DHI user's guide

Western Canadian Dairy Herd Improvement Services

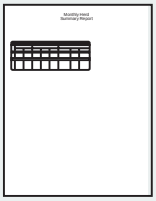
MONTHLY HERD SUMMARY REPORT

Report objectives

- to summarize past and present herd performance
- to predict future herd performance
- to provide an analysis of current test day results and lactation curves by stage of lactation and lactation number
- to list test day results for the previous 12 tests

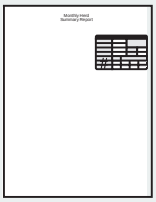
Subsection objectives

ROLLING HERD AVERAGE - COWS WITH BCA



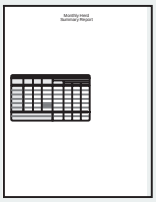
- to provide a rolling average of ‘terminated records’ from the previous 365 days in terms of BCAs and kgs of milk, fat and protein

PREVIOUS 12 MONTHS PRODUCTION



- to indicate average production of milk (kg), fat (kg and %) and protein (kg and %) in the herd for the past 12 months
- to provide data to calculate total herd production available for shipment for the past 12 months
- to provide indicators of management performance

STAGE OF LACTATION PROFILE

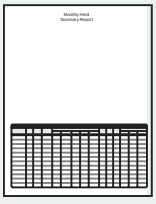


- to subdivide the herd into five stages of lactation
- to evaluate herd response to management changes
- to be used as a guide in monitoring lactation production patterns
- to be used as an indicator of herd calving patterns

TEST DAY SUMMARY

- to indicate animal distribution among lactation groups
- to provide performance data on each lactation group
- to provide an analysis of lactation curve characteristics

TEST DAY SUMMARY (PREVIOUS 12 TESTS)



- to detect herd trends in terms of production, average days in milk, current BCAs, calving patterns and cow turnover rates

Report checklist

ROLLING HERD AVERAGE - COWS WITH BCA

- ✓ check # of records included in RHA relative to total # of cows in herd
- ✓ compare the herd's RHA to its previous month's RHA

PREVIOUS 12 MONTHS PRODUCTION

- ✓ check # of cow years relative to total # of cows in herd
- ✓ calculate productivity per cow year by multiplying # of cow years by either milk, fat or protein kg
- ✓ goal : average days dry within the 45-60 day range
- ✓ goal : average calving interval within 12.0-12.4 months for herds averaging < 8000 kg milk per lactation and within 12.5-13.0 months for herds > 8000 kg

STAGE OF LACTATION PROFILE

- ✓ compare % distribution of cows across all stages to the recommended % distribution table in this guide (page 10)
- ✓ note differences in actual, projected and completed production figures across consecutive stages of lactation
- ✓ compare the herd's current herd averages to the Regional and Provincial breed averages

TEST DAY SUMMARY

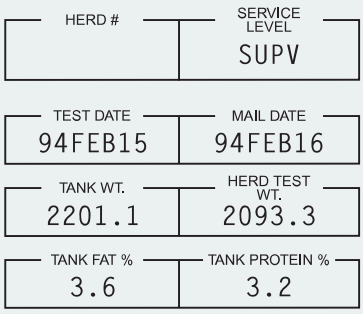
- ✓ check % distribution of cows across all 3 lactation groups
- ✓ compare production averages (BCAs) across all 3 groups
- ✓ compare peak milk production across all 3 lactation groups
- ✓ goal : peak production for first lactation cows within the 50-70 days in milk (DIM) range; for second and later lactation cows within the 35-55 DIM range
- ✓ compare post-peak % persistency figures for all three lactation groups to persistency reference figures

TEST DAY SUMMARY (PREVIOUS 12 TESTS)

- ✓ look for trends in each column
- ✓ goal : DIM within 150-175 day range
- ✓ compare standard milk across test dates to identify management factors responsible for changes in production
- ✓ look for an age-related effect on production: compare changes in standard milk to changes in average age of herd
- ✓ review changes in # of cows milking relative to # of cows dry
- ✓ review turnover rates: # cows sold/died relative to # cows entering herd
- ✓ look for changes in the current herd average BCAs - this will reflect the future direction of the BCA.

Explanation and Interpretation of output

HERD AND TEST DATE INFORMATION



In the top left corner of the Monthly Herd Summary Report the following are listed:

- HERD #;
- SERVICE LEVEL;
- TEST DATE;
- MAIL DATE;
- TANK WT. : the one-day milk production in kilograms on the date of the test. This may be calculated either from a bulk tank measurement or from the most recent pick-up slip, adjusted for milk used on the farm;
- HERD TEST WT. : the total of the test day weights (kg) for all cows tested;
- TANK FAT % : average percent fat for a sample of milk taken from the bulk tank on the date of the test.
- TANK PROTEIN % : average percent protein for a sample of milk taken from the bulk tank on the date of the test.

If tank data are not available, N/A is printed in the respective boxes.

ROLLING HERD AVERAGE - COWS WITH BCA

ROLLING HERD AVERAGE - COWS WITH BCA

BREED	# OF RECORDS		BCA			PRODUCTION		
	ACTIVE COWS	INCLUDED IN AVE	MILK	FAT	PROTEIN	MILK KG	FAT KG	PROTEIN KG
H	48	81	174	171	184	8393	303	279
ROLLING BREED AVERAGE - MULTI-BREED HERDS								

The Rolling Herd Average (RHA) is the average of *terminated records* in the herd for the last 365 days. The average *rolls* forward at each test date. Individual cow records included in the RHA calculation are listed in Table 1. A record will enter the RHA at day 305 or at termination date, if less than 305 days when completed. The RHA includes all cows that have *completed* a BCA during the last 365 days. It is updated at each test date as new cow records are added and records that were completed more than 365 days ago are deleted. Supervised (official) herds receive a RHA only if there are 8 or more cows with terminated records. Owner sampler herds receive a RHA with no minimum requirements.

RHA contributions for cows purchased and sold

When a cow 120 or more days in milk (DIM) is sold to another DHI herd owner, her projected BCA and production record is used in calculating the RHA for the *seller's* herd, even though the record is completed in the buyer's herd. When a cow less than 120 days-in-milk is sold to another DHI herd owner, her BCA and production record is used in calculating the RHA in the *buyer's* herd.

Table 1 : Terminated records included in the Rolling Herd Average.

DAYS IN MILK	COW STATUS	EFFECT ON RHA
< 120	dry/sold/died	no BCA calculated not included in RHA
≥ 120	dry	actual BCA included in RHA
≥ 120 and < 305	sold/died	projected BCA included in RHA
≥ 305	all	actual BCA included in RHA

The ROLLING HERD AVERAGE table lists the following information:

- BREED : in a single breed herd, the first letter of the breed milked in the herd is entered; in a multi-breed herd, this box is left blank;
- # OF RECORDS : if a cow has 2 records in the last 365 days, both records are included in the RHA or ROLLING BREED HERD AVERAGE (RBHA: see below) calculation;
  - ACTIVE COWS : the number of records included in RHA or RBHA for only those cows *currently* in the herd;
  - INCLUDED IN AVE : the total number of records included in RHA or RBHA.
- BCA - MILK, FAT, PROTEIN : the sum of the respective BCAs divided by the number of records with BCAs;
- PRODUCTION - MILK KG, FAT KG, PROTEIN KG : the sum of 305 day yields for records included in RHAor RBHA divided by the number of records.

A ROLLING BREED HERD AVERAGE (RBHA) is calculated for multiple breed herds. Supervised (official) herds receive a RBHA if there are 8 or more cows of the same breed with terminated records. Owner sampler herds receive a RBHA without any minimum requirements. A maximum of 4 RBHA results will be printed.

PREVIOUS 12 MONTHS PRODUCTION

This section of the Monthly Herd Summary Report shows the average production per cow over the past 12 months. All cows that were part of the herd at any time in the previous 12 months are included in this section. The average number of cows in the herd (in the previous 12 month period) is reported as # OF COW YEARS. This is calculated as follows: each cow, including dry and nursing cows, accumulates a *cow day* for each day she is in the herd; 365 cow days make one cow year. Calculated in this way, the milk production of cows that were in the herd for only part of the year is represented accurately in the average.

The # OF COW YEARS is usually greater than the # OF RECORDS INCLUDED IN AVE (in the RHA table) because cow years includes cows with long dry periods as well as cows culled before 120 days in milk.

PREVIOUS 12 MONTHS PRODUCTION reports the average production of the whole herd over the last 12 month period. The average production is determined for MILK KG, FAT KG and PROTEIN KG and is calculated as follows:

$$\frac{\text{Total production on test days last 12 months}}{\text{number of tests in last 12 months}} = \text{Ave production per test in last 12 months}$$

$$\frac{\text{Ave production per test in last 12 months}}{\text{NUMBER OF COW YEARS}} \times 365 = \text{MILK, FAT or PROTEIN KG}$$

PREVIOUS 12 MONTHS PRODUCTION				
# OF COW YEARS	84			
MILK KG	8510			
FAT KG	310	FAT %	3.6	
PROTEIN KG	282	PROTEIN %	3.3	
	AVE	% OF COWS		
DAYS DRY	68	< 40 20	40 - 70 40	> 70 40
CALVING INTERVAL	12.8	< 12 43	12 - 13.5 28	> 13.5 29

The MILK KG x # OF COW YEARS should be equal to the amount of milk produced. This production minus adjustments for milk used on the farm is useful in quota management and cash flow predictions. PREVIOUS 12 MONTHS PRODUCTION reflects the true average production per cow in the herd over the last 12 months.

The average FAT % and PROTEIN % for the herd are shown to the right of FAT KG and PROTEIN KG. These are calculated as follows:

$$\frac{\text{FAT (or PROTEIN) KG}}{\text{MILK KG}} \times 100 = \text{FAT (or PROTEIN) \%}$$

Relationship between RHA PRODUCTION and PREVIOUS 12 MONTHS PRODUCTION

In a herd with an average calving interval (see AVE CALVING INTERVAL below) *longer* than 12 months, the average production in the PREVIOUS 12 MONTHS PRODUCTION section is often *lower* than the average production in the RHA table. Conversely, a herd with a calving interval *shorter* than 12 months, will often have a *higher* average production in the PREVIOUS 12 MONTHS PRODUCTION section than in the RHA table. A herd with a 12 month calving interval will have a similar average production in both tables.

Cows culled before 120 DIM *are not* included in the RHA or RBHA but *are* included in the calculation of PREVIOUS 12 MONTHS PRODUCTION.

DAYS DRY is the number of days between the last dry date and the last calving date. For dry cows, only the previous completed dry period is reported. Abnormally long or short dry periods will have an adverse effect on the profitability of a dairy operation. A short dry period does not provide cows with adequate rest, nor does it allow sufficient time for mammary involution and regeneration. A long dry period results in higher feed costs with no milk production returns. Figure 1 shows the results of a study (involving 281,816 cows) illustrating that a minimum of 40 days dry is a necessity, but anything over 70 days is a needless expense.

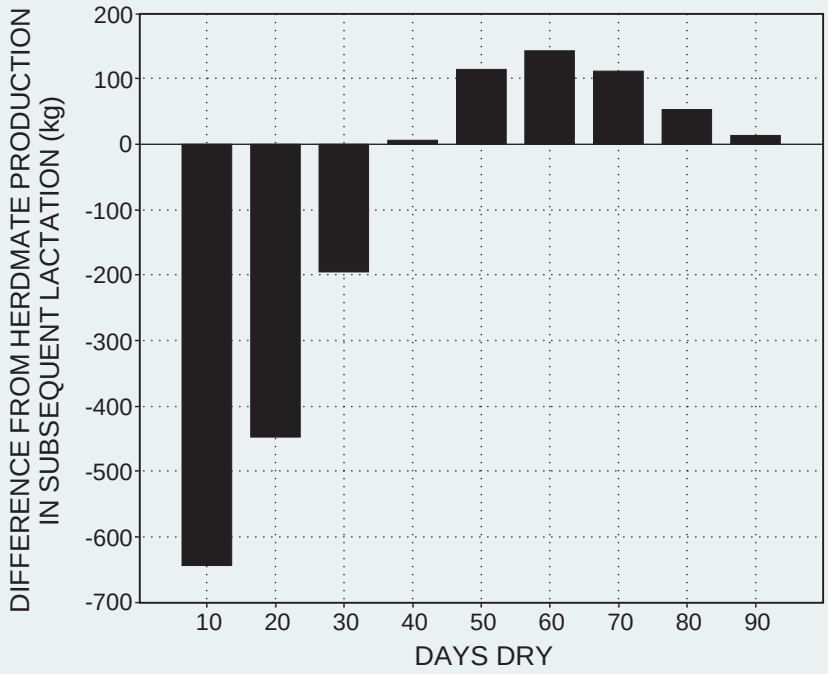


Figure 1. Effect of days dry on difference from herdmate production in the subsequent lactation.

AVE DAYS DRY of 50 days for 2+ lactation cows and 60 days for heifers is advisable. Improper dry period length is costly. Dry periods of less than 30 days or more than 60 days have been estimated to result in a loss of approximately $3.00 per day for every day beyond these limits.

It is possible for a herd to have a normal AVE DAYS DRY figure even when problems exist. For example, if half the cows have a 30 day dry period, while the other half are dry for 90 days, the average days dry for the herd would be 60 days, yet neither a 30 day nor a 90 day period is desirable. The distribution of DAYS DRY into < 40, 40 - 70 and > 70 day categories helps to identify this type of problem. Table 2 suggests practical goals.

DAYS DRY	< 40	40 - 70	> 70
% of cows	5	85	10

Table 2 : Suggested goals for DAYS DRY *distribution.*

CALVING INTERVAL is the number of months between the last two calvings. It is, therefore, calculated only for cows that have calved at least twice. AVE CALVING INTERVAL includes all cows currently in the herd - culled cows are not included. Purchased cows are included if the previous calving dates are known. Research indicates that the annual milk production of herds with a calving interval of under 11.9 months or over 13.0 months is significantly less than that of herds with a calving interval of 12.0 to 12.9 months.

Calving interval cannot be directly controlled, since it is determined by the number of days open (days to last breeding) in the previous lactation. Aspects of reproductive management that can be controlled are: days to first service, heat detection rate, and conception rate. Therefore, the calving interval is an indication of what has happened from 9 months to approximately 2 years prior to the current test date. Average calving interval does not indicate current reproductive efficiency status.

It is possible for a herd to have a normal AVE CALVING INTERVAL even when breeding problems exist. For example, one cow with a calving interval of 15 months and 3 cows with 11-month intervals would result in a 12 month AVE CALVING INTERVAL, yet neither 11 months nor 15 months is desirable.

Table 3 : Losses in returns to operator's labour and management associated with extended calving intervals.

Calving Interval (months)	Loss/Cow ($/lactation)
12.6	0.00
13.0	0.36
13.3	14.62
13.6	32.96
14.0	57.54
14.3	88.92

Since days to last breeding determines the calving interval of a cow, it has a direct effect on production per day of life. Longer calving intervals mean lower productivity per day of life. The losses this entails are shown in table 3.

Extended calving intervals result in fewer calves being born each year. For each month that the calving interval is extended beyond 12 months, there will be an 8% reduction in the number of calves born in the herd each year. The effect of calving interval on the number of herd replacements available is shown in table 4.

Table 4 : Effect of calving interval on herd replacements available in 100 cow herd assuming that 75% of the female calves born survive to freshening.

Calving Interval	Average # of calves born per year	Bred Heifers available for herd replacements per year
12	100	38
13	92	35
14	84	32
15	76	29

The DHI Breeding Guide Plus option provides more current information on a herd's reproductive performance.

STAGE OF LACTATION PROFILE

The STAGE OF LACTATION PROFILE shows the number of cows, and percentage of the herd, in various stages of lactation on test day. As well, the columns are summarised to give the HERD TOTAL. Current REGIONAL and PROVINCIAL BREED AVERAGES are presented for comparison. The # OF COWS column includes all cows in the herd on the current test date. The % OF HERD shows the herd distribution on test day as a percentage of the whole herd. It reveals the uniformity of the herd's calving pattern. This distribution is correlated with the length of the calving interval. Table 5 shows a normal distribution for a herd with a 12.0-12.5 month average calving interval.

Table 5 : Normal DIM distribution of cows in a herd with 12.0 - 12.5 month calving interval.

DAYS IN MILK	% OF HERD
1 - 65	15 - 20
66 - 200	34 - 40
201 - 305	25 - 30
over 305	0 - 10
dry	15

AVE DAILY PRODUCTION is the average milk production in kg for cows in each stage of lactation on test day. Production for cows with missing or invalid milk weights or data flags are not included. The distribution of AVE DAILY PRODUCTION is an approximation of the herd's complete lactation curve.

STAGE OF LACTATION PROFILE

STAGE (DIM)	# OF COWS	% OF HERD	AVE DAILY PRODUCTION	CURRENT HERD AVERAGE			
				MILK KG	CURRENT BCA		
					MILK	FAT	PROTEIN
1 - 65	19	22	35.2	8670	175	165	167
66 - 200	33	38	31.3	8781	187	187	197
201 - 305	20	23	23.2	8773	191	194	202
OVER 305	4	5	19.4	9880	209	205	219
DRY	12	14		7896	173	177	182
HERD TOTAL	88	100	29.5	8686	185	185	193
REGIONAL BREED AVE				7990	172	161	171
PROVINCAL BREED AVE				8228	179	169	179

Milking a large number of cows in late lactation tends to reduce average daily milk production, while milking a large number of cows in early lactation will increase the average daily milk production for the herd (see also AVE DAYS IN MILK).

CURRENT HERD AVERAGE 305 day production for cows in each stage of lactation is also reported as MILK KG. For cows 1 - 65, 66 - 200 or 201 - 305 days in milk, MILK KG is the average 305 day projected milk yield on the current test day. For cows OVER 305 DIM and DRY cows, the actual 305 day milk yield is used. Cows less than 45 DIM and cows with no projections (because necessary data is missing) are not included in average MILK KG. The breakdown by stage of lactation can indicate changes in future production levels in the herd.

In the CURRENT BCA for MILK, FAT and PROTEIN columns, the average projected (or actual) BCA of all cows with BCAs at each lactation stage on test day is provided. The current BCA is a better indicator of the herd's management than RHA. A change in projected BCAs from the previous test day may be caused by changes in management practices. Individual cows who experience a change in projected BCA of >15 points are identified in the DHI Management Tips option. Most changes in BCA projections occur in the first 200 days of lactation.

The REGIONAL and PROVINCIAL BREED AVERAGES are calculated only when there are at least 5 herds with cows of that breed in the the region or province. In multi-breed herds, the REGIONAL and PROVINCIAL BREED AVERAGES for the predominant breed are given.

TEST DAY SUMMARY

TEST DAY SUMMARY				
		LACTATION #		
		1ST	2ND	3RD+
# OF COWS		38	21	29
% OF COWS		43%	24%	33%
CURRENT BCA	MILK	176	198	186
	FAT	187	193	177
	PROTEIN	192	202	187
PEAK MILK	AVE KG	29.3	40.4	43.0
	AVE DIM	73	42	51
PERSISTENCY %	DIM 66 +	96	89	89
PERSISTENCY REFERENCE	66 +	96	92	91

The TEST DAY SUMMARY table presents a comparison of 1ST, 2ND and 3RD+ lactation animals as of the current test day. The effectiveness of the breeding and heifer management program is illustrated by comparing the 1ST lactation animal results with those of the older cows. The # OF COWS row shows the total number of cows, including dry cows, in each lactation group. It is important to obtain the lactation number of purchased cows so that they can be included in the correct lactation group. If no lactation number is available, they will be included in the first lactation group. Table 5 shows a typical distribution of the % OF COWS in each lactation group.

CURRENT BCA in the TEST DAY SUMMARY are the MILK, FAT and PROTEIN BCA averages for cows in each lactation group on test day. They include projected and actual BCAs and are more current than the ROLLING HERD AVERAGE BCAs.

Table 5 : Typical distribution of cows by lactation group.

Lactation group	1ST	2ND	3RD+
% OF COWS	30	20	50

The BCAs of the first lactation cows should be equal to or better than the herd average. However, it is important to note that second and later lactation cows may have higher BCAs since they have survived the selection process during the entire first lactation. In other words, the older cows are the best of their group and reflect a bias due to the selection that has already occurred. If the BCAs of first lactation cows are consistently lower than herd average BCA, check:

- genetic level of sires of first lactation cows;
- size and body condition of heifers before calving;
- access to feed and water - first lactation cows are not as aggressive as older cows;
- nutrient balance of the lactation rations - due to growth requirements, a problem with the milk cow ration may initially show up in the first lactation cows;
- average age at first calving - heifers that calve at an older age will have a lower BCAs than heifers with identical milk production that calve at a younger age.

PEAK MILK AVE KG is the average of the highest test day yields recorded for cows within a lactation group. Cows included must have a minimum of 2 valid test day weights.

PEAK MILK AVE DIM is the average number of days in milk on which peak test day yields were recorded.

PEAK MILK has a direct effect on lactation yields. For each kg increase in peak yield, the 305-day lactation yield will increase by 200 - 250 kg if normal persistency can be maintained. A typical mature cow reaches peak production between 40 and 60 days in milk. First lactation animals reach peak levels between 45 and 70 DIM. In general, cows in high producing herds peak higher and later in lactation. Table 6 shows relationships between 305 day yield, peak yield and DIM to peak. Notice that every kg of peak milk results in a greater increment of 305 day milk as production level rises.

Table 6 : Relationships between peak milk and peak DIM by herd production level.

305 day Milk (kg)	Peak Milk (kg)	Peak DIM	Peak Ratio[1]
6686	31.4	57	1 : 213
7766	35.0	59	1 : 222
8339	37.3	60	1 : 224
8955	39.5	63	1 : 227
9950	42.7	65	1 : 233

based on data from 655 herds
[1]the ratio between Peak and 305 day Milk

Mature cows should be expected to peak higher than first- or second- lactation animals. Relationships between peak yields are normally as follows:

- 1st lactation peak : 75-80% of peak for second lactation.
- 1st lactation peak : 70-73% of peak for mature cows;
- 2nd lactation peak : 92-93% of peak for mature cows;

PERSISTENCY % is an indicator of how closely the milk test weights for a lactation group follow a normal lactation curve. It measures the change in milk production between two consecutive test days, standardized to a 30 day interval. Between calving and peak milk production, persistency will normally be greater than 100%, indicating increasing production. After peak, as production decreases, persistency will normally be in the 91-98% range as suggested in table 7.

Table 7 : Average persistency values for Holsteins, calculated from the ADHIS database.

	LACTATION NUMBER		
	1	2	3+
DIM	-------- PERSISTENCY % --------		
5 - 35	141	131	136
36 - 65	102	97	97
66 - 95	98	94	94
96 - 125	97	93	92
126 - 155	96	92	91
156 - 185	96	92	91
186 - 215	96	92	91
216 - 245	96	92	91
246 - 275	96	92	91
276 - 305	96	93	91

In the TEST DAY SUMMARY table, PERSISTENCY % is the average persistency between tests for cows which have 2 or more tests after 65 DIM. PERSISTENCY REFERENCE suggests guidelines for each lactation group in the 66+ DIM region of the lactation curve.

When persistencies are significantly outside the normal range, cows are likely not producing milk up to their genetic potential. High persistencies after peak may indicate that a significant number of cows in the lactation group are failing to reach their potential peak production. This is most commonly due to a poorly balanced ration and/or inadequate feed intake in early lactation. Similarly, low post-peak persistencies may be due to poorly balanced rations, low energy intake or depleted body reserves resulting from inadequate nutrient intake in early lactation.

PEAK MILK and PERSISTENCY % are helpful in evaluating herd performance. Although low production can be caused by many factors, some possible reasons for low peak production and/or low lactation persistency are:

- inadequate nutrition in early lactation;
- subclinical, chronic or acute mastitis;
- low genetic potential;
- short or long dry period;
- early breeding - less than 45 days;
- disease at calving and/or during early lactation;
- poor dry period nutrition;
- inadequate milking system;
- substandard housing and/or feeding system.

The DHI Lactation Curves option User Guide and Persistency of Milk Production publication provide additional information on the interpretation of peak milk and persistency.

TEST DAY SUMMARY (PREVIOUS 12 TESTS)

This section summarises information on each of the previous 12 tests, providing a convenient source of herd trend information. The most recent test appears at the top of the list and the least recent at the bottom.

The 12 test dates are shown in the DATE TESTED column. DAYS IN PERIOD reports the number of days between consecutive tests.

The AVE DAYS IN MILK column reports the average stage of lactation for the herd on each test day. Herds that calve uniformly throughout the year will have a consistent average days in milk ranging from 150 to 175 days in milk for a 12 - 13 month calving interval. Average days in milk varying from test day to test day can be a result of reproductive problems or an uneven calving pattern. Longer days in milk translates into lower average daily milk production and lower total lifetime production per cow. A reasonable goal for AVE DAYS IN MILK is 150 -175 days.

TEST DAY SUMMARY (PREVIOUS 12 TESTS)														
DATE TESTED	DAYS IN PERIOD	AVE DAYS IN MILK	AVE AGE OF HERD YR-MO	MILKING COWS					# DRY COWS	# COWS SOLD/ DIED	# COWS ENTERED HERD	CURRENT BCA		
				#	MILK/DAY KG	FAT %	PROTEIN %	STANDARD MILK/DAY KG				MILK	FAT	PROTEIN
94FEB15	35	154	3-09	76	29.5	3.6	3.3	31.4	12	1	5	185	185	193
94JAN11	32	141	3-10	74	30.6	3.8	3.3	32.6	10	1	3	185	186	195
93DEC10	31	161	3-10	72	28.8	3.7	3.4	31.1	10	2	4	182	183	192
93NOV09	28	138	3-11	69	29.3	3.7	3.4	31.0	13	7	6	182	183	193
93OCT12	39	157	4-00	73	27.5	3.8	3.4	30.0	11	9	7	180	180	190
93SEP03	23	150	4-03	76	26.1	3.7	3.2	27.3	10	2	3	174	172	180
93AUG11	29	156	4-02	71	26.8	3.7	3.3	28.2	14	0	1	174	173	181
93JUL13	32	140	4-02	68	29.3	3.6	3.2	29.8	16	4	4	176	173	183
93JUN11	30	157	4-03	77	29.9	3.5	3.2	30.2	7	1	5	180	174	187
93MAY12	28	159	4-03	69	30.1	3.4	3.2	30.4	11	4	1	182	173	189
93APR14	36	149	4-02	69	28.8	3.7	3.3	30.2	14	7	4	178	174	188
93MAR09	28	162	4-02	71	28.7	3.5	3.4	30.6	15	6	1	181	177	190

AVE AGE OF HERD is calculated and recorded in number of years and months on test day. The average age of the cows in the herd gives an indication of the longevity of the cows in the herd. Mature cows produce more milk than heifers, while new heifers should bring genetic improvements. A low AVE AGE OF HERD indicates rapid cow turnover which may reduce profitability because of the high cost of raising replacements. When the AVE AGE OF HERD is high, the rate of genetic improvement will be reduced due to fewer heifers entering the herd.

Research at the University of Alberta has determined that the optimal economic replacement time occurs at the end of the third lactation (see figure 3). The average age of the herd would then be about 4.8 years (assuming : average heifer calves at 24 months; 12.5 month calving interval; 305 day 3rd lactation).

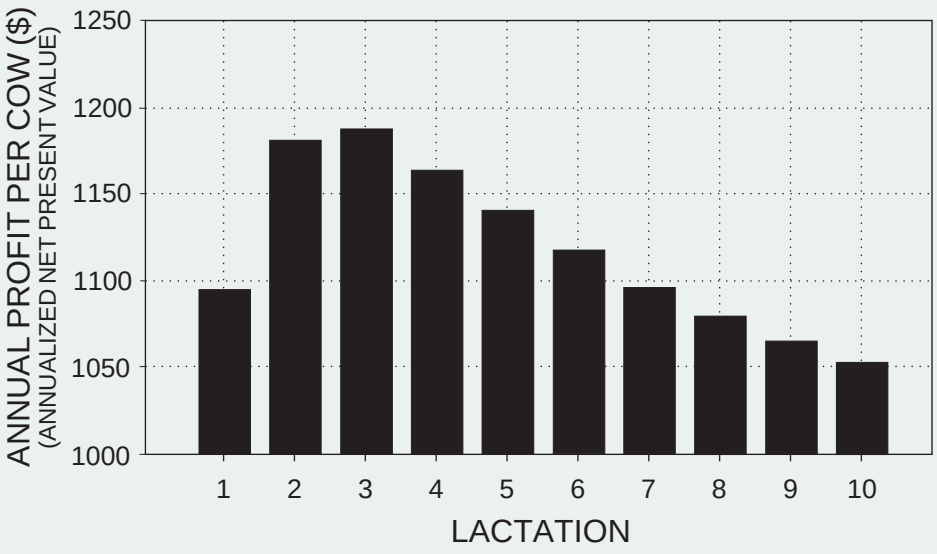


Figure 3 : Annual profit per cow reported as Annualized Net Present Value after replacement at the end of specified lactations.

MILKING COWS				
#	MILK/DAY KG	FAT %	PROTEIN %	STANDARD MILK/DAY KG

The # of MILKING COWS is the total number of cows milked on each of the last 12 test days. In a typical herd, about 85 % of all the cows are milking on any given test day (see cow distribution under the STAGE OF LACTATION PROFILE section).

MILK/DAY KG is the average milk production for the milking cows on each test day. Production for cows with missing or invalid milk weights is not included in the calculation. This value also appears on the HERD TOTAL line of the STAGE OF LACTATION PROFILE.

The number one reason for low production is inadequate nutrition. Other causes include :

- mastitis (high SCC);
- poor reproduction (long AVE DAYS IN MILK);
- high proportion of heifers (low AVE AGE OF HERD).

FAT % and PROTEIN % are the weighted average component levels for the herd on each test day. They are calculated as follows:

for each cow :

$$[\text{FAT (or PROTEIN) \%} / 100] \times \text{MILK KG} = \text{FAT (or PROTEIN) KG}$$

$$\frac{\text{sum of cow FAT (or PROTEIN) KGs}}{\text{sum of cow MILK KGs}} \times 100 = \text{FAT (or PROTEIN) \% for herd}$$

Production for cows with missing or invalid milk weights, missing samples or data flags is not included in these calculations.

STANDARD MILK/DAY KG makes it possible to compare average milk production from test to test. Production is standardized to :

- a FAT % of 3.5;
- a PROTEIN % of 3.2;
- 150 AVE DAYS IN MILK;
- a herd mix of 30% 1ST LACTATION, 20% 2ND LACTATION and 50% 3RD+ LACTATION animals.

STANDARD MILK/DAY KG is an improvement upon the idea of *adjusted-corrected milk* and is similar to Management Level Milk which is used by some DHI processing centres in the US. Factors used for standardization are derived from Western Canadian test results compiled in the ADHIS database. For more information on the calculation of STANDARD MILK, refer to pages 17-18.

How Standard Milk is Calculated

The average production level for the herd on test day is reported as MILK/DAY KG in the TEST DAY SUMMARY (PREVIOUS 12 TESTS) section of the Monthly Herd Summary Report. MILK/DAY KG varies from test to test as a result of :

- changes in season, weather, temperature and humidity;
- changes in feed intake;
- milk component variations resulting from changes in rations and feeding schedules;
- the proportion of 'fresh' versus 'stale' cows in the herd as indicated by AVE DAYS IN MILK;
- the changing mix of heifers and older cows in the herd.

Some of these factors have predictable effects on milk yield. The calculation of STANDARD MILK removes the influence of these predictable effects, making it possible to focus on other causes of test to test changes in production volume.

Adjustment of milk yield, fat % and protein % to 150 DIM equivalent

Stage of lactation affects both milk yield and milk component levels. Figure A shows average lactation curves for MILK KG, FAT % and PROTEIN % for 2nd lactation Holsteins in the ADHIS database. A cow currently at 250 days in milk (DIM) would be expected to produce less milk with higher fat and protein tests than the same cow at 150 DIM. To compare cows at different stages of lactation, STANDARD MILK adjusts all cows to their equivalent 150 DIM MILK KG, FAT % and PROTEIN %.

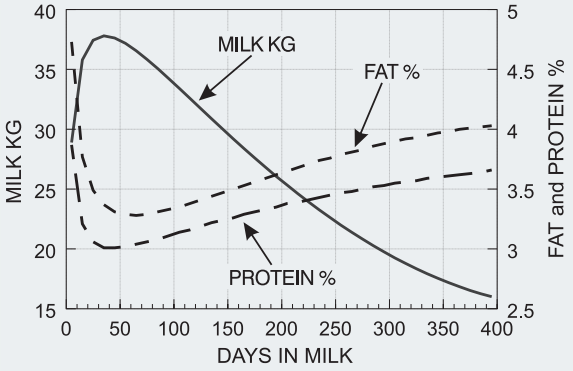


Figure A : Average milk, fat and protein production curves for 2nd lactation Holsteins.

For example, at 250 DIM the average 2nd lactation Holstein (figure A), produces 22.6 kg of milk with a 3.74% fat test and 3.49% protein. If she were at 150 DIM, she would have produced 29.6 kg of milk with 3.48% fat and 3.25% protein. To adjust her current production to 150 DIM, *adjustment* factors derived from the ADHIS database are used. In this case :

	at 250 DIM	adjustment factor	at 150 DIM
MILK KG	22.6	1.31	29.6
FAT %	3.74	0.93	3.48
PROTEIN %	3.49	0.94	3.25

Correction of 150 DIM adjusted milk yield to 3.5% fat, 3.2% protein

A cow producing milk with high fat and protein levels should be credited with increased production because more energy is required to produce higher component milk. Conversely, the value of milk containing lower component levels should be discounted.

Milk testing 3.5% fat, 3.2% protein and 4.75% lactose has an energy value of 691.8 kcal/kg. Milk energy value changes by 9.18 kcal/kg for each 0.1% change in fat % and by 5.32 kcal/kg for each 0.1% change in protein %.

In the calculation of STANDARD MILK, 150 DIM adjusted milk yield is *corrected* to give an amount of milk having the same energy value as milk containing 3.5% fat and 3.2% protein. For example, *adjusted energy-corrected milk* (AECM) for a cow with 150 DIM adjusted production of 30 KG at 3.3% FAT and 3.0% PROTEIN is calculated as follows :

- ENERGY VALUE of 150 DAY ADJUSTED MILK (3.3% FAT, 3.0% PROTEIN) = 662.8 kcal/kg
- STANDARD ENERGY VALUE = 691.8 kcal/kg
- CORRECTION FACTOR = 662.8 / 691.8 = 0.958
- ADJUSTED ENERGY CORRECTED MILK = 0.957 x 30.0 kg = 28.7 kg

Adjusted, energy-corrected milk yield average for the lactation group

Table A on page 18 shows test day production and adjusted, energy-corrected milk (AECM) values for the 1st lactation animals in a small herd. The lactation group average AECM is the average of the AECM values for individual cows. It cannot be calculated from group average DIM, MILK KG, FAT% and PROTEIN %.

Standardization to a herd mix of 30% 1st, 20% 2nd, 50% 3rd+ lactation animals

The relative proportions of different lactation groups in a herd changes from test to test. Since cows normally produce more milk with each subsequent lactation, this introduces another source of variation in MILK/DAY KG. STANDARD MILK *standardizes* herd average milk yield to a constant mix of lactation groups : 30% 1st lactation, 20% 2nd lactation and 50% 3rd+ lactation animals.

The average AECM for the 1st lactation animals shown in table A was 25.8 kg. On the same test day, the average AECM for 2nd lactation animals in this herd was 25.3 kg; for 3rd+ lactation cows it was 34.1 kg. STANDARD MILK is calculated from these lactation group averages as follows :

1ST LACTATION :	30% x 25.8	=	7.7 kg
2ND LACTATION :	20% x 25.3	=	5.1 kg
3RD+ LACTATION :	50% x 34.1	=	17.0 kg
STANDARD MILK/DAY		=	29.9 kg

COW	DIM	MILK KG	FAT %	PROTEIN %	AECM
86	358	15.2	4.0	3.4	20.3
87	342	18.5	4.0	3.4	24.5
88	313	14.5	3.6	4.1	18.5
89	308	20.8	3.4	3.0	23.8
91	271	13.3	2.9	3.5	14.2
92	258	23.6	3.6	3.5	27.3
95	133	24.1	4.0	3.2	25.4
96	118	23.6	4.1	3.5	25.4
97	109	29.4	4.3	3.3	31.7
98	48	31.6	4.1	3.3	32.6
99	46	33.0	3.9	3.3	33.1
100	44	36.9	4.0	3.0	36.6
101	29	26.8	4.0	3.4	27.5
102	28	27.7	3.4	3.2	26.3
103	22	13.4	2.3	3.6	11.4
104	10	29.1	4.1	3.2	34.5
AVE	152	23.8	3.7	3.4	25.8

Table A : Test day statistics and adjusted, energy-corrected milk (AECM) values for 1st lactation animals in a small herd.

TEST	1	2	3	4	5	6	7	8	9	10	11	12
AVE DIM	158	152	156	153	132	137	147	141	134	167	174	168
MILK/DAY KG	*28.4*	*28.4*	*28.2*	*29.7*	*29.4*	*29.8*	*32.2*	*33.5*	*32.7*	*30.8*	*28.9*	*28.5*
FAT %	3.6	3.6	3.7	3.6	3.7	3.5	3.3	3.5	3.5	3.6	3.7	3.7
PROTEIN %	3.2	3.3	3.2	3.2	3.1	3.1	3.1	3.0	3.1	3.1	3.3	3.3
% IN LACTATION :												
1ST	37	44	39	41	41	41	40	35	31	28	24	19
2ND	14	11	12	14	15	17	20	21	26	31	30	32
3RD+	49	45	49	45	44	42	40	44	43	41	46	49
STANDARD MILK/DAY KG	*29.2*	*29.5*	*29.2*	*30.4*	*29.4*	*29.6*	*31.0*	*31.9*	*30.8*	*31.4*	*31.0*	*30.2*

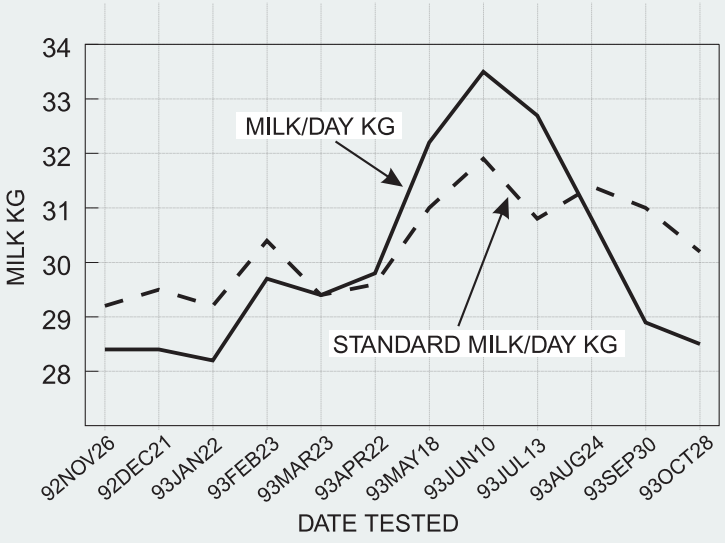
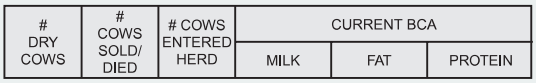


Figure B : Comparison of MILK/DAY KG with STANDARD MILK/DAY KG.

Figure B is a comparison of MILK/DAY KG with STANDARD MILK/DAY KG over 12 tests days. The STANDARD MILK/DAY KG line shows much less variability than the MILK/DAY KG line because test to test changes in stage of lactation, milk component levels and lactation group mix have been removed.



DRY COWS is the total number of dry cows in the herd on each test day. With a 12.5 month calving interval, a 60 day dry period and a uniform calving pattern, it is estimated that about 15% of the cows will be dry at any given time (see % OF HERD under the STAGE OF LACTATION PROFILE section).

COWS SOLD/DIED is the number of cows that were reported sold or that died between specific test dates. The DHI Summary of Disposal Reasons, available each spring, provides valuable information about herd culling.

For herds wanting to maintain about the same number of milking cows, a culling rate of about 30% of the herd is required. The annual culling % can be calculated as follows:

$$\frac{\text{number of cows leaving herd over the past 12 months}}{\text{total number of cows in herd}} \times 100 = \text{ANNUAL CULLING \%}$$

COWS ENTERED HERD is the number of cows reported purchased and the heifers freshened between consecutive test dates.

CURRENT BCA for MILK, FAT, and PROTEIN is the average of the projected (or actual, for cows >305 days in milk) BCAs for all cows in the herd with BCAs, on each test day. Dry cows are included in this calculation. The CURRENT BCA provides an up-to-date prediction of the herd's production trends, since all projected BCA records are included. The trend in CURRENT BCA can be used to estimate the future RHA for the herd. These values also appear on the HERD TOTAL line of the STAGE OF LACTATION PROFILE.

For more information

DHI Lactation Curves option User Guide

DHI Breeding Guide Plus option User Guide

DHI Persistency of Milk Production Infosheet