

Pelvic Area Measurements in the Management of Replacement Heifers

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Dystocia

Dystocia (calving difficulty) can be a major problem for beef cattle producers in Arkansas, especially with heifers that deliver their first calf as two-year-olds. Dystocia rates as high as 34 percent have been reported in first-calf heifers. The primary cause of dystocia is a disproportionately large calf size or birth weight compared to the pelvic area (birth canal) of the cow or heifer.

Since birth weight is moderately heritable, the selection of bulls with low birth weights and with smoothness, balance and straightness of lines is the most dependable method for reducing dystocia in heifers. Because breeds vary with regard to average birth weight, consider the breed of bull to be used on replacement heifers. There is also a tremendous amount of variation in birth weight among bulls within a breed. As a result, some bulls within most breeds have been identified as "calving-ease" bulls, or are bulls with low expected progeny differences (EPDs) for birth weight.

Another management practice that may assist producers in reducing the incidence of dystocia in first-calf heifers is the use of internal pelvic area measurements. This practice has received considerable attention, but its use is still not widespread among beef cattle producers.

How to Measure Pelvic Area

A sliding caliper device referred to as a Rice pelvimeter¹ is used to measure the pelvic area of heifers. The Rice pelvimeter was specifically designed for taking this measurement, which is determined rectally and results read externally in centimeters (cm).

To measure internal pelvic area, the technician must first clear the rectum of feces. The pelvimeter is then introduced into the rectum inside the cupped, gloved hand of the technician, and pushed into the pelvic inlet with the other hand, taking care not to force the device with undue pressure. The height (vertical measurement) is determined by measuring the linear distance from the approximate midpoint of the top surface of the symphysis pubis to the bottom surface of the midsacrum. Pelvic width (horizontal measurement) is measured as the linear distance between the shafts of the ilia at right angles to where the height was measured (Figure 1). The

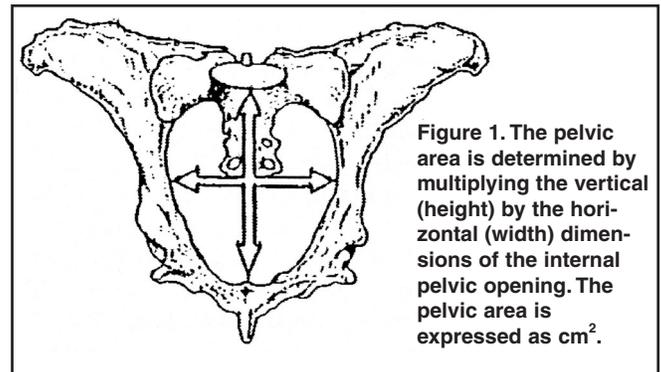


Figure 1. The pelvic area is determined by multiplying the vertical (height) by the horizontal (width) dimensions of the internal pelvic opening. The pelvic area is expressed as cm².

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¹Lane Manufacturing Co., Denver, Colorado.

unit of measure for pelvic area is cm² and is calculated by multiplying the height of the pelvic region by the width of the region.

The best time to measure pelvic areas in heifers is prior to their first breeding season when heifers are 12 to 14 months of age. Based on research, ratios have been developed that give an estimate as to what size calf a heifer could deliver at two years of age without assistance (Table 1: adapted from Deutscher, 1987). For example, a 13-month-old heifer with a pelvic area of 140 cm² should be able to deliver a 67-pound calf without assistance. It is important to emphasize that this calculation does not predict the birth weight of the calf; it simply predicts what size calf the heifer can deliver without assistance. Pelvic area measurements can also be taken at the time of pregnancy examination and even prior to the time of calving, but the division factors to determine deliverable calf size increase with age.

Table 1. Estimating Deliverable (Without Assistance) Calf Birth Weight Using Pelvic Measurements.

Age of Heifer	Pelvic Area (cm ²)	Division Factor	Est. Calf Size (lb) Without Assistance
12-14 mos. (600 lbs)	140	2.1	67
	160	2.1	76
	180	2.1	86
18-19 mos. (1,800 lbs)	180	2.7	67
	200	2.7	74
	220	2.7	82

If heifers vary considerably in weight at the time of obtaining the measurements, different ratios should be used. Table 2 shows ratios (factors) to be used for various weights and ages of heifers. These ratios appear to be good indicators of dystocia, with an accuracy of about 80 percent.

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

Heifer Weight (lb)	Age at 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
1,000	--	2.5	2.9	3.3
1,100	--	--	--	3.4

Heritability of Pelvic Area

Research has estimated the heritability of pelvic area to range from 36 to 92 percent with an average of 61 percent (Deutscher, 1989). These values indicate that pelvic area is a highly heritable trait and may be higher than the 45 percent heritability for calf birth weight. This means both traits will respond rapidly to selection. Birth weight does not appear to be highly correlated with pelvic area, so selection for pelvic size should not give a corresponding significant increase in birth weight. By selecting both bulls and heifers for pelvic size, a herd of cows with large pelvic areas could be developed. However, selecting only for pelvic size would probably result in an increased mature cow size.

Using Heifer Pelvic Measurements

If pelvic measurements are obtained before breeding, potential problem heifers with a small pelvic size can be culled from the herd. One management practice is to cull the smallest 10 to 15 percent. Since the larger, heavier heifers do not always have the largest pelvic area, all heifers should be measured and mated according to pelvic size.

Research indicates that a normal 600-pound yearling heifer should have a pelvis at least 11 centimeters wide and 12 centimeters high (132 cm²) to deliver a 63-pound calf. Heifers with a smaller width or height dimension should be considered for culling.

Average pelvic area growth has been calculated at 0.27 cm² a day from yearling to two years of age in heifers, and continues at a slower rate until the cow reaches maturity. Some producers may wish to adjust pelvic areas of heifers to a standard 365 days of age. This can be accomplished by using the following formula:

$$\text{365-Day Pelvic Area (heifers)} = \text{Actual Pelvic Area (cm}^2\text{)} + [0.27 \times (365 - \text{age in days})]$$

However, in a group of puberal heifers, no adjustment is warranted since all heifers could theoretically become pregnant early in the breeding season and have about the same number of days to develop before calving. Heifers with small pelvic areas as yearlings usually have the smallest pelvic areas at calving.

Pelvic measurements should be taken two to three weeks before the breeding season and can be incorporated into a total heifer management program. This program involves selecting heifers for breeding by size and type, obtaining pelvic measurements, palpating for ovarian and uterine development

(puberty) and vaccinating for reproductive diseases, all during one processing through the chute.

Such a program helps ensure that a high percentage of the heifers are cycling and could become pregnant early in the breeding season and should result in reduced incidences of dystocia. The program would also aid in an estrous synchronization and artificial insemination program by determining the percentage of heifers cycling and assist in sire selection for reducing difficulty.

If heifers are measured at the time of pregnancy examination, small problem heifers could be culled or aborted and sold as feeders. Bred heifers predicted to have a potential problem could also be marked for close observation at calving.

Summary

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

To accommodate fairly heavy birth weights, it is recommended that a cow herd that excels in maternal calving ease is developed. 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.

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 in the following 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 birth-weight EPDs).
2. Develop heifers to prebreeding target weights.
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.

References

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