LEAF
LINKING ENVIRONMENT AND FARMING
Integrated Farm Management

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defra
Department for Environment, Food and Rural Affairs

Environment Agency

waterwise on the farm

Version 2

A simple guide to implementing a water management plan

We are the Environment Agency. It's our job to look after your environment and make it a better place – for you, and for future generations.

Your environment is the air you breathe, the water you drink and the ground you walk on. Working with business, Government and society as a whole, we are making your environment cleaner and healthier.

The Environment Agency. Out there, making your environment a better place.

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Why save water on the farm?

We tend to think of Britain as wet and rarely short of water. However, our variable climate, high population density and the many different ways in which we use water mean that at certain times and in certain places water resources are scarce. This affects the quality of our numerous habitats that depend on water. Climate change is likely to result in wetter winters and drier summers and create increasing pressure on the water available.

Using water more efficiently not only makes good business sense, it will also help to protect a vital natural resource.

This document, which has been tried and tested by farmers, will help you to assess whether you are making the best use of your water resources, and may generate ideas for improvements.

Due to the success of the first version of Waterwise, the original partners Environment Agency, Linking Environment And Farming (LEAF) and the National Farmers' Union (NFU) were keen to publish an updated version, including information on diffuse pollution. We welcome Defra's involvement in helping to achieve this. All the organisations involved have been pleased to work together on a project that gives farmers the opportunity to make practical and cost-effective changes to the way they manage their farms so they can avoid problems in the future. We hope you find this booklet useful and we look forward to working with you on improving the quality of our environment.

Sir John Harman
Chairman, Environment Agency

Ian Pearson
Environment Minister

Tony Worth
Chairman, Linking Environment and Farming

Peter Kendall
President, National Farmers' Union

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President, National Farmers' Union Cymru

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Introduction

Being waterwise is good for farming and good for the environment. Being waterwise is about understanding how water flows around your farm and yard; recognising how you and your farming practices affect these flows; and promoting water efficiency so that you save money and reduce the risk of causing pollution.

The first chapter of this booklet illustrates how water flows around the farm, and describes how being waterwise can help reduce the risk of causing pollution.

Chapters 2 and 3 explain how to carry out a water audit and develop a waterwise action plan on your farm. This will help you to:

- reduce the amount of water and energy you use;
- reduce the volume of dirty water that needs treating and disposing of;
- save money and increase your profits;
- reduce risk of causing water pollution.

Case studies and practical advice that has been tried and tested by LEAF and NFU members provide real-life examples of how activities around the farm may affect water quality and efficiency.

Chapter 4 gives further information on issues such as Catchment Abstraction Management Strategies (CAMS), potential grants, and where to obtain advice on issues such as irrigation, and Chapter 5 provides details of organisations that can offer further information and advice. Tables and forms are grouped together at the end of the booklet.

This guide has been produced by the Environment Agency, Defra, LEAF and the NFU. All four organisations are committed to working with farmers to improve the environment in a practical and realistic way.

1 Water on the farm

Importance of being waterwise

The way to use water efficiently and manage the risk of diffuse water pollution is by carefully examining how you use water on the farm. Being waterwise will reduce the risk of pollution, make sure you use water efficiently and can save you money.

How water flows

The diagram on page 7 illustrates how water flows at the catchment scale. It is important to remember that water does not only flow on the surface but also soaks into the soil. In dry conditions the water may be retained in the soil. However, if the soil is already wet, the water may move down into the groundwater or through the soil in a downhill direction. So even if your farm has no visible watercourses for run-off to flow into, farming practices can still have an impact on water quality.

Good water quality is important because it provides clean drinking water, safe bathing water, healthy fisheries and natural ecosystems. Healthy river systems can reduce the risk of flooding and also encourage recreation and leisure activities.

Water pollution

Water pollution can be split into two main forms; point source and diffuse. Point source pollution comes from a single identifiable source, such as a diesel spillage, and is therefore easier to control. Diffuse pollution can come from a range of activities on the farm, such as the leaching of fertilisers or soil erosion, which are spread out over a wide area and therefore harder to pinpoint and control.

Whilst there are other sources of diffuse pollution – forestry, industrial land use, construction, urbanisation, transport etc. – agriculture is considered to be a significant contributor. Agriculture covers approximately three quarters of the land area of England and Wales, and many of the substances that can cause water pollution (fertilisers, pesticides, manure and slurry, even the soil itself) are essential elements of farming.

The risk of causing diffuse pollution can be greatly reduced by improving farming practices. Table 1 on page 9 contains a list of suggestions.

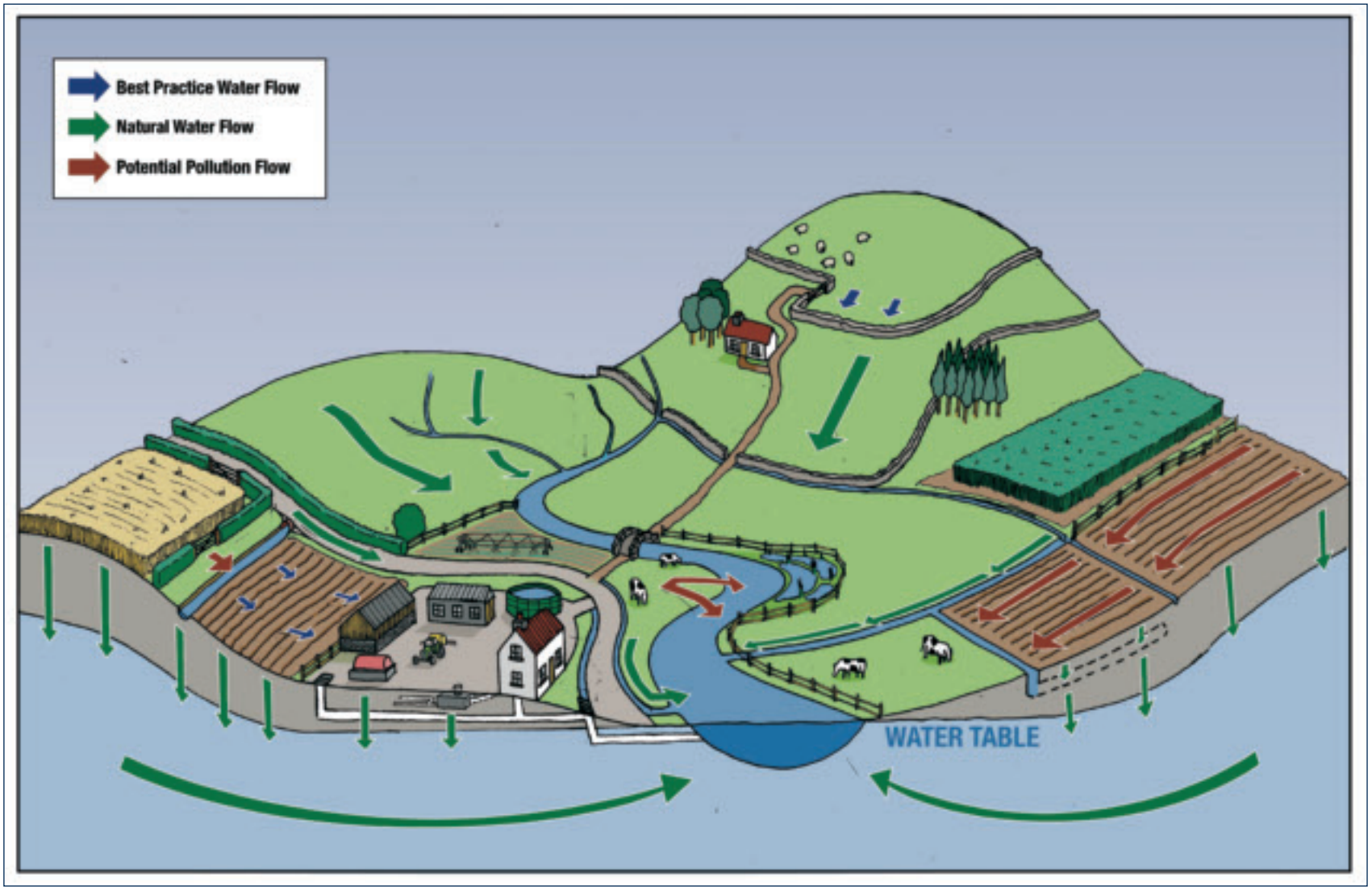
Water Framework Directive

The Water Framework Directive (WFD) is a European Directive. Its aim is to maintain, and improve where necessary, the health of the water environment and its associated ecosystems. It requires all Member States to establish a range of measures to ensure the goal of aiming to achieve 'good ecological and chemical status' for all surface waterbodies (including estuaries and coastal waters) and 'good chemical status' for groundwater bodies is met by 2015, as long as these measures are not disproportionately costly.

To meet the objectives of the WFD, it may be necessary to tackle the problem of diffuse water pollution from agriculture through regulation. We therefore encourage farmers to begin thinking about how their farming practices may impact on the water environment. Taking action now may help to reduce the effect of regulation on your farm. This booklet can help you do this.

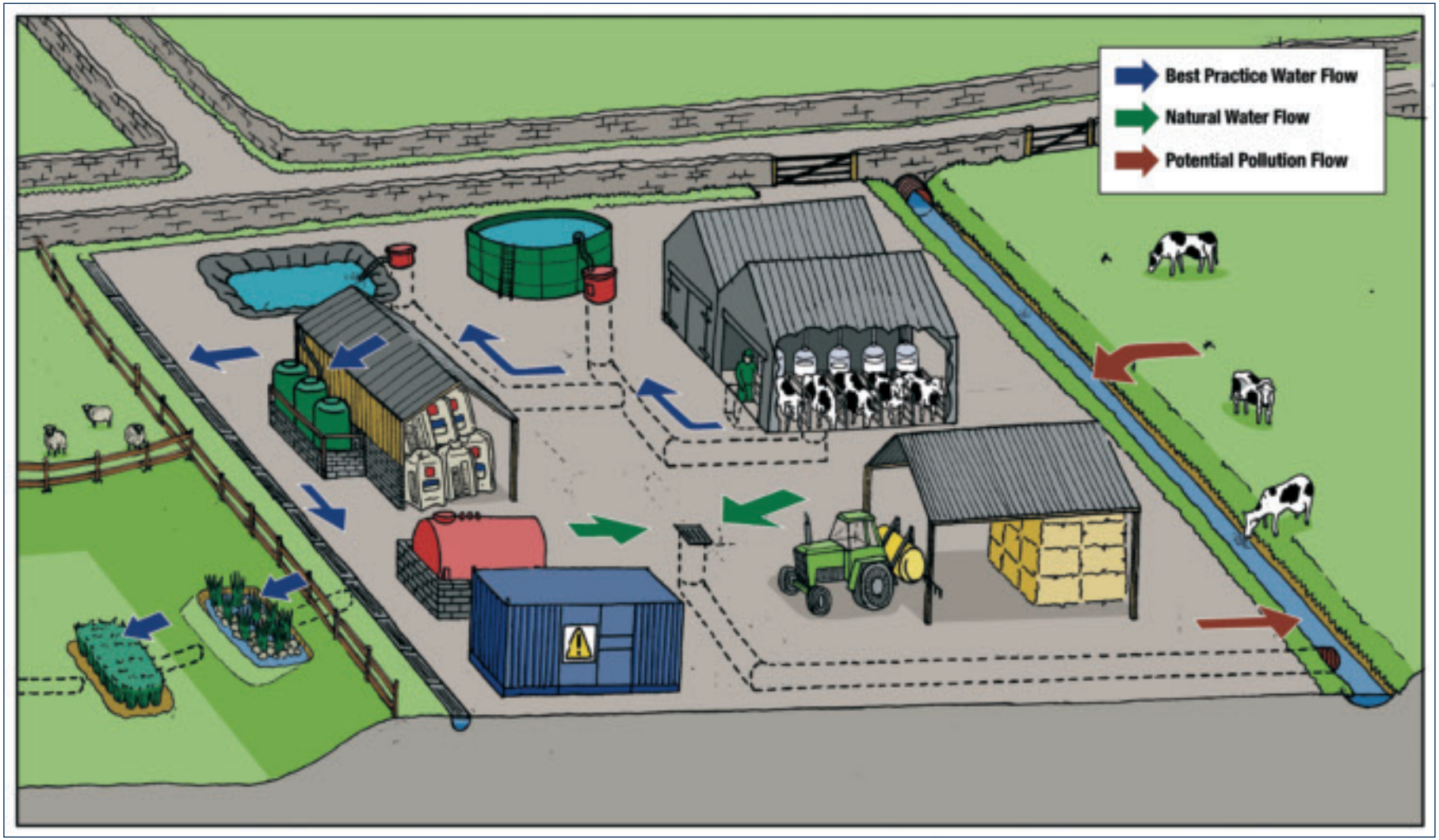
How water flows around the catchment

All activities can potentially have an effect on water as there are many different ways in which nutrients, soils and contaminants can reach both surface water and groundwater. These include through drains, along roadways, ditches, paths and through the soil. The diagram below illustrates how water can flow in a catchment and shows the different effects of ploughing across slope to down slope, the importance of positioning gateways and fencing livestock areas. You also need to think about where water goes underground in field drains, yard drains and septic tanks.



How water flows around the farmyard

To reduce the risk of causing diffuse pollution it is also important to understand how water flows around the farmyard, particularly where the drains are and where they flow to. Being waterwise should help you identify these risks, reduce the volume of dirty water you produce and save you money. The diagram below shows how water can flow round a yard.



In this example, the farmer has bunded his oil tank, got a secure pesticide store, is using rainwater harvesting, has a reed bed for cleaning up run-off from his yard and has a separated out his dirty water into a lagoon and slurry store. However he needs to take care as his drain leads directly to the ditch and livestock can gain direct access to the ditch.

Table 1: Suggested farming practices for tackling diffuse water pollution

Integrated Farm Management (IFM)
• IFM as a whole farm approach provides a framework for implementing the list of suggestions below.
Soil Protection
• Use cover crops to ensure minimal amount of bare soil, reduce wind erosion and capture surplus N; • Establish in-field grass strips to catch any surface run-off; • Plough along contours, use minimum tillage, direct drill and leave seedbeds rough to reduce erosion, and improve water infiltration, where appropriate; • Relocate gates to block run-off pathways; • Check for signs of capping and compaction, subsoil where necessary; • Consider arable erosion for high erosion risk fields.
Nutrients and fertilisers
• Integrate manure and fertiliser management plans; • Test soils for N,P,K and pH every 4-5 years; • Incorporate slurry into soil ASAP after spreading or use methods such as injecting; • Ensure there is sufficient slurry and dirty water storage to prevent untimely spreading; • Compost manure before spreading; • Consider precision farming techniques.
Livestock management
• Move stock and supplementary feeders regularly to avoid poaching; • Ensure all stock and farm tracks are well-drained and sited away from watercourses; • Avoid over-grazing and poaching, match stocking to carrying capacity; • Locate out-wintered stock and sacrifice areas away from watercourses; • Develop a feed plan which takes into account N and P levels from all feedstuffs.
Protecting watercourses
• Fence off watercourses in fields regularly used for keeping livestock; • Provide alternative drinking arrangements with pasture pumps etc; • Construct livestock crossings for watercourses regularly used by livestock.
Crop protection
• Establish buffer zones alongside all watercourses; • Use low-drift technology; • Regularly maintain and calibrate sprayers; • Make sure that areas used for mixing and filling pesticides, as well as sprayer wash-down and storage cannot contaminate surface drains - see VI website for up to date advice; • Establish beetle banks across the slope to encourage natural predators and catch surface run-off.
Yards
• Repair damaged guttering and check for leaks; • Separate clean and dirty water, recycle the clean water or divert to ditch or watercourse; • Roof livestock holding areas and manure stores to reduce the volume of dirty water produced, divert the water to use later; • Consider installing reedbeds for dealing with lightly contaminated yard run-off; • Make sure your pesticide/fertiliser store is secure and located more than 10m away from a watercourse and/or drain; • Make sure any effluent from silage clamps is collected, stored and spread in an appropriate way; • Make sure any oil or fuel storage tanks are properly bunded to 110 per cent of their volume; • Consult the Voluntary Initiative website (www.voluntaryinitiative.org.uk) on best practice for managing your pesticide filling and wash down areas.

For more information please visit the Defra Catchment Sensitive Farming website www.defra.gov.uk/farm/environment/water/csf to view a User Manual of 44 recommended mitigation measures developed by IGER/ADAS and a poster illustrating the main measures.

2 How to carry out a water audit and action plan

A water audit is simply a way of working out where, when and how much water you use. The action plan is to identify where you can reduce the amount of water you use.

To carry out a water audit and develop a water management plan you need to follow five simple steps:

Step 1: Identify how much water you are using and how much it costs

Step 2: Carry out an inventory of the water you use

Step 3: Calculate how much water you should be using

Step 4: Identify and compare water efficiency activities to reduce the amount of water you use

Step 5: Create, implement and review your waterwise action plan

The following information will help you during these steps:

- your water bills from the last two years (a longer record will make your assessment more accurate);
- details of any abstraction licence(s) you hold;
- the number and type (species and age) of livestock on your farm;
- your crop protection and irrigation records;
- a map of the water network on your farm showing water pipes and uses.

To get the best out of this booklet we recommend that you read through it all before developing your waterwise action plan.

Step 1 Identify how much water you are using and how much it costs

Identify all your sources of water on the farm

Possible water sources include:

- mains water supplied by your water supply company;
- water abstracted from rivers, streams, canals, springs or boreholes;
- on-farm ponds or other winter-stored water;
- water drunk by animals from non-metered sources (for example, from puddles or by eating wet grass);
- re-used water, such as plate cooling water or harvested rainwater.

Use Form 1 (page 27) to record the amount and cost of the water that you use each year.

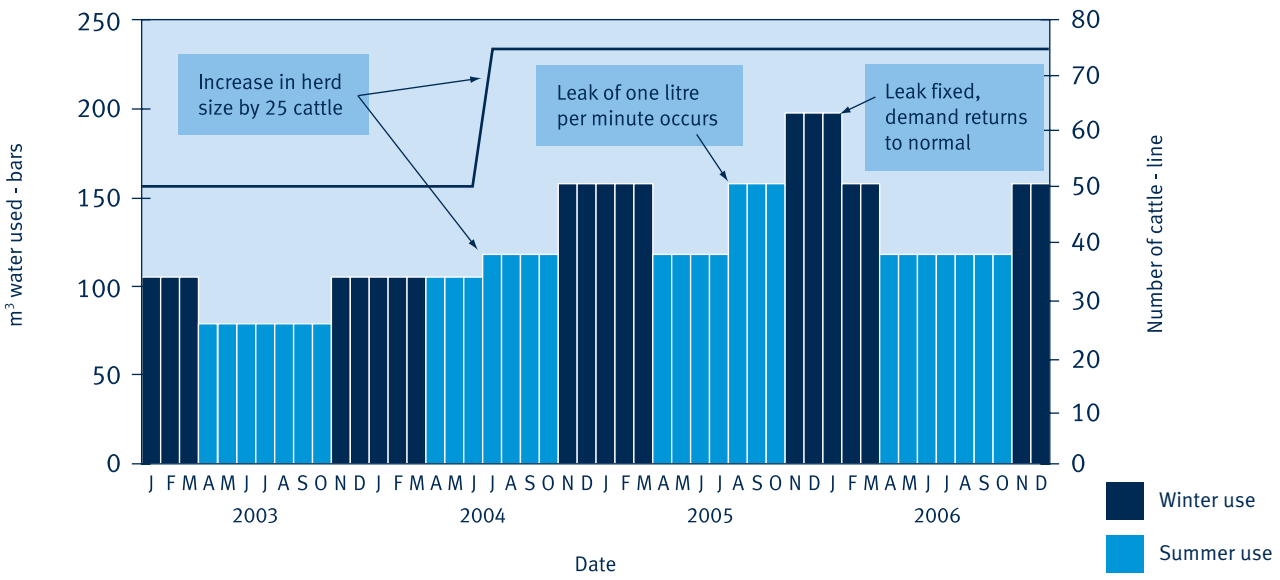
If you expect water consumption from unrecorded sources such as eating wet grass to be high, then you can use a percentage of the theoretical daily consumption data in Table 2 (page 30) to calculate this.

If you collect or recycle any water, such as rainwater or plate cooling water, then you will need to include this. The section on alternative sources of water in Chapter 3 (page 17) will help you calculate how much rainwater you can collect.

Once you have a record of the water you use, you can use this to help you understand any seasonal changes in your water-use patterns, and it will also enable you to watch out for unexpected changes. Plotting the water you use on a graph may help you to do this.

Top tip: meter reading

Set up a routine for monitoring how much water you use. Regularly read and record every water meter on the farm. If possible, you should do this at least once a month. This will alert you to any changes in the amount of water you use and could indicate a problem such as a leaking pipe or a faulty ballcock in a water trough. It may also alert you to problems with your pipes, such as blockages, that may be holding back production.



As the graph shows, a leak of one litre per minute raises water consumption by the same amount as increasing a dairy herd by 25 animals.

The table below shows the cost of the leak at a price of 85p per m^3 for mains water.

Time for which leak of one litre per minute occurs	Litres wasted	Cost at 85p per m^3 (1,000 litres)
1 day	1,440	£1.22
1 week	10,080	£8.57
1 month	43,800	£37.10
6 months	262,800	£222.77
1 year	525,600	£445.54

You need to bear in mind that metered water-use for a dairy herd is lower in summer as the cows will drink from puddles and eat wet grass.

Calculate the cost of the water you use

Your water costs you more than just the amount printed on the bill from your local water company or the Environment Agency, so do not forget the hidden costs.

Costs include:

- mains water and standing charge (from your water company);
- abstraction licence charge (from the Environment Agency);
- recycled water (pumping, storage and capital);
- dirty water (storage, treatment, disposal and capital);
- staff time (operational and maintenance).

Understanding the true cost of water is crucial in managing the water you use. Often, costs are unknown and you may make the mistake of thinking they are too low to be of concern. When you fill in Form 1 (page 27), you may be surprised by just how much you are spending on water each year.

2006 NFU water survey

Early results from the NFU 2006 water survey suggest that the cost of water is higher than many people would think. Even when a mains supply is not being used, costs of pumping and possible treatment (where needed) as well as disposal costs means that the average cost of water is actually close to the cost of mains water supply.

Step 2 Carry out an inventory of the water you use

Once you have found out how much water you use and how much it costs, the next step is to find out where you use it.

Forms 2a and 2b (pages 28 and 29) will help you to review how much water your equipment and animals use. We give examples of the kinds of calculations you may need to make.

Examine how you use water

When you have completed Forms 2a and 2b, you can now examine how you use water. Do you need to:

- **use water for that activity?** Could you use 'dry-clean' methods, such as scraping or brushing before (or instead of) washing down yards and pens?
- **use as much as you do?** Are hoses or taps left running? Are dripping taps fixed quickly?
- **use high quality water for that activity?** Consider collecting rain and used water for washing down yards. Check whether any hygiene or farm assurance requirements need water of a certain quality to be used.

Top tip: measuring the water you use

If you need to estimate the amount of water that a piece of equipment uses or a recycling system saves, all you need is a stopwatch and a container of a known volume. Carefully disconnect the outflow pipe and place the container to catch the outflow. You can then time how long it takes for the container to fill. This gives you the flow rate in litres per second (or other appropriate units) for that piece of equipment. You will then need to multiply this to give you a use per year by working out how often the equipment is used.

Map where you use water

A map of the water network will help you pinpoint sources, uses, any potential areas of wastage and where you could collect rainwater.

This map should show the location of all water uses, pipes, water troughs, taps, shut-off valves and stopcocks. You should also identify the sources of both clean and dirty water draining into the dirty-water system.

Clean water sources, such as roof water and run-off from clean yards, may be contributing to the volume of dirty water you produce. This could be increasing your costs and the risk of running out of storage capacity. This could force you to land spread at times of high-risk, which would increase the risk of diffuse pollution. Consider whether you could divert this water from the system and possibly collect and re-use it.

Remember that while you may save money by changing from mains supply to a borehole, you are not saving water or being more water efficient, but merely using a different source of water.

Step 3 Calculate how much water you should be using

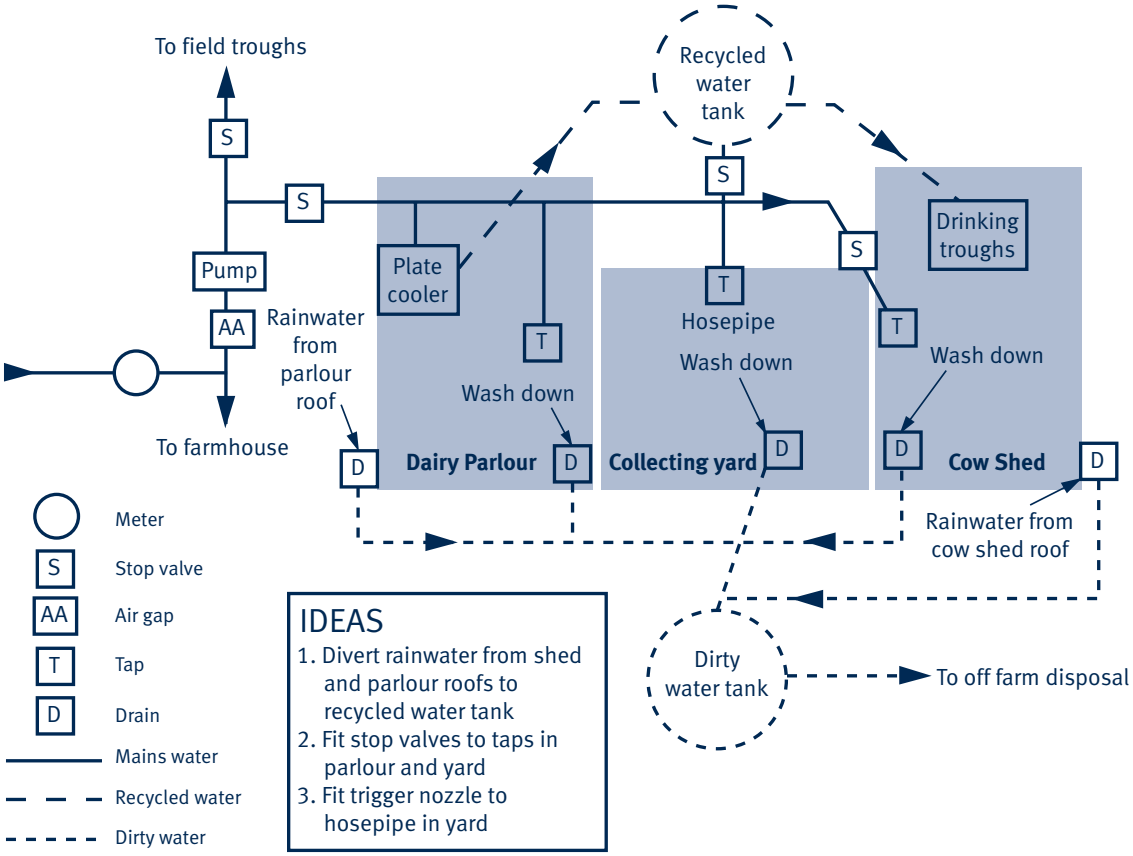
When you know how much water you are using, the next step is to work out how efficiently you are using it.

Using Forms 1, 2a and 2b, compare your expected use to your actual use. If your actual use is more than 10 per cent greater than your expected use, this indicates that you are using water inefficiently. Even if the difference is less than 10 per cent, it is still worth checking regularly how much water you use and following the water efficiency activities in the next chapter to carry on using water efficiently.

If your expected water-use is less than your actual water-use, it may be that:

- your meter is over-recording how much you are using;
- you have underestimated how much water your animals or crops need.

Example of a water network map



Case Study
Water Efficiency Awards Commendation: JR Weekes & Sons

Mr Weekes and his sons, who run a dairy farm in South Wales, have introduced several measures designed to improve overall water efficiency and reduce wastage. Isolation valves are installed in each leg of the pipework that supplies the animal drinking troughs. The legs are drained and inspected during the winter. All pipework above ground is lagged to protect against bursts and leakage in winter, and all visible pipes and troughs are inspected daily for leakage.

Comparing the difference

To compare the percentage difference between your expected and your actual water-use, you need to subtract the total theoretical water-use (from Forms 2a and 2b) from the actual water-use (Form 1) to get the difference between the two. Don't forget to convert the totals into the same units before you start (conversion factors are given in Table 3). Then divide the result by your total theoretical water-use (Forms 2a and 2b) and multiply by 100 to get the percentage difference between your actual and your theoretical water-use.

$$\text{Percentage difference} = \frac{\text{total form 1 - (sum of totals on forms 2a and 2b) x 100}}{\text{sum of totals on forms 2a and 2b}}$$

e.g. $\frac{10{,}000 - (5{,}000 + 3{,}000) \times 100}{8{,}000} = 25\%$ more water being used than would be expected

Step 4 Identify and compare water efficiency activities to reduce the amount of water you use

If your actual water-use is higher than your expected use, then the next step is to calculate which water efficiency activities are the most cost-effective for you.

Chapter 3 gives a list of water efficiency measures for different activities. Many of these options make good business sense and require little capital investment.

By combining your knowledge of how much water you use with the suggestions in Chapter 3, you can calculate the payback period for each option and use the results to set priorities for your actions. As well as the savings on your water bill, do not forget to include savings from reduced dirty water, energy and treatment costs, but also include any increase in maintenance costs.

Step 5 Create, implement and review your waterwise action plan

Creating your plan

Once you have identified which measures you intend to carry out, you should draw up a basic waterwise action plan. This should include:

- how you plan to save water;
- targets for water savings;
- targets for financial savings;
- who is responsible for each action.

An example of a simple waterwise action plan is given in Table 4 (page 32).

Actions should be detailed in full and placed in order of priority for implementation, starting with the most cost-effective measures.

Implementing your plan

Make sure that your waterwise action plan addresses the following issues:

- staff, family and contractors are aware of the need to save water;
- timing of improvements;
- routine maintenance checks;
- monitoring and reviewing progress.

Gaining support from others and promoting successes are just as important as gathering data and setting targets. By involving everyone in the waterwise action plan you can achieve continuous improvements.

Starting with simple and low cost actions will help to build enthusiasm and demonstrate the benefits of being waterwise.

You should also think about your waterwise action plan in the context of other management plans covering nutrients, soil, crop protection and manure.

Reviewing your plan

You should review and update your waterwise action plan at least once a year. Compare your actual savings with expected savings. Review actions that have not achieved the savings you expected, to find out any problems.

Top tip: drain check

After a period without rain, check your drains to see if they are still wet. If they are, then it may be that a leak is flowing into them or that they are blocked.

Case Study
Water Efficiency Awards Finalist: Palmstead Nurseries

A recycling system was constructed to harvest all drainage water on the site of this Kent nursery, which produces a million container shrubs each year.

Rainwater from building roofs and run-off from container standing beds is now transferred by pipe to a holding lagoon, pumped into a 27,300m^3 reservoir and then used for irrigation. This has resulted in:

- water consumption cut by 58 per cent;
- savings of £30,000 per year;
- payback periods of 4 to 5 years.

Calculating payback periods

To determine a payback period of a water-saving action (for example fitting trigger nozzles to two hosepipes) you will need to estimate the annual savings and potantial maintenance cost.

$$\text{Payback period (in years)} = \frac{\text{capital cost (£)}}{\text{annual savings (£) - annual maintenance costs (£)}}$$

Example
Capital cost = 2 trigger nozzles at £10 each = £20.
Annual savings = 10 minutes less use of the hose per day at 30 litres a minute = 109,500 litres per year = 109.5m^3 per year. At a price of 85p per m^3 = £93.08 per year.

Annual maintenance costs = 5 minutes check and clean (for both nozzles) per month = 5 x 12 months = 1 hour per year. At a staff cost of £15 per hour = £15 per year.

$$\text{Payback period} = \frac{£20}{£93.08 - £15} = \frac{£20}{£78.08} = 0.25 \text{ of a year} = 3 \text{ months}$$

Note
This does not include any savings in dirty water disposal costs or improved efficiency in cleaning due to having a better water jet.

3 Water efficiency actions

Listed below are some actions that you can take to use water more efficiently.

All farms

These water efficiency measures could be applied on most farms and many of them are low or no cost options.

Leaks

There are two main ways to check for leaks.

Visual checks

Using your water network map (see Chapter 2), check the ground above your pipes to look for visible signs of a leak. Such signs can include:

- unusually damp ground;
- lusher than expected vegetation (for a recent leak);
- reduced vegetation (for a long-term leak, because of reduced soil quality).

Flow monitoring

There are two main techniques that you can use to detect leaks that you cannot see:

- record your meter readings. See 'night flow' top tip.
- specialist leak detection. If you suspect that the leak is deeply buried or under concrete, then there is various equipment that you can use to detect this. This includes listening sticks, remote listening devices, pressure fluctuation sensors and 'intelligent' meters that 'know' your expected water-use patterns and then alert you to any unexpected flows. To find such services, either consult your local Yellow Pages or contact your local water company to see whether they run a leak detection programme.

Top tip: 'night flow' check

A 'night flow' test involves checking your water meter over a period of time when you would expect water-use to be minimal (for example overnight). Record your meter reading at the start and the end of the period. Has more water passed through the meter than you would expect for this period? If so, this indicates that you have a leak in your network that you will need to find.

You should isolate and drain sections of pipework or troughs that are not used over the winter to prevent frost damage that could result in a leak when they are refilled. If an above-ground pipe is in constant use, you should lag it for the same reason.

Pressure management

Water supplied by your local water company is usually at a pressure (head) of 40 metres (56.8 psi). This may be higher than is necessary for day-to-day use around the farm. The higher the water pressure, the more water is wasted when a leak develops.

To reduce pressure, control valves can be fitted at strategic points across your water network. These allow a steady, lower-pressure flow to be delivered.

Top tip: 'leak location'

If you have shut-off valves on your water network, shut off different sections in turn and then re-perform the night flow test. When the reading stops increasing, the section that you have isolated will be the one with the leak in it.

Fact: how much does a drip cost?

One drip per second wastes 4 litres per day (£1.24 per year)[1]	Drips breaking into stream waste 90 litres per day (£27.92 per year)[1]	1.5mm ($1/16$") stream wastes 320 litres per day (£99.28 per year)[1]	3mm ($1/8$") stream wastes 985 litres per day (£305.60 per year)[1]	6mm ($1/4$") stream wastes 3,500 litres per day (£1085.88 per year)[1]

[1] At a price of 85p per m^3 (does not include disposal costs)

Taps and hosepipes

Fix dripping taps promptly and, where taps are used regularly, consider fitting automatic shut-off valves to make sure that they are not left running when unattended.

Fitting self-closing trigger nozzles to hosepipes will help you to:

- control the flow of water;
- direct the water more accurately to where it is needed;
- eliminate wastage when the hose is unattended.

Check the nozzles regularly to make sure that they are free from blockages and damage.

Washing and cleaning

You can use dry-cleaning techniques, such as scrapers, squeegees and brushes, to remove solid waste from yards and pens before you clean them with water. This will reduce the amount of water you use, as well as the volume of dirty water that needs treating, storing and disposing of. It will also reduce the risk of creating diffuse pollution.

Top tip: pre-soak

If it takes a lot of water and effort to clean your parlour after milking, you could use a small amount of water (a bucket or so) to lightly wet the parlour first. This will make the muck stick less, reducing the amount of water that you will need to use to clean after milking.

Alternative sources of water: rainwater

You can re-use rain collected from the roofs of farm buildings for a variety of activities, including washing down yards and washing equipment. How much rainwater you can use depends on:

- **how much rain you receive.** If you do not know your annual rainfall, your local Environment Agency office may be able to tell you the figure for your nearest rain gauge. See Chapter 5 for contact details. Please have your grid reference handy as this will speed up your enquiry
- **how much you can collect.** This will vary depending on the size, slope and material that your roof is made from. Do not collect the water if your roof is made from, or coated with, bitumen, metals other than stainless steel, or concrete containing asbestos.

Calculating collectable rainwater

Collectable rainwater (litres) = roof area (m^2) x drainage factor x filter efficiency x annual rainfall (mm)

Drainage factor. This allows for evaporation that occurs when water is retained in irregularities in the roofing material. The factor can be viewed as the percentage of the rainwater that will flow off the roof. Examples of factors for different roof types are given in the following table.

Roof type	Drainage factor
Piched roof - tiles	0.75 - 0.9
Flat roof - smooth tiles	0.5
Flat roof - with gravel layer	0.4 - 0.5

Filter efficiency. Filters designed specifically for collecting rainwater will reject the first flush of rainwater, which carries any contaminants (such as leaves or bird droppings) off the roof. High quality filters typically have an efficiency of 90 per cent and so a factor of 0.9. The manufacturer will be able to supply the model-specific efficiency rating.

Example
A farm building with a pitched roof area of 300 m^2, using a downpipe filter unit with an efficiency of 90 per cent, in an area with 1,200 mm annual rainfall would yield:

300 x 0.9 x 0.9 x 1,200 = 291,600 litres of rainwater annually.

- **How much you can store.** This depends on the space you have for storage and your demand for water. For regular demand such as stock watering, you will only need to store a few days' requirement. Irregular uses that need a lot of water, such as irrigation, will probably need a larger tank.

Harvesting rainwater is particularly suited to dairy farms, as they tend to be located in the wetter areas of the country and have a regular demand for water. A study by the Environment Agency has found that a typical dairy farm could meet 20 per cent of its water-use with rainwater.

Before using rainwater, you should check that this does not breach any hygiene or farm assurance scheme requirements that you are part of.

Dairy farms

Re-using plate cooling water

It is possible to re-use plate cooling water for watering livestock or washing down the collecting yards. Cows may even prefer warm drinking water, especially in the winter! Re-using plate cooling water will not only reduce the quantity of water taken from the mains supply, but it will also reduce the amount of water that needs treating, storing and disposing of and the risk of creating diffuse pollution.

Fact
Plate coolers use between two and three litres of water for each litre of milk cooled. For a 150 cow herd, yielding 22 litres of milk per cow, a plate cooler will use up to 9,900 litres of water each day. Compare this to the drinking requirements of the same herd - they drink approximately 10,500 litres of water each day.

Water troughs

Overflowing water troughs and incorrectly set or damaged ball-valves can waste significant amounts of water. You can adjust ball-valves to lower the float so that there is less risk of spillage and overflowing. Water leakages in fields can result in increased poaching, which can contribute to diffuse pollution. You should drain troughs when they are not being used during the winter to reduce frost damage.

Fact
A leaking ball-valve in a water trough can waste up to 150 m^3 of water per year - this is nearly the same amount of water that a family of four would use in a year. A fractured ball-valve can waste up to 2,000 m^3, which is enough water to meet the drinking requirements of 80 cows in milk for a whole year. Replacement valve seats cost less than 10p.

The Milk Development Council are developing a booklet specifically for dairy farmers providing information and recommendations on how to utilise water more efficiently. Copies can be obtained from the MDC publications on 01285 646510 or online at www.mdc.org.uk from Spring 2007.

Case Study
LEAF Demonstration Farmer: Robert Kynaston

At his 240 hectare mixed farm in Shropshire, Robert's dairy uses a total of 2355 m^3 of water a year, 735 m^3 of which is used in cooling the milk. With limited investment, Robert installed additional pipework from the plate cooler to a nearby header tank and water trough. This allowed the plate cooling water to be used again for animal drinking and washing down. This measure also reduced the quantity of dirty water needing treatment and disposal, producing an additional cost saving. At a water price of 107p per m^3 this would save £786 a year in water costs alone. If dirty water disposal costs were twice the supply costs, then these measures would save £2358 per year.

Case Study
Water Efficiency Award Commended: Brackenburgh Home Farms

Brackenburgh Home Farms is a 1,500 acre mixed farm (dairy, arable and sheep) in Cumbria. A dairy modernisation programme resulted in a 33 per cent reduction in mains water use, a 13 per cent reduction in water use per cow and savings dues to lower slurry disposal costs. The project covered feeding passages, reducing the amount of slurry produced. Plate cooling water is reused for animal drinking and rainwater harvested for washing down. Buffer strips were created alongside rivers and the farm is currently investigating whether a reedbed system could be used for the farms septic tank.

Pig and poultry farms

Animal drinkers

Regularly check the water drinkers to make sure they are securely fastened and there are no blockages. When replacing drinkers, consider investing in an alternative design, such as nipple and cup drinkers in poultry units or bite-type drinkers in bowls within a pig unit, as these reduce the amount of water wasted by the animals 'playing' with the drinkers.

Irrigators

By making effective and efficient use of your irrigation water you will be able to make your resources go further and potentially add more value to your crops. You will also reduce the risk of causing diffuse pollution through over-irrigating. Some suggestions are listed below.

- **Pump and pipe size.** Make sure that you are using the correct pump and pipe size - trying to pump too much water through a small pipe will increase friction (reducing pressure at the end) and increase the chance of a leak occurring.
- **Boom irrigation instead of gun irrigation** for fields will apply water more accurately, improving efficiency and resulting in a better quality crop.
- **Trickle irrigation** for certain crop types such as ornamental trees can greatly reduce water consumption.
- **Don't irrigate when it is windy** as this will result in uneven application and, if you are using a spray gun, may result in water drifting onto areas that do not need watering.
- **Irrigate at night** as this will reduce the amount of water that evaporates and is lost to your crops.
- **Schedule your irrigation** according to accepted methods, which take account of evapotranspiration or soil moisture deficits, as this will result in using limited supplies more effectively. Commercial advisers can help you prioritise crops and fields in terms of the water they need.
- **Equipment.** Regularly check the condition of your pumps, mains and hydrants and repair worn items such as seals.
- **Ensure irrigation is uniform,** rates are not too high and droplet size is not too big, to prevent sealing and run-off which could cause diffuse pollution.

Defra and Adas have produced four best practice guides for irrigators:

- Water management for field vegetable crops, a guide for vegetable growers.
- Water management for soil and substrate-grown crops, a guide for top and soft fruit growers.
- A guide for container grown ornamentals.
- Irrigation best practice: Water management for potatoes – a guide for growers.

Copies are available from Adas, Boxworth, Telephone 01954 268214 .

Building on the best practice guides, Defra have commissioned ADAS to produce a 'water audit toolkit', for growers of arable and field vegetables, including potatoes.

The toolkit, available from autumn 2007, features practical advice and spreadsheet tools (in the form of a booklet and CD-ROM), which will enable farmers to monitor water use and plan future savings.

A number of hard copies of the toolkit will be made available to farmers, and the toolkit will be downloadable from the Defra website, visit www.defra.gov.uk

Washing vegetables

Many farms now have to wash vegetables before they sell them to customers and this offers great potential for using water more efficiently:

- **Recycling and re-use.** Instead of letting water go to waste, it can be recycled and used where high quality water is not needed, or even cleaned and recycled for high quality use.
- **Irrigation.** If it is of good enough quality, water can be stored and used for irrigation purposes rather than letting it go to waste.

In the office / home

You should not see minimising the amount of water you use as just a business issue. Experience has shown that the most successful waste minimisation schemes are those where staff are also encouraged to be waterwise in the office and at home.

In the office

There are many areas where water may be used in the office, using water efficient technology in the toilets and washing areas can provide considerable savings. Businesses can access advice on water saving on the Envirowise website at www.envirowise.gov.uk/water or by calling 0800 585794.

In the home

There are many ways of cutting down on water used in the home without compromising on either comfort or hygiene. The key to water efficiency is reducing waste, not restricting use. You can help reduce waste by making small behavioural changes and by choosing more water efficient products. For more information please visit www.waterwise.org

Case Study
Water Efficiency Award Commended: LF Papworth Ltd

LF Papworth Ltd manage over 4000 acres of farmland for 20 different landlords and have a number of interests including cereals, potatoes, livestock, an abattoir and running 3 butchers. They have worked hard to increase their irrigation efficiency to reduce both water and energy usage through detailed irrigation scheduling working with Cambridge University Farms. They have also invested in new computerised irrigation equipment and have put in place a programme of field inspections to check for early signs of compaction, which would reduce water infiltration and affect crop rooting. They also had an irrigation water audit undertaken by Cranfield University and provided staff training on irrigation efficiency from Broadland Agricultural Water Abstractors Group (BAWAG) and undertook the BAWAG audit. This resulted in a decrease in abstraction of over 3000 cubic metres of water during 2006 compared to an average of the last 14 years despite 2006 being a very hot and dry year and also an increase in yield.

4 Further help and information

Grant / tax rebate

England Catchment Sensitive Farming Delivery Initiative Capital Grant Scheme

This scheme runs from April 2007 – March 2008* in the 40 priority catchments identified as being most at risk of failing the Water Framework Directive targets, due to diffuse water pollution from agriculture. The grant will focus on low-cost items such as watercourse fencing, pasture pumps etc. For more information, please visit www.defra.gov.uk/farm/environment/water/csf/capital-grants.htm or speak to your Catchment Sensitive Farming Officer.

Wales also has a Catchment Sensitive Farming Demonstration Project, which has a capital grants element. For more information, please visit www.wales.gov.uk/catchmentsensitive

Enhanced Capital Allowances

Enhanced Capital Allowances (ECAs) enable a business to claim 100 per cent first-year capital allowances on their spending on qualifying plant and machinery. There are three schemes for ECAs:

- energy-saving technologies;
- low carbon dioxide emission cars and natural gas and hydrogen refuelling infrastructure;
- water efficient technologies - including rainwater harvesting equipment.

Businesses can write off the whole of the capital cost of their investment in these technologies against their taxable profits for the period during which they make the investment. For more information, please visit www.eca.gov.uk

* This scheme may be extended beyond this date, please visit the website for further details.

Obtaining or trading an abstraction licence in England and Wales

Anyone intending to abstract more than 20m^3 of water per day for agricultural use from inland and tidal waters in England and Wales must obtain a licence from the Environment Agency. An abstraction licence gives you a right to take a specified quantity of water and guarantees that no one else can take it. Before issuing a licence the Environment Agency first checks that there is sufficient water available and that there are no unacceptable affects on the environment or other water users. Licences are usually issued for 12 years and contain conditions to protect other water users and the environment.

If you hold an abstraction licence in an area where there is insufficient water available for new licences, you may be entitled to trade your licence with other farmers. To carry out a trade abstraction is reduced at one point in the catchment allowing it to be licensed elsewhere. For the trade to work the licences must be within the same catchment and there must be a hydrological link between the abstraction points. Trades will not be allowed if they could cause environmentally stressed catchments; if the new abstraction uses more water than the original licence; or, if the new abstraction is closer to a sensitive wetland or river. To prevent damage to the environment, the Environment Agency may place conditions on traded licences.

The Environment Agency's approach to issuing abstraction licences and to water rights trades in individual catchments throughout England and Wales is set out in Catchment Abstraction Management Strategies (CAMS). See www.environment-agency.gov.uk

The Environment Agency recommends that you consult them early about any proposed licence application or trade so that they can let you know about possible licence conditions before you invest in a formal application.

Catchment Abstraction Management Strategies

In April 2001 the Environment Agency began producing Catchment Abstraction Management Strategies (CAMS). The CAMS process was developed following a proposal set out by the Government in its publication Taking Water Responsibly. CAMS will make information on the amount of water and licensing within a catchment available to the public and will also provide a greater opportunity for the public to become involved. Where abstraction within a catchment is thought to be unsustainable, the options for restoring a sustainable balance will be considered. These will include making sure that the water abstracted is used efficiently.

The main objectives of CAMS are:

- to make information on the amount of water and licensing within a catchment available to the public;
- to provide a consistent and structured approach to local water resources management, recognising both the needs of abstractors and the environment;
- to provide the opportunity for the public to become more involved in managing abstractions at a catchment level;
- to provide a framework for managing time-limited licences;
- to make licence trading possible.

CAMS could potentially affect farm abstraction licences. Further details are available in a booklet entitled Catchment Abstraction Management Strategy Process: Managing Water Abstraction, which is available from the Environment Agency. See www.environment-agency.gov.uk/cams

Mains contamination

The Water Supply (Water Fittings) Regulations 1999 make it a legal duty for installers and users of water fittings not to cause or permit waste, misuse, undue consumption or contamination of the supply of wholesome water. Preventing contamination of mains water supplies by back-syphonage or backflow is particularly relevant to farmers, and inspections are carried out by your local water company. Where water from sources other than the mains supply are used (for example abstracted water or harvested rainwater) there must be adequate backflow prevention, typically a Type AA air-gap to prevent contaminating the mains supply. Specific guidance entitled Water Supply Systems, Prevention of Contamination and Waste of Drinking Water Supplies - Agricultural Premises is available free of charge from the Water Regulations Advisory Scheme (WRAS) on 01495 248454 or consult www.wras.co.uk

Integrated Pollution Prevention and Control

The UK Pollution Prevention and Control regime implements EC Directive 96/61/EC on integrated pollution prevention and control. It will be fully implemented by the Environment Agency in October 2007.

In the agricultural sector IPPC will apply to large intensive pig and poultry producers (farms with a capacity of more than 750 sows, 2,000 finishing pigs over 30 kgs, 40,000 poultry). Pigs reared outdoors are excluded from IPPC.

Farms regulated under IPPC will need a permit to operate. This permit will cover all aspects of farm management. Priority areas include managing drainage systems and run-off, livestock diets, managing manure and slurry systems. For more information, please visit www.defra.gov.uk/environment/ppc/ippcguide/index.htm

Nitrate Vulnerable Zones

Elevated levels of nitrates in waters are of concern because they can make water unfit to drink and can damage the aquatic environment. It has been estimated that around 60 per cent of nitrogen in rivers in England and Wales comes from agricultural sources.

Currently about 55 per cent of land in England is designated as Nitrate Vulnerable Zones (NVZs). In these zones, special rules (the 'Action Programme') apply regarding the spreading of organic manures and manufactured nitrogen fertilisers, to control nitrate loss to waters.

The occupier of each farm, or livestock unit, with land in an NVZ must comply with the Action Programme. To find out if land is designated as an NVZ, please visit nvz.adasis.co.uk/maps/index.html

Pesticides Voluntary Initiative

The industry-led Voluntary Initiative (VI) brings together a wide range of farming, water, conservation, regulatory and government organisations to develop and promote best practice to minimise the environmental impact of pesticides. More information is available from www.voluntaryinitiative.org.uk

Discharge consents

Under the Water Resources Act 1991, it is an offence to cause or knowingly permit polluting matter to enter into surface or groundwater without permission. Permission is obtained through a discharge consent granted by the Environment Agency. The Environment Agency sets conditions in a consent related to volumes and concentrations of particular substances or impose broader controls on the nature of any effluent. Each consent is based on the objective set by the Environment Agency for the quality of the stretch of water to which the discharge is made, as well as any relevant standards from EC Directives.

Anyone who wishes to make a discharge, or is thinking about making a discharge, should contact their local Environment Agency office in the first instance. The Environment Agency welcomes early discussions on such proposals which can often save time and prove to be useful in identifying any potential problems in advance.

Groundwater Directive

The Groundwater Directive prevents groundwater being polluted by controlling discharges and disposals, including accidental loss, of certain dangerous substances where they are not already covered by existing legislation. If you want to dispose of dilute sheep dip, dilute pesticides and washings, vegetable and bulb dips/drenches or fruit and vegetable washings by landspreading, you need a groundwater authorisation. These are granted by the Environment Agency. More information can be found at www.netregs.gov.uk

Silage, slurry and agricultural fuel oil regulations

If you operate a farm in England or Wales that makes or stores silage, stores slurry or fuel oil for agricultural purposes, and your storage facilities were constructed or substantially altered after 1991, then these regulations apply to you. You can find more information at www.netregs.gov.uk

5 Partnership organisations

Department for Environment, Food and Rural Affairs (Defra)

Defra's main purpose is to improve the current and future quality of life. For the first time, one department has brought together the interests of farmers and the countryside, the environment and the rural economy, the food we eat, the air we breathe and the water we drink.

Defra is responsible for all aspects of water policy in England. To tackle the specific problem of diffuse water pollution from agriculture, Defra has set up the Catchment Sensitive Farming Programme, which includes a voluntary Delivery Initiative. For more information on the CSF Programme or any other water related policies, please visit www.defra.gov.uk/farm/environment/water/csf

The environment/farming is a devolved issue, therefore for more information on related policy outside England, please visit www.scotland.gov.uk ; www.dardni.gov.uk (Northern Ireland), www.wales.gov.uk

Environment Agency

The Environment Agency is a statutory organisation whose role it is to manage water resources in England and Wales. The Environment Agency's vision for the next 25 years is: 'abstraction of water that is environmentally and economically sustainable, providing the right amount of water for people, agriculture, commerce and industry, and an improved water-related environment'.

For further information on water efficiency, contact the Water Demand Management team via email savewater@environment-agency.gov.uk or telephone 01903 832275, or consult www.environment-agency.gov.uk/savewater

For further information on Catchment Abstraction Management Strategies (CAMS), abstraction licences or any other aspect of the Environment Agency's work, contact the Environment Agency general enquiry line by telephone 08708 506506 or consult www.environment-agency.gov.uk/cams

Linking Environment And Farming (LEAF)

LEAF is a membership charity helping farmers improve their environment and business performance and focusing on creating a better public understanding of farming through a nationwide network of demonstration farms. LEAF is committed to a viable agriculture, which is environmentally and socially acceptable and ensures the continuity of supply of wholesome, affordable food while conserving and enhancing the fabric and wildlife of the British countryside for future generations.

LEAF's vision for the future is of a sustainable system of agriculture, which meets the economic needs of farmers, addresses the concerns of consumers and minimises any impact on the environment. This can be achieved by adopting Integrated Farm Management (IFM), which provides a common-sense and realistic way forward for farmers and land managers.

The LEAF Marque gives LEAF farmers recognition in the marketplace and consumers the choice to buy affordable food produced by farmers who are committed to improving the environment for the benefit of wildlife and the countryside.

Contact LEAF by telephone 02476 413911 or email enquiries@leafuk.org or consult www.leafuk.org

National Farmers' Union (NFU)

The NFU is the largest, democratic organisation providing professional representation to around three quarters of full-time farmers and growers in England and Wales. Its key objective is to promote the interests of those farming businesses producing high quality food and drink for customers and markets both at home and abroad.

It stands to promote the importance of British agriculture and horticulture in the context and circumstances of the 21st century. Central to this objective is its encouragement of social, environmental and welfare-conscious farming practices and a desire to ensure the long-term survival of viable rural communities.

The NFU is at the forefront of agricultural and environmental policy and takes a close interest in the whole range of rural affairs, working with politicians and officials, both in the UK and internationally, as well as other groups and organisations to advance rural interests. It has particularly close links with consumer groups, countryside and wildlife bodies, animal welfare organisations and academics.

For more information, contact NFU on 024 7685 8500 or log on to www.nfuonline.com

For the Welsh head office, call 01982 554200 or log on to www.nfu-cymru.org.uk

Other organisations

Country Landowners and Business Association (CLA)

The CLA represents and supports business in rural communities. Its members represent the breadth of the rural economy of England and Wales. The CLA can provide information and advice on all areas of water use, including water abstraction and irrigation, general on-farm water use, reservoirs, ponds and lakes. For more information, consult www.cla.org.uk or telephone 020 7235 0511

Envirowise

Envirowise offers UK businesses free, independent, confidential advice and support on practical ways to increase profits, minimise waste and reduce environmental impact. Even though Envirowise's remit does not cover agriculture as such, many of the activities associated with washing, processing and running a water efficient office are covered in useful publications and leaflets which are available on www.envirowise.gov.uk/water or on 0800 585794

Farming and Wildlife Advisory Group (FWAG)

FWAG provides farmers and landowners with practical advice to support wildlife, landscape, archaeology, access and other conservation issues. For more information, consult www.fwag.org.uk

Farm Energy Centre (FEC)

The FEC provides advice to farmers on all issues concerning energy conservation. For more information, consult www.farmenergy.com or telephone 02476 696512.

Local water company

Your local water company may be able to help you with water efficiency issues. See your water bill or Yellow Pages for contact details.

National Farmers' Union of Scotland (NFUS)

The NFUS promotes and protects the interests of the Scottish farming industry. It influences Government in Scotland, Whitehall and Brussels, and it helps its members to meet the needs of their customers, consumers and the environment. For more information, consult www.nfus.org.uk or telephone 0131 4724000

UK Irrigation Association

UKIA provides up-to-date information on irrigation to its members and has been a voice supporting irrigation since it was set up following the droughts in the mid 1970s. UKIA is not a trade association; it runs for the benefit of its individual members and promotes all aspects of irrigation by providing information and helping to improve knowledge and competence in irrigation design, installation and management. For more information, consult www.ukia.org

Ulster Farmers' Union (UFU)

The UFU is the democratic voluntary organisation representing farmers and growers in Northern Ireland. Its main objective is to promote their interests both at home and abroad through professional lobbying. For more information, consult www.ufuni.org or telephone 028 90 370222.

Water Service Northern Ireland

For water resources issues in Northern Ireland, please contact Water Service Northern Ireland who are responsible for delivering water and sewerage services. For more information, consult www.waterni.gov.uk

Form 1: Water supply and cost

		Annual quantity (m^3)					
		Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total	Annual cost
Metered	Mains supply water						
	Abstraction - surface water						
	Abstraction - groundwater						
Total metered							
Unmetered	Stored rainwater (for example storage tank)						
	Other sources (for example water drunk by animals directly from farm ditches)						
	Recycled water (for example vegetable wash water for irrigation)						
Total unmetered							
Other	Dirty water disposal						
	Staff costs (operation and maintenance)						
	Other (for example capital costs)						
Total other							
	Total annual quantity						

Form 2a: Water-use inventory - equipment

Item	Number (A)	Location	Flow rate (litres/minute) (B)	Operating time (minutes/day) (C)	Water used (litres/day) = A x B x C	Source	Comments
Taps	4	Yard	4 litres/minute	30 minutes	480 litres/day	Mains	Left running during machinery washing - fit cut-off valves
Spray irrigation guns	2	In fields as required	50 litres/minute	4 hours a day = 240 minutes	24,000 litres/day	Mains	Used for about 20 days a year = 480m^3 per year

Form 2b: Water-use inventory - stock

Animal	Number (A)	Location	Activity	Use per animal per day (see Table 2) (B)	Water used (litres/day) = A x B	Source	Comments
Cows (in milk)	150	Dairy	Drinking	70	15,500 litres/day	Mains	Store plate cooling water for drinking?

Table 2: Livestock watering requirements

Animal	Production cycle (weeks)	Litre/day/animal		Other requirements
		Drinking	Wash water	
Cattle				
Dairy cow	56	92	25	
Growers and replacements	52	20		
Beef cows and heifers	52	20		
Dairy and beef bulls	52	20		
Beef store cattle	52	20		
Dairy and beef calves	9	5		
Pigs				
Dry sows and gilts	52	6	0.09	
Boars	52	6	0.09	
Farrowing sows	5	30	5.63	
Maiden gilts	10	5.5	0.09	
Barren sows	10	5.5	0.09	
Weaners (‹20kg)	4	2	0.29	
Growers (‹50kg)	5	4	0.37	
Finishing pigs	11	5.5	0.23	
Sheep				**Dipping per head**
Total ewes	52	4.5		2.25
Rams and other adult sheep	52	3.3		2.25
Lambs under 1 yr	52	1.7		2.25
Poultry				
Pullets	16	0.09	5	
Broilers	7	0.2	5	
Laying hens - caged	56	0.2	6	
Laying hens - non-caged	56	0.22	6	
Broiler and layer breeders & cocks	44	0.19	5	
Ducks	7	1.22	5	
Turkeys (m)	20	0.71	5	
Turkeys (f)	16	0.45	5	

Table 3: Conversion factors

Metric	Other units	Imperial
Length		
1 centimetre (cm)	10 millimetres (mm)	0.39 inch (in)
1 metre (m)	100 cm	1.09 yards
1 kilometre (km)	1,000 m	0.62 mile
0.03 m	2.54 cm	1 in
0.91 m	91.44 cm	1 yard
1.61 km	1,609 m	1 mile
Area		
1 square centimetre (cm^2)	100 square millimetres (mm^2)	0.16 square inch (in^2)
1 square metre (m^2)	10,000 cm^2	1,500 in^2
1 m^2	1.20 square yards ($yards^2$)	10.76 square feet ($feet^2$)
1 square kilometre (km^2)	100 hectares (ha)	247.11 acres
6.45 cm^2		1 in^2
0.84 m^2	9 $feet^2$	1 $yard^2$
0.004 km^2	4046.86 m^2	1 acre
Pressure		
1,000 millimetre water (mm H_2O)	1 metre H_2O	1.42 psi
Volume		
1 cubic centimetre (cm^3)	0.000001 cubic metres (m^3)	0.06 cubic inch (in^3)
1 cubic metre (m^3)	1,000 litres	35.32 cubic feet ($feet^3$)
1 m^3		1.31 cubic yards ($yards^3$)
1 cubic decametre (dm^3)	1 litre	0.22 gallons
1 millimetre per hectare (mm ha)	10 m^3	2,199.69 gallons
16.39 cm^3	0.02 litres	1 in^3
0.03 m^3	0.04 $yards^3$	1 $foot^3$
0.77 m^3	168.18 gallons	1 $yard^3$
4.55 litres	8 pints	1 gallon
0.57 litres	20 fluid ounces (fl oz)	1 pint
Weight		
1 gram (g)	1,000 milligrams (mg)	0.04 ounce (oz)
1 kilogram (kg)	1,000 g	2.2 pounds (lb)
1 tonne (t)	1,000 kg	0.98 ton
1 cubic metre (m^3)	1 t	
28.35 g		1 oz
0.45 kg	16 oz	1 lb
1.016 t	20 hundredweight (cwt)	1 ton

Table 4: Example Waterwise Action Plan

Waterwise Action Plan
Raise awareness
• Involve everyone, including family and staff. • Hold meetings at least once a year with all members of staff to discuss the use and management of water around the farm, and identify with them opportunities for improvement. • Make sure staff are aware of the importance of using dry-cleaning techniques – such as brush, scraper and squeegee – before washing down solid waste, soil etc • Make sure that all new members of staff and contractors are aware of the approach to water-use on the farm.
Routine maintenance checks
• During field walking/stock checking, check all taps and water troughs in the farmyard and in outlying fields. • Once a quarter, check all hoses and trigger nozzles to identify blockages and wear and tear. • Once a quarter, check pressure washers against the manufacturer's recommended operating instructions. • Before winter, check all pipes and troughs. Drain those not in use and lag pipes as appropriate.
Phased programme to implement improvements
• Fit trigger-operated nozzles to all hosepipes by the end of quarter two. • Fit shut-off valves to all taps in the farmyard by the end of quarter three. • Get quotes for fitting pipework to divert rain from barn roof to storage tank.
Monitoring programme
• Carry out weekly water meter reading to identify fluctuations in water-use and identify leaks. • Review progress against benchmark each quarter.

Further Case Studies

The Game Conservancy Trust's Allerton Project

Soil cultivations are required to most establish most crops. However, whenever soil is loosened it increases the likelihood of some kind of erosion taking place. At its worst this can result in the formation of gullies, at its least diffuse pollution of water courses with fine soil particles coming from under-field drains. At the Game Conservancy Trust's Allerton Project at Loddington in Leicestershire the farm is looking at ways of reducing soil loss, but without compromising profitable crop production. Methods include:

- where possible, altering the direction of tramlines from up and down the slope to across the slope; recent trials have shown up to 80 per cent of soil erosion can be attributed to eroding tramlines;
- placing beetle banks across slopes, creating a natural barrier;
- installing grassy field margins at the bottom of the slope;
- switching the direction of cultivation to across the slope;
- chopping and incorporating straw rather than baling on sloping ground;
- reducing the number and intensity of cultivations;
- installing mini silt traps in field ditches;
- sowing stewardship mixes in vulnerable gullies;
- repairing broken field drains;
- sowing green covers or encouraging natural re-generation on winter stubbles.

While each of these methods will reduce soil losses by only a small degree, together the result can give a more substantial improvement.

Natures Way Food Ltd

Natures Way Food Ltd are a company who process and produce pre packed salads and vegetables for major supermarkets and catering companies. They have recently changed their practices to increase water efficiency. Some 98 per cent of waste water from factory processes is now recycled into reservoirs to irrigate salad crops. They have also made changes to their washing in the factory and water savings are now recorded weekly. The company also harvests rainwater to 2 lagoons which are attractive to wildlife. Waterless urinals have also been installed in the company offices. Water savings of 35 per cent have been achieved.

CA Strawson Farming Ltd

By installing a number of weather stations, the farm now receives more accurate information on irrigation requirements and has cut down on watering. The change from a gun to a boom irrigation system has saved both water and electricity, as water is applied with greater accuracy to the base of the crop, reducing wastage.

Previously the farm used mains water for washing vegetables and then let it go to waste. Now the water is recycled in a number of different ways:

- for potatoes, the water is cleaned through a cyclone filtration system and then re-used in the wash process;
- for other vegetables, water is re-used for brush and barrel washing before being recycled;
- when the water is changed from time to time it is carried by piping and used to irrigate a willow coppice.

Notes

Would you like to find out more about us, or about your environment?

Then call us on

08708 506 506 (Mon-Fri 8-6)

email

enquiries@environment-agency.gov.uk

or visit our website

www.environment-agency.gov.uk

incident hotline 0800 80 70 60 (24hrs)
floodline 0845 988 1188

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