Type Traits and Culling: Profile of a Low-Risk Jersey Cow

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What makes a Jersey cow last? That's a very pertinent question today, given the price of replacement heifers.

Management practices, including cow comfort, veterinary care, and nutrition play a key role, but the focus of this article is linear type traits. Because type traits are highly heritable and can be measured early in life, they can often serve as useful predictors of cow survival.

Our objective was to determine how each linear trait increases or decreases a cow's risk of being culled from the herd.

How The Study Was Done

Our data consisted of type, production, and survival data of 268,000 U.S. Jersey cows with first calving from January, 1981 through August of 2000. Data were adjusted for the effects of herd, year, and season (when the cow and/or her contemporaries were culled), age at first calving, inbreeding, and milk production.

Because production was taken into account, the survival variable in this study was *functional herd life,* which is a measure of involuntary culling. First lactation scores for 13 linear type traits were evaluated independently. Cows were grouped into 10 classes for each trait; these classes corresponded to linear scores of 1 to 5, 6 to 10, 11 to 15, and so on to 46 to 50.

Results are expressed as the relative risk of culling for cows with each linear type score, relative to a cow with an optimal score for that trait. Because very few cows received scores less than (or equal to) five (5) or greater than 45, results are presented for the eight groups (2 through 9) with linear scores from 6 to 45.

What We Learned

As shown in Table 1, **stature** was not a useful predictor of cow survival. Scores from 11 to 15, 16 to 20, and 41 to 45 were optimal, but the risk of culling for cows in the poorest class (scores 36 to 40) was only 6% higher than that of an 'optimal' cow.

Scores in the ranges of 11 to 15 and 16 to 20 were optimal for **strength** as well, but for this trait, cows with scores of 41 to 45 were 30% more likely to be culled than cows with scores in the optimal ranges.

For **dairy form**, scores of 21 to 25 were optimal. At high risk for culling were cows scoring 41 to 45 (38%) and 36 to 40 (14%). *Remember that we analyzed functional herd life, so voluntary culling of low-producing cows was not considered.*

For **rump angle**, cows with high pins (scores 6 to 10) were only 4% more likely to be culled than cows with intermediate scores of 16 to 20 and 21 to 25. But cows with sloped rumps (scores 41 to 45) were 16% more likely to be culled.

Rump width had an optimum range of 11 to 15, with high scoring cows (range 36 to 40) at an 18% higher risk of involuntary culling.

Feet and leg traits were generally more important than traits related to body size. Intermediate scores of 21 to 25, and also slightly posty (11 to 15) were optimal for **rear leg** set. Cows that deviated by displaying extremely straight rear legs (scores 6 to 10) had a 4% higher risk of culling than intermediate cows. But cows with extremely curved rear legs (scores 41 to 45) were 30% more likely to be culled.

Foot angle was also very important, with respect to cow survival. High scores (41 to 45) were best, and cows with a very low foot angle (scores 6 to 10) were 22% more likely to be culled.

As expected, udder traits were by far the most important. Cows with **fore udder** scores of 36 to 40 survived the longest. Cows with scores in the 6 to 10 range were 53% more likely to be culled, and those scoring 11 to 15 were at 37% greater risk.

For **rear udder height** and **rear udder width**, scores of 36 to 40 and 21 to 25 were optimal, respectively. Low-scoring cows (range 6 to 10) had a 30% and 15% higher risk of culling, respectively, but high-scoring cows (range 41 to 45) were also at higher risk (18% and 16%, respectively) than an optimal cow.

Udder depth was easily the most important trait. Scores of 41 to 45 were most desirable, and cows with extremely low

Table 1. Increase in risk of involuntary culling, relative to an optimal cow, for Jersey cows with a range of scores for each linear trait. Optimal scores are indicated by the symbol, ▲.

Trait	Linear Score							
	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45
Stature	1%	▲	▲	1%	3%	4%	6%	▲
Strength	3%	▲	▲	1%	5%	8%	19%	30%
Dairy Form	9%	4%	1%	▲	2%	7%	14%	38%
Rump Angle	4%	2%	▲	▲	3%	7%	11%	16%
Rump Width	5%	▲	1%	1%	4%	6%	18%	4%
Rear Legs	4%	▲	2%	▲	3%	8%	14%	30%
Foot Angle	22%	12%	10%	8%	6%	5%	9%	▲
Fore Udder	53%	37%	26%	16%	12%	5%	▲	2%
Rear Udder Height	30%	20%	13%	6%	3%	2%	▲	18%
Rear Udder Width	15%	6%	3%	▲	1%	2%	5%	16%
Udder Depth	125%	78%	50%	39%	31%	15%	4%	▲
Udder Cleft	76%	24%	9%	▲	1%	1%	10%	10%
Teat Placement	31%	16%	8%	2%	1%	▲	4%	5%

*To determine the risk of culling for a given linear score, complete the following sentence: "Among cows of equal production, a cow with a score of ___ has a ___% greater risk of being culled than a cow with an optimum score for that trait."*

Stature
Risk of Culling with Production Held Constant

Score	5			25			45	
Risk	1%	0%	0%	1%	3%	4%	6%	0%

Stature is measured as height at the hips. A score of 1 indicates stature of 44", 25 indicates 49", and 50 indicates stature of 54" or greater.
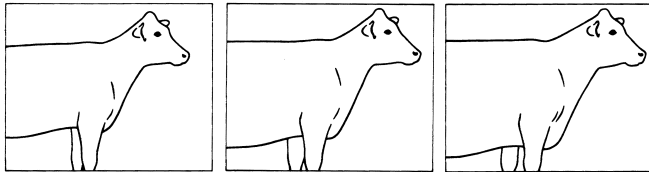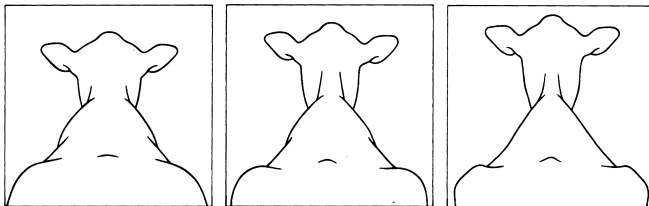
Strength
Risk of Culling with Production Held Constant

Score	5			25			45	
Risk	3%	0%	0%	1%	5%	8%	19%	30%

Strength is measured as the width and depth of chest, width of muzzle, and substance of bone, not to be influenced by body condition. Scores under 10 indicate extreme weakness; scores over 40 indicate extreme strength.

Dairy Form
Risk of Culling with Production Held Constant

Score	5			25			45	
Risk	9%	4%	1%	0%	2%	7%	14%	38%

Dairy Form is defined as the openness and angle of rib, angularity, flatness of bone, length of neck, and any other appearance of milkiness. This appearance, and not just the absence of fleshing, is considered. Ideally, stage of lactation should not influence the dairy form score. Scores below 20 may not only reflect smooth over-conditioned cattle, but also extreme angularity that is frailty and not dairy form.

Rump Angle
Risk of Culling with Production Held Constant

Score	5			25			45	
Risk	4%	2%	0%	0%	3%	7%	11%	16%

Rump Angle *(pins high/low)* is the degree of slope from hooks to pins when the cow is standing. A score of 1 indicates a high rump angle and a score of 50 indicates an extremely sloped rump angle. A score of 20 indicates a level rump angle, each additional five (5) points representing every one (1) inch of slope or height of pins.
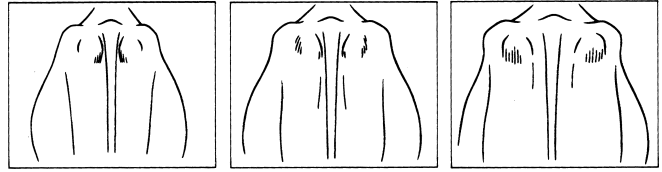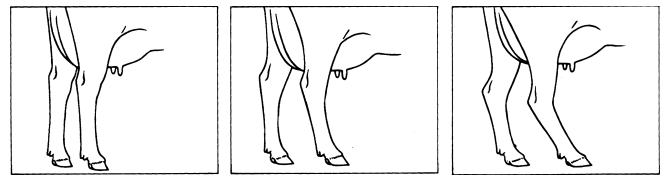
Rump Width
Risk of Culling with Production Held Constant

Score	5			25			45	
Risk	5%	0%	1%	1%	4%	6%	18%	4%

Rump Width is the width of hips. Scores below 15 indicate extreme narrowness in the rump and scores above 35 indicate extreme rump width.
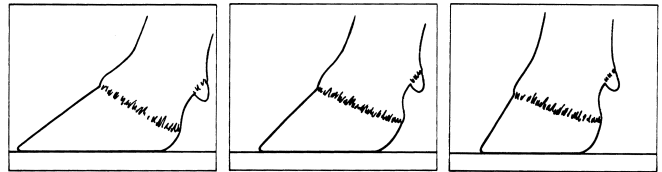
Rear Legs
Risk of Culling with Production Held Constant

Score	5			25			45	
Risk	4%	0%	2%	0%	3%	8%	14%	30%

Rear Legs *(posty/sickle)* is a measurement of the set of hock. A score of 1 indicates extremely posty legs and a score of 50 indicates sickle hocked legs. A score of 25 indicates a slight set to the legs.

Foot Angle
Risk of Culling with Production Held Constant

Score	5			25			45	
Risk	22%	12%	10%	8%	6%	5%	9%	0%

Foot Angle *(low/steep)* is measured as the steepness of the angle of the rear foot from the hairline to 1" anterior to the hairline. A score of 1 indicates an extremely low foot angle and a score of 50 indicates an extremely steep foot angle. A score of 25 is assigned to a medium foot angle and a score of 40 to a 45° foot angle.
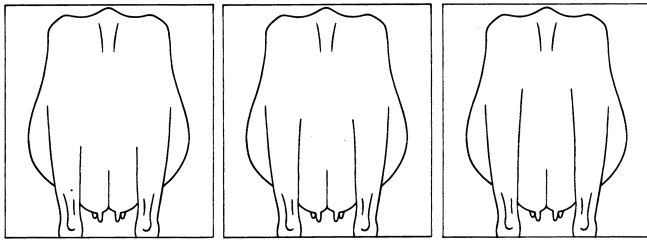
Fore Udder Attachment
Risk of Culling with Production Held Constant

Score	5			25			45	
Risk	53%	37%	26%	16%	12%	5%	0%	2%

Fore Udder Attachment is an evaluation of the strength of attachment of the fore udder to the body wall. A score of 1 indicates a loose attachment and a score of 50 indicates a tight attachment. A score of 25 indicates a slight bulge in the fore udder.

Rear Udder Height
Risk of Culling with Production Held Constant

Score	5			25			45	
Risk	30%	20%	13%	6%	3%	2%	0%	18%

Rear Udder Height is measured as viewed from the rear, based on the point where secretory tissue begins in relation to the midpoint between the point of hock and pins. A score of 1 indicates low rear udder height and a score of 50 indicates high rear udder height. A score of 20 is assigned to a rear udder height attached at the midpoint between the point of hock and pins. An additional 5 points is assigned or removed for every inch above or below the midpoint, respectively.
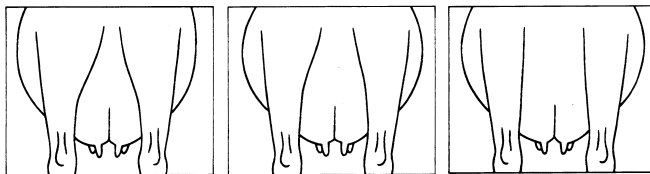
Rear Udder Width
Risk of Culling with Production Held Constant

Score	5			25			45	
Risk	15%	6%	3%	0%	1%	2%	5%	16%

Rear Udder Width is measured at the crease where the udder meets the leg. A score of 1 indicates a narrow rear udder and a score of 50 indicates a wide rear udder (11" or more). A score of 35 is assigned to a rear udder that is 8" wide, a score of 25 to a rear udder that is 6" wide, and a score of 15 to a rear udder that is 4" wide.

### Udder Depth
Risk of Culling with Production Held Constant

Score	5			25			45	
Risk	125%	78%	50%	39%	31%	15%	4%	0%

Udder Depth *(deep/shallow)* is a measure of the depth of udder floor relative to the hock. A score of 1 indicates an udder below the hock, 15 an udder at the hock, 25 an udder 2" above the hock, 35 an udder 4" above the hock, and 50 an udder 7" above the hock.

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scores (6 to 10) had an astounding 125% higher risk of culling than a high-scoring cow. Cows in the 11 to 15 and 16 to 20 ranges, respectively, were also at a 78% and 50% greater risk.

Udder cleft was second in importance, with cows scoring 6 to 10 at a 76% higher risk of culling than cows in the optimal 21 to 25 range.
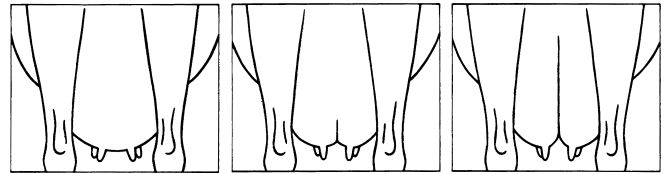
Udder Cleft
Risk of Culling with Production Held Constant

Score	5			25			45	
Risk	76%	24%	9%	0%	1%	1%	10%	10%

Udder Cleft is a measure of the depth of cleft of the udder between the rear teats from the base of the rear teats to the point where the halves of the udder come together. A score of 1 indicates a bulgy udder, 15 a flat udder, 25 an udder with a 1" cleft, 35 an udder with a 2" cleft, and 50 an udder with an extremely deep cleft (3½" or more).
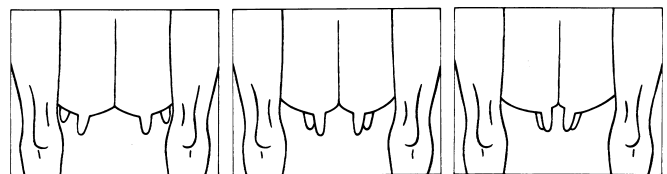
Front Teat Placement
Risk of Culling with Production Held Constant

Score	5			25			45	
Risk	31%	16%	8%	2%	1%	0%	4%	5%

Front Teat Placement *(wide/close)* is a measurement of the placement of the front teats on the quarter. A score of 1 indicates wide placed teats, 20 slightly wide placed teats, 30 centrally placed teats, and 50 teats that are closely placed.

Not examined in this study, but scored:
Front Teat Length *(long/short)* is the length of the front teats from the base to the end of the teat. A score of 1 indicates short teats (0"), 25 indicates intermediate teats (2½") and 50 indicates long teats (5").

Lastly, **teat placement** scores of 31 to 35 were preferred, and cows with wide teat placement (scores 6 to 10) had a 31% higher chance of being culled. Unfortunately, we did not have enough historical teat length data to include it in our study, but based on research in other breeds, it is likely that it would have been a useful predictor of cow survival as well.

In Summary
Here are the key points:

- Cow survival is increasing in importance, due to a shortage of high quality replacement heifers.
- Linear type traits can be useful predictors of survival in young Jersey cows.
- Udder traits, especially udder depth, have a profound effect on survival.
- Feet and leg traits are also important, though not as critical as udder traits.
- Among cows with equivalent product yield, intermediate dairy form is preferred.
- Body size traits and rump traits are less useful, with respect to prediction of cow survival.
- Other traits, including fertility and somatic cell count, also play a key role in cow survival.