MANAGEMENT PRACTICES OF DEVELOPING HEIFERS AFFECT LIFETIME PRODUCTIVITY

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Boyhood advice…

"Once an early calver, always an early calver"
-My Dad

Case Study Literature…

- Lesmeister et al., 1973 – Montana
  - Bozeman and Havre
- Funston et al., 2012 – Nebraska
  - Gudmundsen Sandhills Laboratory
- French et al., 2013 – Colorado
  - John E. Rouse Beef Improvement Center

Retrospective data using "easy" to-collect-histories

CASE STUDY #1:

Date of first calving of 481 cows on subsequent calf performance of 2,036 calves in 1950's and 60's

DATE OF FIRST CALVING IN BEEF COWS AND SUBSEQUENT CALF PRODUCTION[1]

J. L. Lesmeister,[2] P. J. Burfening and R. L. Blackwell
Montana State University, Bozeman 59715

- J Anim Sci 36:1-6, 1973
- Western Regional Research Project W-1
- Data:
  - Bozeman, MT – 1950 to 1968
    - 386 purebred calves from 85 Angus cows
    - 481 purebred calves from 105 Hereford cows
  - Havre, MT – 1952 to 1966
    - 1169 purebred and grade calves born to 291 Hereford cows
- Published 40 years ago
- Cows 45 to 63 years ago

Principle #1 (Lesmeister)

- **Heifers that conceive early as yearlings during their first breeding season appear to be "programmed" for productive lives.**
  - *"…manage first-calf heifers for early calving in the optimum season…"*
  - *"A larger proportion of heifers than needed should be bred, pregnancy tested and culled if open."*

Principle #1 (Lesmeister)

- *"Heifer that conceive and calve earliest immediately indicate their reproductive efficiency and lifetime potential."*
- *"…proper application of selection for rapid growth and early sexual maturity…and adequate nutritional regime[n] are essential for **"programming"** beef cows for early, regular calving throughout their productive lives."*

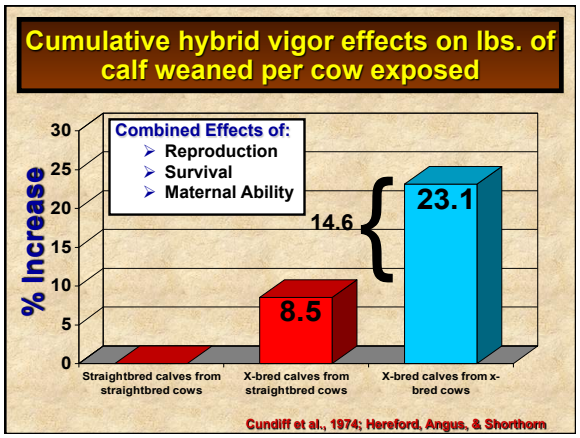
Principle #2 (Lesmeister)

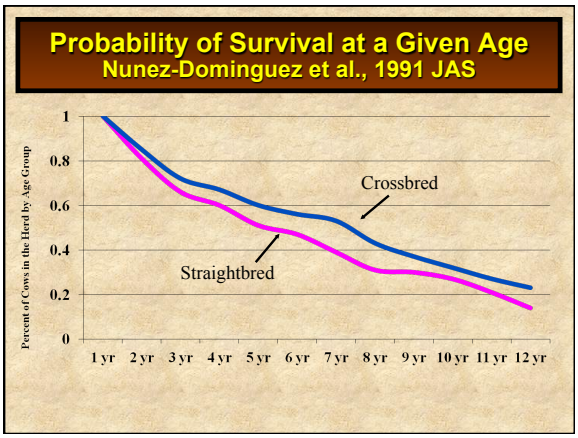
- **Early-born calves performed better than later-born calves**
  - *"The calving group [early, mid or late] for a particular calf had a highly significant (P< .01) effect on its performance from birth to weaning.*
  - *"Calves born earlier in the normal season weighed more at weaning than later calves due to their older age and their faster rate of pre-weaning gain." (Lesmeister et al., 1973)*
  - Primarily due to age, not ADG

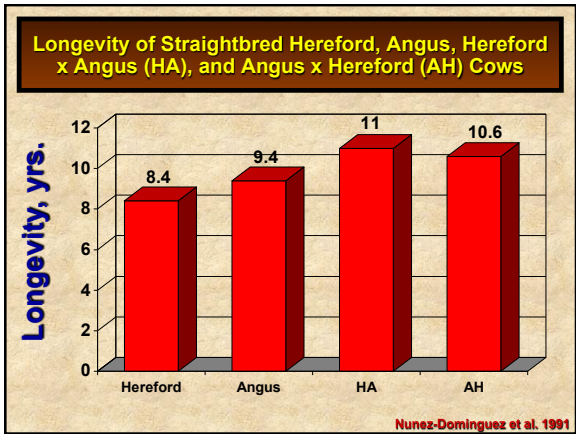
Principle #3 (Lesmeister)

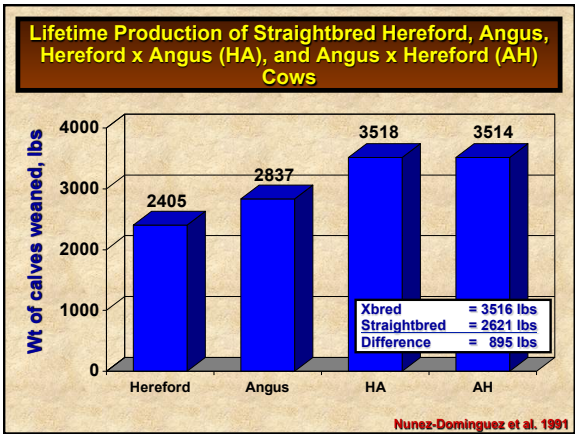
- **Release of dominance expressed as heterosis in reproductive traits is real.**
  - Havre:
    - Four different closed lines and one crossline of Herefords
    - The Havre crossline Hereford cows (line 5) resulted from mating line 1 cows with line 4 cows to evaluate the release of linebreeding dominance.

- *"…The crossline cows [line 5] consistently showed better performance than the straight line cows and earlier initial calving groups than the mean of straight line cows.*
- *"The calves had heavier birth weights, heavier weaning weights, older weaning ages and higher average daily gains than the straight line calves. **Inbreeding depression and heterosis were evident**." (Lesmeister et al., 1973)*









CASE STUDY #2:

Effect of calving date of 1,019 heifer calves on reproductive and progeny performance in the 1990's and 2000's

EFFECT OF CALVING PERIOD ON ADG, REPRODUCTION, AND FIRST CALF CHARACTERISTICS OF HEIFER PROGENY

R. N. Funston*, J. A. Musgrave, T. L. Meyer, and D. M. Larson
University of Nebraska, West Central Research and Extension Center, North Platte

Objective: J Anim Sci 90:5118-5121 (2012)

Determine the effect of time of calving on calf growth rate and impact on reproductive performance

Data

1,019 heifer calves born at UNL Gudmundsen Lab 1997 to 2009 (2-yr-olds excluded, all heifers retained as replacements)

Born in first, second, or third 21-day period

Principle #4 (Funston)

- **Heifers born early in relation to herdmates, increase the likelihood that they will conceive early in their first breeding season.**

Calving Period on Heifer Progeny Performance

	Calving Period		
Item	**1**	**2**	**3**
Birth date, days	0	+16	+36
Weaning weight, lbs	482	467	433
Pre-breeding weight, lbs	651	642	607
Cycling at start of season, %	70	58	39
Pregnancy rate, %	90	86	78

Means differ ($P \leq 0.05$)
Means do not differ ($P > 0.05$)

Principle #5 (Funston)

- **Early-born heifers tend to have early calves themselves.**

Calving Period on Heifer Progeny Performance

	Calving Period		
Item	**1**	**2**	**3**
Birth date of 1st calf, days	0	+5	+7
Calved in first 21 days, %	81	69	65
Weaning wt of 1st calf, lbs	425	416	409
Preg rate after 1st calf, %	93	90	84

Means differ ($P \leq 0.05$)
Means do not differ ($P > 0.05$)

Principle #6 (Funston)

- **Steer progeny from early calving cows produce higher value carcasses than late calving cows.**

	Calving Period			
Item	1	2	3	P Value
HCW, lb	818	805	778	<0.01
YG	3.0	2.9	2.7	<0.01
Marbling	569	544	519	<0.01
CH or greater, %	79	78	65	0.13
Avg CH or higher, %	34	19	14	0.01
Carcass Value, $	$1,114	$1,089	$1,040	<0.01

CASE STUDY #3:

Effect of Early (with synch and AI) vs. Later Conception (to cleanup bull) on Lifetime Production in 1,173 females (1991-2010)

PAS 29:57-63 (2013)

Differences in lifetime productivity of beef heifers that conceived to first-service artificial insemination (AI) or a clean-up bull via natural service (NS) as a yearling and among females that were offspring of an AI or NS mating

J. T. French,* J. K. Ahola,*[1] J. C. Whittier,* PAS, W. M. Frasier,† R. M. Enns,* and R. K. Peel*
*Department of Animal Sciences, and †Department of Agricultural and Resource Economics, Colorado State University, Fort Collins 80523

Project Supported by Select Sires Research Grant

"Early" vs. "Later" Conception on Lifetime Production

Objectives:

Determine differences in lifetime prod'n among:

1) Females that were synchronized and conceived early (to AI) vs. later (to natural service) during breeding season
2) Females that resulted from early (AI) vs. later (natural service) conception

Data:

1,173 Angus females subjected to synchronized AI from 1991 to 2010 (6,693 records)
Conceived to AI or NS beginning 10 d later

John E. Rouse Beef Improvement Center (BIC) Management Practices…

- Yearling heifers
  - AI'd 3 to 4 wks before cows
  - AI'd to same ranch-produced bulls as used for natural service
    - High altitude research objectives – and adaptability to high elevation
    - Reduced some of the benefit of using elite genetics through AI

BIC Management Practices…

- Cows AI'd to outside and ranch-produced bulls
  - Reduce inbreeding
- All females subjected to annual estrus synchronization protocol
  - Protocol varied by year and included fixed-time, observed and/or fixed-time followed by observed
- Bulls went in 10 days post AI

Purpose of Synchronization…

1 — Non-Synchronized ~5% of cycling females in heat each day — 21

Synchronized ~95% of cycling females in heat first day

Induce fertile ovulation in anestrus females

Reminder and caution with this study….

- Natural service did not begin at the same time that AI began
- Bulls only could breed females that did not conceive to AI
- There was not a non-synchronized control group
- Full potential merits of using elite sires through AI were minimized

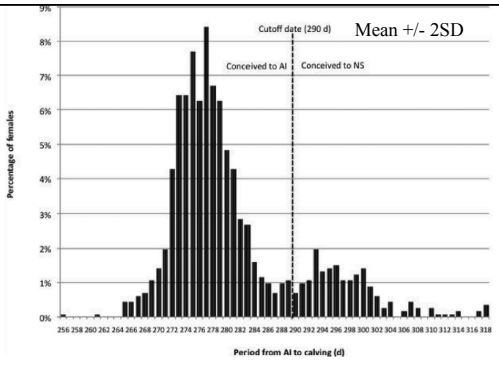


Figure 1. Distribution of the time period (in days) from AI to calving for all females in the data set, and determination if conception as a yearling was to AI or natural service (NS) based on a 290-d cutoff date. Figure includes data from 1,173 females from 1991 to 2010.

Conceiving Early vs. Late as a Yearling

	Heifer's performance				Performance of calves (lifetime)					
Conceived	n =	YW	Age at AI (d)	PPI (d)[1]	n =	BW	WW	Age at wean (d)	TTL WW	# Calves wean
Early to AI	871	680[b]	429[b]	92	4,530	81[a]	462[b]	186[a]	2,358[f]	5.2[f]
Later to NS	302	660[a]	418[a]	87	909	79[b]	451[a]	188[b]	1,395[e]	3.0[e]
Difference		220	11	5		2	11	2	963	2.2

[a,b] Means within a column without a common superscript differ (P < 0.05).
[e,f] Means within a column without a common superscript differ (P < 0.0001).

Lifetime Revenue Produced
Heifers Conceiving Early or Late

	n =	Lifetime Revenue
Conceived early to AI	871	$2,483[a]
Conceived later to NS	302	$1,561[b]
Difference		$922

Principle #7 (French)

- **Yearling heifers that respond to estrus synchronization and conceive early to AI produce greater lifetime revenue than heifers that conceive to natural service.**

Offspring of an Early vs. Late Conception

H-AI	female born to a heifer and early (via AI mating)
H-NS	female born to a heifer and later (natural service)
C-AI	female born to a cow and early (via AI mating)
C-NS	female born to a cow and later (natural service)

Offspring of an Early vs. Late Conception

	Female's performance				Performance of calves (lifetime)					
Dam	n =	YW	Age at AI (d)	PPI (d)	n =	BW	WW	Age at wean (d)	Total WW	Calves wean
H-AI	195	678[a]	450[a]	88	926	81	462	188	2,143	4.6
H-NS	40	658[ab]	421[b]	88	175	81	460	186	1,914	4.2
C-AI	618	691[a]	427[b]	87	2,928	79	460	186	2,125	4.7
C-NS	320	645[b]	403[c]	84	1,454	79	455	187	2,176	4.7

[a-c] Means within a column without a common superscript differ (P < 0.0001).

Lifetime Revenue Produced
Females Resulting from Early or Late

	n =	Lifetime Revenue
H-AI	195	$2,223
H-NS	40	$1,949
C-AI	618	$2,253
C-NS	320	$2,313

So What…

- Managing heifers to calve during the beginning of the calving period:
  - Programs them for productive lives
    - Older, heavier calves
    - More calves
  - Their calves perform better
    - Heifer progeny conceive and calve earlier
    - Steer progeny have higher value carcasses

So What…

- Estrus synchronization is a tool to produce early calving heifers
- Heifers born from AI are more valuable as cows ($922) than those born from the same clean-up bulls

One approach…when resources allow…

- Retain high percentage of heifer calves
- Develop at modest (adequate), less expensive rate of gain
- Synchronize and AI them
- No clean up bulls
- Preg check early – **Selection for fertility**
- Stocker options for open heifers
- "Program" productive cows