



Water management on farms and farmland

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Foreword

Water is a precious resource. The availability of water in Wales is often taken for granted but the droughts experienced on many farms during 2003 and 2006 serve to illustrate problems that water shortages can bring. Using water more efficiently therefore not only helps to protect our natural resource, it also makes good business sense.

This booklet aims to provide information that will help you to identify how much water you require and how much it costs, to look at the sources of water that are currently available and additional potential water sources should you need them and to identify the risks to your farm water supplies. It outlines some of the practical modifications which can be made to current farm practice to improve the efficiency of water use and to minimise the impacts of water shortage on farms.

Water management plans will not only help you to protect your water sources and to prepare for emergencies such as fire and drought but will also bring you additional economic and environmental benefits as well as helping to optimise herd and flock health benefits which in some situations may increase livestock production.

Water failure

Water failure is something that everyone experiences at some point but the cost of water failure is rarely considered.

How much does a dripping tap cost?

	Annual cost (at £1/m ³)
One drip per second	£1.50
Drips breaking into a stream	£32
1.55mm stream	£115
3mm stream	£360
6mm stream	£360

Source: Effective Use Of Water on Dairy Farms

Sometimes a failure is out of your control, e.g. if there is a burst main pipe but if there is a failure on a more local scale there are many things that can be done to reduce the effects.

- Regularly inspect all fittings and tanks for leaks and overflow - repair and replace as necessary
- Protect every water fitting from damage by frost and other causes, e.g. tractors and cattle
- Read and record your water meter regularly (monthly), this may identify leaks, or even blockages holding water back

Water supplied by your local water company may be at a higher pressure than is necessary for day-to-day use on 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 the water network.

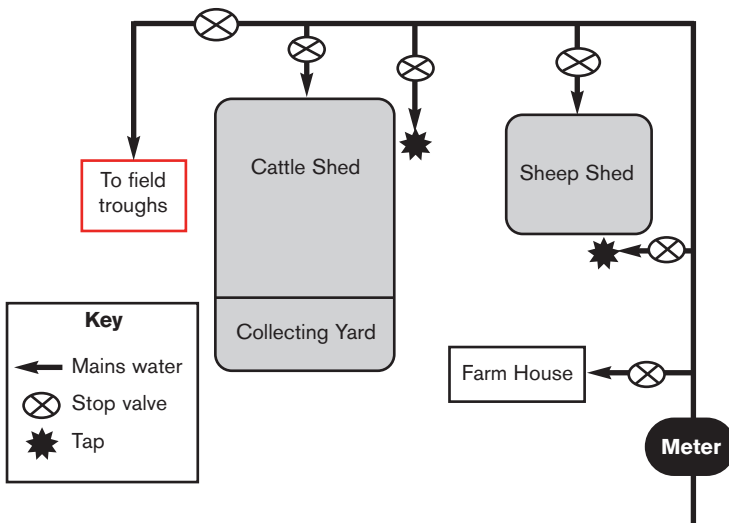
When there is a failure of public supply, make sure that the water company knows. They can probably give an estimate of the time before the supply is restored. In the mean time, water consumption will need to be carefully controlled so that water is used sparingly and recycled where possible.

Water failure

In a drought, the public supply may be affected firstly by a pressure drop which will reduce flow, and later by total failure. Farms and fields on higher ground can therefore be affected immediately. Water may be available on part of the farm and may need to be transported, or livestock moved to a field where a supply is available. If your farm is on higher land and likely to be affected by a pressure drop consider the need to store a supply there.

Failure of farm distribution systems can be overcome if the failure can be isolated allowing the rest of the system to be kept going. This is largely a matter of design, with the incorporation of stop valves at strategic points in the system (Figure 1). Where it is practical, consider separate supply pipes to buildings rather than one pipe to a group of buildings, alternatively a ring main with suitable isolating valves, may be appropriate for a group of buildings to protect against single bursts.

Figure 1



Water failure

A map of the water network will be invaluable when there is a leak as this allows pipes to be easily traced. The water network can also be mapped to pinpoint sources, uses, any potential areas of wastage and where you can collect rainwater. Clean water sources, such as roof water and run-off from clean yards, may be contributing to the volume of dirty water you produce. Consider whether you could divert this water from the system and possibly collect and re-use for washing down yards. Before using rainwater you should check that this does not breach any hygiene or farm assurance scheme requirements (for example recycled water can not be used for dairy purposes). Do not collect rainwater from roofs made with bitumen, metals other than stainless steel, or concrete containing asbestos.

Using your network map, walk your water supply route and check the ground above the pipe for leaks. Signs of leaks include:

- Damp ground after a period of prolonged dry weather
- Lusher than expected vegetation in dry conditions
- Stunted vegetation due to ground being waterlogged

If you suspect that the leak is deeply buried or under concrete, various equipment can be used to detect it. 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. Contact your local water company to see whether they run a leak detection programme.

It is recommended that the supply is connected to fittings via a storage tank fitted with a ball valve control. This regulates the supply, acts as a reservoir during supply failure and with a mains supply, prevents contamination.

However, one problem with storage tanks or reservoirs is that if there is a failure, the water has often run out before a problem has been noticed. If all the water has not been lost an attempt should be made to save what is left. If a tank is leaking close the stop valves to isolate the system. Remember that payment for all water supplied from a public main will still be requested even if it runs to waste. It may be possible to bypass the storage if the public supply can meet all the farm's requirements but this will incur extra costs.

Water failure

Long term failures

There are also many steps that can be taken in preparation for long term failure such as a drought. Before taking any action consider the possible failures and assess each of them on their potential effects. Review your existing water sources and your water storage and distribution systems and consider any possible additions or modifications. Extra storage is often worth considering; it can be very beneficial during long term and general failure.

- How can alternative sources be used e.g. springs, wells, lakes or ponds on the farm? This water should be analysed for chemical and bacteriological quality and treated if necessary before abstraction to troughs, pasture and pumps
- Plan an emergency transport system (what tanks, containers or trailers would be needed)
- Consider equipment which would be needed in an emergency e.g. tractor mounted pump, pasture pumps, plastic sheeting and plastic pipe fittings. These may either be purchased or shared with neighbouring farms.

Alternative water sources

Each potential water source should be considered for its quantity and quality.

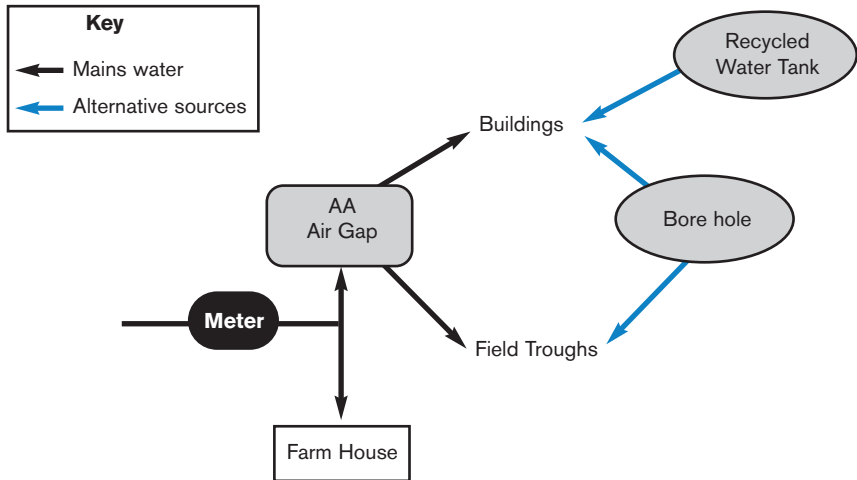
A mains supply should be installed in accordance with the statutory requirements of the Water Authority. For a private supply an abstraction licence is required if more than 20m³ (4,000 gallons) of water is abstracted per day for agricultural use from inland and tidal waters. An abstraction licence can be obtained from the Environment Agency. An abstraction licence gives you the right to take a specified quantity of water. Licences are usually issued for 12 years. If river water is abstracted approval from the appropriate Authority is needed. If you intend to impound (store) water on a watercourse you will need an impounding licence from the Environment Agency. You will have to pay for abstraction and impoundment licences. There is an application fee and an annual charge.

You may also need to carry out an Environmental Impact Assessment (EIA) or provide an Environmental Report before you can proceed with some abstraction projects. If you hold an abstraction licence in an area where there is insufficient water available for new licences you may be able to trade your licence with other farmers in the same catchment. There is a Guide to Trading Water rights available from the Environment Agency.

If the farm has both a private source and public supply do not cross connect the two systems as this contravenes the water authority/water company bylaws. 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. Where sources other than the mains supply are used there must be adequate backflow prevention, typically a Type AA air-gap to prevent contamination of the mains supply (Figure 2).

Alternative water sources

Figure 2



Two sources might be used for different purposes e.g. pond water for washing down yards and well water for livestock consumption.

Alternative water sources

Potential water sources

Please note that any of these sources (apart from mains supply) will require an abstraction licence from the Environment Agency if you intend to abstract over 20m³ per day (4400 gallons).

- **Mains water supply**
- **Borehole** – If the farm has a borehole, which is not the usual source of supply, it may be possible to use it in an emergency. A licence is likely to be needed and a working pump.
- **Well** – An old well on the farm might be suitable if the quality is satisfactory.
- **Spring** – A reliable spring could be developed by the construction of a collecting chamber and sump.
- **Stream/river** – Cross compliance prohibits allowing cattle to foul water courses or erode river banks. If the stream is suitable and water quality satisfactory, pasture pumps operated by cattle or properly constructed drinking bays will allow adequate supplies. A sufficiently deep stream might allow easy abstraction by pump to fill a tank. If streams are diverted through buildings as drinking water e.g. via a modified 4" pipe, an abstraction licence and a discharge licence may be required. Consult with the Environment Agency.

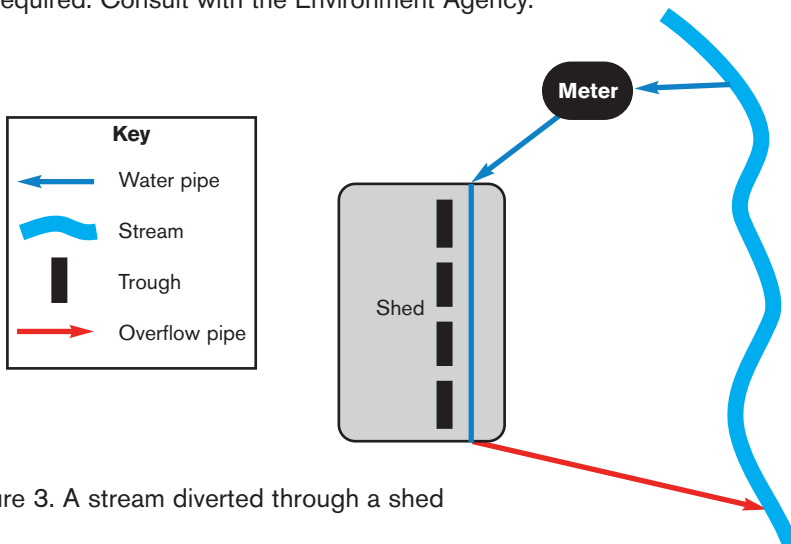
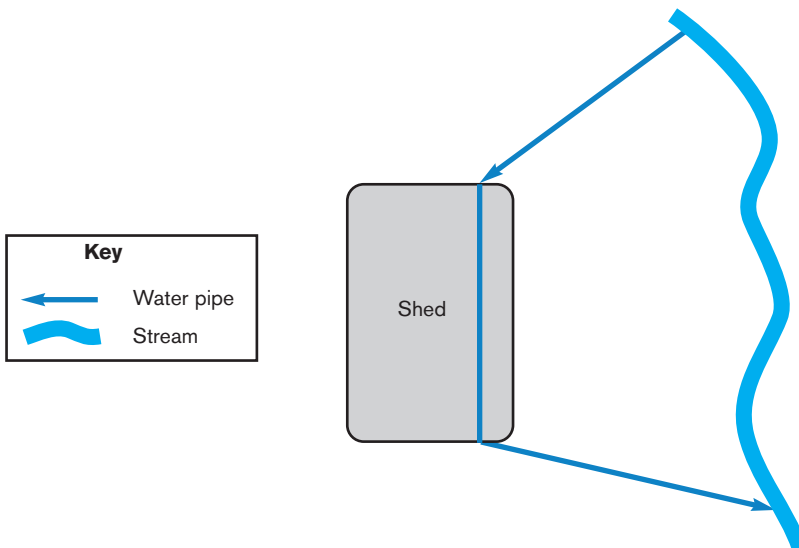


Figure 3. A stream diverted through a shed

Alternative water sources

Many factors affect which approvals are required including, if it is a continual flow through the shed, if there are troughs with a stop valve or if there is a pump. A meter could be placed on the 4" pipe (Figure 3) or, if there is a continual flow, the amount abstracted can be calculated from head of stock (Figure 4). A transfer licence or abstraction licence may be required. A transfer licence is defined as 'a transfer of water with no intervening use'. An example of this would be when there is no net loss of water to the environment. An abstraction licence is required if the daily amount exceed 20m³. Contact the Environment Agency to discuss.

Figure 4. Continual flow through a shed



Alternative water sources

- **Lakes or ponds** – These can offer environmental benefits through habitat creation in addition to supplying an emergency water supply. Only in the very last resort should stock be allowed to walk into water, they will only foul what little there is. If you are considering abstracting it, construct a properly made hard-standing for the tractor and container to stand on during filling and a sump from which to pump. Do not use this container or pump for clean water. You may need an impoundment licence in order to construct a pond. Please contact the Environment Agency at the earliest opportunity to discuss options.



A farm pond can offer environmental benefits and provide an emergency water supply

- **Rain water harvesting** – e.g. collection of roof water or other clean areas, a storage tank is needed and it is advised to filter/treat this water if it is used for stock drinking.

Note: Although water from alternative sources is less expensive than mains, it is generally not free. It could be up to £0.15/m³. This is still cheaper than the water company average UK charge of £0.99/m³.

Transporting Water

An alternative water supply may be available on your farm but in the wrong place. Where practical, it is always easier to take the stock to the water rather than the water taken to the stock but this is not always possible and so water must be moved.

Temporary piping – Gravity can be used if by good luck the supply is higher than the place of need. This is not always the case and a pump might be required. It might be worth buying a suitable pump, plastic water pipe and some fittings if they can be kept in good working order for when they are needed.

Transported containers – If the route from supply to point of use is too far or too difficult for piping, a farm lorry or tractor and trailer with suitable containers will be needed. Do not use tanks or containers which have been used for chemicals. If carrying water from two sources, do not use the same container unless both are equally pure. Do not use a hosepipe direct from the mains to fill containers that have been used for carrying contaminated water or back-siphonage into the main pipe could occur.

If for whatever reason there are serious and widespread supply problems, water may be available from the public supply some distance from the farm. Tankers from the water authority/water company or Local Authority may be available. Tankers would not normally be available at the request of an individual. It is advisable to contact your water company. If supply problems are more widespread then other temporary arrangements will have to be made.

Transporting Water

Emergency drinking trough arrangements

If the public main supply is restricted to certain times of the day or there is a pressure drop, drinking troughs are soon emptied. As cattle, particularly dairy cows, tend to drink at particular times, extra storage capacity at drinking troughs should be constructed utilising the ball-valve control of the permanent trough. Do not tie the ball-valve down so as to allow water to flow unchecked as this causes waste. If a suitable tank or spare trough is not available a temporary trough can be used. An adequate temporary trough can be made by placing a plastic sheet of a reasonably heavy gauge approximately 6m x 6m over straw bales. The sheet should be tied securely around the outside of the bales to hold it in position when filled with water. Assuming a depth of water of about 300mm then the capacity will be 2m x 2m x 300mm = 1200 litres. This may hold sufficient water for about 19 cows for a day. Cows require a minimum depth of about 75mm to drink from.

For smaller livestock such as calves, sheep and lambs, water tight feed troughs are preferable but plastic containers such as mineral buckets could be useful particularly buckets with lids would make it easier to transport with less waste.

Typical water requirements	litres per head per day
Cows in milk	150 (64 litres at grass)
Other Cattle	50
Horses	50
Lactating sows	25
Other sows	8
Growing pigs	5
Sheep	8
Poultry	25 per 100 birds
Domestic use	125

Transporting Water

Marooned stock

Stock marooned by a **fresh water** flood may not be able to obtain clean water but will drink what is present until alternative arrangements are made. Often mains water and drinking troughs are not available in flood plains or marsh areas.

Stock forced to gather on an island surrounded by **salt water** probably need fresh water more than they need food. Flexible containers are available that are capable of being floated across to the stock but an emergency trough and a small pump to transfer the water would have to be taken over by boat. Again straw bales and a plastic sheet trough would be suitable for cattle. If for any reason stock are likely to be isolated on an island for any length of time the economics of providing a limited distribution system will need to be considered.

Environmental issues

Traditionally livestock have been turned out to pastures and allowed to drink from any water source but this has become an increasing issue with concerns for water quality and detrimental effects on livestock themselves. Now many rivers are fenced due to SSSI status and cross compliance issues. The Water Framework Directive provides a new opportunity to help the environment. It requires river, lakes, ground and coastal waters to reach good ecological and chemical status by 2015. This includes issues about diffuse pollution. Diffuse pollution is any nutrients or chemicals that have not originated from a point source and include effluents seeping through soils and surface run off from fields. It also includes soil particles causing sedimentation of watercourses.

Allowing livestock direct access to water sources can lead to a number of problems:

- Damage to banks
- Loss of water storage
- Nutrient build-up in the source and downstream
- Overgrazing near water source
- Deterioration in water quality through sedimentation and faecal organisms from the livestock



Allowing stock direct access to water courses can affect river banks and water quality

Environmental issues

Allowing livestock direct access to water sources can also have detrimental effects on herd health:

- Increased exposure to water-transmitted disease such as salmonella, *Escherichia coli*, campylobacters, and *Cryptosporidium parva*
- Foot-rot
- Leg injuries
- Death by drowning or being stuck

Both poor access and poor water quality can adversely affect livestock production. Water is the main constituent of the animal's body and the loss of 10% of an animal's body water can be fatal. Total water intakes are positively related to feed dry matter. An adequate and safe water supply is essential to the production of healthy livestock.

Today, a variety of watering methods are available to suit any type of pasture and location. The power options to move water to livestock include gravity, solar, wind, fuel, electricity, or stream flow. Consider the natural advantages of the site to select the most appropriate.

Alternatives to direct access livestock watering

Animal operated pasture pumps (nose pumps)

These pumps provide a low cost pumping system since the animals themselves supply the power for pumping. Cattle can operate them by pushing them with their noses and the pump can then lift water. Nose pump devices often consist of a cast-iron body with integrated water bowl and a cast-iron lever arm. When cattle go to drink from the bowl they must push the lever arm out of the way with their nose to reach the water. Movement of the lever arm causes a rubber diaphragm to move back and forth creating suction to draw water to the device from a remote source. These pumps can easily be moved from one water source to another although they should always be securely attached to a solid stand or fence to ensure the lever arm can operate without moving the entire unit. Cattle do have to learn to operate the pump.



Stream Flow

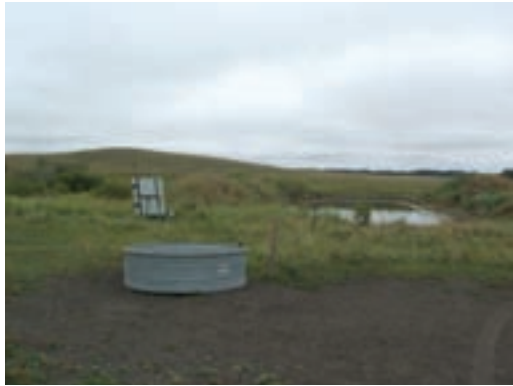
Where there are strong and constant currents in a stream the energy can be used to power a pumping device. Remember that in all cases, if a stream is being diverted in any shape or form a licence is required from the Environment Agency.

Solar-Powered Pumping Systems

A solar powered pump is a normal pump with an electric motor. But the electricity is generated on-site through a solar panel rather than by mains or battery. The advantage of this system is that the solar-powered pumps will naturally work best on sunny days when cattle will consume more water. Solar panels produce some electricity when it is cloudy but their output is diminished.

Alternatives to direct access livestock watering

To ensure that ample water is always available for livestock, solar-powered water pumping systems should incorporate storage sufficient to supply water requirements for three or four days.



A solar panel providing power to raise water into a trough

Wind-powered pumping devices

The energy in the wind drives a propeller. The rotary motion of the propeller is used to drive a pump that moves water to a storage reservoir.

As with solar systems, wind systems must have sufficient storage capacity to maintain a constant water supply through an extended period without wind. Either water or electricity can be stored.



Harnessing wind energy to pump water

Pollution

Most of the current legislation is concerned with minimising the pollution of water and the main regulations are covered by:

- European Water Framework Directive
- The Water Code (The Code of Good Agricultural Practice for the Protection of Water)
- The Water Resources Act 1991
- The Environmental Protection Act 1990
- The Environment Act 1995
- The Water Supply (Water fittings) Regulations 1999

You must ensure that any water you discharge from your site does not adversely affect or damage the environment. In most cases you will not require a discharge consent from the Environment Agency but you will need to have due regard to the Pollution Prevention Guidelines (PPGs). Failure to do this could result in a pollution incident and action may be taken against you. The Environment Agency can advise you on this matter. Trade effluents, such as washwater or cooling water should be kept separate from surface water. Trade effluents discharged to controlled waters do require Discharge Consent.

If you discover that your water is polluted stop using the water immediately and use an alternative source of acceptable quality. Substances that originate on livestock farms and often contaminate water supplies include nitrates, bacteria, organic material and suspended solids. Water samples should be taken throughout the system so that the cause, place and level of contamination can be identified. Samples can be sent to a number of independent authorised laboratories and are likely to cost in the range of £5 and £70 depending on the analysis required. The laboratory should be contacted to establish how much of a sample is needed (up to 2 litres, depending on the analysis required). Typical analysis are; total coliform bacteria, pH, total dissolved solids, nitrates, sulphates and other factors such as toxicity problems. Remedial works and/or water treatment may make the source acceptable for future use. A private water supply should be regularly sampled for bacteria count, streptococcus and coliforms.

It is an offence to cause or knowingly permit polluting matter to enter into surface or groundwater. The Groundwater Directive prevents groundwater being polluted by controlling discharges and disposals including accidental loss of certain dangerous substances. If you want to dispose of dilute pesticides (including spent sheep dip) and washings, vegetable and bulb dips/drenches by land spreading you need a groundwater authorisation available from the Environment Agency.

Pollution

Prevent pollution by;

- Keeping grazing stock away from areas adjacent to springs or wells and erecting or repairing fences as necessary
- Preventing seepage from slurry compounds, silage clamps or cattle yards into underground drainage systems or groundwater
- Repairing and maintaining spring collection chambers, brick or concrete reservoirs and wells to prevent dirty water entering through cracked brickwork or broken covers contaminating the system

Remember that pollution may affect not only affect your farm's own water supply but that of other farms as well.

If the water source fails to meet your needs due to lack of quantity or poor quality a more reliable source must be sought. If steady deterioration is noticed prepare in advance for the day of shortage. It is no use waiting until the well runs dry!

If the farm's primary source is likely to be affected by pollution plan now for the possible emergency;

- Select the best alternative source
- Check water quality and quantity
- Carry out any necessary construction work

Remember:

- In an emergency who could do the work?
- Would the farm have time to do any works with its own resources?
- Would suitable materials be readily available?
- What output losses would the farm suffer due to any delay?

Key points to help you use water more efficiently

Planning

- Carry out a water audit and action plan – further information can be found in the booklet 'Waterwise on the farm' available from the Environment Agency
- Make a plan of the farm water system, including the plumbing system, sources and uses
- Provide a sufficient and logical stop-valve arrangement so that a failure can be isolated
- Arrange storage to cover for a temporary shortage of supply
- Ensure that pipe sizes are correctly designed as the problems of small diameter pipes will be aggravated by the reduction in mains pressure which may occur during an emergency
- Examine ways of transporting water and purchase any spare tanks and containers
- Look into all alternative sources of supply and if necessary check on quality and quantity

Management

- Separate clean and dirty water
- Roof livestock holding areas to reduce volume of dirty water produced
- Recycle rainwater (before using rainwater you should check that this does not breach any hygiene or farm assurance scheme requirements)
- Abstract (draw/remove) water at times of high water levels and store for times of shortage
- Dairy farmers can re-use plate cooling water to water livestock or wash down the collecting yards
- Adjust ball-valves to lower the float so there is less risk of spillage and overflowing
- Isolate and drain troughs and pipes that are not in use over the winter to prevent frost damage that would cause a leak

Key points to help you use water more efficiently

Maintenance

- Regularly check water meter readings
- Carry out routine maintenance on the system, clean and overhaul all valves and renew washers

Equipment

- Pig and poultry farms – nipple and cup drinkers in poultry units or bite-type drinkers in bowls reduce wasted water by animals playing
- Fit self-closing trigger nozzles to hosepipes
- Fit shut-off valves to taps

Enhanced Capital Allowances (ECAs)

The ECAs enables businesses to claim 100% first year capital allowances on the cost of an investment in water saving plant and machinery. Businesses are able to write off the cost against the taxable profits of the period in which the investment is made. ECA qualified products must be used. Qualifying plant and machinery for water efficient technologies include rainwater harvesting equipment, flow controllers, meters, leakage detection and efficient taps. The ECA scheme is a key part of the Government's programme to manage climate change. It provides businesses with enhanced tax relief for investments in equipment that meets published energy-saving criteria. For example, if a rainwater harvesting system costs a farm £1000 and the farm has a large annual turnover and is liable to 40% tax that farm can re-claim 40% of the £1000. Further details and a list of qualified products are available on the ECA website www.eca-water.gov.uk (please note that these details are correct at time of print. Current levels of support and processes to claim support should always be checked before making any investment).

Further information

Effective Use of Water On Dairy Farms Milk Development Council
01285 646510 www.mdc.org.uk

Enhanced capital allowance
Helpline:0800585794
www.eca.gov.uk

GAP Information leaflet 13 Watering stock on sites
www.grazinganimalsproject.org.uk

Water Matters www.nfuonline.com

Waterwise on the Farm Version 2 Environment Agency
www.environment-agency.gov.uk

Free environmental guidance
www.netregs.gov.uk

Useful Contacts:

Environment Agency contact details:

General Enquiries: 08708 506 506 (Mon-Fri 8-6)

Incident hotline: 0800 807060 (24 Hour)

Hazardous Waste Registration number: 08708 502 858 (Mon-Fri 9-5)

Agricultural Waste Registration: 0845 603 3113 (Mon-Fri 8-6)

Floodline: 0845 988 1188 (24 hour)

Welsh Water contact details:

Account enquiries - 0800 052 0145

Water supply - 0800 052 0130

Sewerage services - 0800 085 3968

Report a leak - 0800 281 432

Severn Trent contact details:

Operational Emergencies – 0800 783 4444

Billing Enquiries – 08457 500 500

For further information on this booklet or any of the work undertaken by HCC please contact HCC on 01970 625050.

Email: info@hccmpw.org.uk or visit www.hccmpw.org.uk