

KEY CONSIDERATIONS FOR SUCCESSFUL IRRIGATION DESIGN

Fact sheet



Thorough irrigation system design is essential for efficient water use, straightforward management, and increased business profitability. When planning a new or modifying an existing system, several critical factors must be considered to ensure optimal performance and compliance.

Important considerations for your system

Effective irrigation planning involves assessing:

- Legislative requirements related to water use licensing and environmental compliance
- Available water volume and quality
- Crop type and specific water requirements for your site
- Size and topography of the proposed irrigated area
- Soil types and their suitability for irrigation
- Power availability for system operation
- Existing cultural or on farm practices that could influence design
- Future expansion plans for your operations

Seeking professional guidance

We highly recommend obtaining independent professional advice. Partner with a designer who demonstrates strong design skills, knowledge, and experience in projects similar to yours. Additionally, engage financial and agronomic professionals to provide comprehensive input. An experienced designer, collaborating with an agronomist, will guide you through the following crucial development steps:

- Reviewing your farm's natural resources to determine suitability and scale for irrigation
- Conducting early financial analysis, including Return on Investment
- Identifying any knowledge or skill gaps needed for managing the irrigated enterprise
- Determining the required system capacity
- Optimising the irrigation layout
- Executing the hydraulic design and selecting appropriate equipment
- Assisting with seeking and comparing quotations effectively

Core project assessment areas

NATURAL RESOURCES

To ensure the viability and efficiency of your irrigation system, assess:

- **Water Access:** Understand allocations, access rules, and source locations
- **Irrigatable Areas:** Precisely identify suitable land for irrigation
- **Land Capability:** Evaluate the land's potential and limitations
- **Drainage:** Determine specific drainage requirements for your site
- **Water Budgets:** Develop detailed water budgets for proposed crops and rotations

FINANCIAL VIABILITY

A clear financial overview is critical for project success. Focus on:

- **Crop Rotations & Returns:** Identify your planned crop rotations and projected financial returns
- **Development Budget:** Create a comprehensive budget for the entire development
- **Ongoing Costs:** Clearly understand recurring expenses like labour, energy, and maintenance
- **Profit Sensitivity:** Analyse how changes in variables might affect profitability

OPERATIONAL READINESS

Successful irrigation goes beyond installation; it requires skilled management.

- Assess if you possess the necessary skills to manage the irrigated enterprise
- Determine if you can acquire any missing skills to ensure profitability

REMEMBER

Poorly designed or managed irrigation systems pose significant business risks. Simply adding irrigation does not guarantee increased business profitability.

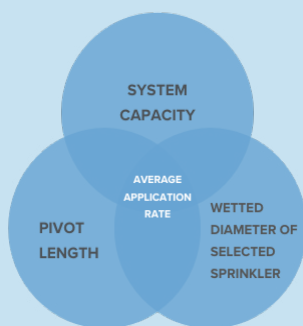
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Average application rate (AAR)

AAR is the rate of water application over the wetted area. It is an average value assuming uniformity within the wetted area. This is a critical consideration for centre pivot system design.

AAR should be compared to the soil infiltration rate. If AAR on a centre pivot irrigator is significantly higher than the soil infiltration rate, runoff will occur.

3 LEVERS TO PULL TO CHANGE THE AAR



CONSIDER OPTIONS TO REDUCE THE AAR

- Lower system capacity
- Shorter pivot length
- Increasing sprinkler wetted diameter

Irrigation design steps

An experienced designer will systematically guide you through the key stages of the irrigation design phase.

1. Determine required System Capacity – this determines the system flow rate and therefore determines the size of much of the related infrastructure
 - Use a metric-based approach to System Capacity which is the maximum possible rate at which the machine can apply water to the irrigated area
- $$\text{System Capacity} = \frac{\text{Daily pump flow rate (ML/day)}}{\text{Area irrigated (ha)}} \times 100 = \text{mm/day}$$
- Understand Evapotranspiration (ET_o) – it is not evaporation!
 - Consideration must be given as to what you are irrigating to arrive at your Peak Water Requirement
2. Consider system types/suitability for the area and the crop to be irrigated
 3. Consider the maximum average application rate (AAR) the system should have relative to soil limitations and crops to be grown
 4. General layouts – traveller runs or pivot circles
 5. Investigate application technology (sprinklers and pressure)
 6. Development staging options
 7. Pipe zoning, routing and sizing (focus on energy efficiency)
 8. Energy efficiency of the system (pipeline, pump and motor efficiency)
 9. Pump station design for serviceability
 10. System controls & monitoring

Seeking quotations

Having a clear design specification brief to take to suppliers will ensure that quotations are comparable. A good design brief will include:

- Design pressure and flows at the pump and irrigator
- Pipe sizes and pressure ratings
- Air valve locations and sizing
- Consideration of the potential for water hammer with mitigation measures incorporated into the design
- Required pump & motor efficiency at duty
- Sprinkler type & pressure selected with consideration to soil and crop specific issues for the property
- Options to reduce wheel tracking issues

FOR MORE INFORMATION AND RESOURCES

Visit the Water Use Efficiency project website <https://www.tasfarmhub.com.au>

Key Takeaways

- Get the fundamentals right
- Get the System Capacity right
- Don't get fixated on the equipment
- Focus on ensuring the agronomic outcome is achieved
- Seek independent and professional advice

