

Making the most of effluent

Profitable, sustainable use of a 'waste' product

Warren and Asher Jacobs and Perrin Hicks milk 400 cows at their Whispering Pines dairy farm at Mt Compass.

Their dairy shed waste system involves a 3-pond system, with treated liquids stored in the lined 3rd pond before being irrigated out over a 5.5 ha dryland pasture area. However in 2012 they upgraded both the effluent spreading system and also the forage crops grown on the 5½ ha spreading area.

Old system

Until 2012, effluent was spread with a Vaughan traveller, out onto dryland oat or annual ryegrass crops.

With this system and annual forage crops, utilised forage yields averaged 6.2 t DM/ha/year in the five years leading up to 2012. This was reasonably good level of growth however:

- › the pattern of forage production was highly seasonal, with most growth in late-winter and spring
- › summer weeds like melons, fathen and couch required chemical control each summer
- › barley grass was a serious weed in the winter forage crops leading up to 2012.

Upgraded system

The 5.5 ha spreading area was sprayed out and resown to phalaris + lucerne pasture in August 2012. The phalaris and lucerne direct-drilled in alternate rows, without irrigation until the following April.

Over that summer, the Vaughan traveler was discarded and a new "Quickshift sprinkler system" (involving movable sprinklers connected via flexible poly pipe laterals) was installed to spread the effluent.



The old travelling irrigator (now discarded)



Perrin and Warren in the lucerne and phalaris pasture (3-year-old)

Table 1 Forage production (t DM/ha/year)

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015
Forage type	Annual forage crops					Resowing year	Phalaris + lucerne		
Effluent spreading system	Old travelling irrigator						Quickshift sprinklers		
Utilised forage production	7.2	5.3	6.2	7.0	5.3	4.0	7.9	11.6	9.6

The new combination of **perennial pasture** and **Quickshift sprinklers** has delivered several benefits:

- › utilised forage yields have increased, averaging 9.7 t DM/ha/year in the three years (2013–15)
- › The pattern of forage growth is much more even, with cows getting significant grazings every five weeks throughout the year
- › no summer weed problems in the last three years (ie. no summer spraying required)
- › barley grass is only slowly starting to ingress into the perennial pasture after three years.

The new perennial pasture

The pre-existing (barley grass-infested) cereal crop was sprayed out in mid-August 2012 and direct drilled fourteen days later to Holdfast GT phalaris (4 kg/ha) + SARDI-7 lucerne (5 kg/ha coated seed). Seed was drilled in alternate rows (phalaris – lucerne – phalaris) with 15 cm row spacings.

This spring-sown pasture established well in spite of failed spring rains in 2012 and without any effluent irrigations until the new spreading system was installed in March 2013. For forage production information, refer to Table 1.

Virtually no fertiliser has been applied since the new perennial pasture was sown.

The sown lucerne has tended to dominate in the sandier sections of the paddock, but with phalaris more prominent in patches of heavier soil. The lucerne seems to grow reasonably well throughout the year, but with the phalaris being more vigorous between May and August each year.

Once established, the pasture has been block-grazed with dairy cattle every five weeks.

To date, the farm team has not encountered any cattle health problems whilst grazing this pasture.

The effluent spreading infrastructure

From the 3rd storage pond, a 4-inch mainline runs out 500 m to the 5½ ha effluent spreading paddock.

From there, a 2-inch mainline runs a further 250 m into the paddock, with eight risers and Quickshift hydrants installed across the mid slop of the paddock.

Flexible 1-inch lateral poly pipes (60 m long) “tee off” from each hydrant to run two sprinklers/hydrant. Each Quickshift sprinkler has a 6.5 mm (green) spray nozzle and is mounted on a lightweight sled.

- › When pumping, effluent is pumped out to four out of eight hydrants at any one time, so eight sprinklers are running at any one time.
- › The hydrant-to-hose fittings are detachable, so as necessary, the eight sprinklers are moved onto the 2nds grid of four hydrants to complete effluent spreading over the entire paddock.

To spread effluent over the entire 5½ ha paddock involves (six sprinkler shifts) x (eight sprinklers) x (six hours running/shift) x (two irrigation grids). Total pumping time is (6 shifts/grid x 6 hr x 2 grids) = 72 hr.

The 3rd storage pond is equipped with an electric pump delivering 31.5KL/hour.

A complete round of spreading delivers (31.5 x 72) = 2.27 ML at an average irrigation depth of 40 mm

Warren runs four complete rounds of effluent spreading per year, with timings dependent on when the pond needs emptying, but timed after grazing cycles and avoiding effluent spreading in winter months.

So the annual amount of effluent applied here is **1.6 ML/ha/year** or **160mm irrigation depth/year**.

Infrastructure costings?

With the ponds, pump and 4-inch mainline already in place, the switch from a travelling sprinkler to Quickshift irrigation was relatively cheap:

Eight Quickshift sprinklers and stands	\$1000
Risers, hydrants, hoses and fittings	\$1500
250 m of 2-inch mainline (ripped in)	\$800
Total	\$ 3300 (or an average \$600/ha)

Effluent pumping costs

We estimated effluent pumping costs at Whispering Pines to be \$140/ML in 2015.

On a per hectare basis, effluent pumping costs averaged (1.6 ML/ha x \$140/ML) = \$225/ha/year.

Perennial pasture establishment costs

The phalaris + lucerne pasture was established in spring 2012 and involved the direct costs shown in Table 2.

Assuming the perennial pasture persists for six years, these establishment average around \$60/ha/year.

Table 2 Perennial pasture renovation program in 2012

Timing	Item	Cost/ha
Aug '12	Contractor to spray out existing forage crop (glyphosate + dicamba + omethoate 3.0 + 0.2 + 0.1 L/ha)	\$60
“	Contractor to direct drill in new perennial pasture	\$80
“	Perennial pasture seed: (Holdfast GT phalaris 4 kg/ha + SARDI-7 lucerne 5 kg/ha coated seed)	\$114
“	Contractor to spray precautionary bare earth insecticide (bifenthrin + chlorpyrifos 0.2 + 0.8 L/ha)	\$25
Sept '12	Contractor to spray selective post-emergent herbicide (Broadstrike® + 2,4-DB 25 g + 2.0 L/ha)	\$65
Total		\$344



Alternate rows of phalaris & lucerne establishing well in spring 2012



'Quickshift' sprinklers fitted with green 6.5 mm nozzles

Costs of forage production from effluent spreading area

From 2013 onwards, the combination of Quickshift irrigation + perennial pasture has provided an average 9.7 t DM/ha utilised forage yields. We estimate the direct costs of this forage production in Table 3.

With annual forage yields of 9.7 t DM/ha/year, these direct costs average out at only \$80 per t DM.

This is very low cost feed considering:

- > the perennial pasture is providing green feed over the whole year
- > the entire forage yield is consumed by grazing (**no** harvesting or feed-out costs, **no** wastage losses)
- > the new system has eliminated a lot of pesticide and manufactured fertiliser use
- > virtually no summer weed problems
- > the treated dairy effluent had to be pumped somewhere regardless.

Table 3 Direct costs of forage production

Item	Cost/ha/year
Extra infrastructure to switch to Quickshift sprinkler irrigation (\$600/ha amortised over six years)	\$60
Pasture establishment costs (assumed \$360/ha amortised over six years)	\$80
Effluent pumping	\$225
Labour for moving sprinklers (1 hr/shift x 6 shifts/grid x 2 grids/round x 4 rounds/yr x \$40/hr ÷ 5.5 ha)	\$350
One selective broadleaf herbicide spray (p.a.) (Broadstrike® + 2,4-DB 25 g + 2.0 L/ha) – incl. contractor fee	\$65
Contractor to spray precautionary bare earth insecticide (bifenthrin + chlorpyrifos 0.2 + 0.8 L/ha)	\$25
Contractor to spray selective post-emergent herbicide (Broadstrike® + 2,4-DB 25 g + 2.0 L/ha)	\$65
Total	\$344

For more information, contact:

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This case study, written and prepared by Greg Mitchell with the support of Warren Jacobs and Perrin Hicks, contributes to the DairySA Hills & Fleurieu Forage Network project.

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