Réseau laitier canadien
Canadian Dairy Network

Lifetime Performance Index (LPI) Formula
- April 2018 -

$$\text{LPI} = \left(\begin{array}{c} \text{Production Component} \\ \text{x Emphasis} \\ \text{x Factor} \end{array} + \begin{array}{c} \text{Durability Component} \\ \text{x Emphasis} \\ \text{x Factor} \end{array} + \begin{array}{c} \text{Health \& Fertility Component} \\ \text{x Emphasis} \\ \text{x Factor} \end{array} \right) + \text{Constant}$$

Where the relative emphasis placed on each of the three main components in each breed is presented in the following table along with the multiplicative factors for each component.

Breed	LPI Constant	Production		Durability		Health & Fertility	
		Emphasis	Factor	Emphasis	Factor	Emphasis	Factor
Ayrshire	1931	50	.5937	31	.7023	19	.8809
Brown Swiss	911	50	.5906	30	.7121	20	.9711
Canadienne	922	48	.4817	32	.7543	20	.8451
Guernsey	647	50	.5074	30	.7195	20	.7292
Holstein	1992	40	.5518	40	.7638	20	.7000
Jersey	1051	57	.6599	33	.6960	10	.7591
Milking Shorthorn	1051	54	.5473	31	.7946	15	1.1663

Production Component (PROD):

$$\text{PROD} = [W_{PY} x (PY - Avg_{PY})/SD_{PY}] + [W_{PD} x PD/SD_{PD}] + [W_{FY} x (FY - Avg_{FY})/SD_{FY}] + [W_{FD} x FD/SD_{FD}]$$

Where PY = Protein Yield, PD = Protein Deviation, FY = Fat Yield and FD = Fat Deviation, which are standardized using the appropriate averages (Avg) and standard deviations (SD) and then multiplied by their respective relative weight (W), all of which are breed specific as outlined in the following table.

Parameter	Trait	Ayrshire	Brown Swiss	Canadienne	Guernsey	Holstein	Jersey	Milking Shorthorn
EBV Averages	Milk Yield	-156	-111	-310	7	66	65	-147
	Fat Yield	-8	-3	-8	-3	-2	2	-11
	Protein Yield	-5	-3	-6	0	2	2	-4
EBV Standard Deviations	Milk Yield	620	500	450	550	740	760	450
	Fat Yield	25	20	11	23	28	34	19
	Fat Deviation	.21	.20	.20	.27	.28	.38	.16
	Protein Yield	21	17	7	15	21	25	11
	Protein Deviation	.11	.12	.13	.10	.12	.16	.09
Relative Weights Within the Production Component	Fat Yield	4.0	3.8	4.0	3.8	4.0	2.8	3.6
	Fat Deviation		0.2		0.2		0.5	0.4
	Protein Yield	6.0	5.7	6.0	5.7	6.0	5.7	5.4
	Protein Deviation		0.3		0.3		1.0	0.6

Durability Component (DUR):

$$DUR = [W_{HL} \times (HL - 100)/5] + [W_{MS} \times MS/5] + [W_{F\&L} \times F\&L/5] + [W_{DS} \times DS/5] + [W_{RP} \times RP/5]$$

Where HL = Herd Life, MS = Mammary System, F&L = Feet and Legs, DS = Dairy Strength and RP = Rump, and each trait is standardized using the appropriate averages and standard deviations and then multiplied by their respective relative weight (W) that is breed specific as outlined in the following table.

Parameter	Trait	Ayrshire	Brown Swiss	Canadienne	Guernsey	Holstein	Jersey	Milking Shorthorn
Relative Weights Within the Durability Component	Herd Life	4.7	4.0	4.0	4.0	2.0	2.0	2.6
	Mammary System	3.1	3.2	3.2	3.2	4.0	4.0	4.0
	Feet & Legs	2.2	1.6	2.2	2.4	3.0	3.0	2.6
	Dairy Strength			0.6	0.4	1.0	1.0	0.8
	Rump		1.2					

Health & Fertility Component (H&F):

$$H\&F = [W_{DF} \times (DF-100)/5] + [W_{MR} \times (MR-100)/5] +$$
$$[W_{SCS} \times -1 \times (SCS-3.00)/0.23] + [W_{UD} \times UD/5] + [W_{MSP} \times (MSP-100)/5] + [W_{LP} \times (LP-100)/5]$$

Where DF = Daughter Fertility, MR = Mastitis Resistance, SCS = Somatic Cell Score, UD = Udder Depth, MSP = Milking Speed and LP = Lactation Persistency. The relative weights for each trait (i.e.: W_{DF}, W_{MR}, W_{SCS}, W_{UD}, W_{MSP} and W_{LP} respectively), which are specific to each breed, are provided in the following table.

Parameter	Trait	Ayrshire	Brown Swiss	Canadienne	Guernsey	Holstein	Jersey	Milking Shorthorn
Relative Weights Within the Health & Fertility Component	Daughter Fertility	5.3	4.0	5.0	6.7	6.7	3.0	2.0
	Mastitis Resistance	3.7				3.3	7.0	
	Somatic Cell Score		3.0	2.6	2.0			4.8
	Udder Depth		1.0	1.6	1.0			2.4
	Milking Speed	0.5	2.0	0.8	0.3			0.8
	Lactation Persistency	0.5						