Dairy Shed Water Use in Victoria

Table of Contents

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Dairy shed water use - 2009 analysis

For the past nine years, DPI dairy extension officers have been assisting dairy farmers across Victoria to develop effluent management plans for dairy sheds.

This has involved comprehensive on farm data collection, which includes water use measurements and calculations to determine water use by each of the main processes in the dairy operation.

In 2005 DPI senior dairy extension officer Scott McDonald produced a report 'Water use in dairy sheds' from data collected to that point. The report highlighted the variation in the volumes of fresh and recycled water used in dairy shed processes and the total volumes for various dairy shed systems.

This information has been useful for DPI dairy extension staff and service providers assisting dairy farmers to assess and compare their water use requirements against similar dairy shed systems. In turn, this has enabled farmers to adopt water saving strategies and maintain dairy operations

Industry bodies, United Dairyfarmers of Victoria (UDV) and Victorian Farmers Federation (VFF), campaigned to ensure sufficient water allocation for existing dairy farmers and to allow new entrants into the dairy industry.

In line with current water policy, the Department of Sustainability and Environment (DSE) introduced a policy to allow this to happen, with water corporations responsible for the licensing process.

This report has been prepared for DPI by Biometrician Leigh Callinan, Bendigo Scientific Data Analysts, as an update of the 2005 report and to provide predictions of 'reasonable' daily water use.

The key aspects of this report have been reproduced in the Department of Primary Industries booklet 'Dairy shed water – How much do you use?' The booklet is a comprehensive guide to calculating water use in the dairy shed and is available on the DPI website or by contacting the Customer Service Centre on 1300 502 656.

This biometric report has been compiled to determine correlations between the volume of water used within the dairy shed per day and herd numbers or shed type.

The information used to prepare this report was sourced from the DPI Dairy Nutrients databases and collected from more than 1,500 farms across the dairying regions of Northern Victoria, South West Victoria and Gippsland. Data relating to water used in the dairy shed was collected during the development of effluent management plans for the individual farms.

This report has identified a relationship between herd numbers, dairy shed type (rotary, double up herringbone, swing over herringbone) and the volume of water used per day. This is shown in Table 6, 75th percentile for predicted individual Water Use per Day (l) by Herd Size and Dairy Type of this report, and as Table 1 on page four of the DEPI booklet 'Dairy shed water – How much do you use?' However, it should be noted that the dataset is limited in regard to:

- rotary dairies with more than 600 cows (only 27 dairies in the dataset);
- double up dairies with herds of more than 400 cows (only three dairies in the dataset); and
- swing over herringbone dairies with herds of more than 400 cows (only four dairies in the dataset).

As such the percentiles for these categories may be unreliable.

The daily water usage has also been converted to an annual water use by using a multiplier of 365, and is shown in Table 2, Predicted 75th percentile for Dairy Water Use per Year (ML/yr) by Herd Size and Dairy Type of the DEPI booklet 'Dairy shed water – How much do you use?'. This gives an indication of 'reasonable' annual dairy shed water usage.

Even though the report showed a correlation between herd size and water use, it is worth noting even the smaller herd operators have been known to have water consumption equalling the larger herds.

When the data was collected, the daily water use was determined by either flow rate or storage volume measurements as well as detailed discussions with dairy owners and shed operators. Flow rate was measured by timing how long a known volume container took to fill then multiplying this by the time taken for each process and totalling to reach the daily water use. However, this method relied heavily on the accuracy with which the dairy shed operator could determine how long each task took with variables including daily, seasonal and operator differences. Alternatively, if all the water used in the dairy shed was sourced via a storage such as a tank, then a daily estimate could be made from the proportion of the storage volume used.

When calculating and comparing total dairy water use it is worth noting that within the dairy the tasks that generally require large amounts of water are the plate cooler, yard wash and continuous platform sprays used in some rotary dairies. Although the water from these tasks is often reused within the dairy, such as recycling the plate cooler water for yard wash, this is not always the case and can be the reason for high annual volumes of water used.

Also note that in this report the term effluent refers to the urine and solid components accumulated in the yard and dairy and the water used to clean the yard and inside the dairy (all material that would enter the effluent management system).

Water saving strategies in the dairy are important, but these should never compromise milk quality.

The biometrician report (4 August, 2009) - summary

The Department of Environment and Primary Industries surveyed water use volumes and practices on approximately 1,500 dairy farms in Victoria (Gippsland, North and South West), from January 2001 to February 2009. The means, medians and ranges for all the water use components within the dairy, as well as an overall comparison of regions and dairy types (double up herringbones, rotaries and swing over herringbones) are reported here.

South Western Victoria had proportionately more swing overs (61 per cent compared to 42 per cent in Gippsland and 51 per cent in the North) and less doubles.

Northern Victoria had proportionately more rotaries (26 per cent compared to 21 per cent in Gippsland and 23 per cent in the South West).

Water use per day was significantly greater in the North than in South West which in turn was significantly greater than in Gippsland.

Water use per day was significantly associated with both dairy type (rotary greater than swing over and in turn greater than double) and herd size. Water use per day increased with increasing herd size in swing overs to a significantly greater extent than in doubles or rotaries; and doubles to a greater extent than in rotaries. Rotaries have higher water use which is less sensitive to herd size.

Water use per day per cow, as well as being significantly associated with region (North greater than South West and Gippsland), was significantly associated with dairy type (rotary greater than swing over and in turn greater than double).

Rotaries had significantly:

- More effluent per cow produced than either herringbones
- Greater incidence of recycled water use than double
- Greater incidence of caught shed water than double
- More flood than hose yard wash than either double or swing over
- Greater incidence of plate cooler water diverted than swing over

Swing over had significantly:

- Greater incidence of caught shed water than did double
- Lower incidence of plate cooler water diverted than did swing over.

Gippsland had significantly more hose than flood yard wash than either the North or South West. Gippsland and Northern Victoria had significantly higher proportions of farms that used recycled water and caught shed water than the South West.

Gippsland and the South West had a significantly greater proportion of farms that had plate cooler water diverted than did the North.

Northern Victoria had significantly more plant rinse and pit/platform washing than the South West.

Methods

The distribution of continuous variables like water use per day was tabled with:

1. The number of farms with water use per day recorded
2. The mean of water use per day
3. Some percentiles of water use per day, viz: 0, 5, 25, 50, 75 and 100. The 0 percentile is the minimum water use per day recorded, the 100 percentile is the maximum and the 50 percentile is the median. When recorded water use per day are arranged from lowest to highest, the median is the value in the middle, or the mean of 2 values in the middle, the 5 percentile is the highest value of the lowest 5 per cent of values.

Significant differences between levels of factors such as region in variates such as water use per day were determined by analysis of variance, using Fisher's Unprotected Least Significant Difference with a type 1 error of 5%, ie. LSD5%. Residual Maximum Likelihood (REML) was used to determine the significance of differences between levels of multiple factors and variates. Contingency table analyses were done with X2 test, Fisher's Exact 2 * 2 test and multinomial analytical methods. In this report significant means $p < 0.05$, unless otherwise specified.

Statistical analyses were done with:

- GenStat for Windows. (2007). 10th Edn. VSN International Ltd., Hemel Hempstead, UK,
- R version 2.7.2 (2008). The R Foundation for Statistical Computing, and
- StatXact Version 8.0.0. Cytel Studio. MA, USA.

Results

Data was collected from 14 January 2001 to 9 February 2009.

Regions

The regional distribution of water use per day is shown in Table 1.

Table 1. Frequencies, means and percentiles for water use per day (l/day) by region

Region	No	Mean	0%	5%	25%	50%	75%	95%	100%
Gippsland	702	9780.69	100	1501.5	3500	6000	10400	30000	140000
North	337	14867.82	1010	3000	6045	9900	19700	45220	84000
SW	298	10568.97	1000	2113.5	4887.5	7000	12075	29150	97000
Overall	1337	11238.63	100	2000	4220	7200	13350	35000	140000

Water use per day was significantly greater in the North than in the South West which in turn was significantly greater than in Gippsland.

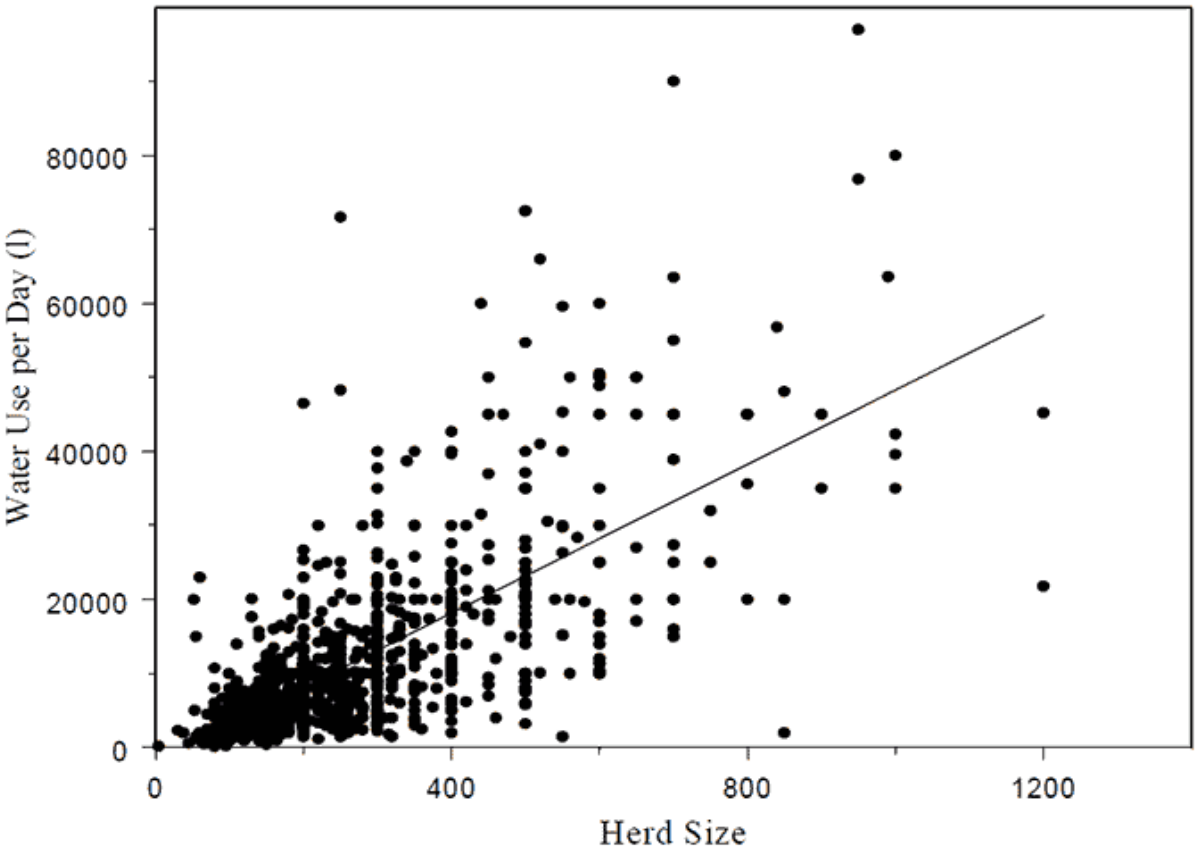
The data indicates that dairies in the northern area use more water per day than dairies in the South West or Gippsland for comparable herd size and shed type. This could be due to a number of reasons:

- Many of the effluent plans for the northern area were done in earlier years, prior to the current prolonged dry conditions and reduced access to water, when the farms had ready access to a plentiful supply of water via the channel system.
- Comparative higher rainfall in Gippsland and South West could also contribute additional water to the effluent system, to be stored in the ponds for reuse or recycling.
- Greater volumes of water used for cooling cows to reduce heat stress
- Higher evaporation, resulting in drying and caking of manure, requiring more water to washdown.
- Significantly more floodwash systems in larger dairy sheds in the North.
- A report by Dairy Australia on dairy farms and cow distribution in Catchment Management Authority (CMA) regions (2007) indicated the Goulburn Broken has more larger farms (more than 300 cows) compared to other catchments.

Herd size

Water use per day increased significantly ($p < 0.001$) with increasing Herd Size (Figure 1).

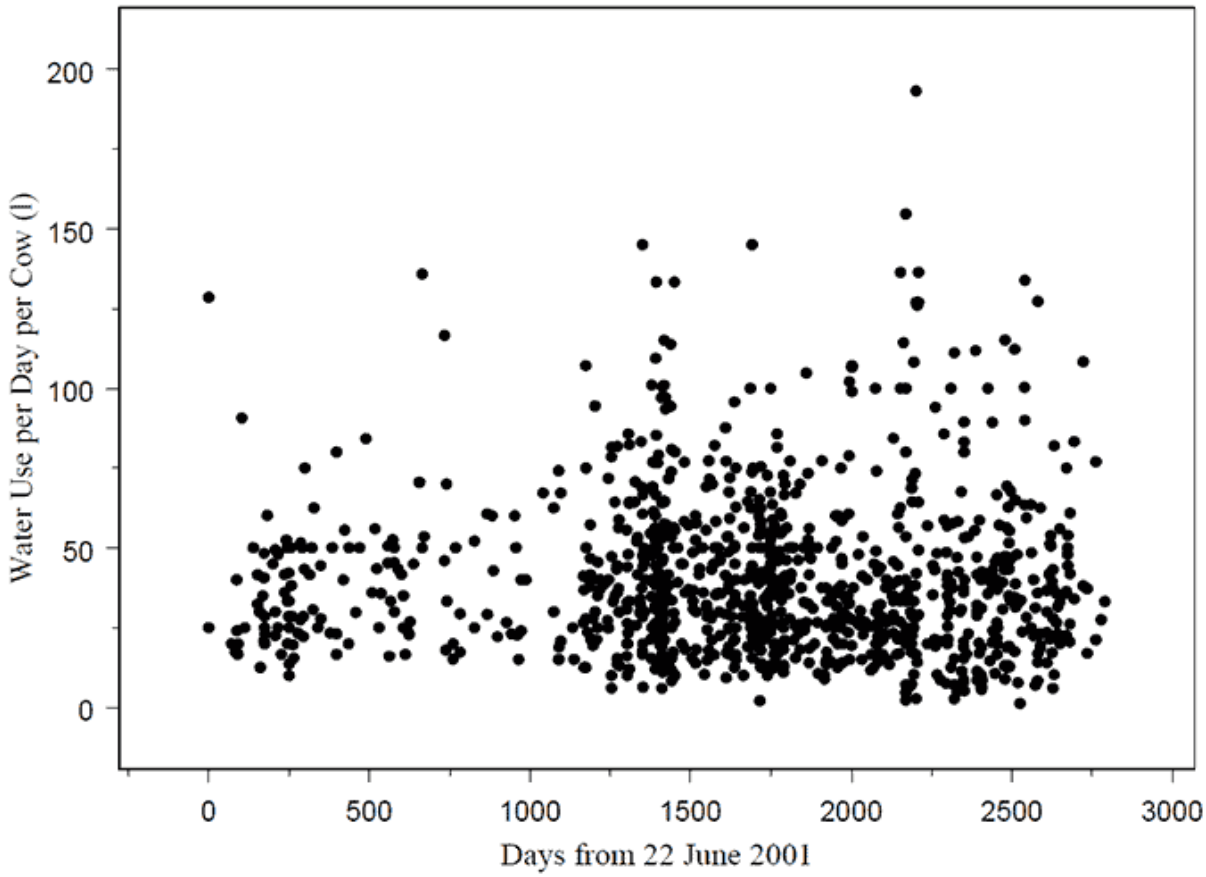
Figure 1. Water use per day by herd size with linear best fit (1 outlier removed)



Water use per day per cow

There was a near significant (p = 0.07) decline in water use per day per cow during June 2001 to February 2009 (Figure 2).

Figure 2. Water Use per Day per Cow vs Date



Statistical models of water use might need to include day number as an explanatory variable.

There was no significant association between water use and day number of year. This is not surprising, as water use per day is an estimate for the overall milking period, not the water use on the day the farm was visited.

Water use per day per cow was significantly higher in the North than in either Gippsland or the South West (Table 2).

Table 2. Frequencies, means and percentiles for Water Use per Day per Cow (l/day)

Region	No	Mean	0%	5%	25%	50%	75%	95%	100%
Gippsland	681	39.51	1.25	10.00	20.00	32.5	50.00	89.44	384.62
North	336	53.00	6.4	17.09	30.05	43.08	64.27	115.13	383.62
SW	270	36.24	3.94	12.50	22.93	31.33	45.81	71.14	155.00
Overall	1287	42.35	1.25	11.62	22.86	11.62	51.05	100.00	384.62

Dairy type

Herringbone dairies can be either double or swing over; the latter has one cluster shared between each pair of adjacent cows. Twenty-three dairies were not identified as either double or swing over. For the purposes of the analysis, this group was omitted (Table 3).

Table 3. Frequencies, means and percentiles for water use per day (l/day) by dairy type

Dairy type	No	Mean	0%	5%	25%	50%	75%	95%	100%
Double H/bone	221	7038.95	100	1570	3500	5025	9000	18930	30000
H/bone	23	6963.04	2400	2500	3875	6500	10000	13250	14000
Rotary	182	25102.16	1500	4929	12250	20000	30225	60361	140000
Swing over h/bone	389	8010.33	480	1922	3880	6200	10000	20552	48300
Walk-through	17	2909.41	150	190	1010	2000	3000	7800	15000
Overall	832	11357.97	100	2000	4000	7000	14450	35270	140000

There was a significant ($p < 0.01$) association between region and dairy type (Table 4).

Table 4. Frequency distributions for dairy type by region

Region	Double H/bone	Swingover h/bone	H/bone	Rotary	Walk-through	Total
Gippsland	141	199	23	93	16	472
North	69	150	0	77	1	297
SW	12	47	0	18	0	77
Total	222	396	23	188	17	846

South West Victoria had proportionately more swing overs (61 per cent compared to 42 per cent Gippsland and 51 per cent in the North) and less doubles. The North had a greater proportion of rotaries (26 per cent compared to 21 per cent in Gippsland and 23 per cent in the South West).

Water use per day, as well as being significantly ($p < 0.001$) associated with the region (North greater than Gippsland and in turn greater than South West), was significantly ($p < 0.01$) associated with dairy type (rotary greater than swing over and in turn greater than double) (Table 5).

There was no significant ($p = 0.13$) interaction between these two factors. The differences between dairy types did not differ significantly between regions (Table 5).

Table 5. Frequencies and means of water use per day for region by dairy type

Region	Double	Rotary	Swingover	All regions
Gippsland Mean	6574.82	21802.73	6449.22	9795.19
Gippsland No	140	93	199	432
North Mean	8489.87	30355.40	10338.28	14937.28
North No	69	73	148	290
SW Mean	4111.00	20312.19	7203.81	9669.81
SW No	12	16	42	70
Total	7038.95	25102.16	8010.332	11666.90
All dairies	221	182	389	792

Water use per day was significantly associated with both dairy type (rotary greater than swing over and in turn greater than double, $p < 0.001$) and herd size ($P < 0.001$), and there was a significant interaction between dairy type and herd size, viz: water use per day rose with increasing herd size in swing overs to a greater extent than in doubles or rotaries; and doubles to a greater extent than in rotaries ($p < 0.001$). Rotaries have higher water use and are less sensitive to herd size.

The statistical model predicts that 75 per cent of individual dairies would have water use per day below the thresholds shown in Table 6 below.

Table 6. 75th percentile for predicted individual water use per day (l) by herd size and dairy type.

Dairy type/Herd size	50	100	200	300	400	500	600	700	800	900
Double	5642	6456	8465	11131	14654	19348[1]				
Rotary		18358	21057	24142	27694	31790	36509[1]	41957[1]	84243[1]	55502[1]
Swing Over	4921	6113	9444	14618	22663	25195[1]				

[1] There were only three double and four swing over dairies with herd sizes of more than 400 and there were only 27 rotary dairies with herd size of more than 600; so percentiles for these categories may be unreliable.

Water use per day per cow, as well as being significantly ($p<0.001$) associated with the region (North greater than Gippsland and South West), was significantly ($p < 0.01$) associated with dairy type (rotary greater than swing over and in turn greater than double) (Table 7). There was no significant ($p = 0.18$) interaction between these two factors.

Table 7. Frequencies and means of water use per day per cow (l) for region by dairy type.

Region	Double	Rotary	Swingover	All regions
Gippsland Mean	32.75	50.05	33.73	35.63
Gippsland No.	135	91	196	422
North Mean	43.84	65.69	48.62	56.38
North No	69	72	148	289
SW Mean	19.55	50.11	36.02	39.72
SW No	11	15	39	65
All regions Mean	36.94	51.73	36.48	42.41
All regions No.	215	178	383	776

Dairy size

Dairy size was measured by total number of clusters in use at any one time.

Total cluster number was not significantly different between regions (Table 8).

Table 8. Frequencies and means for total cluster number by region.

Region	No.	Mean
Gippsland	441	25.73
North	281	27.91
SW	51	26.98
Overall	773	26.6

Water use per day was significantly and positively associated with total cluster number. Water use per day per cow was found to be significantly associated with dairy type ($p < 0.001$), but not with total cluster number ($p = 0.12$) and there was no significant interaction between dairy type and total cluster number ($p = 0.46$).

Vat washing

The distribution of vat washing overall and in the regions is shown in Table 9.

Table 9. Frequencies, means and percentiles for vat washing (l/day) by region

Region	No.	Mean	0%	5%	25%	50%	75%	95%	100%
Gippsland	12	378.75	35	49	100	325	525	890	1000
North	310	366.71	10	42	116	300	600	800	1600
SW	88	423.75	20	40	150	300	600	1000	2500
Overall	410	379.3	10	40	120	300	600	800	2500

There was no significant (p = 0.79) difference in vat washing between the North and South West. There were too few vat washing dairies in Gippsland to include in this analysis.

Vat washing was recorded for only two walk-through dairies. This category was not included in Table 10.

Table 10. Frequencies, means and percentiles for vat washing (l/day) by dairy type

Dairy Type	No.	Mean	0%	5%	25%	50%	75%	95%	100%
Double H/bone	79	275.57	20	34	34	200	400	800	800
Rotary	75	572.13	100	100	100	600	800	1060	1600
Swing Over H/bone	166	347.74	20	46	46	300	500	800	1400
Overall	322	383.28	10	40	40	350	600	800	1600

There was significantly more vat washing water used in rotaries than in swing overs and significantly more in swing overs than in doubles.

However, there were no significant differences between dairy types in vat washing per cow (Table 11).

Table 11. Frequencies and means for vat washing (l/day) per cow

Type of dairy	Count	Mean
Double Herringbone	78	1.396
Rotary	74	1.311
Swing over Herringbone	165	1.689
Overall	317	1.529

Plant rinse

The regional distributions of plant rinse are shown in Table 12 - see next column.

Table 12. Frequencies, means and percentiles for plant rinse (l/day) by region

Region	No.	Mean	0%	5%	25%	50%	75%	95%	100%
Gippsland	12	974.17	150	309.5	500	700	1075	2340	3000
North	315	1174.7	60	271	600	940	1200	2500	18000
SW	30	850.56	100	205	500	800	1000	1600	2750
Overall	417	1098.97	60	236	600	900	1200	2452	18000

The North had significantly (p = 0.005) more plant rinse than the South West. There were not enough dairies with plant rinse in Gippsland to include in this analysis.

Only one walk-through had a record for plant rinse. Significantly more plant rinse occurred in rotaries than in either herringbones (Table 13).

Table 13. Frequencies, means and percentiles for plant rinse (l/day) by dairy type

Dairy Type	No.	Mean	0%	5%	25%	50%	75%	95%	100%
Double H/bone	81	887.78	60	120	500	750	980	2000	9000
Rotary	75	1852.8	150	800	1200	1600	2400	3060	6470
Swing Over H/bone	170	874.58	140	240	600	800	1175	1473	5454
Overall	No.	Mean	0%	240	600	900	1200	2485	9000

There were no significant differences in plant rinse per cow per day between dairy types (Table 14).

Table 14. Frequencies and means for plant rinse per cow (l/day) by dairy type.

Type of Dairy	Count	Mean
Double Herringbone	80	4.673
Rotary	74	4.262
Type of Dairy	169	Mean
Double Herringbone	323	4.673

Pit and platform washing

The regional distributions of pit and platform washing are shown in Table 15.

Table 15. Frequencies means and percentiles for pit and platform washing (l/day) by region.

Region	No.	Mean	0%	5%	25%	50%	75%	95%	100%
Gippsland	6	2000.00	300	475	1050	1600	2375	4375	5000
North	301	5413.96	40	800	2000	3990	6000	13500	91000
SW	77	3256.1	100	380	1250	2400	4000	10328	15600
Overall	384	4927.92	40	500	2000	3500	6000	12426.5	91000

The North had significantly ($p < 0.001$) more pit and platform washing than the South West. There were not enough dairies with pit and platform washing in Gippsland to include in this analysis.

The distribution of pit and platform washing in the dairy types is shown in Table 16.

Table 16. Frequencies means and percentiles for pit and platform washing (l/day) by dairy type.

Dairy Type	No.	Mean	0%	5%	25%	50%	75%	95%	100%
Double H/bone	74	4684.27	100	323	1500	3000	4800	9210	91000
Rotary	73	8510.66	600	2240	4000	6800	10800	21780	43200
Swing over H/bone	157	4157.05	40	800	2000	3200	5625	9020	48000
Overall	325	5315.97	40	800	2000	3750	6000	13160	91000

There were no significant differences between dairy types in pit and platform washing per cow.

Flood wash

The regional distributions of flood wash are shown in Table 17.

Table 17. Frequencies, means and percentiles for flood wash (l/day) by region

Region	No.	Mean	0%	5%	25%	50%	75%	95%	100%
Gippsland	4	19125.00	3000	3300	4500	6750	21375	52275	60000
North	192	10931.36	1000	1300	4000	8650	15000	27956	60000
SW	10	8625.009	1800	1845	2487	5550	9500	24600	30000
Overall	206	10978.50	1000	1374	4000	8000	15000	29720	60000

There were too few dairies in Gippsland and the South West with flood washing for any statistical inference about regional differences.

The distribution of flood wash in the dairy types is shown in Table 18.

Table 18. Frequencies, means and percentiles for flood wash (l/day) by dairy type

Dairy Type	No.	Mean	0%	5%	25%	50%	75%	95%	100%
Double H/bone	23	8732.17	1260	1550	3500	7000	13990	15900	18000
Rotary	61	16403.44	2400	4500	10000	15000	18000	40000	60000
Swing over H/bone	75	8096.47	1000	1200	3038	6000	11650	20300	45000
Overall	159	11375.38	1000	1500	4150	9969	15000	27480	60000

There were no significant differences between the dairy types in flood wash used per cow. The data for teat washing, yard washing, plate cooler, cup sprays and yard wetters are very sparse (Table 19) and will not be further considered.

Table 19. Frequencies and means for teat washing, yard washing, plate cooler, cup sprays and yard wetters (l/day) by region.

Region	Teat Washing		Yard Washing	Plate Cooler	Cup Sprays
Gippsland Mean				2000	
Gippsland No.				5	10
North Mean	291			11177	6139
Norths No.	61			30	50
SW Mean			5008	2880	4909
SW No.			58	1	10

Effluent produced per year

Effluent was not recorded in the North (Table 20).

Table 20. Frequencies, means and percentiles for effluent (Ml/year) by region

Region	No.	Mean	0%	5%	25%	50%	75%	95%	100%
Gippsland	515	4.74	0.05	1	2	3.6	5.6	13.16	30
SW	267	4.08	0.65	1.2	2.15	3.1	4.5	10	27
Overall	782	4.51	0.05	1	2	3.5	5	11	30

There was no significant ($p = 0.26$) difference in effluent produced per dairy between Gippsland and the South West.

The distribution of effluent in the dairy types is shown in Table 21.

Table 21. Frequencies means and percentiles for effluent (ML/year) by dairy type.

Dairy Type	No.	Mean	0%	5%	25%	50%	75%	95%	100 %
Double Herringbone	140	3.25	0.2	1	1.77	2.65	4	8	11
Rotary	99	9.27	1.5	3.1	5	7.2	11	24.3	30
Swing over Herringbone	223	3.40	0.3	1	2	3	4.1	6.6	14
Walk-through	13	2.05	0.1	0.1	1	2	2	5.7	10
Overall	475	4.52	0.1	1	2	3.5	5.2	12	30

Effluent produced per cow was significantly higher in rotary than in double and swing over.

Effluent (megalitres per year) increased significantly ($p < 0.001$) with increasing herd size.

Effluent (megalitres per year) increased significantly ($p < 0.001$) with increasing total cluster number.

Yard scraping

Gippsland had significantly higher proportions of farms that did yard scraping than the South West and North Victoria (Table 22).

Table 22. Frequencies for yard scraping by region.

Region	No	Yes	Total
Gippsland	683	61	744
North	541	2	543
SW	332	3	335
Total	1556	66	1622

There was no significant difference between dairy types and the incidence of yard scraping (Table 23).

Table 23. Frequencies for yard scraping by dairy type

Dairy Type	No	Yes	Total
Double Herringbone	209	14	223
Rotary	176	12	188
Swing over Herringbone	361	35	411
Walkthrough	17	0	17
Overall	763	61	824

Recycled water used

Recycled water refers to the liquid effluent component recycled for washing the yard.

Gippsland and the North had a significantly greater proportion of farms that used recycled water, than the South West (Table 24).

Table 24. Frequencies of recycled water used by region

Region	No	Yes	Total
Gippsland	596	147	743
North	447	98	545
SW	292	42	1288
Total	1335	287	1622

A significantly greater proportion of rotary and swing over dairies used recycled water than did double herringbones and all three had a significantly greater proportion than did walk-through (Table 25).

Table 25. Frequencies of recycled water used by dairy type

Dairy Type	No	Yes	Total
Double Herringbone	174	49	223
Rotary	126	62	188
Swing over Herringbone	277	119	411
Walk-through	17	0	17
Overall	594	230	824

Shed water caught

Gippsland and the North had a significantly greater proportion of farms that caught shed water (Table 26).

Table 26. Frequencies of shed water caught by region

Region	No	Yes	Total
Gippsland	478	265	743
North	351	194	545
SW	279	55	1288
Total	1108	514	1622

A significantly greater proportion of rotary and swing over dairies caught shed water than double herringbones and all three had a significantly greater proportion than did walkthroughs (Table 27).

Table 27. Frequencies of shed water caught by dairy type

Dairy Type	No	Yes	Total
Double Herringbone	134	89	223
Rotary	73	115	188
Swing over Herringbone	164	232	411
Walk-through	17	0	17

Plate cooler diverted

Plate cooler diverted refers to when water used in the plate cooler flows into a tank to be reused for the plate cooler again or for yard wash.

Both Gippsland and the South West had a significantly greater proportion of farms that had plate cooler diverted than the North (Table 28).

Table 28. Frequencies of plate cooler diverted by region

Region	No	Yes	Total
Gippsland	443	300	743
North	364	181	545
SW	191	143	1288
Total	998	624	1622

There was a significantly greater proportion of swing overs with plate cooler diverted than double or rotary. All three had a significantly lower proportion of plate cooler diverted than did walk-through (Table 29).

Table 29. Frequencies of plate cooler diverted by dairy type

Dairy Type	No	Yes	Total
Double Herringbone	180	43	223
Rotary	164	24	188
Swing over Herringbone	217	179	411
Walk-through	4	13	17

Yard wash type

Gippsland had significantly more hose than flood yard wash type than either the North or South West (Table 30).

Table 30. Frequencies of yard wash type by region

Region	Flood	Hose	Hydrant
Gippsland	44	219	14
North	71	230	7
SW	21	55	5
Total	136	504	26

Rotary had significantly more flood type than did either double or swing over (Table 31).

Table 31. Frequencies of yard wash type by dairy type

Dairy Type	Flood	Hose	Hydrant
Double Herringbone	14	150	5
Rotary	61	55	6
Swing over Herringbone	33	214	13
Walk-through	0	7	0