

Saving money by reducing waste

Waste minimisation manual: a practical guide for farmers and growers



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Department for Environment,
Food and Rural Affairs

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1 How to Use This Manual

Step 1 Refer to the contents page and place a tick against each waste or resource which is generated on your farm.

Step 2 Read:

- the Introduction which explains the principles of waste minimisation, and
- the section on the Agricultural Waste Regulations which identifies waste management options.

Step 3 Fill in your farm details at the bottom of this page. This may prove useful when completing farm audits.

Step 4 Refer to the contents page where you have placed a tick against each waste or resource you have; follow the colour banding and page

number to the relevant section. Complete your review of current practice with guidance notes provided.

Step 5 Identify potential savings by referring to **Waste minimisation – opportunities for savings** at the end of each section.

Step 6 Transfer your conclusions from each completed section to the Action Summary.

Step 7 Identify who has responsibility for making decisions on waste and resource management and their training needs.

Step 8 Refer to the Actions Summary on a regular basis as a reminder of where and when you can make savings by minimising waste.

Farm Details

Farm Name

Manager's Name

Farm Address

Postcode

Telephone Number: Office

Mobile

2 Introduction

Opportunities for saving money

It has been shown that considerable savings can be made by adopting simple cost-effective techniques for minimising industrial waste during the production processes.

Research projects sponsored jointly by the Department for Environment, Food and Rural Affairs and The BOC Foundation, were set up to investigate whether these benefits could be realised in agriculture. The results revealed many opportunities for savings in animal feeds, water, energy, sprays, fertiliser, field crops and produce in the store.

Savings in some cases were considerable and in many cases the changes necessary to improve resource efficiency or reduce waste required little or no expenditure. Substantial environmental benefits were also found to be possible even as a result of small changes.

Waste minimisation:

- **Helps you to comply with waste legislation.**

Farmers and growers are now faced with the responsibility of managing their waste according to the Waste Management (England and Wales) Regulations 2006, commonly known as Agricultural Waste Regulations. A number of previous practices undertaken on the holding will no longer be allowed. This manual will help your business comply with these Regulations.

- **Reduces the quantity of raw materials you buy.**

Reducing the amount of waste means making better, more efficient use of the raw materials you have bought. If these are expensive, you will soon begin to save a lot of money.

- **Saves time and money involved in managing and handling waste.**

By creating less waste, your farm will be tidier and the time saved can be spent on more worthwhile tasks.

- **Reduces your 'disposal' costs.**

You may already be paying directly to have someone take waste away. Reducing such waste will help you to contain these costs.

Introduction

- **Increases the value of crops, animals or produce for sale.**

A production system that creates waste can often result in lower quality products. For example, poor control of grain drying will result in spoilt grain and lower prices.

- **Reduces harmful effects on the environment.**

Minimising the quantity of waste reduces the risk of causing water, air or soil pollution.

Publications referred to in this manual, including various Codes of Practice, are listed in **Useful Information References**, on page 112.



Principles of waste minimisation

So how does waste minimisation work?

The basic principle of Waste Minimisation is to **identify opportunities** for improvement by using the following **six steps** for each aspect of your farm enterprise.

- 1 Review current practice**
Carry out a **review** of your current management practices. Evaluate the nature, the quantity and the full costs of dealing with waste. Identify the source and the current disposal route. Pay greatest attention to the more significant issues.
- 2 Avoid waste**
See if the waste can be **avoided** from the outset. Consider alternative materials or the use of alternative techniques.
- 3 Reduce waste**
Where waste cannot be avoided then consider how it may be **reduced**. Look at all the options. Consider technical changes to the system or the use of other management techniques. Consider staff qualifications and training.
- 4 Reuse waste**
Some waste materials may be **reused** as the raw material for another process.
- 5 Recycle waste**
Many waste materials can be **recycled** for a secondary purpose. Check the Recycling Directory at www.wasterecycling.org.uk or check local directories and web sites for recycling centres or specialist contractors.
- 6 Take action**
Compile a shortlist of potential improvements and **take action** in order to make the savings work.

3 Agricultural Waste Regulations

The Waste Management (England and Wales) Regulations 2006 (SI 2006 No. 937), referred to in this manual as the Agricultural Waste Regulations, will be in force in England and Wales from 15th May 2006. These Regulations have significant impact on farmers and growers and the way that they manage their business.

Agricultural waste is now 'controlled' or 'industrial' waste and subject to the same legislative controls as waste from other industries. Historically, farmers and growers have taken waste disposal into their own hands, with the majority disposing of waste in on-farm tips/dumps and by open air burning. This is no longer legal, unless the farmer has the necessary waste management permits, licences or registered the relevant waste management licensing exemptions. Waste management licences involve demanding requirements and fees are charged. It is unlikely that it will be appropriate for farmers and growers to seek permits or licences in most cases.

The alternative is to remove the waste from the farm and use licensed waste facilities capable of dealing with the waste generated. Some waste management facilities and contractors can be found by viewing the National Recycling Directory at www.wasterecycling.org.uk. The Directory is an internet site developed by the Environment Agency and the Agricultural Waste Stakeholders' Forum to help farmers and growers find ways of recycling or disposing of their waste. Farmers and growers will need to log on to the above website, enter their postcode, select the types of waste they wish to recycle or dispose of and it will search for the sites nearest to the postcode given for each waste type selected. Only waste management companies who choose to be listed on the site are shown.

If farmers and growers do not have internet access or are unable to log on to the site they can contact the Environment Agency on **0845 603 3113**, who will then search the site for them.

Exemptions

What are exemptions?

Exemptions are designed to encourage the recovery of waste and to enable the waste producer to manage their low risk waste activities. Exemptions can only be made for:

- waste disposal at the place of production or;
- waste recovery.

They are subject to general rules such as size, quantity and must not have adverse impacts upon the environment.

Twenty three of the existing licensing exemptions (used by other industries) may be of use to farmers and growers. These are listed here:

- Burning waste as fuel,
- Waste for construction,
- Waste used as packaging or containers,
- Preparatory treatments of waste plant matter,
- Burning waste as fuel in small appliances,
- Crushing, grinding or size reduction of bricks, tiles or concrete,
- Waste for the benefit of land,

- Waterway dredging,
- Land reclamation,
- Baling, compacting or pulverising,
- Preparatory treatments of certain wastes,
- Storing returned goods,
- Composting waste,
- Disposal by incineration at the place of production,
- Construction and soil materials,
- Burning waste plant tissue in the open,
- Manufacture of finished goods,
- Waste from sanitary conveniences with removable receptacles,
- Use of waste,
- Storage of waste not at the place of production,
- Storage of waste in a secure place,
- Storage of waste at the place of production,
- Wastes in secure containers.

A full list of exemptions can be found at:
www.defra.gov.uk/environment/waste/agforum/

Agricultural Waste Regulations

There are two new exemptions, specifically designed for use in agriculture; they are:

- The deposit of waste milk diluted by water or slurry by spreading to land for agricultural or ecological benefit,
- The deposit of plant tissue on land to allow it to rot down e.g. crop waste from handling, grading and storage.

Proposals for other new exemptions are being considered for agricultural waste, in 2006.

How to register an exemption

The person carrying out the exempt waste management activity must register the exemption. For example, a farmer burning hedge trimmings must register the exemption "burning waste in the open".

Usually it will be easy to determine who the responsible person should be, but it is something you will have to consider if involved in contract farming or employing a contractor to do some work for you.

If you are employing a contractor you should ensure that you make it clear who is responsible for registering the exemption. This will depend on how much control you retain over the activities of that contractor.

If you are engaging in contract farming we recommend that you discuss and agree waste management responsibility when setting the contract.

Most exemptions need to be registered with the Environment Agency, but there are some that need to be registered with your local authority. Most exemptions will only need to be registered once. If your registration details change, this can be amended at any time.

Exemptions can be registered using Defra's Whole Farm Approach (in England) or directly with the Environment Agency (ring 0845 603 3113). The following exemptions need to be registered with the local authority;

- Burning waste as fuel,
- Crushing, grinding or size reduction of bricks, tiles or concrete.

Management options

There are five options for managing agricultural waste:

- 1 Store your waste, pending collection, on the site where it is produced for up to 12 months. Before the 12 month period expires, you will have to do one or more of the following options:
- 2 Take the waste yourself for recovery or disposal off-farm at an appropriately licensed site.
- 3 Engage a waste management contractor to handle the recovery or disposal off-farm at an appropriately licensed site. There are waste management companies who can visit your farm to do this.
- 4 Register an appropriate licence exemption with the Environment Agency to recover or dispose of some of your waste on-farm.
- 5 Apply to the Environment Agency for a waste management licence or landfill permit to recover or dispose of your waste on-farm.

Listed below is an overview of the do's and don'ts of agricultural waste management:

Do:

- Use "waste minimisation" techniques to reduce both the environmental and financial burden of waste arisings.
- Segregate waste by type prior to storage.
- Separate hazardous and non-hazardous waste.
- Store waste securely and prevent it from escaping from your control.
- Safely store waste for no longer than 12 months before it goes for recovery or disposal elsewhere.
- Ensure that, if passing waste to somebody else for disposal, they are authorised to take it.
- Obtain a waste transfer note for each movement of waste off-farm by third parties. This must include a description of the waste.
- Keep copies of waste transfer notes and waste descriptions for a minimum of two years when a contractor removes waste.
- Ensure you are registered as a "professional waste carrier" with the Environment Agency when carrying waste on behalf of somebody else.

Agricultural Waste Regulations

- Dispose of waste at licensed sites.
A list of these sites can be found at www.environment-agency.gov.uk
 - Make full use of licensing exemptions and register such exemptions with the Environment Agency.
 - Burn small amounts of plant matter in the open (if you have registered this exemption).
 - Continue to use authorised animal carcass incinerators, without the need for a waste management licence, to burn carcasses only.
 - Ensure hazardous waste e.g. asbestos, batteries, obsolete pesticides and veterinary products are disposed of appropriately.
 - Read Section 5 of the Code of practice for using plant protection products thoroughly. It will give you useful advice on preventing and disposing of pesticide waste.
 - Use a pressure rinsing device or manually rinse pesticide containers three times so that they are no longer classed as hazardous waste.
 - Consult the Environment Agency about licences/permits for activities not covered by an exemption.
- Do not:**
- Use farm tips/dumps unless you have a landfill permit.
 - Allow waste to escape from your control.
 - Burn materials unless you have registered an exemption.
 - Allow an unauthorised person to remove or handle your waste.
 - Put agricultural waste in your household dustbin.
 - Receive waste onto your farm unless you have a licence or the waste activity is registered as an exemption.



4

Waste from
Crop Production

4.1 Pesticide application, handling and storage

Improved management and use of pesticides can produce significant savings. Many assurance schemes and environmental bodies look favourably on well-managed pesticide systems. Reducing the use of pesticide decreases the amount of pesticide containers and washings produced.

Farmer saves £3,500 p.a. in chemical application, and improves crop yield

A 200 ha farm growing combinable crops, potatoes and sugar beet, with an annual pesticide bill £34,000, originally took advice from a pesticide supplier. Yields were good but chemical input was high and application costs increasing. The farm manager paid £1,000 for a training course and achieved the BASIS certificate of competence for crop protection, and began a policy of monitoring fields regularly and spraying to thresholds. As a result the annual pesticide bill has dropped to £31,000, which includes £1,000 paid annually to a consultant for strategic advice on pesticides. In addition, the sprayer was replaced with a direct chemical injection machine, saving operator time and resulting in a further saving of £500 per year on operators wages. An added bonus has been crop yield and quality improvement.

Review of current practice

Who decides the farm's pesticide policy?

Farmer/Manager

Adviser

Trade rep/Supplier

Is the person BASIS qualified?

Yes No

Manage pesticide use carefully so that all applications can be justified. Get information and help with decision making from trade representatives, trade associations and independent crop consultants. Read the Code of practice for using plant protection products, particularly Section 3 on planning and preparation. Also refer to the UK Pesticide Guide and check with the Crop Protection Association.

Seek advice from a qualified adviser, such as those on the BASIS Professional Register. For many pesticides, applications must be carried out by a NPTC (National Proficiency Test Council) qualified spray operator unless that operator qualifies for the 'grandfather rights' derogation. Details of certification, including continued professional development via the National Register of Spray Operators (NRoSO) and BASIS, are available.

How is application rate and timing decided?

Previous experience

Crop monitoring/threshold levels

Research finding/warning bulletins

Protective/prophylactic spraying

Press articles

Product label

For up to date information, refer to the research findings/newsletters/warning bulletins available from several organisations.

Threshold guidelines have been developed for several crops for disease, weed and pest levels above which a pesticide application can be justified, or pesticide doses optimised.

How often do you calibrate your sprayer?

When applications are inaccurate

Beginning of every season

When changing water volume/nozzle

When changing wheels/tractor

Every 100 ha

Calibrate your sprayer to ensure accurate application of pesticides. Research has shown significant benefits if sprayers are calibrated not only at the start of the season, but also when changes are made to the volume applied, wheel

sizes or types of nozzles used. The National Spray Testing Scheme (NSTS) is an independent voluntary inspection and testing scheme for a variety of equipment used to apply pesticides. A valid test certificate, to a recognised industry standard, provides evidence that application equipment is working correctly. For more information go to the NSTS website at www.nsts.org.uk

Do you have a large stock in store?

Yes No

What do you do with unused concentrated pesticides?

Disposal contractor

Apply to an appropriate crop

Take into account any chemicals currently in stock and try to match your order to pack sizes. This will reduce the amount of pesticide being left over and reduce the amount of packaging waste. Where more than 200 kg or 200 litres of pesticides are stored for sale or supply to others, there are additional legal obligations. Guidance is available in the Yellow Code.

Return unused or unapproved pesticides to the supplier or dispose of them by a licensed waste disposal operator.

Sprayer

Make? (write in)

Machine 1 _____

Machine 2 _____

Machine 3 _____

Last calibrated? (write in date)

Machine 1 _____

Machine 2 _____

Machine 3 _____

	Tank wash system?		Handbook available?	
Machine 1	Yes <input type="radio"/>	No <input type="radio"/>	Yes <input type="radio"/>	No <input type="radio"/>
Machine 2	Yes <input type="radio"/>	No <input type="radio"/>	Yes <input type="radio"/>	No <input type="radio"/>
Machine 3	Yes <input type="radio"/>	No <input type="radio"/>	Yes <input type="radio"/>	No <input type="radio"/>

Calibrate your sprayer to ensure accurate application of pesticides. Research has shown significant benefits if sprayers are calibrated not only at the start of the season, but also when changes are made to the volume applied, wheel sizes or types of nozzles used. The National Spray Testing Scheme (NSTS) is an independent voluntary inspection and testing scheme for a variety of equipment used to apply pesticides. A valid test certificate, to a recognised industry standard, provides evidence that application equipment is working correctly.

For more information go to the NSTS website at www.nsts.org.uk

A built-in tank wash system using a rotating spray jet can significantly cut down on the amount of water used.

Refer to the handbook when changing sprayer settings and carrying out regular servicing and maintenance. This will ensure accurate application.

How do you fill your sprayer?

- Closed transfer systems
- Induction bowl
- Direct into tank/hopper

Where do you dispose of tank washings?

- Previously treated crop
- Pesticide treatment system
- Disposal contractor
- Authorised area of land

Use sprayer filling facilities, e.g. induction bowls/hoppers, to reduce spillage/waste of concentrated pesticide.

Tank washings/cleanings can be disposed of by spraying out over the crop, provided you comply with label recommendations. To dispose of washings to other areas of land, you must have an authorisation from the Environment Agency (under the Groundwater Regulations 1998). Soakaways are no longer permissible. Check with the Environment Agency if you are considering a pesticide washings treatment system.

Review quantities, types and costs of pesticide

As from 1 January 2006 it has been a legal requirement for all food and feed producers to record their pesticide and biocide use. The Code of practice for using plant protection products also suggests that you evaluate the effectiveness of your pesticides. You can use this new requirement and advice to your financial advantage by assessing your costs and input effectiveness year on year.

Make a note of the known, or estimated quantities or values of pesticides used each year over the farm. Include herbicides, fungicides, insecticides, molluscicides, seed treatments and growth regulators. Include physical formulations of pesticides including liquids, granules, pellets, powders and tablets. Enter the values in the boxes below and consider what financial savings may be possible if pesticide used could be cut by 5%, 10% or more.

	Annual cost
Spray pesticides	£ <input type="text"/>
Granules, pellets and powders	£ <input type="text"/>
Other pesticide	£ <input type="text"/>
Total annual cost	£ <input type="text"/>
Value of 10% saving	£ <input type="text"/>

Waste minimisation – opportunities for savings

Waste avoidance

Do you have to use a pesticide?

Yes No

If the problem can be tackled in another way, you will save the costs of application and avoid any waste disposal difficulties. Make sure you know about integrated crop management and integrated farm management.

Can you improve pesticide stock control?

Yes No

Practice good store management by buying only what you need when you need it. It helps with cash flow and reduces the risk of spoilage or loss in store. Good store management reduces the risks of damage and/or waste through handling, extremes of weather, fire or expiry of 'approval for use'.

Read through Section 3 of the Code of practice for using plant protection products for ideas.

Waste Reduction

Could you grow alternative lower Plant Protection products input crops?

Yes No

The cost of pesticide use on crops such as wheat is by far the greatest input cost item.

Could you use other cultural or biological control methods to reduce pesticide use?

Yes No

Methods include cultivation, crop rotation, crop/variety resistance and inter-cropping.

Do you make use of regular crop monitoring, research findings and thresholds?

Yes No

Regular crop monitoring linked to research findings and thresholds aims to maximise crop returns with minimum inputs.

Have you considered the use of specialist application machinery?

Yes No

Specialist application machinery can assist pesticide application at lower application rates, e.g. air assistance.

Have you considered the appropriate use of adjuvants?

Yes No

Adjuvants are chemicals which help a pesticide to be more effective. If you use an adjuvant with products for which they are approved you may be able to improve pesticide effectiveness at lower application rates.

Can you better target the pesticide?

Yes No

You might be able to lower the amount of pesticide used, and therefore any waste, by applying the product as a spot, patch or varied dose treatment or using weed wipers. Check the approval allows for this and that it is safe.

Have you considered the use of direct injection spray application?

Yes No

Direct injection machinery reduces the amount of pesticide washings because the sprayer tank is not used for mixing the chemical.

Can the dosage be reduced or chemical strength changed?

Yes No

Check differences between brand names to see if reductions can be made.

Waste Reuse

Can you reuse tank washings?

Yes No

Compatible tank washings may be added to the tank water for the next mix. Check approvals.

Summarise the most appropriate actions in order to minimise waste and make savings.

Estimated annual cost savings £

4.2 Inorganic fertiliser application, handling and storage

Inorganic fertiliser can account for up to 60% of variable costs for arable and forage crops. Badly timed or excessive fertiliser applications result in crop losses, reduced income, and nutrient losses that can damage the environment. Developing and following a nutrient management plan will help to optimise your use of fertilisers and other sources of nutrients.

Nutrient management planning saves £3,500 per year

A 250 ha arable farm growing combinable crops on varying soil types, began nutrient management planning by sampling fields for pH, and P, K & Mg indices on a regular basis. The farmer built up an accurate picture of soil fertility for every field at an initial cost of £300. The use of nitrogen fertiliser was examined, and blocks of fields with similar soil type and previous cropping were sampled in the spring to establish available soil nitrogen. This was taken into account in calculating crop nitrogen requirements. In some situations this reduced nitrogen applications by up to 100 kg/ha, with no effect on yield or quality.

Review of current practice

Who decides the farm's nutrient policy?

Farmer/Manager

Adviser

Trade rep/Supplier

Is this person FACTS qualified?

Yes No

Develop a Nutrient Management Plan for your farm; this is one of the options in the Entry Level Stewardship scheme. Keep good field records of cropping, fertiliser and organic manure applications and update your plan at the start of each cropping year.

Take advice from a person qualified under the Fertiliser Advisers Certificate and Training Scheme (FACTS). They can provide detailed fertiliser recommendations.

How is application rate and timing decided?

Rate

Soil analysis P, K

Soil analysis N

Leaf analysis

Timing

Growth stage

T sum 200

Identify soil nutrient status (by sampling and analyses, every 3 to 5 years), and use published data for determining crop requirements. Very useful sources of information include Fertiliser Recommendations for Agricultural and Horticultural Crops (Defra, RB209) and a computerised version of RB209 called PLANET.

Apply nitrogen at the correct crop growth stage.

Use fertiliser timing prediction models (e.g. T Sum 200, published in Farmers Weekly) to improve decisions for applying nitrogen to grassland early in the year.

Do you apply nitrogen in the autumn?

Yes No

For oilseed rape

In a compound fertiliser

Timing is important. Applying nitrogen in autumn may, in some cases, have an adverse environmental effect such as nitrate being leached out with drainage water or travelling downwards into the ground aquifer below.

How much of the land you farm is in a Nitrate Vulnerable Zone (NVZ)?

All

Part

None

Areas within Nitrate Vulnerable Zones (NVZs) have special requirements for nitrogen applications in order to protect groundwater and surface water. Full details of the Action Programme for England can be found on Defra's web pages at www.defra.gov.uk/environment/water/quality/nitrate/default.htm

How do you store fertiliser?

- Outside uncovered
- Under cover
- Bulk hopper
- Bulk tank (liquid)

How do you handle fertiliser?

- Big bags
- 50 kg bags
- Containers
- Bulk solid
- Bulk liquid

Storage losses can be high due to damp, split/broken bags and rodent damage. Ideally, store fertiliser in big bags under cover, with effective rodent control. Liquid fertiliser offers certain benefits in handling but secure storage to avoid leaks is essential.

Application machinery

Make? (write in)

Machine 1 _____

Machine 2 _____

Last calibrated? (write in date)

Machine 1 _____

Machine 2 _____

Handbook available?

Machine 1 Yes No

Machine 2 Yes No

Inaccurate application rate and a poor spread pattern from fertiliser spreaders can result in both fertiliser and crop losses. Check the spread pattern annually by carrying out tray tests; remember that some fertiliser will spread better than others (SP rating). Aim for a coefficient of variation of the spread pattern of less than 15%. Check the calibration of liquid fertiliser applicators (sprayers) by attention to the flow from nozzles or dribble bars, and the pressure settings, together with travel speed.

www.defra.gov.uk/environment/water/quality/nitrate/default.htm

On what basis do you select fertiliser?

- Soil/Crop requirement
- Price of material
- Availability
- Spreadability

Inaccurate application rate and a poor spread pattern from fertiliser spreaders can result in both fertiliser and crop losses. Check the spread pattern annually by carrying out tray tests; remember that some fertiliser will spread better than others (SP rating). Aim for a coefficient of variation of the spread pattern of less than 15%. Check the calibration of liquid fertiliser applicators (sprayers) by paying attention to the flow from nozzles or dribble bars, and the pressure settings, together with travel speed.

Where are the empty fertiliser bags or containers stored?

- Under cover
- Outside
- Other (specify)

How are the fertiliser bags or containers disposed of?

- Recycled
- Landfilled
- Other (specify)

Recycle fertiliser packaging bags. Reuse containers, but where this is not feasible, these too can be recycled. Separate and store plastics by type, to ease collection, i.e. the outer woven polypropylene plastic bag should be separated from the inner polyethylene bag. Store the plastic securely under cover and away from potentially contaminating materials. Further information is available in the 'Packaging' section, page 80.

Hedgerow/headland applications. What do you use to reduce waste in this area?

- Boundary device/setting for spinning disc or oscillating spout spreader
- Boundary device for pneumatic spreader
- Nothing

Headland application devices or machine adjustments for spinning disc, oscillating spout and pneumatic spreaders will alter the quantity of fertiliser and spread pattern to avoid hedgerows or field margins (see machine operators handbook). Do not spread fertiliser in areas under management agreements or under legal requirements that prohibit such applications.

Do you produce organic manure on your farm?

- Farmyard manure
- Slurry
- Poultry manure
- Other organic waste

	Annual cost
Nitrogen fertiliser	£ <input type="text"/>
Phosphate and potash	£ <input type="text"/>
Other fertiliser	£ <input type="text"/>
Total annual cost	£ <input type="text"/>

Do you use organic manure?

- Farmyard manure
- Sewage sludge
- Slurry
- Other organic waste
- Poultry manure

Take account of any livestock manure and organic wastes (e.g. sewage sludge), in your nutrient management plan to make savings in purchased inorganic fertiliser. See also the section on "Nutrients from manures and silage effluent", page 97.

Waste minimisation – opportunities for savings

Waste Avoidance

Is the use of nitrogen in autumn necessary?

Yes No

Nitrogen should only be used in autumn where it will be fully utilised by the growing crop or locked up in the breakdown of straw and crop residues, which would otherwise have a detrimental effect on crop growth.

Can you reduce fertiliser waste during storage?

Yes No

Fertiliser storage should be sufficient to eliminate wastage due to the effects of weather and rodents to aid handling, and to prevent the pollution of a watercourse in the event of fire.

Do you use soil analysis results to adjust phosphate and potash application rates?

Yes No

Past applications of organic manures and fertilisers have built up soil phosphorus levels in many soils. Around 50% of arable soils have phosphorus levels above the target level for arable crop production where reduced or nil rates of phosphate application are recommended.

Have you considered using bulk solid or liquid fertiliser?

Yes No

Bulk solid or liquid fertiliser avoids packaging wastage. However not all farms are capable of handling bulk supplies. But on farms which can, the use of bulk supplies may increase the field efficiency of the spreader output, and therefore improve timeliness of operation and optimise nutrient uptake.

Waste Reduction

Have you considered nutrient management planning?

Yes No

Nutrient management planning aims to reduce waste by ensuring applications are calculated accurately on a field by field basis. It takes full account of soil indices, previous cropping, soil type, crop yield and any organic manure applied.

Could you improve your spreader/sprayer calibration and thus reduce crop lodging and associated losses?

Yes No

Calibration and maintenance is essential to ensure accuracy of application to reduce environmental impacts and the incidence of crop lodging and/or areas of under nutrition.

Waste Recycling

Do you recycle your waste fertiliser packaging?

Yes No

A number of farm plastics recycling schemes will collect waste fertiliser packaging.

Estimated annual cost savings

Summarise the most appropriate actions in order to minimise waste and make savings.

Savings level estimate:

- 2-5%
- 5-10%
- 10-15%
- Anticipated savings £

4.3 Plastic crop covers

In recent years there has been an increase in the area of vegetable crops, including potatoes, which are grown under plastic film covers or planted through plastic mulches laid on the surface of the soil. Effective use and disposal of plastics is expensive and therefore the opportunities for savings are large.

Plastic crop covers are recovered and reused

Re-using plastic covers saves money. A brassica grower in Lincolnshire uses non-woven films more than once and puts them in bulk boxes to keep over winter. A celery grower in Cambridge recycles crop covers so they are used more than once.

Review of current practice

What types of sheets are used?

	Yes	No
Polythene	<input type="radio"/>	<input type="radio"/>
Non-woven film	<input type="radio"/>	<input type="radio"/>

The two main categories of plastic film used are non-woven fleeces and polythene sheet. Non-woven films are more expensive (about £1000/ha) than the polythene films (£400 to £800/ha). They do not give such high temperature lifts as the polythene, but can remain on the crop for longer, even up to harvest in some cases. Alternatives to polythene films include paper mulches. These are available as an option for use as weed suppressants, but can really only be used with transplanted crops e.g. plug plants of lettuce, brassicas, etc. The use of paper mulch is still very small in comparison to plastics as they are more expensive and heavier, which entails heavier tackle for laying operations.

What width are the sheets?

	Yes	No
1.8 – 2.0 m	<input type="radio"/>	<input type="radio"/>
10 – 14 m	<input type="radio"/>	<input type="radio"/>

There are several specifications of each type of plastic film crop cover and the rolls may come in several widths, appropriate to each crop. For example, carrot growers tend to use 1.8 to 2.0 m wide film whereas most early brassica and salad crops are grown beneath 10-14m wide film, this minimises the number of outside rows close to an edge of the film, which suffer impeded crop development.

How is ventilation provided to the crop?

	Yes	No
Perforations	<input type="radio"/>	<input type="radio"/>
Hand slashing of the plastic	<input type="radio"/>	<input type="radio"/>

The plastic sheets are used to achieve particularly early crops, but the system is risky in that the temperature may be too high under the film causing damage to the crop. The film must have ventilation provided, either by holes pre-punched in the material at the factory (this ranges from 60–500 x 1 cm holes/m²) or by hand slashing of a non-perforated material in the field as the crop develops. Hand slashing makes reuse impractical.

Are the plastic covers used with one overlying the other?

Yes No

The two types of cover may be used together in a 'double cover' system, with the non-woven laid directly over the crop and the polythene laid over the non-woven cover. The polythene sheet is removed at the 'standard time' according to crop development and the non-woven cover may be left on until harvest. Earlier cropping is achieved by combining the high temperatures from the polythene with the longer term benefit of the non-woven cover.

Is the polythene film:

	Yes	No
UV photo-degradable?	<input type="radio"/>	<input type="radio"/>
Biodegradable by water?	<input type="radio"/>	<input type="radio"/>
'Trigger agent' degradable?	<input type="radio"/>	<input type="radio"/>

Plastic film can be manufactured to be photo-degradable and biodegradable, either by reactions to ultra violet (UV) light or water. A chemical agent can be sprayed onto the plastic either to trigger or enhance the reaction and, after treatment, the plastic can be ploughed into the soil. Research has been done on organic films.

Biopolymer films are derived from protein, polysaccharide and lipids. Many of these are edible and all are biodegradable.

Photodegradable films are used on sweetcorn and maize in the UK during summer. They degrade at a fairly reliable rate, even though climatic conditions in the UK are variable at that time. The material does not break up sufficiently well into small and uniformly-sized pieces at the end of use, and the larger pieces left over may cause a pollution and litter problem.

Is the plastic cover reusable?

Do you reuse some/all for:

	Yes	No
A second time?	<input type="radio"/>	<input type="radio"/>
More than twice?	<input type="radio"/>	<input type="radio"/>

On wide bed work, the edges of the plastic sheet that touch the soil become dirty, brittle and fail. By removing the edges, the sheet can be reused.

Review of plastics recycling/disposal

Approximately what fraction of plastic is reused a second time?

<10% <input type="radio"/>	11-25% <input type="radio"/>
26-50% <input type="radio"/>	>51% <input type="radio"/>

Where is the plastic stored?

Under cover <input type="radio"/>
Outside in the open <input type="radio"/>

How is the plastic stored?

Loose folded <input type="radio"/>
Rolled <input type="radio"/>
In boxes <input type="radio"/>

How is the plastic disposed of?

Recycled <input type="radio"/>
Landfilled <input type="radio"/>
Other (specify) <input type="radio"/>

The greatest drawback to plastics recycling is contamination by other wastes or by water. Store plastic away from other wastes, keep different types of plastic separate from each other and keep the plastic as dry as possible. Waste plastic should be stored securely and prevented from blowing around the site.

The preferred option is to reuse the plastic, on wide bed work, the edges of the plastic sheet that touch the soil become dirty, brittle and fail. By removing the edges, the sheet can be reused. However, when this is no longer a viable option, recycle it through a recognised contractor.

Summarise annual amount of waste plastics

Total annual estimated wastage

Quantity	<input type="text"/>
Annual value	£ <input type="text"/>

Waste minimisation – opportunities for savings

Waste Avoidance

Have you considered alternative systems which avoid the use of plastic sheet?

Yes No

Monitor the research work on new generation degradable plastics and organic alternatives, straw and compost mulches.

Waste Reduction

Do you check that the machine is properly set to ensure that the sheet is properly buried at the edges?

Yes No

Wastage can be reduced where the sheet is not properly dug in at the edges and breaks free in the wind. In such instances, some of the sheet has to be re-laid, wasting not only sheet, but time and money.

Do you check the machine settings to see the correct tension is being applied?

Yes No

Take care with machine settings in order to avoid problems with the failure of the plastic film and therefore increased costs of disposal.

Waste Reuse

Can you reuse some or all of the sheet?

Yes No

Investigate what width of film at the edges needs to be trimmed off in order to reuse the sheet. Check to determine the amended crop bed widths needed to suit the reusable width.

Could you use a different type of sheet which lends itself to reuse?

Yes No

Rather than slashing the sheet for ventilation, evaluate whether a perforated sheet would give similar performance and lend itself to reuse.

Can you improve the storage of the sheet to keep it in better condition?

Yes No

Collecting the sheet into containers for transport and storage means it can be handled and stacked up without increased damage to it.

Waste Recycling

Can you keep the sheet in a cleaner condition so that it may go for recycling?

Yes No

Recycling companies prefer clean plastic in order for it to be useful, this means the absence of contamination.

Can you keep the sheet in a cleaner condition so that it may go for conversion to energy?

Yes No

The plastic may be used in a properly licensed waste to energy scheme but it needs to be clean.

Estimated annual cost savings

Summarise the most appropriate actions in order to minimise waste and make savings.

Anticipated savings

2-5%

5-10%

Greater than 10%

Value of savings £

4.4 Crop and produce waste

Crop and produce losses at harvest, together with out-graded material or spoilage in store can account for between 2% to over 25% of yield. There is potential for making large reductions in crop and produce waste that will save significant amounts of money, and for system improvements that will contribute to better marketing options.

Improved controls for grain drying saves £3,000 p.a.

A penalty was being paid on some 40% of the crop which was over-dried or under-dried because ventilation control was poor in an on-floor system. Improved control of air humidity was identified as the key issue which, when corrected, would provide more even drying to predicted moisture levels and shorter fan running time. Estimated savings were £3,000 p.a. for an investment of £1,000 in improved controls.

Savings estimated at £4,000 per year for improved potato and vegetable harvesting management and equipment

Potatoes destined for processing need to meet high standards of quality. On an arable farm crop value was being lost due to out-grades of green potatoes resulting from soil erosion. Stones and clods were causing bruised potatoes and mechanical damage was causing losses on the harvester and grading line. The cost of losses and disposal problems were high. Attention to production management, together with machinery investment of £5,000 will produce an estimated £4,000 p.a. saving. Furthermore, a move to a field mobile packhouse system will enable all washing, trimming and preparation to be completed in the field saving handling and storage costs and minimising field-to-field disease transfer, odour and pollution risks.

Review of current practice

Do you apply special quality management systems for production of vegetables and roots?

Yes No

Identify staff responsibilities. Modern management methods work on the principle of delegated responsibility. Clear lines of communication enable the person responsible to look after commitments for any particular part of the crop production, storage, quality and marketing activities. Identifying these responsibilities is fundamentally important, and proper training is essential.

Do you prepare produce for specialist markets?

Yes No

Do you keep abreast of new production and packing techniques?

Yes No

Use consultancy, press and merchant on-line computer systems for keeping up-to-date with market intelligence. Major downgrading of marketable value can occur if the appropriate markets have not been identified and their quality standards determined. By gathering market intelligence of trends and prices paid, crop or produce may be prepared to meet the higher value markets.

The higher prices for quality produce are generally paid by the supermarkets, especially those operating quality or produce assurance schemes. Of foremost importance is meeting the quality standards and keeping records of produce traceability. Such schemes will also require records of chemical inputs and environmental aspects.

Field vegetables or protected cropping produce, have relatively high value and is generally required for a fresh produce market. New crop production, storage, marketing and packaging methods are continually being implemented to extend the season of production. Keep abreast of these techniques and changes in order to meet the demands of future markets. Implement operator training at the beginning of harvest and at regular intervals to maintain job satisfaction and consistent standards of work quality.

Do you use the following for cereals?

	Yes	No
High temperature drying of cereals	<input type="radio"/>	<input type="radio"/>
Long term cereals storage period	<input type="radio"/>	<input type="radio"/>
Grain cleaning sieves/drums	<input type="radio"/>	<input type="radio"/>

Cereal prices have dropped dramatically in recent years and therefore premiums paid for quality are more important. Maintaining a strong relationship with dealers is essential and using techniques to enhance quality will be beneficial. However because of lower overall cereal prices the premiums

must be balanced against the additional costs of the drying, cleaning or grading operation, together with any reductions in saleable weight due to the out-graded fraction. Use test methods to determine grain or seed out-grade ratios, and enable better decisions to be made when drying or grading large quantities.

Do you do the following?

	Yes	No
In-field washing/trimming/packing	<input type="radio"/>	<input type="radio"/>
Ambient vegetable storage	<input type="radio"/>	<input type="radio"/>
Refrigerated storage	<input type="radio"/>	<input type="radio"/>
Rapid cooling & cold chain system	<input type="radio"/>	<input type="radio"/>

With increased trade from overseas countries which have cheaper production methods or better climate, fruit and vegetable crop production has become more competitive. Consumer tastes have changed and a much wider range of foods is available to supply the demand. This has generated new markets but decreased others. To avoid mistakes, it is vital to be certain about the markets for your produce.

Do you have secured destinations for crops and produce?

	Yes	No
Local merchant, takes it at harvest	<input type="radio"/>	<input type="radio"/>
Store on farm, sell on open market	<input type="radio"/>	<input type="radio"/>
Co-operative type packhouse	<input type="radio"/>	<input type="radio"/>
Own farm use, animal feed/forage	<input type="radio"/>	<input type="radio"/>

Make regular appraisal of the various markets to enable new opportunities to be spotted and longer-term contracts to be secured. In some instances, produce classed as out-grade can fit into niche markets, e.g. large baking potatoes.

What is the estimated crop and produce waste?

Tonnes	<input type="text"/>
£	<input type="text"/>

Keep tabs on the value of crop losses including trimmings, out-grades and surpluses and don't forget to include the costs of waste handling and removal. Losses are extremely variable, depending on crop type, post-harvest treatment and quality requirements.

Waste minimisation – opportunities for savings

Waste Avoidance

Do you consider crop production requirements with attention to the security of the markets?

Yes No

Where manual quality control is required, it maintains a high standard of training and consistency among CQ inspectors and operators.

Do you consider the entire enterprise and crop production system at the outset?

Yes No

Budget for the likely quantities of out-grade and cost in the necessary associated disposal costs.

Do you plan for inventory control and marketing strategy?

Yes No

Plans or strategies should avoid excess long term spoilage and assist business cash flow.

Waste Reduction

Have you considered staff training for the quality control (QC)/decision maker?

Yes No

Where manual quality control is required, then maintain a high standard of training and consistency among QC inspectors and operators.

Are you careful in selection of product harvesting date and technique (e.g. field/trim/select)?

Yes No

Monitor the crop as harvest approaches as harvesting a few days either side of optimum may result in poorer quality or more out-grades.

Do you consider the machine settings of the harvester and subsequent graders and cleaners?

Yes No

Monitor machine settings and vary them to suit conditions. Harvest losses can be 2-10%. Set equipment to avoid crushed grain and sliced/bruised roots.

Do you take advantage of weather conditions to improve product quality?

Yes No

Where crops (e.g. salad/vegetables) need to be kept cool, or marketed to a specific dry matter, then harvest at coolest time of day or in suitable weather.

Can the system operation be improved to leave dirt and out-graded residue product in field?

Yes No

Harvesting rigs which also comprise mobile packhouses are available and have many benefits.

Can store management, selection of storage temperature, humidity, calibration of controls and other store conditions be improved?

Yes No

Losses due to heating and respiration in grain and vegetables may be high. Humidity is difficult to control. Check and re-calibrate all sensors/controls regularly.

Can you reduce deterioration in store (e.g. ageing/dead spots/moulds etc)?

Yes No

Good store design avoids unventilated corners and inaccessible residues.

Can you improve the design of handling equipment?

Yes No

Poor handling equipment can lead to spoilage. Handling systems should suit the type of crop.

Can storage of crops for home use be improved (e.g. clamp silage and feed grain)?

Yes No

Attend to the sheeting and sealing of clamp silage. Keep grain fresh by cold air ventilation.

Waste Reuse

Are leaks and spillages cleared up and reused for other stock?

Yes No

Certain spillages may be fed to sheep, pigs or other stock fed outdoors.

Can you feed left over feed to other stock (e.g. feed grain cleanings and broken pellets to gamebirds)?

Yes No

By feeding in feeders in the first instance, left-overs may be reused as described above.

Waste Recycling

Do you use out-grades or residues as feedstuffs for animals?

Yes No

Have out-graded cereals milled or other products ensiled to produce feeds for livestock.

Do you consider niche markets for out-graded produce?

Yes No

Out-graded produce may be suitable for pet foods.

Estimated annual cost savings

Summarise the most appropriate actions in order to minimise waste and make savings.

Estimated level of savings

2-5%

5-10%

Estimates savings potential £



5

**Waste from
Livestock
Production**

5.1 Plastic silage wrap/sheet

Recent estimates suggest that approximately 25,000 tonnes of non-packaging plastic materials are supplied to UK farmers and growers each year. They are often used only once, are bulky to handle and frequently contaminated by soil and feed residues. Contamination makes plastics more expensive to recycle.

Clamp silage saves plastic costs compared to baled silage

Changing from an existing clamp silage system to a baled shrink-wrapped silage system, will involve extra cost for the wrap and additional disposal problems. In the long term it may be cheaper to upgrade an existing silage clamp rather than pay the extra costs of wrap each year. This will depend on the amount of work required to minimise pollution risks from the silage clamp.

Review of current practice: silage clamp sheet

Who works out how much silage sheet is required?

Farmer/Manager

Merchant

Adviser

The amount, size and shape of the sheet required for clamp silos can be difficult to estimate, given that overlaps and corners need to be accounted for. Take a second opinion on what will be needed, based on the number of silage cuts and anticipated yields.

Is the sheet generally required to be cut in order to fit the clamp?

Yes No

How many times does the existing system use the sheet?

Once Twice

Measure, rather than guess, the length of plastic that needs to be cut off the roll and try to leave a sufficient length to cover a complete width or length. Use the sheet a second year for covering the shoulders, or as underlay to protect the new sheet.

Is the plastic stripped off and removed to store straight away?

Yes No

Is the plastic collected into a designated container or area?

Yes No

Use a front spike for bales, where possible, rather than a rear spike to reduce mud splash from tractor wheels. Collect and store the waste plastic straight after use, using a covered storage area, bin or trailer to keep it in a cleaner condition and to avoid wind blown litter. Roll used silage wraps into tight 'sausages' to reduce the surface area of the wrap open to further contamination.

Is waste plastic kept out of the dirt/silage effluent/rain/mud/soil?

Yes No

Is the plastic mixed with other materials before it is disposed of?

Yes No

Keep the sheet/wrap clean and separate from other rubbish because contaminants such as water, soil and stone will significantly add to the weight of plastic to be recycled. Such contaminants increase haulage and recycling costs that will ultimately be passed to the farmer. Some recycling schemes will refuse to take highly contaminated plastic as they are unable to deal with it.

**Review of current practice:
shrink wrapped or bagged big bales**

What surface are the bales stored on?

Field Concrete

Store bales on a firm surface to help prevent the heap from slipping, reduce the number of rips, tears or splits and so minimise any need for re-wrapping. Bales stored on a concrete surface tend to be cleaner than those stored on a field surface. Effluent can also be more easily drained to a suitable receptor from a concrete surface, so reducing the amount of water trapped by the plastic.

Are the bales shrink-wrapped?

Yes No

Are bags used?

Yes No

If so, are they reusable?

Yes No

Shrink wrap cannot be reused whereas bags can be, if the grade of plastic is suitable.

What shape are the bales?

Square Round

What density are the bales?

High Medium Low

The bale shape makes a large difference to the amount of wrap needed, but density is more important because large volume, high density bales will require less wrap per tonne of silage made.

Is the pile of bales protected using further plastic cover/net?

Yes No

Is the pile of bales fenced against dogs or other livestock?

Yes No

Are bird/rodent control measures used?

Yes No

Protect the heap from animals, birds and rodents. This will reduce torn wraps and perforations, reducing spoiled silage and minimising the need for re-wrapping.

Is the plastic stripped off and removed to store straight away?

Yes No

Is the plastic collected into a designated container or area?

Yes No

Use a front spike for bales, where possible, rather than a rear spike to reduce mud splash from tractor wheels. Collect and store the waste plastic straight after use, using a covered storage area, bin or trailer to keep it in a cleaner condition and to avoid wind blown litter. Roll used silage wraps into tight 'sausages' to reduce the surface area of the wrap open to further contamination.

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Review of plastics recycling/disposal

Where is the plastic stored?

Undercover

Outside

Other (specify)

Over half of the weight of waste silage plastic can be water. Therefore store the material undercover and keep it as dry as possible to reduce recycling costs significantly, particularly for those schemes that charge by weight. Plastic sheet should be folded and/or rolled and stored in the dry, ready for reuse.

How is the plastic disposed of?

Recycled

Landfilled

Other (specify)

Ideally the plastic wrap/sheet should be recycled to an approved scheme when no longer useable. A number of local farm plastics recycling schemes have been set up around the country and the Government is looking to set up a National Collection Scheme for non packaging farm waste plastics.

Review of material quantities

The approximate amount of plastic sheet required for clamp silos is 0.16 kg per tonne of silage; for wrapped bales it is 1.3 kg of film per tonne silage.

Make use of the recommendations to farmers on reducing contamination on silage plastic (bale wrap and sheet). These are based on research and development:

- Ensilage grass at a high dry matter where possible to minimise effluent.
- Store silage bales on a clean, well drained (preferably concreted) surface. Where stored in a field, consider using a silage sheet to stack bales on in order to minimise soil contamination.
- If rodents are a problem, place suitable rodenticides around (not within) the stack.
- Store the bales undercover wherever possible. Consider covering the bale stack with a simple roofing system, e.g. corrugated sheets. If stored outside, ensure the stack is netted to minimise damage from birds and wind.
- Avoid placing the bale stack under trees.
- Where possible, carry wrapped bales using a front spike, avoid using a back spike or adjust the back spike to prevent the bale from dragging along the ground.

- Do not allow the waste plastic to be dragged over mud or get caught under tractor wheels.
- Open the bale from underneath, allowing any collected effluent to drain off (in a safe manner) before removing the wrap.
- Where possible, remove plastic from bales under cover over a clean dry surface.
- Ensure string and waste silage is not adhered to the wrap.
- Do not allow other materials such as tyres, bricks, stones, metal objects etc to be mixed with the waste plastic.
- Segregate silage wrap from silage sheet and ensure that all other types of plastic (e.g. bales netting) are stored separately.
- Prevent waste plastic from being blown around.
- Store waste plastic undercover in a dry, airy environment within a sealable holder made of the same material, e.g. low density polyethylene.
- If the plastic must be stored outside, roll it up tightly.
- Keep storage of waste plastic away from animals and machinery.

Summarise annual production of waste silage plastics

Tonnes

Waste minimisation – opportunities for savings

Waste Avoidance

Could you make less silage?

Yes No

Different finishing systems for beef require less silage and more cereals/grazing or use of roots.

Do you choose film rolls without plastic centres?

Yes No

Cardboard centres are easier to dispose of.

Waste Reduction

Can you match your sheet purchase to the needs for the site?

Yes No

Buy only the size you need for the clamp. Check number of bale overlaps e.g. 50% overlap twice.

Can you maximise the dry matter conserved per unit of film?

Yes No

Use of chopper feed mechanism on balers increases bale mass by 20%. Square bales use more wrap.

Would deeper silage clamps be a possibility?

Yes No

This reduces surface area and uses less sheet.

Can you avoid plastic film wastage during wrapping?

Yes No

Use appropriate amount of pre-stretch tension. Check wrapping machine type and settings.

Can you reduce the volume the plastic occupies?

Yes No

Compress the plastic prior to disposal.

Waste Reuse

Can you reuse sheet in non critical areas to reduce the amount of new sheet?

Yes No

Re-use of sheet in the following year reduces amount of new plastic required.

Waste Recycling

Are efforts made to keep sheeting as clean as possible during and immediately after use?

Yes No

Cleaner sheet is more suited to recycling.

Could you keep clean off-cuts separate?

Yes No

Clean off-cuts are easier to recycle or reuse.

Could the used plastic be kept cleaner during storage so that it may go for recycling or conversion to energy?

Yes No

Recycling companies prefer to take clean plastic. It may go to a licensed waste-to-energy scheme.

Does your supplier offer a take back scheme?

Yes No

Check on the Recycling Directory (www.wasterecycling.org.uk) or with the NFU or suppliers for schemes.

Estimated annual cost savings

Summarise the most appropriate actions in order to minimise waste and make savings.

Anticipated savings

£

Value of savings

£

5.2 Feed waste

The costs of feed waste can be high, especially in the case of bought-in concentrate feeds.

Improved manger dimensions lead to feed savings

A poorly designed feed manger for dairy cattle allowed the cows to push 19 tonnes per annum of complete diet feed onto the floor. A £200 modification produced a saving of £700 in feed costs and saved clean up costs of the waste.

Review of current practice

What triggers ordering?

Stock level

Supplier

Time (date of month etc).

Good inventory control and slick ordering procedures avoid long-term deterioration in store and help business cash flow.

How is delivery made?

In bulk In bags

Bulk order economies can be false if the feed loses value as a result of deterioration. Dead corners in bins may lead to feed which becomes unusable. Maintenance and training prevents damage to sacks and spillage of valuable feed.

Do you have a fast turnover of feed stocks?

Yes No

Rotation of stocks maintains freshness of feed. Mould and dust may entail health risks to staff.

Is delivery and storage:

	Yes	No
Vermin proof	<input type="radio"/>	<input type="radio"/>
Waterproof	<input type="radio"/>	<input type="radio"/>
Well ventilated?	<input type="radio"/>	<input type="radio"/>

Damage to bags by rodents will lead to spillages and losses. Animal health risks occur from feed spoilage due to moulds or other pests. Ingress of water will lead to moulds and spoilage. Ventilation with cold dry air is beneficial.

Where is feeding generally done?

On the floor inside

On the ground outside

In troughs or mangers

In feeders or racks

Losses from floor feed systems can be considerable, but are not easily measured. Feeder and drinker design can affect losses to floor or to slurry system.

Is the full cost of feed preparation carefully assessed?

Yes No

Energy used in feed preparation and handling is also wasted if the feed is not eaten.

Are rations carefully formulated?

Yes No

Correctly formulated diets ensure that stock are fed the required nutrient balance with less waste.

Feed as: % of production cost

Lowland sheep	40%
Egg layer	70%
Pigs	90%
Dairy	70%
18 month beef	46%

Review of feed wastage value

Estimate Annual Cost of Feed Wastage

£

Waste minimisation – opportunities for savings

Waste Avoidance

Can you reformulate rations easily?

Yes No

Keeping rations simple reduces the likelihood of surpluses. Formulate to use up surpluses.

Can you modify your feed storage to improve it?

Yes No

Losses in store should be avoided by design.

Can you install transponder or timer-activated feeder systems?

Yes No

Some systems avoid giving animals access to feed when it is not necessary. This avoids 'recreational' spillage of feed.

Waste Reduction

Are feeders calibrated regularly?

Yes No

Volumetric feeders must be recalibrated regularly and always when changing feed physical form. Check also gravimetric feeders.

Do you check that access to feed is controlled?

Yes No

Wastage may occur by the action of the stock.

Could you improve the location of your silage clamp?

Yes No

Clamp location is an important factor in ensuring good quality silage and minimum runoff and spoilage.

Could you improve the sealing and storage of silage, or improve the feeding arrangements (if self feeding for example)?

Yes No

For notes see overleaf.

Silage can be lost in the clamp by poor feed face management e.g. too large a face area and/or poor unloading methods that allow air into the clamp causing spoilage.

Could you modify mangers or replace old feeders?

Yes No

Correct dimensions of mangers and height settings will avoid losses. Replace or repair broken feeders.

Could you improve control of vermin in feed stores?

Yes No

Use feed troughs or racks in the field in preference to tipping feed on the ground.

Does the feeding equipment damage the physical form of the pellets and cause excess dust?

Yes No

Poor handling equipment can lead to spoilage. Choice of conveyers and feeders should reflect the form and type of feed. Change to more stable pellets. Check maintenance, change equipment, train staff.

Waste Reuse

Are leaks and spillages cleared up and reused for other stock?

Yes No

Certain spillages may be fed to sheep, pigs or other stock fed outdoors.

Can you feed 'left-over' feed to other stock (e.g. feed grain cleanings and broken pellets to gamebirds).

Yes No

By feeding in feeders in the first instance, left-overs may be reused as described above.

Waste Recycling

Could you spread waste feed to land?

Yes No

Recycling waste feed with FYM can be beneficial and is often better than disposal.

Have you considered feeding silage effluent?

Yes No

See Section on silage effluent, page 97.

Estimated annual cost savings

Summarise the most appropriate actions in order to minimise waste and make savings.

2-5%

5-10%

Potential savings value £

5.3 Used sheep dip

Sheep dipping/showering is carried out in the UK to control sheep scab, lice, ticks, keds and blowfly. Proper control of these parasites is an essential part of good animal husbandry while lack of control leads to ill-health in the neglected animals and economic loss to the farmer. Dipping more than is necessary, however, is expensive and increases any potential risk that dip chemicals may pose to human health and the environment. The Groundwater Protection Code: Use and Disposal of Sheep Dip Compounds aims to help people avoid polluting groundwater and to comply with Regulations.

Shepherd saves £1,150 per year by reduction in dipping

A shepherd was determined to save time and costs of dipping a flock of 1,250 sheep. To ensure that scab did not re-enter the flock from exterior sources, the timing of dipping was checked, and with expert help it was decided to reduce from two dips per year down to one. The shepherd was aware of the need to be more vigilant for other parasite infestations. At an average dipping cost with synthetic pyrethroids of £0.60 per sheep and the lower costs of labour and dip disposal, the shepherd saved £1,150 per year.

Review of current practice

Is advice and guidance in the Groundwater Protection Code followed?

Yes No

Who decides when to dip the sheep on the farm?

Farmer/Manager

Vet

Shepherd

Is this person trained? Yes No

Is this person qualified? Yes No

Why do you dip?

Scab

Blowfly

Other (specify)

Whether to dip or not will depend on the parasite identified, the availability of a dip bath or the accessibility to a mobile dip facility, alternative treatments and the associated practicalities and legislation. Seek advice from your veterinary surgeon, or other suitable qualified person. Read the Groundwater Protection Code: Use and Disposal of Sheep Dip Compounds.

When do you dip your flock?

Mar Apr May Jun July Aug Sep Oct

Dipping is frequently carried out in May/June/July as a preventative measure against blowfly strike and many shepherds would protect their flock from sheep scab in the autumn, typically before the autumn sales. Segregate and treat all replacement stock on arrival at the farm, to eliminate the possibility of infection of the whole flock. Markets and stock transport vehicles are potential sources of the sheep scab mite.

Who does the dipping?

Farmer/Manager

Head shepherd

Shepherd

Contractor

Do any of the above hold a certificate of competence for sheep dipping?

Yes No

Use qualified or trained persons to carry out the dipping. A certificate of competence is required (National Proficiency Tests Council).

Do you have a dip chemical purchase and storage policy?

Yes No

Do you have a large stock in store?

Yes No

Do you generally use up all the dip bought at one time?

Yes No

If dip facilities are available on farm, then purchase only the appropriate chemical in the required amount from the local agricultural supplier or veterinary surgeon. Avoid purchasing excessive quantities and keeping them in store.

Review of the system and operation

Dip bath

Type?

Age?

Capacity?

Drain down area size?

Is it completely watertight? Yes No

Is draining area covered? Yes No

The size of dip bath is particularly important; if it is over sized then more dip may be made up than is required, and greater wastage may occur.

What type of dip concentrate do you use?

Organophosphate

Synthetic pyrethroids

Other (specify)

Do you use pour-ons?

Yes No

Do you use injectables?

Yes No

The choice of chemical will depend on operator preference and the parasites to be controlled. Consider worker health issues and provide all necessary protective clothing (for details see the HSE booklet AS29 on sheep dipping. Consider environmental issues). The range of chemicals available for use in sheep dipping is shown on page 52. One dip in an Organophosphate or Flumethrin should be adequate to control sheep scab and protect the sheep for a further period of time. However, some dips require two dippings 14 days apart and do not have any significant residual effect.

Do you further dilute the working strength used dip with water or slurry before disposal to land?

0 1:1 2:1 3:1 4:1 5:1

How long after dipping is the used dip disposed of?

- 1 day 1 week 1 month
 3 months Other (specify)

If the dip is disposed of using a vacuum tanker, then as a general rule it will need to be diluted threefold with water or slurry and disposed of at a rate not exceeding 20m³/ha. But the requirements for disposal to land will be contained in the authorisation issued by the Environment Agency and must be followed. Dip baths should be emptied as soon as possible after dipping to reduce the risk of leakage or overflowing due to rain.

How do you dispose of the used dip bath residue and washings?

- Disposal contractor
 Apply to appropriate land
 Specialist treatment plant
 Area of waste ground
 Soakaways

If final disposal is to land or waste ground, have you or your contractor obtained an authorisation from the Environment Agency?

- Yes No

An authorisation is needed from the Environment Agency under the Groundwater Regulations

1998, before used dip can be disposed of onto land. The Environment Agency has powers under the Regulations to prevent, or place conditions upon, activities which threaten to pollute groundwater and to prosecute if pollution occurs. The Defra “Groundwater Protection Code: Use and disposal of sheep dip compounds” (PB5803) gives advice on complying with the Regulations. Defra has also produced a sheep dip checklist (PB5803A) to summarise the main points.

Review of quantity and cost of treatment

Estimate your chemical and labour costs (per head) for a single dipping

£

(add a proportion of any disposal authorisation costs)

If you use/could use a contractor, how much does he charge per head for plunge dipping?

p

(add a proportion of any disposal authorisation costs)

Note:

- 1) Organo-phosphorus compounds;
a) Diazinon
- 2) Synthetic pyrethroids;
a) Flumethrin
b) Cypermethrin

Waste minimisation – opportunities for savings

Waste Avoidance

Can you avoid dipping by use of pour-ons?

Yes No

A wide range of pour-on preparations are available for the effective treatment of ectoparasites, but none are effective against sheep scab.

Can you avoid dipping by use of injectables?

Yes No

Currently 3 licensed injectable products are available for controlling sheep scab. Be sure to follow the manufacturer's instructions carefully. Other measures may be required as some products do not provide much residual protection.

Can you introduce a quarantine and checking system?

Yes No

By operating a closed flock system and retaining strict control on the movement of other sheep or carriers, problems can be vastly reduced or avoided.

Waste Reduction

Can you reduce the frequency of dipping?

Yes No

The frequency of dipping may be reduced by choice of chemicals and reduced sheep movements.

Can you buy less but be more efficient?

Yes No

The type of chemical and method of dipping can maximise the chemical efficiency and thereby reduce the amount required. The draining pens should direct drainage from dipped sheep back into the bath. If dip is lost from the bath with each sheep dipped, then more dip will be needed.

Could you redesign the dipping bath and drain down area to reduce waste?

Yes No

The dip capacity should be the minimum for your flock. This reduces the dip concentrate needed and the amount of used dip for disposal. Drain pipes draining back into the dip also enables the dip to be effectively reused. Design for a 10 minute holding time for animals.

Could you make a better estimate of the quantities required and reduce the amount stored between dippings?

Yes No

See notes overleaf.

When ordering dip concentrate, take account of existing chemicals in stock and try to identify pack sizes which fit requirements. This reduces the excess in store. See label recommendations to check amounts required.

Can you improve your calculation of dilution rates?

Yes No

Check the details on the chemical pack for directions on dilution rates and replenishment. Accurately knowing the volume of the dipping bath will make calculation of dilution rates easier.

Could you use pour-ons or injectables in some cases to reduce dip requirements?

Yes No

Pour-ons or injectables result in reduced wastage. They may be preferred to dipping in some cases to avoid handling of pregnant ewes.

Waste Reuse

After dipping has been completed, used dip should not be reused, but should be disposed of properly.

After use, the used dip must be disposed of in accordance with the Groundwater Regulations 1998, unless it is consigned off farm to a registered waste disposal contractor. All dip products are hazardous substances, which may harm humans and pollute the environment. Spreading thinly onto farmland is the usual route for disposal. Even in very small quantities this requires written authorisation from the Environment Agency.

Estimated annual cost savings

Summarise the most appropriate actions in order to minimise waste and make savings.

Savings level estimate

2-5%

5-10%

Anticipated savings £

5.4 Veterinary products

Veterinary medicines are an essential part of livestock enterprises to ensure high standards of disease control and animal welfare. Combined with veterinary fees, total costs of “vet and med” are considerable. It is estimated that the UK agriculture industry spends around £340 million per year on veterinary medicines. Improvements to animal husbandry and management will benefit both animals and enterprise profitability as well as reduce the use of medicines.

Dairy farmer saves £4,700 p.a. on “vet and med” bills

By following the Defra Mastitis Management Action Plan a dairy farmer was able to save around £4,700 per year. This was achieved by introducing a full and proper milking routine to optimise milk let down, reduce milking unit “on time”, improve teat condition and improve the condition of dry cows. Under the previous management policy - the herd of 200 cows averaged 80 cases of clinical mastitis and missed out on the monthly somatic cell count (SCC) bonus offered by the milk buyer on average twice per year. The improved regime rewarded the dairy enterprise by reducing the clinical rate to 45 cases per year- saving on antibiotic costs and reducing the amount of discarded milk. The benefits included improved lactation yield per cow, reduced time in the parlour and the monthly SCC bonus. Additionally, improved dry cow housing and management reduced calving difficulties and the level of metabolic disorders, as well as reducing lameness.

Review of current practice

Who is responsible for animal health and welfare on the farm?

Farmer/Manager

Stock person

Is this person correctly trained? Yes No

Check what procedures and responsibilities are in place and identify any further ones that may be required.

It is important that someone has responsibility for checking the well-being and health of the animals (see the animal welfare codes of practice) on a regular basis and is aware of what to do in any given situation. It is also important that the responsibility for calling in a vet is given to the right person to ensure there is no delay. Being trained to handle a sick animal is equally important, not only due to the risk of further injuring the animal, but also the risks of injury to farm staff in the case of heavy pigs or cattle etc.

Who decides the farm medicines policy?

Farmer/Manager

Stock person

Vet

Consultant

Trade rep/supplier

Veterinary medicine applications should be recommended by a qualified individual (vet or pharmacist). All administrations should be justified by seeking appropriate professional advice. All prescription only medicines (POMs) will be supplied by the veterinary surgeon for the farm, while others on the Prescribed Medicines List (PML) may be obtained from a variety of sources.

Do you have the following policies?

	Yes	No
High health status	<input type="radio"/>	<input type="radio"/>
Farm disease import prevention	<input type="radio"/>	<input type="radio"/>
Checks on feed/drinking water quality	<input type="radio"/>	<input type="radio"/>
Checks on ventilation control (where applicable)	<input type="radio"/>	<input type="radio"/>

Do you have the following facilities?

	Yes	No
Isolation bay for sick animals	<input type="radio"/>	<input type="radio"/>
Vehicle wheel dips and footbaths	<input type="radio"/>	<input type="radio"/>

Many assurance schemes require that established procedures are in place for well managed and supervised use of medicines and the correct disposal of veterinary waste. Health risks can be reduced and welfare improved by attention to biosecurity, i.e. minimising the risk of diseases being brought on to the farm or being spread from animal to animal. Good ventilation and

temperature control in livestock buildings can be very effective, for both non-intensively and intensively housed stock.

Provide a sick bay/hospital pen or separate housing for sick animals so that the temperature may be regulated and risks of disease spread are reduced. Such facilities are likely to be a requirement of quality assurance schemes. Isolation facilities are required for sick or injured animals under Welfare of Farmed Animals Regulations.

Wheel and foot dips will reduce the risk of importing disease. Make routine use of wellington boot dips.

Do you have the following?

	Yes	No
Medicines purchase policy	<input type="radio"/>	<input type="radio"/>
Prophylactic treatment policy	<input type="radio"/>	<input type="radio"/>
Anthelmintics treatment policy	<input type="radio"/>	<input type="radio"/>
Medicines storage policy	<input type="radio"/>	<input type="radio"/>
Secure medicine store	<input type="radio"/>	<input type="radio"/>
Large stocks in store	<input type="radio"/>	<input type="radio"/>
Much out of date medicine stock	<input type="radio"/>	<input type="radio"/>

You must maintain records of the purchase of medicines. It is a legal requirement that medicines used on farm should be recorded in a standard format. You can use this information to establish the efficiency of certain treatments in specific situations. As a minimum you must record the

name of the animal medicine used, the name and address of the supplier, the date of purchase, the date of administration, the total quantity of animal medicines used, the identity of the animal/group of animals treated and the number of animals treated.

The storage and usage of medicines on the farm should be controlled and monitored. Do not purchase medicines unnecessarily or keep large amounts in store.

Do you take unused medicines back to the vet or agent/supplier?

Yes No

Some veterinary surgeons/suppliers operate a take back system.

Do you take used medicine containers back to the vet or agent/supplier?

Yes No

Do you have a sharps container and disposal policy?

Yes No

Separate your veterinary waste into different risk categories and identify a recognised disposal route. Consult your supplier.

Review of veterinary and medicines costs

Estimate all veterinary and medicine costs and compare to some typical costs (see notes below).

£

Typical cost per animal of vet and medicines

Type of animal	Typical annual cost (£) per animal		
	High	Average	Low
Dairy cow	70	40*	30
Beef suckler cow	30	22*	15
Ewe & twin lambs	11	5.5*	3
Sow	45	38*	30

*Taken from the Farm Management Pocket Book (2005)

Waste minimisation – opportunities for savings

Waste Avoidance

Can you improve animal husbandry to avoid the need for so much veterinary medicine?

Yes No

Prevention of sickness or injury is better than a cure. You should have a Herd Health and Welfare Plan in place, agreed with your veterinary surgeon and specialist consultants. This will include an action plan and monitoring of health and welfare. An evaluation of livestock welfare, housing design and conditions will also be appropriate. Spotting the early signs of sickness enables early corrective action to be taken.

Can you improve some aspects of livestock environmental control?

Yes No

Inadequate ventilation is a major contributory factor for diseases such as pneumonia, stress and spread of disease. Environmental control is used to keep animals at appropriate levels of temperature and humidity.

Can you improve the control of disease imported to the farm?

Yes No

Avoid importing disease by attention to the history of animals bought in. Segregate new arrivals.

Waste Reduction

Do you review medicines policy annually?

Yes No

An annual review with your veterinary surgeon as part of the Herd Health and Welfare Plan can help formulate a medicines purchase policy that takes a more strategic approach.

Do you generally buy more medicines than you immediately need?

Yes No

Take veterinary advice on whether purchases are necessary.

Is the use of all medicines essential, e.g. precautionary treatments and wormers?

Yes No

Check with veterinary advice on the use of prophylactic and anthelmintics treatments. Improved grazing management may lead to savings and prevent disease resistance to anthelmintics.

Do you weigh animals before dosing?

Yes No

Some treatments require an accurate assessment of bodyweight.

Do you regularly monitor and record animal growth or output such as milk or eggs?

Yes No

Good stockmanship and knowledge of veterinary issues pays. Regular livestock monitoring linked to research findings and thresholds aims to maximise animal health and minimises medicine inputs.

Could you make better use of research findings/newsletters/warning bulletins?

Yes No

These are available from several organisations which can aid decisions on veterinary medicines use.

Can you improve stock control and management of veterinary medicines in store?

Yes No

Good stock control of medicines in store can minimise the quantity of expensive veterinary medicines on the farm. Most importantly, keep a check on use-by dates and storage conditions. Antibiotics kept above the maximum storage temperature can lead to much longer withdrawal times.

Could you provide improved facilities for isolation of sick animals?

Yes No

An isolation bay for sick animals will reduce the risk of disease spread and can lead to faster recovery times.

Could you provide improved facilities for reducing risks of importing disease?

Yes No

Reduce the risk of importing disease by attention to animal and delivery vehicle movements, rodent and wild bird entry. Make routine use of vehicle wheel dips and wellington boot dips. Issue visitors with farm-specific protective clothing. Biosecurity on your farm is under your control.

Estimated annual cost savings

Summarise the most appropriate actions in order to minimise waste and make savings.

Savings level estimate

2-5%

5-10%

Anticipated savings £

5.5 Carcasses

There are significant benefits from making every effort to reduce animal fatalities.

Fallen stock now present a double cost: the loss of the animal and, in most cases, a charge for collecting and disposal of the carcass. These charges may increase as there are now fewer disposal contractors and they are faced with higher disposal costs.

Livestock mortality costs reduced by better stockmanship

A novel approach to treating a long term disease problem on a large pig unit led to 38 fewer deaths per month in a finishing house. This equated to an annual saving in stock numbers of 456 which, when sold at mature weight, would realise £36,024. In addition, there was an annual saving of £2,280 from carcass collection costs, making a net overall saving of £38,304.

Review of current practice

Who is responsible for fallen stock on the farm? E.g. removal to central point, arranging for disposal, etc.

Farmer/Manager

Stock person

Good livestock husbandry will reduce livestock mortality. To start with, check that livestock welfare, housing design and conditions are satisfactory. Being able to spot the early signs of sickness or disease enables corrective action to be taken before the situation becomes serious.

Someone should be made responsible for checking the well-being and health of the animals (see the animal welfare codes of practice) on a regular basis, and be aware of what to do in any given situation. It is also important that the responsibility for calling in a vet is given to the right person to ensure there is no delay, particularly when there is a higher than usual mortality rate.

Does the farm have a policy for casualty slaughter?

Yes No

Many assurance schemes for supermarkets and other outlets now require that established procedures are in place for the careful handling of sick animals and the correct disposal of dead

ones. A policy for the slaughter of casualty animals is often included in such protocols.

How are carcasses disposed of?

Hunt kennels/other

Knacker's yard

Renderer

Incinerator

National Fallen Stock Scheme

(Burial and open burning is not permitted except in certain remote areas)

It is essential that dead animals are taken to a dedicated storage area as soon as possible after death - in order to reduce any possibility of disease transferral. With pigs and poultry, livestock mortalities occur on a regular basis throughout the year and so an ongoing procedure for carcass disposal is required. For other livestock, the mortality rate is seasonal, e.g. at the peak period of lambing or calving and specific measures need to be taken at these times.

Dispose of fallen stock without undue delay in accordance with the "Animal By Products Regulation" (Regulation (EC) No 1774/2002). A number of disposal routes for fallen stock are permitted by the Regulation, including rendering, incineration or sending the carcasses to a knacker or hunt kennel. Consult local Defra Animal Health Divisional Offices for advice.

Burial and open burning is only permitted as a disposal route for animal by-products (in this case fallen stock) in certain remote areas (parts of the Highlands and Islands of Scotland, the Scilly Isles and Lundy Island) and during outbreaks of notifiable disease if there is a lack of capacity at rendering plants and incinerators or if transport of the carcasses would spread disease.

To help farmers source an approved disposal route and obtain value for money, an industry led Fallen Stock Collection Scheme, backed by Government funding, started on 22 November 2004. An information pack containing details of how to join is available and farmers may obtain a copy or find out more about the scheme by telephoning **0845 054 8888**. More information about the Scheme can also be found at www.nationalfallenstock.co.uk

If you use an incinerator, is its capacity greater than 50 kg/hr?

Yes No

There are different requirements for incinerators with burn rates above and below 50 kg/hr. Check with the local authority licensing department and the Environment Agency for guidance on the use of incinerators. The State Veterinary Service is responsible for inspecting and approving all animal carcass incinerator plants in accordance with Regulation 1774/2002. Guidance on using incinerators to dispose of fallen stock is available on the Defra website and from local Defra Animal Health Divisional Offices.

Estimate annual livestock mortality costs

	Cost of lost stock value	Cost of carcass disposal
Dairy cattle	£	£
Beef cattle	£	£
Sheep	£	£
Pigs	£	£
Poultry	£	£

Under the BSE Monitoring (England) Regulations 2001, any bovine animal aged over 24 months found dead on a holding or in transit must be notified to Defra’s appointed agent (Rural Payments Agency) within 24 hours of its discovery. Such carcasses will be removed free of charge. Equivalent measures have been introduced across the rest of the UK.

The costs of mortality include the lost value of the animal as well as the carcass disposal. The costs of carcass disposal can be assessed from the contractor’s invoices for removal or from the capital and operating costs for on-farm incineration.

Typical mortality rates for various livestock

Stock	Annual Mortality
Dairy/beef cows	1.0%
Bullocks/heifers	1.5%
Calves	8.5%
Ewes	4.0%
Lambs	10.0%
Sows	4.0%
Finishers	2.0%
Piglets	12.0%
Hens	5.0%
Broilers	10.0%

Take action if actual mortality levels are significantly higher than the typical industry standards given above.

Waste minimisation – opportunities for savings

Waste Avoidance

Do you have a stock replacement policy and health security policy?

Yes No

Take time to find out the health status of incoming stock.

Do you know the standards for stocking density?

Yes No

Follow legal requirements and the animal welfare codes of practice.

Do you have a good disease prevention policy with good practices, disinfection programme, improved stockmanship, timeliness of spotting problems and alerting the vet?

Yes No

Timely evaluation at death by a vet will enable you to take appropriate action and undertake precautions to avoid disease spread.

Do you have a good standard of livestock environment: feeding, water, choice of buildings material, ventilation, ensuring correct nutrition?

Yes No

Some buildings of general purpose design, or of restricted height may cause physical problems or lead to poor ventilation.

Is automatic ventilation of livestock houses tested as required in the Welfare of Farmed Animals Regulations?

Yes No

Follow legal requirements with regard to lighting levels for stock inspection and fail-safe ventilation hatches in case of power cuts.

Are pest and predator control measures in place?

Yes No

Examples are fox control, for outdoor lambing, or outdoor pig units.

Waste Reduction

Can you reduce transmissible disease problems on your farm?

Yes No

Check public access, visitors, protective clothing, washdown and showers, farm security.

Can you increase cleanliness, hygiene and disinfection standards?

Yes No

Check feed lorries, stock lorries, waste management vehicles, other vehicles, use different disinfectants e.g. in solid form.

Can you prevent injury by improved building maintenance?

Yes No

Reduced pests, vermin, viruses. Reduced slips/broken limbs from slippery floors.

Can you improve procedures for prompt veterinary intervention?

Yes No

Use of medication, inoculation, antibiotics; either in feed or water or via injection.

Can you improve mechanical equipment reliability and efficiency?

Yes No

Identify improvements to ventilation, fail-safes/alarms, and manure management to reduce mortality risks.

Can you improve management procedures and vaccination/medication effectiveness?

Yes No

Supervise at specific times including synchronised births/lambing.

Can you improve carcass removal, containment, and removal to an isolated storage area?

Yes No

See notes overleaf.

Removing carcasses quickly will reduce the chance of disease spread.

Can you dispose of carcasses by incineration?

Yes No

Incineration is a very effective means of disposal. Check legal requirements.

Waste Reuse

Can you use a licensed knackerman?

Yes No

Continually review charges for disposal.

Can you send to hunt kennels/zoos/circuses or maggot breeding farm?

Yes No

Continually review charges and options for disposal.

Have you considered use of Renderers?

Yes No

Review this option for disposal.

Have you considered use of the National Fallen Stock Scheme?

Yes No

Review this option for disposal.

Estimated annual cost savings

Summarise the most appropriate actions in order to minimise waste and make savings

Anticipated savings

£



6

General Farm
Waste

6.1 Scrap metals

Sending redundant machinery to an authorised scrap metal merchant is a way of converting waste into cash. Metal tubes, pipes and panels may have many uses and so also have a value. The disposal of certain vehicles that have come to the end of their lives will be free of charge if disposed of using a designated route.

Reuse of metal saves the costs of the new cultivator points

A farmer in the East Midlands has a policy to reuse all metal off-cuts and to weld used points and hardfacing onto soil engaging machinery such as cultivators and harrows. This extends the life of the current points and saves on the purchase of a new set.

Review of current practice

Who decides the farm's machinery replacement and procurement policy?

Self Dealer Adviser
 Engineer Accountant

What is your general replacement policy?

Replace with new after 2 years
 Replace with 2-year-old after 5 years
 Replace with 5-year-old after worn-out

Tick the types of machines you have:

Water pumping Tractors
 Combine harvester Lorry
 Space heating
 Other (specify)

Do you have a service and maintenance policy for all machines?

Yes No

Do you keep records of each machine's spares and repairs bills?

Yes No

Do you have a policy on waste metals?

Yes No

What are your scrap metals stored in?

Bins Skips
 Bulks Secure piles

Are all your tractor drivers trained for effective and efficient machine operation?

Yes No

Are all your tractor drivers trained to service and maintain their machines?

Yes No

Tick the types of equipment you have:

Ploughs Discs
 Cultivators Grain drills
 Potato harvester
 Sugar beet or other root harvester
 Other (specify)

Tick the types of waste metals you have:

Mild steel	<input type="radio"/>	Cast iron	<input type="radio"/>
Hardened steel	<input type="radio"/>	Stainless steel	<input type="radio"/>
Lead, batteries and pipes	<input type="radio"/>		
Copper, wiring/motors	<input type="radio"/>		
Aluminium castings or pipes	<input type="radio"/>		
Scrap machines/vehicles	<input type="radio"/>		
Scrap equipment/implements	<input type="radio"/>		

Summarise annual wastes:

	Quantity per year (t)	Annual value
Ferrous metals	<input type="text"/>	£ <input type="text"/>
Non-ferrous metals	<input type="text"/>	£ <input type="text"/>
Scrap machines/ equipment/implements	<input type="text"/>	£ <input type="text"/>

Waste minimisation – opportunities for savings

Waste Avoidance

Can you use plastic materials instead of metals?

Yes No

Plastic tanks, plastic sheeting and plastic piping may be used instead of metals and will be resistant to corrosion.

Can you use a contractor for some types of work?

Yes No

Using a contractor saves machine ownership costs and improves the utilisation of specific types of machine. A contractor also brings expertise in the machine’s use and looks after its maintenance.

Are all field operations necessary?

Yes No

Cultivation operations are particularly expensive on metal wear and energy use. Check whether all operations are necessary and whether they are correct for the soil moisture and structure.

Waste Reduction

Have you considered altering machine settings?

Yes No

Have you considered operator training for servicing and operation?

Yes No

Trained operators will be able to set equipment to reduce wear and tear and will ensure all maintenance aspects are looked at.

Do you select the correct machine for the job?

Yes No

Machine selection to suit the job is important, especially in cultivations, e.g. where discs or cultivators may produce similar results to a power harrow, but much faster and with less energy cost.

Have you considered heavy duty machines, rather than light duty?

Yes No

Where the task is particularly demanding, due to soil type or period of operation, it will pay to use heavier duty equipment to reduce breakdown and machine fatigue.

Have you considered re-tipping of cultivator points/hard facing?

Yes No

There are many options for tip replacement. Using metal or hard-facing will reduce the weight of metal being wasted.

Waste Reuse

Have you considered antique value?

Yes No

Some old machines may be collectable and could realise a better value than the scrap value.

Can you sell equipment to a neighbour, dealer or even third world machinery exporter?

Yes No

It is better to sell an old machine while it is still working, either for export or spare parts.

Waste Recycling

Can you use an authorised scrap merchant for ferrous and non-ferrous metals?

Yes No

It is better to segregate your scrap metals from other types of wastes and take the going price for metal recycling, rather than paying for disposal.

Can you utilise used metals for facing or repair of other items?

Yes No

Using metals available from other used components will save on the purchase of new metal resources.

Do you need to dispose of passenger vehicles or vans (e.g. Landrovers and pickups) from your holding?

Yes No

End-of-Life passenger vehicles (this does not include tractors, combines and self-propelled machinery) can be taken to a designated permitted Authorised Treatment Facility* (list is published on the Environment Agency's website at www.environment-agency.gov.uk) to be recycled or reused. This is free of charge to the owner of the vehicle. * From January 2007.

Summarise the most appropriate actions in order to minimise waste and make savings

Anticipated savings £

6.2 Fuel oil and lubricants

Efficient use of energy makes good environmental sense and good business sense.

Fuel oil and petroleum products cost the agricultural industry more £450 million/year. To reduce these costs, farm businesses increasingly need to practice good energy management. One example is integrated crop management that, by rationalising soil cultivations, can achieve consistent savings in fuel costs.

Careful selection of cultivation systems can produce major fuel savings

By careful tyre selection and choice of field operations, a farmer has reduced trafficking in unsuitable soil conditions and so reduced the need for remedial cultivations - saving up to £6 per hectare in fuel cost alone. This has also freed up labour and machinery, leading to improved timeliness of other operations.

A further 40-60% of cultivation fuel costs has been saved by using combination implements (to accomplish field work with fewer passes) and non-powered seedbed cultivators. In addition, this has reduced labour & machinery costs and improved timeliness of operations.

Who decides the farm's fuel oil procurement policy?

Farmer/Manager

Supplier

Engineer

Are all tractor drivers trained to optimise on fuel use?

Yes No

Tick the equipment you have which uses fuel oil:

Tractors Lorry

Combine harvester Grain drier

Space heating Water pump

Other (specify)

Is the main diesel oil tank kept locked?

Yes No

Does the diesel oil tank have a meter?

Yes No

Do you keep records of each machine's specific use of fuel?

Yes No

Are your oil-fired heating systems thermostatically controlled?

Yes No

Do you have a service and maintenance policy for all machines?

Yes No

Summarise annual use:

	Quantity per year (l)	Annual value
Heating oil	<input type="text"/>	£ <input type="text"/>
Engine fuel oil	<input type="text"/>	£ <input type="text"/>
Lubricants	<input type="text"/>	£ <input type="text"/>

Waste minimisation – opportunities for savings

Waste Avoidance

Is the use of all fuel oil necessary?

Yes No

Avoid use of machines for journeys or tasks which themselves are not productive, or which could be dealt with by internet, email, telephone or mail order.

Can you change fuel?

Yes No

Consider other fuel types including gas, electricity, LPG. See section on electricity, page 86.

Do you know where all your energy is being used?

Yes No

Records of fuel usage by individual machines helps identify inefficient use and enables action to be taken.

Can you improve oil and lubricant storage?

Yes No

Some losses or leaks are avoidable. Using locks and pass-codes for drawing fuel oil will deter theft and improve fuel efficiency.

Can you avoid crop drying by attention to weather?

Yes No

Selection of harvest conditions can reduce drying need. Grain for rolling may be stored at a higher moisture content by using alternative techniques.

Waste Reduction

Can you improve on tractor and equipment selection and maintenance?

Yes No

Regular maintenance and servicing will improve efficiency and economy.

Can you fit heating controls on driers and heating systems?

Yes No

Over-drying grain by 1% costs around £1/tonne. Spacing heating to an extra degree can cost 10% more.

Can you increase fuel efficiency by altering machine settings?

Yes No

Check plough or cultivator settings. Cultivating too deep uses disproportionately more fuel. Careful ballasting and speed settings will also save fuel.

Farm transport is a major user of fuel. Can journey distances for materials be reduced?

Yes No

Ensure all journeys are necessary. Use fuel-efficient vehicles and double up loads or utilise return trips.

Can air or water leakages be reduced?

Yes No

Leakage means lost product and energy loss.

Could you install better insulation?

Yes No

Insulation to the latest recommended levels will save money over the longer term.

Waste Reuse

Can you re-circulate warm air?

Yes No

Re-circulation of heated air reduces energy requirement.

Waste Recycling

Can you recycle oil to oil specific recycling schemes?

Yes No

Recycling waste oil avoids the risk of localised pollutions and enables beneficial reuse.

Can you use waste oil for the overwintering of machinery in storage?

Yes No

Waste oil can be used for applying to the wearing parts of machinery, provided rubber is avoided.

Summarise the most appropriate actions in order to minimise waste and make savings.

Estimated savings potential

2 - 5%

5 - 10%

10 - 15%

Potential savings £

6.3 Tyres

Use of tractors on the road increases tyre wear. Tyres represent 8 – 15% of the cost of a tractor and an average tractor will require at least 4 sets during its life. A 10% saving in tyre wear could save approximately £2000 over the life of a tractor.

Training in better tyre management saves money and time

A farmer in Nottinghamshire sent his farm engineer on a tyres training course with the result that improved tyre choice and care led to reduced punctures and longer tyre life. This saved the cost of repairs and downtime, and increased the performance of tyres for traction work. The farm's new policy is to send used tyres back to the tyre supplier, as paying the small charge each time ensures environmentally acceptable recycling.

Review of current practice

Who decides the farm's machinery tyre selection and procurement policy?

Self Dealer Adviser

Engineer Tractor driver

Do you service your own tyres or use a specialist fitter?

Self Fitter

Do you have a policy on waste tyres?

Yes No

If yes, what is your general policy?

Send used tyres back with fitter

Send off-farm for recycling

Reuse on the farm

Other (specify)

Are all your tractor drivers trained for efficient machine operation with regard to ballasting and tyre pressures?

Yes No

Do you keep records of each machine's tyre sizes and pressure ratings?

Yes No

Do you have lots of tyres to dispose of?

Yes No

Significant problems can occur when a farmer has a bulk of waste tyres to dispose of all at once. Typically this can be experienced by farmers using tyres on the top of silage clamps.

Summarise annual quantity of scrap tyres:

	Quantity (number/year)	Annual cost of disposal	Annual tyre costs
Tractor tyres	<input type="text"/>	£ <input type="text"/>	£ <input type="text"/>
Machine/ equipment/ implement tyres	<input type="text"/>	£ <input type="text"/>	£ <input type="text"/>

Waste minimisation – opportunities for savings

Waste Avoidance

Can you use a contractor for heavy field work?

Yes No

Contractor costs can be very competitive and they will have the right size of equipment available.

Can you use tracked vehicles for some types of work?

Yes No

Tracked vehicles are much better at heavy draught work, and do less damage to soil.

Are all road operations necessary?

Yes No

High speed road use causes accelerated wear of lugged type tractor tyres. Using rubber tracked vehicles on the road also increases wear.

Can you avoid keeping used tyres?

Yes No

If a used tyre has no practical use on the farm, then it is best to pay the small charge to return the tyre with the fitter.

Waste Reduction

Have you considered machine operator training?

Yes No

Proper operation can result in improved efficiency of the tractor by 20%. Optimum slip should be in the range 10 - 12%.

Have you considered use of a specialist fitter, rather than unskilled labour?

Yes No

In some cases, a trained fitter will be able to fit the tyres with less risk of bead damage and reduced risk of slippage on rim or misalignment.

Is care taken to choose the correct type of tyre?

Yes No

Consider load, weight, pressure, ballast, speed rating, design, size, tracking, speed, ground pressure, gearing front/rear, balancing and road use requirements. Help from an advisor or tyre engineer will save problems later. Savings could be of the order 10 - 15%.

Is care taken to make the correct choice of machinery for the job?

Yes No

Choosing tractors which can work at speed rather than a high torque and draught, will improve efficiency and reduce strain on tyres.

Is care taken to ensure the correct matching of tractors to implements?

Yes No

Tractor size should be matched to implement speed, width and depth settings. Workrate can be improved by 10 - 15% and tyre slip and wear reduced.

Do you give attention to machine settings?

Yes No

For ploughs, cultivators and subsoilers, the draught force increases quickly with depth of setting. Using shallower settings decreases the stress and wear on tyres considerably.

Waste Reuse

Have you considered reuse of some types of tyre on other equipment?

Yes No

Use some vehicle tyres as tractor front tyres, as implement land wheel tyres, or packer rollers. Tractor tyres can be made into yard scrapers.

Have you considered remoulding or re-treading of tyres?

Yes No

These methods give tyres extended life.

Waste Recycling

Are you able to make better use of the tyre fitter/dealer for recycling the tyres?

Yes No

Most dealers/fitters now offer a take back system. There is a fee, but it is usually much less expensive than trying to dispose of it yourself.

Summarise the most appropriate actions in order to minimise waste and make savings

Estimated savings potential

2 - 5%

5 - 10%

Potential savings £

6.4 Packaging (except pesticide and fertiliser packaging)

Many forms of packaging are used in agriculture and disposal costs may be significant for individual farmers and growers. Without correct management, the packaging, which may include paper, card and plastics, can become litter. Good opportunities exist, and may be developed further, for reusing and recycling these materials.

Improved arrangements for packaging recycling and disposal produce several environmental benefits

Instead of paying £40 per tonne for rubbish taken to landfill, a farmer now recycles some packaging materials. Income is derived from waste pallets by selling them to other farmers who need them and paper sacks go for recycling for £10/tonne. Even though the income from this is very small, there is a reduction in environmental pollution and a saving in landfill disposal costs.

Review of current practice

What is your waste packaging stored in?

Bin	<input type="radio"/>	Skip	<input type="radio"/>
Plastic drum	<input type="radio"/>	Metal cage	<input type="radio"/>
Pallet-box	<input type="radio"/>	Bulk	<input type="radio"/>
Old shed	<input type="radio"/>	Chemical store	<input type="radio"/>

What is your general policy?

Attempt to reduce incoming packaging	<input type="radio"/>
Return it back to the place it came from	<input type="radio"/>
Accept all packaging and dispose of it	<input type="radio"/>
Accept all packaging and recycle it	<input type="radio"/>
Accept all packaging and burn most of it	<input type="radio"/>
Are the burnable materials segregated from non-burnable materials?	
Yes	<input type="radio"/>
No	<input type="radio"/>

Where does the waste packaging go?

Collected by a recycling scheme	<input type="radio"/>
A contractor takes it away	<input type="radio"/>
Taken to the landfill site	<input type="radio"/>
Burnt in multi-fuel boiler	<input type="radio"/>
Sold	<input type="radio"/>
Reused	<input type="radio"/>
Returned to supplier	<input type="radio"/>

Review of waste packaging arising annually

Packaging Category	Is disposal a problem?	Estimated quantity per year (kg)	Estimated costs of disposal (£)
Paper	Y <input type="radio"/> N <input type="radio"/>	<input type="text"/>	£ <input type="text"/>
Cardboard	Y <input type="radio"/> N <input type="radio"/>	<input type="text"/>	£ <input type="text"/>
Foil/aluminium	Y <input type="radio"/> N <input type="radio"/>	<input type="text"/>	£ <input type="text"/>
Plastics film	Y <input type="radio"/> N <input type="radio"/>	<input type="text"/>	£ <input type="text"/>
Rigid plastics	Y <input type="radio"/> N <input type="radio"/>	<input type="text"/>	£ <input type="text"/>
Polystyrene	Y <input type="radio"/> N <input type="radio"/>	<input type="text"/>	£ <input type="text"/>
Glass	Y <input type="radio"/> N <input type="radio"/>	<input type="text"/>	£ <input type="text"/>
Wood	Y <input type="radio"/> N <input type="radio"/>	<input type="text"/>	£ <input type="text"/>

Waste minimisation - opportunities for savings

Waste Avoidance

Can packaging be avoided by using bulk delivery?

Yes No

Use of bulk delivery and storage instead of bags can avoid waste packaging production.

Can packaging be avoided by using return-trip containers?

Yes No

Find alternative container types other than paper. Instead of cardboard, use reusable plastic or metal tray type containers.

Waste Reduction

Could packaging be reduced by changing to larger sized containers or bags?

Yes No

Instead of plastic fertiliser sacks use a bigger container size, such as a big bag. For all other types of packaging consider using bigger container sizes including bigger bottles and bigger boxes or cartons, but don't over buy and watch the use-by dates on bulk or large batches.

Could waste packaging be reduced by better storage arrangements?

Yes No

Avoid storing bagged powders or meal in damp conditions. Store cardboard boxes off the floor.

Could better purchase planning reduce the amount of packaging?

Yes No

Reduce wastage by sensible buying which includes attention to stock control, inventory control, use-by-dates and quantities etc.

Waste Reuse

Can packaging be reused?

Yes No

Sacks, bags and pallets may be reused.

Could extra care be taken to keep packaging intact and enable longer life for reuse?

Yes No

Reuse packaging materials by careful handling of the existing materials in the first place to avoid rips and tears of sacks or broken pallets.

Waste Recycling

Have you assessed the recycling potential of your waste?

Yes No

Refer to the Recycling Directory www.wasterecycling.org.uk along with your local directories for further information.

Can paper and card be recycled to produce income?

Yes No

Paper generally has a value by recycling to a normal paper recycler, but card may also cover costs or be cheaper to recycle than to dispose of.

Can metal packaging be recycled?

Yes No

Metal containers can be taken to a recycling centre or added to the pile of metal scrap. Tin and aluminium are high value metals.

Can you recycle glass?

Yes No

Most glass bottles of whatever colour are recyclable, but colours should be kept separate. Take care with chemical/medicine bottles/jars.

Can you recycle plastics?

Yes No

Some plastics can go to recycling organisations. Different types should be segregated. Some sacks or big-bags may be used as geotextiles. See section on plastic silage wrap/sheet on page 38.

Could some materials (wood, paper and card) be used in a waste-to-energy system?

Yes No

Combustible waste may be used in a multifuel boiler system.

Summarise the most appropriate actions in order to minimise waste and make savings

Estimated savings potential

2 - 5%

5 - 10%

Potential savings £

A close-up photograph of a glowing incandescent lightbulb. The bulb is the central focus, with its filament and internal structure visible through the glass. The light it emits is a warm, golden-yellow color. A semi-transparent teal rectangular box is overlaid on the right side of the image, containing the number '7' and the text 'Optimising Use of Inputs'.

7

Optimising Use of Inputs

7.1 Electricity

Agricultural use of electricity, especially for ventilation, heating and cooling, is increasing annually. However, new increasingly efficient systems can save at least 10% on electricity costs.

Livestock farm saves money on electrical heating

The electricity required to run piglet creep lamps resulted in higher than average energy costs for a pig enterprise. By installing simple dimmers on the lamps at £3,000, annual electricity savings of £3,800 per year were expected.

Typical electricity usage on farms

Enterprise (and assessment unit)	Usage per 'assessment unit' (kWh)	
	Good	Poor
Dairy (per cow)	280	430
Arable (per ha)	89	183
Pig (per head)	51	79
Broilers (per 1000 birds)	250	300
Layers (per 1000 birds)	310	460
Grain drying (per tonne)	41	123
Potato storage (per tonne)	55	123

Review of current practice

Have you considered alternative suppliers and /tariffs?

Yes No

You can negotiate favourable contracts, saving up to 10% and could save 35% costs (not energy) with different tariffs.

Are all your appliances automatically controlled?

Yes No

Automatic control can save 50% of energy usage.

Are any of your buildings metered separately?

Yes No

Separate meters make management easier.

Do workers switch off equipment and lights?

Yes No

Switch-off in breaks saves 12% in energy usage.

Do you consider the energy efficiency of motors?

Yes No

High-efficiency electric motors save 4 - 10% of energy usage.

Are low-energy lamps used for continuous duties?

Yes No

75% energy saving possible.

Are smaller 26 mm diameter fluorescent tubes used?

Yes No

8% energy saving on 38 mm at reduced item cost.

Do you check thermostats regularly?

Yes No

Correct setting will save up to 20% energy compared to an incorrect setting.

Are your buildings insulated to current standards?

Yes No

10% energy saving by refurbishment.

Are lighting systems switched independently?

Yes No

30% energy saving.

Are you planning future investment in buildings or heating/cooling?

Yes No

Efficient designs gives 60% energy reduction in running costs for 8% increase in project cost.

Review of present electricity consumption

**Enterprise:
e.g. dairy**

	Energy used kWh	Annual Cost £
Annual use of day rate electricity		
Annual use of night rate electricity		
Annual total		

Note: Repeat your review for each enterprise.

Enterprise:

	Energy used kWh	Annual Cost £
Annual use of day rate electricity		
Annual use of night rate electricity		
Annual total		

Waste minimisation - opportunities for savings

Waste Avoidance

Do you monitor all your energy usage?

Yes No

More meters or hour meters give useful information.

Can you change to gas, oil or LPG type fuel?

Yes No

For heat, these fuels reduce CO₂ emissions by 66%.

Can you avoid having to cool down crops?

Yes No

Harvest crops early in the day to reduce the amount of heat to be removed.

Can you pre-cool produce with ambient air?

Yes No

In refrigerated potato stores this may save 10kWh/tonne.

Can you avoid crop drying by attention to weather?

Yes No

Dry by using cold air ventilation instead of heat. Avoid drying unless necessary.

Can you reduce electricity used in lighting?Yes No

Make use of natural light. Use fluorescent lights.

Can you use deep straw bedding systems?Yes No

Deep straw bedding for pig housing saves heat input.

Can you install natural ventilation?Yes No

Automatically controlled natural ventilation avoids the use of fans in poultry and pig housing.

Could buying pre-mixed feed be cheaper?Yes No

Buying in avoids energy use of 20 kWh/tonne.

Waste Reduction**Can you improve on equipment selection and maintenance?**Yes No

System selection affects the accuracy of control. Regular maintenance and calibration costs little.

Can you fit automatic temperature controls?Yes No **Do you check control settings regularly?**Yes No

Automatic controls and correct settings can save 20 kWh per pig or 200 kWh per 1000 broilers per 1°C reduction.

Do you check control settings regularly for crop stores?Yes No

In cold stores inaccurate settings cost 40 kWh/tonne. Over-drying grain by 1% costs 10 kWh/tonne and also incurs loss of saleable weight.

Is your refrigeration plant design correct?Yes No

Effective cold store sealing saves 10 kWh per tonne stored.

Can you fit cooling controls in the dairy?Yes No

1°C overcooling of milk costs 40 kWh/cow/year.

Can you reduce air or water leakages?Yes No

Leakage means lost product and energy loss.

Can you save lighting energy costs?Yes No

See notes overleaf.

Use PIR sensors, low-energy lights, dimmers or zoned switching of lights.

Can you pre-cool milk using water and improve the efficiency of your bulk tank?

Yes No

Milk pre-cooling reduces energy usage by 50%. Select refrigeration plant correctly to save 80 kWh/cow/year.

Can you change washing systems?

Yes No

Cold wash systems will save one hot wash per day.

Can you use high efficiency motors?

Yes No

Use high-efficiency motors for long running motors.

Could you install better insulation?

Yes No

Save 200 kWh per 1000 broilers, 2 kWh per piglet and 20 kWh per tonne in cold stores.

Waste Reuse

Can you re-circulate warm/cold air?

Yes No

This reduces heating or cooling requirements.

Waste Recycling

Can you recover heat from milk cooling water?

Yes No

Can you recycle process water?

Yes No

Recycle heated water for wash water. Save up to 14 kWh/cow/year. Use final hot rinse water for other washing.

Can you recover heat from cooling plant?

Yes No

Heat recovery units can recycle heat from warm air.

Can you incorporate heat recovery unit?

Yes No

Heat pumps can extract heat from warm water/air.

Summarise the most appropriate actions in order to minimise waste and make savings

Anticipated savings

5 - 10%

10 - 15%

Potential savings £

7.2 Clean water

Water is a valuable commodity and costs are increasing. The droughts of recent years have shown that water is a finite resource. Therefore, efficient use of water is becoming ever more significant.

Irrigation water use is reduced by better equipment selection

An old-style hose reel irrigator wind-in mechanism was wasting water at the headland, giving uneven application as well as uneven droplet sizes from its rain-gun applicator - leading to run-off and soil erosion. Using a new turbine type machine with speed regulation, a boom with sprinklers is now used to produce better water distribution prior to crop canopy cover. This has reduced erosion, saved water and improved potato crop quality by decreasing greening.

Bite type pig drinkers saved 10% water charges

A pig farmer identified that large spillages and recreational play with nipple drinkers were leading to losses and increased slurry volume. By installing bite type drinkers, losses decreased, saving 10% of drinking water charges and reducing the cost of slurry spreading.

Review of current practice

Tick the relevant features of the systems used on your farm

Source

- Public supply _____
- Private supply _____
- Borehole _____
- River/canal _____
- Well or spring _____
- Rainwater _____
- Other (specify) _____

Storage

- Storage tank _____
- Reservoir _____
- Dyke _____
- Other (specify) _____

Point of use

- Irrigation _____
- Livestock drinking _____
- Cleaning, washing _____
- Domestic _____
- Pre cooling _____
- Dipping _____
- Other (specify) _____

The cost of water varies a great deal, depending on the source and the season of abstraction. Consider storing water abstracted during cheaper periods as a way of saving costs in the long term.

Do you have separate water meters for each enterprise on your farm?

Yes No

There is a large difference between livestock needs and irrigation requirements. 220 cows may each drink 150 litres of water every day, a total of 30 m³/day, whereas a single irrigator will use 80-100 m³/hour for specific periods during the irrigation season. Water is needed not only for livestock drinking but also for washing down, especially in milking parlours (typical livestock water requirements are shown below). On a large mixed farm, separate water meters will enable water costs to be budgeted against each enterprise or livestock husbandry system. Check water meters regularly to reveal leakages.

Do you have frequent problems with pipe freezing or burst water pipes?

Yes No

Once water is abstracted and paid for, check leakage and evaporation losses are kept to a minimum. Protect pipework from freezing.

Do you use large quantities of water for washing?

Yes No

Large amounts of washing water are used in livestock, fruit and vegetable enterprises. Consider ways in which these large volumes may be reduced. Consider vegetable wash water reuse options.

Do you use a commercial irrigation scheduling service (e.g. consultant, marketing group)?

Yes No

Crop irrigation is by far the greatest consumer of water and good system management can reduce consumption by 10% for overhead irrigators and 20 - 30% for trickle systems. Excessive use of irrigation will greatly increase energy and labour costs, increase the risk of soil erosion and reduce the quality of the crop, e.g. green or misshapen potatoes.

Do you use direct measurements of soil moisture deficit to assess irrigation requirement?

Yes No

Traditionally, potatoes have shown the best economic response to irrigation and irrigation is often essential for good quality, high-yielding crops. Check actual requirements with an agronomist and predictions are based on crop type, soil type, crop coverage, air temperature, humidity and wind speed together with expected rainfall.

Do you monitor irrigation applications?

Yes No

Remember there are often differences between *planned* and *applied* irrigation rates due to pressure fluctuations, application uniformity and the effects of wind.

Summary of annual costs of water

Irrigation	£	
Drinking	£	
Washing	£	
Domestic	£	
Total	£	

The costs of water ranges from approximately £0.50/m³ for mains water (price will vary between water companies), to £3 per 1,000 m³ (check with your local Environment Agency office) for winter abstraction from rivers. Make an estimate of the costs for each part of your business.

Typical livestock drinking water need	Litres/ head/ day	Typical wash water use
Dairy cows	45 -150 *	18l/cow/day
Sheep	2.5 - 5	
Pigs	5 - 15	2l/pig after each batch
Poultry (1,000 birds)	15 - 30	
Beef	25 - 45	

*Consumption will be a factor of milk yield, weight and availability of trough space.

Proposed actions

Estimated savings potential

2 - 5%	<input type="radio"/>
5 - 10%	<input type="radio"/>
Potential savings value	£

Waste minimisation - opportunities for savings

Waste Avoidance

Do you supply irrigation water to crop requirements only?

Yes No

Irrigation scheduling services avoid over and under application.

Could you change systems to avoid wastage of water?

Yes No

Consider using potable water where only necessary (e.g. for final rinse on a carrot washing line).

Waste Reduction

Do you use controls, sensors and meters?

Yes No

Use meters to check on water consumption by each enterprise, and to detect leakage.

Can you improve irrigation management?

Yes No

Irrigation scheduling services avoid over and under application. Tied ridges retain water and prevent soil erosion. Night-time applications will help minimise evaporative losses.

Can you select irrigation equipment which uses water more efficiently?

Yes No

Use trickle irrigation to apply water closer to the root zone. Choose irrigators and settings to give uniform coverage. Use booms with sprinklers on tender crops or bare soil. Avoid older piston/bellows drive reels which discharge water at the headland.

Can you reduce cold water running to drains when filling hand basins and sinks?

Yes No

Several litres of water are wasted before taps run hot. Instant hot water heaters save water and energy.

Could your use of valves, trigger nozzles and hand lances be improved?

Yes No

Avoid misuse of hose pipes and pressure washers. Check flow/pressure relationship for cleaners. Steam cleaning may be better.

Can you employ a good storage system design?

Yes No

Use professional reservoir design to ensure ground impermeability or liner standard is good.

Could you use tank covers?

Yes No

Covers prevent algal growth and evaporative losses.

Do you check for leaks regularly?

Yes No

e.g. check for leaks on remote water troughs.

Could you install stock drinkers which avoid spillage?

Yes No

Use bite types for pigs; nipple and cup for poultry.

Waste Reuse

Can you reuse water?

Yes No

Reuse cooling water/rainwater for washing or stock.

Waste Recycling

Can washing water be recycled within the process?

Yes No

Where hygienically practicable, use potable water only for a final washing stage in vegetable preparation. Then recycle this in pre-washes.

Can washing water be recycled for other purposes?

Yes No

On-site settlement and treatment of vegetable wash water enables potential reuse for irrigation needs.

Estimated annual cost savings

Summarise the most appropriate actions in order to minimise waste and make savings.

Estimated level of savings

2-5%

5-10%

Potential savings £

7.3 Nutrients from manures and silage effluent

By using appropriate systems and careful timing of poultry manure, farmyard manure, slurry & dirty water applications to land, these materials can be turned into valuable resources. Developing and following a Nutrient Management Plan will help to optimise your use of these livestock manures, fertilisers and other sources of nutrients.

Silage effluent is one of the most concentrated potential water pollutants produced on farms and so must be safely contained. Such effluent also contains valuable nutrients and typically is applied to land for benefit. But minimising the quantity of effluent reduces the risks of pollution and the problems and costs of storage tanks and handling systems.

Developing and following a Manure Management Plan will reduce the risk of causing water pollution from land application.

Farmer saves over £3,000 by monitoring soil nutrient levels and making best use of manure

A farmer has 300 ha of combinable crops, roots and 100 dairy cows. Previously fields were only soil sampled prior to root cropping every five to six years and soil indices were gradually falling. Combinable crops received a blanket application across all fields of an NPK compound fertiliser although there were distinct variations between fields.

All organic manure was spread on land prior to planting root crops in the autumn and no account of its nutrient value was taken. Subsequently some problems were seen on a regular basis in sugar beet - with lower sugars and higher amino-N. Potatoes were also suffering due to excess nutrients.

The farmer has taken independent advice and developed a nutrient management plan, taking full account of all organic manure for both previous and future applications. All fields are sampled on a 3 year cycle and a combination of manure and inorganic fertiliser is applied on an individual field basis to meet crop requirements. The new system has saved in excess of £3,000 and has made a positive improvement to farm performance.

Using a grass wilt programme reduced silage effluent by 85%

A farmer with a herd of 120 Friesians, makes 1200 tonnes of grass silage in a roofed clamp. By moving from a six-hour wilt programme to a 24-hour wilt, the ensiled material has increased from an average of 20% to 25% dry matter and the amount of effluent arising has dropped by 85%. This has minimised the risk of pollution, saved costs of applying effluent to land (approximately £140/year) and reduced the need for additives.

Review of current practice

Manures

Who is responsible for management of manure/slurry/dirty water?

- Farmer/Manager
-
- Stock person
-
- Tractor driver
-
- Adviser
-

Identify someone to be responsible for manure management to make best use of manures, to reduce risks of causing pollution, and to consider improvements.

Do you have a Nutrient Management Plan?

Yes No

Develop a Nutrient Management Plan for your farm; this is one of the options in the Entry Level Stewardship scheme. Keep good field records of cropping, fertiliser and organic manure applications and update your plan at the start of each cropping year. Estimate volumes and nutrient content of manures. Take advice from a person qualified under the Fertiliser Advisers Certificate and Training Scheme (FACTS). They can provide detailed fertiliser recommendations.

Do you have a Manure Management Plan?

Yes No

Draw up a Manure Management Plan to help you decide where and at what rate to apply solid manure, slurry and dirty water to avoid causing water pollution and whether you have sufficient storage (see the Code of Good Agricultural Practice for the Protection of Water). This is one of the options in the Entry Level Stewardship scheme.

Do you take manure samples and analyse them?

Yes No

Use laboratory analysis or a rapid on-farm slurry tests to check nutrient content.

What are the sources of dirty water?

- Open yards
-
- Un-roofed silage clamps
-
- Washing down water
-
- Run-off from solid manure storage
-
- From clean roofs, tracks, or springs
-

Minimise the quantities to reduce the costs of storage and spreading - for example, by eliminating clean roof water, altering yard drainage, and reducing fouled yard areas. Consider roofing some areas.

How long do you store ?

	FYM	Slurry	Dirty water
2 weeks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1 month	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2 months	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3 months	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4 months	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6 months	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1 year	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Draw up a Manure Management Plan to help you decide where and at what rate to apply solid manure, slurry and dirty water to avoid causing water pollution and whether you have sufficient storage (see the Code of Good Agricultural Practice for the Protection of Water). This is one of the options in the Entry Level Stewardship scheme.

How is slurry/dirty water applied to land?

Dual purpose spreader	<input type="radio"/>
Slurry tanker	<input type="radio"/>
Umbilical hose	<input type="radio"/>
Splash plate discharge	<input type="radio"/>
Boom discharge	<input type="radio"/>
Injector tines or discs	<input type="radio"/>
Dirty water sprinkler	<input type="radio"/>
Mobile irrigator	<input type="radio"/>
Band spreader	<input type="radio"/>

Check the uniformity of the spread pattern and the application rate achieved. Use band spreaders or shallow injectors to reduce ammonia loss and odour problems.

How much of the land you farm is in a Nitrate Vulnerable Zone (NVZ)?

All	<input type="radio"/>
Part	<input type="radio"/>
None	<input type="radio"/>

Areas within Nitrate Vulnerable Zones (NVZs) have special requirements for nitrogen applications, including manures, in order to protect groundwater and surface water. Full details of the Action Programme for England are available on the Defra web pages. www.defra.gov.uk/environment/water/quality/nitrate/default.htm

Estimate manure volumes and associated nutrient amounts and write them in the table below

	FYM	Poultry Litter	Slurry	Dirty water
Annual quantity	tonnes	tonnes	m ³	m ³
Total nitrogen	kg	kg	kg	kg
Total phosphate	kg	kg	kg	kg
Total potash	kg	kg	kg	kg

Estimates of livestock manure quantities and nutrient content are published in Defra RB209 and Managing Livestock Manures booklets. Free Defra software packages: MANNER calculates available nitrogen for manures, depending on manure type, spreading rate and date, and post-spreading management, and PLANET calculates N, P, K, S and Mg availability to crops from manures.

Now estimate the value of these nutrients. Multiply the estimated kg of nutrients (previous table) by the appropriate financial value below:

	Nitrogen value @ 36 p/kg *	Phosphate value @ 29 p/kg	Potash value @ 21 p/kg	TOTAL (sum across)
FYM	£	£	£	£
Poultry Litter	£	£	£	£
Slurry	£	£	£	£
Dirty water	£	£	£	£

* Not all nitrogen is available in the season following application; actual value may be 10 - 50% of this.

NB. All values depend on current fertiliser prices.

Review of current practice

Silage effluent

Who is responsible for deciding when to cut and harvest silage on the farm?

Farmer/Manager

Adviser

Contractor

Cutting a crop in dry weather and letting it wilt (to at least 25% dry matter for clamp silos) will significantly reduce the amount of effluent and reduce or eliminate the need for an additive.

Acidic additives can increase the amount and speed of effluent production. Absorbents will decrease but may not eliminate the release of effluent.

When do you make silage?

Apr May Jun July Aug Sep Oct Nov

Digestibility and dry matter content of the ensiled material depend on when the grass is cut. Using a contractor may speed the harvesting but may necessitate working under 'wet' conditions, particularly in a bad season.

Avoid very early and late cuts of silage which are likely to be wetter and give rise to more effluent.

For how many hours do you wilt the crop?

0 4-6 6-10 10-18 18-24 24-36

Cutting a crop in dry weather and letting it wilt (to at least 25% dry matter for clamp silos) will significantly reduce the amount of effluent and reduce or eliminate the need for an additive.

How many cuts?

1 2 3 4

Develop a Nutrient Management Plan for your farm; this is one of the options in the Entry Level Stewardship scheme. Keep good field records of cropping, fertiliser and organic manure applications and update your plan at the start of each cropping year. Estimate volumes and nutrient content of manures. Take advice from a person qualified under the Fertiliser Advisers Certificate and Training Scheme (FACTS). They can provide detailed fertiliser recommendations.

Do you use additives?

Yes No

Do you use absorbents?

Yes No

If you do dilute the effluent before application to land, what ratio of water do you add?

- 1:1
- 2:1

Dilute effluent with an equal quantity of water before spreading to land. Where silos are roofed, the effluent may be much stronger and require more dilution.

How do you make use of the effluent?

Applied to fields:

- By tanker By low rate irrigator
- Load into slurry store
- Use for animal feed

Effluent may be collected in an existing slurry or dirty water store, but ensure that it is well ventilated and can resist corrosion; such effluent can increase odour at spreading. New silos should be provided with a dedicated effluent tank, designed and constructed to comply with the latest regulations.

What is the silage system?

- Roofed clamp
- Un-roofed clamp
- Large bales

In high rainfall areas un-roofed clamps will give rise to a large amount of dilute effluent if rainfall occurs during or immediately after ensiling. On the other hand, big bales are normally ensiled at 35% dry matter or more, producing no effluent.

What is the average dry matter of ensiled grass?

Dm%	10-15	15-20	20-25	25-30	30-35	
Wet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Dry

What is the effluent tank capacity?

m³

The total likely effluent production for a range of grass dry matter contents is:

(Use the figures in this note and those in the estimates quantity of silage below to estimate quantities of effluent arising, calculating tonnages of dry matter of each cut separately if necessary)

Dry matter %	15	18	20	22	24	26
Litres per tonne	150	110	73	45	25	11

Type of crop ensiled, silage conservation system and storage facilities will each have an effect on the volume and nature of effluent arising. Further advice on dealing with effluent is given in the Code of Good Agricultural Practice for the Protection of Water.

Estimated quantity of silage

What is the estimated annual quantity of silage?

	First cut	Second cut
Clamp 1	<input type="text"/>	<input type="text"/>
Clamp 2	<input type="text"/>	<input type="text"/>
Clamp 3	<input type="text"/>	<input type="text"/>

Grass, unless wilted, can produce large volumes of effluent, whereas maize or whole crop cereals, if harvested at an appropriate state of maturity, will be sufficiently dry to produce little effluent.

Estimated volume of silage effluent

What is the estimated annual volume of silage effluent?

m³

See note above.

What is the estimated annual cost of making use of silage effluent?

£

Typical handling costs using a tanker might be £1.50-£2.00/m³, based on a 7 m³ tanker handling 3 loads per hour at a total tanker, tractor and driver cost of £25/hour. Add the additional costs for handling the water used for dilution.

Waste minimisation – opportunities for savings

Waste Avoidance and Reduction - Manures

Does any run-off from fields or roads reach the slurry or dirty water system?

Yes No

Particularly on sloping sites, run off from fields and roads above and adjacent to the dirty area may enter the system. Wherever possible, divert this drainage.

Can any open yard areas or silos be roofed over?

Yes No

Roofing over existing yard or silo areas may be considered for high rainfall areas. Capital costs of £30 – 40/m² must be weighed against savings in handling costs and other factors, such as protecting cattle and stored silage from the elements.

Do any gutters or downpipes need repair?

Yes No

Gutters and downpipes should be regularly inspected and maintained. Additional water volumes arising from poor condition of these items is usually underestimated. Consider any large roof areas first.

Can the amount of washing water be reduced?

Yes No

Remove excess dung from parlours and yards with a brush or squeegee before hosing down. Reduce washing water by reducing the time for which the hose is used per day.

Can you improve the manure collection and storage system to reduce the exposed area which collects rain water?

Yes No

Due to their shape and relatively shallow depth, lagoons and compounds collect much rainwater. Stack FYM high in middens to reduce exposure. Consider roofing FYM stores.

Can you adjust storage periods and store size?

Yes No

Improve the time period available for spreading, by planning access to grassland or maize and spring cropping or land coming out of set-aside.

Waste Avoidance and Reduction - Silage

Can you substitute maize for grass silage?

Yes No

Maize silage normally matures to a dry matter level where no effluent is produced.

Can you use a local weather forecasting service to help determine a better choice of cutting date?

Yes No

Reduce effluent production by ensiling grass at high dry matter contents.

Can you encourage better wilting by extending the wilting period?

Yes No

In favourable weather conditions, wilt in the field for 24 hours to raise the dry matter content to at least 25%. Longer periods of wilt, or an additional rowing-up operation may be needed if a higher dry matter is required, e.g. for big bale silage.

Can you use a mower conditioner more suitable to rapid wilting?

Yes No

Certain designs of conditioner are better able to promote rapid wilting. In heavy crops there can be a tendency for some material to pass through the conditioner with little treatment.

Can you use absorbents?

Yes No

The use of absorbents such as dried sugar beet shreds or rolled barley will reduce effluent production. However, absorbents cannot soak up all the effluent from very low dry matter material.

The use of straw bales in the base of the clamp has been practised on some farms.

Nutrient recycling

Have you considered nutrient management planning to reduce waste by ensuring manure and slurry applications are calculated on a field by field basis?

Yes No

Take account of soil indices, previous cropping, soil type, crop yield potential and crop fertiliser needs. Livestock manure/slurry contain valuable nutrients. PLANET software makes calculation and record keeping much easier.

Are you able to have your manure and slurry analysed for nutrients. Could you use portable meters for this?

Yes No

Slurry and manure analyses are best done using laboratory techniques. Slurry analyses may be done using relatively inexpensive and simple meters.

Waste Reuse

Can you use the effluent as a feed?

Yes No

Feed value will vary depending on dilution, but will be around 14.5 MJ/kg dry matter. If all effluent is to be fed, then a relatively large

purpose-built long-term storage facility, such as proprietary flexible bag will be required.

Waste Recycling

Can you recycle effluent to land as NPK fertiliser?

Yes No

Typical analysis per m³: 3 kg total N, 1 kg P₂O₅, 4 kg K₂O (Defra Booklet RB 209).

Can you employ improved techniques for land spreading to reduce crop damage and give better results?

Yes No

Consider tramline-width slurry spreaders, trailing shoes, shallow injectors and umbilical systems. Check settings to improve nitrogen utilisation.

Estimated annual cost savings

Summarise the most appropriate actions in order to minimise waste and make savings.

Annual savings £

Estimated potential for savings in fertiliser by better use of manure £

Estimated labour and equipment savings by improving system £

8 Actions Summary

From the earlier sections it will be apparent that some opportunities exist to make improvements and reduce costs. The purpose of this section is to summarise the more important opportunities and actions to be carried out. Pages 107 to 109 may then be copied or taken out and used as an action list for the appropriate member of staff to attend to when the time is right.

Subject <i>Pesticides</i>	Action to be taken by: <i>J Smith</i>
Proposed actions	
<ol style="list-style-type: none"> 1 <i>Reduce pesticide inputs to crops by making use of independent advice at an earlier crop planning stage. Aiming for 5% saving in first year.</i> 2 <i>Decrease washing water from sprayer by fitting an internal tank wash system.</i> 	
Date to review: <i>Spring 2006</i>	Potential savings value <i>£ 5,000 p.a.</i>

Subject	Action to be taken by:
Proposed actions	
Date to review:	Potential savings value <i>£</i>

Subject	Action to be taken by:
Proposed actions	
Date to review:	Potential savings value £

Subject	Action to be taken by:
Proposed actions	
Date to review:	Potential savings value £

Subject	Action to be taken by:
Proposed actions	
Date to review:	Potential savings value £

Subject Proposed actions	Action to be taken by:
Date to review:	Potential savings value £

Subject Proposed actions	Action to be taken by:
Date to review:	Potential savings value £

Subject Proposed actions	Action to be taken by:
Date to review:	Potential savings value £

9 Responsibilities and Training Needs

The following table provides a checklist for you to identify who has responsibility for the various activities on your farm. Tick boxes are provided to prompt you to consider the qualifications and experience of that person for each area of work. This will help you consider whether further staff training would be beneficial.

In businesses with only a few staff, it is often the manager who assumes responsibility for waste and resource management. In larger enterprises the person responsible may be the one most familiar with the work in that area, for example, the sprayer operator, tractor driver, herdsman or shepherd.

Insert name of person and identify their responsibility for managing waste or resource (tick appropriate circles). Insert the persons number in the final column where there is a need for training.

	1	2	3	4	5	6	Training need (insert info)
Wastes from Crop Production							
Pesticide application	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Inorganic fertiliser	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Plastic crop covers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Crops and produce	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Wastes from Livestock Production							
Plastic silage wrap/sheet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Feed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Used sheep dip	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Veterinary products	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Carcasses	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
General Farm Wastes							
Scrap metals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Fuel oil and lubricants	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Tyres	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Packaging	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Optimising Use of Inputs							
Electricity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Clean water	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Manures & silage effluent	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

10 Useful Information References

This section provides details of where to obtain more information and guidance that is currently available and has been referred to in this document:

British Crop Protection Council (BCPC) publications:

The UK Pesticide Guide is available from the BCPC. Go to www.bcpc.org or telephone 01420 593200 for more information.

Crop Protection Association (CPA)

represents members active in crop protection, amenity, home and garden with a strong focus on food production. Go to www.cropprotection.org.uk or telephone 01733 294228 for more information.

Defra – Department for Environment, Food and Rural Affairs

Defra Help line 08459 335577

General website is www.defra.gov.uk

Some publications can be obtained from the website at www.defra.gov.uk/corporate/publications/ or by contacting the free publications unit on 08459 556000. The free publications unit might ask for a “PB” reference number this is unique to a publication and where known is provided next to the publication.

- **Animal Welfare Codes of Practice** These are available free from Defra Publications and on Defra’s website at www.defra.gov.uk/animalh/welfare/farmed/index.htm.
- **Codes of Good Agricultural Practice for:**

Air	PB0618
Soil	PB0617
Water	PB0587
Summary of all three codes	PB4029

These codes of practice are being revised and are only available from Defra’s website at www.defra.gov.uk/envIRON/cogap/cogap.htm
- **Entry Level Stewardship scheme**
Environmental Stewardship is a new agri-environment scheme which can provide funding to farmers and other land managers in England who deliver effective environmental management on their land. The scheme is open to all farmers and landowners. For further information you can view the website at www.defra.gov.uk/erdp/schemes/es/default.htm or telephone 0845 603 7777.
- **The Groundwater protection code:**

Use and Disposal of Sheep	
Dip compounds	PB5803
Check list – Poster	PB5803A
Sheep Dip Check List	PB5803B

- **Nitrate Vulnerable Zones (NVZ)**

Detail of NVZ's can be found in the following publications, both of which are available from Defra's publications line (see above) or on the website at www.defra.gov.uk/environment/water/quality/nitrate/nvz.htm.

Guidelines for Farmers in Nitrate Vulnerable Zones	PB5505
Manure Planning in Nitrate Vulnerable Zones	PB5504

Environment Agency

The Environment Agency can provide information in most areas regarding the environment, agriculture and waste, go to www.environment-agency.gov.uk or telephone the Environment Agency's National Customer Contact Centre 08708 506506.

Fallen Stock Collection Scheme

If you have fallen stock that needs to be disposed of, contact the National Fallen Stock Company on 0845 054 8888 or visit their website www.nationalfallenstock.co.uk.

The Farm Management Pocket Book is written by John Nix and is regularly updated. To request a copy telephone 01664 564508.

Fertiliser Advisers Certificate and Training Scheme (FACTS)

For further information about FACTS contact 01335 343945 or view website www.basis-reg.co.uk

- **RB209** – “Fertiliser Recommendations for Agricultural and Horticultural Crops” and a computerised version of RB209 called “PLANET” (ISBN 0112430598) can be ordered from the Stationary Office on 08706 005522 or downloaded from the Defra website at www.defra.gov.uk/environ/pollute/envpoll.htm.

Health and Safety Executive (HSE)

HSE booklet AS29 on sheep dipping is available from the HSE at www.hse.gov.uk or by telephoning 01787 881165.

Legislation

UK legislation is available from the Office of Public Sector Information's website at www.opsi.gov.uk or by telephone on 01603 723011. Details of some of the links to UK legislation are listed below:

- Groundwater Regulations 1998 (SI 1998 No. 2746) www.opsi.gov.uk/si/si1998/19982746.htm
- BSE Monitoring (England) Regulations 2001 (SI 2001 No. 1644) www.opsi.gov.uk/si/si2001/20011644.htm

Each of the Devolved Administrations have made Regulations for the Welfare of Farmed Animals they are as follows:

- England (SI 2000 No. 1870) www.opsi.gov.uk/si/si2000/20001870.htm;

Useful Information References

- Scotland (SSI 2000 No.442) www.opsi.gov.uk/legislation/scotland/ssi2000/20000442.htm
- Wales (WSI 2001 No.2682 (W.223)) www.opsi.gov.uk/legislation/wales/wsi2001/20012682e.htm;
- Northern Ireland (SR 2000 No. 270) www.opsi.gov.uk/sr/sr2000/20000270.htm.
- The Waste Management (England and Wales) Regulations 2006 (SI 2006 No. 937) www.opsi.gov.uk/si/si2006/20060937.htm, known as the Agricultural Waste Regulations 2006 more information about these Regulations can be found at the beginning of this manual on page 6. A list of the waste management licensing exemptions that have been identified for farmers and growers can be found at www.defra.gov.uk/environment/waste/agforum/meetings/2003/index.htm. For details of all of the waste management licensing exemptions contact the Environment Agency on 0845 603 3113.

European Union legislation is available from the EU Commission. They can be contacted by telephone (International number) 00 8800 6 7 8 9 10 11 or by viewing the Commission's website at http://europa.eu.int/index_en.htm. Defra has some links to European legislation from their web pages they are:

- The Waste Framework Directive www.defra.gov.uk/environment/waste/strategy/leg_dir.htm
- Animal By Products Regulation ((EC) No 1774/2002) www.defra.gov.uk/animalh/by-prods/legislation.htm
- The Waste Incineration Directive www.defra.gov.uk/environment/ppc/wasteincin/index.htm

The National Proficiency Test Council provides training and certificates of competence regarding the use of pesticides and fertilisers, go to www.nptc.org.uk or telephone 024 7685 7300.

The National Spray Testing Scheme

Under a Voluntary Initiative (aimed to minimise the environmental impacts of pesticides) a commitment was made by the agricultural and horticultural industries to extend sprayer testing to the majority of field sprayers. For further information go to www.aea.uk.com/sprayer/nsts_scheme.htm or call 01733 362925.

Pesticides Safety Directorate (PSD)

Contact PSD if you have any concerns with pesticides they can be contacted on 01904 455775 or by looking at their website www.pesticides.gov.uk

- **The Code of practice for using plant protection products.** Available from Defra (see above) as both a free CD and a priced publication (£15.00). It is also available from the Pesticides Safety Directorate website at www.pesticides.gov.uk.

Useful Information References

- Training for personnel engaged in the sale, supply and use of Pesticides
Information on training can be found on the PSD website at www.pesticides.gov.uk/safe_use.asp?id=626.
- **The Yellow Code**
Can be obtained from the PSD website or by telephoning Defra's free publications. The title "Suppliers of Pesticides to Agriculture, Horticulture and Forestry" – PB3529.

Rural Payments Agency (RPA)

The RPA is a major delivery body for Defra, providing a range of services in support of the Departments' objectives. Key services include making rural payments, carrying out rural inspections and livestock tracing. Further information can be obtained from the website at www.rpa.gov.uk or by telephoning the RPA Customer Service Centre on 0845 603 7777.

State Veterinary Service (SVS)

The SVS is the Government's delivery agent responsible for animal health and welfare in the UK, it is divided into regional Defra Animal Health Offices where divisional veterinary managers can be contacted, For information on the SVS go to www.svs.gov.uk or telephone 01905 768862. For divisional Veterinary Managers go to www.svs.gov.uk/ahdo_locations.htm or telephone the Defra help line.

Veterinary Medicines Directorate (VMD)

For information about veterinary medicines you can contact the VMD by telephone 01932 336911 or by viewing their website at www.vmd.gov.uk.

Further copies can be obtained free of charge. Contact: Defra Publications, Admail 6000, London SW1A 2XX. Tel: 08459 556000.

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