

DIY Irrigation Evaluation: WORK SHEET

How To #2: Calculate Flow Rate

Reading 1 = A m³
 Time 1 = B
 Reading 2 = C m³
 Time 2 = D
 Volume used = E = C - A m³
 Time elapsed = F = D - B minutes
 Flow Rate = G = E / F m³/min
 Flow Rate = 16.7 * G l/s

Workspace:

How To #3: Read a Pressure Gauge

		Desired Unit			
		psi	kPa	bar	m
Gauge Unit	psi	1	6.9	0.069	0.7
	kPa	0.145	1	0.01	0.1
	bar	14.5	100	1	10
	m	1.4	9.8	0.098	1

Workspace for unit conversions:

How To #4: Depth to Water in a Well

Air Pressure Method:

Pressure = A m
 (make sure pressure has been converted to right units)
 Depth down to pump = B m
 Tube distance above pump = C m
 Depth of tube in well = D = B - C m
 Depth to Water = B - D - A m

Workspace:

How To #5: Measure Power Use

Method 1 - Use the electricity meter

Reading 1 = A kWh
 Reading 2 = B kWh
 Time = C minutes
 Meter Factor = D (e.g. 40x)
 Power used = E = B - A kWh
 kW = D * E * 60 / C kW

Workspace:

How To #5: Measure Power Use

Method 3 - Use the ammeter

Current = A Amps
 Voltage = B Volts
 Power factor = C "cos φ"

Workspace:

For a 3-phase power supply:

kW = A * B * C / 578 kW

For a single-phase power supply:

kW = A * B * C / 1,000 kW

How To #6: Measure Application Depth

If the buckets have straight sides:

Add all the depths = A mm
 Number of buckets = B
 Average depth = A / B mm

If the buckets have sloped sides:

Add all the volumes = A mℓ
 Number of buckets = B
 Width across the bucket (diameter) = C mm
 Bucket radius $D = C / 2$ mm
 Average volume $E = A / B$ mℓ
 Bucket area $F = 3.14 * D * D$ mm²
Application depth $1,000 * E / F$ mm

Workspace:

How To #7: Measure Flow Rate at the Irrigator

Average application depth A mm
 Area covered by one run B ha
 Time taken to complete run C hours
 Volume of water used $D = 10 * A * B$ m³
 Flow rate to the irrigator $E = D / C$ m³/hr
 Flow rate to the irrigator $E / 3.6$ ℓ/s

Workspace:

How To #8: Calculate System Capacity

Option 1

Total flow rate = A ℓ/s
 Total irrigated area = B ha
 System Capacity = A / B ℓ/s/ha

Option 2

Application depth = A mm
 Time to finish one run = B hours
 (use "24" for centre-pivots)
 Return interval = C days
 System Capacity = $24 * A / B / C$ mm/day

System Capacity Conversions:

Multiply ℓ/s/ha * 8.64 to get mm/day
 Multiply mm/day * 0.116 to get ℓ/s/ha.

How To #9: Check the Return Interval

Application depth = A mm
 Soil PAW = B mm
 The smaller of A or B = C mm
 Normal Evapotranspiration D mm/day
 (summer ET is assumed to be 5 mm/day in Canterbury)
Time for soil to dry C / D days

Workspace:

← (the return interval should be less than this)

How To #10: Calculate Pumping Efficiency

Pump flow rate = A ℓ/s
 Pump pressure = B m
 Power use = C kW
Pumping efficiency = (i.e. 0.65)
 $0.098 * A * B / C$

Workspace: