DIY Irrigation Evaluation
Measure application depth and distribution uniformity (DU)

The 'Bucket Test'

Use a set of buckets to measure how much water is being applied by the irrigator and how uniformly. Carry out these measurements at least once, even if there is a digital readout on the machine, as sometimes they can be wrong.

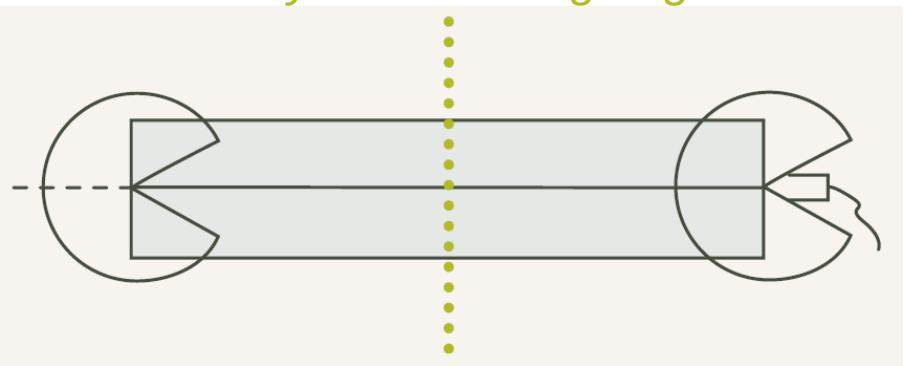
1. Spread 10 to 50 buckets evenly across the irrigated area putting a stone or weight in each bucket for stability. See the bucket layout suggestions
2. Operate the irrigation on that area as per normal procedure
3. Measure and record how much water is in each bucket using the tables below
4. Calculate the application depth and application uniformity using the steps on the following pages.

Bucket number	Irrigator 1	Irrigator 2	Irrigator 3
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
Total volume	ml	ml	ml

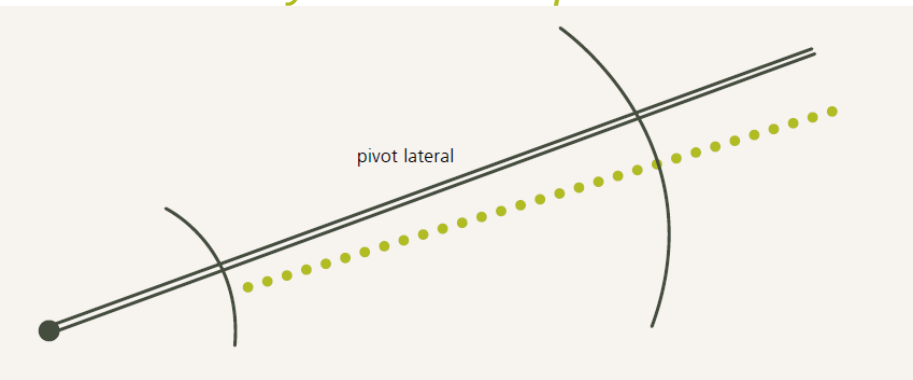
Bucket number	Irrigator 1	Irrigator 2	Irrigator 3
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			
Total volume	ml	ml	ml

This 'bucket test' guide has been adapted from the 'DIY Irrigation Evaluation' publication Version 1 (2012). Get the full DIY at http://www.dairynz.co.nz/publications/environment/diy-irrigation-evaluation-guide/ or phone 0800 4 DairyNZ (0800 4 324 7969)

Bucket test layout: travelling irrigator



Bucket test layout: centre-pivot



Centre pivot and travelling irrigators

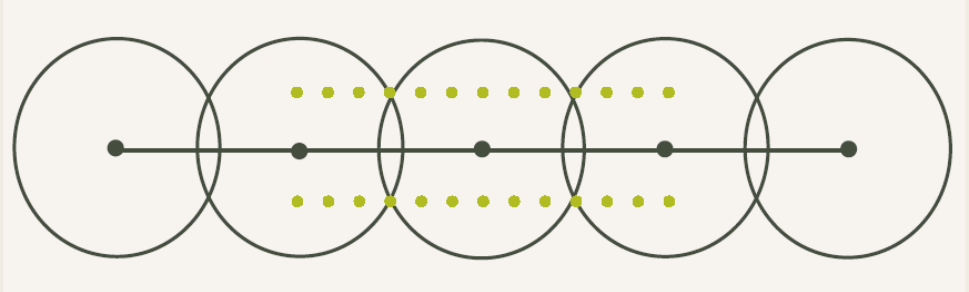
	Value	Irrigator 1	Irrigator 2	Irrigator 3	Units
Number of buckets	**A**				
Total volume of buckets	**B**				**ml**
Average volume C = B ÷ A	**C**				**ml**
Total number of buckets ÷ 4 D = A ÷ 4	**D**				
Total volume of water from the lowest 25% of buckets (refer to previous page)	**E**				**ml**
Average volume of water from lowest 25% of buckets (refer to previous page) F = E ÷ D	**F**				**ml**
Width across the bucket (inside top diameter)	**G**	**Warehouse bucket = 255mm**			**mm**
Bucket radius H = G ÷ 2	**H**	**255** ÷ 2 =127.5mm			**mm**
Bucket area (πr^2): I = 3.14 x H x H	**I**	**51044mm²**			**mm²**
Average application depth J = 1000 x C ÷ I Or for 255mm bucket J = C x 0.02	**J**	**Warehouse bucket** J = C x 0.02			**mm**
Average distribution uniformity (DU) K = F ÷ C	**K**				**%**

K-line irrigator

1. Spread 12 to 20 (a multiple of 4) buckets evenly, every 2-3 metres under the K-line, as shown in the diagram, putting a stone or weight in each bucket for stability
2. Operate the irrigation on that area as per normal procedure (allow at least 6 hours to collect enough water to measure)
3. Measure how much water is in the buckets after a known amount of time, and calculate the average application depth and distribution uniformity.

Bucket layout: k-line

The unique watering pattern and low application rate of k-line irrigators require a different bucket test design and slightly different calculations to determine application depth.



To do this:

	Value	Irrigator 1	Irrigator 2	Irrigator 3	Units
Number of buckets	**A**				
Total volume of buckets	**B**				**ml**
Average volume C = B ÷ A	**C**				**ml**
Total number of buckets ÷ 4 D = A ÷ 4	**D**				
Total volume of water from the lowest 25% of buckets (refer to front page)	**E**				**ml**
Average volume of water from lowest 25% of buckets (refer to front page) F = E ÷ D	**F**				**ml**
Width across the bucket (inside top diameter)	**G**	**Warehouse bucket = 255mm**			**mm**
Bucket radius H = G ÷ 2	**H**	**255**÷2=127.5mm			**mm**
Bucket area (πr2): I = 3.14 x H x H	**I**	**51044mm^2**			**mm^2**
Time that buckets were under k-lines	**J**				**hours**
Average application depth (1 hr) K = 1000 x C ÷ I ÷ J Or for 255mm bucket K = C x 0.02 ÷ J	**K**	**Warehouse bucket** K = C x 0.02 ÷ J			**mm**
Or					
Average application depth (12 hr) L = K x 12	**L**				**mm**
Or					
Average application depth (24 hr) M = K x 24	**M**				**mm**
Average distribution uniformity (DU) N = F ÷ C	**N**				**%**

Common unit conversions

Flow rate

	m^3/hr	m^3/min	gpm	l/s
m^3/hr	1	0.017	3.7	0.28
m^3/min	60	1	220	17
gpm	0.27	0.0045	1	0.076
l/s	3.6	0.060	13.2	1

Pressure

	psi	kPa	bar	m
psi	1	6.9	0.069	0.70
kPa	0.145	1	0.01	0.10
bar	14.5	100	1	10
m	1.4	9.8	0.098	1

System capacity

l/s/ha x 8.64 = mm/day

mm/day x 0.116 = l/s/ha

Water depths and volumes

1 mm applied to 1 m^2 = 1 litre

1 mm applied to 1 ha = 10 m^3

Seasonal volume (m^3) → mm applied

m^3 ÷ ha ÷ 10 = mm

mm applied (irrigation or rainfall) → m^3

mm x 10 x ha = m^3

Other tools

Soil moisture monitoring - There are many methods available to show how irrigation is affecting the plant root zone. **myirrigation.co.nz** > Click on 'free guides'

Irrig8Quick - For measuring performance parameters in more detail, including application uniformity (DU). **pagebloomer.co.nz** > Click on 'resources'

DairyNZ Guide to Good Irrigation – Parts one and two

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