Farm Dairy Effluent Irrigation Evaluations

Pivot 2

System details

- Pivot fitted with under-hung effluent irrigation splash plates ('pots')
  - used to apply all effluent generated from the shed
  - any one of three sets of pots can be operated at a time
  - signs of heavy sludge dumps where effluent application starts? Stripes in pasture

- Soils are variable, with Wakanui clay loam being heaviest and Templeton silt loam lightest.

- Effluent consents held
  - pond system and
  - Application to land (no 'contaminants to water')
  - Conditions
    - discharge area defined by survey block IDs
    - 200 kgN/ha
    - Depth not exceed half capillary storage capacity
    - No ponding for longer than 12 hours
    - Daily volume spread recorded

Figure 1. Effluent outlet nozzle and splash plate

Figure 2. Effluent patches and pasture variability

Effluent irrigation evaluation

Pivot with splash plates in three sets of seven outlets, approximately one span each set. The seventh outlet on set one is effectively treating part of the area served by set two. Similarly, the seventh outlet on set two is effectively serving area three.

Visual field observations noted definite areas where heavy effluent application had been made (Figure 2). This is most probably the more fibrous component of the effluent stream which appears to be applied first.

Two evaluation tests noted visually quite different material being applied at the beginning of the day's application compared to some twenty minutes later. Pasture growth and utilisation appear very different in these areas.

Table 1: Summary of Effluent Irrigation Performance

Pivot Pots	**Section 3**	**Whole Field**	
Application Area	10.36	26.34	ha
Effluent Mean Depth	7.9	7.6	mm
Hi Quartile Mean Depth	13.2	13.8	mm
Low Quartile Mean	2.6	3.1	mm
DU high	1.66	1.81	
DU low	0.32	0.41	
Mean Application Rate	110	106	mm/h
Max Application Rate	183	192	mm/h

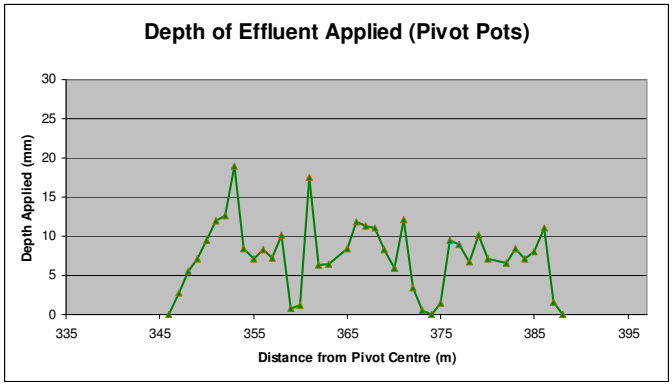

Figure 3. Effluent application pattern measured under span 7

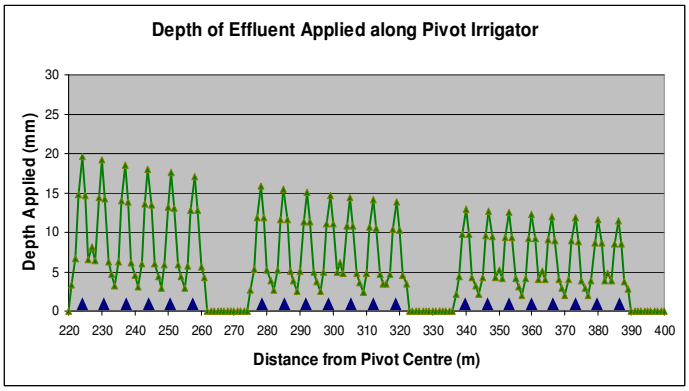

Figure 4. Derived application all sections included.

The graph (Figure 4) is as the machine operates over the field as a whole. The graph assumes each section will be operated at the same pivot speed and for the same number of passes. The application pattern shown is an overlapping of the apparent nozzle performance based on measurements made in the field.

Effluent Application Area

The effective area over which effluent is applied is a calculated value. It is determined from areas calculated by subtracting inner from outer extents of rings of application as determined from derived application patterns (shown in Figure 4).

Table 2: Area of Effective Effluent Coverage

Section		Inner 1	Outer 1	Inner 2	Outer 2	Total (ha)
1	Radii	221	261	275	281	
1	Areas	15	21	24	25	7.11
2	Radii	282	322	337	343	
2	Areas	25	33	36	37	8.87
3	Radii	344	389			
3	Areas	37	48	0	0	10.36
				TOTAL		26.34

Recommended improvements

The effluent irrigation is adversely affecting the performance of the pivot as a water irrigation system. Severe blockages and stoppages of the rotators are clearly evident and is measurably reducing the performance of the machine.

- If possible, the effluent outlets should be lowered sufficiently to avoid splash reaching the irrigator rotator nozzles.

The effluent is applied in bands so not all the area is actually used.
Note that there are varying depths applied as the machine travel speed is higher further from the pivot centre. This effectively compromises efficiency, reducing uniformity across the field as a whole.

- Management can address this by operating the end effluent nozzles more frequently than those closer in to the centre.

- Better management and mixing of effluent from the sump may reduce problems of dumped fibre.