How Your Measure Matters: Performance Data Collection Method Comparisons

Advancements in Producer Applications
Trent Smith
2012 BIF Annual Convention
Houston, TX

Introduction

- Reporting accurate measures are important for animal selection and culling decisions
  - Comparison to contemporaries
  - Information used in national cattle evaluations
- Measuring performance
  - Variability in methods
    - Cost
    - Convenience
    - Ability
      - Labor
      - facilities

Measurements

- Birth weight
  - Most important variable influencing dystocia in heifers (Naazie et al., 1989)
  - Birth weight information greatly affects the prices beef producers are willing to pay for bulls (Chvosta et al., 2001; Dhuyvetter et al., 1996, 2004)
- Hip height
  - Frame scores are important in maintaining body size, fatness level, and maturing rate dictated by the resources, breeding system, and market specifications of a herd (Beef Improvement Federation, 2010)

Comparison of Four Different Methods of Calf Birth Weight Data Collection

Parish, J. A.[1], T. Smith[1], J. R. Parish[2], T. F. Best[3], and J. T. Best[4],1Department of Animal & Dairy Science, Mississippi State, MS, [2]Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS, Prairie Research Unit, Prairie, MS, Leveck Animal Research Center, Mississippi State, MS

Objective

- To evaluate the accuracy of birth weight collection methods: visual appraisal, hoof circumference tapes, hand-held hanging spring scales, digital scales

Materials and Methods

- Birth weight measurements and estimates were taken on 587 fall- (January to March) and spring-born (September to November) calves within the first 24 hr of birth
- Two locations
  - Leveck Animal Research Station (Mississippi State, MS)
    - Purebred Angus, Charolais, Hereford, and crossbred calves predominantly Angus and Hereford sired
  - Prairie Research Unit (Prairie, MS)
    - Crossbred calves sired by Angus, Hereford, Brangus, Braford, and Gelbvieh

Materials and Methods

- Birth weight measurements
  - Visual - first weight taken by two observers (average of the two weights used in analysis)
  - Hoof tape - (Calfscale™ Birthweight Tape, Nasco, Fort Atkinson, WI)
    - Placed around the coronary band of the calf's anterior, right foot
  - Spring scales - hand-held hanging spring scales (Detecto Matic, Model #11S, Webb City, MO)
    - Securing together two hind limbs and one fore limb with a rope
  - Digital scales - battery powered digital scales (Pelouze® Straight Weigh Electronic Digital Receiving Scale Model #4010, PELSTAR LLC, Bridgeview, IL)
    - Restrained calf was placed in large container on scales
    - Considered the standard

MAFES

Materials and Methods

- Percentage of calving season - what portion of the calving season the calf was born
  - 1 - 4 with each pertaining to 25% of the calving season
- Birth weight levels were defined using standard deviations from the digital weight data
  - Low - < 71.5 lbs.
  - Medium - 71.5 to 84.7 lbs.
  - High - > 84.7 lbs.

MAFES

Least Square Means and Descriptive Statistics for Methods (lbs)

Method	LSM±SE	vs. DIG (Diffs)	RANGE (Diffs)
VIS	79.6 ± 0.50b	0.7	-16.00 to 18.01
HF	81.1 ± 0.50a	2.2	-26.21 to 26.21
SPR	79.6 ± 0.50b	0.7	-12.01 to 16.5
DIG	78.9 ± 0.52b	0	0

Different letters indicate differences at P<.05

MAFES

Differences vs. DIG for Percentage of Calving Season

% of Calving Season	VIS
1	2.57a
2	1.87ab
3	1.23bc
4	0.08c

Different letters indicate differences at P<.05

MAFES

Differences vs. DIG for Birth Weight Level

Birth Weight Level	VIS	HF	SPR
High	$-1.54^{c}\pm0.44$	$-0.44^{c}\pm0.44$	$0.66^{c}\pm0.22$
Medium	$2.20^{b}\pm0.44$	$3.52^{b}\pm0.44$	$1.54^{b}\pm0.22$
Low	$3.52^{a}\pm0.44$	$5.95^{a}\pm0.44$	$1.98^{b}\pm0.22$

^{a,b,c}Means within row and columns with different super scripts differ (P<0.05)

MAFES

Simple Correlations

Methods	DIG
VIS	0.90
HF	0.85
SPR	0.95

MAFES

Summary

- Birth weights taken by hoof tape were significantly higher.
- All methods were positively correlated to the digital method with measurements from the hoof tape being the lowest, while weights taken by spring scales were the closest.
- There was a trend for differences between visual estimates and digital weights to get smaller as the calving season progressed.

MAFES

Summary

- When birth weight levels were examined, visual estimates and hoof tape measurements tended to underestimate high birth weights while all weights tended to overestimate low birth weights.

MAFES

Evaluation of Different Methods of Cattle Hip Height Data Collection

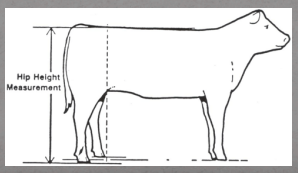
Parish, J. A., B. M. Bourg, M. L. Marks, N. B. Simmons, and T. Smith. Department of Animal and Dairy Science, Mississippi State University

MISSISSIPPI STATE UNIVERSITY EXTENSION SERVICE

MAFES

Hip Heights

- Recommended site for hip height measurement is a point directly over the hooks (Beef Improvement Federation, 2010)
- Different methods used



MAFES

Objectives

- To evaluate different methods of measuring hip height
- Determine if head restraint affects hip height data accuracy
- Assess reproducibility of hip height measurements using different observers

MAFES

Materials and Methods

Visual appraisal using a pre-measured board placed on opposite side of animal from observer (VIS)

MAFES

Materials and Methods

Measurement of difference in distance down to hips from distance down to floor with descending tape placed above animal (TPE)

MAFES

Materials and Methods

Measurement using altitude stick (STK)

MAFES

Materials and Methods

- Head restraint
  - Heads unrestrained (UNRESTR)
  - Heads restrained (RESTR)
- Chute score
  - 5-point scale (adapted from Voisinet et al., 1997)
    - 1 = calm, no movement
    - 2 = restless shifting
    - 3 = constant shifting with occasional shaking of chute
    - 4 = continuous movement and shaking of chute
    - 5 = violent and continuous struggling
- Hip height levels
  - Cows - Low = < 51.5 in; Moderate = 51.5 to 53.0 in; High = > 53.0 in.
  - Calves - Low = < 41.9 in; Moderate = 41.9 to 43.9 in; High = > 43.9 in.

MAFES

Material and Methods

- Hip height estimates and measurements were collected on cows (n = 329) and calves (n = 341) during routine pre-weaning or weaning processing
  - September 13, 2011 to October 3, 2011
  - Research centers and farms throughout Mississippi
  - Angus, Brangus, Charolais, Hereford, and crossbred
- Care taken to ensure cattle standing on a level surface with proper posture for measurements

Observer 1 completed measurement process then Observer 2 replicated process

MAFES

Observer correlations for cow and calf hip height collection and restraint methods

Cows

Method	Head restraint	Simple Correlation
VIS	RESTR	0.88
STK	RESTR	0.92
TPE	RESTR	0.93
VIS	UNRESTR	0.87
STK	UNRESTR	0.89
TPE	UNRESTR	0.86

Calves

Method	Head restraint	Pearson correlation
VIS	RESTR	0.94
STK	RESTR	0.94
TPE	RESTR	0.91
VIS	UNRESTR	0.94
STK	UNRESTR	0.94
TPE	UNRESTR	0.93

MAFES

Cow hip height least squares means (in) and descriptive statistics for hip height data collection methods

Method	LSM	Minus STK	Diffs Range
VIS	$52.2^{b} \pm 0.07$	0.0	-2.5 to 2
STK	$52.2^{b} \pm 0.07$	0.0	0
TPE	$52.8^{a} \pm 0.07$	0.6	-4.4 to 3.5

Means with different superscripts within column differ ($P < 0.05$).

MAFES

Results

- Chute score (scores 1, 2, 3)
  - Cows
    - No effect
    - Correlation coefficients ($P < 0.01$) between observers tended to decrease as CS increased
      CS 1, r = 0.91; CS 2, r = 0.86; CS 3, r = 0.83
  - Calves
    - As chute score increased hip height decreases (43.0 ± 0.0; 42.7 ± 0.1; 42.0 ± 0.1 in, respectively) decreased ($P < 0.01$)
    - Correlation coefficients ($P < 0.01$) between observers tended to decrease and then increase as CS increased
      CS 1, r = 0.95; CS 2, r = 0.87; CS 3, r = 0.90

MAFES

Results

- Restraint method
  - Cows
    - No effect
  - Calves
    - UNRESTR (42.9 ± 0.1 in) greater ($P < 0.01$) than RESTR (42.2 ± 0.1 in)

	Cow Restraint Method		Calf Restraint Method	
Chute score	RESTR	UNRESTR	RESTR	UNRESTR
1	$52.2^{b} \pm 0.1$	$52.5^{a} \pm 0.1$	$42.8^{b} \pm 0.1$	$43.2^{a} \pm 0.1$
2	$52.6^{a} \pm 0.2$	$52.4^{ab} \pm 0.2$	$42.3^{c} \pm 0.3$	$43.2^{a} \pm 0.1$
3	$52.2^{ab} \pm 0.6$	$52.1^{b} \pm 0.3$	$41.5^{d} \pm 0.3$	$42.4^{c} \pm 0.2$

Means with different superscripts within age class and within rows and columns differ ($P < 0.05$).

Results

	Hip height level (Cows)		
Method	Low	Moderate	High
VIS	$50.2^{f} \pm 0.1$	$52.2^{e} \pm 0.1$	$54.0^{c} \pm 0.1$
STK	$50.3^{f} \pm 0.1$	$52.2^{e} \pm 0.1$	$54.2^{b} \pm 0.1$
TPE	$50.3^{f} \pm 0.1$	$52.5^{d} \pm 0.1$	$54.5^{a} \pm 0.1$
VIS – STK	$-0.1^{hi} \pm 0.07$	$0.0^{h} \pm 0.03$	$-0.2^{i} \pm 0.03$
TPE – STK	$0.04^{h} \pm 0.07$	$0.3^{g} \pm 0.03$	$0.5^{g} \pm 0.03$

[a,b,c,d,e,f]Means with different superscripts within rows and columns differ ($P < 0.05$).
[g,h,i]Means with different superscripts within rows and columns differ ($P < 0.05$).

Summary

- Collection method, head restraint, and CS all affect hip height measurement
- TPE overestimate heights
- Despite a high degree of reproducibility, operator error could affect hip height measurement

MAFES

Recommendations

- Recommendations for hip height measurement
  - Confine cattle to a chute with their heads unrestrained
  - Allow extra time and care in technique for cattle with CS > 1 or when cattle are moving
- STK
  - Level and floors
- VIS
  - Obstructions and clearness of marks
- TPE
  - Properly positioned and consistent

MAFES

Conclusions

- Different methods available for measuring birth weight and hip height
  - Variations in data collected
- Inaccurate data submitted to breed associations could affect EPD calculations
- Time to collect the most accurate measures possible

MAFES