4. Herd improvement

A. Use of herd testing

Farmers were offered a number of herd testing options in 1998/99. They were able to choose between Sample Officer Service (where a sample officer is present at the milking to measure milk volumes and take milk sub-samples), Self Sample Service (where the farmer does the sampling using equipment supplied by Livestock Improvement), and Self Sample Assist (where the farmer does the sampling using equipment supplied by Livestock Improvement and Livestock Improvement provides an assist officer). The Sample Officer Service received minimal use (less than 30 farms) in the 1998/99 season and has been discontinued in the 1999/2000 season.

All herd test systems are based on measured yields obtained over a 24-hour period, with samples collected from consecutive evening and morning milkings.

Farmers were able to choose the frequency of testing. If they tested at eight weekly intervals, or more frequently, they receive information on individual cow's milk, milkfat and protein yields plus milkfat and protein percentages, and somatic cell count information. Also included is the Production Worth, which takes account of each lactation of the cow as well as the date of calving, age, stage of lactation and Breeding Worth. With higher frequencies of herd testing the estimates of absolute lactation yields are more reliable. (See section 4D for Animal Evaluation statistics).

Farmers who opted for two or three tests during the season received Production Worth for individual cows but did not receive estimated lactation yields for fat, milk or protein. Production Worth information is sufficient for farmers to cull for low production.

- ***84% of herds undertake herd testing in 1998/99***

The regional uptake of herd testing services in 1998/99 is shown in Table 4.1, where the number of cows tested refers to all cows tested at least once in the season. Bay of Plenty/East Coast region has the highest percentage of herds using herd testing with 90.4%. Auckland region at 92.2% reported the highest number of cows herd testing.

Table 4.1: Use of herd testing by region in 1998/99

All systems (Sample Officer, Self Sample and Self Sample Assist)

Livestock Improvement Region	*Herds tested*	*Total herds*	*% of total herds*	*Cows tested*	*Total cows*	*% of total cows*
Northland	1,344	1,795	74.9	276,652	343,959	80.4
Auckland	5,057	5,842	86.6	1,161,284	1,259,214	92.2
Bay of Plenty/East Coast	750	830	90.4	174,329	189,973	91.8
Taranaki	2,095	2,457	85.3	423,069	481,088	87.9
Wellington/Hawkes Bay	1,178	1,411	83.5	288,274	346,333	83.2
South Island	1,635	2,027	80.7	495,370	668,752	74.1
New Zealand	12,059	14,362	84.0	2,818,978	3,289,319	85.7

The trend of the percentage of total herds using herd testing has increased since 1955/56 (Graph 4.1). However, both the 1997/98 and 1998/99 seasons have shown a decrease in herds undertaking herd testing (Table 4.2).

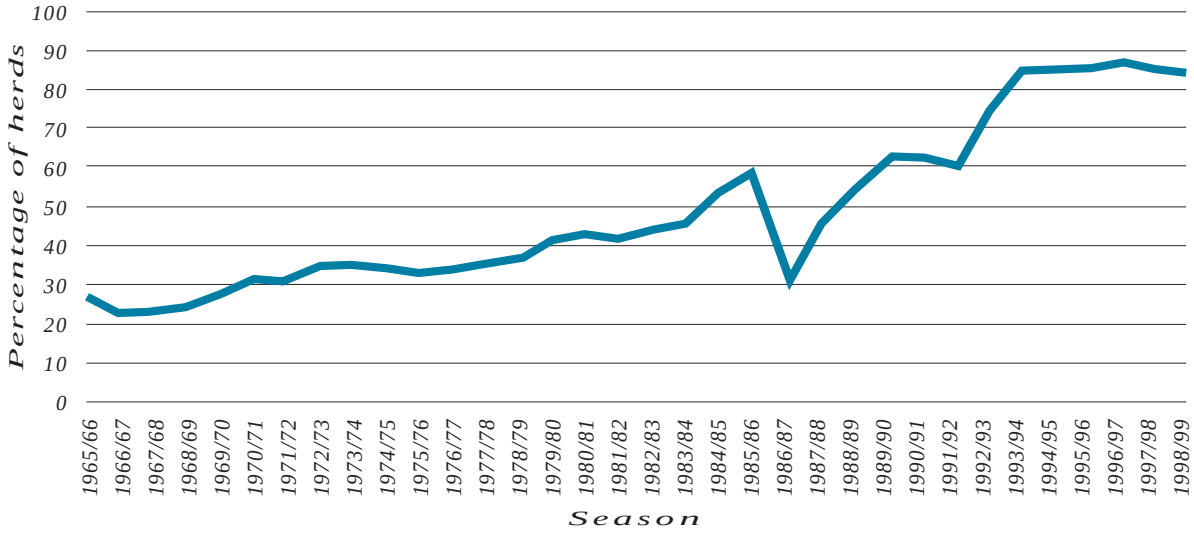
Table 4.2: Trend in the use of herd testing services since 1955/56

All systems (Sample Officer, Self Sample and Self Sample Assist)

Season	*Number of herds*	*% of total herds*	*Number of cows (000)*	*% of total cows*
1955/56	7,469	21.0	476	23.8
1960/61	7,006	22.5	494	25.6
1965/66	6,206	27.7	521	25.0
1966/67	5,730	22.7	501	23.5
1967/68	5,724	23.1	538	24.1
1968/69	6,089	24.7	601	26.1
1969/70	6,768	28.4	700	30.2
1970/71	6,574	31.0	716	32.0
1971/72	6,274	30.3	690	31.4
1972/73	6,771	35.3	772	35.3
1973/74	6,640	35.8	780	36.4
1974/75	6,436	34.9	779	37.5
1975/76	5,858	32.7	706	33.7
1976/77	5,945	34.2	725	35.0
1977/78	6,159	36.4	771	37.6
1978/79	6,250	37.9	801	39.3
1979/80	6,662	41.4	871	42.6
1980/81	6,789	42.9	909	44.8
1981/82	6,702	42.4	922	44.7
1982/83	7,018	44.0	995	46.8
1983/84	7,430	46.8	1,092	49.4
1984/85	8,445	53.6	1,294	56.8
1985/86	9,026	58.9	1,484	63.9
1986/87	4,555	30.7	753	33.0
1987/88	6,930	47.0	1,175	52.5
1988/89	7,932	54.3	1,341	59.1
1989/90	9,213	62.7	1,604	69.3
1990/91	8,918	61.7	1,566	65.2
1991/92	8,661	59.9	1,611	66.1
1992/93	10,843	75.0	2,039	78.4
1993/94	12,372	84.8	2,377	86.9
1994/95	12,446	85.0	2,474	87.4
1995/96	12,620	85.6	2,592	88.3
1996/97	12,851	87.2	2,746	89.6
1997/98	12,510	85.3	2,826	87.7
1998/99	12,059	84.0	2,819	85.7

The percentage of herds using herd testing services (Graph 4.1) shows a drop in the 1986/87 season, coinciding with the low payout received by farmers in that season which had the effect of reducing expenditure on herd testing compared with previous and later seasons.

Graph 4.1: Trend in the percentage of herds testing since 1965/66



B. Herd test averages

i) Season averages

- ***South Island has highest herd test production***

The lactation yield figures in this section are for cows herd tested. Before September 1998 the herd testing system calculated lactation yields for all tested cows in herds that tested four or more times during the season. After this time all cows herd tested once or more during the season were included in the calculation, only including cows that lactated for one hundred days or more. In comparison, the average milkfat figures given in Sections 2 and 3 are based on all herds supplying a dairy company, regardless of whether herd testing was used, and represent the average production per cow as supplied to the dairy company. Therefore, production figures reported using each of these methods would likely differ.

Days in milk (herd testing) information is the number of days from the start of lactation to the calculated end of lactation. The start of lactation is four days from calving (with a maximum of 60 days between the estimated start of lactation and the first herd test). The end of lactation is the last herd test date plus 15 days. The inclusion of herds with less than four tests slightly reduces the average lactation.

There has been additional information presented for the number of days in milk reported since 1997/98. The days in milk (production) figure is the number of days from the estimated start of lactation to the estimated end of lactation. The results are derived from seasonal supplier tanker pick-up information factored for calving spread. The new methodology will provide a more accurate measure of the average lactation length of dairy cows.

Average per cow statistics for each Livestock Improvement region is summarised in Table 4.3. The additional information for the days in milk (production) more accurately reflects the lactation length by using milk supply information from seasonal suppliers. The South Island recorded the highest per cow per day milk volume (3,982 litres), milkfat (179 kg) and protein (141 kg) of cows herd tested.

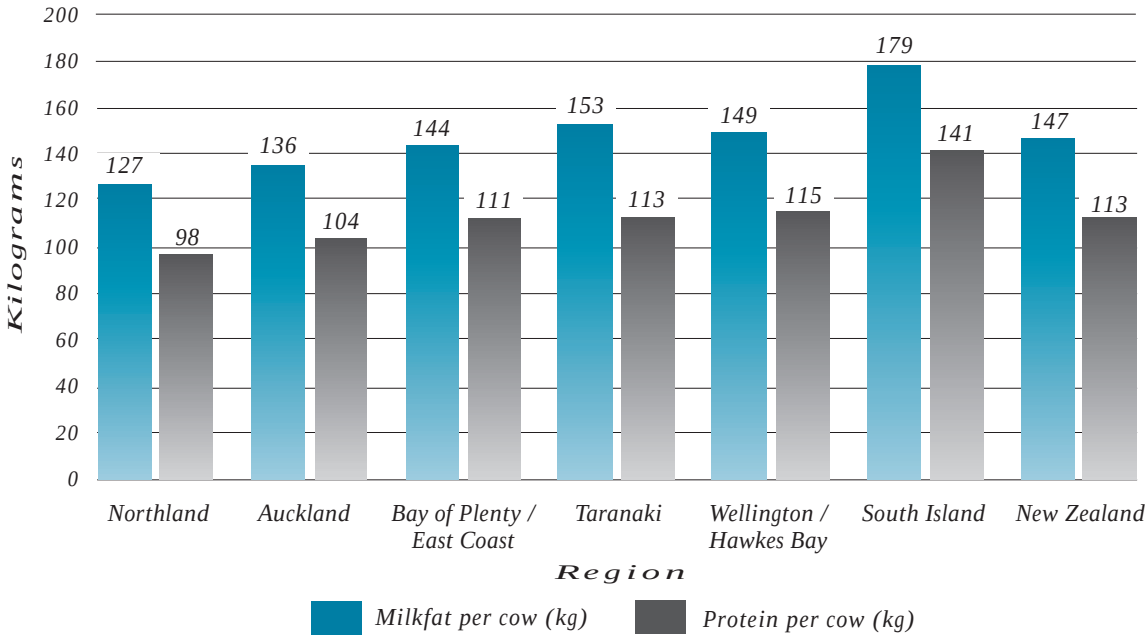
Information reported in Table 4.3 contains aggregated herd test data which can be useful to farmers for comparison with individual farm herd test data.

Table 4.3: 1998/99 Season herd test averages by region

Livestock Improvement Region	Milk (litres)	Milkfat (kg)	Milkfat (%)	Protein (kg)	Protein (%)	Somatic cell count (000 cells/millilitre)	Days in milk (herd testing)	Days in milk (production)
Northland	2,866	127	4.40	98	3.38	214	205	297
Auckland	2,971	136	4.41	104	3.36	202	188	270
Bay of Plenty / East Coast	3,256	144	4.39	111	3.40	215	208	276
Taranaki	3,030	153	4.97	113	3.66	211	206	277
Wellington / Hawkes Bay	3,277	149	4.45	115	3.42	208	215	284
South Island	3,982	179	4.45	141	3.49	218	218	272
New Zealand	3,189	147	4.51	113	3.44	208	200	277

The 1998/99 milkfat and protein lactation regional averages of herd tested cows (Graph 4.2) shows a wide range in values between all regions, with milkfat production ranging from 127 to 179 kg per cow and protein production from 98 to 141 kg per cow. While the South Island region had the highest overall production with 179 kilograms of milkfat and 141 kilograms of protein per cow, it had the lowest proportion of cows herd tested.

Graph 4.2: Average milkfat and protein production per cow in 1998/99



• Decrease in production per cow for 1998/99

The last twenty years has seen a general trend of increasing production in both milk volume and milkfat. However, in individual years this trend can be masked by other factors, in particular, weather conditions. The 1998/99 season shows a decrease in production per cow, the lowest in more than eight years (Table 4.4).

Additional information for the days in milk figure has been included for the last two seasons. This figure (shown in brackets) more accurately reflects the lactation length by using seasonal milk supply information. The decrease in the average somatic cell count per millilitre of milk from 1992/93 to 1997/98, as shown in Table 4.4, is due to a number of factors, including industry pressure for improved milk quality, farm management practice, and climatic conditions. The 2.6% increase in somatic cell count (000 cells per millilitre) recorded in 1998/99 can be attributed to unfavourably dry climatic conditions during the latter half of the season.

Table 4.4: Trend in the national herd test averages since 1970/71

Season	Milk (litres)	Milkfat (kg)	Milkfat (%)	Protein (kg)	Protein (%)	Days in milk	Somatic cell count (000 cells/millilitre)
1970/71	2,809	134	4.77	–	–	–	–
1971/72	3,089	146	4.73	–	–	–	–
1972/73	2,941	139	4.73	–	–	–	–
1973/74	2,797	135	4.83	–	–	–	–
1974/75	2,913	138	4.74	–	–	–	–
1975/76	3,112	149	4.79	–	–	–	–
1976/77	3,240	154	4.75	–	–	–	–
1977/78	3,027	142	4.69	–	–	–	–
1978/79	3,266	155	4.75	–	–	–	–
1979/80	3,380	162	4.79	–	–	–	–
1980/81	3,331	160	4.80	–	–	–	–
1981/82	3,326	159	4.78	–	–	–	–
1982/83	3,377	160	4.74	–	–	–	–
1983/84	3,451	165	4.78	–	–	–	–
1984/85	3,416	162	4.74	–	–	–	–
1985/86	3,424	161	4.78	247	–	–	–
1986/87	3,046	143	4.79	230	–	–	–
1987/88	3,300	156	4.81	235	–	–	–
1988/89	3,197	149	4.67	115	3.60	237	265
1989/90	3,221	152	4.72	117	3.66	235	358
1990/91	3,190	152	4.81	116	3.65	222	298
1991/92	3,361	162	4.83	124	3.70	226	282
1992/93	3,298	157	4.77	121	3.65	221	280
1993/94	3,560	171	4.84	131	3.69	223	216
1994/95	3,253	154	4.77	118	3.64	208	206
1995/96	3,501	164	4.72	126	3.60	224	206
1996/97	3,641	173	4.78	133	3.66	223	197
1997/98	3,373	158	4.67	119	3.52	209 (266*)	195
1998/99	3,189	147	4.51	113	3.44	208 (277*)	200

– not available

**derived from milk supply information*

ii) Monthly averages

- ***Lowest Somatic Cell Count per cow per day recorded in Auckland***

Before September 1998 monthly herd test averages include all herds scheduled for four or more tests during the season. After this time all cows herd tested in each month were included, where they were tested once or more during the season (Table 4.5).

The seasonal average figures presented in Table 4.5 are calculated using national monthly averages, and therefore are affected by milk volume. Statistics for May, June and July are based on far fewer cows than are other months, because only a few herds (generally town milk herds) test in these months. Differences in climate between regions, which in turn can affect the mating period, available feed and cow condition, are illustrated by differing months of peak production.

Table 4.5: 1998/99 Monthly herd test averages by region

Average litres of milk per cow per day

Livestock Improvement Region	1998 June	July	Aug	Sept	Oct	Nov	Dec	1999 Jan	Feb	Mar	April	May	Season average
Northland	14.04	13.08	14.77	15.58	15.56	14.45	13.18	11.68	11.23	8.45	7.61	11.84	12.86
Auckland	16.55	16.05	17.6	18.59	18.47	16.5	14.94	12.06	12.04	8.10	7.36	11.72	14.16
B.O.P. / East Coast	15.82	13.67	17.78	19.15	18.56	16.74	15.12	13.04	12.40	9.31	8.24	12.07	14.44
Taranaki	15.89	15.57	17.04	17.83	17.29	15.77	14.65	12.87	12.41	8.96	9.05	10.56	13.86
Well. / Hawkes Bay	16.28	15.63	18.06	19.81	19.69	17.28	16.16	13.67	13.23	10.08	9.94	11.46	15.04
South Island	16.81	17.89	19.62	22.66	22.66	21.22	18.92	17.52	15.10	13.24	12.4	11.9	17.43
New Zealand	15.98	15.9	17.03	18.59	18.94	16.96	15.65	13.2	12.76	9.37	9.58	11.74	14.67

Average kg of milkfat per cow per day

Livestock Improvement Region	1998 June	July	Aug	Sept	Oct	Nov	Dec	1999 Jan	Feb	Mar	April	May	Season average
Northland	0.59	0.57	0.64	0.66	0.67	0.64	0.58	0.53	0.53	0.43	0.40	0.55	0.58
Auckland	0.68	0.66	0.78	0.81	0.82	0.74	0.68	0.56	0.58	0.43	0.40	0.56	0.65
B.O.P. / East Coast	0.65	0.58	0.77	0.8	0.8	0.72	0.67	0.57	0.58	0.46	0.43	0.57	0.64
Taranaki	0.72	0.69	0.82	0.84	0.83	0.77	0.74	0.66	0.66	0.51	0.52	0.58	0.70
Well. / Hawkes Bay	0.71	0.65	0.77	0.86	0.87	0.77	0.73	0.62	0.63	0.51	0.52	0.56	0.69
South Island	0.75	0.78	0.84	0.97	0.98	0.92	0.84	0.77	0.7	0.65	0.63	0.6	0.79
New Zealand	0.68	0.68	0.75	0.81	0.84	0.77	0.72	0.61	0.62	0.49	0.51	0.58	0.68

Average kg of protein per cow per day

Livestock Improvement Region	1998 June	July	Aug	Sept	Oct	Nov	Dec	1999 Jan	Feb	Mar	April	May	Season average
Northland	0.46	0.44	0.49	0.51	0.53	0.5	0.46	0.4	0.41	0.31	0.30	0.43	0.44
Auckland	0.54	0.52	0.61	0.63	0.64	0.58	0.53	0.41	0.43	0.3	0.29	0.44	0.50
B.O.P. / East Coast	0.52	0.46	0.61	0.64	0.63	0.57	0.53	0.43	0.44	0.34	0.32	0.44	0.50
Taranaki	0.54	0.53	0.62	0.63	0.63	0.59	0.56	0.48	0.48	0.36	0.38	0.44	0.52
Well. / Hawkes Bay	0.54	0.52	0.61	0.68	0.69	0.61	0.57	0.47	0.47	0.38	0.39	0.44	0.53
South Island	0.57	0.59	0.64	0.77	0.79	0.74	0.66	0.61	0.54	0.5	0.49	0.47	0.62
New Zealand	0.53	0.53	0.58	0.63	0.66	0.6	0.56	0.46	0.46	0.35	0.38	0.46	0.52

Average somatic cell count (000 cells per millilitre)

Livestock Improvement Region	1998 June	July	Aug	Sept	Oct	Nov	Dec	1999 Jan	Feb	Mar	April	May	Season average
Northland	218	207	180	168	170	176	192	206	210	251	308	264	205
Auckland	191	218	159	148	149	148	159	189	201	252	309	266	188
B.O.P. / East Coast	254	235	184	170	158	165	178	204	204	244	296	308	208
Taranaki	287	251	179	165	171	174	174	184	203	224	241	261	206
Well. / Hawkes Bay	247	211	200	179	185	186	191	214	228	258	275	294	215
South Island	238	231	215	214	192	199	204	216	229	239	229	238	218
New Zealand	226	222	175	163	166	166	177	197	209	245	273	256	200

Average somatic cell count (SCC) information presented in Table 4.5 should not be compared with bulk milk SCC (which is not reported in this publication) as different calculation methods are used for each. Bulk milk SCC is calculated using a weighted average, whereas the figures presented in this table are not.

iii) Breed averages

- ***Holstein-Friesian/Jersey cross bred cows show higher milkfat production***

The 1998/99 herd test statistics were analysed for Holstein-Friesian, Jersey, Ayrshire and Holstein-Friesian/Jersey Crossbreds. Before September 1998 the breed averages listed in Table 4.6 are for cows herd tested four or more times during the season, whereas from September breed averages are for cows herd tested once or more during the season.

The number of days in milk reported is the number of days from the estimated start of lactation to the estimated end of lactation. The estimated start of lactation is four days from calving (with a maximum of 60 days between the estimated start of lactation and the first herd test). The end of lactation is the last herd test date plus 15 days. Therefore the number of days in milk does not reflect the average lactation length of dairy cows.

On average, the Holstein-Friesian/Jersey Crossbred cows produced more milkfat than the other breeds listed, while the Holstein-Friesian cows produced more protein and a higher volume of milk.

Six-year-old cows produced more milkfat, protein and milk than any other age group for Holstein-Friesian, Jersey and Holstein-Friesian/Jersey Crossbred cows.

In the Ayrshire breed, 7-year-old cows had higher production than any other age group.

Table 4.6: 1998/99 Herd test breed averages by age of cow

Holstein-Friesian

Age	*Number*	*Days in milk*	*Milk (litres)*	*Milkfat (kg)*	*Protein (kg)*	*Milkfat %*	*Protein %*
2	283,702	211	2,874	122.6	95.9	4.29	3.34
3	250,232	211	3,273	142.3	112.3	4.38	3.44
4	218,825	212	3,623	156.4	123.5	4.34	3.42
5	179,488	212	3,823	163.7	129.7	4.31	3.40
6	142,625	212	3,836	165.3	131.4	4.34	3.44
7	115,055	210	3,763	162.6	128.9	4.34	3.43
8	83,172	208	3,671	158.7	125.4	4.34	3.43
9	59,362	206	3,543	154.1	120.6	4.37	3.41
10+	70,826	201	3,311	142.7	111.9	4.33	3.39
Total	1,403,287	210	3,452	148.8	117.4	4.34	3.41

Jersey

Age	*Number*	*Days in milk*	*Milk (litres)*	*Milkfat (kg)*	*Protein (kg)*	*Milkfat %*	*Protein %*
2	76,456	214	2,140	117.5	82.9	5.50	3.87
3	67,161	214	2,417	136.5	96.7	5.67	4.01
4	62,770	215	2,680	150.9	107.3	5.64	4.01
5	53,080	216	2,749	156.7	110.2	5.71	4.02
6	41,265	215	2,771	156.8	110.9	5.67	4.01
7	34,387	213	2,713	156.2	109.5	5.77	4.05
8	26,717	211	2,637	152.9	107.2	5.81	4.07
9	18,546	209	2,570	148.2	104.0	5.78	4.06
10+	23,298	204	2,486	136.9	98.4	5.52	3.97
Total	403,680	214	2,536	143.2	101.2	5.65	3.99

Holstein-Friesian X Jersey crossbred (1st-2nd cross)

Age	Number	Days in milk	Milk (litres)	Milkfat (kg)	Protein (kg)	Milkfat %	Protein %
2	157,564	212	2,713	125.8	94.8	4.67	3.50
3	130,693	213	3,087	146.3	111.1	4.78	3.61
4	116,612	213	3,402	160.4	122.1	4.75	3.60
5	90,392	214	3,588	167.9	127.9	4.72	3.58
6	69,305	214	3,594	168.6	129.1	4.73	3.61
7	57,752	212	3,524	167.2	127.3	4.78	3.63
8	41,301	210	3,424	163.1	123.7	4.80	3.63
9	29,333	208	3,315	157.7	118.9	4.79	3.60
10+	33,402	202	3,106	145.6	110.2	4.71	3.56
Total	726,354	212	3,231	152.0	115.4	4.74	3.58

Ayrshire

Age	Number	Days in milk	Milk (litres)	Milkfat (kg)	Protein (kg)	Milkfat %	Protein %
2	5,849	216	2,570	112.5	89.4	4.39	3.48
3	5,195	214	2,946	127.7	103.5	4.35	3.51
4	4,632	211	3,262	139.4	114.3	4.29	3.50
5	4,097	212	3,355	144.3	117.5	4.31	3.50
6	3,279	212	3,420	147.2	120.1	4.32	3.51
7	2,628	211	3,469	147.5	121.4	4.26	3.50
8	1,911	211	3,375	144.3	118.1	4.28	3.50
9	1,344	208	3,221	138.7	112.8	4.30	3.50
10+	1,935	205	3,123	132.8	108.9	4.25	3.48
Total	30,870	212	3,121	134.4	109.2	4.32	3.50

Table 4.7: Liveweight by age and breed of cow for 1998/99

	Holstein Friesian		Jersey		Hol Friesian X Jersey		Ayrshire	
Age	Average liveweight (kg)	Number of cows	Average liveweight (kg)	Number of cows	Average liveweight (kg)	Number of cows	Average liveweight (kg)	Number of cows
2	407	17,039	316	5,316	384	11,103	370	284
3	454	4,673	355	1,608	426	3,617	405	45
4	483	3,602	371	1,401	451	2,898	423	26
5	500	2,784	383	1,157	469	2,266	435	35
6	515	2,295	387	850	482	1,700	452	25
7	516	1,922	393	638	483	1,308	462	21
8	512	1,269	392	498	480	875	476	11
9	512	923	392	338	480	629	462	6
10+	505	919	406	426	479	677	453	11
Total	450	35,426	351	12,232	426	25,073	395	464

C. Artificial Breeding Statistics

- ***Minimal decrease in total cows to AB for 1998/99***
- ***Inseminations per cow increase from 1997/98***

All artificial inseminations are recorded on the Livestock Improvement National Database. Table 4.8 provides a summary of cows mated to artificial breeding (AB) for the last nine seasons. The number of cows inseminated has increased every year, with the exception of 1998/99 which showed a minimal decrease of 0.1%. A decline in the number of yearlings to AB can be seen since 1996/97.

Table 4.8: Trends in Artificial Breeding (AB) use since 1990/91 by region: cows and yearlings to AB

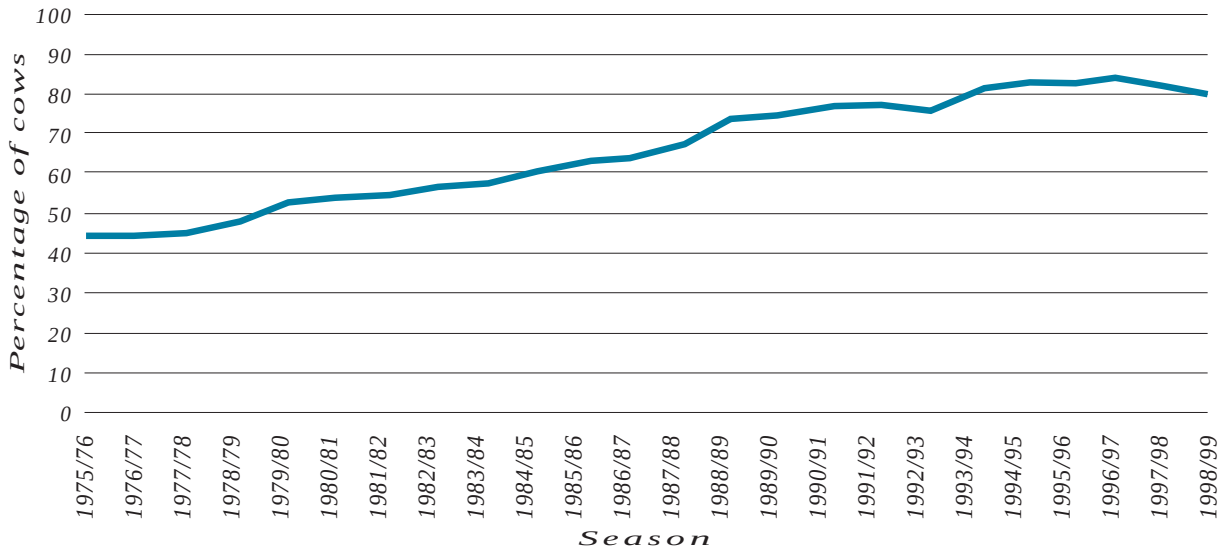
Cows to AB

Livestock Improvement Region	*1990/91*	*1991/92*	*1992/93*	*1993/94*	*1994/95*	*1995/96*	*1996/97*	*1997/98*	*1998/99*
Northland	229,246	224,597	216,772	249,293	253,662	257,557	262,429	258,057	244,115
Auckland	830,117	841,397	886,199	960,928	992,301	1,007,497	1,065,624	1,069,038	1,066,442
B.O.P. / East Coast	128,405	131,478	134,648	147,388	151,469	152,836	155,267	156,602	153,294
Taranaki	345,591	350,946	361,864	388,152	398,201	398,571	399,435	404,930	395,636
Wellington / Hawkes Bay	163,439	164,950	174,192	204,054	220,471	230,582	254,002	266,514	266,171
South Island	162,168	181,003	206,475	266,201	319,949	371,210	437,078	483,968	510,514
New Zealand	1,858,966	1,894,371	1,980,150	2,216,016	2,336,053	2,418,253	2,573,835	2,639,109	2,636,172

Yearlings to AB

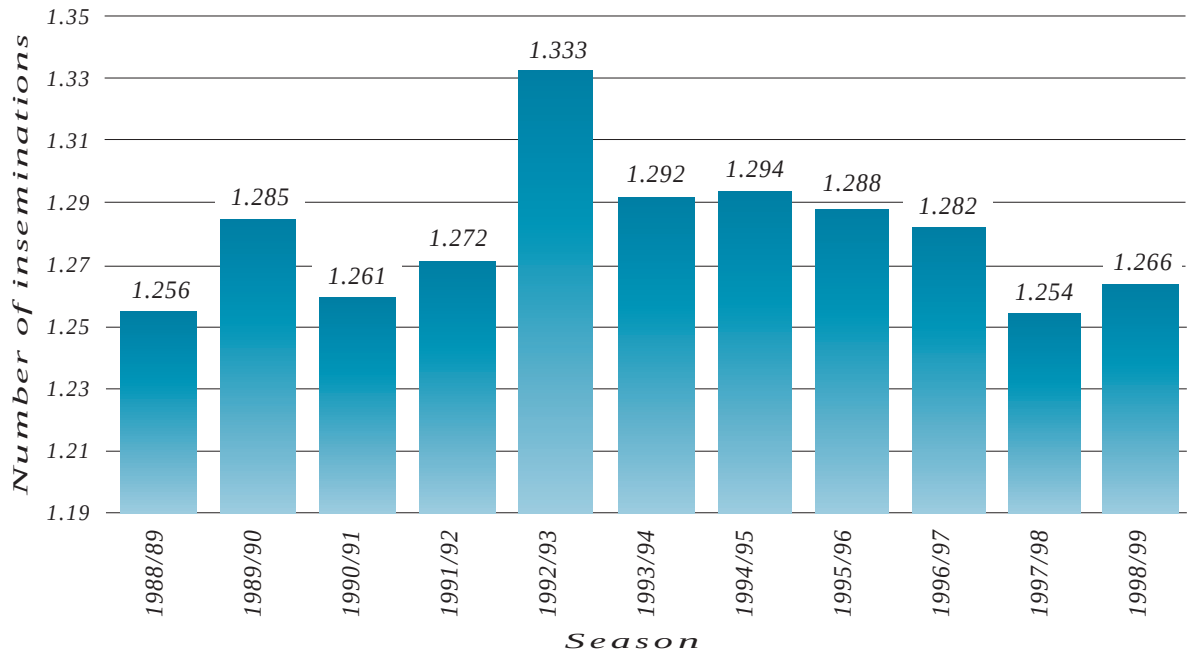
Livestock Improvement Region	*1990/91*	*1991/92*	*1992/93*	*1993/94*	*1994/95*	*1995/96*	*1996/97*	*1997/98*	*1998/99*
Northland	14,219	13,071	14,475	19,555	21,159	22,034	20,613	15,966	11,188
Auckland	28,861	24,921	32,608	42,856	54,867	53,038	48,291	31,102	25,968
B.O.P. / East Coast	7,035	6,996	8,582	13,286	16,773	17,501	15,753	10,317	7,854
Taranaki	11,056	9,884	11,989	15,740	19,099	17,864	11,909	8,428	5,748
Wellington / Hawkes Bay	5,822	5,118	5,534	10,882	13,473	15,321	14,375	9,887	6,223
South Island	7,488	10,033	16,011	32,382	44,715	48,194	54,152	35,159	34,906
New Zealand	74,481	70,023	89,199	134,701	170,086	173,952	165,093	110,859	91,887

Graph 4.3: Trend in the percentage of cows to Artificial Breeding (AB) since 1975/76



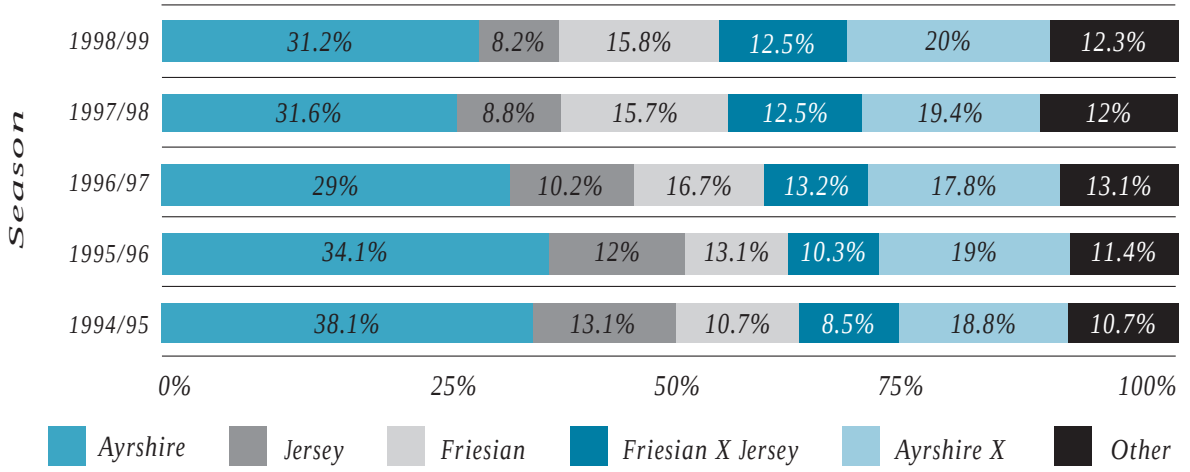
Since the 1988/89 season, the average number of inseminations per cow as recorded on the Livestock Improvement National Database has ranged between 1.25 and 1.33 inseminations (Graph 4.4). In 1998/99 the average number of inseminations per cow increased by 1% from the previous year to 1.27.

Graph 4.4: Average number of inseminations per cow since 1988/89

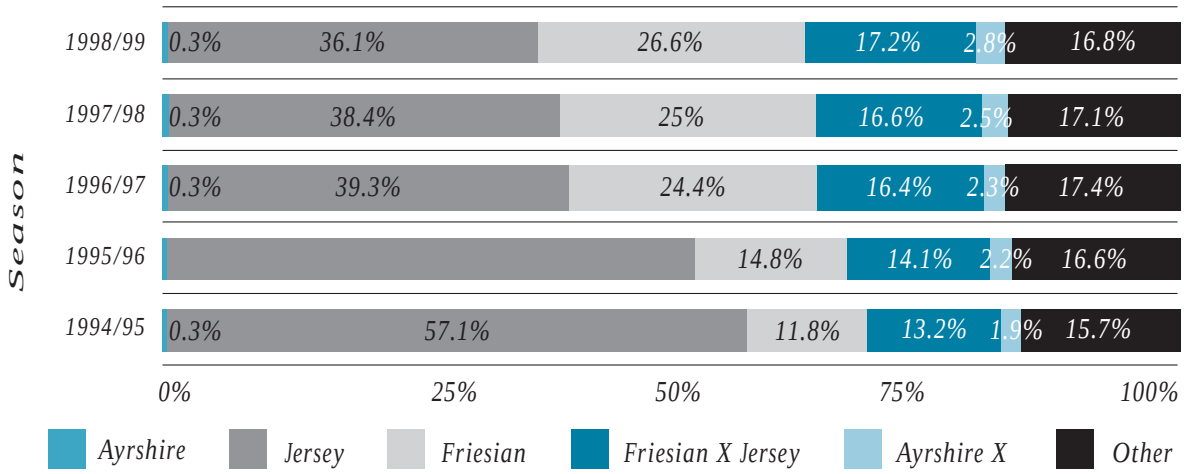


The use of Ayrshire, Holstein-Friesian and Jersey semen over different cow breeds for the seasons 1994/95 to 1998/99 is shown below. Ayrshire semen use over all other breeds remained similar to the previous season (Graph 4.5). The use of Jersey semen over Holstein-Friesian cows has shown a continued increase (Graph 4.6). The use of Holstein-Friesian semen over Holstein-Friesian cows has seen little change since 1994/95 (Graph 4.7).

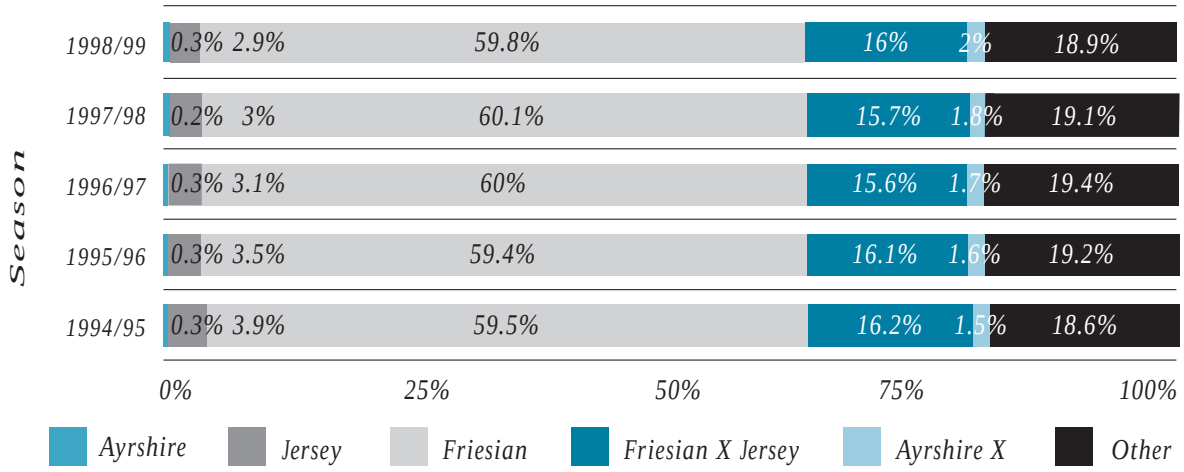
Graph 4.5: Ayrshire semen usage by cow breed since 1994/95



Graph 4.6: Jersey semen usage by cow breed since 1994/95

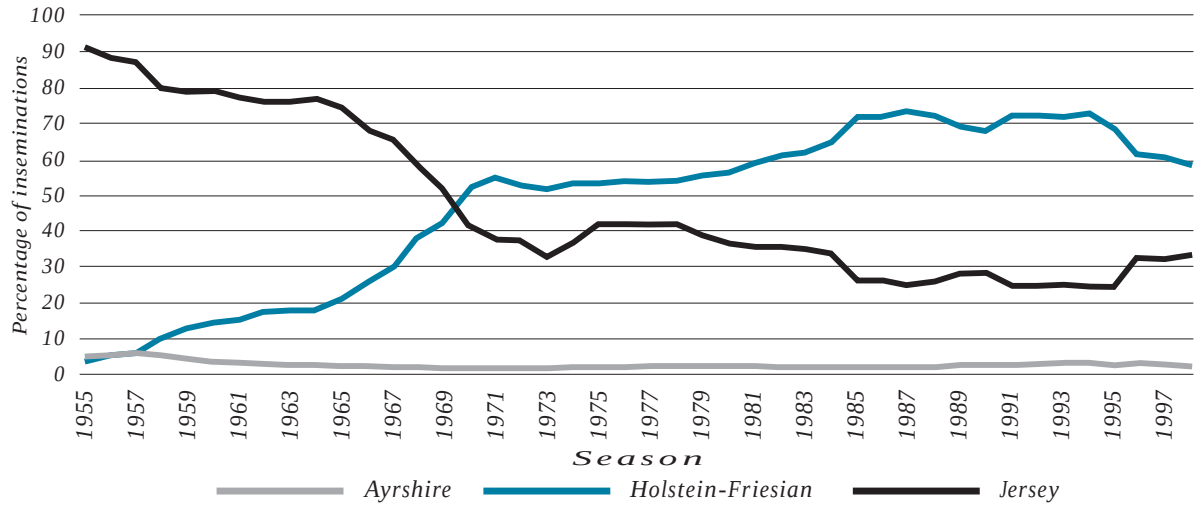


Graph 4.7: Holstein-Friesian semen usage by cow breed since 1994/95



The number of inseminations for each major breed (Holstein-Friesian, Jersey and Ayrshire) as recorded on the Livestock Improvement National Database is shown in Graph 4.8. The Holstein-Friesian breed has declined slightly in use for the 1998/99 season, while the Jersey breed has increased by 1.6 %.

Graph 4.8: Trend in the percentage of inseminations of each major breed since 1955



D. Animal Evaluation

The genetic merit of New Zealand dairy cows and sires is estimated using statistical methods that allow simultaneous evaluation of cows and sires of all breeds, using all recorded relationships. The structure of the national herd reveals large numbers of crossbred cows, and large numbers of herds with mixed breeds. For this reason the national animal evaluation system is designed to compare animals irrespective of breed, both nationally and within herd to allow farmers to select the most profitable animals for the future.

There are two types of evaluation calculated for New Zealand dairy animals:

1. Trait evaluations are a measure of an animal's genetic merit (*Breeding Value*), lifetime productive ability (*Production Value*) and current season productive ability (*Lactation Value*) for individual traits, including milkfat, protein, volume, liveweight, and survival.
2. Economic evaluations combine an animal's individual trait evaluations to measure its ability to convert feed into profit, through breeding replacements (*Breeding Worth*), lifetime production (*Production Worth*) and current season production (*Lactation Worth*).

For each economic index, Economic Values are calculated for the relevant traits. For Breeding Worth, the Economic Values represent the net income per unit of feed from breeding replacements with a one unit genetic improvement in the trait. For Production Worth, the Economic Values represent the net income per unit of feed from milking cows with a one unit improved productive ability in the trait. In each case the base unit of feed is 4.5 tonnes of dry matter in average quality pasture.

The profit-related traits are combined into a single economic index. For example:

Breeding Worth	=	Milkfat BV	x	$EV	+
		Protein BV	x	$EV	+
		Milk BV	x	$EV	+
		Liveweight BV	x	$EV	+
		Survival BV	x	$EV	

where : BV = Breeding Value for each trait

$EV = economic value for each trait for breeding replacements

Animal Evaluation ranks animals in terms of their expected profit per unit of feed eaten, i.e. it identifies those animals in a herd which are the most efficient converters of feed into profit. Breeding Worth (BW) and Production Worth (PW) are based on future price predictions for milk components, while Lactation Worth (LW) is based on predicted end of season prices.

The economic values for 1998/99 are presented below (Table 4.9). The economic values are reviewed annually and therefore may change from year to year.

Table 4.9: Economic values used from 27 February 1999

	Milkfat ($/kg)	*Protein ($/kg)*	*Milk ($/kg)*	*Liveweight ($/kg)*	*Survival ($/% change)*
Breeding Worth	0.80	3.35	–0.047	–0.43	0.91
Production Worth	1.17	4.21	–0.061	–0.58	–
Lactation Worth	1.94	4.82	–0.076	–0.70	–

The information for all animal evaluation statistics was sourced from animals recorded on the Livestock Improvement National Database at 15 May 1999.

Table 4.10 shows the Breeding Values (BV) and BW by breed, of all bulls born in 1994, first proven in the 1998/99 season with a reliability of 75% or greater.

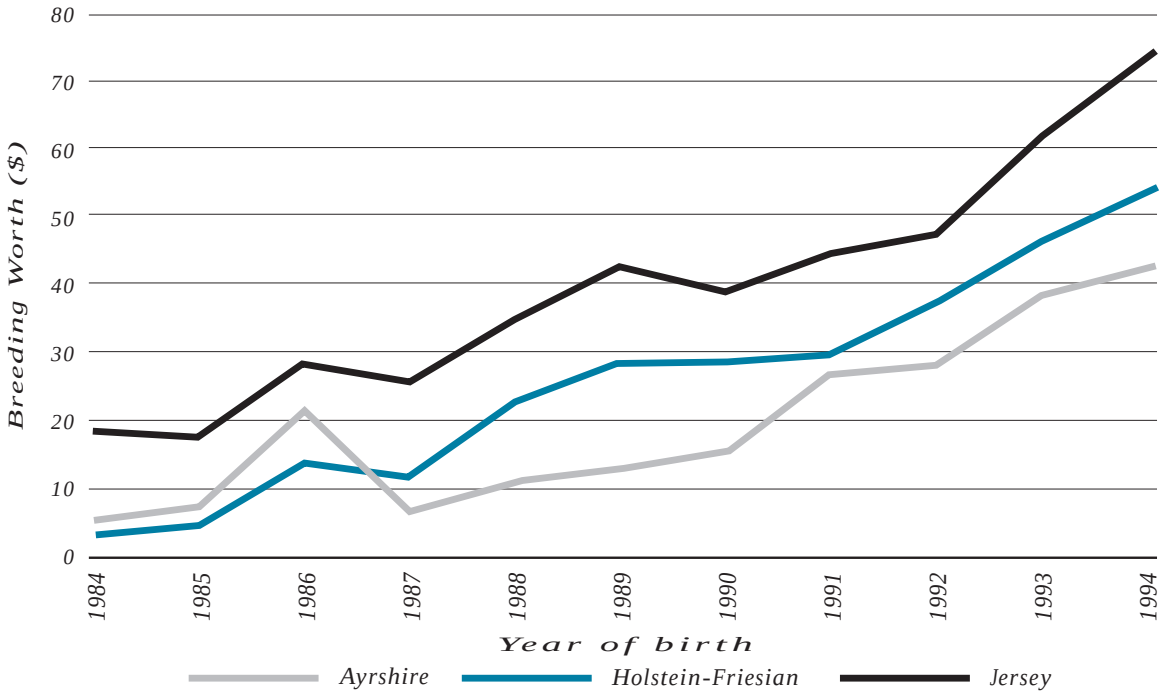
Table 4.10: Average Breeding Values and Breeding Worth of 1994 born bulls first proven in 1998/99 season (reliability of 75% or greater)

Breed	*Fat BV*	*Protein BV*	*Milk Vol BV*	*Liveweight BV*	*Survival BV*	*BW>75% Rel*	*Number of Sires*
Ayrshire	12.5	21.2	704	13.9	–0.15	41.9	6
Holstein-Friesian	31.8	36.3	1237	81.3	0.04	54.1	195
Jersey	20.1	13.3	106	–40.2	0.79	73.6	96

(Evaluation date 15 May 1999)

The genetic trend of proven dairy bulls is shown in Graph 4.9. Bulls born in 1994 are first proven in the 1998/99 season.

Graph 4.9: Genetic trend of proven dairy bulls by year of birth (reliability of 75% or greater)



(Evaluation date: 15 May 1999)

Young bulls are initially selected for Artificial Breeding (AB) use based on the genetic merit of their sire and dam. These young sires are then progeny tested to estimate their true Breeding Worth via the production of their daughters. Each year the best progeny tested bulls are returned to service for use as proven sires.

Table 4.11 shows the number of sires with BW (estimated with reliability of at least 75%) by birth year and breed. The information in this table is updated every year for all age groups to include older bulls that have now been proven in New Zealand.

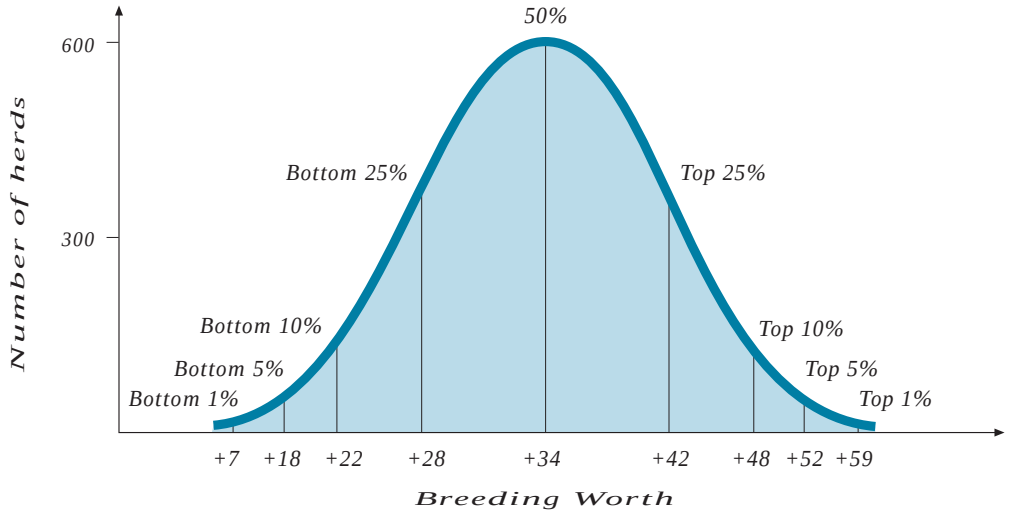
Table 4.11: Number of sires obtaining Breeding Worth (BW) by birth year and breed (reliability of 75% or greater, includes overseas bulls)

Year of birth	Number of sires	Holstein-Friesian	Jersey	Ayrshire	Other breeds
1984	315	182	94	31	8
1985	311	182	93	22	14
1986	287	177	82	22	6
1987	316	191	95	18	12
1988	317	193	95	22	7
1989	353	203	115	19	16
1990	316	186	97	24	9
1991	331	204	96	24	7
1992	333	208	102	17	6
1993	305	180	102	21	2
1994	298	195	96	6	1

(Evaluation date 15 May 1999)

The distributions of BW and PW for herds presented below (Graphs 4.10, 4.11) are based on all cows recorded on the Livestock Improvement National Database with a test number in herds signed up for herd testing for the 1998/99 season. For example, Graph 4.10 shows 50% of New Zealand herds have a BW of 34 or greater and 25% of New Zealand herds have a BW of 42 or greater.

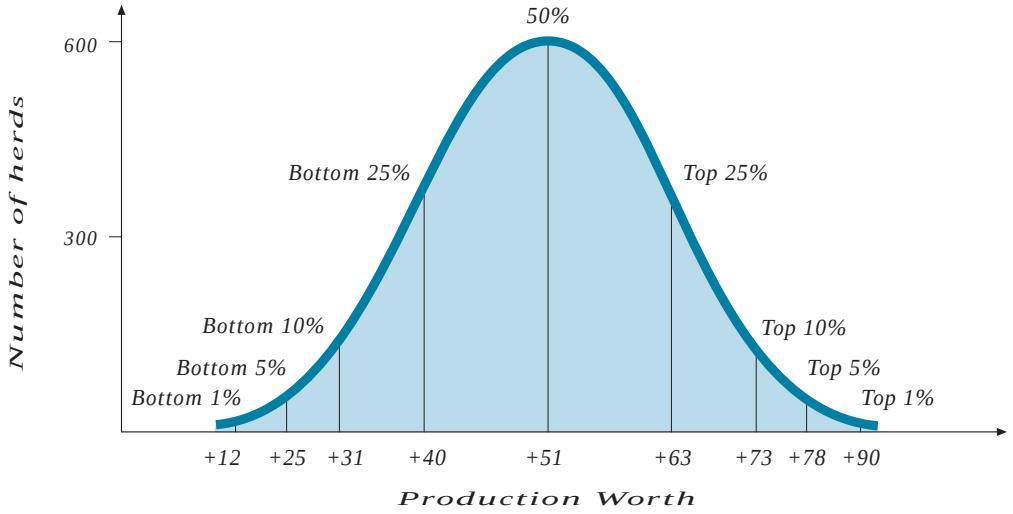
Graph 4.10: Distribution of herd Breeding Worth (BW) in 1998/99



(Evaluation date: 15 May 1999)

The distribution graph for PW for herds in the 1998/99 season is based on all cows recorded with a test number in herds signed up for herd testing for 1998/99. Graph 4.11 shows that 50% of New Zealand herds have a PW of 51 or greater, and that 25% of New Zealand herds have a PW of 63 or greater.

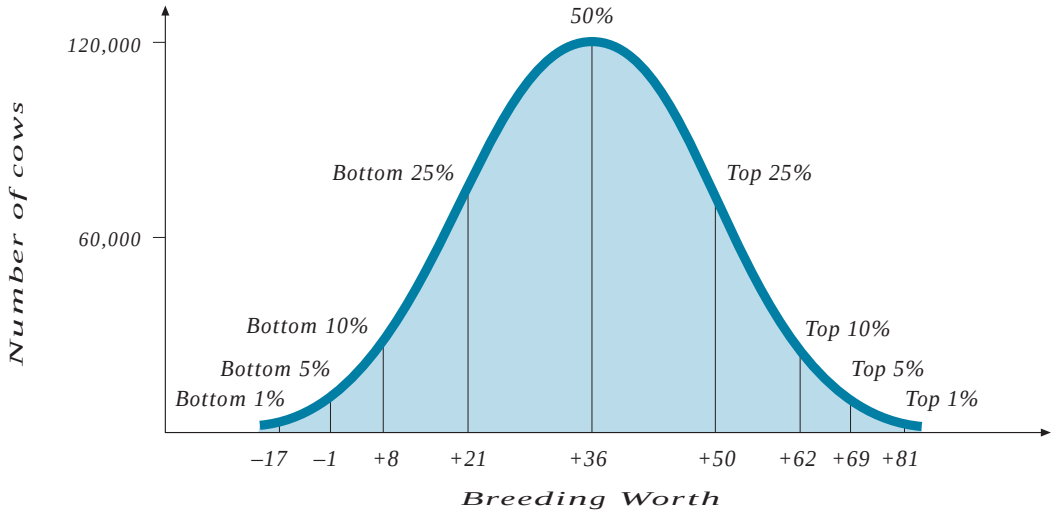
Graph 4.11: Distribution of herd Production Worth (PW) in 1998/99



(Evaluation date: 15 May 1999)

The distribution graphs for cows presented below (Graphs 4.12, 4.13) are based on all cows recorded on the Livestock Improvement National Database with a test number in herds signed up for herd testing for the 1998/99 season. Graph 4.12 shows that 50% of New Zealand cows have a BW of 36 or above and that 25% of New Zealand cows have a BW of 50 or above.

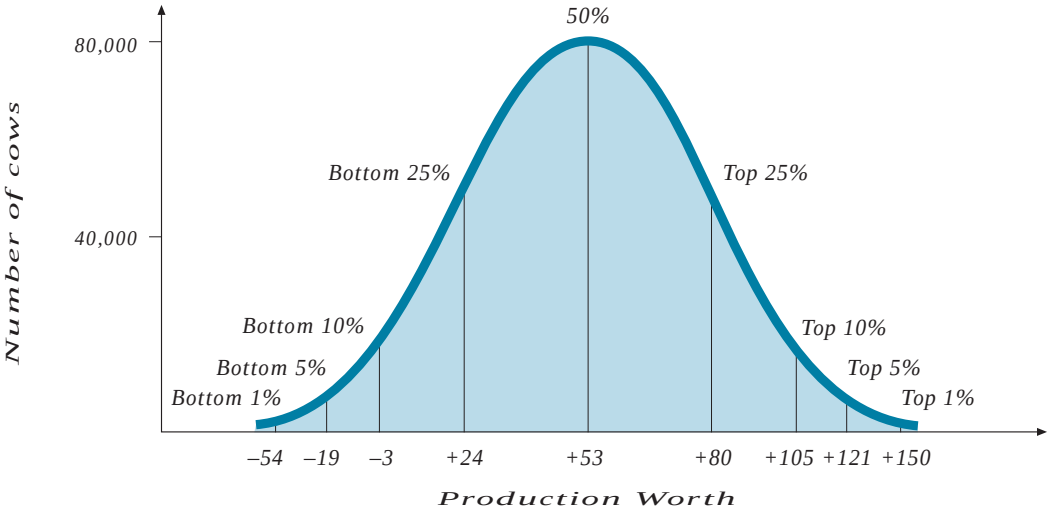
Graph 4.12: Distribution of cow Breeding Worth (BW) in 1998/99



(Evaluation date: 15 May 1999)

The distribution graph for cows presented below (Graph 4.13) is based on all cows recorded with a test number in herds signed up for herd testing for the 1998/99 season. Graph 4.13 shows that 50% of New Zealand cows have a PW of 53 or above and a quarter have a PW of 80 or above.

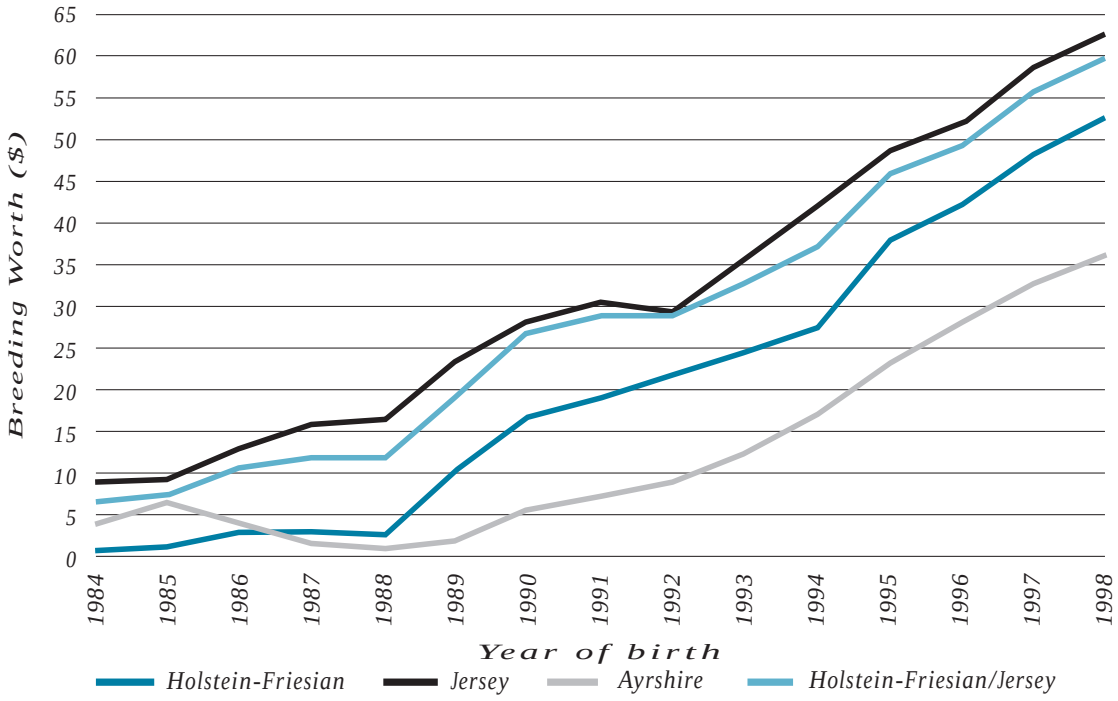
Graph 4.13: Distribution of cow Production Worth (PW) in 1998/99



(Evaluation date: 15 May 1999)

The genetic trend for cows is based on all cows recorded on the Livestock Improvement National Database up to the 1998/99 season. Also included are the estimated BW and PW for replacement stock (1997 and 1998 born animals). All evaluations can be compared across breeds. The genetic trend for BW by breed is presented in Graph 4.14. The Breeding Worth for all breeds has increased over time.

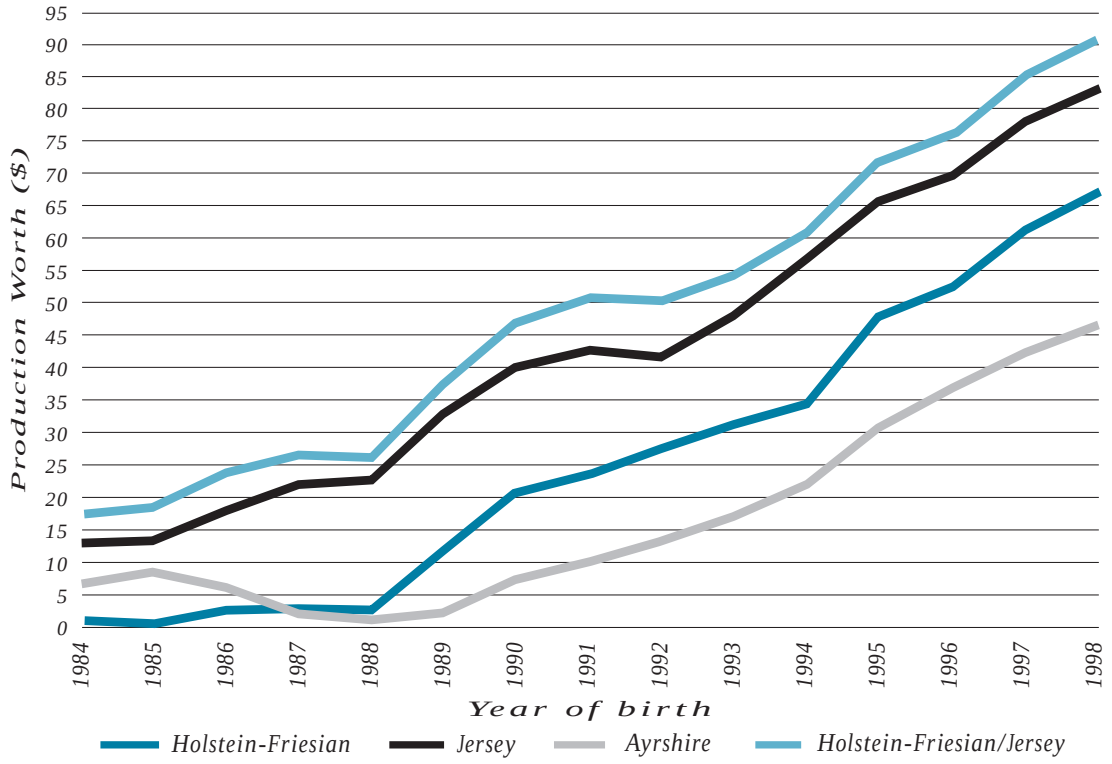
Graph 4.14: Genetic trend in Breeding Worth (BW) for all cows in 1998/99



(Evaluation date: 15 May 1999)

The trend for PW by breed is presented in Graph 4.15. Holstein-Friesian/Jersey crossbreds have maintained a higher PW over other breeds, caused by the effect of heterosis (hybrid vigour) in the crossbreds.

Graph 4.15: Trend in Production Worth (PW) for all cows in 1998/99



(Evaluation date: 15 May 1999)

Table 4.12 shows the average BVs and BW by breed, of all 1996 born cows. The Jersey breed has the highest BW at 52.1. Holstein-Friesian cows have the highest milkfat, protein, and milk volume BVs. All evaluations are comparable across breeds.

Table 4.12: Average Breeding Worth (BW) and Breeding Values (BV) of all cows by breed born in 1996

Breed	BW $	Fat BV (kg)	Protein BV (kg)	Milk Vol BV (l)	Liveweight BV (kg)	Survival BV (%)	Cow numbers
Holstein-Friesian	43.3	26.7	25.5	850	55.7	0.4	460,773
Jersey	52.1	12.9	5.3	–97	–45.1	0.3	118,534
Ayrshire	27.8	8.4	13.1	430	5.3	–0.3	10,701
Hol-Fr X Jersey	49.8	21.7	17.0	432	10.2	0.4	148,163
Guernsey	–7.2	–2.4	2.0	36	17.8	–2.8	203
Milking Shorthorn	–7.0	–5.1	3.4	97	18.7	–1.9	1,313
Brown Swiss	–21.7	–9.6	3.7	106	43.8	–3.1	171
Other	34.3	14.8	14.7	432	14.0	–0.1	25,295
Weighted average	45.2	22.8	20.1	600	29.1	0.3	

Evaluation date 15 May 1999

Survivability is measured by the percentage of cows that have lactations recorded for consecutive years. The 1998/99 season 2-3 years figure is the percentage of cows that were milking as 2-year-olds in 1997/98 season and are now milking as 3-year-olds in the 1998/99 season. Table 4.13 shows that for the 1998/99 season the highest percentage of survival is in animals ageing from 3-4 years.

Table 4.13: Survivability percentages since 1996/97

	Percentage (%) of age group surviving to next lactation						
	2-3 years	3-4 years	4-5 years	5-6 years	6-7 years	7-8 years	8-9 years
1996/97	83.8	84.3	84.0	80.9	77.6	73.7	68.5
1997/98	84.8	85.8	84.8	81.1	77.0	73.2	67.8
1998/99	83.6	85.4	85.1	82.4	79.5	75.1	70.1