



Farm Dairy Effluent Irrigation Evaluations

Traveller 4

System details

- Medium traveller with rubber orifices on rotating boom
 - Used to apply all effluent generated from the shed
 - Large storage pond on site
 - Irrigator run at 'full' speed
 - Wetting width approx
 - Overlap varies between runs with average 38m
- Soils are variable;
 - ponding and runoff on upper terrace but not lower down on day of visit
- Irrigation
 - Farm is not irrigated
- Effluent consents held
 - Permitted Activity
 - Maximum Nitrogen application 150kg/ha per annum



Figure 1. Effluent irrigator crossing catch can transect

In general, this system was working well for a travelling irrigator. The depth applied is less than 20mm which seems appropriate for the soil type and depth. The uniformity of application, after accounting for overlap effects and ignoring the effects of the leaking seal, is reasonable (0.75). This will vary with wind conditions, and also between runs with different lane spacings.

Effluent irrigation evaluation

Medium Traveller

This irrigator was applying effluent at rates in excess of the soil's infiltration capacity at the start on the run. This was easily identified with ponding covering much of the wetting area and effluent running up to 3m to the side on relatively flat ground. At the time of testing the machine had a damaged seal which was allowing significant leakage. This is seen in the graph as a very high peak in the centre.

A second transect on the terrace slope appeared to have significantly less ponding with little evident run-off. A summary of system performance is given in Table 1.

The maximum application rate is calculated from the area of the ring wetted by the irrigator boom as it rotates. Most of the effluent is applied in a ring between about 5m and 11.5m out from the centre of the irrigator. In this smaller area, the effective instantaneous application rate is higher, causing noticeable ponding on the higher terrace and potential run off. However, NO run off was observed during testing.

Table 1: Summary of Effluent Irrigation Performance

Small Traveller	Include Deep Centre		Exclude Deep Centre		Units
	No Overlap	Overlap	No Overlap	Overlap	
Wetting Diameter	24	24	24	24	m
Instant Application Area	452	452	452	452	m ²
Machine speed	1.33	1.33	1.33	1.33	m/min
Effluent Mean Depth	12.6	14.7	10.8	12.6	mm
Mean Application Rate	42.1	48.8	35.9	41.9	mm/h
Wetting Ring Area	337	337	337	337	m ²
Max Application Rate	56.5	56.5	48.2	48.2	mm/h
Hi Quart Mean Depth	22.7	24.0	15.5	15.7	mm
Lo Quart Mean Depth	4.3	9.4	4.3	9.4	mm
DU high	1.79	1.64	1.44	1.25	
DU low	0.34	0.64	0.40	0.75	

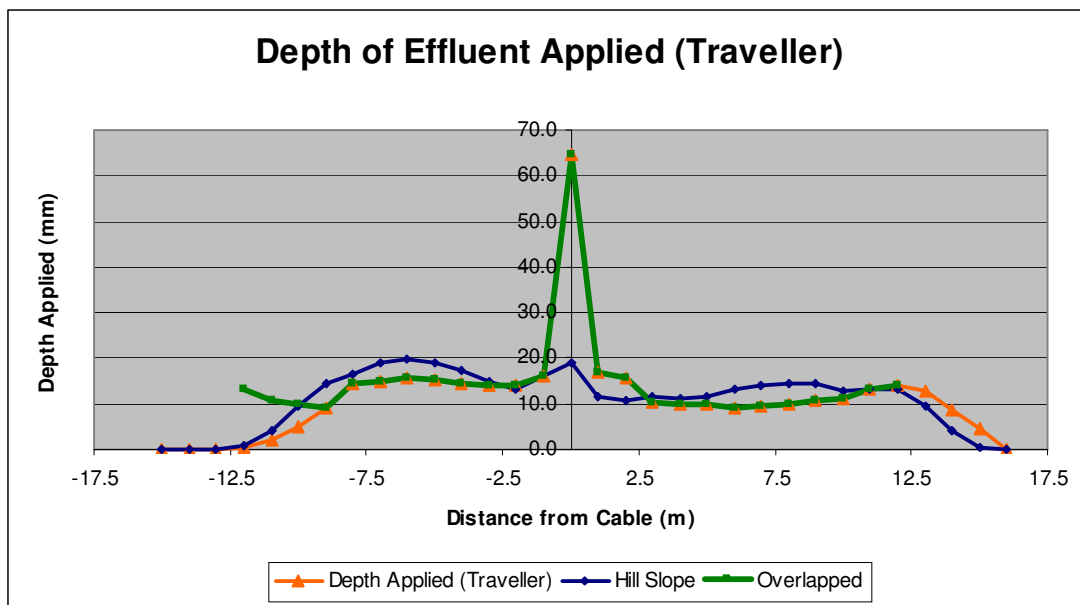


Figure 2. Effluent application pattern measured at normal pressure and full machine speed and calculated overlapped pattern based on 28m hydrant spacing

In the graph (Figure 2), the depths measured in the field are shown as the orange and black lines. The calculated overlapped pattern is shown as the green line.

The peaks at the sides of the application pattern typically occur with travelling irrigators. Because of the ring application pattern and the forward movement, the sides receive effluent for a longer period than the centre of the travel path. The effect is much less apparent on this machine, presumably because the rubber nozzles fitted (see Fig.4) direct more effluent to the middle of the travel path.

Recommended improvements

Machinery maintenance

- The damaged seal requires replacement. While it does not constitute a large affected area, there will be increased loss of effluent through the soil profile where this depth is applied.

There is surface ponding

- The high application rate on small areas is causing surface ponding. This is causing redistribution through overland flow, though not to sensitive areas in the field where testing took place.



Figure 3. Splash plate fitted to end nozzle to widen spread Figure 4. Rubber nozzle crimped & cut to increase footprint

A policy of alternating machine paths would help improve the overall uniformity over successive applications. This will not help on a single event basis, but will over the course of a season.