

4. Herd improvement

A. Use of herd testing

Herd testing enables farmers to collect information about individual cows in their herds. The information gained from herd testing is vital for effective herd management and decision making. Farmers are able to benchmark animal performance within herd, within region, and nationally.

Farmers had the choice of two herd testing service providers in 2005/06 (AmBreed and LIC) and were able to choose the frequency of testing.

Herd testing involves the collection of individual milk samples from every milking animal in the herd. A full herd test provides information on milk volumes, milkfat and protein yields, and somatic cell counts.

Information from herd testing cannot be gained in any other way. Herd test information identifies low producing cows (for culling or drying off), high producers (for breeding), and cows with mastitis (for therapy or culling). Herd testing also provides an overall picture of the production of the herd, and enables the mastitis status to be monitored.

The regions in Chapter 4 refer to areas used by LIC. Appendix 1 shows a list of districts included in each region.

- **76% of herds undertake herd testing in 2005/06**

The percentage of total herds using herd testing increased slightly to 76.4% in 2005/06 (Table 4.1). This figure is down 10.8% from the highest percentage of herd testing set in 1996/97. Although the total cow population decreased slightly (3.83 million), more were tested (2.85 million) compared with last season (2.81 million). The percentage of total cows tested increased to 74.3%.

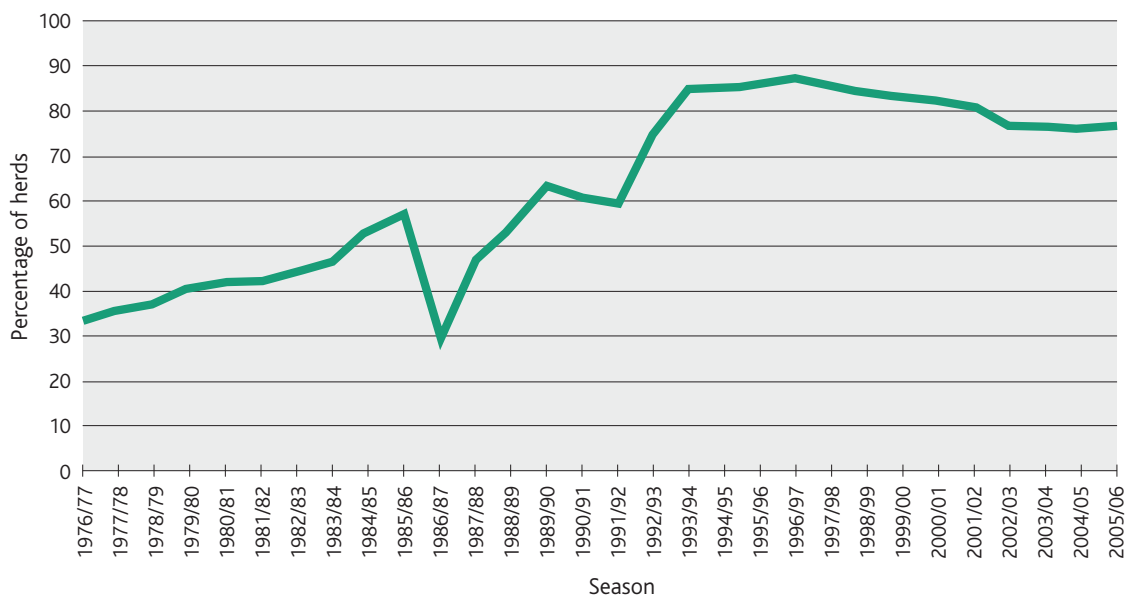
Table 4.1 **Trend in the use of herd testing services for the last 20 seasons**

Season	Number of herds	% of total herds	Number of cows (000)	% of total cows	Total herds	Total cows
1986/87	4,555	29.7	753	33.0	15,315	2,281,849
1987/88	6,930	46.8	1,175	52.5	14,818	2,236,290
1988/89	7,932	53.8	1,341	59.1	14,744	2,269,073
1989/90	9,213	63.1	1,604	69.3	14,595	2,313,822
1990/91	8,918	60.7	1,566	65.2	14,685	2,402,145
1991/92	8,661	59.9	1,611	66.1	14,452	2,438,641
1992/93	10,843	75.0	2,039	78.3	14,458	2,603,049
1993/94	12,372	84.8	2,377	86.9	14,597	2,736,452
1994/95	12,446	85.0	2,474	87.4	14,649	2,830,977
1995/96	12,620	85.6	2,592	88.3	14,736	2,935,759
1996/97	12,851	87.2	2,746	89.6	14,741	3,064,523
1997/98	12,510	85.3	2,826	87.7	14,673	3,222,591
1998/99	12,059	84.0	2,819	85.7	14,362	3,289,319
1999/00	11,521	83.1	2,806	85.8	13,861	3,269,362
2000/01	11,472	82.6	2,942	84.4	13,892	3,485,883
2001/02	11,113	81.4	2,974	80.5	13,649	3,692,703
2002/03	10,113	77.0	2,855	76.3	13,140	3,740,637
2003/04	9,772	76.6	2,842	73.8	12,751	3,851,302
2004/05	9,306	75.8	2,811	72.7	12,271	3,867,659
2005/06	9,082	76.4	2,846	74.3	11,883	3,832,145

Herd improvement – Use of herd testing

The trend in the percentage of total herds using herd testing increased slightly in the 2005/06 season.

Graph 4.1 *Trend in the percentage of herds testing for the last 30 seasons*



The regional uptake of herd testing services in 2005/06 is shown in Table 4.2, where the number of cows tested refers to all cows tested at least once in the season. Taranaki had the highest percentage of herds using herd testing (81.8%) and also reported the highest percentage of cows herd testing (81.7%).

Table 4.2 *Use of herd testing by LIC region in 2005/06*

LIC Region	Herds tested	Total herds	% of total herds	Cows tested	Total cows	% of total cows	Average herd size tested	Average herd size
Northland	894	1,221	73.2	232,012	311,132	74.6	260	255
Auckland	3,528	4,688	75.3	1,013,547	1,379,633	73.5	287	294
Bay of Plenty/East Coast	494	642	76.9	141,976	190,347	74.6	287	296
Taranaki	1,585	1,938	81.8	394,311	482,620	81.7	249	249
Wellington/Hawkes Bay	900	1,131	79.6	288,848	373,258	77.4	321	330
South Island	1,681	2,263	74.3	775,496	1,095,155	70.8	461	484
New Zealand	9,082	11,883	76.4	2,846,190	3,832,145	74.3	313	322

Note: Table includes figures from both herd test providers

B. Herd test averages

The lactation yield figures in this section are for cows herd tested. Season and breed averages (parts i and iii) are calculated on lactation yields for herds tested four or more times during the season. Monthly averages (part ii) are calculated on lactation yields for herds tested at least once during the season, and only cows that lactated for one hundred days or more were included in herd test averages. In comparison, the average milksolids figures given in Chapters 2 and 3 (national and regional dairy statistics respectively) 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 will 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 fewer than four tests reduces the calculated average lactation length. Therefore, the number of days in milk does not necessarily reflect the average lactation length of dairy cows.

The days-in-milk (production) figure is the number of days from the estimated start of lactation to the estimated end of lactation (reported since 1997/98). The results are derived from seasonal supplier tanker pick-up information adjusted for calving spread. The days-in-milk (production) methodology provides a more accurate measure of the average lactation length of dairy cows than days-in-milk (herd testing).

i) Season averages

- **South Island has the highest herd test production (kg)**
- **Taranaki has the highest milkfat, protein and milksolids percentages**

Average per cow statistics for each LIC region is summarised in Table 4.3. The days-in-milk figure derived from tanker pick-up dates (production) more accurately reflects the lactation length than does the days-in-milk figure derived from herd tests and calving dates (herd testing).

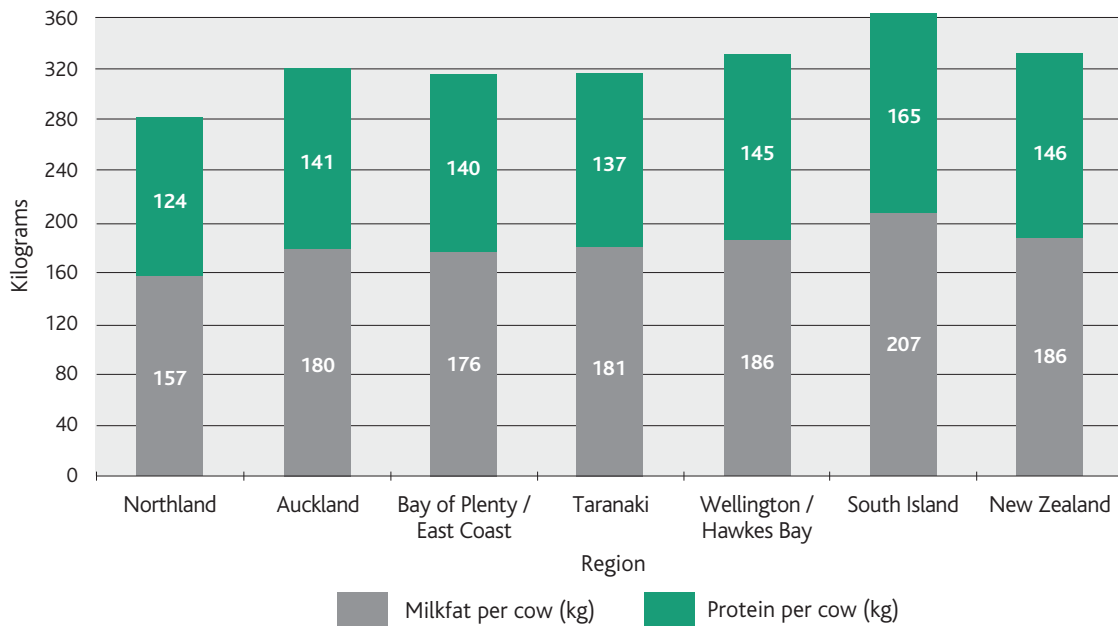
The South Island recorded the highest per cow milk volume (4,451 litres), milkfat (207 kg) and protein (165 kg) of cows herd tested. Taranaki recorded the highest percentages for milkfat (5.11%), protein (3.87%) and milksolids (8.94%).

Table 4.3 **Season herd test averages per cow by LIC region in 2005/06**

LIC Region	Milk (litres)	Milkfat (kg)	Milkfat (%)	Protein (kg)	Protein (%)	Milksolids (kg)	Milksolids (%)	Days in milk (herd testing)	Days in milk (production)	Somatic cell count (000 cells/millilitre)
Northland	3,415	157	4.62	124	3.62	281	8.23	223	269	221
Auckland	3,845	180	4.70	141	3.65	321	8.35	229	266	198
Bay of Plenty / East Coast	3,924	176	4.52	140	3.59	316	8.05	226	271	254
Taranaki	3,556	181	5.11	137	3.87	318	8.94	228	266	210
Wellington / Hawkes Bay	3,970	186	4.68	145	3.63	331	8.34	228	267	236
South Island	4,451	207	4.63	165	3.68	372	8.36	227	271	228
New Zealand	3,951	186	4.72	146	3.68	332	8.40	227	266	213

The 2005/06 milkfat and protein lactation regional averages of herd tested cows (Graph 4.2) show some variability in figures between all regions, with milkfat production ranging from 157 (Northland) to 207 kg per cow (South Island) and protein production from 124 (Northland) to 165 kg per cow (South Island).

Graph 4.2 Average milkfat and protein production per cow in 2005/06



• Increase in production per cow (kg) for 2005/06

The last twenty years have seen a general trend of increasing production in both milk volume and milksolids. However, in individual years this trend can be masked by other factors, in particular, weather conditions. The 1998/99 season recorded 260kg milksolids per cow, the lowest in more than 10 years (table 4.4).

The sharp decrease in the average somatic cell count per millilitre of milk from 1993/94 onwards compared with the seasons prior to 1993/94, as shown in Table 4.4, is due to a number of factors, including industry pressure for improved milk quality and farm management practice. However, a consistent trend upwards has appeared over the last several seasons.

Table 4.4 Trend in the national herd test averages for the last 20 seasons

Season	Milk (litres)	Milkfat (kg)	Milkfat (%)	Protein (kg)	Protein (%)	Milksolids (kg)	Milksolids (%)	Days in milk (herd testing)	Days in milk (production)	Somatic cell count (000 cells/ millilitre)
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	264	8.26	237	-	265
1989/90	3,221	152	4.72	117	3.66	269	8.35	235	-	358
1990/91	3,190	152	4.81	116	3.65	268	8.40	222	-	298
1991/92	3,361	162	4.83	124	3.70	286	8.51	226	-	282
1992/93	3,298	157	4.77	121	3.65	278	8.43	221	-	280
1993/94	3,560	171	4.84	131	3.69	302	8.48	223	-	216
1994/95	3,253	154	4.77	118	3.64	272	8.36	208	-	206
1995/96	3,501	164	4.72	126	3.60	290	8.28	224	-	206
1996/97	3,641	173	4.78	133	3.66	306	8.40	223	-	197
1997/98	3,373	158	4.67	119	3.52	277	8.21	209	266	195
1998/99	3,189	147	4.51	113	3.44	260	8.15	208	266	200
1999/00	3,601	169	4.69	130	3.58	299	8.30	221	263	193
2000/01	3,706	173	4.68	134	3.59	307	8.28	224	268	196
2001/02	3,791	176	4.64	138	3.61	314	8.28	227	268 ^a	210
2002/03	3,736	175	4.68	138	3.66	313	8.38	219	-	213
2003/04	3,871	184	4.75	142	3.64	326	8.42	224	265	220
2004/05	3,812	181	4.75	140	3.66	321	8.42	225	265	229
2005/06	3,951	186	4.72	146	3.68	332	8.40	227	266	213

- Not available

^a Average excludes Northland, Taranaki and Wellington/Hawkes Bay

ii) Monthly averages

- *Highest average production per cow per day occurred in September*

The seasonal average figures presented in Table 4.5 are calculated using national monthly herd test averages, and are therefore affected by the number of samples processed. Statistics for May, June and July are based on far fewer cows than the statistics for other months, as only a few herds (generally winter 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.

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

Table 4.5 *Monthly herd test averages by LIC region in 2005/06*

Average litres of milk per cow per day

LIC Region	2005							2006					Season average
	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	
Northland	14.98	14.82	18.63	19.87	18.43	16.78	14.62	13.00	12.21	9.25	8.74	11.54	14.64
Auckland	17.18	17.32	20.53	21.77	20.27	18.53	16.98	15.31	14.21	10.66	9.67	11.03	16.16
BOP / East Coast	13.86	13.34	20.92	22.47	21.11	19.37	17.73	15.00	14.39	11.84	10.22	11.69	16.70
Taranaki	16.83	12.50	18.81	20.41	19.46	17.51	15.41	14.62	13.10	10.01	8.87	10.51	15.01
Wgtn / Hawkes Bay	15.91	16.11	19.97	22.25	21.34	19.69	17.51	15.34	14.20	11.06	10.77	12.69	16.51
South Island	17.54	17.80	20.42	24.09	24.08	22.48	20.36	18.40	17.04	15.02	13.05	12.31	18.69
New Zealand	16.09	16.35	20.10	21.83	21.41	19.29	17.86	15.62	14.86	11.56	10.86	11.91	16.64

Average kg of milkfat per cow per day

LIC Region	2005							2006					Season average
	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	
Northland	0.68	0.68	0.81	0.88	0.82	0.76	0.66	0.62	0.58	0.50	0.47	0.60	0.68
Auckland	0.76	0.74	0.93	0.98	0.91	0.85	0.78	0.74	0.69	0.57	0.53	0.59	0.77
BOP / East Coast	0.66	0.58	0.89	0.96	0.90	0.84	0.78	0.68	0.67	0.61	0.54	0.58	0.75
Taranaki	0.81	0.65	0.89	0.96	0.93	0.87	0.78	0.77	0.70	0.58	0.54	0.59	0.77
Wgtn / Hawkes Bay	0.72	0.73	0.87	0.99	0.96	0.90	0.81	0.73	0.69	0.59	0.58	0.66	0.78
South Island	0.79	0.79	0.89	1.07	1.06	1.01	0.91	0.85	0.83	0.76	0.70	0.66	0.88
New Zealand	0.73	0.73	0.90	0.98	0.96	0.89	0.82	0.75	0.73	0.61	0.60	0.64	0.79

Average kg of protein per cow per day

LIC Region	2005							2006					Season average
	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	
Northland	0.52	0.54	0.68	0.72	0.66	0.60	0.52	0.47	0.45	0.37	0.35	0.45	0.53
Auckland	0.61	0.61	0.75	0.79	0.72	0.67	0.61	0.56	0.52	0.42	0.40	0.45	0.59
BOP / East Coast	0.50	0.48	0.75	0.80	0.74	0.68	0.62	0.53	0.52	0.46	0.41	0.45	0.60
Taranaki	0.62	0.49	0.70	0.77	0.73	0.67	0.59	0.57	0.52	0.42	0.38	0.45	0.58
Wgtn / Hawkes Bay	0.56	0.59	0.72	0.81	0.76	0.71	0.63	0.56	0.53	0.44	0.44	0.50	0.61
South Island	0.62	0.61	0.71	0.87	0.87	0.81	0.73	0.68	0.65	0.60	0.54	0.52	0.70
New Zealand	0.57	0.58	0.73	0.79	0.77	0.70	0.64	0.58	0.56	0.46	0.45	0.49	0.62

Average somatic cell count (000 cells per millilitre)

LIC Region	2005							2006					Season average
	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	
Northland	240	242	183	174	173	181	209	224	246	287	322	303	221
Auckland	228	220	177	160	160	155	169	181	218	240	284	301	198
BOP / East Coast	324	410	277	204	191	184	202	224	244	253	305	369	254
Taranaki	324	282	197	163	159	160	173	179	207	233	263	267	210
Wgtn / Hawkes Bay	270	274	250	202	197	199	208	230	239	274	272	278	236
South Island	265	284	285	205	187	189	193	212	217	229	247	274	228
New Zealand¹	254	264	198	174	172	170	185	198	221	246	273	285	213

¹ Volume weighted averages

iii) Breed averages

- *Holstein-Friesian cows show highest milksolids (kg) production*

Herd test statistics by breed (Table 4.6) include cows herd tested four or more times during the season.

On average, Holstein-Friesian/Jersey Crossbreed cows produced more milkfat than the other breeds listed, while Holstein-Friesian cows produced more protein and a higher volume of milk. Jerseys have the highest milkfat and protein percentages. In the Holstein-Friesian breed, six-year-old cows produced more milk, and five-year-olds more milksolids than any other age group. Five-year-olds dominated production for Jerseys and Holstein-Friesian/Jersey Crossbreeds, while six-year-olds had the highest production for Ayrshires.

A crossbreed is defined as having at most 13/16 of any one breed. For example, a Holstein-Friesian/Jersey Crossbreed may be 13/16 Holstein-Friesian, 2/16 Jersey and 1/16 Ayrshire.

Table 4.6 *Herd test breed averages by age of cow in 2005/06*

Holstein-Friesian

Age	Number	Days in milk	Milk (litres)	Milkfat (kg)	Protein (kg)	Milksolids (kg)	Milkfat (%)	Protein (%)	Milksolids (%)
2	181,056	226	3,464	150.1	122.3	272.4	4.37	3.54	7.91
3	162,673	219	3,958	173.0	140.7	313.8	4.41	3.57	7.98
4	155,883	219	4,340	191.7	154.6	346.2	4.46	3.58	8.04
5	131,097	220	4,605	198.1	162.6	360.7	4.34	3.54	7.88
6	103,656	219	4,628	196.7	162.7	359.3	4.29	3.53	7.82
7	85,166	217	4,554	193.2	159.2	352.5	4.28	3.51	7.79
8	69,246	216	4,427	191.2	155.5	346.6	4.35	3.52	7.87
9	51,147	214	4,363	187.4	151.2	338.5	4.32	3.48	7.80
10+	75,768	210	3,973	172.5	137.6	310.1	4.37	3.47	7.84
Total	1,015,692	219	4,184	181.1	147.5	328.6	4.37	3.54	7.91

Jersey

Age	Number	Days in milk	Milk (litres)	Milkfat (kg)	Protein (kg)	Milksolids (kg)	Milkfat (%)	Protein (%)	Milksolids (%)
2	67,908	228	2,536	143.1	101.9	245.0	5.67	4.03	9.70
3	62,994	224	2,880	164.7	118.0	282.8	5.74	4.11	9.85
4	57,414	224	3,123	180.1	128.7	308.8	5.80	4.13	9.93
5	48,860	225	3,266	185.9	133.8	319.6	5.72	4.11	9.83
6	39,299	224	3,244	185.3	133.8	319.1	5.73	4.14	9.87
7	31,102	223	3,132	179.9	129.8	309.7	5.77	4.16	9.93
8	25,224	221	3,119	177.1	128.5	305.6	5.70	4.13	9.83
9	16,018	217	3,029	169.4	124.1	293.5	5.62	4.11	9.73
10+	19,703	213	2,888	160.0	116.7	276.6	5.57	4.05	9.62
Total	368,522	224	2,989	170.2	122.4	292.6	5.72	4.10	9.82

Holstein-Friesian/Jersey crossbreed

Age	Number	Days in milk	Milk (litres)	Milkfat (kg)	Protein (kg)	Milksolids (kg)	Milkfat (%)	Protein (%)	Milksolids (%)
2	157,087	228	3,152	154.7	118.2	272.8	4.95	3.77	8.72
3	138,985	223	3,638	180.1	138.3	318.4	5.00	3.82	8.82
4	120,001	223	3,964	197.8	151.2	349.0	5.04	3.83	8.87
5	95,661	224	4,165	205.2	157.9	363.0	4.97	3.81	8.78
6	72,772	223	4,131	203.8	157.1	360.9	4.98	3.82	8.80
7	55,741	221	4,025	199.2	152.9	352.1	5.00	3.82	8.82
8	46,513	220	3,965	196.1	150.8	346.9	4.98	3.82	8.80
9	24,111	217	3,942	190.6	146.8	337.4	4.88	3.75	8.63
10+	33,432	212	3,667	176.0	135.0	311.0	4.83	3.70	8.53
Total	744,303	223	3,765	185.7	142.5	328.2	4.98	3.80	8.78

Herd improvement – Herd test averages – Breed averages

Ayrshire

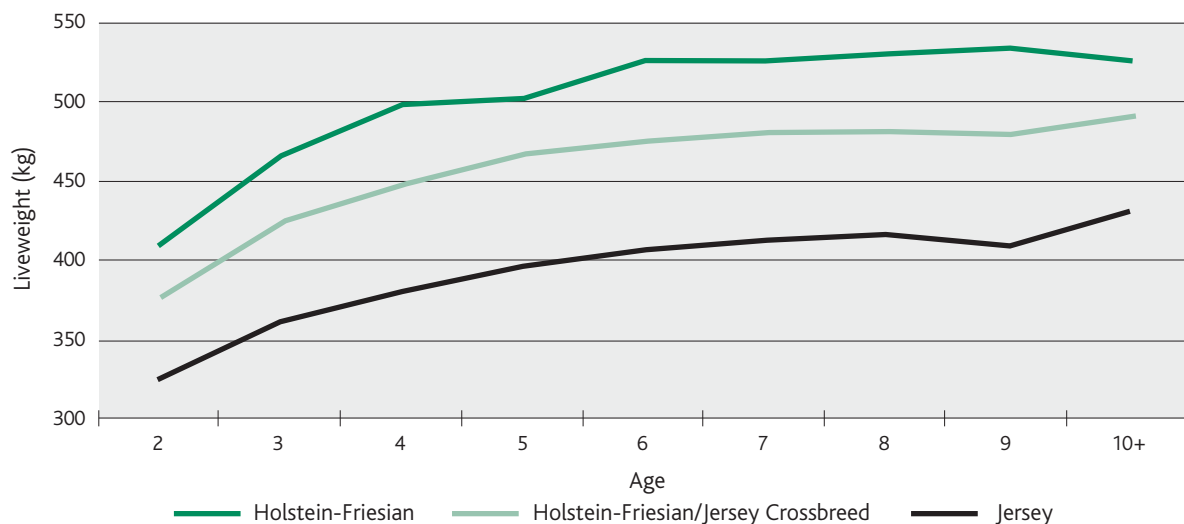
Age	Number	Days in milk	Milk (litres)	Milkfat (kg)	Protein (kg)	Milksolids (kg)	Milkfat (%)	Protein (%)	Milksolids (%)
2	4,067	228	3,048	134.3	108.2	242.4	4.42	3.55	7.97
3	3,615	223	3,495	152.8	125.7	278.5	4.40	3.60	8.00
4	3,364	223	3,890	168.9	140.1	308.9	4.36	3.61	7.97
5	2,908	224	4,030	174.4	144.6	319.0	4.36	3.59	7.95
6	2,347	225	4,131	178.9	148.3	327.2	4.36	3.60	7.96
7	2,045	222	4,037	172.6	144.2	316.8	4.30	3.58	7.88
8	1,685	223	4,042	173.8	144.3	318.1	4.32	3.58	7.90
9	1,286	219	3,839	164.7	136.5	301.2	4.31	3.56	7.87
10+	1,911	217	3,735	158.4	131.4	289.7	4.25	3.52	7.77
Total	23,228	223	3,731	161.6	133.4	295.0	4.36	3.58	7.94

Holstein-Friesians have the highest average liveweight across all ages for the breeds shown in Table 4.7. In contrast, Jerseys have the lowest average liveweight for all ages. Liveweight by age and breed is illustrated in Graph 4.3.

Table 4.7 **Liveweight by age and breed of cow in 2005/06**

Age	Holstein-Friesian		Jersey		Holstein-Friesian/Jersey Crossbreed	
	Average liveweight (kg)	Number of cows	Average liveweight (kg)	Number of cows	Average liveweight (kg)	Number of cows
2	410	10,740	325	4,174	377	13,057
3	466	749	363	365	424	852
4	498	603	379	334	448	848
5	503	552	395	275	466	568
6	526	439	408	195	475	404
7	526	399	412	150	481	264
8	531	256	416	119	481	245
9	534	227	408	70	480	141
10+	526	307	431	93	490	189
Total	489		381		441	

Graph 4.3 **Liveweight by age and breed of cow in 2005/06**



C. Artificial Breeding statistics

- *South Island and Wellington/Hawkes Bay are the only regions with an increase in the number of cows to AB for 2005/06*

All artificial inseminations are recorded on the LIC Database. Table 4.8 provides a summary of cows mated to artificial breeding (AB) for the last nine seasons. This is the fourth consecutive season where the percentage of cows to AB is below 80% (Graph 4.4). The number of yearlings to AB has increased to 95,795 in 2005/06 (Table 4.8).

Graph 4.8 *Trend in Artificial Breeding use for the last nine seasons by LIC region: cows and yearlings to AB*

Cows to AB

LIC Region	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06
Northland	258,057	244,115	246,617	257,752	261,197	228,988	218,488	212,210	205,352
Auckland	1,069,038	1,066,442	1,057,618	1,096,379	1,089,655	1,030,788	1,025,071	1,019,596	981,242
BOP / East Coast	156,602	153,294	152,751	157,162	154,762	147,047	145,464	140,493	139,975
Taranaki	404,930	395,636	405,605	427,683	423,723	400,322	398,794	388,277	380,160
Wellington / Hawkes Bay	266,514	266,171	276,517	294,387	302,349	291,188	281,448	279,240	286,348
South Island	483,968	510,514	587,957	660,075	756,874	769,954	817,952	829,141	854,850
New Zealand	2,639,109	2,636,172	2,727,065	2,893,438	2,988,560	2,868,287	2,887,217	2,868,957	2,847,927

% Cows to AB

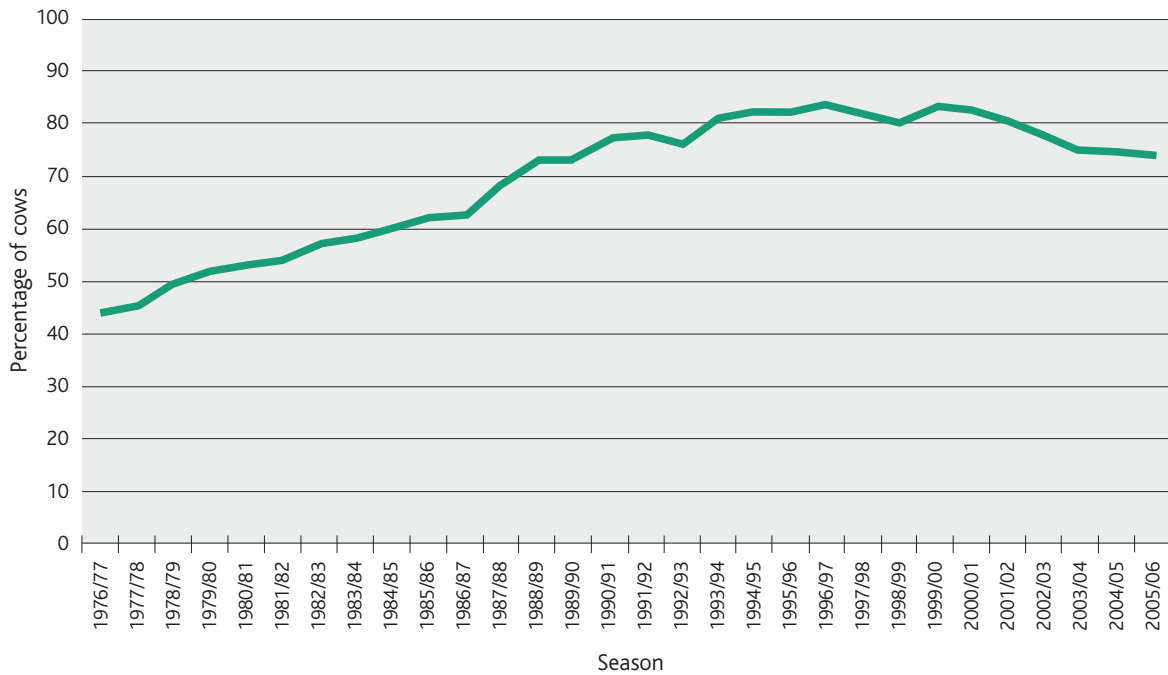
LIC Region	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06
Northland	83.1	71.0	69.5	76.4	74.4	66.3	64.3	64.2	66.0
Auckland	82.8	84.7	79.6	92.9	78.8	74.7	72.7	72.7	71.1
BOP / East Coast	84.8	80.7	81.6	85.2	81.8	77.9	74.8	73.2	73.5
Taranaki	84.4	82.2	81.8	88.7	84.6	82.7	80.5	78.5	78.8
Wellington / Hawkes Bay	80.7	76.9	74.2	81.5	79.3	76.1	72.6	72.8	76.7
South Island	77.3	76.3	78.7	91.2	85.2	80.3	79.8	78.0	78.1
New Zealand	81.9	80.1	78.2	88.5	80.9	76.7	75.0	74.2	74.3

Yearlings to AB

LIC Region	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06
Northland	15,966	11,188	9,825	10,437	10,942	7,982	7,765	7,428	8,490
Auckland	31,102	25,968	21,804	24,543	24,988	20,143	17,264	17,275	16,972
BOP / East Coast	10,317	7,854	7,250	8,492	8,929	6,763	4,691	5,014	6,645
Taranaki	8,428	5,748	5,700	7,698	7,528	8,220	3,703	3,268	3,373
Wellington / Hawkes Bay	9,887	6,223	6,313	7,823	7,517	5,948	5,076	5,960	7,330
South Island	35,159	34,906	41,469	56,743	55,680	47,162	39,401	40,019	52,985
New Zealand	110,859	91,887	92,361	115,736	115,584	96,218	77,900	78,964	95,795

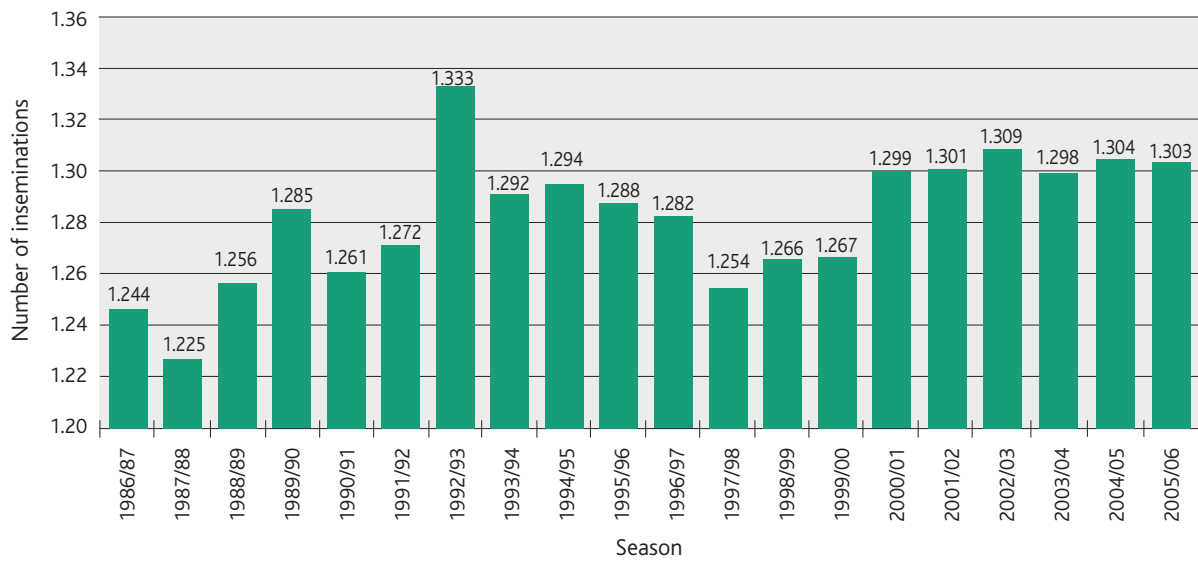
Herd improvement – Artificial breeding statistics

Graph 4.4 *Trend in the percentage of cows to Artificial Breeding for the last 30 seasons*



In 2005/06 the average number of inseminations per cow (1.30) as recorded on the LIC Database, was similar to previous seasons (Graph 4.5).

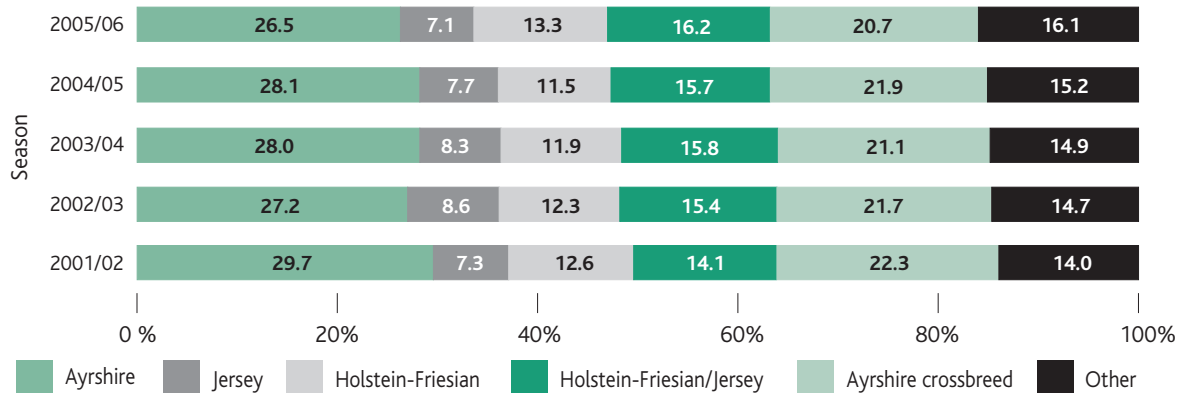
Graph 4.5 *Average number of inseminations per cow for the last 20 seasons*



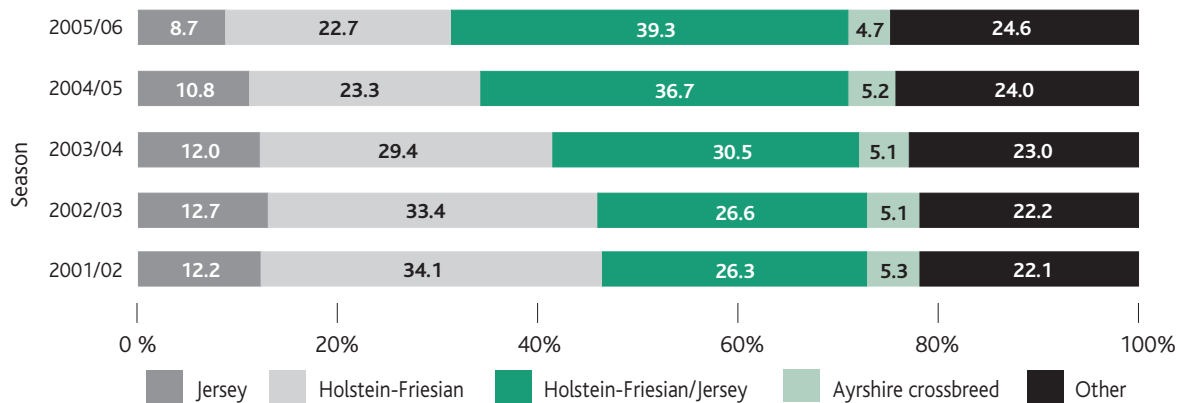
Herd improvement – Artificial breeding statistics

The use of Ayrshire, Holstein-Friesian, and Jersey semen over different cow breeds for the past five seasons is shown in the graphs below. Ayrshire semen use over Ayrshire cows is 26.5% (Graph 4.6). Crossbreed semen is used increasingly over Friesian/Jersey crosses followed by Friesian cows (Graph 4.7). The trend in the use of Jersey semen over Friesians is decreasing, but increasing over Jerseys (Graph 4.8). The percentage of Holstein-Friesian semen over Holstein-Friesian cows continues to decrease, and has been increasing over Friesian/Jersey crosses (Graph 4.9).

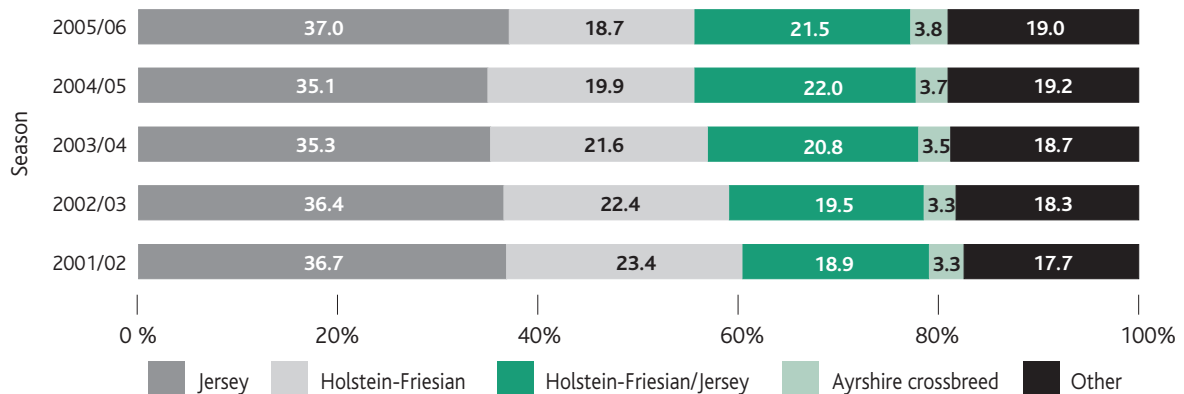
Graph 4.6 **Ayrshire semen usage (%) over cow breed for the last five seasons**



Graph 4.7 **Crossbreed semen usage (%) over cow breed for the last five seasons**

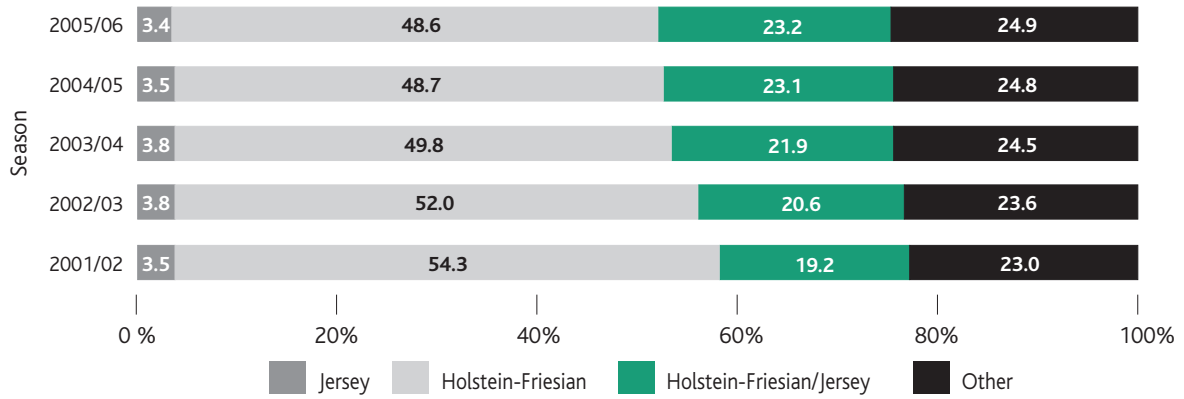


Graph 4.8 **Jersey semen usage (%) over cow breed for the last five seasons**



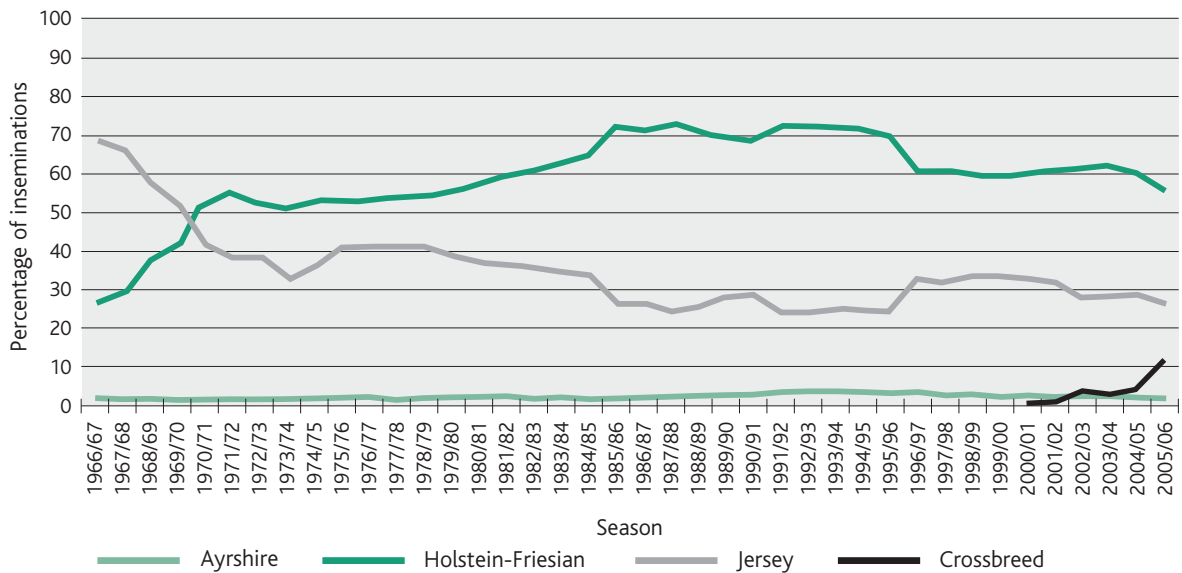
Herd improvement – Artificial breeding statistics

Graph 4.9 *Holstein-Friesian semen usage (%) over cow breed for the last five seasons*



The percentage of inseminations for each major breed (Holstein-Friesian, Jersey and Ayrshire) as recorded on the LIC Database is shown in Graph 4.10. The percentage of inseminations for the three breeds has decreased compared to the previous season. The percentage of inseminations for Crossbreed (shown for the last five seasons) increased from 4.0% in 2004/05 to 11.2% for the 2005/06 season.

Graph 4.10 *Trend in the percentage of inseminations of each major breed for the last 40 seasons*



D. Animal Evaluation

The genetic merit of New Zealand dairy cows and sires is estimated using statistical methods which 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 evaluation system is designed to compare animals irrespective of breed, both nationally and within herd, to assist farmers to select the most profitable animals for the future.

Two types of evaluation are calculated for New Zealand dairy animals:

- Trait evaluations** are estimates of an animal's genetic merit (*Breeding Values*), lifetime productive ability (*Production Values*) and current season productive ability (*Lactation Values*) for individual traits, including milkfat, protein, volume, liveweight, somatic cell, fertility and residual survival.
- Economic evaluations** combine an animal's individual trait evaluations to estimate its comparative 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 (Milkfat)	+
		Protein BV	x	\$EV (Protein)	+
		Milk BV	x	\$EV (Milk)	+
		Liveweight BV	x	\$EV (Liveweight)	+
		Somatic Cell BV	x	\$EV (Somatic cell)	+
		Fertility BV	x	\$EV (Fertility)	+
		Residual Survival BV	x	\$EV (Residual Survival)	

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. 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 2006 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 18 February 2006*

	Milkfat (\$/kg)	Protein (\$/kg)	Milk (\$/kg)	Liveweight (\$/kg)	Somatic Cell (\$/score)	Fertility (\$/%)	Residual Survival (\$/day)
Breeding Worth	1.251	6.328	-0.070	-0.987	-21.744	1.638	0.033
Production Worth	1.266	5.709	-0.067	-0.901	-	-	-
Lactation Worth	1.512	6.505	-0.077	-1.032	-	-	-

The information for all Animal Evaluation statistics was sourced from cows and sires recorded on the LIC Database as at 13 May 2006.



Herd improvement – Animal evaluation

Table 4.10 shows the Breeding Values (BV) and Breeding Worth (BW) by breed, of all bulls born in 2001 first proven in the 2005/06 season with a BW Reliability of 75% or greater. Reliability of BW is reported on a scale from 0% to 99%, where 0% indicates there are no performance records for any related animal used in the bull's evaluation, and 99% indicates the bull has a very large number of performance-recorded daughters.

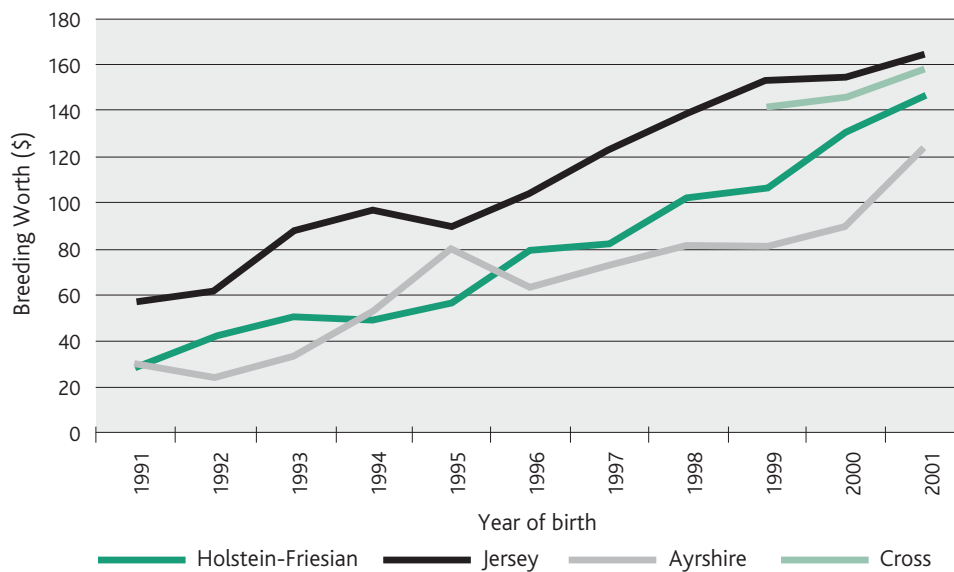
Table 4.10 **Average Breeding Values and Breeding Worth of 2001 born bulls (reliability of 75% or greater)**

Breed	Milkfat BV	Protein BV	Milk Volume BV	Liveweight BV	Somatic Cell BV	Fertility BV	Residual Survival BV	BW	Number of Bulls
Ayrshire	30.4	27.9	634.3	42.5	0.2	-1.3	42	124.3	4
Holstein Friesian	40.3	41.1	1182.1	73.6	0.3	-2.0	46	146.6	198
Jersey	30.9	15.9	81.6	-33.0	0.3	0.2	154	165.0	125
Holstein Friesian Jersey Cross	35.0	26.4	519.4	14.6	0.3	0.3	132	158.4	65

(Evaluation date: 13 May 2006)

The genetic trend of proven dairy bulls is shown in Graph 4.11. Bulls born in 2001 are first proven in the 2005/06 season.

Graph 4.11 **Genetic trend of proven dairy bulls by year of birth (reliability of 75% or greater)**



(Evaluation date: 13 May 2006)

Young bulls are initially selected for use in Artificial Breeding based on the genetic merit of their sire and dam. These young sires are then progeny tested to estimate their Breeding Worth more accurately via the performance of their daughters. Each year some progeny tested bulls are returned to service for use as proven sires.

Table 4.11 shows the number of sires, by birth year and breed, for which the reliability of the BW was at least 75%. 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 by birth year and breed (reliability of BW 75% or greater, includes overseas bulls)**

Year of Birth	Number of Sires	Holstein-Friesian	Jersey	Holstein-Friesian Jersey Cross	Ayrshire	Other Breeds
1991	412	262	104	0	32	14
1992	417	260	118	1	28	10
1993	405	239	121	0	37	8
1994	444	264	131	2	38	9
1995	469	287	137	0	40	5
1996	418	235	143	1	34	5
1997	414	254	126	3	26	5
1998	415	237	141	6	28	3
1999	380	201	125	23	28	3
2000	437	228	124	66	16	3
2001	392	198	125	65	4	0

(Evaluation date: 13 May 2006)

Herd improvement – Animal evaluation

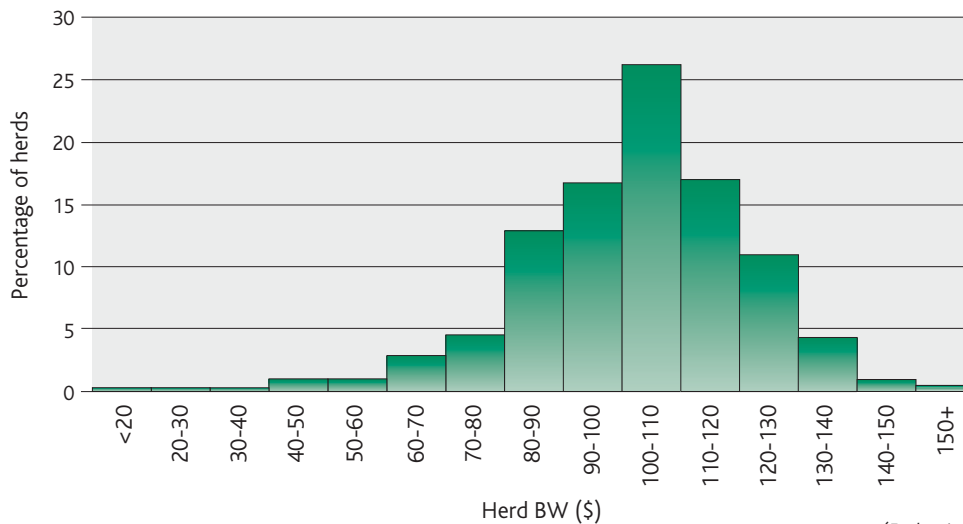
The Breeding Worth for **herds** presented below (Table 4.12 and Graph 4.12) is based on cows of the users of the LIC herd testing service, in herds with at least 80 cows, and signed up for herd testing in the 2005/06 season. Table 4.12 shows that 50% of these herds had a BW of 105 or above and 25% of these herds had a BW of 115 or above.

Table 4.12 **Herd Breeding Worth in 2005/06**

	Median	Top 5%	Top 10%	Top 25%	Bottom 25%	Bottom 10%	Bottom 5%
Herd BW	105	> 132	> 126	> 115	< 93	< 80	< 69

(Evaluation date: 13 May 2006)

Graph 4.12 **Distribution of Herd Breeding Worth in 2005/06**



(Evaluation date: 13 May 2006)

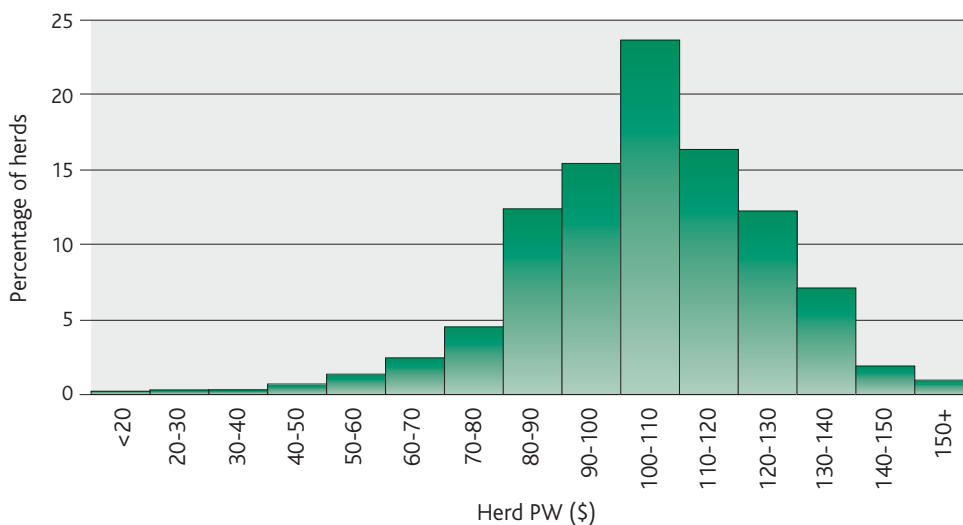
The Production Worth (PW) for **herds** presented below (Table 4.13 and Graph 4.13) is based on cows of the users of the LIC herd testing service, in herds with at least 80 cows, and signed up for herd testing in the 2005/06 season. Table 4.13 shows that 50% of these herds had a PW of 107 or above and 25% of these herds had a PW of 120 or above.

Table 4.13 **Herd Production Worth in 2005/06**

	Median	Top 5%	Top 10%	Top 25%	Bottom 25%	Bottom 10%	Bottom 5%
Herd PW	107	> 137	> 130	> 120	< 94	< 80	< 71

(Evaluation date: 13 May 2006)

Graph 4.13 **Distribution of Herd Production Worth in 2005/06**



(Evaluation date: 13 May 2006)

Herd improvement – Animal evaluation

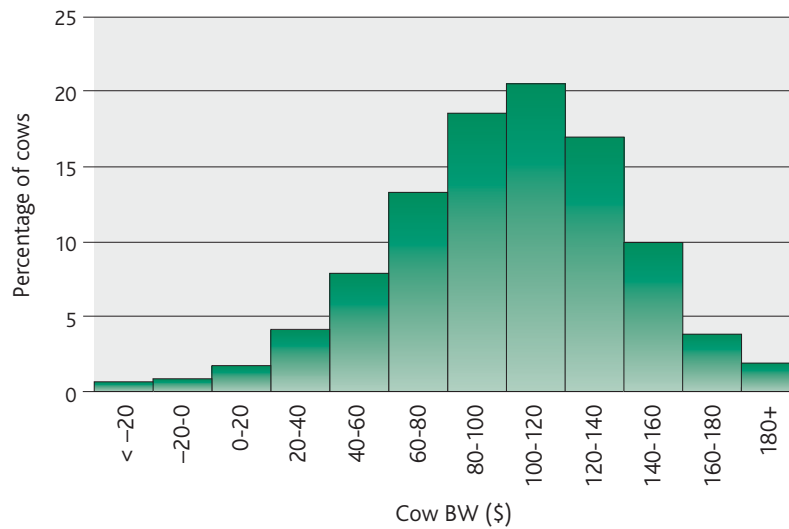
The Breeding Worth (BW) for **cows** presented below (Table 4.14 and Graph 4.14) is based on all cows of the users of the LIC herd testing service, in herds with at least 80 cows, and signed up for herd testing in the 2005/06 season. Table 4.14 shows that 50% of these cows had a BW of 105 or above and that 25% of these cows had a BW of 130 or above.

Table 4.14 **Cow Breeding Worth in 2004/05**

	Median	Top 5%	Top 10%	Top 25%	Bottom 25%	Bottom 10%	Bottom 5%
Cow BW	105	> 165	> 152	> 130	< 77	< 50	< 33

(Evaluation date: 13 May 2006)

Graph 4.14 **Distribution of Cow Breeding Worth in 2005/06**



(Evaluation date: 13 May 2006)

30

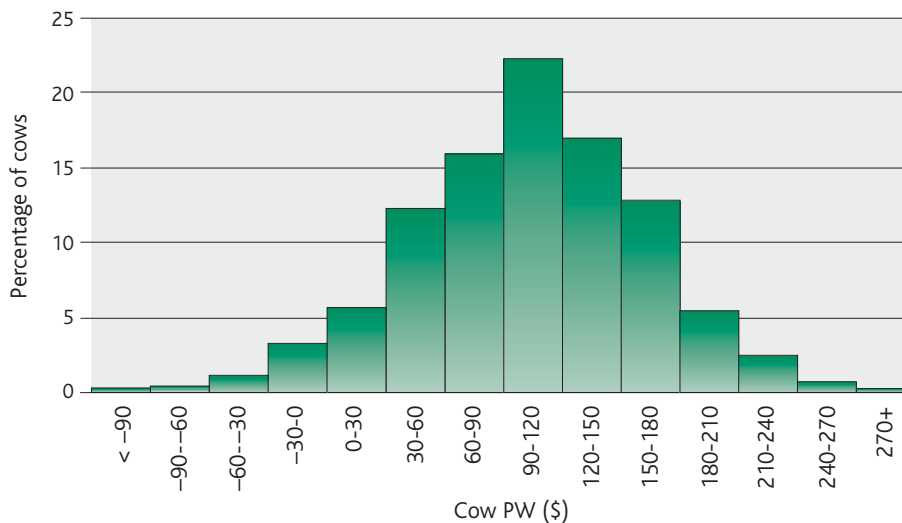
The Production Worth (PW) for **cows** presented below (Table 4.15 and Graph 4.15) is based on cows of the users of the LIC herd testing service, in herds with at least 80 cows, and signed up for herd testing for the 2005/06 season. Table 4.15 shows that 50% of these cows had a PW of 108 or above and that 25% of these cows had a PW of 145 or above.

Table 4.15 **Cow Production Worth in 2005/06**

	Median	Top 5%	Top 10%	Top 25%	Bottom 25%	Bottom 10%	Bottom 5%
Cow PW	108	> 200	> 179	> 145	< 68	< 30	< 6

(Evaluation date: 13 May 2006)

Graph 4.15 **Distribution of Cow Production Worth in 2005/06**

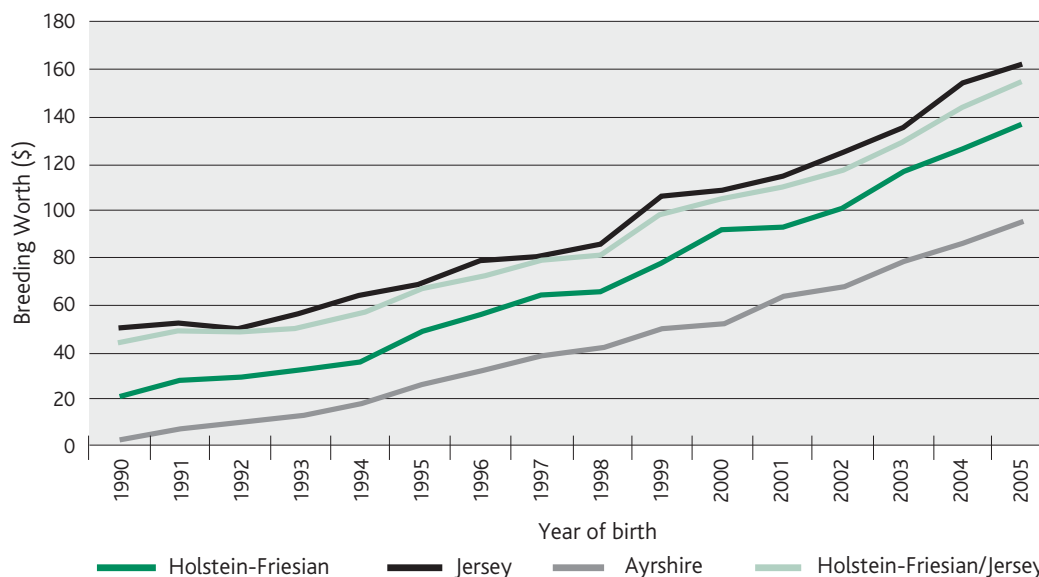


(Evaluation date: 13 May 2006)

Herd improvement – Animal evaluation

The genetic trend for cows is based on all cows (alive or dead) recorded on the LIC Database in the 2005/06 season. Also included are the estimated BW and PW for replacement stock (2004 and 2005 born animals). All evaluations can be compared across breeds. The genetic trend for BW by breed is presented in Graph 4.16. The Breeding Worth for all breeds has increased over time.

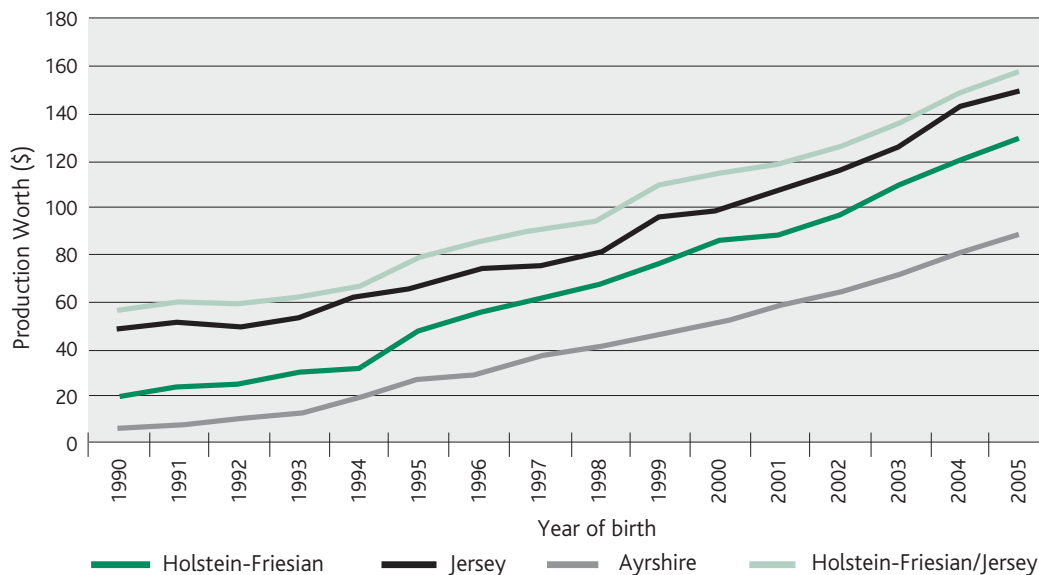
Graph 4.16 *Trend in Breeding Worth for all cows in 2005/06*



(Evaluation date: 13 May 2006)

The trend for PW by breed is presented in Graph 4.17. Holstein-Friesian/Jersey crossbreeds have maintained a higher PW over other breeds, partly caused by the effects of heterosis (hybrid vigour) in the crossbreeds.

Graph 4.17 *Trend in Production Worth for all cows in 2005/06*



(Evaluation date: 13 May 2006)

Table 4.16 shows the average BVs and BW by breed, of all 2003 born cows. The Jersey cows had the highest average BW at 134.4. The Holstein-Friesian cows had the highest milkfat, protein, and milk volume BVs. All evaluations are comparable across breeds.

Table 4.16 Average Breeding Worth and Breeding Value of all cows by breed born in 2003

Breed	BW \$	Milkfat BV (kg)	Protein BV (kg)	Milk Volume BV (l)	Liveweight BV (kg)	Somatic Cell BV (score)	Fertility BV (%)	Residual Survival BV (days)	Cow Numbers
Holstein-Friesian	115.6	30.8	33.4	981	61.2	0.31	-0.1	57	403,275
Jersey	134.4	22.4	11.5	33	-36.4	0.26	1.3	114	120,837
Ayrshire	77.1	13.3	18.0	541	13.5	-0.04	-5.6	186	8,318
Holstein-Friesian /Jersey	128.6	27.9	23.7	552	16.2	0.27	0.8	91	288,681
Guernsey	-26.3	0.8	5.1	175	22.7	0.51	-4.4	-200	137
Milking Shorthorn	3.8	-1.2	8.3	238	23.7	0.20	-2.8	52	720
Brown Swiss	-20.6	-1.1	11.5	327	50.2	0.09	-10.4	-18	99
Other	94.4	20.5	20.9	554	21.3	0.17	-1.8	87	28,935
Weighted Average	121.4	28.1	26.4	681	30.2	0.28	0.3	79	851,002

(Evaluation date: 13 May 2006)

Survivability is measured by the percentage of cows that have a lactation recorded for consecutive years. The 2005/06 season 2-3 years figure is the percentage of cows that were milking as two-year-olds in the 2004/05 season and are now milking as three-year-olds in the 2005/06 season. Table 4.17 shows that for the 2005/06 season the highest percentage of survival is in animals ageing from 4-5 years (87.6%), followed by animals ageing from 3-4 years (87.5%).

Table 4.17 Survivability percentages since 1996/97

Season	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	84.9	85.1	84.8	81.6	78.2	74.2	69.0
1997/98	85.9	86.7	85.6	81.9	77.7	73.9	68.3
1998/99	84.5	86.1	85.8	83.0	80.0	75.5	70.5
1999/00	84.1	86.2	85.8	82.8	80.7	76.3	70.8
2000/01	85.3	86.7	86.5	83.2	80.1	76.5	71.7
2001/02	85.6	88.4	86.8	84.3	80.8	77.1	73.5
2002/03	85.7	85.9	86.6	83.8	80.8	76.0	71.2
2003/04	85.2	86.9	86.0	83.0	78.7	74.8	69.4
2004/05	85.7	87.3	86.7	82.7	79.7	74.6	69.6
2005/06	85.0	87.5	87.6	84.2	79.7	76.7	70.6