Farm Dairy Effluent Irrigation Evaluations

Pivot 1

System details

- Main Pivot fitted with rubber nozzle splash plates
  - Pivot wipes, 270 deg rotation
  - Used to apply all effluent generated from the shed
  - Nozzles hung under pivot, seven sets of 2 or three, one set run at a time
  - Irrigator always runs at 50% speed so applied effluent depth varies on each tower
  - Nozzles spread no overlap between sets, reduced effective area for discharge (40ha reported at Compliance visit)

- Soils are variable; silt loam Stony, very shallow in places
  - Significant ponding and mud on day of visit.

- Effluent consents held
  - pond system and
  - Application to land where contaminants may enter water
  - Conditions
    - 6,480 L/d averaged over 7 days (1000 cows)
    - discharge area defined on map
    - 200 kgN/ha
    - Depth not exceed half capillary storage capacity
    - No ponding

Figure 1. Effluent outlet nozzle and splash plate

Figure 2. Effluent coated irrigation sprinkler

Initial effluent irrigation evaluation

Pivot with Rubber nozzle Splash Plates:
This irrigator was fitted with guns mounted on towers but, due to constant blocking and related problems, has been converted to suspended splash plates. Rubber nozzles are used to assist automatic clearing of blockages, but are reported to have problems.

A summary of system performance is given in Table 1.

Table 1: Summary of Effluent Irrigation Performance

Pivot with Rubber Nozzle Splash Plates	Span 12 3 Pots	Whole Field	
Application Area	12.2	30.5*	ha
Effluent Mean Depth	5.57	6.68	mm
Hi Quartile Mean Depth	9.21	13.07	mm
Low Quartile Mean	1.79	1.41	mm
DU high	1.65	1.96	
DU low	0.32	0.21	
Mean Application Rate	54.8	65.8	mm/h
Max Application Rate	90.6	128.6	mm/h

* Existing system covers 30.5 ha, new additions fitted add further 12.4 ha.

Effluent Applied Depth

The mean depth applied was about 6mm per application. The depth applied is very variable, both within effluent application sets and along the length of the pivot.

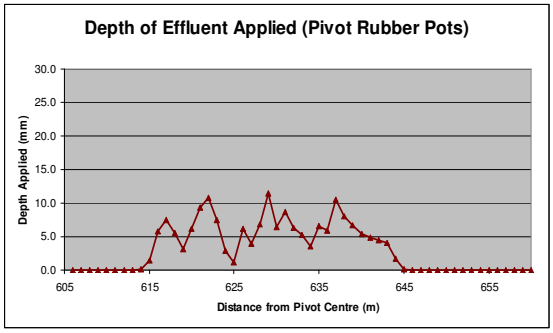

Figure 3. Effluent application pattern measured under span 12

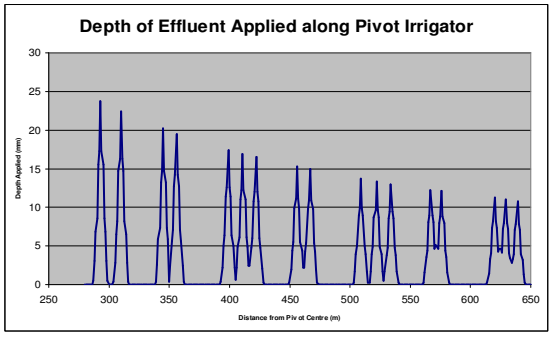

Figure 4. Derived application pattern once newly installed sections are operative.

The graph (Figure 4) is as the machine will operate once all existing and newly fitted nozzles are operating. 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 individual 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

	Radius (m)		3/4 Ring Area (ha)	
Set#	Inner	Outer	New	Existing
1	287	299		1.66
2	304	316	1.75	
3	339	362		3.80
4	393	428		6.77
5	450	473	5.00	
6	503	540		9.09
7	561	582	5.66	
8	614	645		9.20
TOTAL			12.41	30.52

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 are 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 if actually used.

- New outlets are being installed at present that will increase the area over which effluent is applied.

Note however 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.