Water for Profit

Whole Farm Irrigation Planning
The Planning Process Steps

1. Resources
2. Financial Budgets – Return on investment
3. Determine the required System Capacity
4. System Layout and Design
1. Where to irrigate?
2. Know your soils
3. Determine their suitability for irrigated agriculture
4. Land capability
   I. Determine potential short term and long term sustainable crop rotations
   II. Soil limitations – soil type, depth, RAW, slope, frost risk, water infiltration rate
   III. Use soil maps – Simple soil reconnaissance survey to EM
5. Consider and plan drainage
6. Do a water budget – how much water do you have v/s need?
7. Get help! - use an agronomist, soil scientist etc.
Financial

• Know your potential crop rotations and returns
• Compile development budget – include incidentals such as fencing, drainage & pivot crossings
• Know the operational costs – labour, energy & maintenance
• Look at the sensitivity – Will it still make $ if inputs or output costs change
• Get help if needed
• Ensure you can make $ before proceeding
Making it work?

- Do you have the necessary skills to make this work?
- Can you learn the skills to make this profitable?
- Often the required skills are missing
System Design

What are we trying to achieve?

• “to make water available when and where the plant needs its”
• Manage water in the root zone to maximise agricultural outcomes
• Avoid off target applications – losses to runoff and deep drainage
Design Steps

1. Determine system capacity required
   • This gives us the design flow rate
   • Which in turn allows us to size the pipes, pumps and all other equipment
System Capacity

• Irrigation systems should be able to meet reasonable peak crop water demand – **System Capacity**
• We can draw down into soil moisture reserves
• **Underdone** on System Capacity = *plant stress at key times* = *reduced yields & quality*
• **Overdone** on system capacity = *overcapitalise & increased application related issues* - off target application, wheel tracking etc.
• Consider what you are irrigating – Crops v/s Pasture
System Capacity

- Don’t get caught up with trying to use just off peak power
- Pumping cost should not be put before the crop requirements

Cost Cents KWh (T75) vs Hours Pumping Per Day

CKWh Ave.

9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Hrs per day
System Capacity

• “The rate at which water can be supplied to the irrigated area” normally expressed in mm/day

• Design SC mm/day = Peak crop water required / Application efficiency / PUR
System Capacity

• Application efficiency - “the proportion of total water applied that the crop can use” i.e. minus losses for evaporation, drainage, off target applications, and non-uniform application
  • Centre Pivot systems should be around 90% if well designed
• Pump utilisation ratio (PUR) - “the proportion of time the machine has to operate to supply the peak crop water requirement”
  • Allows for moving of irrigators, spraying, power outages and minor breakdown.
  • 90% gives 21.6 hours per day of operational time
System Capacity

• Derived from peak 3 consecutive day ETo averages
• The likely re occurrence of the 3 day average ETo in a season
System Capacity

- Exceedance for Cressy
- Average daily ETo for Jan = 4.64mm

**Frequency of 3 day Average ETo Exceedance per Season (1994 - 2013)**
Design Steps

Design Steps – continued

2. Consider system types available / suitability
   • Labour
   • Energy usage
   • Water use efficiency
   • Land use efficiency

3. General Layouts – Traveller runs / Pivot circles

4. Investigate application technology – sprinklers and pressure
Design Steps

4. Development Staging
5. Pipe routes & sizing (energy efficiency)
6. Pump station design
7. Energy efficiency of the system – Design pressure and pump & motor efficiency
8. System controls & monitoring
Evaluating Quotations – Questions to Ask

- System flow rate
- Design Pressure at Pump and Irrigator
- Pipe sizes
- Pump & Motor Efficiency at duty
- Pumping cost $ML
- Sprinkler type & pressure
- Sprinkler package Average Application Rates
- Sprinkler Chart
  - number of sprinklers
  - Flow variation
  - Placement of sprinklers
  - Use of part circles for dry wheel tracks
- Does it all add up?
Take Home Messages

1. Get the fundamentals right
   - Resource Base
   - Financials
   - Skills

2. Get the System Capacity right

3. Don’t get fixated on the equipment

4. Concentrate on ensuring the Agronomic outcome is achieved