworks and partnerships exist (and are evolving) at regional and local level, and agricultural waste management should be integrated rapidly and effectively into these. Of particular relevance are:

- the waste planning system (with specific roles for Regional Planning Bodies to develop planning guidance and strategies, advised by Regional Technical Advisory Bodies, and for Waste Planning Authorities to prepare local waste plans and strategies);
- the frameworks developed by the Regional Development Agencies under their regional strategies.

Formal local partnerships for agricultural waste management should be established if and when needed.

6.4 Monitoring progress

***Recommendation 11*: In the short-term, the proposed National Stakeholder Forum should monitor progress. For the longer-term, key performance indicators for agricultural waste management should be integrated into the systems developed by Government departments and agencies to monitor various aspects of sustainable development.**

The proposed National Stakeholder Forum should meet on a regular basis during the first one to two years to track progress in implementing the action plans(1). In addition, the Forum should discuss and agree key performance indicators to measure the success of the strategy in the longer-term. These might include, for example, the quantity of non-natural waste streams and the percentage of waste recovered.

The relevant Government departments and agencies should integrate the key performance indicators into the systems developed to monitor various aspects of sustainable development (for example, under *A Better Quality of Life, Waste Strategy 2000, A New Direction for Agriculture* and the *Rural White Paper*).

(1) *The possibility of a longer-term monitoring role for the Forum should be reviewed at the end of this stage.*

Appendices

A - Consultees
B - Focus group members
C - Waste estimates and calculation methodology
D - Waste management principles
E - Methodology for assessing waste management options
F - Further information on the recovery of waste plastics
G - Key agricultural statistics for EU Member States

Appendix A - Consultees

Consultees in the UK

Manufacturers and suppliers

- ABN
- Agrichemicals (South West)
- Agricultural Engineers Association
- Agritraders
- Anaplast
- ATS Euromaster
- Aventis
- Banks Agriculture
- Bayer
- BOCM Pauls
- British Plastics Federation (BPF)
- British Polythene Industries
- British Rubber Manufacturers Assoc
- British Veterinary Association (BVA)
- Buyrite Tyres
- Cargills
- Confederation of Paper Industries
- Crop Protection Association
- Cyanamid
- Dalgety Arable
- Darts
- Dupont
- Eternit
- Exide Batteries
- Fertiliser Manufacturers Association
- Fibre Cement Manufacturers Association
- F.W. Perkins
- George Burlingham & Sons
- IAWS Fertilisers
- Iken & Oxenham Veterinary Practice
- J. Pickard & Son
- Masstock Arable
- Mole Avon
- National Packaging Council
- National Organisation of Animal Health (NOAH)
- National Tyre Association
- Plastic Industrial Films Association
- Polypen
- Procam
- Scats
- SWEB
- Timcon
- Tyre Industry Council
- UK Agricultural Supply Trade Association (UKASTA)
- Valuplast
- Varta
- Veterinary Medicines Directorate
- Westridge Veterinary Practice

Government bodies and agencies

- Cambridgeshire County Council
- Countryside Agency
- Department of the Environment,Transport and the Regions (DETR) *
- Devon County Council
- Department of Trade and Industry (DTI)
- East of England Regional Development Agency
- English Nature
- Environment Agency
- Food Standards Agency
- Forestry Commission
- Local Government Association
- Ministry of Agriculture, Fisheries and Food (MAFF)
- National Assembly for Wales
- Norfolk County Council
- Northern Ireland Department of Agriculture & Rural Development
- Scottish Environment Protection Agency (SEPA)
- Scottish Executive
- South West Regional Development Agency
- Wales Waste Policy Support Unit

Farming organisations

- Country Land & Business Association
- Horticultural Trades Association
- Independent farmers
- Large farming groups
- Machinery Ring Association
- National Farmers Union (NFU)
- National Sheep Association
- Process Vegetable Growers Association

***** *Now the Department for Environment, Food and Rural Affairs (DEFRA)*

Appendix A - Consultees (continued)

Consultees in the UK (cont.)

Non-Governmental organisations

- Composting Association
- Council for the Protection of Rural England (CPRE)
- Farming & Wildlife Advisory Group (FWAG)
- Linking the Environment & Farming (LEAF)
- Ramblers' Association
- RSPB
- Soil Association
- Bowland Initiative
- Green Business Network
- National Waste Awareness Initiative
- Recoup
- Rural Design & Building Association

Research and consulting organisations

- ADAS
- BHR Group
- Building Research Establishment
- EA Technology
- Ecobalance UK
- Ecotec
- ERM
- Institute of Grassland and Environmental Research (IGER)
- Silsoe Research Institute
- University of Exeter
- University of Hertfordshire
- University of Plymouth
- University of Reading
- University of Surrey

Waste industry

- Automotive Waste Solutions
- Biffa Waste Services
- Cleanaway
- County Environmental Services
- Difpak
- Dumfries Plastics Ltd
- Ellendale Engineering Ltd
- Environmental Services Association (ESA)
- Farm Clear
- Incineration South West
- Institute of Wastes Management (IWM)
- OSS Group
- P&M Birch
- Recoup
- Solway Recycling
- Valpak
- Viridor Waste Management
- Waste Recycling Group
- Waste Tyre Solutions

Food retail organisations

- Assured Produce Ltd
- British Retail Consortium
- Checkmate International

Appendix A - Consultees (continued)

Consultees in other countries

European organisations

- Association of Plastics Manufacturers Europe (APME)
- COPA (European agricultural organisation)
- European Adjuvants Association
- European Commission, DGXI, Waste Section
- European Commission DGXI, Legal Section
- European Crop Protection Association
- European Environment Agency
- FEAD (European waste management organisation)
- IMPEL

Austria

- Prasidentenkonferenz Der Landwirtschaftskammern Osterreichs, PK (farmers' association)
- Alstoff Recycling Austria (ARA)
- Fachverband der Chemischen Industrie Osterreichs (crop protection association)
- Fertiliser Manufacturers Association

Belgium

- Institut Bruxelles de Gestion de l'Environment
- Boerenbond (farmers' association, Flanders)
- Federation Agriculture Wallone (farmers' association, Wallone)
- Federation des Enterprises de Gestion de l'Environment (waste and environmental management association)
- Fechiplast (film manufacturers' association)
- Phytofar Recover
- Raffinerie Tirlemontoise
- European Crop Protection Association

Denmark

- Dakofa
- Waste Management Information Centre
- Danish Farmers Association
- Danish Plastics Federation

Finland

- Finnish Environment Institute
- Agricultural Research Centre

France

- ADEME
- APCA
- Chambre d'Agriculture de Bretagne
- Committee de Plastics Agriculture
- Fertiliser Manufacturers Association
- UIPP (crop protection association)

Germany

- Deutscher Bauernverband eV, DBV (farmers' association)
- Raiffeisein (agricultural co-operative)
- Industrie Verband Agrar, IVA (agrochemical and fertiliser manufacturers' association)
- Budesverband der Deutschen Entsorgungswirtschaft eV, BDE (waste management association)
- Industrieverband Verpackung und Folien aus Kunstoff eV, IK (film manufacturers' association)
- Federal Environmental Protection Agency
- Federal Ministry of Food, Agriculture and Forestry

Greece

- Confederation Panhellenique Des Unions Des Cooperatives Agricoles, Paseges (farmers' association)
- Association of Hellenic Plastics Industries
- Greek Agrochemical Association
- SEEDA (waste management association)

Appendix A - Consultees (continued)

Consultees in other countries (cont)

Ireland

- Irish Farm Films Producers Group
- Irish Farmers Association
- APHA (crop protection association)
- Repak (packaging recovery organisation)
- Department of Agriculture
- Department of Environment
- Environmental Protection Agency

Italy

- Confederazione Generale Dell Agricoltura Italiana (farmers' association)

Luxembourg

- Luxembourg Centrale Paysanne
- Administration de L'Environment
- Oeko Management

Netherlands

- Europlastecs (film recovery organisation)
- Folined Foundation (film recovery organisation)
- Land-En Tuinbouw Organistie, LTO (farmers' association)
- Monsanto
- Ministry of Housing, Spatial Planning and the Environment (VROM)
- Ministry of Agriculture, Nature Management and Fisheries
- Verenging Van Foliefabrikanten, VvF (film manufacturers association)

Portugal

- Associacao Portuguesa da Industria de Plasticos, APIP (plastic manufacturers' association)
- Confederacao Dos Agricultores De Portugal, CAP (farmers' association)
- PLASTVAL (plastic packaging recovery organisations)
- CERNE (private consultancy)

Spain

- AEPLA- Asociacion Empresarial para la Proteccion de las Plantas (crop protection association)
- Asociacion Agraria - Jovenes Agricultores (ASAJA)- Andalucia (farmers' association)
- Asociacion Agraria - Jovenes Agricultores (ASAJA) (farmers' association)
- Coordinadora De Organizaciones De Agricultores Y Ganaderos - Iniciativa Rural (COAG-IR) (farmers' association)

Sweden

- Institute of Agricultural and Environmental Engineering
- Lantmannen (agricultural co-operative)
- Lantbru Karnas Riksforbund, LRF (farmers' association)
- Ministry of Agriculture
- REPA (packaging recovery organisation)
- Svenska Renhallingsverkforeningen, RVF (waste management association)
- Swedish Environmental Protection Agency

Canada and the United States

- Alberta Environmental Department
- Crop Protection Institute
- Dow Agrosciences
- Saskatchewan Environment and Resource Management

Australia

- Avcare Programme
- McGuffog & Co

Appendix B - Focus Group Members

St Neots Meeting (19 June 2000)

- Peter Squire, Bassmead Manor Farm
- William Ward, Brook End Farm
- Neil Brodie, Manor Farm
- Paul Stevens, John Sheard Farm
- Martin Keightley, Banks Agriculture
- Rob Chaddock, Waste Recycling Group
- Dave Foster, Cleanaway
- Marilyn and Peter Birch, P. & M. Birch
- John Terry, Norfolk Arable Land Management Initiative
- Clem Davies, BDB Associates
- Sara Bragg, Marcus Hodges Environment
- Ian Panton, BDB Associates

Exeter Meeting (21 June 2000)

- Henry Gent, Moss Hayne Farm
- Maurice Retallick, Bagtor Lodge
- David Plummer, Mole Valley Farmers Ltd
- Andrew Farley, Agrichemicals (South West)
- Jeff Marston, ABN
- Simon Steele-Perkins, Viridor Waste Management
- Steve Scott, independent contractor
- Sue Penaluna, Devon County Council
- Alan Venner, Husseys
- Dick Sibley, Westridge Veterinary Practice
- Clem Davies, BDB Associates
- Sara Bragg, Marcus Hodges Environment
- Ian Panton, BDB Associates

Appendix C - Waste Estimates and Calculation Methodology

The estimates of agricultural waste arisings shown on the following pages have been generated using a methodology first developed by the Project Team in 1998 under contract to the Environment Agency. During the course of the current project, the methodology has been reviewed and modified, and additional waste streams have been included.

The estimates are based on information obtained through extensive consultation. More than 200 individuals have been contacted during the course of this, and the previous, project.

The methodology has three key stages:

1. Development of a 'unit waste estimate' (an estimation of the quantity of a specific waste material generated per head of livestock or per hectare of cropping).

2. Generation of regional estimates by multiplying the unit waste estimates by MAFF Census Results.

3. Assessment of accuracy level.

1. Development of unit waste estimates

The unit waste estimates have been generated by using a combination of a mass balance approach and a 'bottom-up' farm-practice approach (in consultation with the numerous individuals and organisations contacted).

The mass balance approach to generating estimates is based on the assumption that the mass of materials supplied to the agricultural sector arise as wastes. For example, the estimate of silage plastic waste has been calculated by assuming that the quantity of silage plastic supplied to the agricultural sector subsequently arises as waste. In this case, an estimate of the quantity of associated contamination that the plastic may accumulate during use has also been included.

The farm-practice approach is based upon an estimation of the typical quantities of materials used on individual farms which subsequently become wastes. For example, the estimation of the quantities of used syringes has been based upon an assessment of typical farm practice with regard to the administration of animal-health products.

2. Generation of regional estimates

The unit waste estimates were applied to the June 1998 Agricultural and Horticultural Census Results to calculate estimates of waste arisings for each planning region in England, and for Wales, Scotland and Northern Ireland. The 1998 Census data is the most recent comprehensive set of statistics on UK agriculture and horticulture. The calculations for the estimates have been established in a set of more than 40 Excel worksheets.

Appendix C (continued)

3. Assessment of accuracy level

It should be appreciated that the figures presented are *estimates* and that the limited precision and availability of some of the data means that the accuracy of the final estimates cannot be guaranteed. To put this in context, an assessment of the likely accuracy of the estimates was undertaken. For each waste arising, a qualitative confidence level was determined for both the original data and the calculations, and was defined as either 'High', 'Medium' or 'Low'. Based on these confidence levels, an overall assessment of the accuracy of the final estimates was made. This is shown in the tables of estimates included on the following pages.

Appendix C (continued)

Estimates of agricultural waste arisings[1]: 1998 (tonnes per year)

Type	*Accuracy[2]*	England	Wales	Scotland	Northern Ireland	UK total
Packaging						
Plastic						
Agrochemical Packaging	*Medium*	1,720	30	276	374	2,400
Fertiliser Bags	*Medium*	8,748	984	1,654	815	12,200
Seed Bags	*Medium*	840	15	134	12	1,000
Animal Feed Bags [3]	*Medium*	6,419	1,283	2,019	1,680	11,400
Animal Health Packaging	*Medium*	444	105	124	76	750
Oil Containers	*Low*	501	47	84	38	669
Miscellaneous Packaging	*Medium*	2,063	331	1,166	240	3,800
Total Plastic Packaging		***20,734***	***2,794***	***5,457***	***3,235***	***32,219***
Cardboard & Paper						
Agrochemical Packaging	*Medium*	1,146	20	184	249	1,600
Animal Health Packaging	*Medium*	148	35	41	25	250
Animal Feed Bags	*Medium*	3,378	675	1,063	884	6,000
Seed Bags	*Medium*	1,511	26	240	22	1,800
Silage Wrap Boxes	*Medium*	156	75	73	31	335
Total Paper and Card Packaging		*6,340*	*832*	*1,601*	*1,212*	*9,985*
Metal, Wood, Glass & Rubber						
Animal Health	*Medium*	5.9	1.4	1.7	1.0	10
Metal & Rubber (inc. sheep dip containers)						
Animal Health Glass	*Medium*	444	105	124	76	750
Oil Drums	*Low*	873	81	147	66	1,166
Wooden Pallets	*Low*	16	2.1	4.2	2.7	25
Total metal, wood, glass & rubber		*1,339*	*190*	*277*	*145*	*1,951*
Total Packaging		***28,413***	***3,817***	***7,335***	***4,592***	***44,156***
Non-Packaging Plastics						
Films						
Silage Plastic	*Medium*	12,425	5,016	5,029	2,530	25,000
Silage Plastic + Contamination	*Low*	24,851	10,032	10,058	5,060	50,000
Greenhouse and Tunnel Film	*Medium*	242	4.9	6.1	5.5	500
Mulch Film and Crop Cover	*Medium*	3,738	30	657	76	4,500
Mulch Film and Crop Cover + Contamination	*Low*	18,689	148	3,283	380	22,500
Total Films		*16,405*	*5,050*	*5,692*	*2,611*	*30,000*
Total Films + Contamination		*43,782*	*10,184*	*13,347*	*5,445*	*73,000*
Other Non-Packaging Plastics						
Silage Wrap Cores	*Medium*	703	339	327	138	1,506
Other Horticultural Plastics	*Low*	5,617	114	143	127	6,000
Bale Twine and Net Wrap	*Medium*	7,934	821	1,683	662	11,100
Tree Guards	*Medium*	6,694	532	4,492	182	11,900
Total Non-Packaging Plastics		*37,353*	*6,856*	*12,336*	*3,721*	*60,506*
Total Non-Packaging Plastics (including contamination)		*64,729*	*11,990*	*19,991*	*6,554*	*103,506*
Non-Packaging Cardboard						
Silage Sheet Cores	*Low*	542	122	146	118	929
Agrochemicals						
Pesticide Washings	*Low*	72,070	4,784	23,506	4,189	104,549
Animal Health Products						
Sheep Dip	*Low*	56,537	23,598	27,959	8,360	116,454
Used syringes	*Low*	31	5	5	5	46
Machinery Waste						
Oils [4]	*Low*	20,272	1,893	3,406	1,524	27,095
Batteries	*Low*	2,228	222	362	see Note 5	2,812
Tyres	*Low*	20,680	1,981	3,312	see Note 5	25,974
Redundant Vehicles and Machinery	*Low*	18,573	1,637	3,102	see Note 5	23,312
Equipment Containing CFCs	*Low*	10	1.7	1.4	1.8	15
Construction and Demolition Waste						
Asbestos Cement Bonded Roof Sheeting	*Low*	18,243	2,925	10,312	2,122	33,602

Notes:

1. This does not include estimates for several known waste arisings, such as veterinary medicines/dressings due to a lack of reliable data.

2. See details of the accuracy assessment methodology at the beginning of this appendix.
3. Includes stretch wrap used to cover bags delivered on pallets.
4. EA conversion factor of 0.85 used for converting cu.m into tonnes.
5. Data not available at present to derive estimates of machinery waste for Northern Ireland.

Appendix C (continued)

Estimates of agricultural waste arising in the planning regions of England [(1)]: 1998 (tonnes per year)

Type	*Accuracy*[(2)]	North West	North East	Yorkshire & The Humber	East Midlands	East of England	West Midlands	South East	Greater London	South West
Packaging										
Plastic										
Agrochemical Packaging	*Medium*	44	68	223	317	452	159	239	2.1	215
Fertiliser Bags	*Medium*	642	408	1,053	1,357	1,691	941	1,100	11	1,545
Seed Bags	*Medium*	21	33	109	155	221	78	116	1.0	105
Animal Feed Bags [(3)]	*Medium*	1,071	329	721	591	356	843	574	6.3	1,926
Animal Health Packaging	*Medium*	60	27	81	41	52	50	39	0.4	96
Oil Containers	*Low*	40	20	64	73	92	54	65	0.7	91
Miscellaneous Packaging	*Medium*	200	129	244	276	329	213	266	3.0	402
Total Plastic Packaging		2,079	1,015	2,495	2,810	3,193	2,339	2,401	24	4,379
Cardboard and Paper										
Agrochemical Packaging	*Medium*	30	46	148	211	301	106	159	1.4	143
Animal Health Packaging	*Medium*	20	8.8	27	14	17	17	13	0.1	32
Animal Feed Bags	*Medium*	564	173	380	311	187	444	302	3.3	1,014
Seed Bags	*Medium*	39	60	196	279	398	140	209	1.8	189
Silage Wrap Boxes	*Medium*	29	16	19	13	5	22	14	0.1	38
Total Paper and Card Packaging		681	304	770	827	909	729	698	6.8	1,415
Metal, Wood, Glass and Rubber										
Animal Health Metal and Rubber (inc. sheep-dip containers)	*Medium*	0.8	0.4	1.1	0.5	0.7	0.7	0.5	0.01	1.3
Animal Health Glass	*Medium*	60	27	81	41	52	50	39	0.4	96
Oil Drums	*Low*	69	35	112	128	161	95	113	1.2	159
Wooden Pallets	*Low*	1.7	0.8	1.9	2.1	2.4	1.8	1.8	0.02	3.5
Total metal, wood, glass & rubber		131	63	195	171	216	147	155	1.6	259
Total Packaging		2,891	1,381	3,460	3,808	4,317	3,214	3,254	33	6,054
Non-Packaging Plastics										
Films										
Silage Plastic	*Medium*	2,368	1,049	1,388	1,015	401	1,763	1,106	8.4	3,327
Silage Plastic + Contamination	*Low*	4,737	2,099	2,775	2,029	802	3,526	2,212	17	6,654
Greenhouse and Tunnel Film	*Medium*	31	2.3	33	22	46	21	60	2.3	25
Mulch Film and Crop Cover	*Medium*	328	23	224	1,173	1,180	231	359	17	202
Mulch Film and Crop Cover + Contamination	*Low*	1,638	117	1,122	5,867	5,900	1,157	1,795	86	1,008
Total Films		2,727	1,075	1,644	2,210	1,627	2,016	1,525	28	3,554
Total Films + Contamination		6,405	2,218	3,929	7,918	6,748	4,704	4,066	105	7,687
Other Non-Packaging Plastics										
Silage Wrap Cores	*Medium*	132	71	84	58	22	100	63	0.4	172
Other Horticultural Plastics	*Low*	719	53	759	502	1,063	497	1,383	53	587
Bale Twine and Net Wrap	*Medium*	542	395	988	1,209	1,519	833	1,032	10	1,406
Tree Guards	*Medium*	294	283	621	825	1,477	604	1,411	14	1,165

Total Non-Packaging Plastics	4,414	1,877	4,096	4,804	5,708	4,051	5,414	105	6,884
Total Non-Packaging Plastics (including contamination)	8,092	3,020	6,381	10,512	10,829	6,739	7,956	182	11,018

Appendix C (continued)

Estimates of agricultural waste arisings in the planning regions of England [(1)]: 1998 (tonnes per year)

Type	*Accuracy*[(2)]	North West	North East	Yorkshire & The Humber	East Midlands	East of England	West Midlands	South East	Greater London	South West
Non-Packaging Cardboard										
Silage Sheet Cores	*Low*	106	25	51	44	18	76	47	0.5	174
Agrochemicals										
Pesticide Washings	*Low*	3,084	2,265	7,098	9,489	15,040	8,332	14,961	90	11,711
Animal Health Products										
Sheep Dip	*Low*	11,210	6,569	7,273	4,487	1,404	8,306	5,013	12	12,262
Used syringes	*Low*	5.1	0.8	3.6	3.0	2.5	3.8	2.8	0.03	9
Machinery Waste										
Oils [(4)]	*Low*	1,609	820	2,593	2,970	3,740	2,201	2,627	27	3,685
Batteries	*Low*	225	88	272	325	273	241	365	16	423
Tyres	*Low*	2,135	821	2,495	2,904	3,520	2,215	2,638	186	3,767
Redundant Machinery	*Low*	2,115	738	2,408	2,352	3,179	1,980	2,658	195	2,949
Equipment Containing CFCs	*Low*	2.2	0.2	0.8	0.8	0.3	1.5	0.8	0.01	3.7
Construction & Demolition Waste										
Asbestos Cement Bonded Roof Sheeting	*Low*	1,768	1,140	2,160	2,441	2,913	1,887	2,352	26	3,556

Notes:

1. *This does not include estimates for several known waste arisings, such as veterinary medicines/dressings and unused pesticides, due to a lack of reliable data.*
2. *See details of the accuracy assessment methodology at the beginning of this appendix.*
3. *Includes stretch wrap used to cover bags delivered on pallets.*
4. *EA conversion factor of 0.85 used for converting cu.m into tonnes.*
5. *Data not available at present to derive estimates of machinery waste for Northern Ireland.*

Appendix C (continued)

Estimates of organic and animal by-products: 1998 (tonnes per year)

Type	*Accuracy*[1]	England	Wales	Scotland	Northern Ireland	UK Total
Organic By-Products/Wastes						
Slurry and FYM	*High*	51,031,199	8,242,571	11,167,791	11,035,187	81,476,748
Silage Effluent	*Low*	748,659	215,305	289,419	252,679	1,506,061
Waste Milk [2]	*Medium*	15,908	2,678	2,704	2,704	23,993
Vegetable and Cereal Residues	*Low*	849,054	21,390	175,865	45,675	1,091,984
Straw (ploughed in or cultivated)	*Medium*	1,922,820	31,531	290,344	38,758	2,283,453
Straw (baled and removed)	*Medium*	7,411,258	121,534	1,119,093	149,387	8,801,271
Animal By-Products						
Animal Carcasses	*Medium*	126,288	39,108	40,385	26,004	231,785
Animal Tissue	*Medium*	55,490	20,089	23,404	12,989	111,972

Notes:
1. *See details of the accuracy assessment methodology at the beginning of this appendix.*
2. *EA conversion factor of 1.03 used for converting cu.m into tonnes.*

Estimates of organic and animal by-products in the planning regions of England: 1998 (tonnes per year)

Type	*Accuracy*[1]	North West	North East	Yorkshire & The Humber	East Midlands	East of England	West Midlands	South East	Greater London	South West
Organic By-Products/Wastes										
Slurry and FYM	*High*	7,758,644	1,975,930	6,865,230	4,772,479	4,648,755	6,394,291	4,566,313	53,322	13,996,235
Silage Effluent	*Low*	211,189	16,318	34,286	30,477	13,416	52,161	32,520	398	357,893
Waste Milk [2]	*Medium*	3,437	281	1,308	1,207	433	2,308	1,291	15	5,628
Vegetable and Cereal Residues	*Low*	57,550	20,039	135,227	151,925	242,753	123,773	52,208	313	65,265
Straw (ploughed in or cultivated)	*Medium*	47,513	84,125	262,036	354,961	496,136	177,137	265,579	2,041	233,291
Straw (baled and removed)	*Medium*	183,134	324,249	1,009,984	1,368,151	1,912,292	682,749	1,023,639	7,868	899,190
Animal By-Products										
Animal Carcasses	*Medium*	18,246	7,655	17,577	12,712	12,051	16,339	11,571	87	30,049
Animal Tissue	*Medium*	9,955	5,164	6,683	5,101	1,910	7,693	4,966	32	13,986

Notes:
1. See details of the accuracy assessment methodology at the beginning of this appendix.
2. *EA conversion factor of 1.03 used for converting cu.m into tonnes.*

Appendix D - Waste Management Principles

Sustainable waste management
Sustainable waste management means using resources efficiently to cut down on the amount of waste produced and, where waste is generated, dealing with it in a way that contributes to the economic, social and environmental goals of sustainable development.

Best Practicable Environmental Option (BPEO)
The best practicable environmental option (BPEO) was first defined in 1976 in the 12th Report of the Royal Commission on Environmental Pollution as "*the outcome of a systematic and consultative decision-making procedure which emphasises the protection and conservation of the environment across land, air and water. The BPEO procedure establishes, for a given set of objectives, the option that provides the most benefits or the least damage to the environment as a whole, at acceptable cost, in the long term as well as in the short term*".

Waste hierarchy
The waste hierarchy is a conceptual framework that should be used as a guide when assessing the BPEO. It provides an order to consider various waste management options:

- ***reduction*** in the generation of waste, and the hazards associated with the waste;
- ***re-use*** of materials for the same or a different purpose;
- ***recovery*** of value from the waste through recycling, composting or energy recovery;
- ***disposal*** only being considered if none of the other options is appropriate.

Proximity principle
The proximity principle means that waste should be treated or disposed of as near as possible to the point where it arises. It recognises that the transportation of waste can have a significant environmental impact, and it makes the link between the waste hierarchy and the BPEO. Where the BPEO for a particular waste stream is towards the lower end of the waste hierarchy, this can often be because the environmental impact or cost of transport to a distant reprocessing facility outweighs the benefit of recovering the waste. However, the application of the principle varies according to the type and volume of waste, the potential impact of the method of recovery or disposal, and the mode of transport. There also has to be a balance between the proximity principle and economies of scale. In some cases, economies of scale may mean that some specialist recovery or disposal operations may be located far from the point where the waste arises.

Precautionary principle
The precautionary principle states that where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

Producer responsibility
Producer responsibility (increasingly in the form of legislation or voluntary agreements) requires industry and commerce involved in the manufacture, distribution and sale of particular goods to take greater responsibility for the disposal and/or recovery of those goods at the end of their useful life.

Appendix E - Methodology for Assessing Waste Management Options

To determine the most sustainable options for agricultural waste, a methodical assessment was conducted for each waste stream (based on qualitative and, where available, quantitative information obtained through literature review and consultation with a wide range of organisations and individuals). The methodology used is summarised below.

Step 1:
Examine all of the options based on the 'waste hierarchy' of reduction, re-use, recovery and disposal (both on-farm and off-farm).

Step 2:
Identify the viable options (eliminating those not worth further consideration due to insurmountable legal, technical or economic constraints). (1)

Step 3:
Assess the viable options against the following criteria:

- technical and logistical
- legal (2)
- financial
- environmental (including amenity)
- human health.

Step 4:
Compare and evaluate the options against the criteria, and identify the 'best options'. (3)

Step 5:
Examine the barriers to implementation.

Notes:

1. *On-farm landfill has not been considered a viable option for any of the waste streams due to the high financial cost associated with meeting existing and likely future legal requirements (see 3.1 of main report).*
2. *The assessment is based on the assumption that waste management controls will be extended to agricultural waste, and the legislation affecting other industrial waste will apply. Off-farm landfill has been taken as the 'baseline option' since this is currently the most common option for industrial waste in the UK.*
3. *The term 'best options' is used to define the options that have ranked highest against the above criteria (taking note of factors that influence their performance). These are therefore potentially the most sustainable options and are worth further consideration for implementation at a local level.*

Appendix F - Further Information on Waste Plastics Recovery

Possible recovery methods for waste agricultural plastics include recycling and energy recovery. Each of these methods is discussed briefly below.

Recent research has shown that the best practicable environmental option (BPEO) for waste plastics is often an integrated mix of recycling, energy recovery and landfill.

Recycling

The two main methods of plastic recycling, mechanical and feedstock recycling, are described below.

Plastic recycling methods

Mechanical recycling
This takes advantage of the fact that most plastics soften on heating and can be reprocessed into new plastic products. An important consideration is the type and mix of plastics. Different plastics are not compatible and give poor mechanical properties when mixed together Even plastics of the same type can be incompatible due to differences in melt flow behaviour. This means accurate and extensive sorting, washing and separation is required to achieve streams suitable for recycling. This is why recycling of homogenous industrial waste streams is more widely practised than post-consumer waste streams.

Feedstock recycling
These technologies, many under development today, break the plastics down into their chemical constituents. These can be used as building blocks for a wide range of new industrial intermediate and consumer products. In effect, the plastics are reprocessed at the place of origin, the petrochemical complex. Feedstock recycling is particularly well-suited to mixed plastics, but the capital and operating costs are high. There are only two pilot plants in the UK at present.

Most of the plastic recycling activity in Europe is currently in the form of mechanical recycling. However, it is useful to note that some of the agrochemical packaging waste collected under a recovery scheme in Germany is used as a chemical reactant in the production of steel. This is a form of feedstock recycling.

Key factors that affect the viability of recycling agricultural plastics include:

- the mix of polymers;
- the availability of suitable facilities;
- the level and nature of contamination;
- the weight and volume of the waste;
- market demand for secondary materials;
- the price of virgin polymers.

Appendix F (continued)

Recycling of non-packaging plastics

At present, there is one facility in the UK designed to reprocess used silage plastic. This is located in Dumfries, Scotland. British Polythene Industries (BPI) first invested in this 12,000t capacity plant in 1987 when the plastics market was buoyant. Since that time, the price of virgin polymer has dropped considerably (from £700 per tonne to £550 per tonne in 2000/1). This has significantly affected the economics since the cost of reprocessing is roughly equal to the virgin polymer price. Consequently, BPI now charges a gate fee of £30 per tonne (in 2000/1).

Products produced at the Dumfries plant include black bin bags and plastic 'wood' for benches, fences and other similar products. Over the past decade, the company has made considerable improvements to the design and operation of the plant, particularly the washing facilities. This is significant because s a key characteristic of the used plastic films is the high level of contamination with soil and other debris (typically 50 per cent of the total weight of used silage plastic). This high level of contamination is one of the key factors that affects the financial and environmental costs of recycling used silage and horticultural plastic films. Waste crop cover and mulch films (horticultural plastics) typically contain 80 per cent contamination and, in general, it is not considered viable to recycle these films.

The results of a lifecycle assessment study of options for managing waste silage plastic (co-ordinated by the Environment Agency in 2000 using the WISARD software) indicate that recycling at the Dumfries plant has net environmental benefits relative to landfill and incineration with energy recovery. The study centred on the waste silage plastic collected as part of the *Second Life Plastics Wales* scheme in South Wales. It concluded that the environmental benefits of recycling could be increased significantly if the level of contamination of the plastic is reduced at source, if cleaner/more fuel-efficient vehicles are used for collection, and if the distance to a suitable facility is decreased (reducing the environmental impacts of transportation). Clearly these factors would also reduce the financial cost.

To improve the long-term viability of plastic film recycling, action is needed to stimulate investment in additional reprocessing facilities, develop markets for secondary materials, and encourage improved cleaning and storage on farms.

Opportunities to recycle other non-packaging plastic waste such as bale twine, net wrap, tree guards, pots and trays should also be investigated.

Recycling of packaging plastics

The packaging waste streams include a mix of plastic polymers (principally polyethylene and polypropylene). The majority of the plastic used for agrochemical products is high density polyethylene (HDPE). The common 500kg fertiliser and seed bags are comprised of polypropylene with polyethylene inners. A key issue for packaging recycling is therefore the sorting of plastics. At present, only two plants in the UK are designed to reprocess mixed plastic waste (one in Scotland and another in Bradford; the latter commissioned in summer 2000).

Appendix F (continued)

Other important issues that affect the financial cost of packaging recycling include:

- classification of the packaging waste streams (for example, effective rinsing of agrochemical packaging is needed to ensure that the waste is not classified as 'special waste');
- the large volume-to-weight ratio of many of the packaging items, particularly agrochemical packaging (crushing or shredding at source is needed to increase logistics efficiency);
- the value of Packaging Recovery Notes (PRNs) under the *Producer Responsibility Obligations (Packaging Waste) Regulations 1997* (at present PRN prices are low, but may increase following the expected rise in recycling and recovery targets).

Energy recovery

Energy recovery is suitable for all plastic waste streams since plastics have a high calorific value. The options include direct incineration with energy recovery and use as a fuel substitute. The most common example of this is in the manufacture of cement where high temperatures and long residence times ensure complete combustion of the waste.

The advantage of energy recovery for packaging waste is that it can handle a variety of materials.

The main potential barriers to energy recovery as an option for agricultural waste management are the limited number of suitable facilities in the UK and high logistics costs. Further research and investment are needed.

Appendix G - Key agricultural statistics (from EC DG Agriculture, 2000)

Member State	Utilised agricultural area (1,000 ha)	Number of holdings (1,000 holdings)	Average holding size (ha)	Number employed (1) (1,000 persons)	Final production for agriculture (Mio ECU)	Inputs (Mio ECU)	Share of agriculture in the GDP (%)
	(1997)	(1997)	(1997)	(1998)	(1998)	(1998)	(1998)
1. Austria	3,415	210	16.3	235	3,553	1,828	0.9
2. Belgium	1,383	67	20.6	86	6,247	4,102	1.0
3. Denmark	2,689	63	42.6	99	6,199	3,480	1.8
4. Finland	2,172	91	23.7	155	2,147	1,520	0.6
5. France	28,331	680	41.7	993	46,187	22,999	1.8
6. Germany	17,160	534	32.1	988	32,043	17,331	0.8
7. Greece	3,499	821	4.3	704	8,834	2,625	5.8
8. Ireland	4,342	148	29.4	149	4,430	2,392	2.7
9. Italy	14,833	2,315	6.4	1,293	35,694	9,779	2.5
10. Luxembourg	127	3	42.5	5	183	84	0.6
11. Netherlands	2,011	108	18.6	246	16,283	7,831	2.5
12. Portugal	3,822	417	9.2	654	3,935	2,097	1.9
13. Spain	25,630	1,208	21.2	1,041	26,642	11,580	3.0
14. Sweden	3,109	90	34.7	121	3,252	2,406	0.4
15. UK	16,169	233	69.3	463	17,838	11,758	0.5
TOTAL	128,691	6,989	18.4	7,083	213,467	101,813	1.5

(1) Number employed in agriculture, forestry and fishing

ANNEX: Sustainable management of organic materials

1. Introduction

As discussed in section 1 of the main report, the principal focus of the project has been the management of non-natural agricultural waste (as advised by the Project Steering Group). However, the management of the organic by-products of farming is a subject too important to ignore, bearing in mind the quantity and nature of these materials, and the fact that controlled waste legislation is likely to apply when they are not used for agricultural benefit (see 3.1). Moreover, a certain amount of organic waste is imported onto some farms from other sectors, and this could grow substantially in the light of increasing pressures on local authorities and industry to divert waste from landfill.

The objectives of this annex are therefore to:

- highlight the key issues associated with the management of organic materials (considering both the by-products of farming such as manure, slurry and crop residues, and the increasing role of agriculture in recovering organic waste from other sectors);
- present the Project Team's preliminary recommendations to stimulate further discussion.

It should be noted that this annex represents the views of the Project Team only, since it has not been formally discussed by the Project Steering Group. Furthermore, it is based on a preliminary review of the issues. Further research is planned under a separate project.

2. Key issues

Considerable research has been conducted on current and best practices for the recovery of organic by-products of farming via landspreading (for example, research co-ordinated by MAFF, SEPA and the Recycling of Organic Wastes in Agriculture, ROSA, Concerted Action Group), and it is not our intention to reproduce the findings of this research here. Rather, our aim is to highlight what we believe are the key issues and, consequently, to illustrate the need for a holistic national strategy to maximise value recovery from organic materials whilst minimising risks to the environment and human health.

In summary, it is important to consider:

- the benefits and opportunities associated with on-farm recovery of organic materials;
- the potential impacts on the environment and human health;
- existing legislation and other controls;
- stakeholder concerns;
- alternative management options;
- the drivers and barriers to sustainable management of these materials.

Benefits and opportunities

Large quantities of organic materials are produced on farms; roughly 80 million tonnes per year of manure and slurry in the UK in total (excluding horse manure), but also a range of other materials such as silage effluent and crop residues (see Appendix C of the main report for details). Typical practice is to apply these materials to arable land and grassland. This practice is considered to be a recovery operation if properly controlled since it can provide valuable nutrients for crops (allowing reduction in the amount of inorganic fertilisers used) and can also improve the soil structure. The potential environmental and financial benefits of utilising organic materials on land are therefore significant.

Recognising the potential benefits, an increasing amount of non-agricultural organic waste (for example, sewage sludge and green municipal waste) is imported onto some farms (either for direct landspreading or composting), although reliable, up-to-date data are not available. Amid growing pressure to reduce reliance on landfill, the diversion of this waste to farms is seen as a potential option by producers/operators in other sectors, One example is local authorities facing targets set in the *EC Landfill Directive* to reduce landfilling of biodegradable municipal waste to 75 per cent, 50 per cent and 35 per cent of 1995's level by 2010, 2013 and 2020 respectively.

Potential impacts on the environment and human health

Poor management of organic materials can result in increased losses of pollutants to the environment. Nitrogen can be lost as nitrate, nitrous oxide (a greenhouse gas) or ammonia (a constituent of acid rain and a cause of terrestrial eutrophication). Phosphorus-rich particles can be washed into watercourses, and can raise levels of soil phosphorus to levels where leaching occurs. This can all lead to degradation of local ecosystems and contribution to global environmental problems (for example, global warming).

In addition, there is a risk to human health from contamination of water supplies and food with nutrients, chemicals and micro-organisms; odour problems can also arise.

However, the risks to the environment and human health vary depending on a number of factors such as the type and quantity of organic materials, the climate, topography, hydrogeology and, critically, the land application practices (for example, the timing of application).

Existing legislation and other controls

An array of legislation and guidance exists to minimise the risks associated with landspreading of organic materials. For example, for organic materials arising on farms:

- the *Water Resources Act 1991* makes it an offence to cause pollution of controlled waters;
- the *Codes of Good Agricultural Practice* and a variety of other guidance have been designed to provide practical guidance to farmers to help them improve nutrient management and avoid pollution;
- the *Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) Regulations 1991 (amended 1997)* regulate on-farm storage;
- for large intensive pig and poultry farms, the *Pollution Prevention and Control (PPC) Regulations* 2000 apply (they affect new units with more than 2,000 production pig places, 750 sow places or 40,000 poultry places immediately, and existing units of the same size in 2006/2007);
- farmers operating in any of the Nitrate Vulnerable Zones (NVZs) established to implement the *EC Nitrates Directive (1991)* must comply with specific criteria for organic material management to reduce loss of nitrate to controlled waters (and the area covered by NVZs is set to increase considerably as a result of legal action being taken by the European Commission);
- on implementation of the proposed *Waste Management Licensing (Amendment) Regulations* (see 3.1 of the main report), additional controls on organic materials that are not used for agricultural benefit are likely to exist, although the precise requirements and enforcement regime are unknown at present (as at June 2001).

For landspreading of non-agricultural organic wastes, the controls are more prescriptive (particularly for sewage sludge) and are tightening. All of these wastes are controlled under the *Waste Management Licensing Regulations 1994*. Landspreading for agricultural benefit is considered to be a waste recovery operation and is exempt from the requirement for a licence, but this exemption must be registered with the Environment Agency. In addition, sewage sludge applications are controlled by the *Sludge (Use in Agriculture) Regulations* that implement the *EC Directive on Sewage Sludge in Agriculture*; relating to their heavy metal and pathogen contents as well as setting limits for nitrogen and phosphorus application. Furthermore, due to concern about the risk of pathogens entering the food chain, more stringent controls were developed by the British Retail Consortium in collaboration with Water UK and ADAS in 1998 (the 'Safe Sludge Matrix') and are now stipulated by food retailers. This has led many farmers to stop using sewage sludge altogether, and has also encouraged water companies to adopt new practices such as drying of sewage sludge.

Stakeholder concerns

Despite improved controls and guidance, and greater uptake of best practices by farmers in recent years, stakeholder concerns associated with the landspreading of various organic materials are increasing. For example:

- retailers and their customers are becoming more concerned about the risk of microbiological contamination of food;
- water companies are concerned about increasing water treatment costs, and the risk of disruption to water supplies;
- local communities and the general public are increasingly concerned about the quality of drinking water and recreational waters, and high water charges;
- regulators are concerned about non-compliance with legislation and targets for environmental improvement.

In view of these concerns, several stakeholder partnerships have formed to evaluate the risks and develop best practice guidance to facilitate safe recovery. To date, these partnerships have focused on specific issues. For example, the Confidence in Recycling Organic Wastes (CROW) Steering Group was formed in October 1999 to review the risk of microbiological contamination of food (following a conference at Silsoe Research Institute). The group includes representatives of DEFRA, the Food Standards Agency, NFU, British Retail Consortium, Food and Drink Federation, Chilled Food Association, Soil Association, Water UK and the research community.

Alternative management options

Other management options for organic materials exist (as an alternative to direct application to land), such as composting and anaerobic digestion. Interest in these options is increasing, and they could play an important role in an integrated system for sustainable management of organic materials (particularly in areas of the country where there are large quantities of materials and/or the risks to the environment are high due to the local topography/hydrogeology, and the like). The European Commission's draft working document on the biological treatment of biowaste sets out the various options. However, implementation of these options is limited at present, and although R&D is ongoing there is a need for greater co-ordination.

Drivers and barriers to sustainable management

Awareness of the resource value of organic materials is growing, and the drivers for better utilisation of these materials are increasing. For example, farmers are facing increasing legislation, retailer demands and financial pressures (leading to greater attention to nutrient management planning). Local authorities are facing challenging targets to divert biodegradable waste from landfill (as discussed earlier). And other industry sectors are facing increasing waste treatment and disposal costs as a result of the Landfill Tax and the upcoming requirements of the *EC Landfill Directive*.

Critically, however, there are several barriers that are delaying progress towards sustainable management of these materials. For example:

- the complexity of legislation and guidance;
- confusion over the risk of microbiological contamination of food;
- limited information on the costs and benefits of alternative management options.

3. Recommendations

In view of the issues summarised in the previous section, the Project Team has developed some preliminary recommendations for discussion (described below).

***Recommendation 1*: The Government should facilitate the development of a holistic, integrated strategy for sustainable management of organic materials from agriculture and other sectors.**

The issues associated with the management of organic materials from agriculture and other sectors are complex (as summarised in Section 2 of this annex). To facilitate sustainable development, a national strategy is needed to:

- bring together all stakeholders with an interest in the management of organic materials from agriculture and other sectors (building on the existing partnerships discussed in Section 2);
- collate research outputs, and co-ordinate ongoing and future R&D studies;
- identify the range of existing and likely future drivers and barriers;
- develop a clear vision agreed by stakeholders;
- develop practical action plans;
- monitor and communicate progress.

***Recommendation 2*: Data on the sources, quantities and nature of organic materials, current practices, and the costs and benefits of alternative management options should be collated.**

To be effective, the strategy must be based on reliable information and sound science. This requires collation of data from a number of sources, for example:

- agricultural research organisations;
- waste management research organisations;
- Government departments and agencies;
- farmers and advisers; and
- relevant industry organisations.

Other projects, such as the Recycling of Organic Waste in Agriculture (ROSA) Concerted Action Group and the Confidence in Recycling Organic Wastes (CROW)

project (discussed in Section 2) have started this process, but the scope should be broadened to include municipal biodegradable waste and alternative options to landspreading (such as energy recovery).

<u>Recommendation 3</u>: A methodology should be developed to facilitate the integration of agriculture and its role in managing organic materials into the economic and waste strategies developing in each region.

Farmers have a key role to play in achieving the objectives for sustainable development in each region of the UK, for example by:

- improving landspreading practices, thus providing environmental benefits and associated economic benefits for farmers, local tourism businesses and a range of other stakeholders;
- utilising organic waste from other sectors (so reducing the amount of waste sent to landfill);
- managing composting facilities;
- providing materials for energy recovery (where appropriate).

This needs to be recognised by those involved in developing economic and waste strategies in each region, for example:

- the Regional Development Agencies responsible for developing regional development strategies;
- the Regional Technical Advisory Bodies (RTABs) responsible for providing advice on waste management and strategy to the Regional Planning Bodies (who in turn are responsible for developing planning guidance and strategies);
- the Waste Planning Authorities responsible for preparing local waste plans and strategies.

To assist these organisations, a methodology should be developed to assess the costs and benefits of alternative management options. This should be integrated into existing decision-making systems and take account of:

- the number, type and distribution of farms and other land units;
- the type and quantity of organic materials arising on farms;
- the type and quantity of organic waste from other sectors (that is, industrial and municipal);
- the available land area;
- the climate, topography and hydrogeology of the region;
- existing objectives and targets.

<u>Recommendation 4</u>: A system to distil legislation and best practice standards into site-specific 'integrated farm management plans' should be developed.

An array of existing and upcoming legislation applicable to farmers exists (for example, the *Water Resources Act 1991*, the proposed *Waste Management Licensing (Amendment) Regulations*, the *Pollution Prevention and Control Regulations 2000*, the *Sludge (Use in Agriculture) Regulations, and the EC Water Framework Directive*. Much of this emanates from European Directives, and much of it has direct or indirect implications for the management of organic materials.

In addition, Government departments and agencies, non-governmental organisations and retailers have developed a wide range of useful best practice guidance.

To facilitate compliance and uptake of best practices, an effective way of translating complicated and often overlapping regulations is needed. The whole range of technical guidance must be presented in clear, practical language that farmers can understand.

As recommended by the Better Regulation Task Force in its report on *Environmental Regulations and Farmers* (November 2000), the Government should consider supporting the development of integrated management plans for individual farms. The aim of these plans would be to translate the range of environmental, health and welfare requirements into practical advice specific to the farm enterprise type, size and local conditions. Collaboration with food retailers is recommended to incorporate their requirements and so avoid duplication and/or confusion with food assurance schemes.

The development of such an approach would:

- provide clarity for farmers;
- enable more efficient and effective compliance monitoring by Government agencies;
- provide other stakeholders with greater assurance that risks are being managed effectively;
- reduce overall costs;
- allow regular updating as requirements and best practices evolve.

<u>Recommendation 5</u>: A comprehensive communication strategy should be developed to ensure a flow of consistent, reliable information to and between all stakeholders.

In view of the wide range of stakeholders, a comprehensive communication strategy is essential. This should identify the specific needs and roles of each stakeholder group, for example:

- farmers;
- agricultural contractors;
- central and local government departments and agencies;

- water and sewerage companies;
- other industry sectors producing organic waste;
- retailers;
- consumers;
- waste management companies (and composting organisations);
- local businesses and communities;
- visitors to the countryside;
- education and research establishments;
- other non-governmental organisations.

It should also establish the best approach for ensuring a flow of consistent, reliable information to and between stakeholders.

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