IRRIG8Quick

Irrigation Calibration Quick Test

Guidelines for Drip Micro Irrigation

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What is the Irrigation Quick Test about?

The purpose of the Irrigation Performance Quick Test is to determine the depth of irrigation applied during an irrigation event and how uniformly the irrigation is distributed. Good management requires calibration of every separately managed block within the overall irrigation system.

IRRIG8Quick is designed so irrigation managers can do the testing and calculations themselves. As well as this guideline, a worksheet is available to assist. If findings are unexpected, or suggest low performance, consider getting professional advice.

Why check irrigation performance?

Profitability – effective irrigation maximises production. A well setup system makes money!

Sustainability – efficient irrigation minimises water and energy use and leaching. A well setup system saves money!

It is essential for irrigation managers to know how much water is being applied as it is an important input into any irrigation budgeting or scheduling process. It is particularly important if nutrients are being applied with the irrigation.

The uniformity of irrigation determines whether all plants are receiving the same amount of water. As uniformity decreases, some plants will be more over-watered while some are more under-watered. This is even more important if applying nutrients.

What is involved?

The IRRIG8 Irrigation Calibration Quick Test method is based on measurements collected at specified locations (Diagram 1). Follow placement instructions carefully and read volumes as accurately as possible to be sure of best results.

Measured flow rates are combined with emitter or sprinkler and adjacent lateral spacing data. This allows calculation of the 'rain equivalent' depth of irrigation applied in a time period.

The calibration process should be repeated in each separately managed block within the irrigation system. A "block" is a part of the irrigation system controlled a single unit.

If there are key differences (e.g. emitter type or flow rate, emitter spacing or row spacing) within a block, it should be split into sub-blocks.

What will the testing show?

The main things the Quick Test will show are:

Crop Applied Depth – The 'rainfall equivalent' depth of water the irrigation system is applying on average to each block. Compare the measured applied depth to target application to calibrate each block. Adjust block run times to correct applied depths.

Emission Uniformity EU – The evenness of flow from individual outlets. The higher the EU, the better the system is performing. And the higher the uniformity, the more confident you can be that measurements are truly representative of system performance.

Soil Applied Depth – The depth of water being applied to the area actually wetted by the irrigation system.

Adjusted Block Run Time – Calculates the irrigation duration to ensure 7/8ths of each Block gets at least the Target Application Depth. It accounts for variations in outlet spacing, flow rate and uniformity.

What needs to be done?

- Gather information about the system
- Record the data on the worksheet
- Work out the answers using the worksheet calculations

When should calibration be done?

Complete the calibration test if commissioning any new block and after any major changes.

Calibration should be repeated as part of system checks at the start of every season.

Micro irrigation system performance is largely unaffected by weather conditions. But performance can be influenced if alternative water takes significantly alter system pressure.

What are the Quick Test's limitations?

The Quick Irrigation Calibration Test will only provide information for the blocks measured, running at a given pressure on a given day. The depth of water applied will change if system pressure changes (with possible exception of fully pressure compensated systems).

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What is acceptable?

Applied Depth

You should expect your measured Applied Depth to be within 10% of your target depth. A result within 5% is better. Depth will change with flow rates, spacings and run time. Calibration determines correct run times for each block.

Emission Uniformity within Blocks

EU > 0.9 Uniformity is very good - the system is performing very well. You can be confident of this result.

0.9 – 0.8 Uniformity is good - performance better than average. You can be confident of this result.

0.8 – 0.7 Uniformity is fair - performance could still be improved. The result is likely to be a good indication of system performance.

0.7 – 0.6 Uniformity is poor - system should be investigated. Results may be less reliable – redo the testing to check.

EU < 0.6 Uniformity is unacceptable - system must be investigated. Results are less reliable – redo the testing to check.

Why does performance change?

The applied depth is determined by *application rate* and irrigation *run-time*.

The applied rate is determined by emitter or sprinkler output and spacing.

The *output* from most emitters or sprinklers varies as pressure changes. Flow from fully pressure compensating emitters will change very little, if sufficient pressure is available.

Output will change as outlets wear, or become blocked with debris, sediments or algae etc.

The *emitter spacing* varies if the distance between emitters along laterals, or between laterals, changes. Spacing is usually constant in any block, but may vary between blocks. Changing spacing has very significant effects on average applied depths.

Blocks with different application rates will apply the target depth if *run times* are adjusted accordingly.

Micro irrigation systems usually wet only a strip along plant lines, with inter-row areas left dry. *Wetted strip width* is the average spread of water both sides away from the lateral. Because irrigation is concentrated into this strip, excessive depths can be applied and water and nutrients wasted.

Measurement Procedure

What equipment will you need?

- This guide and the worksheet
- Containers to collect water from outlets
  - 9 Litre buckets are good for sprinklers
  - Ice cream containers are good for drippers

1 Measuring cylinder
- 1 or 2 Litre for high flows (sprinklers)
- 100 mL or 200mL for lower flows (drippers)

1 50 m tape measure

1 Stop watch

1 Pen or pencil

Field measurements

Repeat the following field measurements and calculations in each block [e.g**. B1 – B5** in Diagram 1].

If necessary, use multiple copies of the worksheet to record more Blocks.

Emitter/sprinkler measurements

1 Measure the distance between outlets along a lateral. It is often best to use an average distance between a number of outlets

2 Measure the distance between adjacent laterals, usually adjacent rows. Take an average spacing between several laterals

3 Estimate the average width (below ground) of the wetted strip along each row

4 Determine the area of each Block

Application test

1 Collect the output from one emitter at the beginning, middle and end of the lateral *nearest* to the block inlet. [**L1** in Diagram 1]

2 Measure the volume of water caught in each container and record on the Record Sheet

3 Repeat along two *middle* laterals [**L2** and **L3** in Diagram 1] and the lateral *furthest* from the block inlet. [**L4** in Diagram 1]

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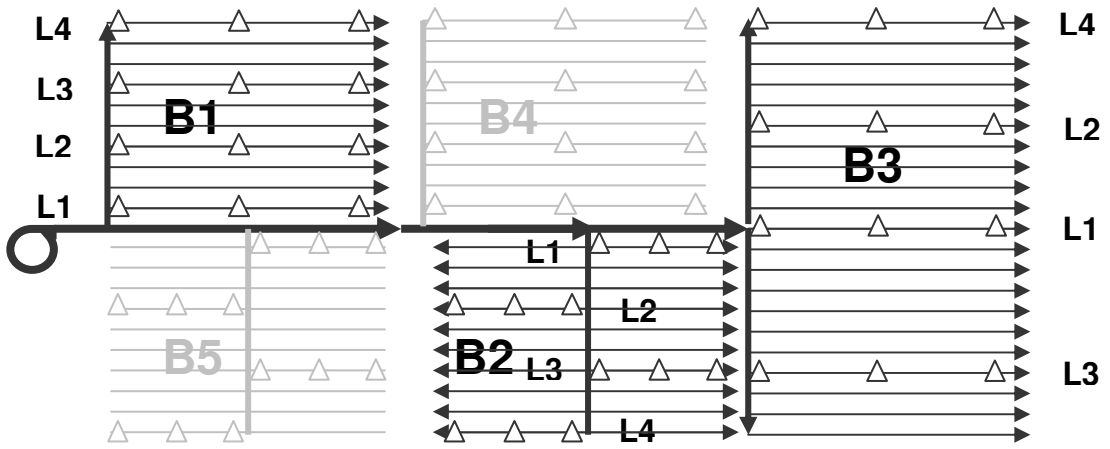

Diagram 1. Recommended locations for emitter or sprinkler flow measurements

Example Worksheet for IRRIG8Quick Drip Micro Irrigation Calibration Test

Enter outlet spacings, run times and block areas in Box A
Enter collection times and volume measurements in Box B overleaf
Complete the Calculations as directed
Enter information using the measurement units (e.g. millimetres or metres) specified to ensure calculated answers have the correct units.

BOX A: BLOCK DETAILS **Date:** *12 September 09* **Tester Name:** *Chris*

	Block Name	R1-37	R38-72	G1-37	B2-97	Y33-68			
a	Outlet Spacing: m	0.3	0.3	0.3	0.3	0.4			
b	Lateral Spacing: m	2.5	2.5	2.5	2.1	2.1			
c	**Area/outlet: m2** [*a x b*]	0.75	0.75	0.75	0.63	0.84			
d	**Outlet Density: #/ha** [*10,000 ÷ c*]	13333	13333	13333	15873	11905			
e	Run Time: hr	2	2	2	2	2			
f	Target Depth: mm	3.5	3.5	3.5	3.5	3.5			
g	**Actual Applied: mm** [*u x d x e ÷ 10,000*]	4.0	4.0	4.0	5.2	3.8			
h	**Target/ Actual** [*f ÷ g*]	0.88	0.88	0.88	0.67	0.92			
i	**Adjusted Runtime: hr** [*e x h ÷ t*]	1.88	1.94	1.88	1.70	2.67			
j	Wetted strip width: m	0.4	0.4	0.4	0.4	0.4			
k	**Soil App'd Depth: mm** [g ÷ *(j ÷ b)*]	25.0	25.0	25.0	27.5	20.0			
l	Block Area: ha	2	1.75	2	1.82	2			
m	**Meter Flow: m3/hr** [*u x d x j ÷ 10,000*]	0.80	0.80	0.80	1.05	0.76			

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Worksheet for IRRIG8Quick Drip Micro Irrigation Calibration Test

Enter outlet spacings, run times and block areas in Box A overleaf
Enter your collection times and volume measurements in Box B
Complete the Calculations as directed

BOX B: Emitter or Sprinkler (Outlet) Flow Rates

	Block Name	R1-37	R38-72	G1-37	B2-97	Y33-68			
n	Collection Time (min)	12	12	6	6	3			
	Lat 1 Outlet 1: mL	330	360	165	210	105			
	Lat 1 Outlet 2: mL	310	310	155	160	95			
	Lat 1 Outlet 3: mL	300	280	150	165	85			
	Lat 2 Outlet 1: mL	290	305	145	155	80			
	Lat 2 Outlet 2: mL	315	315	165	170	90			
	Lat 2 Outlet 3: mL	305	285	150	115	75			
	Lat 3 Outlet 1: mL	315	330	155	190	100			
	Lat 3 Outlet 2: mL	270	270	135	135	80			
	Lat 3 Outlet 3: mL	295	295	145	165	75			
	Lat 4 Outlet 1: mL	280	260	140	205	60			
	Lat 4 Outlet 2: mL	300	300	150	170	55			
	Lat 4 Outlet 3: mL	290	290	145	140	60			
p	**Sum All 12: mL** [*Add 12 values above*]	**3600**	**3600**	**1800**	**1980**	**960**			
q	**Avg All 12: mL** [*p ÷ 12*]	**300**	**300**	**150**	**165**	**80**			
	Low Catch 1: mL	270	260	135	115	50			
	Low Catch 2: mL	280	270	140	135	55			
	Low Catch 3: mL	290	280	145	140	60			
r	**Sum Low 3: mL** [*Add 3 values above*]	**840**	**810**	**420**	**390**	**165**			
s	**Avg Low 3: mL** [*r ÷ 3*]	**280**	**270**	**140**	**130**	**55**			
t	**EU Block** [*s ÷ q*]	**0.93**	**0.90**	**0.93**	**0.79**	**0.69**			
u	**Avg Flow: L/hr** [*q / n x 0.06*]	**1.50**	**1.50**	**1.50**	**1.65**	**1.60**			

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