



Pelvic Measurements and Calving Difficulty*

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Although researchers agree that birth weight is the most important measurable trait affecting calving difficulty, there is evidence that the size and shape of the pelvis also has an effect on a heifer's ability to calve.

Calving Difficulty

Calving difficulty results in major economic loss to the beef cattle industry. Estimated losses resulting from dystocia (calving difficulty) equal or exceed \$750 million annually. Calving difficulty influences the economics of a cow/calf enterprise through increased calf death loss, increased labor and veterinary costs, reduced subsequent reproductive performance of the cow, potential loss of the cow, and reduced milk production.

Calf mortality may be four to eight times greater in dystocia cases than in normal births. The majority of calf deaths occur within the first 24 hours following calving (58 percent), with 75 percent of the total occurring within the first week of life. Studies indicate that calf death loss due to dystocia accounts for the single largest peri- and postnatal death loss category through the first 96 hours after birth.

A number of factors affect calving difficulty, including:

- birth weight of the calf,
- pelvic area of the cow,
- gestation length,
- sex of the calf,
- inadequacies in heifer development,
- body condition of the cow at calving,
- abnormalities in hormone profiles at the time of birth, or
- abnormal presentation of the calf at birth.

Table 1. Using pelvic measurements to estimate deliverable calf size (birth weight).

Time of Measurement	Heifer Age (mo)	Heifer Wt (lb)	Pelvic Area (cm ²)	Pelvic Area/Birth Wt Ratio	Estimated Calf Birth Wt, lb
Before breeding	12-13	600	140	2.1	67
			160	2.1	76
			180	2.1	86
Pregnancy exam	18-19	800	180	2.7	67
			200	2.7	74
			220	2.7	82

We also know that the single major cause of dystocia is a disproportion between size of the calf at birth (birth weight) and the cow's birth canal (pelvic area). Differences in pelvic area are generally due to pelvic height, with discrepancies between the dam and fetus more likely to occur for pelvic height and depth of calf chest than for width measures.

Pelvic size, independent of cow weight, affects calving difficulty. Heifers of increased skeletal size usually have larger pelvic openings but also tend to have heavier calves at birth. Hence, selection for cow size alone is ineffective.

Heifer weight and age generally have a positive relationship to pelvic area, but weight is not always a good indicator. External dimensions such as width of hooks and length of rump are not good indicators of pelvic area or calving difficulty. For these reasons, **pelvic measurements can be a useful management tool to eliminate heifers with a higher potential for calving difficulty.**

Pelvic Measurements

University of Nebraska researchers developed ratios that you may use to estimate deliverable calf size. You can divide total pelvic area prior to breeding by a ratio that is based on age and weight to estimate the amount of birth weight a heifer could accommodate as a 2-year-old without substantial difficulty.

Example: a 600-lb yearling heifer (Table 1) with a pelvic area of 140 sq cm should be able to deliver, as a 2-year-old, a 67-lb calf without difficulty ($140/2.1 = 67$).

* This publication was adapted and revised from "Pelvic Measurements for Reducing Calving Difficulty," by Gene H. Deutscher, NebGuide G88-895, of the Nebraska Cooperative Extension Service, University of Nebraska Institute of Agriculture and Natural Resources. The tables contain Nebraska data.

Table 2. Pelvic area/calf birth weight ratios for various heifer weights and ages to estimate deliverable calf birth weight.

Heifer Wt (lb)	Age at time of measurement (months)			
	8-9	12-13	18-19	22-23
500	1.7	2.0	--	--
600	1.8	2.1	--	--
700	1.9	2.2	2.6	--
800	--	2.3	2.7	3.1
900	--	2.4	2.8	3.2
1000	--	2.5	2.9	3.3
1100	--	--	--	3.4

Pelvic measurements can be obtained at the time of pregnancy exam, but a factor of 2.7 should be used to estimate calf birth weight of 18- to 19-month-old 800-lb heifers. Tables 1 and 2 provide estimates of the deliverable calf size a heifer may accommodate at first calving, based on pelvic area at given weights and ages. Scientists at the University of Nebraska suggest that these ratios appear to be good indicators of dystocia and report an accuracy of nearly 80 percent.

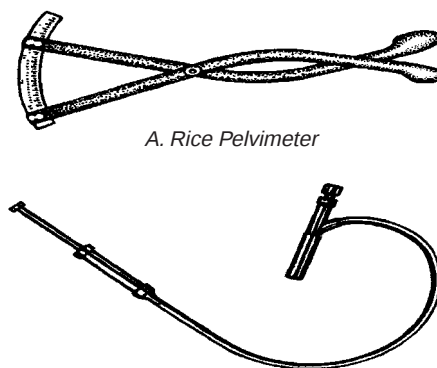
Structural traits in cattle tend to be highly heritable, and pelvic area is no exception. This means there is a large genetic influence on pelvic area which results in rapid response to selection. However, pelvic area is genetically correlated with many other traits, so **selection for increased pelvic area alone can result in other traits changing for the worse**. For example, selecting for increased pelvic area can result in increased birth weight and mature weight.

Pelvic measurements can be taken prior to the first breeding season and combined with a reproductive tract examination. Pelvic measurements should be used in addition to, not in place of, selection for size, weight, and, above all, fertility. Producers should be aware that selection for pelvic area will likely result in increased size of the entire skeleton and animal. Increased skeletal size of the dam will be reflected in higher birth weights and dimensions of the calf.

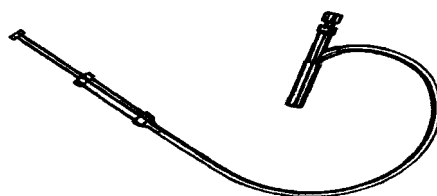
Pelvic measurements, on the other hand, can be used successfully to identify abnormally small or abnormally shaped pelvises. These situations left unidentified are often associated with extreme dystocia, resulting in cesarean delivery and even death of the calf or cow.

Pelvic measurements can be obtained with a Rice Pelvimeter (see Figure 1A), the Krautmann-Litton Bovine Pelvic Meter (see Figure 1B), or the Equibov Bovine Pelvimeter.

Figure 1. Instruments to measure pelvic area, in cattle.



A. Rice Pelvimeter

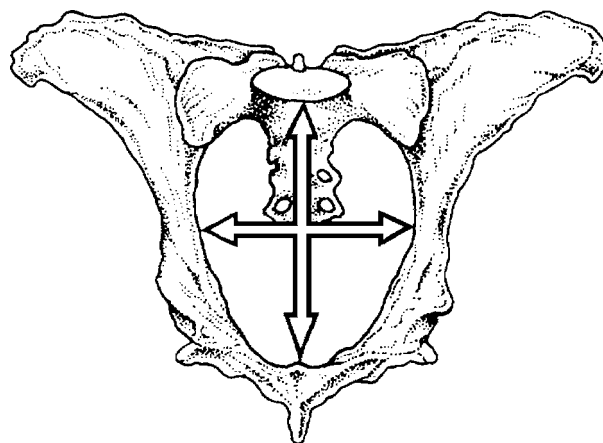


B. Krautmann - Litton Bovine Pelvic Meter

The vertical measurement is the vertical diameter between the symphysis pubis on the floor of the pelvis and the sacral vertebrae. The horizontal measurement is obtained by determining the horizontal diameter at its widest point between the left and right ileal shafts (see Figure 2). These measurements are read in centimeters and multiplied together to obtain the total pelvic area in square centimeters.

Measurements may be obtained by a veterinarian or experienced producer. It is important that the person doing the measuring have a thorough understanding of the birth canal, pelvic structure, and reproductive tract. Practice and experience are necessary before accurate measurements can be obtained.

Figure 2. Vertical and horizontal measurements are obtained to determine pelvic area.



Summary

Calving ease will continue to be an important consideration as the industry produces fast-growing, muscular progeny by terminal sires. These sires should be selected on measures of direct calving ease by using EPD values for calving ease and birth weight.

To accommodate fairly heavy birth weights, scientists at Colorado State University recommend that you **develop a cow herd that excels in maternal calving ease**. Sires of replacement females should be selected to maintain cow size and milk production at levels compatible with available resources. In addition, cows should be selected for total maternal calving ease along with gestation length.

Research indicates that **bigger is not necessarily better when one considers actual pelvic measurements**. In other words, heifers with large pelvic measurements fail to calve more easily than average-sized heifers. However, heifers with abnormally small pelvises or abnormally shaped pelvises generally experience a higher than normal incidence of calving difficulty and should be identified and culled from the herd.

Remember, pelvic area and shape are only a part of the calving difficulty complex. Follow the suggestions on this list to minimize the incidence and severity of calving difficulty in your herd.

How to reduce calving difficulty (in ranked order):

1. Breed heifers to proven calving ease bulls (low BW EPDs).
The following are general guidelines:
Lowest 25%—British Breeds
Lowest 15%—Small Continental
Lowest 10%—Large Continental
2. Develop heifers to pre-breeding target weights.
(See ASC-144, *Management Considerations in Beef Heifer Development*)
3. Ensure that heifers are in good body condition going into the calving period (minimum body condition score of 5).
4. Obtain pelvic measurements at yearling age, and cull heifers with abnormally shaped or abnormally small pelvic areas.