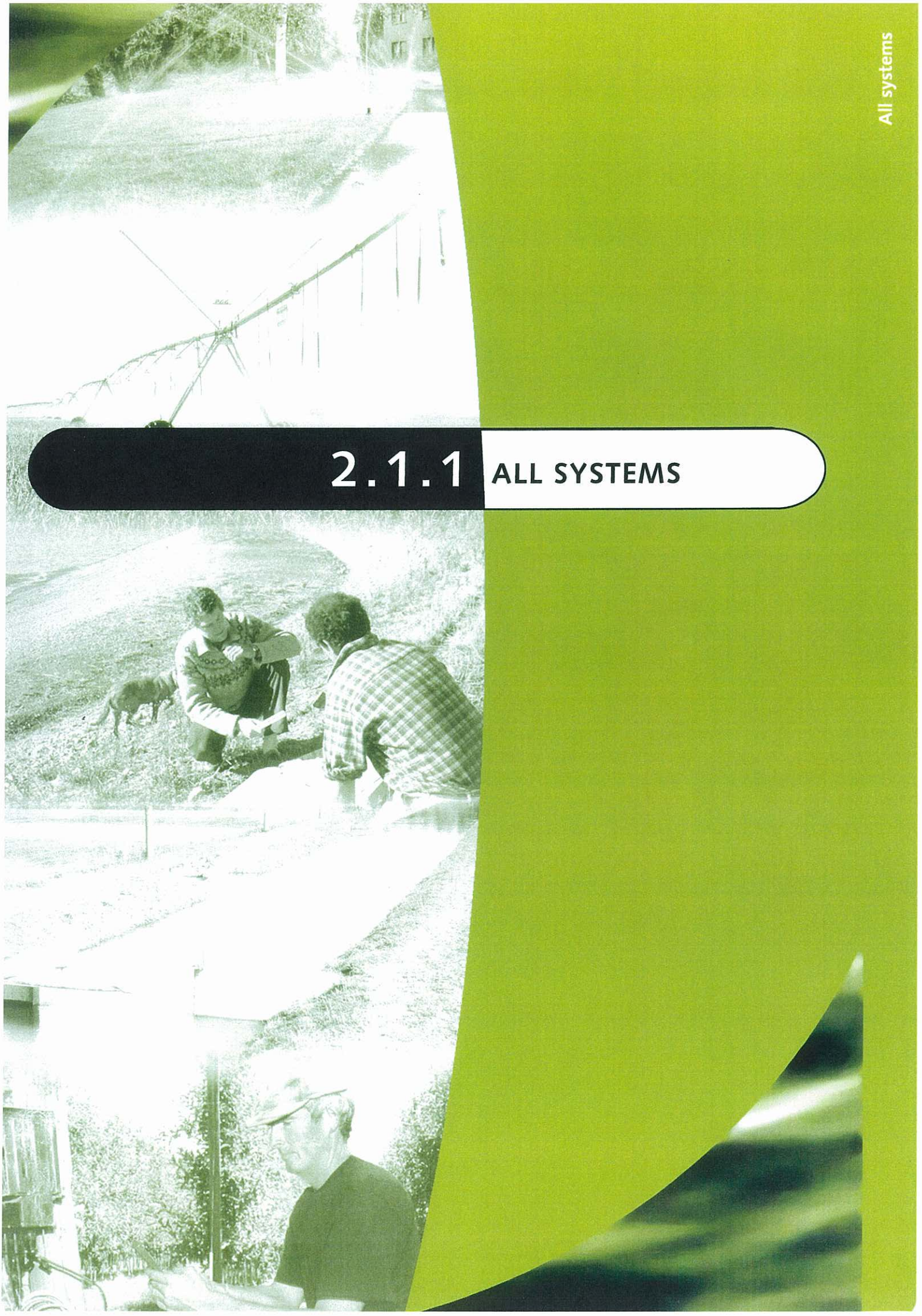

2.1.1 ALL SYSTEMS

How much water is likely to be available this season?

This question cannot be answered with any certainty. The availability of water is a question of source – groundwater, run-of-river surface water, or stored surface water – and of how it is managed.

Groundwater

The amount of water available for the upcoming season depends on existing groundwater conditions and on the limitations of your system.

If water is pumped from a confined aquifer (normally a deep aquifer):

- Where the water level is high, there are unlikely to be problems with the amount of water available, and normal irrigation can occur.
- When the water level at the start of spring is already low, it is unlikely there will be any seasonal recharge. If the drawdown level is close to the low water limit, there is every likelihood there will be insufficient water for irrigation for all or part of your programme.
- Check with the local regional council regarding their expectation of water level trends for the season.

If water is pumped from a water table aquifer or the aquifer is hydraulically connected to a stream:

- Where the amount of available water is not to be restricted, recharge is usually required during the season.
- When the water level is high at the start of the irrigation season and there is recharge during the season, the water available for irrigation should not be restricted.
- In situations where the water level is high at the start of the irrigation season but there is no recharge, expect water available for irrigation to be restricted. The restriction is most likely in late summer and/or autumn.
- When the water level is low at the start of the season, expect water available for irrigation to be restricted.

Run-of-river surface water

- All river systems have low flow restrictions, which result in a sharing of flow or a complete ban on water for irrigation.
- Any restriction will limit the area that can be irrigated.
- Timing of the restriction usually depends entirely on the prevailing climatic conditions and in some cases the winter snow accumulation.
- Most large New Zealand rivers supplying water for irrigation do not have large catchment or snow pack storage. Flows are therefore very dependent on summer rainfall.
- Plan on restricted water available for irrigation in every season. The local regional council can advise on the likelihood of pending restrictions during the season.

Stored surface water

- If the storage is full and the scheme has been designed to provide irrigation for the entire season, expect a continued and unrestricted supply of water for irrigation.
- If the storage is not full, the irrigation company will advise how much the supply will be reduced or restricted during the season. Under this circumstance, plan on restricted water being available for irrigation for the season.

Summary

- Plan for restricted water being available for irrigation, especially if you rely on run-of-river surface water, or the groundwater source is hydraulically connected to a stream.
- Have a contingency plan in place. In particular, decide on irrigation priorities.

June 2001

What area can be irrigated?

The size of area that can be irrigated is determined by the system capacity and the design or expected maximum daily crop water requirement.

System capacity is the amount of water available for irrigation, expressed as litres/second (l/s). It could be the volume or rate pumped from groundwater or the amount allocated from a surface or stored supply. The system capacity will not be restricted unless:

- Groundwater levels are low or
- The river flow is low and restrictions are imposed or
- There is insufficient storage to meet the allocated supply.

To estimate the area that can be irrigated, do not rely on unsubstantiated claims about the irrigator flow rate – have it measured.

Crop water use is the amount of water used by a crop each day, expressed as millimetres/day (mm/d). It can be approximated by the potential evapotranspiration rate, or can be estimated from soil moisture measurements.

How much area can be watered?

The area can be estimated using the following simple calculation:

Step 1 :	Obtain water supply rate in l/s.
Step 2 :	Multiply the flow rate by 82.8. This converts the supply rate from l/s to m^3/d, assuming 23 hours of irrigation per day.
Step 3 :	Obtain the expected crop water use in mm/d.
Step 4 :	Divide the crop water use by 1000. This converts it to m/d.
Step 5 :	Calculate the area by dividing the supply rate (in m^3/d) by the crop water use (in m/d).
Step 6 :	Convert this area to hectares by dividing by 10,000.

The result of this calculation is the maximum area that could be irrigated if there is no supplementary rainfall. It is also the maximum area that could be irrigated using the design daily crop water use. Normally this figure is the peak daily water use averaged over a period of 7-10 days. For much of the season, daily water use will not be this high, but it is the high demand periods that result in water deficit conditions and yield losses, and therefore must be considered in the calculation.

Example:

To illustrate this calculation the following example is provided for a system capacity of 50 l/s and a design daily crop water use of 5 mm/d:

Step 1 :	50 l/s
Step 2 :	50 x 82.8 = 4140 m^3/d
Step 3 :	5 mm/d
Step 4 :	5 ÷ 1000 = 0.005 m/d
Step 5 :	4140 ÷ 0.005 = 828,000 m^2
Step 6 :	828,000 ÷ 10,000 = 82.8 ha

Therefore, with 50 l/s available, 82.8 ha can be fully irrigated at any time during the season, with or without rainfall. In some seasons, and often during individual seasons, much more than 82.8 ha could be irrigated. But there will always be periods (weeks or months) when there is insufficient rainfall to supplement irrigation of the extra area. During these dry times, only 82.8 ha can be fully irrigated.

If the amount of water available for irrigation is restricted, the reduced flow can be used in the calculation to determine what area can be adequately irrigated.

June 2001

What needs to be monitored?

Every aspect of the irrigation system must be monitored. Monitoring is only of value, however, if the results are used to make better management decisions. This requires keeping records of what has been monitored and the steps taken to remedy any problems.

Monitoring should be an ongoing part of operating an irrigation system. It can be grouped into pre-season monitoring and during-the-season monitoring.

Pre-season monitoring

If these checks are not carried out, the irrigation season is likely to get off to a poor start, with preventable breakdowns and equipment failure.

Irrigator

- Read the irrigator manual, and carry out any maintenance checks recommended. Pay attention to lubrication (swivels, axles etc.), filter replacement, tyre inflation pressure, all nuts and bolts, flanges and boots for leaks, nozzles for blockage, pipes for blockage.
- Check any pressure gauges on the irrigator; they are an essential indicator as to whether irrigator performance is normal. Gauges can be removed and taken to the supplier to test for correct operation.
- Check the application depth by putting out 5-10 catch cans (straight sided) across the irrigator path. The depth of water can be measured by dipping with a wooden ruler or stick. If there is a significant difference across the path, check the irrigator nozzles for blockage or excessive wear.
- Check the travel speed of the irrigator at previously measured settings. A check on at least two runs should be carried out to determine if any further investigation or remedial action is required.
- Check the drag hose for leaks and wear. Repair any minor cuts or tears before they become major repair or replacement issues.
- Check the wire rope for damage and wear.

Mainline

- Flush the mainline, especially if any repairs or maintenance have been carried out.
- Check the pressure in the mainline: at the headworks and at the hydrants, particularly those at the lowest and highest points along the mainline (these being the points that are likely to give the highest and lowest pressures). Compare to the original design to determine if any remedial maintenance is required.
- Repair any obvious leaks, e.g. wet spots along the buried mainline or leaking hydrants.

Well and pump

- Measure the water level, and compare to previous seasons.
- Check the pressure gauge(s) at the pump outlet, and remove for testing if required.
- Measure the pump pressure. A drop in discharge pressure may be the result of pump wear, decreased impeller speed, excessive drawdown, a broken pipe downstream of the pump, or excessive irrigator discharge.
- Request a pump test to check the pump performance.
- A well test will show whether there has been any deterioration in the well and/or pump performance. A comparison with earlier tests of flow at various drawdown levels will show whether the well performance has deteriorated.
- Check all the electrical wiring and connections for damage.
- Check that all the gauges and meters in the pumpshed are functioning correctly.

Raingauge

Make sure your raingauge is empty. Measuring rainfall is the first step toward making good irrigation management decisions (refer to Section 2.4.2, Sheet 1: *Raingauges*)

Monitoring during the season

Observation

Be observant! Watch for the obvious signs of poor performance and for simple repairs that can be carried out to minimise downtime or to pre-empt large-scale problems.

Irrigator

- Check the drag hose for leaks and excessive wear.
- Check the wire rope for fraying and wear. If it "snags" frequently, there is a reason.
- Watch for ponding and/or runoff. This could indicate a worn nozzle, a sprinkler that is not working, etc.
- Watch for missed patches. This could indicate a blocked nozzle or a malfunctioning sprinkler or gun.
- Regularly check any pressure gauges on the irrigator.
- Ideally, measure the application depth for each irrigation event. The best way of doing this is to fit a totalising flow meter to the irrigator.

Mainline

- Check pressure during the season.
- Repair any leaking hydrants.

Pumps and well

Regularly monitor and record pressure, power usage and water level. Any changes from the beginning of the season are a warning of pending pump and/or well problems.

Soil

Regularly monitor the soil moisture content – preferably by measuring it using a proven method. See Section 2.4.1 for more details.

Summary

There is no substitute for monitoring and recording. It is not enough to do a pre-season check; the process must be ongoing. Comparison with previous monitoring records will alert you to any remedial or preventative maintenance work that may be required.

June 2001

Should you change electricity supplier?

With the recent separation of electricity companies into line companies and energy companies, most irrigators now have the opportunity to purchase electricity from a range of energy suppliers.

Line companies are responsible for the distribution networks and charge the energy companies for the use of their lines. Energy companies then pass these costs on to consumers. Some of the energy companies can offer electricity nationally, while others supply only to a regional customer base.

Advantages of changing supplier

- Savings in electricity costs.
- Opportunity for detailed information on electricity use.
- Can sometimes get deals through farm retail stores, e.g. Farmlands/Genesis.

Disadvantages of changing supplier

- May require a small initial expense for new meters/ equipment.
- May be required to sign contracts to take electricity for minimum period.
- Electricity charges may reduce while you are locked into a fixed-term contract at a higher rate.
- You may be asked to do your own meter readings.

Summary of options

The options available to you will depend on what each energy company can offer in each region.

The pricing policies of line and energy companies make it very difficult to make a choice regarding the best option for irrigation. Energy companies often bundle energy and lines charges to repackage their service, which means that it is not possible to look at energy costs alone to compare options. You need to consider the total cost of electricity based on the size of pumps that you are using and the expected number of operating hours per year. The time of day that electricity is used is also important for some of the options.

The pricing policies will include some or all of the following:

- Fixed daily charge (¢/day), usually payable for 365 days per year.
- Invoice charges ($/month).
- Installation control point (ICP) charges, generally applicable to each metering site.
- Meter charges (¢/day), depending on the type of meter.
- Capacity charge (¢/day/kW or $/year), sometimes spread over 365 days, or payable over several months. Can be fixed for various load ranges.
- Power factor rebates (cents/kVaverage/day).
- Discounts for prompt payment.
- Discounts for large users.
- Energy charges (¢/kWh)
  - time of use
  - fixed daily
  - day
  - night
  - summer
  - winter
  - controlled
  - uncontrolled

Before making a decision to change supplier, all of the appropriate costs must be determined. This will normally be based on location, motor sizes, total operating hours per year and time of use. An estimate for the total expected annual electricity cost should be calculated for each option. Options that include time-of-use metering will probably require you to purchase enclosed cabinets to house new meters and communications equipment. This is to protect the equipment from birds and other hazards.

Precautions

- Be prepared to negotiate for the best option. Some companies may not offer the best deal first up.
- Make sure that the energy price applies to that metered on farm.
- Check whether prices are fixed for a specified period or can be changed during the term of a contract.
- Check whether the supply is controlled or unrestricted, and if controlled, how often and when it is likely to be turned off.
- Make sure that the reliability of supply meets your needs.

Where to get help

Ask electricity suppliers to provide you with a written quote detailing their best deals.

For independent help, talk to local irrigation or electrical experts.

June 2001

Planning vineyard and orchard irrigation management

The goal of most growers is to grow high quality crops of uniform maturity. Irrigation management deals with how much water to apply and when to apply it to reach this goal. This requires a comprehensive irrigation management plan. Consider all of the following factors in formulating your plan:

1. Have clear objectives of what you expect from your orchard or vineyard – tonnage at harvest, size of canopy, number and length of canes (vineyard), expected flowering date, harvest date etc.
2. Be aware of the potential and limitations of your irrigation system. How good is your distribution uniformity? Will "deficit irrigation" cause crop loss in poorly watered areas? Will fertiliser injection cause excessive emitter blockages?
3. Know your soils. Soil variability has a significant effect on crop uniformity. Can you manage your system to accommodate this variability?
4. Know where the crop roots are concentrated. This varies according to soil, variety, rootstock, emitter placement and irrigation practices. This knowledge is essential when placing soil moisture sensors or considering fertiliser injection.
5. Know how much water the crop needs to meet your objectives, and develop an irrigation strategy to meet those needs. This is absolutely necessary to control the vigour of the crop.
6. Know the quality of your irrigation water. This includes sands, silts, organic material, dissolved salts and chemical makeup.
7. Develop a good fertigation plan. This will depend on water quality, soil type, types of fertiliser, application methods, crop vigour, and crop yield objectives.
8. Know how to operate the irrigation system. If you don't, you won't achieve your objectives, and in some cases may make things worse than they would have been the case with no irrigation.
9. Know how to maintain the irrigation system. This particularly applies to filtration, which requires regular monitoring and maintenance. Filtration problems can quickly lead to blockages and perhaps permanent damage to the system.
10. Train your staff. Everyone involved needs to understand what is expected, and those operating the system must be properly trained to ensure the plan objectives will be met.
11. Obtain a permit to take water for irrigation, or an agreement to purchase water from a supplier, ***early in your development programme.***
12. Obtain sound technical advice on the water supply reliability in your area. An irrigation system is of little benefit if the water supply will be regularly closed down due to low stream flow or groundwater levels.

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