

Centre Pivot Irrigation – System Capacity

Introduction

The system capacity for centre pivot irrigation is a very important design and management issue. System capacity is the volume of water the irrigator is capable of supplying to a given area in a given time period (mm/day).

System Capacity Factors

System capacity is dependent on the following:

1. Peak crop water requirements;
2. Effective crop root depth;
3. Soil texture and infiltration rate;
4. Available soil water holding capacity;
5. Management Techniques; and
6. Pumping capacity from water source.

The flow rate required must adequately replenish water at a rate equal to the peak crop water use for a given area. Peak crop water use is dependent on the peak evapotranspiration rate for the crop.

Not meeting the crop water use will result in plant stress and yield reduction.

System Capacity Calculation

The system flow rate is calculated knowing the required system capacity and the irrigated area. The total system flow rate, Q (l/s), is:

$$Q = 0.1157 * A * d$$

where A is total irrigated area (Ha), and d is required system capacity depth (mm/day).

Managing System Capacity

The system capacity is affected by management techniques and the application efficiency of the center pivot. The calculated system capacity assumes irrigation 24 hours per day every day and 100% application efficiency. Increasing system capacity should compensate for non-irrigation periods and inefficient irrigation. Non-irrigation periods include:

- Cultural practices (including chemical and fertiliser application) for example irrigating 6 days out of 7, or irrigating at night to limit power costs;
- Part-circle irrigation;
- Moving towable pivots to other sites; and
- Down time due to system maintenance or repair.

Consideration must be given to the water-holding capacity of the soils. This will determine the rate and amount of water that can be applied and the duration to the next irrigation.